2014 RCMT MEETING

38th Annual Meeting

Hosted by: ***California Dept. Fish & Wildlife***
Location: ***NOAA SW Fisheries Science Center****, Santa Cruz, CA*
Dates: ***April 29,30, 2014***

Meeting Minutes

For further information see: **http://www.rmpc.org/2014-meeting-calander-and-information.html**

APR 29: TUESDAY: 9:00 AM – 4:00 PM

1. General Business Items (George Nandor/PSMFC)

- Welcome and introductions;
- Next year's mtg – 2015 -- is intended to be hosted in Alaska: what dates to consider?
  - Planned to be held in Juneau in May 2015; Dion will coordinate and pass along details as they become available
- The 2016 meeting is intended to be hosted in Idaho
- Review agenda

2. Regional Mark Processing Center operations & announcements (RMPC staff)

A. Status of CWT Datasets (Dan Webb/PSMFC)

Summary document available online: ***http://www.rmpc.org/2014-mark-meeting-documents.html***

- No longer conducting a data trend analysis for this presentation
  - Instead of comparing current year record counts to those reported in previous years, we are only looking to see if individual reporting agencies have recently submitted data files for validation (per Mark Committee Meeting 2013)

- All locations necessary to validate data are present

- All release reporting agencies have either updated or confirmed that their data sets are current
  - WDFW recently re-reported all their releases to improve accuracy and remove redundancies
    - Issues relating to these kind of mass changes will be discussed later in the agenda
    - If you have questions on agency data that has been submitted, use the Contact Lists on the Publications page of the RMPC website to contact the submitting agency directly
  - ADFG & WDFW have started submitting FULLSET releases on a weekly basis, other agencies submitting monthly or periodically throughout the year
  - Nez Perce tag releases: ODFW and WDFW both have recovered a very large number of Nez Perce tags over the past several years. Unfortunately, these recoveries can't be reported to RMIS for inclusion into the regional CWT database because the release data for the given tag codes have not been submitted to RMIS. This non-reporting problem has persisted for at least five years now and needs to be resolved to break the logjam of region-wide unreported recovery data for Nez Perce tagging.

- Recoveries were reviewed to make sure every agency had records through the 2012 run year in the database
  - Recoveries currently missing:
    - CDFW/ Klamath Trinity data for 2008-2012 (will be submitted in the next two weeks), no one is assigned the responsibility to manage and submit the data
    - CRITFC data sets for 2002-2012 reported by individual agencies
    - Nez Perce does not currently have any recovery years present or a data provider to submit their data.
    - NMFS 2012-2013 data errors

        - QDNR 2012 data sets not present
        - Quileute Tribe- 2010 data errors, 2011 & 2012 data sets not present, currently working with NIFC to resolve issues
        - Yurok Tribe Fisheries Program- 2008 data errors not expected to be resolved at this time. No one is assigned the responsibility to manage and submit the data
        - Makah Tribe (MAKA) has recovery data in preparation (to be sent through WDFW)
        - Colville Tribe (COLV) will also be reporting recovery data

- Catch/ Sample was reviewed with the same criteria as the Recovery data for missing data sets and data sets with errors (Dan can discuss errors on an individual basis with the reporting agency)
    - Catch Sample currently missing:
        - FWS has one 2004 data set with 1 failed record
        - CDFW/ Klamath Trinity- 2008 thru 2012 data sets are not present
        - CRITFC data sets for 2002-2012 reported by individual agencies
            - 2000-2001 CRFC data should belong to someone else (probably YAKA)
        - IDFG- presently working to begin reporting Catch/Sample data
        - Nez Perce- same issues as with recoveries
        - QDNR- 2012 data sets not present
        - QUIL- 2009 data errors, 2011-2012 data sets not present
        - YAKA- 2008 data errors, 2009-2012 not present
        - YTFP- same issues as with recoveries

B. Project to update agency acronyms throughout database (Dan Webb)

Summary document available online: ***http://www.rmpc.org/2014-mark-meeting-documents.html***

- Identifying acronyms in the database that should be changed/ updated and went through the proposed changes for the group for any objections or edits

- Items identified during the meeting for change/ follow-up:
    - COOP- change to WDFWCOOP not WACFWRU
    - CTWS- change to CTWSRO
    - Will check on Elwha/ Klallam spelling
    - Need to highlight the changes that impact reporting agencies
    - Will check on official names of all tribal entities. Ken Phillipson will contact the RMPC on this. In general, there will be few or no changes to the current acronyms or tribal names.
    - Need to add (AK) to Norton Sound Economic Development Corporation
    - Remove “office” from NFMS NW Fisheries Science Center
    - Need to call Colville and Spokane tribes directly for official names since they are not represented elsewhere

- Will add in state abbreviations to agency names (useful for locating tribes)

- Changing these codes means you need to notify people who may pull data by codes on already written programs and may miss items or error out if they don’t have the updated info- make sure to provide them with plenty of advance notice

C. NPCC – Columbia Basin Marking & Tagging report & maps (Jim Longwill/PSMFC)

Summary document available online: ***http://www.rmpc.org/2014-mark-meeting-documents.html***

- The Northwest Power and Conservation Council requested the report in February. They didn’t say why or what it was to be used for (may have wanted to see how well agencies were doing in meeting Adipose Marking Mandate for federally funded programs).
- Report profiles Release Year 2012 and looks at percentage Fin Clip vs percentage Non Fin Clip by species and rearing location
- Maps provide clipping percentages by species at hatchery locations
- What proportion of fin clipped fish have CWT? Usually around 5%

    - Question was not addressed in this report or asked by the Council
- Ringold Springs Hatchery- Steelhead have traditionally been clipped (WA/ USFWS may need to correct their data); locations shown are based on rearing location and not release location. According to the future brood document - these fish (180,000 fish release goal) should have received an ad-clip.
- Mark Engelking noted that Minto Pond facility was under repairs throughout year 2012, so the fish were transferred to Willamette Hatchery during that time.

D. Demonstration of new RMIS InfoList / InfoMap service (Jim Longwill)

- Jim went through some examples with the group
- InfoMap service georeferences the hatchery, release site, and recoveries for a particular tag code
- Recovery points do not indicate the specific point of recovery; rather, they represent the central point of the catch area designation
    - Would be interesting to have different colored dots for different recovery years
    - Would be interesting to have the catch area designation overlaid when you zoom in on a dot
- RMPC has been working with states to assign lat/long data when it's been left blank
- Hatchery location dot will cover up the recovery dot at the hatchery- trying to figure out a way to address this with different symbols or minor edits to lat/long
    - yellow dots designate the 'Hatchery of rearing'
    - Could size of dots be tied to number of recoveries? Or could the number be added to the dot?
    - Could Stock Site be mapped as well? Or at least be able to filter by Stock Group? Would be useful in the case of transfers
    - Plans are underway to improve the content of pop-up boxes when clicking on the dots

3. California: Hatchery Scientific Review Group (HSRG) process (Heather McIntire /CDFW)

PowerPoint presentation available online: http://www.rmpc.org/2014-mark-meeting-documents.html

Presentation on implementation & status to date

- Hatchery Policy Team
    - Reviews HCT recommendations (11 Hatchery Coordination Teams- just started to meet this year, beginning to develop the hatchery purpose, will be a long process)
    - Identifies funding sources
    - Ensures consistency/ integration statewide
- http://www.cahatcheryreview.com/

Discussion of regional drought situation & possible ramifications

- First time in 15 years that the entire state is under drought conditions
- Reservoirs are at about 50% of storage
- Governor has determined that the drought is the number 1 priority for the state
- Drought #1 priority for CDFW:
    - Coordinating with water operators on many fronts
    - Emergency fishing closures
    - Enhanced monitoring statewide
    - Hatchery actions
- Looking at lots of fish coming back with no habitat for them- trying to implement new regulations to deal with this drought probably won't be in place in time for this year, but will be ready for future droughts
- There is talk of adult rescue for listed fish
- Hatchery Practices for Salmon & Steelhead bill proposes 100% CWT for chinook, coho, and steelhead and adclipped- no funding identified in the legislation
- Coleman NFH fish are affected by the Delta Cross Channel gate. When opened it may require trucking down to the lower delta (Rio Vista, etc.)
- Given the potential ramifications of 2013-2014 California Assembly Bill 2684 (with possible requirements to mark & CWT), is there a mechanism for other states to provide input (at the agency level) especially with

regards to concerns about recoveries? Are there concerns about the ability to maintain a CWT database? Note also: bill is amended as of May 27, 2014. **Bill text added as: Appendix G.**

4. California: Update & discussion of tagging programs (Stan Allen/PSMFC)

Handout was provided as Appendix B

- 25% of all CA Hatchery Fall Chinook are CWT and ad-clipped
- 100% of all CA Hatchery Steelhead are ad-clipped only (never been tagged because there is no recovery program in place)
- 100% of all CA Hatchery late-fall/ winter/ spring Chinook are CWT and ad-clipped
- Tagging rates expected to be consistent for at least the next couple of years

5. Update on current BPA funding & ramifications for agencies (George Nandor)

- Bonneville (BPA) been receiving pressure to reduce funding over ~ 3 year period to fish & wildlife programs- utilities are arguing that it isn't their responsibility to fund CWT programs or sampling/ recoveries for Mitchell Act hatcheries
- Results in significant impacts to agencies and requires them to reallocate funding in order to compensate for BPA cuts- if agency is going to have a fishery, they have to do the sampling
- Same thing is occurring in California- mitigating agencies refusing to pay for tagging or sampling
- BPA maintained full funding for RMIS database and created separate contracts for the WA and OR projects
- At BPA built/ funded hatcheries, they accept responsibility for tagging those fish; at Mitchell Act funded hatcheries, they claim that they are not responsible for those fish and that the Mitchell Act should fund those tagging programs

6. Update & Discussion of CWTIT Program & Project Status (Marianne McClure /CRITFC)

Summary documents provided as Appendix C

- CWTIT program sent out final year's request for proposals (5th year of 5 year project
- Received 17 proposals for $2 million in funds requested
- 14 projects recommended for funding include:
    - $23,000 for CWTIT travel to complete review process
    - $253,000 for WA/ $165,000 for OR coastwide CWT sampling programs
    - Purchase of 41 new T-wands for NWIFC
    - $68,000 for expansion of SE Alaska Marine Sport Sampling
    - $95,000 for purchase of 20 ruggedized tablets for SEAC
    - Purchase of 60 new wands for WDFW
    - $61,000 to improve ability of Makah tribe to process heads (got them a second freezer and a second technician during the season)
    - $75,000 to improve OR database systems

- Drafted a memo to identify projects that have been supported through this funding that are in danger of disappearing now that funding has expired
    - This is the first year for Canada to not have funding and are seeing some regression because of it

7. All-Agency Update on: (Tag-Coordination Representative, ALL-AGENCY Participation)

- Tagging Levels for 2014.....see tables below
- Mass Marking for 2014.....see tables below
- Mark-Selective Fishery Plans &/or Comments.....see tables below

Agency or Organization	2014 Tagging Levels, Mass Marking, MSF Plans, Comments
WDFW / Washington Dept. Fish & Wildlife	**see Appendix D** tagging levels consistent with previous years at around 15 million fish, bolded items on the handout indicate changes from 2013
ODFW / Oregon Dept. Fish & Wildlife	**see Appendix D** tagging/ marking levels consistent with previous years, mark nearly 100% of all fish in some way
[BCFW / B.C. Ministry of Env., Fish & Wildlife]	130K steelhead ad clip only
IDFG / Idaho Dept. Fish & Game	**see Appendix D** Changes to Snake River Sockeye levels- BY2013 will be at ½ million fish, goal of 1 million fish by BY2015; Springfield hatchery (new) is now coming operational All sport fisheries are mark selective
ADFG / Alaska Dept. Fish & Game	Tagging levels remain the same Thermal Marking Chinook in SE Alaska (no recovery for it)
CRFC / Columbia River Intertribal Fish Commission	Tribal tagging levels remain at status quo
CDFW / California Department of Fish & Wildlife	Tagging levels remain at status quo **(see Appendix B)**
CDFO / Fisheries & Oceans Canada	**see Appendix D** (includes an update on their MSF requests)
NIFC / Northwest Indian Fisheries Commission	**See Appendix D (included with WDFW update)** Tagging levels increasing slightly- 5 mil tags per year (4mil Chinook, 1 mil Coho, 100K Steelhead); new increases are for Chinook conservation programs (CWT only) MM 14 million (approx.7 mil marked by WDFW)

	A couple of experimental MSF for tribes
NMFS / National Marine Fisheries Service, Alaska	Tag+AdClip 162K Chinook
MIC / Metlakatla Indian Community	Tagging levels remain at status quo
FWS / U.S. Fish & Wildlife Service	**see Appendix D** not many changes for this year; italicized fish on the handout are those that are marked/ tagged and then transferred to another agency- Can provide contact info for whoever received the transferred fish on request No longer employing a DIT program at Quinault for Coho

8. Special Marking Requests & Announcements for 2014: (George Nandor)

- **Requests & Announcements received to date:**
- **Requests involving use of 'agency-only wire'?**
- **Other requests?**

Variance Requests provided as Appendix E

CDFW Variance Request previously received and approved
CDFO will continue with their Sockeye variance (clipped but no CWT), will submit an official request form

WDFW dealing with an 'agency-only wire' request for 200K Chinook

9. Update on PSC Data Standards Working Group (Jim Longwill)

Summary document available online: http://www.rmpc.org/2014-mark-meeting-documents.html

- Most recent meeting was in February 2014 in Vancouver, Canada
- Proposed changes will go to the Data Sharing Committee for review
- Reviewed the minutes from the meeting to highlight changes
    - For all data types, there is a proposed new file naming standard for data files sent to the RMPC for validation
    - For releases- use the term 'preliminary' rather than 'incomplete mid-year'
    - For releases- new field 'Stock Origin Type' created (natural origin parents, hatchery origin, mixed parents, captive brood parents, unknown)
        - Who is going to instruct users on how to determine which code to use?
        - Need to define the categories better within Data Standards Committee
    - For releases- introduce new code for Agency-Only Blank Wire releases (type A record)
    - For releases- adopt optional new field Length Coefficient of Variation (Length CV)
    - For recoveries- new field 'Unresolved Reason' to indicate why it is a status 7
    - Changing term 'pseudo tag' to 'ag-wire'

- For Catch/Sample- there are quality concerns with the Catch/Sample ID particularly with '0', null, or duplicated
- Use term 'heads taken' to better define 'recovered'.
  - A sub workgroup is to be convened to better define these fields and add a supporting chapter in the appendix
- For Locations, agreed to replace embeeded blanks in the code with a dot '.'
- Suggested timeline- finalize minutes by May 1, compile summary of changes by Nov 2014 Data Sharing Meeting

- Data Standards Meeting minutes will be forwarded to Mark Committee Members/ posted online when final

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APR 30: WEDNESDAY: 8:00 AM – NOON

10. Update on High Seas CWT Sampling and Recovery Program (Adrian Celewycz/NMFS-AK)

PowerPoint presentation available online: ***http://www.rmpc.org/2014-mark-meeting-documents.html***

High Seas Recoveries for 2012-2013

Three High Seas CWT Sampling Programs

- Gulf of Alaska Groundfish fishery
  - North Pacific Groundfish & Halibut Observer program
  - CWT Tunnel Detector Test
  - Salmon Excluder Device trawling
  - Rockfish Trawl Fishery
- Bering Sea-Aleutian Islands (BSAI) Groundfish fishery
  - North Pacific Groundfish & Halibut Observer program
- Research Trawling for juvenile salmon

Chinook Salmon by-catch in the GOA:

- Visual Sampling in Observer Program
  - 2012- Sampled 1004 fish, found 9 CWT
  - 2013- Sampled 740 fish, found 27 CWT
- Electronic Sampling with Tunnel Detector
  - 2012- Sampled 1203 fish, found 71 CWT
  - 2013- Sampled 611 fish, found 40 CWT
- Electronic Sampling in Rockfish Trawl
  - 2013- Sampled 2111 fish, found 113 CWT

Chinook Salmon by-catch in the BSAI:

- Visual Sampling in Observer Program
  - 2012- Sampled 1160 fish, found 5 CWT
  - 2013- Sampled 1323 fish, found 4 CWT

Salmon by-catch in the juvenile salmon Research Trawling Program:

- Electronic Sampling in Research Trawling
  - 2012- Sampled 554 chinook, found 68 CWT
  - 2012- Sampled 645 coho, found 15 CWT
- Electronic sampling programs are highlighting the issue that visual CWT detection/ Ad-Clip identification by observers is a low priority for observers that have many other tasks associated with each trawl haul.

- New electronic sampling programs in GOA have significantly increased the number of CWT recoveries in GOA over the last two years

- Note there is missing WA-OR-CA Hake fishery data for years 2012, 2013

- Contact Vanessa Tuttle regarding information on the Hake fishery by-catch

- Adrian is retiring at the end of 2014, no successor has been identified as of yet. Hopefully NMFS-Alaska will continue to participate on the Regional Committee on Marking and Tagging. If not, contact Phil Mundy, the lab director of the Auke Bay Laboratories, Ted Stevens Marine Research Institute for information.

11. Update on PSC SFEC Activities (Carrie Cook-Tabor/USFWS)

PowerPoint presentation available online: http://www.rmpc.org/2014-mark-meeting-documents.html

- PSC Selective Fishery Evaluation Committee tasks:
  - Coordinate and report on MM and MSF programs
  - Advise PSC
  - Develop analytical tools
  - Assessment and monitoring of stocks
- Made up of the Analytical Workgroup (AWG) & Regional Coordination Workgroup (RCWG)
- Looking for a NOAA rep to the Analytical Workgroup

- Primary AWG tasks:
  - Develop analytical tools
    - Evaluate potential impacts on the CWT program
    - Exploitation rates
    - Tagging rates
    - Sampling rates
  - Annual review of MSF proposals
- Primary RCWG tasks:
  - SFEC Annual Review of MM Proposals
  - Annual Coordination Report
    - Documentation of MM, DIT, MSF, and CWT Sampling activities
  - Coordinate and report on continuing research on electronic tag detection and MM technologies

- Minor decrease in Coho MM Proposals for 2013-2014
- Increase in Chinook MM Proposals for 2013-2014
- 2014 Projected Sampling Encounters for marked and untagged fish reduced from the previous year estimates
- Issues identified:
  - Need more DITs, especially in Columbia River and the OR coast
  - Need better coastwide electronic tag detection
  - Agencies not submitting post-season MSF reports
  - Inadequate modeling capacity to evaluate impacts of large-scale MSFs on Chinook
  - Mixed bag regulations hinder ability to estimate mortality in MSFs

- Mark Selective Fishery Evaluations ***(see associated document: "Chinook Marine MSF Summary 2003-2013", Robert Conrad /NWIFC)***
  - Are MSFs operating as intended? Were told that MSFs would allow for:
    - Increased of consistent harvest opportunity
    - Better brood stock managements
    - Meet unmarked mortality rates
    - Provide clear regulations
    - Develop management tools
  - MSFs for Chinook began in 2003 for Puget Sound
    - Conducted fishery assessments- some intensively monitored, other just baseline monitoring
  - Want the release mortalities to be lower than fish retained- working in some areas, not so well in others
  - Conclusions & next steps
    - Bias in FRAM projections
    - More years of assessment are needed
    - Stock-specific evaluations are needed

Discussion:

- ADFG has run across fish with a CWT and no ad-clip (their observers required to wand every 10th fish) that are reported as CWT w/ ad-clip. It is assumed here that the release data is actually incorrect in mark type. Need to contact the reporting agency so that they can correct as needed.
- In CA, the ad-clip always means there is a CWT so they take the head- they sometimes see "regenerated" adipose fins and take the head anyway just in case- find tags in 95% of them
- *Parental based tagging was also discussed.* ***Ron Olson handed out a NWIFC paper on PBT that was written by SFEC members. This is not a SFEC document, but he thought it would be of interest to the Mark Committee. (see 'Q&A About Parental Based Tagging' provided as Appendix F)***

12. Improve reporting practices of fish groups prior to release (Melodie Palmer-Zwahlen/CDFW)

- appears that some data reporting problems are impacting cohort reconstructions, ocean harvest models, other analyses;
- seeking to improve follow up reporting to RMPC in cases of high pre-release mortality;
- CA is seeing ad-clipped fish in fisheries where release indicated '0% ad clipped'.

- 2 key components for their models are release and recovery data
- With two sampling methods being used, means there are two production factors to deal with (electronic production factor vs visual production factor)
- Need to make sure they have the right production factors and expansions to come up with natural origin vs hatchery proportions
    - Is it possible to bring production factor information into the release data to avoid errors?
        - There is no easy way to get to a production factor (other agencies may be calculating other variables)
        - Simplicity of the past disappeared with Mass Marking- only way to come up with a # shed is to use the tag loss rate
        - Need to report back to agency when errors are discovered so they can be corrected
          Mark Committee would like CDFW error checking to be documented for Data Standards (provide some examples of what is being seen, what the errors look like, their validation process, etc) to address improvements for the future
        - Not likely that new fields will be introduce for an agency's specific use (not trying to create replication within the database)
        - Agencies are not consistent in how they are documenting the various potential marks, nor shed tags.
- Reports (escapement, recovery rates, etc) are available on CDFW website

13. Presentation on TOPP (Tagging of Pacific Predators) program (Daniel Costa /UCSC)

PowerPoint presentation

- 60 different investigators involved in the project
- Had a very generalized idea of where the animals went prior to this project- wanted to better understand migratory patterns and how their life history drives the behavior
- Published their results in 2011 in 'Nature'
- Data collected identified the biological hotspots of the Pacific Ocean
    - CA Current and N Pacific Transition Zone have highest predator density and are a return draw for species
    - Also discovered 'White Shark Café' area- no one knew this area was an aggregating site or what the sharks are doing there, some speculation that it might be a breeding site, no reason to be there in terms of primary productivity or geographic significance
- Discovered that movement patterns and migratory corridors (especially with ectotherms) are tied to sea surface temperature and follow spikes in primary productivity; also discovered very strong habitat partitioning (in terms of both geography and activity within the water column) within species and guilds

14. Northwest Marine Technology (Geraldine Vander Haegen/NMT)

- Product update& General Information
  - Gave 2.3 million DIT to CDFO- were used on indicator stocks; allowed them to sustain higher levels of CWTIT tagging
  - Gave 25,000 tags to Tulalip tribe- were used on indicator stocks
  - Good time for trailer maintenance
    - If your computers are over 5 years old they are outdated and need to be replaced
  - New trailer in Idaho at Clearwater Hatchery, new trailer for Colville tribe
  - Power supplies are available for the V detectors in the lab if you prefer that instead of using 9 volt batteries (contact NMT for recommendations)

- Q&A: issues with electronic detection & T-Wands.. How well are they working? etc.
  - Sold over 500 T wands to date, 422 in PNW, 30 to Great Lakes
    - Had very few repairs (only 6 back in 2014)
    - Wands seem to be stable and sturdy
  - Should they adjust the sensitivity of the wands? Trying to get the maximum detection range to allow for variation in technique while still maintaining effective detection. Currently set at 5.2, and may need to re-tune to a lower detection range (like at 4.5).
    - Seeing interference where there is a lot of metal (on boats, on traps)
    - Need to provide additional training to samplers
    - More concern about false negatives than false positives
  - Kathy Fraser remarked that she would not like to see the wands set lower until a study could be done to ensure that tags would not be missed. She then mentioned a study underway at CDFO this fall. **See Appendix H for details on this study**.
  - If anyone is interested in testing wands tuned to different detection distances, or want their wands re-tuned, or want additional training, contact NMT.

APR 30: AFTERNOON

Tour: NMFS coho captive broodstock program at the NMFS laboratory. (on site)

Introduction: 11:30-11:45: Dr. Brian Spence, NMFS
Tour: 11:45-12:30: Dr. Erick Sturm, NMFS

Appendix A

2014 Mark Meeting Attendees

***Committee Member or Designee**

Name	Agency	Mailing Address/ Telephone/E-mail Address
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Appendix B

Constant Fractional Marking in California

(Stan Allen with Jason Azat)

Appendix B

California Marking/Tagging Program – 2014
Stan Allen (PSMFC) with Jason Azat (CDFW)

Klamath

Iron Gate Hatchery

Fall chinook	25% ad-clip/CWT
Coho	No ad-clip/CWT
Steelhead	100% ad-clip/no tag

Trinity Hatchery

Fall chinook	25% ad-clip/CWT
Spring chinook	100% ad-clip/ CWT
Steelhead	100% ad-clip/no tag

Central Valley/San Joaquin

Coleman NFH/Livingston Stone

Fall chinook	25% ad-clip/CWT
Late-Fall chinook	100% ad-clip/CWT
Steelhead	100% ad-clip/no tag
Winter chinook	100% ad-clip/CWT

Feather River Hatchery/Annex

Fall chinook	25% ad-clip/CWT (some groups 100% ad-clipped/CWT)
Spring chinook	100% ad-clip/CWT
Steelhead	100% ad-clip/no tag

Nimbus Hatchery

Fall chinook	25% ad-clip/CWT
Steelhead	100% ad-clip/no tag

Mokelumne Hatchery

Fall chinook	25% ad-clip/CWT
Steelhead	100% ad-clip/no tag

Merced Hatchery

Fall chinook	25% ad-clip/CWT

Friant Hatchery (experimental)

Spring chinook	100% ad-clip/CWT (from Feather River Hatchery)
Fall chinook	100% ad-clip/CWT (experimental/research)

Coastal California

Warm Springs Hatchery

Steelhead	100% ad-clip/no tag
Coho	no ad-clip/100% CWT but varies (conservation program)

Mad River Hatchery

Steelhead	100% ad-clip; no tags

Rowdy Creek Hatchery

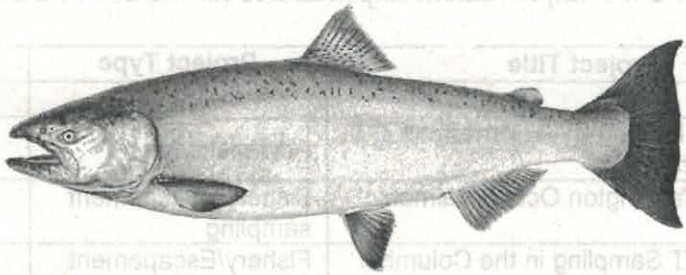
Fall chinook	100% ad-clip/CWT
Steelhead	100% ad-clip; no tags

NMFS Santa Cruz

Coho	100% CWT/ no ad-clip

Appendix C

CWTIT Funding Recommendations for 2014



PSC Coded Wire Tag Implementation Team

U.S. CWTIT

TO: U.S. Section, Pacific Salmon Commission

FROM: Scott McPherson, Co-Chair CWTIT and U.S. CWTIT Members

DATE: February 7, 2014

SUBJECT: 2014 Coded Wire Tag (CWT) Improvement Funding Recommendations

The members of the Coded Wire Tag Implementation Team (CWTIT) have conferred to recommend projects for funding in the 2014 cycle, as of February 7, 2014. The U.S. CWTIT members recommended projects for funding total $1,538,000.00 (see Tables 1 and Appendix 1). Briefs describing what the benefits of funding each project and the consequences of not funding them are included for each project in the section below Table 1.

The CWTIT recommends using the full funding available for FY14, $1,500.000.00, plus $38,000.00 remaining from a previous year's project.

CC: U.S. Commissioners
Cheryl Ryder, U.S. Section
Allen Willey/Federal Program Office

Table 1. Proposed U.S. CWT Improvement Expenditures for the 2014 PSC cycle.

Rank	Project Title	Project Type	Agency	Cost
1	Funding for holding CWTIT meeting(s) & 2014 workshop	Administration	PSC	$23,000
2	Sampling Washington Ocean Salmon Fisheries	Fishery/Escapement sampling	WDFW	$252,912
3	Oregon CWT Sampling in the Columbia River Ocean Area	Fishery/Escapement sampling	ODFW	$165,289
4	Coded Wire Tag Recovery Electronic Sampling Equipment (41 Wands)	Equipment	NWIFC	$130,708
5	SE Alaska Marine Sport Catch Sampling	Fishery/Escapement sampling	ADFG	$58,266
6	Elk R Mid-Oregon Coastal Production Region Coded-Wire Tagging, Recovery and Escapement Estimation of Fall Chinook Salmon	CWT tagging & recovery	ODFW	$131,500
7	SEAK Commercial Port Sampling Data Loggers	Equipment	ADFG	$95,122
8	Stikine River Chinook Smolt CWT	CWT tagging & recovery	ADFG	$134,562
9	Coded Wire Tag Field Equipment Replacement (60 Wands)	Equipment	WDFW	$187,527
10	U.S. CWTIT Co-Chair: Partial Funding	Administration	ADFG	$19,471
11	Staff Support and Coded-Wire Tag Lab Improvements	Equipment & Fishery Sampling	Makah Tribe	$61,562
12	Calibrating Spawning Ground Surveys in Salmon River to Estimate Abundance for Oregon's North Coast Aggregate Exploitation Indicator Stock	Escapement Estimation	ODFW	$114,055
13	Chilkat River Chinook Salmon CWT	CWT tagging & recovery	ADFG	$89,084
14	ODFW Coded Wire Tag Database Error Reports, Training and Documentation	Reporting System Upgrade	ODFW	$74,942
TOTAL				**$1,538,000**

* * *

U.S. Project Briefs for 2014 U.S. CWTIT Projects

Primary questions:

1) **Project description.**
2) **Why fund it?**
3) **What happens if we don't fund it?**

Rank	#	Agency	Project Description	Cost	Fund?
1	18	PSC	Hold CWTIT meetings and 2014 CWTIT Workshop	$23,000	YES

1. This project will fund travel costs to review past CWTIT projects in November 2014 and produce a CWTIT 5-year synthesis report summarizing the CWT Improvement Program accomplishments and expenditures through 2014.
2. Will provide review of current CWTIT projects, recommendations for the future regarding the CWT program and produce a 5-year report to document the CWT Improvement Program in the PSC technical report series.
3. Review, recommendations and documentation will not occur.

Overall: This is an important element in completing the CWTIT process and documentation thereof.

Rank	#	Agency	Project Description	Cost	Fund?
2	3	WDFW	Sampling Washington ocean salmon fisheries	$252,912	YES

1. This SAMPLING project funds the portion of the base sampling for the WA coast ocean troll and sport fisheries that was lost through the discontinuation of Anadromous Fish Act (AFA) grants 4 years ago. This project was funded in 2011-2013 using CWTIT funds with the expectation that WDFW would be able to find replacement funding for the loss of the AFA funds; unfortunately, replacement funding has not been secured.
2. The sampling rates for these fisheries will be much less than 20%.
3. Sampling rates will be lower and CWT data imprecise without the CWTIT funding.

Overall: This project covers the base funding for WDFW previously provided by the AFA. The Chinook sampling rates in the ocean troll fishery averaged about 47% for 2006-2003 and the average sampling rate in the sport fishery was 40%. This is a well established and well run project. This project will require future funding.

Rank	#	Agency	Project Description	Cost	Fund?
3	5	ODFW	Oregon CWT sampling in Columbia River Management Area	$165,289	YES

1. This SAMPLING project funds the portion of the base sampling for the Columbia River mouth and ocean management area in Oregon for ocean troll and sport fisheries that was lost through the Anadromous Fish Act (AFA) 2 years ago. This project was funded in 2011-2013 using CWTIT as a stop-gap measure. Note that about 50% of this project represents CWT improvements by continuing full electronic sampling, which began in 2011.

2. To conduct basic sampling in these fisheries and implement full electronic sampling.
3. The sampling rate in these fisheries will drop and estimates based on data from these fisheries will be less precise.

Overall: This project covers half or more of the base funding for ODFW lost through the AFA. The Chinook sampling rates in the troll fishery have averaged 38% for 2006-2012 and 46% in the sport fishery. This is a well established and well run project. This project will require future funding.

Rank	#	Agency	Project Description	Cost	Fund?
4	7	NWIFC	Purchase New Handheld CWT Wand Detectors	$130,708	YES

1. This EQUIPMENT project proposes to purchase 41 new-style NMT T-Wands to be used by tribal staff sampling fisheries and spawning grounds. These samplers previously used wand detectors borrowed from WDFW. This is a cost-effective purchase as agency overhead costs were waived.
2. Will increase the accuracy and efficiency of detecting CWTs in fisheries and on spawning grounds, and ease the handling of Chinook salmon for samplers and commercial processors.
3. Tribal staff will continue to sample using their remaining old blue NMT wands which are less sensitive in detecting tags and ergonomically more difficult for field staff.

Overall: This is an equipment purchase that will have lasting benefits to the CWT system.

Rank	#	Agency	Project Description	Cost	Fund?
5	10	ADFG	Southeast Alaska Marine Sport Catch Sampling	$58,266	YES

1. This SAMPLING project increases sport sampling rates in Juneau, Ketchikan and Craig to >20%, by adding 6 catch samplers, who will sample for CWTs and not be involved in creel estimates of harvest. The Chinook sampling rates in Juneau have averaged 12% over the 5 years 2008-2012 (average harvest = 7,600) and 10% in Ketchikan (average harvest = 14,000). Sampling rates have averaged 21% in Craig (average harvest = 6,200) with its larger mix of PSC indicator stocks. With funding in 2013, sampling rates were at or above 20% in all 3 ports.
2. PSC Indicator Stocks are caught in these fisheries and past sampling rates for several ports and time strata have been well below 20%.
3. Without funding, the sample rates for these fisheries will not be expected to meet coast wide standards. The Juneau sport fishery will not produce enough CWTs to adequately estimate exploitation by age for the jointly managed Taku transboundary river stock.

Overall: It was noted that SEAK sport was below 20% in TR25, 18-19% overall, but that sampling rates are too low in the ports of Juneau (12%) and Ketchikan (10%), which take about 30-35% of SEAK sport catch. In 2011 and 2013, with CWTIT funding, sampling rates were raised in those 2 ports. This project will require future funding.

Rank	#	Agency	Project Description	Cost	Fund?
6	14	ODFW	Mid-Oregon Coast CWT tagging, recovery, and escapement of Elk River Fall Chinook	$131,500	YES

1. Mid-Oregon Coast (MOC) INDICATOR STOCK—this project covers several aspects needed for an Exploitation Rate Analysis (ERA) indicator stock, including tagging the hatchery stock with CWTs, escapement sampling, and estimation and sampling of the inriver freshwater (terminal) harvest. This stock is used in the ERA by the CTC.
2. A MOC indicator stock would help close a geographic gap in coverage identified in TR25 and by Oregon for the mid-Oregon coast stock aggregate.
3. There won't be a MOC indictor stock without this or alternative funding.

Overall: This project requires future funding and the tags are recovered in PST fisheries in both countries.

Rank	#	Agency	Project Description	Cost	Fund?
7	4	ADFG	SEAK Commercial Port Sampling Data Loggers	$95,122	YES

1. This EQUIPMENT project upgrades 20 outdated data loggers for commercial port sampling staff, which sample over 80% of the Chinook landed in SEAK. The funding also provides programming to incorporate data transfer into the Alaska Tag Lab CWT database.
2. It improves efficiency of sampling, as well as accuracy, and timeliness of reporting CWTs from SEAK commercial Chinook catches.
3. CWT reading and reporting will be less timely and efficient.

Overall: This is a one-time equipment purchase that will have lasting benefits to the CWT system.

Rank	#	Agency	Project Description	Cost	Fund?
8	1	ADFG	Stikine River Chinook Smolt CWT	$134,562	YES

1. This INDICATOR STOCK project funds efforts to capture and CWT wild smolt from the Stikine River stock, with a tagging goal of > 30,000 smolt/year with combined U.S. and Canadian funding. This is a jointly managed transboundary river stock and is an escapement indicator stock for the CTC/PSC.
2. This project provides the ability to jointly manage the terminal run of Stikine River Chinook by providing estimates of harvest, exploitation and total adult and smolt production.
3. Without it, we won't have the data for run reconstruction and harvest sharing, making management of these fisheries difficult.

Notes: This project has been successful as CWT tagging goals have been exceeded over the past 5 years. Funding for tag recovery in marine fisheries, in Canadian fisheries, and in the escapement are in place and funded with other funding sources.

Rank	#	Agency	Project Description	Cost	Fund?
9	11	WDFW	CWT field equipment replacement-60 Handheld Wands	$187,527	YES

1. This EQUIPMENT project will purchase 60 new-style NMT "T-wands" with cost efficiencies from trade-in of old wands and waiver of agency overhead costs.
2. Will increase the accuracy of detecting CWTs in fisheries and on spawning grounds and sampling efficiency, and the ease of handling Chinook salmon for samplers and commercial processors. This project is cost effective as WDFW waived its normal overhead charge of about 28% for this project.
3. WDFW will continue to sample using their old blue "stick" NMT wands which are less sensitive in detecting tags and ergonomically more difficult for field staff.

Overall: This is an equipment purchase that will have lasting benefits to the CWT system.

Rank	#	Agency	Project Description	Cost	Fund?
10	17	ADFG	U.S. CWTIT Co-Chair: Partial Funding	$19,471	YES

1. This ADMINISTRATIVE project pays for the U.S. Co-Chair time spent administering the U.S. CWTIT program.
2. Will maintain the ability of the Co-Chair to produce the products of the CWTIT, including production of the annual timeline/work plan, organizing the annual workshop in 2014, the annual progress report to the PSC each January, completion of a 5-year CWTIT synthesis report to be published as a PSC technical report to document the program's accomplishments and expenditures, and working with the PIs and NOAA on all aspects of producing proposals and obtaining grants through NOAA.
3. Other funding or personnel will need to accomplish these tasks, which are part of the 2009 PST Agreement.

Overall: The CWTIT process was added to the 2009 PST Agreement without any funding to administer it. All of the CWTIT members are on other PSC technical committees; primary administration of the program falls back to the Co-Chair.

Rank	#	Agency	Project Description	Cost	Fund?
11	13	Makah Tribe	Staff Support and CWT Lab Improvements	$61,562	YES

1. This EQUIPMENT and SAMPLING project pays for equipment upgrades in the Makah Tribe CWT Lab, including added space and a second freezer, and sampling costs for the Makah Tribe fisheries.
2. The harvests in the Makah tribal fisheries are of the magnitude to warrant the equipment upgrades and sampling time. This is a cost-effective project and will increase sampling rates, sampling efficiency, and the timeliness and accuracy of CWT data reporting from the Makah fisheries.
3. Sampling rates will be lower, CWT data will be reported less timely and likely not in time for the PFMC process.

Overall: The equipment portion of this project will provide lasting benefits to the CWT program. Future funding is required for the sampling portion of this proposal.

Rank	#	Agency	Project Description	Cost	Fund?
12	16	ODFW	Calibrating Spawning Ground Surveys in Salmon River to Estimate Abundance for Oregon coast NOC aggregatw	$114,055	YES

1. This ESCAPEMENT estimation project funds a mark-recapture project to estimate the spawning escapement of Chinook salmon in the Salmon River in 2014. This river is the exploitation rate indicator stock for the NOC aggregate of naturally produced Chinook on the north Oregon Coast.
2. The escapement was estimated via M-R from 1988-2002 and needs to be revisited to determine if the expansion factor is consistent and to provide accurate escapement and exploitation data for the NOC aggregate.
3. Escapements and exploitation rates will not be as accurate, potentially.

Overall: This project will allow ODFW to verify escapement estimates to the Salmon River and provide direct estimates for the NOC model stock.

Rank	#	Agency	Project Description	Cost	Fund?
13	6	ADFG	Chilkat River Chinook Salmon CWT	$89,084	YES

1. Chilkat INDICATOR STOCK—wild stock capture and tagging of juveniles in fall of 2013 will continue the time series of CWT statistics for this natural stock. This stock is used by the CTC for both an exploitation rate indicator stock and an escapement indicator. It was proposed as a PSC Chinook Model Stock by ADFG in 1998 and the data base has been built by ADFG for that purpose. It is awaiting inclusion as a model stock when the CTC's model improvement workgroup has completed model work to include it as such.
2. To have a Northern SEAK Inside (NSI) exploitation rate indicator stock now and, in the future, a NSI Indicator Model Stock for SEAK.
3. CWT geographic coverage GAP for NSI (Chilkat) stocks in SEAK.

Overall: This project has met tagging goals each year it has been run, including 2010, 2011 and 2013 with CWTIT funding Future funding is required to continue to tag this stock and ADFG has likely obtained funding for the future; the recovery of tags from adults in ocean, terminal and the escapement is funded by separate agency funding.

Rank	#	Agency	Project Description	Cost	Fund?
8	7	ODFW	ODFW CWT Database Error Reports, Training and Documentation	$74,942	YES

4. This DATABASE UPGRADE project funds training for hatchery, fishery and spawning grounds staff to transmit tag and recovery CWT data electronically and eliminate the old paper forms. This is part of ODFW's complete overhaul of their Data Reporting System upgrade. The project funds additional error detection and correction for CWT data reporting. The project also documents all of the next aspects of CWT system to have a permanent working knowledge and transferability of that knowledge to new employees and interested outside parties.
5. Faster, more accurate and timely data, easier input and retrieval.
6. CWT reporting takes longer, less accurate and timely.

Appendix 1. Details of proposed projects and funding levels for the CWT Improvement Program in 2013, per USCWTIT recommendations January 31, 2013.

Rank	Project No.	Project Category	TR25 Issue	Project Title	Region / Area	Agency/ Contact	Cost this FY	Project Description	Comments
1	US-18	CWTIT Meetings	Various	Costs of CWTIT Workshops/Mtgs	PSC	Pacific Salmon Commission / Ilinca Manisali	$23,000	Funds meeting costs for CWTIT members to attend annual CWTIT workshop and meetings.	Provides funding to review past CWTIT projects and to develop a 5-year CWTIT synthesis report by 2015.
2	US-3	Mixed-stock Sampling	7, 8, 12	Sampling Washington Ocean Salmon Fisheries	WA Coast	WDFW/ Doug Milward	$252,912	15 month project to maintain catch sampling rates for ocean troll & sport.	Replaces sampling lost from Anadromous Fish Act. Sampling expected to be >20%.
3	US-5	Mixed-stock Sampling	7, 8, 12	Ocean Sampling North of Cape Falcon	N Or Coast	ODFW/ Eric Schindler	$165,289	Maintain catch sampling for Columbia River Management Area, for ocean troll & sport.	Replaces sampling lost from Anadromous Fish Act (about 50% of proposal) and allows full electronic sampling, which started in 2011.
4	US-7	CWT Equipment Upgrade	12, 13	CWT Field Eq. Purchase: Handheld Wand Detectors (41)	WA	NIWFC/ Ken Phillipson	$130,708	Buys 41 new NMT Handheld Wands, formerly borrowed from WDFW.	Increases accuracy of detecting CWTs, sampling efficiency, ease of sampling and handling Chinook.
5	US-10	Mixed-stock Sampling	7, 8	SEAK Marine Sport Catch Sampling	SEAK	ADFG/ Mike Jaenicke	$58,266	Increase catch sampling rates for marine sport.	Rates for SEAK sport have been <20% overall and <15% in some major ports.
6	US-14	Indicator Stock Tagging – without representation	1,3, 4, 6	Mid-Oregon Coast CWT Recovery, and Escapement of Elk River Fall Chinook	ORC	ODFW/ Shelly Miller	$131,500	CWT indicator stock for the mid-Oregon Coast aggregate	Creel survey FW sport, hatchery & esc. CWTs, survey esc. CWT & clip 325,000 presmolts.
7	US-4	Mixed-stock Sampling	4, 7, 13	SEAK Commercial Port Sampling Data Loggers	SEAK	ADFG/ Anne Reynolds	$95,122	Pays for 20 data loggers, programming and training for sampling commercial fisheries.	Increases efficiency of sampling; accuracy, timeliness and reporting of CWT data to managers and coastwide database.
8	US-1	Indicator Stock Tagging – without hatchery representation	1, 2	Stikine River Chinook Smolt CWT	TBR	ADFG/ Phil Richards	$134,562	CWT wild smolt in spring 2014 cooperatively with Canada for TBR stock.	Tagging goal is a minimum of 35,000 yearling wild smolt; goal exceeded last 6 years. Produces run reconstruction and production data for bilateral management of relatively large TBR stock.

9	US-11	CWT Equipment Upgrade	12, 13	CWT Field Eq. Replacement: Handheld Wand Detectors (60)	WA	WDFW/ John Kerwin	$187,527	Buys 60 new NMT Handheld Wands with trade-in of 60.	Increases accuracy of detecting CWTs, sampling efficiency, ease of sampling and handling Chinook.
10	US-17	CWTIT Administration	19	U.S. CWTIT Co-Chair Partial Funding	SEAK, S.U.S.	ADFG / Scott McPherson	$19,471	Funds time spent administering U.S. CWTIT program.	Products include annual work plan, CWTIT reports, annual RFP, annual CWTIT workshop, recommendations documents, assistance.
11	US-13	Sampling Mixed-Stock Fisheries & CWT Lab Equipment	7, 10, 13	Staff Support & Equipment for CWT Lab	WACO	Makah Tribe/ Hap Leon	$61,562	Provides and additional sampler for summer season, additional CWT Lab space and freezer.	Improves fishery sampling rates and timeliness, accuracy and data reporting in Makah Tribe CWT Lab.
12	US-16	Escapement Validation for ERA/Model Stock	6	Calibrating Spawning Grounds Surveys in Salmon River to Estimate Escapement	OR	ODFW/ Shelly Miller	$114,055	Conduct M-R estimate of escapement to improve estimates and verify past expansions.	This ERA stock is the basis for the NOC aggregate and represents a substantial production. The escapement has not been verified for the past 10 years.
13	US-6	Indicator Stock Tagging – without hatchery representation	1, 2	Chilkat River Chinook Salmon CWT	Northern SEAK	ADFG/ Brian Elliott	$89,084	CWT wild Chinook juveniles for this CTC ERA and escapement indicator stock, and proposed model stock.	Tagging goal has been met in past 4 years and tagging rate is about 9% of wild population. Population statistics meet standards.
14	US-12	Database Reporting System Upgrade	13, 14, 17, 18	ODFW CWT Database Error Reports, Training and Documentation	OR	ODFW/ Mark Engleking	$74,942	Funds training for staff, producing error reports from reporting system and documentation of new CWT reporting system.	Replaces archaic paper forms, trains hatchery, fishery and sp grounds staff for new equipment & uploading. Produces error reports and additional validation. Documents all aspects of new ODFW CWT processes & systems.
				U.S. Total			$1,538,000		

PSC Chinook Technical Committee, Sentinel Stocks Committee & Coded Wire Tag Implementation Team

TO: PSC Commissioners
FROM: John Carlile, Robert Kope, and Chuck Parken: CTC Co-chairs
Scott McPherson and Arlene Tompkins: CWTIT Co-chairs
Chuck Parken, David Bernard and Marianna Alexandersdottir: SSC Co-chairs
CC: John Field, Cheryl Ryder, Heather Wood
DATE: March 13, 2014
SUBJECT: Chinook PST CWTIT, SSC and MI Activity and Project Priorities.

This memo provides the response from the CTC, SSC and CWTIT to the Commission's request for projects and activities funded by CWTIT, SSC and Model Improvements (MI). The request to the technical committees from the chairs of the Commission appears to be focused solely on identifying projects or activities that have be funded previously by the SSP, CWTIT or MI funds that should continue but are at risk of being lost. However, there is a broader question regarding the original intent of the SSP, CWTIT and MI funds and whether their mandates have been achieved. It would be beneficial to identify the items of greatest importance in each of these arenas that are lacking sufficient information and dedicate resources to filling those holes regardless whether the projects or activities have been funded previously. That will of course require more time and thought by the technical committees than simply reviewing what projects and activities have occurred up to this point.

The following list includes prioritized activities, projects, suggested funding levels, and the former PST funding source. There are other high priority activities and projects currently funded by other sources that are at risk of being lost, however, this list does not include those items. Please note that some of the projects expiring in 2014 and 2015 are one-time projects (e.g. equipment purchases). Appendix A lists projects funded by the SSP and Appendices B and C list Canadian and US CWTIT projects, respectively.

1. Adequate sampling in fisheries and escapements is needed to recover tags necessary to meet precision standards for exploitation rates and other CWT statistics.
    - Mark Recovery Program Fishery Sampling $300K (CWTIT; Very High Priority, Canadian CWTIT projects ranging from #22-35)
    - Sport and First Nation Fishery Sampling Coordinator $85K (CWTIT; Very High Priority, Canadian CWTIT project #21)

- Ocean Sampling – Oregon Coast $165K (CWTIT; Very High Priority)
- Ocean Sampling – Washington Coast $253K (CWTIT; Very High Priority)
- Sport Sampling – Southeast Alaska $58K (CWTIT; Very High Priority)

2. Adequate Coded Wire Tag marking for CTC exploitation rate indicator stocks including single index tagging and double index tagging. Higher tagging levels are necessary for several CTC indicator stocks in order to improve the quality assurance, quality control and quantity of CWT data and to meet the PSC CWT guidelines.
   - CWT Indicator Stock Tagging $350K (CWTIT, High, Canadian CWTIT projects #1-17)
   - CWT Indicator Stock Tagging- Elk River $132K (CWTIT; Medium Priority)
   - CWT Indicator Stock Tagging- Stikine River $135K(CWTIT; Medium Priority)
   - CWT Indicator Stock Tagging- Chilkat River $89K (CWTIT; Medium Priority)

3. Chinook head recovery processing and reporting funding is needed for CWT labs for the cost associated with increased tagging.
   - Mark Recovery Program Head Lab $100K (CWTIT; Very High Priority, Canadian CWTIT project #19)
   - Catch Data QA/QC Analyst $75K (CWTIT; Medium Priority, Canadian CWTIT project #21)

4. Continued or improved estimates of escapements that are accurate and precise.
   - Stillaguamish Escapement Estimation $68K (SSP; Very High Priority; SSP Project #20)
   - Snohomish Escapement Estimation $235K (SSP; Very High Priority; SSP Project #18)
   - Nooksack Escapement Estimation $177K (Funded by US LOA in 2014 only due to funding limits in SSP; Very High Priority)
   - Skeena Chinook Escapement Estimation via GSI $35K (SSP; Medium Priority, SSP Project #2)
   - South Thompson Chinook Escapement Estimation $150K (SSP, Medium Priority, SSP project #5)
   - Chilko Chinook Escapement Estimation $175K (SSP, Medium Priority, SSP project #6)
   - Nass Chinook Escapement Estimation $115K (SSP, Medium Priority, SSP project #1)
   - WCVI Chinook Escapement Estimation $120K (SSP, Medium Priority, SSP project new)

5. CWTIT and CTC Committee Travel.
   - CWTIT Wrap-up $50K (CWTIT; High Priority)
   - CTC AWG/MI travel $75K (MI; High Priority)

6. PSC Chinook Model and Exploitation Rate Analysis Improvements
   - Exploitation Rate Analysis and Chinook Model Computer Code Development $120K (MI, Medium Priority)

Appendix A. Projects funded by the Sentinel Stocks Committee, 2009-2014.

Project	Region	Project Name	SSP Funding Level (1000's)					
			2009	2010	2011	2012	2013	2014
1	Northern BC	Nass	$ 63	$ 98	$ 105	$ 109	$ 112	$ 115
2	Northern BC	Skeena using GSI	$ 29	$ 36	$ 25	$ 36	$ 36	$ 36
3	Northern BC	Skeena Radio Telemetry	$ -	$ 417	$ -	$ -	$ -	$ -
4	Northern BC	Skeena Historic GSI	$ -	$ -	$ 125	$ 191	$ -	$ -
5	Fraser	South Thompson	$ 102	$ 133	$ 169	$ 161	$ 188	$ 137
6	Fraser	Chilko	$ -	$ 265	$ 226	$ 224	$ 221	$ 173
7	Fraser	Harrison	$ -	$ -	$ -	$ 51	$ -	$ -
8	WCVI	Burman	$ 143	$ 75	$ 99	$ 176	$ 122	$ -
9	WCVI	Kaouk	$ 322	$ 209	$ 225	$ -	$ -	$ -
10	WCVI	Moyeha	$ -	$ 112	$ 60	$ -	$ -	$ -
11	WCVI	Statistical Framework for Stock Assessment	$ -	$ -	$ -	$ 30	$ -	$ -
12	WCVI	Marble	$ -	$ -	$ -	$ 70	$ 76	$ -
13	WCVI	Tahsis & Leiner	$ -	$ -	$ -	$ 148	$ -	$ -
14	WCVI	Sarita	$ -	$ -	$ -	$ -	$ 61	$ -
15	WCVI	Tranquil	$ -	$ -	$ -	$ -	$ 58	$ -
16	WCVI	Conuma	$ -	$ -	$ -	$ -	$ -	$ 140
17	WCVI/Oregon Coast	SEAK GSI Otoliths	$ -	$ -	$ -	$ -	$ 154	$ 34
18	Puget Sound	Snohomish	$ 221	$ -	$ -	$ 218	$ 239	$ 235
19	Puget Sound	Skagit	$ 46	$ -	$ -	$ -	$ -	$ -
20	Puget Sound	Stillaguamish	$ -	$ 6	$ 117	$ 72	$ 85	$ 68
21	Puget Sound	Green	$ -	$ 128	$ 140	$ 142	$ 153	$ -
22	Oregon Coast	Nehalem	$ 269	$ 280	$ 305	$ 301	$ 237	$ -
23	Oregon Coast	Siletz	$ 252	$ 287	$ 224	$ 229	$ 205	$ -
24	Oregon Coast	Siuslaw	$ -	$ -	$ -	$ -	$ -	$ 194
		Total Approved	***$ 1,447***	***$ 2,047***	***$ 1,820***	***$ 2,157***	***$ 1,947***	***$ 1,132***

Note: For some projects actual expenditures were less than approved funding, and Canadian funds were not converted to US currency. Thus the total approved funding exceeds $10M.

Appendix B. Canadian projects funded by the CWT Improvement Program, 2009-2013.

Proj.	Project Category	TR25 Issue	Project Title / Description	Region/ Area	Canadian CWTIT Funding Level (1000's)				
					2009	2010	2011	2012	2013
1	Increased CWT Marking of CN Indicators	Issue 2	Robertson Cr.	BC/SC	$ 61	$ 32	$ 33	$ 35	$ 35
2	Increased CWT Marking of CN Indicators	Issue 2	Cowichan	BC/SC	$ 86	$ 39	$ 55	$ 63	$ 63
3	Increased CWT Marking of CN Indicators	Issue 2	Big Qualicum	BC/SC	$ 39	$ 27	$ 26	$ 29	$ 25
4	Increased CWT Marking of CN Indicators	Issue 2	Quinsam	BC/SC	$ 39	$ 39	$ 40	$ 44	$ 44
5	Increased CWT Marking of CN Indicators	Issue 2	Lower Shuswap	BC/ Fraser	$ -	$ 39	$ 33	$ 35	$ 33
6	Increased CWT Marking of CN Indicators	Issue 3	Middle Shuswap	BC/ Fraser	$ 11	$ -	$ -	$ -	$ -
7	Increased CWT Marking of CN Indicators	Issue 2	Nicola	BC/ Fraser	$ -	$ 8	$ 11	$ 12	$ 12
8	Increased CWT Marking of CN Indicators	Issue 2	Chilliwack	BC/ Fraser	$ 4	$ 13	$ 9	$ 12	$ 8
9	Increased CWT Marking of CN Indicators	Issue 2	Harrison	BC/ Fraser	$ 39	$ 15	$ 20	$ 29	$ 29
10	Increased CWT Marking of CN Indicators	Issue 2	Alternate release strategy Harrison indicator	BC	$ -	$ 80	$ -	$ -	$ -
11	Increased CWT Marking of CN Indicators	Issue 2	Taku	BC/YTB	$ 30	$ 30	$ 30	$ 30	$ 30
12	Increased CWT Marking of CN Indicators	Issue 2	Stikine	BC/YTB	$ 30	$ 30	$ 30	$ 30	$ 30
13	Increased CWT Marking of CN Indicators	Issue 2	Kitsumkalum	BC/NC	$ 25	$ -	$ 25	$ 25	$ 25
14	Increased CWT Marking of CN Indicators	Issue 2	Atnarko	BC/NC	$ -	$ 25	$ 5	$ 6	$ 5
15	Increased CWT Marking of CN Indicators	Issue 2	Phillips River	BC/SC	$ -	$ -	$ 28	$ 10	$ 10
16	Increased CWT Marking of CN	Issue 2	Evaluation CWT Placement	BC	$ -	$ 10	$ -	$ -	$ -

Proj.	Project Category	TR25 Issue	Project Title / Description	Region/ Area	Canadian CWTIT Funding Level (1000's) 2009	2010	2011	2012	2013
	Indicators		study						
17	Increased CWT Marking of CN Indicators	Issue 2	Incremental CWT Purchase	BC	$ 585	$ 140	$ -	$ -	$ -
18	Increased CWT Marking of CN Indicators	Issue 2	Tagging Training Workshop	BC	$ 20	$ -	$ -	$ -	$ -
			Sub-Total --> Tagging		***$ 948***	***$ 527***	***$ 345***	***$ 359***	***$ 348***
19	Increased Head Recovery Costs	Issues 2, 4, 5, 7	CWT Head Lab Processing and Data Management	BC	$ 47	$ 95	$ 95	$ 70	$ 200
			Sub-Total -->Head Dissection Lab		***$ 47***	***$ 95***	***$ 95***	***$ 70***	***$ 200***
20	Catch QA/QC Analyst (EG4)	Issues 6&8	Regional CWT and Catch Estimation QA/QC	BC	$ 40	$ 75	$ 75	$ 75	$ 75
21	Sport and FN CWT Recovery Coordinator (EG5)	Issues 4, 7, 9, 10 & 11	Regional Sport & FN Fishery CWT Recovery Coordination	BC	$ 71	$ 85	$ 85	$ 85	$ 85
			Sub-Total --> Full Time Staffing		***$ 111***	***$ 160***	***$ 160***	***$ 160***	***$ 160***
22	Low Sample Rates in Terminal Fisheries, FN Fishery CWT recovery improvements	Issue 4 & 10	Georgia Strait First Nation Fishery CWT Recovery Improvements*	BC/SC	$ -	$ -	$ 14	$ 14	$ -
23	Low Sample Rates in Terminal Fisheries, FN Fishery CWT recovery improvements	Issue 4 & 10	WCVI FN Fishery CWT Recovery Improvements	BC/SC	$ -	$ 10	$ 15	$ 6	$ -
24	Low Sample Rates in Terminal Fisheries, FN Fishery CWT recovery improvements	Issue 4 & 10	Cowichan FN CWT sampling	BC/SC	$ 2	$ 2	$ 2	$ -	$ -
25	Low Sample Rates in Terminal Fisheries, FN Fishery CWT recovery improvements	Issue 4 & 10	Operational Support for First Nations CWT Sampling Projects	BC	$ -	$ -	$ 35	$ 25	$ 25
26	Low Sample Rates in Terminal Fisheries, FN Fishery CWT recovery improvements	Issue 4 & 10	Lower Fraser First Nations (LFFA) Coded Wire Tag Recovery (CWT)	BC/ Fraser	$ -	$ 15	$ 40	$ 25	$ 25
27	Low Sample Rates in Terminal Fisheries, FN Fishery CWT recovery improvements	Issue 4 & 10	Bella Coola River First Nation Fishery CWT Sampling	BC/NC	$ 10	$ 10	$ 10	$ 10	$ 10
			Sub-Total -->First Nations Fisheries CWT Sampling		***$ 12***	***$ 37***	***$ 116***	***$ 80***	***$ 60***

Proj.	Project Category	TR25 Issue	Project Title / Description	Region/ Area	Canadian CWTIT Funding Level (1000's)				
					2009	2010	2011	2012	2013
28	Uncertainty in Estimates of Catch; Non-Representative Sampling & Low Sample Rates in Highly Mixed Stock Fisheries	Issue 6, 7, 8, 9 & 10	Middle Shuswap Sport Fishery Catch Card Pilot	BC/ Fraser	$ -	$ -	$ 10	$ -	$ -
29	Uncertainty in Estimates of Catch; Non-Representative Sampling & Low Sample Rates in Highly Mixed Stock Fisheries	Issue 6,7,8,9& 10	Expansion Catch Monitoring & Sampling Southern BC Sport Fishery (Operational enhancement of the southern BC marine waters recreational creel survey)	BC/SC	$ -	$ 80	$ 180	$ 100	$ -
30	Low Sample Rates in Terminal Fisheries, FN Fishery CWT recovery improvements	Issue 4 & 10	Middle Shuswap Sport Fishery Catch Estimation and CWT sampling	BC/ Fraser	$ -	$ -	$ 20	$ 12	$ -
31	Uncertainty in catch estimates and CWT expansions, data management	Issue 10	Central coast creel mark rates & submission		$ -	$ 5	$ 5	$ 7	$ 10
32	Uncertainty in Estimates of Terminal Fishery Catch; Low Sample Rates in Terminal Fisheries	Issues 4&6	Expansion Catch Monitoring & Sampling Chilliwack River Sport Fishery	BC/ Fraser	$ -	$ -	$ 15	$ 15	$ -
33	Low Sample Rates in Terminal Fisheries, Sport and FN CWT recovery improvements	Issues 4, 7, 9, 10 & 11	Regional Commercial, Sport & FN Fishery CWT Recovery Improvements	BC	$ 90	$ 140	$ 140	$ 215	$ 278
34	Low Sample Rates in Terminal Fisheries, FN Fishery CWT recovery improvements	Issue 4 & 10	Operational Support for Recreational CWT Sampling Projects	BC	$ -	$ -	$ 39	$ 30	$ 25
35	Uncertainty in Catch and Low Sample Rates in Terminal Fisheries	Issue 4 & 6	Atnarko River Sport Fishery CWT Sampling & Creel Survey	BC/NC	$ 5	$ 5	$ -	$ 10	$ -
			Sub-Total -->Sport Fisheries CWT Sampling		***$ 95***	***$ 230***	***$ 409***	***$ 389***	***$ 313***
36	Low Sample Rates in Terminal Fisheries, Sport and FN CWT recovery improvements	Issues 4, 7, 9, 10 & 11	Purchase Wand CWT Detectors	BC	$ -	$ -	$ -	$ -	$ 50
37	Low Sample Rates in Terminal Fisheries, Sport and FN CWT recovery improvements	Issues 4, 7, 9, 10 & 11	Sampling Table Ucluelet Fisheries Plant	BC	$ -	$ -	$ -	$ -	$ 10

Proj.	Project Category	TR25 Issue	Project Title / Description	Region/ Area	Canadian CWTIT Funding Level (1000's) 2009	2010	2011	2012	2013
38	Timeliness of Reporting	Issue 13	Computer Programming & Sampling Protocols: barcoding and scanning interface for automating label reading in field and lab	BC	$ -	$ 50	$ -	$ -	$ -
			Sub-Total -->CWT Sampling Equipment		***$ -***	***$ 50***	***$ -***	***$ -***	***$ 60***
39	Uncertainty in Estimates of Escapement	Issue 6 & 18	Fraser Chinook indicator stock AFC/CWT historic data QA/QC.	BC/ Fraser	$ -	$ -	$ 12	$ -	$ -
40	Uncertainty in catch estimates and CWT expansions, data management	Issue 10	Chinook Test Fishery CWT and Biosample data import to FOS (Albion & Tyee)	BC	$ -	$ -	$ 26	$ 15	$ -
41	Uncertainty in catch estimates and CWT expansions	Issue 1 & 6	Historic CWT Data Recovery Fraser river Chinook	BC/ Fraser	$ -	$ 20	$ 19	$ -	$ -
42	Uncertainty in catch estimates and CWT expansions, data management	Issue 10	MRP Archive Data Recovery	BC	$ -	$ -	$ -	$ 20	$ 20
			Sub-Total -->Historic CWT Data Rescue		***$ -***	***$ 20***	***$ 57***	***$ 35***	***$ 20***
43	Increased Deadpitch CWT Recovery Effort, all Indicators	Issue 5	Quinsam	BC/SC	$ 8	$ 8	$ 8	$ 8	$ 8
44	Increased Deadpitch CWT Recovery Effort, all Indicators	Issue 5	Robertson Cr.	BC/SC	$ 2	$ 2	$ -	$ -	$ -
45	Increased Deadpitch CWT Recovery Effort, all Indicators	Issue 5	Cowichan	BC/SC	$ 30	$ 25	$ 30	$ 30	$ 30
46	Increased Deadpitch CWT Recovery Effort, all Indicators	Issue 5	Big Qualicum	BC/SC	$ 5	$ 5	$ 5	$ 5	$ 3
47	Increased Deadpitch CWT Recovery Effort, all Indicators	Issue 5	Chilliwack	BC/ Fraser	$ 14	$ 14	$ 14	$ 14	$ -
48	Increased Deadpitch CWT Recovery Effort, all Indicators	Issue 5	Harrison	BC/ Fraser	$ 16	$ 16	$ 16	$ 16	$ 16
49	Increased Deadpitch CWT Recovery Effort, all Indicators	Issue 5	Kitsumkalum	BC/NC	$ -	$ 10	$ -	$ -	$ -
50	Increased Deadpitch CWT Recovery Effort, all Indicators	Issue 5	Nicola	BC/ Fraser	$ 4	$ 4	$ 8	$ 8	$ 8

Proj.	Project Category	TR25 Issue	Project Title / Description	Region/ Area	Canadian CWTIT Funding Level (1000's) 2009	2010	2011	2012	2013
51	Uncertainty in Estimates of Escapement or Terminal Fishery Catch	Issue 1 & 6	Atnarko Chinook CWT Indicator Stock	BC/NC	$ 120	$ 120	$ 120	$ 110	$ 110
			Sub-Total --> Escapement Sampling Rates		***$ 199***	***$ 204***	***$ 201***	***$ 191***	***$ 175***
52	Programmer	Issues 14, 15, 17 & 18	Regional CWT Data System Programming	BC	$ 80	$ 90	$ 90	$ 90	$ 90
53	Uncertainty in catch estimates and CWT expansions, data management	Issue 10	Improvements to Commercial Catch Databases (FOS)	BC	$ -	$ -	$ -	$ 60	$ -
54	Non-representative Sampling	Issue 9	Programming Support: GIS mapping sport locations / web-based GIS mapping tool	BC	$ -	$ 40	$ -	$ -	$ -
55	Uncertainty in catch estimates and CWT expansions, data management	Issue 10	Salmonid Enhancement Database improvements	BC	$ -	$ -	$ -	$ 67	$ 75
56	Uncertainty in catch estimates and CWT expansions, data management	Issue 10	Feasibility & Design Regulations Database	BC	$ -	$ 20	$ 10	$ -	$ -
			Sub-Total --> Database Development		***$ 80***	***$ 150***	***$ 100***	***$ 217***	***$ 165***
			Grand Total		***$ 1,492***	***$ 1,473***	***$ 1,482***	***$ 1,500***	***$ 1,500***

Appendix C. Planned U.S. CWT Improvement Expenditures for the 2014 PSC cycle.

Rank	Project Title	Project Type	Agency	Cost
1	Funding for holding CWTIT meeting(s) & 2014 workshop	Administration	PSC	$23,000
2	Sampling Washington Ocean Salmon Fisheries	Fishery/Escapement sampling	WDFW	$252,912
3	Oregon CWT Sampling in the Columbia River Ocean Area	Fishery/Escapement sampling	ODFW	$165,289
4	Coded Wire Tag Recovery Electronic Sampling Equipment (41 Wands)	Equipment	NWIFC	$130,708
5	SE Alaska Marine Sport Catch Sampling	Fishery/Escapement sampling	ADFG	$58,266
6	Elk R Mid-Oregon Coastal Production Region Coded-Wire Tagging, Recovery and Escapement Estimation of Fall Chinook Salmon	CWT tagging & recovery	ODFW	$131,500
7	SEAK Commercial Port Sampling Data Loggers	Equipment	ADFG	$95,122
8	Stikine River Chinook Smolt CWT	CWT tagging & recovery	ADFG	$134,562
9	Coded Wire Tag Field Equipment Replacement (60 Wands)	Equipment	WDFW	$187,527
10	U.S. CWTIT Co-Chair: Partial Funding	Administration	ADFG	$19,471
11	Staff Support and Coded-Wire Tag Lab Improvements	Equipment & Fishery Sampling	Makah Tribe	$61,562
12	Calibrating Spawning Ground Surveys in Salmon River to Estimate Abundance for Oregon's North Coast Aggregate Exploitation Indicator Stock	Escapement Estimation	ODFW	$114,055
13	Chilkat River Chinook Salmon CWT	CWT tagging & recovery	ADFG	$89,084
14	ODFW Coded Wire Tag Database Error Reports, Training and Documentation	Reporting System Upgrade	ODFW	$74,942
TOTAL				**$1,538,000**

Appendix D

Agency Updates on Marking/ Tagging Levels for 2014

Pacific Coast FWS - Planned Releases of Hatchery Fish for 2014 - with Mark and Tag Status

4/24/2014

production in italics will be released and reported by another agency

c. cook-tabor

Office	Hatchery	Species	Stock	CWT+AD	CWT only	AD only	None	Total	Comments
CRFPO	Entiat NFH	Chinook	Entiat - Summers 1+	200,000	0	200,000	0	400,000	
CRFPO	Carson NFH	Chinook	Carson - Springs 1+	75,000	0	1,045,000	0	1,120,000	
CRFPO	Carson NFH	Chinook	Carson - Springs 1+	50,000	0	200,000	0	250,000	Walla Walla R. release
CRFPO	Willard NFH	Chinook	Little White Salmon - Springs 1+	25,000	0	232,000	0	257,000	
CRFPO	Little White Salmon NFH	Chinook	Little White Salmon - Springs 1+	75,000	0	693,000	0	768,000	
CRFPO	Little White Salmon NFH	Chinook	White R. - Wenatchee Springs 1+	0	150,000	0	0	150,000	White River/Wenatchee R. ESA restoration program
CRFPO	Warm Springs NFH	Chinook	Warm Springs - Springs 1+	770,000	0	0	0	770,000	
CRFPO	Leavenworth NFH	Chinook	Leavenworth - Springs 1+	200,000	0	1,000,000	0	1,200,000	
CRFPO	Winthrop NFH	Chinook	Methow - Springs 1+	610,000	0	0	0	610,000	
IFRO	Kooskia NFH	Chinook	Kooskia - Springs 1+	100,000	0	550,000	50,000	700,000	
IFRO	Dworshak NFH	Chinook	Dworshak - Springs 1+	120,000	0	930,000	0	1,050,000	
CRFPO	Spring Creek NFH	Chinook	Spring Creek - Tule Falls	405,000	405,000	9,690,000	0	10,500,000	
CRFPO	Little White Salmon NFH	Chinook	Spring Creek - Tule Falls	200,000	0	1,500,000	0	1,700,000	
CRFPO	Little White Salmon NFH	Chinook	Little White Salmon - URB Falls	200,000	200,000	1,600,000	0	2,000,000	
CRFPO	*Little White Salmon NFH*	Chinook	*Little White Salmon - URB Falls*	*200,000*	*0*	*1,500,000*	*0*	*1,700,000*	YN-Prosser release
RBFWO	Coleman NFH	Chinook	Central Valley Fall Chinook	3,000,000	0	0	9,000,000	12,000,000	
RBFWO	Coleman NFH	Chinook	Central Valley Late-fall Chinook	1,000,000	0	0	0	1,000,000	
RBFWO	Livingston Stone NFH	Chinook	Sacramento River Winter Chinook	200,000	0	0	0	200,000	
WFWO	Makah NFH	Chinook	Sooes River Falls	200,000	0	1,000,000	0	1,200,000	
WFWO	*Makah NFH*	*Chinook*	*Makah Falls*		*0*	*100,000*	*0*	*100,000*	Educket Creek program - reported by NWIFC
			Chinook Total	7,630,000	755,000	20,240,000	9,050,000	37,675,000	
			What FWS will report to RMIS	7,430,000	755,000	18,640,000	9,050,000	35,875,000	
CRFPO	Eagle Creek NFH	Coho	Eagle Creek - 1+	25,000	25,000	300,000	0	350,000	
CRFPO	*Eagle Creek NFH*	*Coho*	*Clearwater River - 1+*	*0*	*30,000*	*0*	*245,000*	*275,000*	Clear Cr. Release - NPT restoration
CRFPO	*Eagle Creek NFH*	*Coho*	*Clearwater River - 1+*	*0*	*30,000*	*0*	*245,000*	*275,000*	Lapwai Cr. Release - NPT restoration
CRFPO	*Eagle Creek NFH*	*Coho*	*Eagle Creek/Yakima R. - 1+*	*0*	*400,000*	*100,000*	*0*	*500,000*	Yakima R. Release - YN restoration
CRFPO	*Willard NFH*	*Coho*	*Wenatchee R. - 1+*	*0*	*550,000*	*0*	*0*	*550,000*	Wenatchee R. Release - YN restoration
CRFPO	*Cascade Hatchery*	*Coho*	*Wenatchee R. - 1+*	*0*	*650,000*	*0*	*0*	*650,000*	Wen. R. Rel. - (Tagged by FWS) YN restoration
CRFPO	*Winthrop NFH*	*Coho*	*Wenatchee R. - 1+*	*0*	*250,000*	*0*	*0*	*250,000*	YN restoration program
WFWO	*Makah NFH*	*Coho*	*Sooes River*	*0*	*0*	*40,000*	*0*	*40,000*	Educket Creek program - reported by NWIFC
WFWO	Makah NFH	Coho	Sooes River	55,000		145,000	0	200,000	
WFWO	Quinault NFH	Coho	Cook Creek	80,000	80,000	500,000	0	660,000	
WFWO	Quicene NFH	Coho	Big Quilcene River	72,000	72,000	256,000	0	400,000	
WFWO	*Quicene NFH*	*Coho*	*Big Quilcene River*	*40,000*	*0*	*160,000*	*0*	*200,000*	Quilcene Bay Net Pens - reported by NWIFC
			Coho Total	272,000	2,087,000	1,501,000	490,000	4,350,000	
			What FWS will report to RMIS	232,000	177,000	1,201,000	0	1,610,000	
AFTC	Abernathy FTC	Steelhead	Abernathy	20,000	0	0	0	20,000	
CRFPO	Winthrop NFH	Steelhead	Wells/Methow	155,000	0	0	0	155,000	
IFRO	Dworshak NFH	Steelhead	Dworshak	180,000	0	1,820,000	0	2,000,000	1.2M Released On-station
IFRO	Dworshak NFH	Steelhead	Dworshak	0	0	0	200,000	200,000	Lolo Cr., M. Fk. Clearwater R. Restoration
IFRO	*Hagerman NFH*	*Steelhead*	*Salmon River*	*80,000*		*1,020,000*	*0*	*1,100,000*	Marked by IDFG
RBFWO	Coleman NFH	Steelhead	Battle Creek Steelhead	0	0	600,000	0	600,000	
WFWO	Makah NFH	Steelhead	Sooes River	0	0	158,000	0	158,000	
WFWO	*Makah NFH*	*Steelhead*	*Sooes River*	*0*	*0*	*22,000*	*0*	*22,000*	Educket Creek program - reported by NWIFC
WFWO	Quinault NFH	Steelhead	Cook Creek/Quinault	20,000	0	180,000	0	200,000	
			Steelhead Total	455,000	0	3,800,000	200,000	4,455,000	
			What FWS will report to RMIS	375,000	0	2,758,000	200,000	3,333,000	

Idaho Department of Fish and Game- Marking and Tagging for 2014

Brood Year 2013 Spring/Summer Chinook Salmon

Sum of BY13 Number Released		Marks & Tags			
Fish Hatchery	Release Site	AD	AD/CWT	CWT	Grand Total
Clearwater	Clear Creek	515,000	120,000		635,000
	Lower Selway R.	145,000	120,000	135,000	400,000
	Powell Pond	300,000		300,000	600,000
	Red River Pond	980,000	120,000		1,100,000
Clearwater Sum		1,940,000	360,000	435,000	2,735,000
McCall	Knox Bridge S.F. Salmon R. (Seg)	630,000	120,000		750,000
	Knox Bridge S.F. Salmon R. (Int)			250,000	250,000
McCall Sum		630,000	120,000	250,000	1,000,000
Pahsimeroi	Pahsimeroi R. (Seg)	680,000	120,000		800,000
	Pahsimeroi R. (Int)			200,000	200,000
Pahsimeroi Sum		680,000	120,000	200,000	1,000,000
Rapid River	Hells Canyon	350,000			350,000
	Little Salmon	150,000			150,000
	Rapid River	2,380,000	120,000		2,500,000
Rapid River Sum		2,880,000	120,000		3,000,000
Sawtooth	Yankee Fork		200,000		200,000
	Sawtooth weir (Seg)	1,280,000	120,000		1,400,000
	Sawtooth weir (Int)			200,000	200,000
Sawtooth Sum		1,280,000	320,000	200,000	1,800,000
Grand Total		7,410,000	1,040,000	1,085,000	9,535,000

Brood Year 2013 Sockeye and Fall Chinook Salmon

Sum of BY13 Number Released		Marks & Tags		
Fish Hatchery	Release Site	AD	AD/CWT	Grand Total
Eagle/Sawtooth (Sockeye)	Redfish Lake Cr.-Sawtooth Reared	170,000		170,000
	Redfish Lake Cr.-Oxbow Reared	90,000		90,000
	Redfish Lake Cr.-Springfield Reared	200,000		200,000
Eagle/Sawtooth (Sockeye) Sum		460,000		460,000
Oxbow (Fall Chinook)	IPC Hells Canyon Dam-Irrigon FH Reared	800,000	200,000	1,000,000
Oxbow (Fall Chinook) Sum		800,000	200,000	1,000,000
Grand Total		1,260,000	200,000	1,460,000

Brood Year 2014 Steelhead

Sum of Number Released			Marks & Tags				
Fish Hatchery	Release Site	Stock	AD	AD/CWT	No Clip	CWT Only	Grand Total
Clearwater	Newsome Cr.	DWOR			123,000		123,000
	Red House Hole	DWOR	220,000				220,000
	Meadow Cr	SFCLW	140,000			140,000	280,000
		DWOR	150,000		70,000		220,000
Clearwater Total			510,000		193,000	140,000	843,000
Hagerman National	Sawtooth Weir	SAWA	1,190,000	90,000			1,280,000
	Upper EF.Salmon R. (Wei	EFNat				60,000	60,000
	McNabb Point	SAWA	130,000				130,000
	Sawtooth Weir (recirc)	SAWA		90,000			90,000
Hagerman National Total			1,320,000	180,000		60,000	1,560,000
Magic Valley	Pahsimeroi Trap	DWOR				93,000	93,000
		USAL				93,000	93,000
	Squaw Creek	DWOR/USAL	186,000				186,000
	Red Rock	PAH	93,000				93,000
	Shoup Bridge	PAH	93,000				93,000
	Colston Corner	PAH	93,000				93,000
	Little Salmon R.	DWOR/USAL	217,000				217,000
		PAH	186,000				186,000
	Yankee Fork	DWOR/USAL	279,000		217,000		496,000
Magic Valley Total			1,147,000		217,000	186,000	1,550,000
Niagara Springs	Hells Canyon Dam	OX	550,000				550,000
	Pahsimeroi Trap	PAH	800,000				800,000
	Little Salmon R.	PAH	200,000				200,000
		OX	250,000				250,000
Niagara Springs Total			1,800,000				1,800,000
Grand Total			4,777,000	180,000	410,000	386,000	5,753,000

2014 Canadian Marking Summary

Project	Coded Wire Tag	AD Fin Clip	RV Fin Clip	Thermal	Total
Chinook	5,030,000	N/A	35,000	24,785,000	29,850,000
Coho	1,018,500	5,125,000	N/A	150,000	6,293,500
Chum	N/A	375,000	N/A	35,200,000	35,575,000
Sockeye	50,000	2,520,000	N/A	9,450,000	12,020,000
Steelhead	N/A	102,941	N/A	N/A	102,941
Total	6,098,500	8,122,941	35,000	69,585,000	83,841,441

2014 Chinook CWT Marking Plans

Project	Coded Wire Tag	RV Fin Clip	Thermal	Grand Total
Alouette R			15,000	15,000
Big Qualicum R	450,000			450,000
Capilano R	120,000			120,000
Chehalis R	300,000		0	300,000
Chilliwack R	200,000		1,230,000	1,430,000
Conuma R			3,430,000	3,430,000
Cowichan R	600,000		700,000	1,300,000
Esquimalt Hb			100,000	100,000
Gillard Pass	190,000			190,000
Gwa'ni			250,000	250,000
L Campbell R		35,000		35,000
Nanaimo R			340,000	340,000
Nitinat R			4,570,000	4,570,000
P Hardy/Marble			990,000	990,000
Poco Hatchery			25,000	25,000
Puntledge R	135,000		1,250,000	1,385,000
Quinsam R	575,000		3,900,000	4,475,000
Robertson Cr	565,000		6,435,000	7,000,000
San Juan R	80,000		900,000	980,000
Shuswap R	675,000			675,000
Snootli Cr	450,000			450,000
Spius Cr	195,000		350,000	545,000
Tahsis R			300,000	300,000
Terrace	260,000			260,000
Toboggan Cr	35,000			35,000
Tofino	50,000			50,000
Whitehorse	150,000			150,000
Total	**5,030,000**	**35,000**	**24,785,000**	**29,850,000**

2014 Coho Hatchery Marking Plans

Project	Coded Wire Tag	AD Fin Clip	Thermal	Grand Total
Alouette R		25,000		25,000
Big Qualicum R	140,000	360,000		500,000
Black Cr	15,000			15,000
Capilano R		525,000		525,000
Carnation Cr	3,000			3,000
Chapman Cr		85,000		85,000
Chehalis R		700,000		700,000
Chilliwack R		800,000		800,000
Conuma R		50,000		50,000
Courtenay		50,000		50,000
Eby Street	25,000			25,000
Fanny Bay/GSVI		110,000		110,000
French Cr		30,000		30,000
Goldstream R	20,000			20,000
Hoy Cr		5,000		5,000
Hyde Cr/LWFR		5,000		5,000
Inch Cr	150,000	425,000		575,000
Kanaka Cr		10,000		10,000
Keogh R	50,000			50,000
L Campbell R		40,000		40,000
Little R/GSVI		50,000		50,000
Millard Cr		10,000		10,000
Myrtle Cr	500			500
Nanaimo R		84,000		84,000
Nitinat R		300,000	150,000	450,000
Noons Cr		10,000		10,000
Oldfield Cr		15,000		15,000
P Hardy/Quatse		300,000		300,000
Poco Hatchery		20,000		20,000
Puntledge R	200,000			200,000
Quinsam R	160,000	520,000		680,000
Reed Point/Ioco		8,000		8,000
Robertson Cr	40,000	160,000		200,000
Seymour R		30,000		30,000
Sliammon R		60,000		60,000
Snootli Cr	25,000			25,000
Spius Cr	125,000			125,000
Tenderfoot Cr		300,000		300,000
Toboggan Cr	35,000			35,000
Tofino		30,000		30,000
Westridge Term		8,000		8,000
Zolzap Cr	30,000			30,000
Total	**1,018,500**	**5,125,000**	**150,000**	**6,293,500**

CDFO -- MSF Plans Summary -- 2014

ID #	Species	Fishery type (Commercial-C, Recreational-R)	Water Type (Freshwater-F, Marine - M)	Region and Fishery Area	Period (Yr/Mon)	Bag Limit hatchery/wild	Lower Size Limit	PFMA Areas in Fishery
CO-R-M-1	Coho	R	M	All South Coast waters unless otherwise indicated in ID# CO-R-M-2 to CO-R-M-23	Jun 1 - Dec 31	2/0	30cm	11-29, 111-127
CO-R-M-2	Coho	R	M	Johnstone Strait	Apr 1 - Mar 31	2/2	30cm	Subareas 11-3 to 11-10
CO-R-M-3	Coho	R	M	Johnstone Strait	Jun 1 - Jul 31	2/2	30cm	111, subareas 11-1, 11-2 and 12-14
CO-R-M-4	Coho	R	M	Johnstone Strait	Jun 1 - Jul 31	2/1	30cm	12-3 to 12-13, 12-15 to 12-19, 12-26 to 12-48
CO-R-M-5	Coho	R	M	Johnstone Strait	Aug 1 - Dec 31	2/1	30cm	111, subareas 11-1, 11-2, portions of 12-4, 12-14 and 12-19 (McNeill Bay), 12-26-12-48
CO-R-M-6	Coho	R	M	Johnstone Strait	Aug 1 - Dec 31	4/0	30cm	12-16 (Hardy Bay only)
CO-R-M-7	Coho	R	M	Northern Georgia Strait	Aug 1 - Sep 15	2/1	30cm	13-20, 13-21 and a portion of 13-22 (Bute Inlet)
CO-R-M-8	Coho	R	M	Northern Georgia Strait	Sep 1 - Dec 31	2/1	30cm	14-11
CO-R-M-9	Coho	R	M	Northern Georgia Strait	Aug 15-Oct 15	2/2	30cm	15-1
CO-R-M-10	Coho	R	M	Northern Georgia Strait	Jul 1 - Dec 31	4/0	30cm	Subareas 16-5, portions of 16-6
CO-R-M-11	Coho	R	M	South Georgia Strait	Oct 23 - Dec 31	2/2	30cm	Subarea 18-8 inside a line from Separation Point to Cherry Point
CO-R-M-12	Coho	R	M	BC Juan de Fuca	Oct 1 - Dec 31	2/1	30cm	19
CO-R-M-13	Coho	R	M	South Georgia Strait	Jan 1 - Dec 31	2/0	30cm	Subareas 28-1 to 28-7 and 28-9,and 29-3 (easterly of a line from Gower Point to the Tango 10 Light Buoy, then to the northern tip of Lulu Island)
CO-R-M-14	Coho	R	M	South Georgia Strait	Apr 1 - Sep 30	2/0	30cm	Subareas 28-11 to 28-14
CO-R-M-15	Coho	R	M	South Georgia Strait	Sep 15 - Dec 31	2/2	30cm	Subareas 29-1
CO-R-M-16	Coho	R	M	BC Juan de Fuca	Oct 1 - Dec 31	4/1	30cm	Portion of Subareas 20-1 (seaward of a line between a square white boundary sign at Owen Point, the Port San Juan Light and Whistle Buoy, and San Juan Point) 20-3 to 20-7
CO-R-M-17	Coho	R	M	BC Juan de Fuca	Sep 4 - December 31	4/2	30cm	those waters of 20-2 and a portion of 20-1 (shoreward of a line between the square white boundary sign at Owen Point, the Port San Juan light-and-whistle buoy and San Juan Point)
CO-R-M-18	Coho	R	M	WCVI	June 1 - Dec 31	4/4	30cm	Area 22, and portions of Subareas 23-7, 23-8 and 23-11 shoreward of a line from Amphitrite Point Light to the Chrow Island Light, then to the Benson Island Light, then to the Coaster Channel Light, then to the southwestern tip of Sanford Island, then to Aguilar Point. (Barkley Sound), portions of subareas 25-1 to 25-6, a portion of sub area 25-8 [Tahsis Inlet] north of a line from the northern most tip of Strange Island due east to a boundary sign on the opposite shore of Tahsis Inlet, a portion of sub area 25-9 [Zeballos Inlet] northwest of a line drawn from a flashing green light located on Vancouver Island at 49°54.424.'N and 126°48.088'W to a boundary sign located on the opposite shore of Zeballos Inlet at 49°54.819.'N and 126°47.171'W, a portion of sub area 25-11 [Espinosa Inlet] northwest of a line drawn from a point located on Vancouver Island at 49°55.444.'N and 126°55.100'W to a boundary sign located on the opposite shore of Espinosa Inlet at 49°55.444.'N and 126°56.485'W, 25-13, 25-14, (Esperenza Inlet) and subareas 27-1, 27-2, 27-7 to 27-11 (Quatsino Sound)
CO-R-M-19	Coho	R	M	WCVI	Sep 1 - Dec 31	4/0	30cm	Areas 21, 121, and those portions of Subareas 23-7, 23-8 and 23-11 seaward of a line from Amphitrite Point Light to the Chrow Island Light, then to the Benson Island Light, then to the Coaster Channel Light, then to the southwestern tip of Sanford Island, then to Aguilar Point, (Barkley Sound), and a portion of Sub Area 24-2 seaward of a line from Starling Point on Flores Island true west to a boundary sign on Vancouver Island (Clayoquot Sound), subarea 25-7 and subarea 27-4
CO-R-M-20	Coho	R	M	WCVI	Sep 1 - Dec 31	4/0	30cm	Areas 123, 124
CO-R-M-21	Coho	R	M	WCVI	Sep 1 - Dec 31	4/0	30cm	Areas 125, 126, 127
CO-R-M-22	Coho	R	M	WCVI	Jun 01-Aug31	2/2	30cm	Subareas 24-6, 24-8, a portion of 24-9 westerly of a line commencing at Ginnard Point on Meares Island to a point on the Vancouver Island shoreline on the opposite shore of Browning Passage at 49°07.48'N and 125°51.81'W and a portion of Subarea 24-10 seaward of a line from boundary signs on either side of the entrance to Warn Bay and a portion of Subarea 24-11 northerly of a line between boundary signs on Vancouver Island on either side of Grice Bay approximately half way between the entrance and the head of the Bay (Clayoquot Sound)
CO-R-M-23	Coho	R	M	WCVI	Sep 01-Dec31	4/2	30cm	Subareas 24-6, 24-8, a portion of 24-9 westerly of a line commencing at Ginnard Point on Meares Island to a point on the Vancouver Island shoreline on the opposite shore of Browning Passage at 49°07.48'N and 125°51.81'W and a portion of Subarea 24-10 seaward of a line from boundary signs on either side of the entrance to Warn Bay and a portion of Subarea 24-11 northerly of a line between boundary signs on Vancouver Island on either side of Grice Bay approximately half way between the entrance and the head of the Bay (Clayoquot Sound), portions of subareas 26-1 to 26-11 (Kyuquot Sound).
CO-R-M-24	Coho	R	M	Lower Fraser	2014 Jan 1 to Dec	2 hatchery marked Coho per day	30 cm	Subareas 28-1 to 28-7 & 28-9
CO-R-M-25	Coho	R	M	Lower Fraser	2014 June 1 to De	2 hatchery marked Coho per day	30 cm	Subarea 28-8 & 28-10
CO-R-M-26	Coho	R	M	Lower Fraser	2014 Apr 1 to Sep	2 hatchery marked Coho per day	30 cm	Subareas 28-11 to 28-14
CO-R-M-27	Coho	R	M	Lower Fraser	2014 early Oct to	2 hatchery marked Coho per day	30 cm	Area 29, tidal portion of the Fraser (i.e. Steveston to Mission)
CO-R-F-1	Coho	R	F	North Georgia Strait	Oct 1 - Dec 31	4/Day, 2 HM only > 35 cm	30cm	Quinsam / Campbell Rivers
CO-R-F-2	Coho	R	F	North Georgia Strait	October 16 - Dec 31	4/Day, > 25 cm	30cm	Big Qualicum River
CO-R-F-3	Coho	R	F	WCVI	August 25 - Dec 31	2/Day, > 25 cm	30cm	Nitinat River
CO-R-F-4	Coho	R	F	WCVI	August 25 - Dec 31	2/Day, > 25 cm	30cm	Somass River
CO-R-F-5	Coho	R	F	WCVI	August 25 - Dec 31	2/Day, > 25 cm	30cm	Somass River

CO-R-F-9	Coho	R	F	Lower Fraser	2014 Jan 1 to Dec	2 hatchery marked Coho per day	30 cm	Area 29, excluding the tidal portion of the Fraser (i.e. marine waters)
CO-R-F-11	Coho	R	F	Lower Fraser - Fraser River Mainstem	2014 early Oct to	2 hatchery marked Coho per day	25 cm	
CO-R-F-12	Coho	R	F	Lower Fraser - Nicomen Slough/Norrish Creek	2014 Jan 1 to Dec	4 hatchery marked Coho per day, only 2 over 35 cm	25 cm	
CO-C-M-1	Chinook is target species, Coho is bycatch	C - troll	M	WCVI - Area G	Dec-Apr	HM Coho only	30cm	(123 to 125 and 126-1 to 126-3 (5 nm seaward of the surfline), 126-4 and 127 (2 nm seaward of the surfline))
CO-C-M-2	Chinook is target species, Coho is bycatch	C - troll	M	WCVI - Area G	Sep - Dec	HM Coho only	30cm	(123 to 125 and 126-1 to 126-3 (5 nm seaward of the surfline), 126-4 and 127 (2 nm seaward of the surfline))
CN-R-M-1	Chinook	R		Juan de Fuca	March 1 - June 15	2/Day HM or wild between 45 and 67 cm, or 2 HM >67cm	45 cm	(19-1 to 19-4 and 20-5 (those waters near Victoria between Sydney to Sheringham Pt))
CN-R-M-2a	Chinook	R		Juan de Fuca	June 16 - July 15	2/Day HM or wild; only 1 >67cm	45 cm	(19-1 to 19-4 and 20-5 (those waters near Victoria between Sydney to Sheringham Pt))
CN-R-M-2b	Chinook	R		Juan de Fuca	June 16 - July 20 (will be implemented instead of CN-R-M-2a if Fraser Spring/Summer 52 chinook returns are assessed as low inseason.	2/Day, HM or wild <85cm or 2 HM >85 cm	45 cm	(19-1 to 19-4 and 20-5 (those waters near Victoria between Sydney to Sheringham Pt))

ODFW: 2014 FISH MARKING PROGRAM

STOCK	2014 PRODUCTION				
	TAGGED (CWT)		UNTAGGED		
	AD+CWT	CWT only	AD Clip	No AD Clip	Total Marked
Spring Chinook	*2,710,000*	*266,000*	*9,278,000*		*12,254,000*
Fall Chinook	*2,820,000*	*200,000 (DIT-Big Cr)*	*18,691,000*	*2,170,000 (LV only clip)*	*23,881,000*
Coho	300,000	100,000	5,187,000		5,587,000
Sum. Steelhead	335,000		1,605,000		1,940,000
Win. Steelhead	60,000	530,000			590,000
Chum		116,000			116,000
Sockeye			127,000		127,000
TOTALS:	**6,225,000**	**1,012,000**	**34,888,000**	**2,170,000**	**44,495,000**

1) Spring Chinook Ad only clips: Total includes 20,000 'Agency only' tags
2) Fall Chinook Ad only clips: Includes 300,000 'Agency only' tags (Umatilla Hatchery evaluation)
3) ODFW has only one DIT group: 200,000 CWT only (Tule fall Chinook: Big Creek Hatchery)
4) LV only clips used to identify Rogue R fall Chinook in terminal SAFE fishery(Youngs Bay -lower Col. R.)

Comparison of AD+CWT and AD Clip Only Marks (2011 - 2014)						
	Spring Chinook		Fall Chinook		Coho	
Year	AD+CWT	AD Clip only	AD+CWT	AD Clip only	AD+CWT	AD Clip only
2011	4,130,000	8,600,000	2,665,000	16,760,000	250,000	5,330,000
2012	3,210,000	9,265,000	2,955,000	15,775,000	350,000	5,494,000
2013	2,825,000	7,285,000	2,860,000	18,740,000	300,000	5,585,000
2014	**2,710,000**	**9,278,000**	**2,820,000**	**18,691,000**	**300,000**	**5,187,000**

WDFW and TRIBAL PUGET SOUND CHINOOK MASS MARKING and CODED-WIRE TAGGING 2014

Species: Chinook
Area: Puget Sound
Brood: 2013
Releases: 2014 and 2015

Data from 2013 Future Brood Document

4/25/2014

Agency	Hatchery	Stock	Number of fish to be released with a CWT		Number of fish to be released without a CWT		Total Production	Proposed to be marked this year (Y/N)	Marked in previous year (Y/N)
			Ad Clipped	Unclipped	Ad Clipped	Unclipped			
WDFW	Kendall Creek	NF Nooksack springs	200,000	0	550,000	0	750,000	Y	Y
Tribal	Skookum Creek	SF Nooksack springs	0	1,000,000	0	0	1,000,000	NA	NA
WDFW	Marblemount *	Skagit River springs	277,500	200,000	110,000	0	587,500	Y	Y
WDFW	**Hupp Springs**	White River springs	400,000	0	0	0	400,000	NA	NA
WDFW/Tribal	**Puyallup**	**White River springs**	**0**	**100,000**	**700,000**	**0**	**800,000**	**NA**	**NA**
Tribal	White River	White River springs	0	340,000	0	0	340,000	NA	NA
Tribal	White River	White River springs 1+	0	55,000	0	0	55,000	NA	NA
WDFW	Dungeness	Dungeness River springs	0	50,000	0	0	50,000	NA	NA
WDFW	Hurd Creek	Dungeness River springs 1+	0	50,000	0	0	50,000	NA	NA
WDFW	Greywolf Acclimation	Dungeness River springs 0+	0	50,000	0	0	50,000	NA	NA
WDFW	Upper Dungeness Acc Pond	Dungeness River springs 0+	0	50,000	0	0	50,000	NA	NA
		Total spring chinook	877,500	1,895,000	1,360,000	0	4,132,500		
WDFW	Marblemount	Skagit River summers	200,000	0	0	0	200,000	Y	Y
Tribal	Whitehorse	NF Stillaguamish River summers	220,000	0	0	0	220,000	Y	Y
Tribal	Bernie Gobin	Skykomish River summers	100,000	0	1,600,000	0	1,700,000	Y	Y
WDFW	Wallace River*	Skykomish River summers	200,000	200,000	600,000	0	1,000,000	Y	Y
WDFW	Wallace River	Skykomish River summers 1+	0	0	500,000	0	500,000	Y	Y
		Total summer chinook	720,000	200,000	2,700,000	0	3,620,000		
WDFW	Glenwood Springs	Glenwood Springs falls	100,000	0	450,000	0	550,000	Y	Y
Tribal	Lummi Bay Sea Ponds	Samish River (Friday Creek) falls	0	0	500,000	0	500,000	Y	Y
WDFW	Whatcom Creek	Samish River (Friday Creek) falls	0	0	500,000	0	500,000	Y	Y
WDFW	Samish*	Samish River falls	200,000	200,000	3,600,000	0	4,000,000	Y	Y
WDFW	Soos Creek*	Big Soos Creek falls	200,000	200,000	2,800,000	0	3,200,000	Y	Y
WDFW	Icy Creek	Big Soos Creek falls 1+	0	0	300,000	0	300,000	Y	Y
Tribal	Palmer Pond / Keta Creek	Big Soos Creek falls	0	0	1,000,000	0	1,000,000	Y	Y
WDFW	Issaquah	Issaquah Creek falls	0	0	**2,000,000**	0	**2,000,000**	Y	Y
WDFW	Minter Creek	Minter Creek falls 0+	0	0	1,400,000	0	1,400,000	Y	NA

WDFW	Hupp Springs	Minter Creek falls 1+	75,000	0	45,000	0	120,000	Y	Y
Tribal	Gorst Creek	Grovers Creek falls	0	0	1,580,000	0	1,580,000	Y	Y
Tribal	Grovers Creek *	Grovers Creek falls	**0**	**0**	**425,000**	**0**	**425,000**	Y	Y
Tribal	Clarks Creek	Puyallup River falls	**180,000**	0	**220,000**	0	**400,000**	Y	Y
WDFW	Voights Creek	Voights Creek falls	90,000	0	**1,510,000**	**0**	**1,600,000**	Y	Y
WDFW	Garrison Springs	Garrison Springs falls	**0**	0	**850,000**	**0**	850,000	Y	Y
Tribal	Clear Creek *	Clear Creek falls	200,000	200,000	3,100,000	0	3,500,000	Y	Y
Tribal	Kalama Creek	Kalama Creek falls	100,000	0	**500,000**	**0**	600,000	Y	Y
WDFW	Tumwater Falls	Deschutes River falls	0	0	3,800,000	0	3,800,000	Y	Y
WDFW	George Adams *	George Adams falls	225,000	225,000	3,350,000	0	3,800,000	Y	Y
WDFW	RFEG 6	**Hamma Hamma falls**	0	80,000	0	0	80,000	NA	NA
WDFW	Hoodsport	Hoodsport falls	200,000	0	2,600,000	0	2,800,000	Y	Y
WDFW	Hoodsport	Hoodsport falls 1+	0	0	120,000	0	120,000	Y	Y
WDFW	Morse Creek	Elwha River falls 1+	0	200,000	0	0	200,000	NA	NA
WDFW	Elwha	Elwha River falls	0	0	0	2,500,000	2,500,000	NA	NA
WDFW	Elwha	Elwha River falls 1+	0	200,000	0	0	200,000	NA	NA
Tribal	Hoko Falls	Hoko River falls	200,000	0	220,000	0	420,000	Y	Y
		Total fall chinook	1,770,000	1,305,000	30,870,000	2,500,000	36,445,000		
	Total		**3,367,500**	**3,400,000**	**34,930,000**	**2,500,000**	**44,197,500**		
	Total Chinook Production				**44,197,500**				
	Percent Marked				**87%**				

* DIT group

WDFW and TRIBAL PUGET SOUND COHO MASS MARKING and CODED-WIRE TAGGING 2014

Species: Coho
Area: Puget Sound
Brood: 2013
Release Year: 2015

Data from 2013 Future Brood Document

10/28/2013

Agency	Hatchery	Stock	Number of fish to be released with a CWT		Number of fish to be released without a CWT			Proposed to be marked this year (Y/N)	Marked in previous year (Y/N)
			Ad Clipped	Unclipped	Ad Clipped	Unclipped	Total Production		
Coop	Baker Lake	Baker River	0	0	**60,000**	0	**60,000**	Y	Y
WDFW	Glenwood Springs	Glenwood Springs	0	0	100,000	0	100,000	Y	Y
Tribal	Lummi Bay Sea Pens	Lummi Bay	50,000	0	950,000	0	1,000,000	Y	Y
Tribal	Skookum Creek	Skookum Creek	50,000	**0**	950,000	0	1,000,000	Y	Y
WDFW	Marblemount*	Skagit (Clark Creek)	45,000	45,000	160,000	0	250,000	Y	Y
Tribal	North Fork (Stillaguamish)	Fortson Creek	50,000	0	0	0	50,000	Y	Y
WDFW	Wallace River*	Skykomish (May Creek)	45,000	45,000	60,000	0	150,000	Y	Y
Tribal	Bernie Gobin	Skykomish (May Creek)	50,000	0	950,000	**0**	1,000,000	Y	Y
WDFW	NWSSC Everett Net Pens	Skykomish (May Creek)	0	0	20,000		20,000	Y	Y
WDFW	**NWSSC - Eagle Creek**	Skykomish (May Creek)	0	0	54,000	0	54,000	Y	Y
WDFW	Laebugten Net Pens	Issaquah Creek	0	0	25,000	0	25,000	Y	Y
WDFW	Issaquah	Issaquah Creek	50,000	0	400,000	0	450,000	Y	Y
WDFW	Soos Creek*	Green River (Soos Creek)	45,000	45,000	510,000	0	600,000	Y	Y
Tribal	Keta Creek / Crisp Creek	Green River (Soos Creek)	**0**	0	500,000	0	500,000	Y	Y
Tribal	Elliott Bay Net Pens	Green River (Soos Creek)	**0**	0	395,000	0	395,000	Y	Y
WDFW	NWSSC Des Moines	Green River (Soos Creek)	0	0	30,000	0	30,000	Y	Y
WDFW	Marine Tech Center	MTC / Soos Creek	0	0	10,000	0	10,000	Y	Y
WDFW	Voights Creek*	Puyallup (Voights Creek)	45,000	45,000	690,000	0	780,000	Y	Y
Tribal	**Clarks Creek**	**Puyallup (Voights Creek)**	**0**	**0**	**3,200**	**0**	**3,200**	Y	NA
Tribal	Puyallup Tribal (Rushing)	Puyallup (Voights Creek)	100,000	0	0	0	100,000	Y	Y
WDFW	Minter Creek	Minter Creek	50,000	0	450,000	0	500,000	Y	Y
WDFW/Tribal	SSNP/Squaxin Net Pens	Skykomish (May Creek)	50,000	0	1,750,000	0	1,800,000	Y	Y

Tribal	Kalama Creek	Kalama Creek	45,000	0	355,000	0	400,000	Y	Y
WDFW	George Adams*	George Adams (Purdy Creek)	45,000	45,000	210,000	0	300,000	Y	Y
WDFW-Tribal	Port Gamble Net Pens	Big Quilcene River	45,000	0	355,000	0	400,000	Y	Y
Tribal	Quilcene Bay Net Pens	George Adams (Purdy Creek)	40,000	**0**	110,000	0	150,000	Y	Y
WDFW	Dungeness	Dungeness	0	0	500,000	0	500,000	Y	Y
Tribal	Lower Elwha*	Elwha River	75,000	75,000	**275,000**	0	**425,000**	Y	Y
* = DIT Group									
	Total		**880,000**	**300,000**	**9,872,200**	**0**	**11,052,200**		
	Total Coho Production		**11,052,200**						
	Percent marked		**97%**						

Table 1.

WDFW and TRIBAL COASTAL CHINOOK MASS MARKING and CODED-WIRE TAGGING 2014

Species: Chinook
Area: Coastal Washington
Brood: 2013
Releases: 2014 and 2015 Data from 2013 Future Brood Document

4/25/2014

Agency	Hatchery	Stock	Number of fish to be released with a CWT		Number of fish to be released without a CWT		Total Production	Proposed to be marked this year (Y/N)	Marked in previous year (Y/N)
			Ad Clipped	Unclipped	Ad Clipped	Unclipped			
Tribal	Educket Creek	Sooes River falls	0	0	100,000	0	100,000	Y	Y
Tribal	SolDuc	SolDuc summers 0+	70,000		0	0	70,000	Y	Y
Tribal/WDFW	SolDuc	SolDuc summers 1+	80,000	0	170,000	0	250,000	Y	Y
Tribal	Bear Springs	SolDuc spring/summers	0	50,000	**0**	0	50,000	NA	NA
Tribal	Salmon River	Queets River falls	200,000	0	0	0	200,000	Y	Y
Tribal	Quinault River*	Quinault River falls	200,000	200,000	**0**	0	**400,000**	Y	Y
WDFW	Humptulips	Humptulips River falls	0	0	500,000	0	500,000	Y	Y
WDFW	Lake Aberdeen	Van Winkle Creek falls	0	0	50,000	0	50,000	Y	Y
WDFW	Wishkah (Mayr Bros)	Wishkah River falls	0	0	200,000	0	200,000	Y	Y
WDFW	Bingham Creek	Satsop River falls	**0**	**0**	200,000	0	200,000	Y	Y
WDFW	Satsop Springs	Satsop River falls	0	0	300,000	0	300,000	Y	Y
WDFW	Forks Creek*	Willapa River falls	200,000	200,000	2,800,000	0	3,200,000	Y	Y
WDFW	Nemah	Nemah River falls	0	0	3,000,000	0	3,000,000	Y	Y
WDFW	Naselle	Naselle River falls	**75,000**	**75,000**	**650,000**	0	800,000	Y	Y
	Total		**825,000**	**525,000**	**7,970,000**	**0**	**9,320,000**		

Total Chinook Production **9,320,000**
Percent Marked **94%**

* DIT

WDFW and TRIBAL COASTAL COHO MASS MARKING and CODED-WIRE TAGGING 2014

Species: Coho
Area: Coastal Washington
Brood: 2013
Release Year: 2015

Data from 2013 Future Brood Document

10/28/2013

Agency	Hatchery	Stock	Number of fish to be released with a CWT		Number of fish to be released without a CWT			Proposed to be marked this year (Y/N)	Marked in previous year (Y/N)
			Ad Clipped	Unclipped	Ad Clipped	Unclipped	Total Production		
Tribal	Educket Creek	Sooes River	0	0	40,000	0	40,000	Y	Y
WDFW	Solduc	Solduc summers	0	0	100,000	0	100,000	Y	Y
WDFW	Solduc *	Solduc falls	75,000	75,000	250,000	0	400,000	Y	Y
Tribal	Salmon River *	Salmon River	75,000	75,000	500,000	0	650,000	Y	Y
WDFW	Humptulips	Humptulips	0	0	400,000	0	400,000	Y	Y
WDFW	Humptulips	Humptulips lates	**0**	0	100,000	0	100,000	Y	Y
WDFW	Friends Landing	Satsop River	0	0	25,000	0	25,000	Y	Y
WDFW	Mayr Brothers	Wishkah River	0	0	300,000	0	300,000	Y	Y
WDFW	Buzzard Creek	Wishkah River	0	0	25,000	0	25,000	Y	Y
WDFW	Lake Aberdeen	Van Winkle	0	0	30,000	0	30,000	Y	Y
WDFW	Bingham Creek *	Satsop River	75,000	75,000	0	0	150,000	Y	Y
WDFW	Bingham Creek	Satsop Lates	**0**		150,000	0	150,000	Y	Y
WDFW	Satsop Springs	Satsop River	**0**	0	450,000	0	450,000	Y	Y
WDFW	Skookumchuck	Satsop River	**0**	0	50,000	0	50,000	Y	Y
WDFW	Skookumchuck	Satsop lates	50,000	0	**0**	0	50,000	Y	Y
WDFW	Carlisle Lake	Satsop River	0	0	50,000	0	50,000	Y	Y
WDFW	Carlisle Lake	Satsop lates	0	0	50,000	0	50,000	Y	Y
WDFW	Eight Creek	Satsop lates	0	0	100,000	0	100,000	Y	Y
WDFW	Forks Creek *	Willapa River	75,000	75,000	50,000	0	200,000	Y	Y
WDFW	Forks Creek	Willapa lates	0	0	100,000	0	100,000	Y	Y
WDFW	Naselle	Naselle River	0	0	1,200,000	0	1,200,000	Y	Y
WDFW	Naselle	Naselle River lates	0	0	200,000	0	200,000	Y	Y
WDFW	Westport Net Pens	Humptulips River	0	0	100,000	0	100,000	Y	Y
	Total		**350,000**	**300,000**	**4,270,000**	**0**	**4,920,000**		

Total Coho Production **4,920,000**
Percent Marked **94%**

* DIT groups

WDFW and TRIBAL COLUMBIA RIVER CHINOOK MASS MARKING and CODED-WIRE TAGGING 2014

Species: Chinook
Area: Columbia River
Brood: 2013
Release Year: 2014 and 2015

Data from 2013 Future Brood Document

4/25/2014

Agency	Hatchery	Stock	Number of fish to be released with a CWT		Number of fish to be released without a CWT			Proposed to be marked this year (Y/N)	Marked in previous year (Y/N)
			Ad Clipped	Unclipped	Ad Clipped	Unclipped	Total Production		
WDFW	**Beaver Creek**	**Elochoman - Wild Falls**	**0**	**190,000**	**0**	**0**	**190,000**	**NA**	**NA**
WDFW	Deep River Net Pens	Elochoman - Falls	90,000	0	910,000	0	1,000,000	Y	Y
WDFW	**Cowlitz**	**Cowlitz - Falls**	**1,100,000**	**0**	**0**	**0**	**1,100,000**	**Y**	**NA**
WDFW	**Cowlitz**	**Cowlitz - Falls**	**0**	**0**	**400,000**	**0**	**400,000**	**Y**	**Y**
WDFW	**Cowlitz**	**Cowlitz - Falls**	**100,000**	**0**	**1,900,000**	**0**	**2,000,000**	**Y**	**Y**
WDFW	N Toutle	Toutle - Falls	**100,000**	0	1,300,000	0	1,400,000	Y	Y
WDFW	Kalama Falls	Kalama - Falls	**125,000**	0	3,375,000	0	3,500,000	Y	Y
WDFW	Fallert Creek	Kalama - Falls	**125,000**	0	**3,375,000**	0	3,500,000	Y	Y
WDFW	Lewis River	Lewis River - Falls (wild)	100,000	0	0	0	100,000	Y	Y
WDFW	Washougal	Washougal - Falls	**150,000**	0	**2,850,000**	0	3,000,000	Y	Y
Tribal	Klickitat	Klickitat - falls	**450,000**	0	**3,600,000**	**0**	4,050,000	Y	Partial
Tribal	Hanford Reach	Hanford - Wild	200,000	0	0	0	200,000	Y	Y
WDFW	Lyons Ferry	Lyons Ferry - Falls	400,000	0	0	0	400,000	Y	Y
WDFW	Lyons Ferry	Lyons Ferry - Falls 1+	225,000	225,000	0	0	450,000	Y	Y
WDFW	Ringold **	URBs	200,000	0	3,250,000	0	3,450,000	Y	Y
WDFW	Priest Rapids	Priest Rapids - URBs	600,000	600,000	**5,825,543**	0	**7,025,543**	Y	Partial
		Total Fall Chinook	**3,965,000**	**1,015,000**	**26,785,543**	**0**	**31,765,543**		
		Total Percent Marked	**97%**						
WDFW	Chelan Falls	Wells - summers 1+	576,000	0	0	0	576,000	Y	Y
WDFW	Dryden Pond	Wenatchee - summers 1+	**500,001**	0	0	0	**500,001**	Y	Y
WDFW	Wells	Wells - summers	484,000	0	0	0	484,000	Y	Y
WDFW	Wells	Wells - summers 1+	320,000	0	0	0	320,000	Y	Y
WDFW	Carlton Pond	Methow / Okanogan - summers 1+	200,000	0	0	0	200,000	Y	Y
WDFW	Similkameen Pond	Methow / Okanogan - summers 1+	167,000	0	0	0	167,000	Y	Y
		Total Summer Chinook	**2,247,001**	**0**	**0**	**0**	**2,247,001**		
		Total Percent Marked	**100%**						
WDFW	**Cathlamet Channel Net Pens**	Cowlitz - springs 1+	**250,000**	0	**0**	0	250,000	Y	Y
WDFW	Cowlitz	Cowlitz - springs fall release	100,000	0	400,000	0	500,000	Y	Y

WDFW	Cowlitz	Cowlitz - springs 1+	200,000		1,093,529		1,293,529	Y	Y
WDFW	Friends of the Cowlitz	Cowlitz - springs 1+	0	0	55,000	0	55,000	Y	Y
WDFW	Fallert Creek	Kalama - springs 1+	125,000	0	0	0	125,000	Y	Y
WDFW	Gobar Pond	Kalama - springs 1+	125,000	0	250,000	0	375,000	Y	Y
WDFW	Lewis River*	Lewis River - springs 1+	150,000	150,000	800,000	0	1,100,000	Y	Y
WDFW	**Speelyai**	**Lewis River - springs 1+**	**0**	**0**	**0**	**15,000**	**15,000**	**N**	**NA**
WDFW	Muddy River Acc Pond	Lewis River - springs 1+	0	**50,000**	**0**	0	50,000	NA	NA
WDFW	Echo Net Pens	Lewis River - springs 1+	0	0	150,000	0	150,000	Y	Y
WDFW	Clear Creek Acc Pond	Lewis River - springs 1+	0	**35,000**	**0**	0	35,000	NA	NA
Tribal	Klickitat	Klickitat - springs 1+	**140,000**	0	**460,000**	0	600,000	Y	Y
WDFW	Tucannon	Tucannon - springs 1+	0	225,000	0	0	225,000	NA	NA
WDFW	Chiwawa Pond	Chiwawa - springs 1+	204,452	0	0	0	204,452	Y	Y
WDFW	Methow	Methow - springs 1+	0	**135,000**	0	0	135,000	NA	NA
WDFW	Twisp	Twisp - springs 1+	0	**30,000**	0	0	30,000	NA	NA
		Total Spring Chinook	**1,294,452**	**625,000**	**3,208,529**	**15,000**	**5,142,981**		
		Total Percent Marked	**88%**						
		Total Chinook	**7,506,453**	**1,640,000**	**29,994,072**	**15,000**	**39,155,525**		
		Total Percent Marked	**96%**						

* DIT group
** marked by ODFW

WDFW and TRIBAL COLUMBIA RIVER COHO MASS MARKING and CODED-WIRE TAGGING 2014

Species: Coho
Area: Columbia River
Brood: 2013
Release Year: 2015

10/25/2013

Data from 2013 Future Brood Document

Agency	Hatchery	Stock	Number of fish to be released with a CWT		Number of fish to be released without a CWT		Total Production	Proposed to be marked this year (Y/N)	Marked in previous year (Y/N)
			Ad Clipped	Unclipped	Ad Clipped	Unclipped			
WDFW	Deep River Net Pens	Type S	30,000	0	**970,000**	0	1,000,000	Y	Y
WDFW	Grays River	Grays River - Type N	**45,000**	0	**105,000**	0	150,000	Y	Y
WDFW	Cowlitz	Cowlitz - Type N	0	0	**1,200,000**	0	1,200,000	Y	Y
WDFW	Cowlitz	Cowlitz - Type N (wild)	978,000	0	0	0	978,000	Y	Y
WDFW	N Toutle	Toutle - Type S	**45,000**	0	**105,000**	0	150,000	Y	Y
WDFW	Kalama Falls	Kalama Falls - Type N	**45,000**	0	**555,000**	0	600,000	Y	Y
WDFW	Fallert Creek	Kalama Falls - Type S	**45,000**	0	**55,000**	0	100,000	Y	Y
WDFW	Lewis River*	Lewis River - Type S	75,000	75,000	**950,000**	0	**1,100,000**	Y	Y
WDFW	Lewis River*	Lewis River - Type N	75,000	75,000	**275,000**	0	**425,000**	Y	Y
WDFW	Speelyai Bay Net Pens	Lewis River - Type S	0	0	**475,000**	0	475,000	Y	Y
WDFW	Washougal (Klickitat release)	Washougal - Type N	**70,000**	0	**2,430,000**	0	2,500,000	Y	Y
WDFW	Washougal	Washougal - Type N	**45,000**	0	**105,000**	0	150,000	Y	Y
Tribal	Klickitat	Klickitat - Type N	**47,000**	0	**953,000**	0	1,000,000	Y	Y
Tribal	Beaver Creek Acclimation Pond	Mid-Columbia Type S	0	97,000	0	0	97,000	NA	NA
Tribal	Butcher Pond	Mid-Columbia Type S	0	148,000	0	0	148,000	NA	NA
Tribal	Coulter Pond	Mid-Columbia Type S	0	125,000	0	0	125,000	NA	NA
Tribal	Nason Wetlands	Mid-Columbia Type S	0	105,000	0	0	105,000	NA	NA
Tribal	Rolfings Pond	Mid-Columbia Type S	0	100,000	0	0	100,000	NA	NA
Tribal	Twisp Acclimation Pond	Mid-Columbia Type S	0	90,000	0	0	90,000	NA	NA
		Total	**1,500,000**	**815,000**	**8,178,000**	**0**	**10,493,000**		
		Total Coho Production	**10,493,000**						
		Percent Marked	**92%**						

* DIT group

WDFW and TRIBAL MASS MARKING and CODED-WIRE TAGGING 2014

4/28/2014

Area	Species	Number of fish to be released with a CWT		Number of fish to be released without a CWT		
		Ad Clipped	Unclipped	Ad Clipped	Unclipped	Total Production
Puget Sound	Spring Chinook	877,500	1,895,000	1,360,000	0	4,132,500
	Summer Chinook	720,000	200,000	2,700,000	0	3,620,000
	Fall Chinook	1,770,000	1,305,000	30,870,000	250,000	34,195,000
	Coho	880,000	300,000	9,872,200	0	11,052,200
Coast	Spring Chinook	0	0	0	0	0
	Summer Chinook	150,000	50,000	170,000	0	370,000
	Fall Chinook	675,000	475,000	7,800,000	0	8,950,000
	Coho	350,000	300,000	4,270,000	0	4,920,000
Columbia River	Spring Chinook	1,294,452	625,000	3,208,529	15,000	5,142,981
	Summer Chinook	2,247,001	0	0	0	2,247,001
	Fall Chinook	3,965,000	1,015,000	26,785,543	0	31,765,543
	Coho	1,500,000	815,000	8,178,000	0	10,493,000
Total	Spring Chinook	2,171,952	2,520,000	4,568,529	15,000	9,275,481
	Summer Chinook	3,117,001	250,000	2,870,000	0	6,237,001
	Fall Chinook	6,410,000	2,795,000	65,455,543	250,000	74,910,543
	Coho	2,730,000	1,415,000	22,320,200	0	26,465,200

Appendix E

Variance Requests

Requests for Marking Variance – List – 2014

Regional Mark Committee

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1: **Request for Marking Variances** ……ACTION: ALREADY APPROVED

Agency: CDFW **Date: 1/13/2014**

Marking Coordinator

a) Name:Jason Azat

b) Email:jason.azat@wildlife.ca.gov

1. Mark Requested: No Mark

2. Details of Marking

a) Number of fish: 30,000

b) Species and Run: Coho Fall

c) Brood year: 2012

d) Stock(s): Scott Creek

e) Hatchery(ies): Big Creek

f) Geographic area(s): Santa Cruz

g) Release date: 3/2013 - 5/2013

h) Duration of this marking program: Continuing 3. Specific Management and/or Research Objectives (give examples):

Restore Coho to Scott Creek

4. Impact on Coastwide CWT Programs

a) Predicted number observed recoveries by state/province and by year:

California: 1

Other states / provinces: 0

b) Changes to current CWT sampling program: None

c) Other:

5. Specify Expected Benefits:

By leaving adipose fin intact, zero recoveries in fisheries projected, thereby leaving more fish available to return to spawning grounds.

6. Alternatives Considered (specify reason(s) for rejection):

An alternative strategy is to clip the adipose fin. This alternative is rejected because we want no targeted fishing pressure and zero recoveries in fisheries.

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2: **Request for Marking Variances** ……ACTION: ALREADY APPROVED

Agency: CDFW **Date: 1/13/2014**

Marking Coordinator

a) Name:Jason Azat

b) Email:jason.azat@wildlife.ca.gov

1. Mark Requested: No Mark

2. Details of Marking

a) Number of fish: 200,000

b) Species and Run: Coho Winter

c) Brood year: 2012

d) Stock(s): Russian River

e) Hatchery(ies): Warm Springs

f) Geographic area(s): San Francisco

g) Release date: 6/2013 - 2/2014

h) Duration of this marking program: Continuing 3. Specific Management and/or Research Objectives (give examples):

Restore Coho to Russian River

4. Impact on Coastwide CWT Programs

a) Predicted number observed recoveries by state/province and by year:

California: 20

Other states / provinces: 0

b) Changes to current CWT sampling program: None

c) Other:

5. Specify Expected Benefits:

By leaving adipose fin intact, zero recoveries in fisheries projected, thereby leaving more fish available to return to spawning grounds.

6. Alternatives Considered (specify reason(s) for rejection):

An alternative strategy is to clip the adipose fin. This alternative is rejected because we want no targeted fishing pressure and zero recoveries in fisheries.

Appendix F

Q & A About Parental Based Tagging (PBT)

Q&A About Parental Based Tagging (PBT)

Gary Morishima (Quinault Management Center)
Marianna Alexandersdottir (Northwest Indian Fisheries Commission)

October 17, 2013

Table of Contents

Introduction.

The CWT Expert Panel[1] determined that a novel genetic method, termed Parental Based Tagging (PBT)[2], had the potential to identify stock and age compositions of tissue samples taken from individual fish, but that a large scale feasibility study was required before the methodology could be considered a viable alternative to coded-wire tagging (CWT). The purpose of this briefing paper is to provide basic information about PBT.

What is PBT?

PBT involves the genotyping of hatchery brood stock using single nucleotide polymorphisms (SNPs) to develop genetic baselines of possible parent pairs. SNPs, the most fundamental unit of genetic variation, are copying errors in DNA, analogous to typos. These copying errors lead to variations in the DNA sequence at specific locations. Variations at these locations are called SNPs. Substantial polymorphism and population-specific differentiation as DNA is inherited provide a means to identify parents of progeny. Many SNPs from closely related individuals will match with siblings, grandparents, aunts, uncles, and cousins, but far fewer SNPs will match with distant relatives. The number and specific variations of SNPs can therefore be used to determine the probability of parentage; the ability to identify specific parents increases as more informative SNPs are used. The vast majority of SNP research involves the human genome; so far over 52 million SNPs have been identified. Far less research has been done with Pacific salmon; the number of potential SNPs and the specific informative SNPs necessary to achieve desired level of parentage resolution is not known.

Tissue samples are analyzed using panels of informative SNPs (panels using 96 SNPs have been employed to identify the origins of the limited number of stocks involved in studies reported in the literature[3]) with reagents that are designed to identify unique SNPs for the stocks and brood years of interest. Results are matched against the SNP baseline to make inferences about the parentage of fish.

What are the potential advantages of PBT over CWTs?

The implementation of CWTs includes a release database identifying all CWT groups to hatchery, experiment and brood. CWTs recovered in fishery and escapement sampling can be matched against the release database to identify the origin and age of the fish. Garza and Anderson[4] summarized how PBT could be implemented to provide the same information gathered from CWTs:

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[1] PSC. 2005. Expert Panel on the Future of the Coded Wire Tag Program for Pacific Salmon. 2005. Pacific Salmon Comm. Tech. Rep. No. 18: 230 p.

[2] Anderson, E.C., and J.C. Garza. 2005. A Description of Full Parental Genotyping. Report Submitted to the Pacific Salmon Commission, April 27, 2005

[3] The number of highly informative SNPs required to correctly assign progeny to parents of Chinook progeny from the Columbia River system with at least 90% accuracy has been estimated to be between 100 and 200. Hess, J.E., A.P. Matala, S.R. Narum. 2011. Comparison of SNPs and microsatellites for fine-scale application of genetic stock identification of Chinook salmon in the Columbia River Basin. Molecular Ecology Resources 11:137-149.

[4] Garza, J.C., and E. Anderson. Undated power point presentation. Parentage-based genetic tagging of salmon and trout at the Trinity River Hatchery will allow for fishery management, ecological investigation and restoration monitoring. Viewed 10/10/13 at http://odp.trrp.net/FileDatabase/Documents/25_TRRP2010talk1.pdf.

- Genotype all hatchery parents
- Create reference (parent) database of all possible parent pairs
- Fishery sampling and genotyping in offspring generation
- Query of reference (parent) database to determine if parents are present
- Determine parental pair and, therefore, hatchery stock of origin and exact age
- Information obtained for each tag recovery is the same as for a CWT

Garza and Anderson also summarized the potential advantages of PBT over CWTs:

- By genotyping two parents, all of their 1,000s of offspring are effectively tagged
- Requires no juvenile tagging, but much higher tagging rates feasible
- Minimal human interaction with the raw genotyping data
- Amenable to high-throughput / low-cost genotyping- new technology brings material costs for 100 SNPs to same as 12-18 microsatellites, and labor costs are much lower.

In contrast to CWTs, PBT does not require sacrificial sampling, potentially providing a means to identify stock-age composition of released fish as to hatchery and age. Genetic tissue sampling would also be less obtrusive than CWT sampling; only a small sample from an area like the caudal fin could be used, which would likely reduce processor concerns for negative impacts on fish sold into the whole (head on) markets. In addition to stock and age, Garza and Anderson have suggested that PBT could provide:

- Near parametric estimates of variance in family size
- Large quantitative genetic studies of phenotype run timing, age at maturity, disease resistance
- Data to map genes for phenotypic traits to locations in the genome
- Data to evaluate different hatchery practices and consequences for fecundity, marine survival and straying
- A means to study relative productivity of hatchery and natural fish by escapement sampling

Has the technical feasibility of PBT been demonstrated?

To a limited degree. No large scale studies have been conducted in highly mixed stock areas. Studies to date have involved testing the methodology in cases where a small number of hatchery stocks are present (e.g., Snake River, central California coast and Little Port Walter in SEAK) and where CWTs and tissue samples from the same fish are available for validation. A study involving steelhead and Chinook salmon from the Snake River basin was one of the first large-scale implementations of PBT in salmonids. The study determined that fewer than 100 SNPs were needed to match parentage assignments with CWT releases and to produce results that were comparable in accuracy to a panel of microsatellites.[5]

The ability to employ PBT coast wide and to identify fish taken in highly mixed stock areas as to parentage has not been demonstrated. Universal SNP panels (how many SNPs, with what

[5] Steele, C.A., Eric C. Anderson, Michael W. Ackerman, Maureen A. Hess, Nathan R. Campbell, Shawn R. Narum, Matthew R. Campbell. 2013. A validation of parentage-based tagging using hatchery steelhead in the Snake River basin. *CJFAS* 70(7): 1046-1054.

reagents, processing protocols, and methods of analysis) would need to be constructed, agreed upon and implemented by contributing agencies within one year to be available when the PBT'd progeny enter fisheries. Because Chinook are harvested at multiple ages and stages of maturity, panels for 3-5 brood years would need to be available and tissue samples from each fish would need to be run through these panels to identify parentage. Since most Coho stocks are primarily harvested in their second year of ocean residence, only panels covering 1-2 brood years would be required (nearly all southern Coho stocks mature at age 3, but a significant portion of some northern Coho stocks mature at age four). Sampling standards and reporting systems would need to be established.

What are the costs of PBT?

A recent report from the Independent Economic Advisory Board (IEAB) from the Columbia River Fish Tagging Forum[6] identifies the complexities of trying to "rationalize" the fish tagging efforts of the Columbia River basin while raising several concerns and limitations of available information. The data necessary to conduct an economic analysis to inform efforts to rationalize tagging efforts in the Columbia Basin are hard to come by. The CWT Expert Panel encountered a wide array of accounting practices employed by agencies which stifled efforts to develop standardized estimates of costs for that relatively mature technology. Developing costs for PBT will be challenging. In addition to the variability in the availability and capabilities of equipment and costs of processing tissue samples, complex accounting procedures (e.g., amortization schedules, handling, archival services), establishing coast wide sampling programs for commercial, recreational, and tribal sectors, and reporting and information systems would likely require agreement of cost accounting standards, not likely to be easily accomplished.

Interestingly, the IEAB report concluded that "genetic marking is not more cost-effective than CWT under current cost conditions, and for the goals that we modeled" even in the overly simplistic and inadequate protocol of sampling the first 100 fish – totally inadequate for rate event sampling when stock compositions are complex (see section on Coast wide Sampling and Stratification). Sampling costs to detect stocks comprising a small proportion of the population in highly mixed stock fisheries alone would be enormous as indicated by the sampling model developed for the CWT studies a few years ago. The IEAB report describes some of the challenges in establishing a PBT system capable of providing information on ocean fisheries, but still falls far short of addressing the practical challenges and costs of attaining the level of coordination and collaboration required to establish a coast wide information system capable of generating the data required to enable the PSC Chinook (CTC) and Coho (CoTC) Technical Committees to perform their stock and fishery assessments.

Tables 5 and 6 of the IEAB report suggest that the costs of PBT could be about double that of the present CWT system even without addressing the costs of sampling highly mixed stock fisheries. The IEAB report does not touch upon potential costs of modifying hatchery facilities and operating procedures to handle discrete groups of fish for various types of studies which is currently accomplished with CWTs. Nor does it address the challenges of establishing and using genetic baselines.

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[6] IEAB (2013). Cost-Effectiveness of Fish Tagging Technologies and Programs in the Columbia River Basin. Independent Economic Analysis Board. Fish and Wildlife Program. Northwest Power and Conservation Council. IEAB 2013-1. June 2, 2013

Should a decision be made to replace CWTs with PBTs, additional costs would be incurred during transition. With Chinook, because of multiple year classes at sea, were the switch to PBT to be made, the recovery program would have to contend with collecting both tissues for genotyping and collection of CWTs for a period of 3-4 years. Implementation with coho would, of course, be simpler because fewer brood years would be involved, but a 2 year minimum transition period would still be needed.

Is PBT a viable alternative to the CWT?

Not yet. Management of coast wide Chinook and coho salmon is currently directed at constraining exploitation on naturally spawning stocks. Fishery regimes depend on stock, age, and fishery specific estimates of exploitation rates and stock assessment parameters that provide the foundation for stock and fishery assessments and planning models using in management forums for Pacific salmon, including the Pacific Salmon Treaty and domestic management processes. Currently these estimates depend on data collected through the CWT system. A memorandum of understanding to the 1985 Pacific Salmon Treaty (PST) commits the parties to maintain a viable coast wide CWT program, where viability is defined as the confidence managers have in using parameter estimates based on CWTs from the indicator stock programs.

While PBT has the potential to provide the information produced by the CWT system, a number of formidable challenges remain, including those briefly mentioned in response to the previous question. To replace CWTs for indicator stock and other programs dependent on the CWT system, a system based on PBTs would have to deliver estimates for each program with the same or better statistical confidence and stratification, coupled with coordination for sampling standards, data quality control and database reporting and maintenance.

What are the requirements for a PBT based system to provide the same information as the current CWT system?

The coded wire tag (CWT) system is a coast wide coordinated program including tagging, tag recovery, analysis and reporting systems (Figure 1). The CWT system provides information for a variety of research and monitoring programs, including evaluation of hatchery practices, estimation of straying of hatchery origin fish into naturally spawning areas and indicator stock programs for coho and Chinook salmon management. As Figure 1 shows the CWT system in reality encompasses many components and these are organized depending on the individual research or monitoring programs using the CWT data to achieve its objectives and on the sample or experimental design of each program. The viability of the CWT system and the data it provides depends on each and all of these components being present and the coast wide coordination of tagging and recovery programs and reporting of all releases and recoveries to the coast wide database maintained by Canada and the U.S.

The components of the current CWT system depicted in Figure 1 are described below, along with a discussion of considerations that must be taken into account when deciding whether or not a PBT based system could produce the information presently provided by the CWT system.

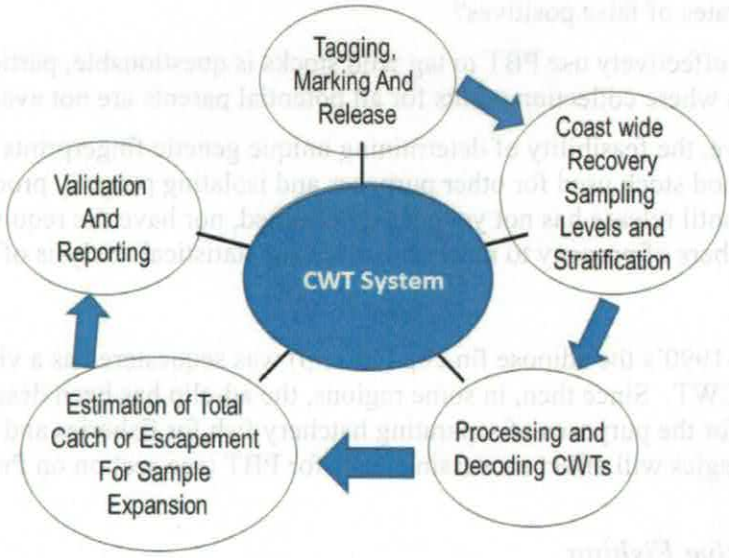

Figure 1. A schematic of the components of the CWT system required to deliver the information necessary for deriving estimates for the programs dependent on the CWTs

Tagging, Marking, and Release

Since the mid 1970's, over 26 thousand Chinook salmon and 16 thousand coho salmon tag groups have been released coast wide with an average of 688 tag groups of Chinook salmon and 396 coho salmon groups per year. Hatcheries commonly release multiple CWT groups in any given year to reflect variations in brood stock, rearing and release strategies as well as for a variety of research and monitoring programs. On average 54 federal, provincial, state, tribal and private entities release over 50 million salmonids with CWTs annually

Tagging and releasing fish

The CTC and CoTC rely on recoveries of CWT'd hatchery and natural origin groups to provide the information necessary to estimate:

- stock composition in fisheries
- fishery, stock and age specific exploitation rates
- survival rates

The ability to maintain multiple release groups with known numbers released per group would depend on the ability to uniquely identify parentage genetically and isolating progeny produced by parental pairs for each group.

Hatcheries often release multiple groups with different CWTs to conduct a variety of studies for specific purposes. The ability of PBT to provide this capability is uncertain since: (1) the feasibility of isolating progeny produced by any given parental pair until release has not yet been

determined; (2) the ability of PBT to accurately identify progeny of sibling parents (likely to occur with hatchery operations) is not known – how many SNPs would be required and what are the expected rates of false positives?

The ability to effectively use PBT to tag wild stocks is questionable, particularly in circumstances where collection points for all potential parents are not available.

As noted above, the feasibility of determining unique genetic fingerprints of parents that may be siblings of brood stock used for other purposes and isolating progeny produced by any given parental pair until release has not yet been determined, nor have the requirements of producing adequate numbers of progeny to meet objectives for statistical analysis of results.

Marking

Until the mid-1990's the adipose fin clip (ad-clip) was sequestered as a visual indicator for a fish containing a CWT. Since then, in some regions, the ad-clip has been desequestered and used as a mass mark for the purposes of separating hatchery fish for fisheries and on spawning grounds. Marking strategies will affect processing costs for PBT (see section on Processing and Decoding).

Mark Selective Fishing

PST fishery regimes for Chinook and coho salmon are intended to constrain exploitation rates on naturally spawning stocks. Prior to the advent of mass marking and mark selective fishing (MSF), fish were subjected to the same harvest patterns regardless of mark status. Consequently, fishery impacts on natural stocks of interest to the PSC could be inferred through the use of selected hatchery indicator stocks. With the advent of MSF, this is no longer the case; because marked and unmarked fish are differentially retained in MSF, they will experience different patterns of exploitation. In order to maintain indicator groups that are representative of natural production the double index tag (DIT) groups are used, where two tag groups are released for each indicator one marked with an adipose fin clip and the other with the adipose fin intact. Impacts of MSFs are estimated by differences in CWT recovery patterns of paired DIT releases. This requires the DIT pairs to be as representative of the stocks of interest as possible and as identical as feasible as to the number of fish released, stock origin, rearing, and release strategy. The ability to maintain to DIT groups under PBT is uncertain; with issues relating to separation and enumeration of the fish belonging to each DIT group, to the feasibility of identifying the informative SNPs necessary to assign progeny to individual parental pairs, to developing the SNP panels, and to potential confounding effects of parentage on progeny behavior.

Coast wide Recovery Sampling Levels and Stratification

Requirements for stratification and sampling protocols would be similar for both CWTs and PBT. Under the CWT system, a coast wide standard for minimum sampling rates of 20% has been maintained for several decades. An average of 165 thousand CWT recoveries is reported to the Pacific States Marine Fisheries Commission (PSMFC) coast wide annually.

Proponents of PBT have tended to focus on comparative costs of processing tissue samples with SNP technology versus CWTs. However, recovery sampling issues go far beyond consideration of sample processing costs.

Sampling costs for PBT are likely to be several times that for CWTs. With CWTs, the objective

is to obtain data from release groups, regardless of the size of the total hatchery release. Consequently, the same number of recoveries would be expected from CWT releases of the same size and stock whether the total release of fish from the hatchery is 20 million or a couple hundred thousand. With PBT, the number of "recoveries" would be determined by the size of the hatchery release and the stock composition of the population being sampled. From a statistical standpoint, after a certain number of recoveries, the marginal value of each additional recovery would be minimal so much of the cost of obtaining that information would be incurred with little benefit. Figure 2 illustrates the marginal decrease in percent standard error (PSE) as the number of tags observed in samples (assuming a 20% sample rate) increases. The PSE decreases rapidly as the number of observed tags increases from 1 to 10, but the size of the change with each additional recovery decreases thereafter. After 10 tags are observed, improvement in the accuracy of the estimate of fishery impacts as reflected by the PSE is barely noticeable. Consequently, for stocks that comprise a large proportion of the sampled population, the benefits of obtaining more recoveries diminish while the cost of processing fish to determine their origins remains unchanged.

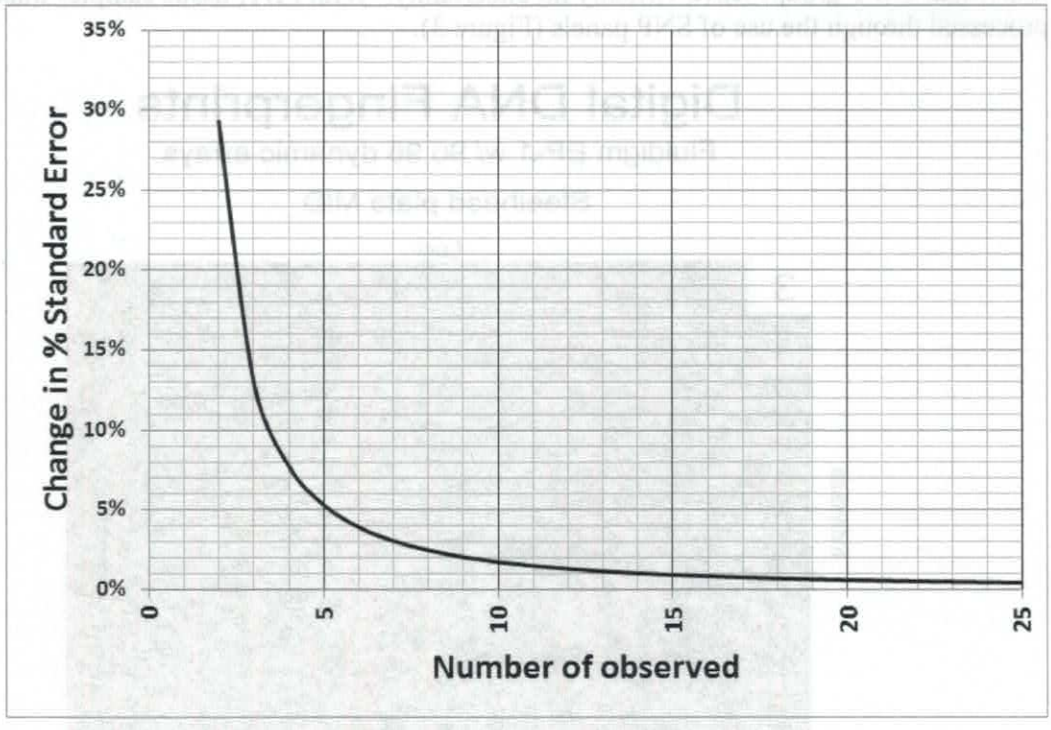

Figure 2. Change in percent standard error (SE/Estimate) of estimate of total tags recovered as a function of the number of tags observed (sample rate of 20%).

With CWTs, the coast wide sample design is intended to recover fish from indicator tagged groups at a 20% sample rate, assuming standard CWT group sizes. Methods for determining sample size requirements for genetic tissue were reported in the January 2008 Special Report of the GSI Steering Committee & the Pacific Salmon Commission's Committee on Scientific Cooperation[7].

There are also some challenging statistical and logistical issues regarding representative selection of fish for studies. For example, for studies involving DIT, evaluation of mark-selective fishing impacts, diet, effects of size, timing, and location of release on ocean distribution, maturation, and survival, with CWTs a random sample of progeny could be selected for tagging and treatment. In contrast, with PBT, experimental design would need to contend with likely confounding by potential effects of the heritable characteristics of the specific parents selected for use in release groups.

Processing and Decoding.

Procedures to process and decode CWTs have been in place for decades. Unique identifiers with individual CWT groups leave virtually no uncertainty. With PBT, tissue samples must be processed through the use of SNP panels (Figure 3).

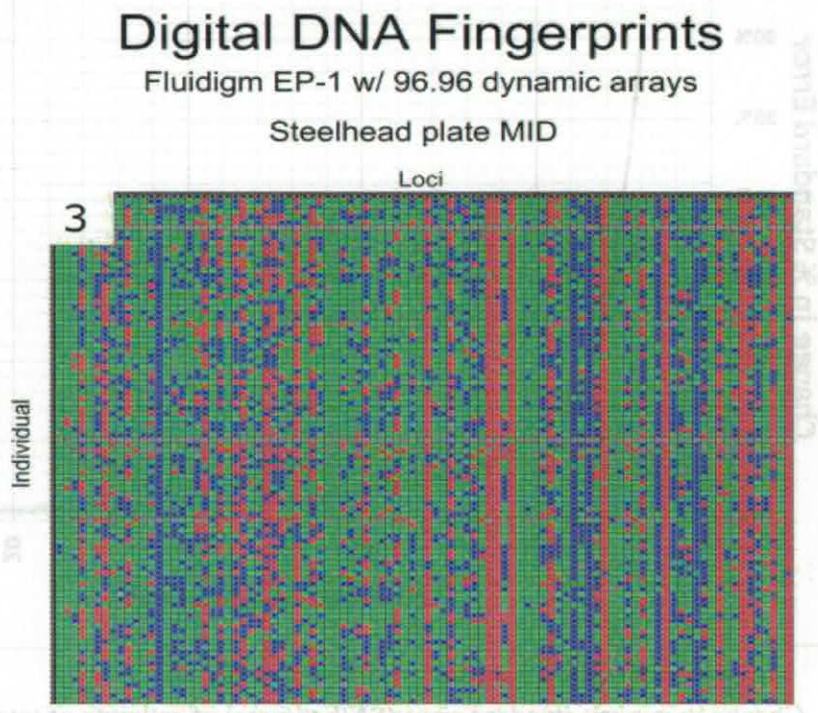

Figure 3. SNP panel illustration taken from Garza and Anderson.

[7] Pacific Salmon Commission. 2008. Recommendations for Application of Genetic Stock Identification (GSI) methods to management of ocean salmon fisheries: special report of the Genetic Stock Identification Steering Committee and the Pacific Salmon Commission's Committee on Scientific Cooperation. Pacific Salmon Comm. Tech. Rep. No. 23: 35 p.

With PBT, parentage is inferred by matching results of SNP panel analysis (currently, 96 SNP panels are employed) against potential mother-father pairs contained in the hatchery brood stock database. Software, such as SNPPIT (developed by the SW NMFS lab) is employed for inference on the composition of the catch by mother-father parent pairs, not for single parents. The feasibility of identifying the number and specific locations of SNPs required to uniquely identify parents of individual release groups which may be produced by closely related siblings is uncertain. The performance on such systems when brood stock are taken from naturally spawning populations or where a substantial proportion of the population to be sampled is not contained in the PBT baseline database (the case for progeny produced by natural spawning) is unknown. The uncertainty and misassignment rate for determining the parents of individual fish has not been determined; it will likely depend on the particular mixtures of stocks and cohorts involved.

SNP panels are currently designed to differentiate stock-age groups of particular interest. For coast wide application of PBT capable of replacing CWTs, a universal SNP panel(s) would be needed for each brood year. To enable levels of resolution comparable to that provided by CWTs, the number of PBT release groups that panels would need to distinguish each year would approximate 3,000 for Chinook (~688 release groups per year x 4-5 brood years) and 800 for coho (~average of 396 release groups per year x 2 brood years). This will require substantial interagency effort to reach agreement on the SNPs to be employed, and the development, deployment, and implementation of SNP panels within one year of collection of a PBT baseline dataset.

Considerable difficulties have been experienced with attempts to standardize methods by GSI labs using microsatellites. In 2004 Seeb et.al. reported that:

> *An important limitation of microsatellites in the context of inter-agency BASIS research is the difficulty of data standardization among laboratories. Standardization of data among laboratories is essential for two reasons. First, it obviates the need for every agency to spend the resources to create independent and redundant baseline data. Second, standardization is prerequisite for reproducibility of data among laboratories, thus enabling treaty partners to independently evaluate one another's fishery estimates. Despite over a decade of use, no inter-laboratory standardized microsatellite database exists for any species of Pacific salmon. Technical hurdles have proven daunting and expensive to overcome.*[8]

With SNPs, although inter-laboratory transportability of data and ease of scoring are expected to substantially alleviate some of the problems with standardizing genetic baselines experienced with microsatellites. The challenge confronting use of PBT are likely to be considerably more formidable because of the need to identify specific SNPs required to attain the required level of stock-cohort-release group parentage assignment, and standardization of methods for processing and reporting within the demanding timelines required for coast wide implementation.

For CWT sampling, the number of heads that have to be taken and processed can be minimized

[8] Seeb, J.E., R. Wilmot, S. Ruawa, S. Abe, L.W. Seeb, and C.T. Smith. 2004. Single Nucleotide Polymorphisms (SNPs) Provide DNA Data For Bering/Aleutian Salmon International Survey (BASIS) Studies. NPAFC Technical Bulletin 6:101-103.

by electronic detection. With PBT, it will not be possible to determine whether a sampled fish belongs to a PBT group unless it is processed. It has been proposed that all hatchery fish be mass marked so only tissue from mass marked fish would need to be processed and genotyped for PBT. However, this method would just eliminate the need to take tissue samples from fish that have their adipose fins left intact. With PBT, tissue would have to be taken and processed from a much larger number of fish compared to CWTs. For the 2009-2013 release years, approximately 16% of the Chinook releases were CWT'd; if all hatchery fish were ad-clipped, PBT would require tissue to be taken and processed from over 6 times as many fish than would CWTs. For the 2009-2013 release years, less than 10% of the coho releases were CWT'd; if all hatchery fish were ad-clipped, PBT would require tissue to be taken and processed from over 10 times as many fish than would CWTs.

Presuming that MSFs will continue as a regulatory means of prosecuting fisheries to harvest hatchery fish while reducing impacts on wild fish, costs of fin clipping would still be incurred. The cost of genetic marking of all the hatchery releases would be compared with the cost of applying CWTs to much smaller numbers of fish in individual release groups. Consequently, realization of cost-savings attributed to PBT marking is questionable.

To estimate the impact of MSFs, a method like DIT would be required. The ability to maintain the DIT groups would depend on having some unmarked fish that can be separated from the marked fish. It has been proposed that if all hatchery fish are mass marked, the mass mark can be used to identify hatchery fish for sampling reasons. However this would not enable collection of data needed to estimate MSF impacts on natural stocks. With PBT, in order to recover genotypes of unmarked DIT groups, tissue from all fish would need to be taken and processed regardless of mass mark status.

Table 1 presents 2007-2011 averages drawn from the PSMFC catch sample database for CWTs for Chinook and coho. The "Sampled" column indicates the number of fish sampled for CWTs; the "Processed" column indicates the number of fish that are processed for CWTs; the "Tags Decoded" column indicates the number of CWTs recovered and decoded; and the "Ad-Clipped" column indicates the number of mass marked fish that were encountered in the sample. For agencies that rely on visual tag detection (i.e., ad-clips as a visual indicator for a CWT), the number processed and number ad-clipped are nearly identical (e.g., ADFG in Table 1). If the ad-clip is used to identify a PBT'd fish, then tissue would have to be taken and processed from all ad-clipped fish. For some agencies, like WDFW, PBT would require tissue to be taken and processed from 62% of the sample, compared to 12% under the CWT system (Table 1). Currently, unmarked and tagged fish include unmarked DIT releases and fish not intended for MSF (e.g., conservation programs) and wild stock studies; to preserve these uses of CWTs with PBT, tissues would need to be taken and processed for all fish in the sample.

Table 1. 2008-2011 average annual CWT sampling statistics for Chinook and coho salmon from the PSMFC catch sample database.

Agency	Number of Fish				Percentages		
	Sampled	Processed	Tags Decoded	Ad Clipped	Processed	Tags Decoded	Ad-Clipped
Chinook							
ADFG	116,369	10,198	6,040	10,198	9%	5%	9%
CDFO	44,049	7,282	2,958	7,785	17%	7%	18%
CDFW	52,161	15,362	14,590	15,360	29%	28%	29%
FWS	56,737	13,370	12,563	31,038	24%	22%	55%
NIFC	15,440	3,770	3,467	12,872	24%	22%	83%
NMFS	23,866	2,438	1,465	20,568	10%	6%	86%
NMFSNWR	1,249	163	87	934	13%	7%	75%
ODFW	90,415	13,484	12,093	27,088	15%	13%	30%
QDNR	2,957	1,116	764	755	38%	26%	26%
STIL	118	71	65	68	61%	56%	58%
WDFW	252,097	29,572	26,327	155,671	12%	10%	62%
Total	655,458	96,827	80,419	282,336	15%	12%	43%
Coho							
ADFG	635,861	10,329	7,789	10,291	2%	1%	2%
CDFO	42,119	588	221	636	1%	1%	2%
CDFW	16	8	1	8	49%	4%	49%
FWS	18,637	4,294	4,029	15,160	23%	22%	81%
NIFC	12,018	1,068	1,041	11,331	9%	9%	94%
NMFS	25	25	2	11	100%	9%	45%
NMFSNWR	33	5	2	28	14%	7%	84%
ODFW	67,406	6,989	6,366	31,168	10%	9%	46%
QDNR	24,949	11,498	2,305	14,773	46%	9%	59%
STIL	-	-	-	-			
WDFW	401,502	49,578	28,761	313,213	12%	7%	78%
Total	1,202,567	84,383	50,517	396,619	7%	4%	33%

Differences in the number of fish that would have to be processed under CWTs and PBTs are likely to be substantial. For example, referring to Table 1 for WDFW Chinook, the number of fish that would need to be processed is summarized in table below.

CWT versus PBT sampling scenario	Number of fish processed
Current CWT system	29,572
PBT limited to mass marked fish	155,671
PBT without mass marking or with DIT and wild stock tagging	252,097

Estimation of Total Catch or Escapement for Sample Expansion

Requirements for estimation of total catch or escapement would be similar for both CWTs and PBT.

Validation and Reporting

Coast wide formats and protocols have been established for CWTs as are systems and procedures for extracting data and producing standardized reports. A comparable system would need to be established and maintained for coast wide application of PBT. Actual reporting of SNP analysis results should be relatively straightforward since major advancements have already been made for application of the technology to the human genome.

In addition, unless standards are agreed upon for analyzing tissue samples, provision for archiving and sharing tissue samples would be required to permit other entities to generate estimates of stock and age composition estimates; some arrangement for resolving disagreements would be needed.

Coordination coast wide

The viability of the CWT system depends on the coordination of agencies coast wide and their commitment to the tagging, sampling and reporting standards established. Table 2 describes all of the process components necessary to implement the CWT indicator stock program for Chinook or coho salmon. Table 2 illustrates the level of coordination that is necessary to achieve the goal of the indicator stock program and provide the parameter estimates for stock monitoring and harvest evaluation. It also describes what entities (technical committees, domestic agency analysts and managers) are responsible for analysis and for providing the estimates of stock parameters (e.g., survival rates, exploitation rates). The agencies participating include the 54 agencies presently employing CWTs and other entities such as the Pacific Salmon Commission (PSC), the Pacific States Marine Fisheries Commission (PSMFC), and regional Management Councils.

Table 2. Process matrix for indicator stock programs for Chinook and coho salmon for estimation of stock parameters.

Process	What?	Who?	Coordination
Identification of major production areas and stocks	Definition by geographical area and life history of natural stocks	CTC, CoTC, Domestic agencies	Coordination and agreement of agencies.
Identify discrete, well-defined groups of fish to represent stocks of interest.	Selection of appropriate CWT release groups	CTC, CoTC, Domestic agencies	Release groups meet criteria for indicator stock, i.e., geographic area, life history and release strategy.
	Ad-hoc guidelines for tag group size	CTC, CoTC	Dependent on survival rates and statistical criteria
	Tag and release indicator stock groups	Domestic agencies	Unique codes identify release agency and tag group
	Report release group data to PSMFC coast wide database	Domestic agencies	Reporting and validation criteria agreed upon.
Fishery landed mortalities and hatchery or spawning escapement	Sample fisheries, hatcheries and spawning grounds	Domestic agencies	Guidelines for sampling rates, stratification into fisheries and time periods. Dependent on statistical and management criteria.
	Recover and read tags. Tag code provides information on release group and age	Domestic agencies	Methods standardized
	Estimation of tags in harvest by tag code	Domestic agencies	Standardized methods to account for lost heads, no pins, unreadable tags, miss ids in tag recovery process
	Report sampling and tag recovery information to PSMFC coast wide database	Domestic agencies	PSMFC standards for reporting data
Estimate non-landed fishing and natural mortalities	Methods vary	CTC, CoTC, Domestic agencies	Standard methods using agreed parameter
Estimate cohort sizes	Sum all mortalities and escapement of tagged fish	CTC, CoTC, Domestic agencies	Standard methods using agreed parameter estimates.
Estimate exploitation rates by stock, age and fishery	All mortalities for each age and fishery divided by cohort size for a tag group	CTC, CoTC, Domestic agencies	Standard methods using agreed parameter estimates.
Estimate survival rate by stock and brood	Cohort size at first age of recruitment divided by number released for a tag group	CTC, CoTC, Domestic agencies	Standard methods using agreed parameter estimates.
Estimation of impacts on natural populations or stocks of interest	The assumption is that estimates of age and fishery specific exploitation rates for CWT indicator stocks can be applied to age-specific estimates of natural escapement (or terminal run) to estimate total recruitment and impacts.	CTC, CoTC, Domestic agencies	Standard methods using agreed parameter estimates.

Adequate, timely coordination of the entire process from marking, tagging, recovery, and reporting is essential to provide the data required to perform the stock and fishery assessment methods and support the planning models for implementation and evaluation of PSC fishery regimes. The same type of data, level of coordination, and commitment to adhere to sampling standards and reporting protocols would be necessary regardless of whether a CWT, PBT, or other system is employed.

With bilateral negotiations to replace current PSC fishing agreements for Chinook and coho anticipated to commence within a few years, a solid foundation for discussion will be vital. Ongoing work to provide improved stock and management statistics includes work by the CWT Implementation Team to maintain the CWT system and the Sentinel Stock Committee on escapement estimation, as well as various CTC projects, will be important to support these upcoming negotiations. The CWT has formed the backbone for management of Chinook and coho salmon for several decades and the ability to maintain continuity of historical data will be invaluable.

PBT is not yet ready to be considered a viable alternative capable of supplanting the CWT. PBT could supplement information provided by the CWT, but there are many substantial questions that will need to be answered before reasoned decisions can be made to chart the future course for data collection systems to support coast wide stock and fishery assessment. In summary, the technical and logistic feasibility of PBT's ability to maintain the integrity of multiple release groups for a variety of study purposes involving highly mixed stock fisheries has not been determined. Will agencies be able to agree on the standards, methods, and reporting systems needed for coast wide application of PBT (e.g., universal informative SNP panels capable of identifying progeny from multiple broods and studies, extensive interagency coordination and agreement within a very short period of time, standards and protocols for reporting, methods of analysis)? Will methods be developed to reduce PBT sampling requirements and costs to levels comparable to that attained by the current CWT system? Table 3 summarizes some of the key the questions that must still be answered before the PBT can be considered a viable alternative to the CWT.

Table 3. Comparison of requirements for estimation of stock assessment and management parameters using CWTs and PBT for Chinook and coho salmon.

Process	CWT	PBT	Comment
Coordination of laboratories	CWT methods of tagging, sampling methods and process for identification of CWTs by agencies, are standard coast wide and have been in place for over 30 years.	Genetic technology is a fast developing and changing arena. In order to implement a coast wide PBT system equivalent to the CWT system, a universal PBT panel would need to be developed, agreed upon and adhered to.	Currently genetic labs use specific SNPs to identify stocks of interest and use different equipment to process tissue samples. Coast wide application of PBTs would require the development and deployment of a universal SNP panel capable of providing the resolution required to identify individual release groups within one year of the establishment of a PBT database.
Tagging and releasing from hatcheries	Each tag code identifies a group as to stock, hatchery and release location, and rearing strategy. One or more tag code release is assigned to the indicator stock groups and any other research or monitoring programs.	Each parent pair provides tagged progeny traceable to parent pair. In order to release a comparable set of groups for separate release groups (indicator stocks, production group, and experimental groups) parents would have to be assigned to each group and their progeny kept completely identifiable throughout the hatchery environment.	In any single hatchery multiple CWT groups are released for indicator stock programs and other research programs. The capacity of PBT to identify parents of progeny produced by sibling parents is unknown as are logistical questions regarding the ability to isolate groups until time of release.
Enumerating and reporting tag releases	The number of fish with each CWT tag code group released is reported to a central CWT database. These data are required to estimate survival rates.	The number of progeny from individual parent pairs would require statistical sampling.	The progeny of the parent pairs assigned to each group would have to be maintained separately from incubation through rearing to provide a count for individual groups on release to report to a central database.

Table 3. continued

Wild stock tagging	Some Chinook indicator stocks are in fact tagged at outmigration, e.g., Hanford on the Columbia River and Salmon River on the Oregon coast, most SE Alaska Chinook indicator stocks.	In order to use PBT for wild stocks, wild parents or progeny would have to be sampled and genotyped.	How would the number of tagged progeny from genotyped wild parents be determined, especially in cases where brood stock are taken from naturally spawning populations?
Recovery sampling	Agencies are committed to sampling all fisheries and spawning locations where tagged fish are present.	For a PBT program all fisheries and spawning ground locations would have to be sampled and sample rate standards established and maintained.	See comments on coast wide sampling levels and stratification
Tag detection and double index tags (DIT).	CWTs are detected in salmon using electronic gear and heads or snouts taken from tagged fish only. Electronic sampling gear allows detection of unmarked and tagged DIT groups.	The genetic tag cannot be detected until the sampled fish has been sent to lab and processed.	It has been proposed to mass mark all hatchery fish using the adipose fin clip as an external indicator, so only clipped PBT samples would have to be retained and processed. To preserve DIT and wild stock tagging capabilities all fish sampled would have to be genotyped to identify PBT groups.
Stock and age identification in fisheries and escapement	Each CWT code is a unique identifier of stock and age group from release groups reported to data base.	PBT tag groups are identified by genotyping the fish sampled and then assigning them to groups using the parental database.	Rates of misidentification in the genotyping of fishery and escapement samples will depend on the number of SNP markers used to separate the PBT tagged groups. Absent coast wide agreement, archiving and tissue sharing would be required for independent evaluation.

Table 3. continued.

Estimation of stock parameters	Expansion of observed CWTs to fisheries and escapement made using standard methods. Uncertainty is due to expansion for sampling. Coast wide reporting system established and operational.	Expansion of fish assigned genetically would be made by expanding for sampling. Methods of estimating uncertainty would need to be developed to include sampling and genotyping components, as well as potential differences in SNP analysis and assignment methods.	PBT would require establishment of coast wide databases for reporting and agreement on methods for analysis.
Quality control and coordination coast wide.	Quality control and coordination of the tagging, sampling, tag processing and validation and reporting is an issue that requires commitment by agencies coast wide to maintain the viability of the CWTs.	Coordination and quality control of PBT genetic databases methods of genotyping will need to be established.	Coast wide standards for CWTs currently must be maintained through consistent quality control. Similar standards for PBT will also need to be maintained through agency commitment.

Appendix G

Assembly Bill No. 2684

AMENDED IN ASSEMBLY MAY 27, 2014

AMENDED IN ASSEMBLY MARCH 27, 2014

CALIFORNIA LEGISLATURE—2013–14 REGULAR SESSION

ASSEMBLY BILL No. 2684

Introduced by Assembly Member Stone
(Coauthors: Assembly Members Cooley and Fong)
(Coauthor: Senator Evans)

February 21, 2014

An act to add Section 1120.5 to the Fish and Game Code, relating to fish.

LEGISLATIVE COUNSEL'S DIGEST

AB 2684, as amended, Stone. Hatchery practices: salmon and steelhead.

Existing law requires the Fish and Game Commission to establish fish hatcheries for stocking the waters of California with fish and requires the Department of Fish and Wildlife to maintain and operate such hatcheries. Existing law also authorizes county boards of supervisors to establish and maintain fish hatcheries and authorizes the commission to issue permits to nonprofit organizations to construct and operate anadromous fish hatcheries.

This bill would require the department to implement specified policies and practices for hatchery chinook ~~salmon, coho salmon, and steelhead~~ *salmon* reared or released in California waters, including a requirement that hatchery chinook ~~salmon, coho salmon, and steelhead~~ *salmon* released in California waters be externally marked on the top fin ~~at a level~~ *in a percentage* to be determined by the department and that ~~all~~ hatchery chinook ~~salmon, coho salmon, and steelhead~~ *salmon* be

coded-wire tagged *in a percentage to be determined by the department* prior to their release. *The bill would provide that any contract between the department and an entity responsible for funding a mitigation hatchery operated by the department shall require the responsible entity to pay the costs of coded-wire tagging hatchery chinook salmon to the extent the payment is consistent with the federal license requiring the responsible entity to fund the operation of the mitigation hatchery.*

Vote: majority. Appropriation: no. Fiscal committee: yes. State-mandated local program: no.

The people of the State of California do enact as follows:

SECTION 1. Section 1120.5 is added to the Fish and Game Code, to read:

1120.5. *(a)* The department shall implement policies and practices for hatchery chinook ~~salmon, coho salmon, and steelhead~~ *salmon* reared or released in California waters by adopting all of the following:

~~(a)~~

(1) Hatchery practices that improve the survival and fitness of the hatchery population.

~~(b)~~

(2) Hatchery practices that reduce the genetic and ecological risks posed by hatchery juveniles and adults to wild and native populations.

~~(c)~~

(3) A requirement that hatchery chinook ~~salmon, coho salmon, and steelhead~~ *salmon* released in California waters be externally marked on the top fin ~~at a level~~ *in a percentage* to be determined by the department and that ~~all~~ hatchery chinook ~~salmon, coho salmon, and steelhead~~ *salmon* be coded-wire tagged *in a percentage to be determined by the department* prior to their release.

(b) Any contract between the department and an entity responsible for funding a mitigation hatchery operated by the department shall require the responsible entity to pay the costs incurred pursuant to paragraph (3) of subdivision (a) to the extent the payment is consistent with the federal license requiring the responsible entity to fund the operation of the mitigation hatchery.

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Appendix H

CDFO T- Wand Project 2014

CDFO T-Wand Testing Project -- 2014

Fisheries and Oceans Canada has a southern endowment project to purchase wands to do a wand study this fall and to purchase replacement wands for our sampling programs.

We planned to test the 5 cm wands in the fall at Chilliwack hatchery in a 'simulated' industrial setting in which we can wand under less pressure than in commercial fishery sampling at plants. With the pressure to go to 4.5 cm, we will also test the 4.5 cm wands.

Last fall we tested the wands at Chilliwack outside from totes. We sampled 1157 Chinook using the 5 cm wands in a blind study vs tube detector. All heads that beeped positive were taken and dissected. Our overall perspective is that the wands functioned well and that any differences in the detection rates of them vs tubes was likely not statistically significant. We have not yet had time to formally write up the results but here are some details:

Sample size was 1155 Chinook (743 males, 211 females, 201 jacks / 940 clipped, 215 unclipped). Sample size was determined by access to Chinook returning to the hatchery and availability of personnel

- Wand and Tube summary results are below vs. lab results using V-detector.

	CWT	NoCWT	Hook	Grand Total	
wand positive	**333**	**7**	**4**	**344**	* 7 false positives with wand (and 4 hooks)
tube positive	331	5	4	340	
tube negative	2	2		4	
wand negative	**0**	**808**	**3**	**811**	* 0 false negatives with wand
tube positive	0	4	3	7	
tube negative	0	804	0	804	
Grand Total	**333**	**815**	**7**	**1155**	

Note that tube results were 347 positive with 9 false positives (7 hooks), and 808 negative with 2 false negatives. We are attributing the tube false negatives to transcription error due to modifications to the standard protocols for use of tubes to ensure that the study was blind. (i.e., we did not cut heads when fish were diverted with the tub – instead we wrote down the head label numbers and cut all heads after sampling with both types of equipment.)