

Bilateral CWTIT Report January 2013

Prepared by the bilateral CWTIT January 15, 2013

Background

The Chinook chapter of Annex IV of the Pacific Salmon Treaty January 1, 2009, provides in paragraph 3(b) as follows:

The Parties agree to provide \$7.5 million each in their respective currencies (subject to the availability of funds) to implement over a five year period beginning no later than 2010 within their respective jurisdictions critical improvements to the coast-wide coded wire tagging program operated by their respective management agencies.

The goal of this coordinated bilateral effort is to improve the precision and accuracy of aspects of the coast wide CWT program for the purpose of better implementing the agreed Chinook management regime.

The Commission established a bilateral body, the Coded-Wire-Tag Improvement Team (CWTIT) to provide recommendations to the Commission and the Parties on use of the funding provided under the new agreement to support specific actions identified in the Pacific Salmon Commission Technical Report Number 25. Although Parties prioritize actions based on their specific requirements to improve the precision and accuracy of statistics used by the Chinook Technical Committee (CTC) in support of the Chinook agreement, the CWTIT also performs a coordination role to optimize the benefits of the CWT programs operated in the various jurisdictions.

Canada implemented the program in 2009, a year earlier than in the U.S. due to differences in the beginning of the fiscal years. 2013-14 will be the final year of funding for this initiative in Canada; the program will continue in the U.S. through 2014-15. Total expenditures by Party and PSC Technical Report #25 issue are reported in Table 1. Projects fall under two main categories: 1) improvements in CWT tagging, sampling, and harvest and escapement estimation and 2) improvements in data coordination and reporting.

Canada has invested close to \$1.5 M annually on a total of 57 individual projects. The majority of investment has occurred on multi-year projects under category 1 (improvements to CWT tagging, sampling, harvest and escapement estimation). Improvement projects under data coordination and reporting have generally been one time investments. The U.S. has invested \$1.5 M annually on a total of 37 individual projects. Like Canada, the majority has been spent on category 1, but a substantial investment has been made into improvement in category 2 as well, which primarily include major upgrades to the CWT reporting systems in Oregon and Washington, and minor upgrades to the same in Alaska.

Benefits / Performance of CWT Improvements to Date

Projects funded under the CWTIT authority are summarized by issue in Table 1. Some individual projects address multiple issues, so the allocation of funding by issue is approximate.

Table 1. Regional priority and total investment 2009-2012 in issues identified in PSC Technical Report 25. Issue priority is rated as low, medium or high (L, M and H) under the column headed by ‘Priority TR 25’ for each Party. ¹

Issue #	Tech Rpt 25 Issue	Canada			US		
		Priority TR 25	Total Funding	% Funding	Priority TR 25	Total Funding	% Funding
CWT Tagging and Sampling							
1	Representation of Production Regions	H	\$623,761	10.5%		\$829,217	18.4%
2	Determination of Tagging Levels	M-H	\$1,885,099	31.8%		\$109,160	2.4%
3	Representation of Hatchery Production	L	\$5,500	0.1%		\$124,349	2.8%
4	Low Sampling Rates in Terminal Fisheries	M_H	\$482,420	8.1%		\$389,313	8.7%
5	Low Sample Rates in Escapements	L-M	\$339,390	5.7%		\$5,628	0.1%
6	Uncertainty in Estimates of Escapement or Catch	L-H	\$359,370	6.1%		\$124,992	2.8%
7	Low Sample Rates in Highly Mixed Stock Fisheries	L-M	\$324,020	5.5%		\$1,219,115	27.1%
8	Uncertainty in Estimates of Catch in Mixed Stock Fisheries	M-H	\$286,600	4.8%		\$14,843	0.3%
9	Non-representative Sampling	M-H	\$267,530	4.5%		\$111,604	2.5%
10	Incomplete Coverage of Fisheries or Escapement	L-M	\$460,645	7.8%		\$111,184	2.5%
11	Voluntary Sport Fishery Sampling Programs	H	\$293,860	5.0%		\$0	0.0%
12	Sampling to Facilitate MSF Evaluations	L	\$73,250	1.2%		\$155,792	3.5%
	sub total		\$5,401,445			\$3,195,196	
Data Coordination and Reporting							
13	Timeliness of Reporting	H	\$154,700	2.6%		\$433,615	9.6%
14	Incomplete/No Exchange of CWT Data		\$122,600	2.1%		\$258,165	5.7%
15	Inter/Intra Agency Coordination	M	\$104,300	1.8%		\$82,775	1.8%
16	Unclear Authority to Enforce/Establish Protocols		\$0	0.0%		\$0	0.0%
17	Updating CWT Data is Difficult/Cannot Be Tracked		\$70,000	1.2%		\$124,716	2.8%
18	Validation is Inadequate For Current Uses of CWT Data		\$70,000	1.2%		\$142,937	3.2%
19	Lack of Formal Designation of RMPC as US Public Database & Lack of Adequate Funding Support		\$0	0.0%		\$115,444	2.6%
DTT	Funding Guidance		\$0	0.0%		\$141,586	3.2%
	sub total		\$521,600			\$1,299,237	
	2009-2012 Total		\$5,923,045			\$4,494,433	

¹ The Canadian summary is for 4 years and the U.S. summary is for 3 years.

In addition to funding provided by the Parties, Northwest Marine Technology, Inc. has worked with agencies to defray costs of increasing tagging levels, and to reduce costs and improve availability of equipment, such as CWT detectors. The objective of these measures is to reduce uncertainties about CWT-derived statistics.

CWTIT-funded projects can be usefully categorized as: (1) “legacy”; (2) “operational”; and (3) “data improvements.”

“Legacy” projects are those that will provide lasting improvements to ongoing database and reporting issues, reduce costs, or improve efficiencies. Examples of legacy projects include:

- a. DFO Salmonid Enhancement Program (SEP) database improvements. This project will improve CWT data coordination and reporting procedures, and develop a formal set of Best Practices for the coordination (collection, transfer and management) of CWT heads and data at all DFO escapement projects. Archived escapement data from DFO enhancement programs are being reviewed to ensure that standardized analytical techniques and data verification procedures have been employed.
- b. DFO Mark Recovery Program (MRP) database and data exchange improvements. DFO has made significant progress in reviewing and converting the legacy FORTRAN system to current technology and improving interfaces within DFO reporting systems (hatcheries system, catch monitoring system, and escapement systems). The query interface has also been updated to a faster, easier system with many new features for all users, from beginner to advanced. These projects will provide lasting benefits for access to information and timeliness of data exchange to the Regional Mark Information Centre (RMIS). Data improvements include validation and corrections to data and historical algorithms.
- c. Improvements to the DFO Fisheries Operating System (FOS) commercial database will establish standard protocols for reporting and will improve timeliness of reporting and availability of final commercial catch estimates including test fishing data.
- d. Updating and integration of Oregon’s computer programs to improve the consistency, timeliness, and accuracy of CWT data reporting.
- e. Updating several aspects of Washington’s CWT reporting system to improve the consistency, timeliness, data retrieval and accuracy of CWT data reporting.
- f. Development of a Decision-Theoretic Tool for planning individual or multiple CWT improvement programs (tagging, sampling, catch/escapement estimation).
- g. Purchase of new or replacement equipment, such as CWT detectors and microscopes.
- h. The development of indirect methods to estimate CWT recoveries by age and stock in freshwater sport fisheries, from the 3-year study in Puget Sound, which provides the basis to correct past estimates and provide estimates in the future.

“Operational” projects are of three general types: (a) projects to maintain existing capabilities; (b) projects that reduce costs of sampling, processing, or reporting CWT data or improving the timeliness of availability; and (c) projects that evaluate the feasibility of developing and applying new estimation methods. Examples of operational projects include:

- Increased coverage and sampling of terminal fisheries (Central Coast marine and fresh water sport, Strait of Georgia marine sport, Chilliwack River sport and Lower Fraser First Nations fisheries) resulting in increased accuracy and precision of exploitation rate estimates for CWT indicators
- Increased effort in monitoring and sampling indicator escapement programs resulting in increased accuracy and precision of indicator cohort abundance, survival rates, and exploitation rates.
- MRP, FOS, and SEP database improvements which will provide more timely reporting and access to data required for assessing fishery impacts.
- Methods to use surrogate data to estimate CWT recoveries in sport fisheries.
- The use of detection wands in SEAK to reduce freight and CWT lab storage and processing costs by not shipping heads from adipose-clipped salmon without CWTs.

It has been difficult at times to separate CWTIT projects from programs conducted by agencies using other funding. For example, in Canada some CWTIT projects were developed to estimate costs and quality of information that would result from the redesign of CWT sampling programs. In the U.S., operational projects have included funding provided to address the loss of funding from Anadromous Fish Act grants for CWT sampling in Washington and Oregon. Operational projects have also included projects to evaluate the feasibility of methods to reduce costs or improve the timelines of providing CWT data.

“Data Improvement” projects involve indicator stock tagging and sampling programs to fill information gaps. The full realization of the improvements resulting from these types of CWT projects depends upon the availability of funding beyond the anticipated end of the CWTIT program. Examples of such projects include increased representation of production regions by indicator systems (e.g., Fraser River, Philips River south coast mainland inlets, Atnarko River central coast BC, Oregon coastal stocks, and Southeast Alaska stocks). For indicator stock programs, some of the data produced by CWTIT projects will not become available until after the anticipated end of CWTIT funding (see Table 2). CWTs from augmented CWT releases began being encountered in two-year-old Chinook in fishery and escapement sampling programs in 2011 but all possible marine ages will not be represented until at least 2015 or later (Table 2). A more detailed analysis of the impacts of the increased CWT releases will be provided in a future year.

Annual program review by CWTIT provides a means to monitor and evaluate the status of the CWT program. Although not project related, the CWTIT program has improved communication and collaboration among agencies. CWTIT workshops have provided opportunities for agency staff involved in all aspects of the CWT program (tagging, monitoring, analysis, data management, etc.) to share information and expertise to improve the CWT program through the exchange of information, discussion of issues, and experience.

Table 2. Year of incremental tag application and anticipated tag recovery by age. Y-Yes, NA-Not Available until future return years.

Fiscal Year	Tag Application	Tag Recovery by Age			
		2	3	4	5
2009/10	Y				
2010/11	Y				
2011/12	Y	Y			
2012/13	Y	Y	Y		
2013/14	Planned	NA	NA	NA	
2014/15		NA	NA	NA	NA
2015/16		NA	NA	NA	NA
2016/17			NA	NA	NA
2017/18				NA	NA
2018/19					NA

Developing Issues

Although the CWT improvement program has delivered many positive benefits to the CWT system some issues were identified as the program proceeded.

Timing and availability of funds has hampered some U.S. projects from beginning at the planned date because of delays in receiving funds due to unanticipated complications in completing the grant process for some agencies/entities and federal appropriations and budgeting processes. In some cases, projects which were approved in February did not begin until 9-10 months after that time.

Inflation has eroded the buying power of the funding available through the CWTIT program due to increases in personnel, transportation, freight, equipment and other costs.

The initial funding commitment of \$15 million over a five year period was insufficient to make needed, lasting improvements to the CWT program just for Chinook. Improvements are also needed for Coho and in systemic programs that affect multiple species (e.g., estimation, sampling, and reporting of catches and escapements, separation of hatchery and wild components, methods to assess impacts of mass marking and mark selective fishing).

The potential for future reductions in funding to support CWT programs is a major concern. Management agencies of both Parties are experiencing substantial pressures for fiscal austerity. In the U.S., a means to provide funding to support continuation of base-level ocean sampling in WA and OR to address budgetary pressures from the loss of Anadromous Fish Act grants has not been addressed to date. Agencies are evaluating alterations to tagging and sampling programs, and major funding agencies like the Bonneville Power Administration are reviewing future commitments for CWT-related efforts.

Long-term Issues

1) CWTs remain the only tool that can provide the information needed for coast wide fishery management and assessment. This is especially true because CWTs provide stock and age specific identification without error, i.e., the tag code is from a specific hatchery or wild stock from a specific year class and provide the established mechanisms for coastwide data sharing and broadly accepted methods for statistical analysis. Other tools have been used for various management or stock assessment objectives, primarily for region-specific applications, but these other tools do not provide the tools necessary to implement the PST and they are more costly.

2) The CWTIT program is scheduled to sunset in 2013/2014 for Canada and in 2014/2015 for the U.S. A means to continue funding is needed for these improvements to be maintained. Projects such as indicator stock programs, tagging levels, sampling and recovery of tags, and data reporting require sustained commitment of funding and staff resources. Funding from other sources, such as the Endowment Funds, which could provide funding to support CWT-related improvements is uncertain due to variability in investment performance and the need to provide funding to support other PSC initiatives, like the Sentinel Stocks Program. **Future funding is required to maintain the CWT program, let alone improve it.** Since 2009 when this program was initiated, core agency monitoring and sampling programs have been reduced. In some cases, CWT improvement funds have been used as a temporary solution to cover emerging gaps in agency resources. The consequences of not adequately funding the CWT program in the future are numerous and include: a) not recovering the CWTs already in circulation, b) reduced sampling rates and coverage coast wide, c) reduced tagging levels, and d) loss of a portion of the base agency ocean sampling in Washington and Oregon.

Appendix 1. Progress reports for projects funded in 2012.

2012 U.S. Project Reporting

Project title (as stated in Project Proposal): Decision-Theoretic Tool (D-T) For Improving the CWT Program

Agency (as stated in Project Proposal): MORI-ko, LLC (through Northwest Indian Fisheries Commission), Gary Morishima

Approved funding for this cycle (as stated in Project Proposal): None

Total CWTIT funding approved to date (if funded previously): \$141,586

Continued CWTIT Funding Needed (yes, no, maybe): Not unless additional modifications or refinements are requested from user feedback

Objectives and Relationship to PSC Technical Report 25: Chapter 6, and the CWT Expert Panel and CWT Workgroups recommended that a Decision Theoretic Tool be developed.

Proposal for CWT Improvement Projects, 2010. Produce a D-T tool to guide modifications to the CWT program as recommended by the CWT Expert Panel (Report of the Expert Panel on the Future of the Coded Wire Tag Program for Pacific Salmon. [PSC Tech. Rep. No. 18, November 2005](#)). The proposed tool would be designed to simultaneously analyze interdependencies between investments involving CWT marking, sampling, and catch/estimation programs on multiple stocks and fisheries in terms of quantitative estimates of improvements in selected PSE/CVs of exploitation rates. Uncertainty surrounding estimates of exploitation rates would be computed using methods described by Bernard and Clark. (1996. *Estimating salmon harvest based on return of coded-wire tags. Canadian Journal of Fisheries and Aquatic Sciences* 53:2323-2332) and Chapter 5 of the CWT Workgroup Report (An Action Plan in Response to Coded Wire Tag (CWT) Expert Panel Recommendations. A Report of the Pacific Salmon Commission CWT Workgroup. [PSC Tech. Rep. No. 25, March 2008](#)). The tool, largely based on the guidance provided in Appendix B of PSC TR25, would consist of four primary components: (1) a menu driven interface to enable users to select the types of statistics to be produced (e.g., stock-age-fishery, total fishery exploitation rate); (2) a simple, steady-state forward cohort model to approximate CWT recovery patterns resulting from changes in survival and fishery harvest rates from base period levels; (3) a module to estimate CVs, given tagging levels, sampling rates, and uncertainties surrounding catch/escapement estimates; and (4) an optimization module to allocate expenditures for proposed projects to improve the CWT program. The D-T tool would be parameterized using CWT data and fishery strata employed by the CTC.

Project Description, Accomplishments (describe shortfalls from objectives), Results and Deliverables:

Funding was not received until September 2010, delaying initiation of the project. CWTIT was consulted during development and modifications made as requested. The tool, named Plan It! (PI!), was completed early in 2012. Executable and source code, user guide, manual, and report have been delivered. The D-T project was originally proposed to be developed in the R statistical system, but was

written as a stand-alone Visual Basic program since that is the primary language that is utilized by the CTC.

Qualitative and Quantitative (if appropriate for project) Benefits to Coded Wire Tag Program and PSC Salmon Management:

- Increased visibility and awareness of costs and benefits of modifying or investing in improving CWT programs
- Improved allocation and use of limited funding to support CWT programs and increased awareness of the implications of CWT programs undertaken by one agency on other jurisdictions.

Project title: Stikine River Chinook Smolt CWT

Project agency: ADFG (note this project is also funded by Canada), Phillip Richards

Approved funding for this cycle: \$121,883

Total CWTIT Funding approved to date: \$356,965

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 1 (Incomplete representation of production regions) and Issue 2 (Determination of Tagging Levels)

Project Description, Accomplishments, Results and Deliverables:

This bilateral project was designed to represent the Stikine River population of Chinook salmon, which averages run sizes of about 50,000 adults, and to increase the level of coded-wire tagging of smolts to 35,000 or more annually. In addition approximately 2 per cent were measured for weight and length. The tagging goal has been reached each year. Returning adults are sampled in marine fisheries, with most CWTs recovered in SEAK sport, gillnet and troll fisheries near Petersburg, but in fewer numbers in other areas of SEAK and occasionally in NBC. The escapement and inriver fisheries are sampled to determine the marked rate by brood year, which provides a basis to estimate harvest contributions, exploitation rates, smolt and adult abundance and survival rates. The U.S. has paid the bulk of funding for the CWT portion of this program since its inception. Canada has paid for the bulk of escapement recoveries since its inception.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Tagging rates could not have been achieved without this funding source. This program, along with the inriver run and escapement estimation program (funded by other sources) provides the tools to forecast and manage the terminal run of this stock per Chapter 1 of the 2009 PST Agreement.

Success: Yes; and additional data will be available when recently tagged broods recruit to fisheries in the future.

Project title: Mid-Oregon Coastal Production Region Coded-Wire Tagging, Recovery and Escapement estimation of Elk River fall Chinook salmon

Project agency: ODFW, Shelly Miller

Approved funding for this cycle: \$123,501

Total CWTIT Funding approved to date: \$376,184

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 1 (Incomplete representation of production regions), Issue 3 (Representation of hatchery production), Issue 4 (Low sample rates in terminal fisheries) and Issue 6 (Uncertainty in estimates of escapement or terminal fisheries)

Project Description, Accomplishments, Results and Deliverables:

ODFW considers the Elk River coded wire tag (CWT) Chinook Salmon Program as a candidate exploitation rate indicator stock (ERIS) for the mid-Oregon coast aggregate. As such, it is critical to estimate the number of CWT Chinook salmon in the terminal run by sampling the freshwater harvest and spawning escapement thus continuing historic data collection efforts to characterize the Chinook salmon run in the Elk River.

Specific objectives include:

1. Conduct a statistical creel survey to sample harvested Chinook salmon and provide estimates of terminal catch within a usable time frame for fisheries management.
2. Assist with broodstock and hatchery collection and processing to recover coded wire tags from returning Chinook salmon adults.
3. Sample spawning grounds to recover a sample of escaping hatchery origin, tagged Chinook salmon.
4. Survey spawning areas to provide an estimate of spawning escapement of returning hatchery, CWT and naturally produced fish.
5. Tag (coded wire tag) and remove adipose fins from approximately 325,000 Elk River fall Chinook salmon annually to provide harvest and escapement estimates in subsequent return years. Work under CWTIT funding for 2012-13 is still ongoing but is on target for successful completion. As of Dec. 6, 2012, all aspects of the 2012 Elk River project are in progress and results should be available in March of 2013. Creel technicians have sampled 589 Chinook and collected 136 snouts. Spawning ground surveys are now in full rotation with peak spawner activity expected in January. Swim-in totals at the hatchery thus far include 930 adult males, 335 females and 142 jacks, with nearly 800 snouts collected that tested positive for CWT. The application of CWT's to approximately 300,000 hatchery smolts from the 2012 brood is scheduled for late spring of 2013.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Without consistent representation, the Mid-Oregon Coast (MOC) aggregate of fall Chinook stocks will not be adequately accounted for nor appropriately modeled for their contribution to Pacific Salmon Treaty (PST) fisheries. Recent evidence demonstrates that the Elk River stock is a significant contributor to aggregate abundance based management (AABM) fisheries. The past three years of CWTIT support have provided consistent ERIS representation of the MOC aggregate, an important contributor to Pacific Salmon Treaty (PST) fisheries. This program is necessary for the proper estimation of CWT Chinook salmon, by tag code, that return to Elk River between 2010 and 2015 to assess ocean survival, ocean and

freshwater harvest and spawner escapement. This project directly relates to the CWTIT RFP 2012 Cycle Themes E and F: "Terminal Fishery Escapement Sampling Issues" and "Tagging Issues" respectively. Completion of the proposed work will augment the existing CWT program by providing consistent estimates of distribution and exploitation rates for MOC stocks.

Success: Yes; and additional data will be available when recently tagged broods recruit to fisheries in the future.

Project title: ODFW Coded Wire Tag Database Program Support Systems

Project agency: ODFW, Mark Engelking

Approved funding for this cycle: \$110,000

Total CWTIT Funding approved to date: \$520,000 on ODFW CWT Reporting System

Continued CWTIT Funding Needed: Probable

Objectives and Relationship to PSC Technical Report 25: Issue 13 (Timeliness of Reporting), Issue 14 (Incomplete/no exchange of CWT data), Issue 17 (Updating data is difficult and updates cannot be tracked) and Issue 18 (Validation is inadequate).

Project Description, Accomplishments, Results and Deliverables:

There are two aspects to the project. Firstly is the conversion of existing CWT historic data and processes for ocean fisheries to newer Web based technology (SQL c#.net) used by the CWT F application. This conversion will improve management of coded-wire tag data and report recoveries promptly. Secondly paper forms and the manual data entry processes for CWT recovery and release information from hatcheries are to be replaced by data loggers and software programs that will provide electronic data uploads to the CWT F application database.

The Agile Software Development process of adaptive and interactive software development was successfully used in the development of the CWT F application. Developers have successfully programmed a data logger to capture CWT recovery data from Bonneville Hatchery and upload it to the CWT F application. Parallel testing at Bonneville Hatchery of this recovery program is in progress. Development for CWT release programs is on-going. Data loggers that are both durable in field conditions and compatible with Microsoft Mobile 6 software have been identified and will be purchased. ODFW has defined 85 development stories for transforming those PC computer-based processes to Web based technology. Reports to support the ocean fisheries programs are in development and testing. Migration of historic information from the MRP is in process to the CWT F application. The CWT F application is now modified to accommodate Ocean fisheries data and migration of historic information is underway.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Timeliness of reporting, access and retrieval of CWT data, updating of CWT data will be easier and can be tracked and validation and accuracy of CWT data from Oregon will all be improved once these improvements are complete and implemented.

Success: Likely Yes, but the project is still in progress.

Project title: Improving Timeliness of Reporting Washington's Catch and Sample Datasets for CWT Expansions

Project agency: WDFW, Brodie Cox

Approved funding for this cycle: \$72,206

Total CWTIT Funding approved to date: \$307,725 on WDFW CWT Reporting System

Continued CWTIT Funding Needed: Unknown

Objectives and Relationship to PSC Technical Report 25: Issue 13 (Timeliness of Reporting), Issue 15 (Inter/intra-agency coordination), and Issue 17 (Updating data is difficult).

Project Description, Accomplishments, Results and Deliverables:

This solution will enhance future WDFW near real-time recovery reporting capabilities. This should improve the timeliness of post season analyses. Future work in this area will involve developing an interface for use by field personnel, thereby creating a fully integrated system of data entry and retrieval, and provide for statewide standardization of CWT reporting.

CWT Recovery Workflow:

1. CWTs heads collected in the field
2. CWTs analyzed in the Tag Recovery Lab
3. The data is entered into the recovery database
4. As the heads are processed and instantly (*more or less*) reported via data.wa.gov/ Salmon Conservation Reporting Engine (SCoRE). Researchers and fishery scientists have access to raw recovery data in a timely manner

Old System: Grade: approximately 6 (scale of 1-10 with 10 being best)

The database improvements affect the third step in the simplified recovery workflow. The old system was designed quite some time ago, and although it had been migrated to SQL Server in 2009, it was non-standard structure and was not connected/connectable to other data sets, including the Tagging Application operational database ("Tagwire"). Reporting of recoveries is via request to the data steward or at twice yearly time of RMIS reporting

New system: approximately 8 (scale of 1-10 with 10 being best)

This project modernizes, simplifies and standardizes both the Tag Recovery lab database as well as the TagWire database. Additionally It adds an automated and accessible reporting component for displaying in-season recoveries as they are processed. Changes to the system are as follows:

- Migration of Tagging Crew operational database to agency standard format
- Mapped the SQL Server database objects used in the MS Access user interface.
- Separated all the database objects that are required by the MS Access user interface and move them into a new database. This includes scripting the stored procedures, views, functions, and the like, to individual files to be checked into source control (CVS). This also includes modifying the MS Access user interface to use the new database.

- Stored procedures refinement. Further investigation revealed a total of 184 stored procedures (many redundant) which our dev. team was able to reduce to 62 stored procedures.
- Lookups successfully migrated to Agency common lookup set.
- Developed 'Live' export web service available via Data.wa.gov

Improvements in timeline:

Before: Recovery data is available every 6 Months (or recovery data on request via steward)

After: Recovery data (non-reconciled) available daily via <https://data.wa.gov/>

Ongoing Work:

Availability of recovery data via Data.Wa.gov anticipated by the time end of December 2012

Availability of recovery data via SCoRE II in Spring of 2013.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Timeliness of reporting, access and retrieval of CWT data from Washington will all be improved.

Success: Yes.

Project title: SEAK Spring Troll Reporting Re-stratification

Project agency: ADFG, Ron Josephson and Tim Frawley

Approved funding for this cycle: \$29,685

Total CWTIT Funding approved to date: \$29,685

Continued CWTIT Funding Needed: No

Objectives and Relationship to PSC Technical Report 25: Issue 8 (Uncertainty in estimates of catch in highly mixed stock fisheries) and Issue 9 (Non-representative sampling).

Project Description, Accomplishments, Results and Deliverables:

This project's objective was to reduce the number of time and area strata in the spring troll fishery in SEAK to reduce errors in expansions of CWTs from this fishery. This fishery is primarily managed to maximize the harvest of returning Alaska hatchery Chinook and over 200 time/area strata are employed in the management plan for this fishery. The number of strata was reduced by 80% by lumping weekly strata into 2 periods, May and June. This eliminates most of the strata with no fish sampled and eliminates expansions with less than 1 fish. Data exploration is complete and programming is underway to complete the transition, which will be complete by spring of 2013. Historical estimates will be updated as well; overall estimates change very little, but the precision of estimates increases substantially.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Precision of CWT estimates from the spring troll fishery in SEAK will be improved and more in line with the summer and winter troll fishery estimates.

Success: Yes, but the project is incomplete for the programming stage.

Project title: Purchase of Microscope and Related Equipment for Coded-Wire Tag Lab

Project agency: The Makah Tribe, Hap Leon

Approved funding for this cycle: \$5,312

Total CWTIT Funding approved to date: \$5.312

Continued CWTIT Funding Needed: No.

Objectives and Relationship to PSC Technical Report 25: Issue 13 (Timeliness of Reporting).

Project Description, Accomplishments, Results and Deliverables:

The objective of this project is to improve the efficiency of reading coded-wire tags in the Makah Fisheries tag lab, by providing an electronic microscope with an LCD display. This equipment should allow for faster, clearer tag reading, as well as providing ergonomic benefits to the tag reader. The equipment was purchased after some difficulties in obtaining funds and it has worked well in the speed and ease of reading CWTs collected from the Makah Tribe salmon fisheries. This data is shared with the tribal staff and managers and then sent to WDFW for transfer to RMPC.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

The timeliness of reading tags from the Makah fisheries has been improved and this will likely translate into a faster upload to RMPC as well.

Success: Yes.

Project title: Coded Wire Tag Field Equipment Replacement—Handheld Wands

Project agency: WDFW, John Kerwin

Approved funding for this cycle: \$230,726

Total CWTIT Funding approved to date: \$230,726

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 12 (Sampling methods to facilitate sampling of mark-selective fisheries and CWT processing) and Issue 13 (Timeliness of Reporting).

Project Description, Accomplishments, Results and Deliverables:

The Washington Department of Fish and Wildlife (WDFW) has approximately 500 coded wire detection wands in current inventory. The WDFW sampling database lists approximately 240 sampling locations where Chinook and coho are sampled for CWTs. Additionally, streams and rivers in every major river basin, as well as all WDFW hatchery facilities are surveyed annually for Chinook and coho that contain CWTs. All of these locations require the necessary equipment to allow for adequate sampling of both marked and unmarked CWTd fish. The purchase of 85 coded wire detection wands represents the first influx of the new technology and significantly more sensitive wands for WDFW samplers to utilize.

Because funding for the purchase of the coded wire detection wands was not received in time to purchase the wands for the 2012 Chinook fishing season, WDFW has not placed the wands into service. However, it has allowed us to plan the most efficient method to deploy the new coded wire detection wands. These wands will be utilized at port sampling locales that have high numbers of Chinook sampled. This will involve replacing coded wire detection wands first at the Washington coastal and Puget Sound sampling locations that have the highest levels of Chinook sampling.

Because there are coded wire detection wands that are at other locations which are unreliable, WDFW will make an assessment of the coded wire detection wands turned in by port samplers and use the most useful to replace the unreliable coded wire detection wands. For example, some wands have been retrofitted with shields while others have not. WDFW will replace non-retrofitted wands with reliable retrofitted wands.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Increased accuracy of detecting CWTs in sampling using handheld wands. Some increase in speed and efficiency of sampling should be realized as well.

Success: Yes, the wands were purchased and will be used for the 2013 season for Washington fisheries.

Project title: Coded Wire Tag Field Equipment Replacement—Handheld Wands

Project agency: ODFW, Ken Johnson

Approved funding for this cycle: \$80,710

Total CWTIT Funding approved to date: \$80,710

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 12 (Sampling methods to facilitate sampling of mark-selective fisheries and CWT processing) and Issue 13 (Timeliness of Reporting).

Project Description, Accomplishments, Results and Deliverables:

ODFW was able to purchase 30 new handheld wands at a significant discount by partnering with WDFW's order of 85 handheld wands. The lower cost per wand was a result of WDFW's waiver of indirect charges for this purchase.

Oregon's Fish Identification Section received 30 new wands in mid September, 2012. Twenty wands were then delivered to Oregon's Ocean Sampling Program, headquartered in Newport. Ten wands were delivered to Oregon's Columbia River Management program which samples lower Columbia River commercial and sport landings for CWT marked Chinook and coho.

The new wands arrived at the end of the fisheries in the Columbia River and the Ocean. As such, the new wands were not been rigorously tested in field sampling. However, preliminary results indicate that samplers appreciate the ergonomic balance of the redesigned wands. In addition, it is very clear that the new wands are much more sensitive and eliminate the need for "mouth wandling" in large Chinook. Full scale use of the wands will start with Oregon's spring 2013 fisheries.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Increased accuracy of detecting CWTs in sampling using handheld wands. Some increase in speed and efficiency of sampling should be realized as well.

Success: Yes, the wands were purchased and will be used for the 2013 season for both Washington and Oregon fisheries.

Project title: SEAK Port Sampling Tag Detection Wands and Sampling/Training

Project agency: ADFG, Anne Reynolds

Approved funding for this cycle: \$131,309

Total CWTIT Funding approved to date: \$131,309

Continued CWTIT Funding Needed: Yes-for additional sampling time but not for additional equipment

Objectives and Relationship to PSC Technical Report 25: Issue 12 (Sampling methods to facilitate sampling of mark-selective fisheries and CWT processing) and Issue 13 (Timeliness of Reporting).

Project Description, Accomplishments, Results and Deliverables:

The primary objective of this project was to purchase 26 new handheld wands from NMT and add sampling effort and training to increase coded-wire-tag (CWT) sample rates and decrease shipping costs in SEAK commercial fisheries. Additional Fish and Wildlife Technicians and one biologist in the ports of Sitka and Craig were supported. Staff were trained and the new wands were tested during the spring troll fishery, whereby all adipose-clipped fish were shipped to the Alaska Tag Lab regardless of tag detection status. In May of the spring fishery, some minor errors in false negatives occurred due to protocol lapses, but accounted for 0.1% of ad-clipped fish. In June, these errors were eliminated and heads tested without CWTs were not shipped. Port samplers in all ports except for Hoonah and Excursion Inlet used electronic tag detection wands to examine adipose clipped Chinook salmon harvested in the summer Southeast Alaska troll fisheries to determine if valid CWTs are present before CWT processing protocols are invoked. The heads of any positively identified tagged fish were collected and the tags decoded by ADF&G staff. During the first summer troll Chinook retention period in July of 2012 port samplers observed 3,138 Chinook salmon missing their adipose fin. Using NMT electronic tag detection wands 2,105 of those Chinook salmon missing their adipose fin did not signal positively indicating the presence of a CWT. During the second troll Chinook retention period in August of 2012 port samplers observed 3,657 Chinook salmon missing their adipose fin. Of those, 1,948 (53%) Chinook salmon did not signal positively indicating the presence of a CWT. In total 4,053 Chinook salmon heads were not shipped to the Alaska Department of Fish and Game (ADF&G) Mark, Tag and Age lab (MTA) saving the department shipping costs on approximately 8,000lbs of salmon heads. Sampling rates of the summer troll fishery remained above the coast-wide standard and overall were above 30% for Chinook salmon harvested in the troll fisheries. The additional port sampling staff funded by this project contributed to this sampling effort.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Costs were reduced for shipping heads without CWTs (No Tags) in SEAK commercial fisheries, primarily troll-caught Chinook salmon. This also maintained sampling rates above 20% and contributed to increased sampling efficiency.

Success: Yes, the wands were purchased and will be used for the 2013 season for Alaska fisheries.

Project title: CWT Sampling and Harvest Estimation in Puget Sound Freshwater Chinook Sport Fisheries: Sampling methods and development of new analytical techniques.

Project agency: WDFW, Kris Ryding

Approved funding for this cycle: \$185,122

Total CWTIT Funding approved to date: \$550,401

Continued CWTIT Funding Needed: No, last of 3-year program

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries) and 6 Uncertainty in estimates of escapement or terminal fishery catch.

Project Description, Accomplishments, Results and Deliverables:

This project involves conducting intensive creel surveys on four freshwater Chinook fisheries in Puget Sound for the purposes of examining differences harvest estimates obtained from creel surveys and catch record cards and to compare the number of expanded CWTs from a sampled sport fishery with expected CWTs numbers for the same fishery obtained using indirect estimation. The objectives for this year's funding are to:

1. Continue to make refinements to creel sampling methodology, focusing on efficient use of resources, ensuring that data are representative of fishing activity, and that sampling rates are adequate to meet data quality criteria.
2. Collect enough CWTs in the sampled fishery so that comparison to indirect methods can be made.
3. Compare harvest estimates obtained from creel sampling with those calculated from catch record cards.
4. Compare direct and indirect methods of estimating the numbers of CWTs in the sampled fisheries.
5. Examine the consistency of catch numbers and CWT recoveries across years in order to evaluate using average recovery and catch values in CTC models when harvest estimates are not yet available.

The objectives of this proposal are to add one more year of data to the analysis making it possible to do across year comparisons of harvest estimates and CWT recoveries within the same fishery.

Deliverables will be a set of fishery specific recommendations on the use of indirect and direct analytical techniques, and on the use of average recovery and catch values in CTC models when harvest estimates are not yet available. Thus far, objectives 1 and 2 have been accomplished. Objectives 3 through 5 will depend on the outcome of analyses that depend on 2012 catch record card estimates not available until late 2013. This project should be successful in meeting its objectives.

Qualitative and Quantitative (if appropriate for project) Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include an objective assessment on the information coming from freshwater fisheries data in Puget Sound, and guidance on which data sources will be most useful in evaluating impacts from these fisheries. Efficiencies are in savings from not sampling the fisheries directly each year.

Project title: Sampling Washington Ocean Fisheries

Project agency: WDFW, Doug Milward

Approved funding for this cycle: \$339,400

Total CWTIT Funding approved to date: \$692,500

Continued CWTIT Funding Needed: Yes, and other funding preferred

Objectives and Relationship to PSC Technical Report 25: Issue 7 (Low sampling rates in highly mixed-stock fisheries).

Project Description, Accomplishments, Results and Deliverables:

This project addressed the priority activity identified by the CWTIT for improving sampling rates in highly mixed-stock fisheries (fisheries with multiple stocks). The activities of this project include catch sampling and collection of Chinook and coho salmon biological data including coded-wire tags (CWTs) from commercial and recreational fisheries conducted along the coast of Washington State. During the 2012 ocean recreational salmon fisheries, the objectives of this project were accomplished. All ocean salmon fisheries were fully sampled temporally and spatially, and the minimum sampling goal of 20% of landed Chinook and coho was exceeded in all fisheries. Sampling rates for most species/fishery combinations increased relative to 2011. Over 3,600 Chinook CWTs and 1,500 coho CWTs were collected and will be added to the RMPC database.

The WDFW Chinook sampling rates of approximately 45% in the recreational ocean salmon fishery and 42% in the non-Treaty commercial troll ocean salmon fishery. Chinook sport fisheries were sampled at about 45%, gleaning a sample size of 15,081 from an estimated catch of 38,581. Chinook troll fisheries were sampled at a rate approximate to 42%, providing a sample of 15,401 from an estimated catch of 36,855 landed Chinook. Coho sampling rates were similarly high, at 52% in the recreational ocean salmon fishery and 28% in the non-Treaty commercial troll ocean salmon fishery.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management: No new benefits, but this is a program with past success that was repeated for base sampling in 2012.

Success: Yes, sampling rates for sport was 45% and that for commercial troll was 42% in 2012.

Project title: Improvements to Oregon Ocean Coded Wire Tag Sampling of Commercial Troll and Recreational Fisheries in the Columbia River Ocean Salmon Management Area

Project agency: ODFW, Eric Schindler

Approved funding for this cycle: \$101,101

Total CWTIT Funding approved to date: \$201,237

Continued CWTIT Funding Needed: Yes, and other funding preferred

Objectives and Relationship to PSC Technical Report 25: Issue 7 (Low sampling rates in highly mixed-stock fisheries) and Issue 13 (Timeliness of reporting).

Project Description, Accomplishments, Results and Deliverables:

The primary objectives of this project (initially begun with the 2011 ocean salmon fishing seasons) have been to implement full electronic sampling for coded wire tags and maintain the minimum required CWT sampling rate of 20% with emphasis on Chinook salmon in Oregon's ocean salmon fishery in the Columbia River Ocean Salmon Management Area. Implementation of this required a uniform approach for the entire Oregon ocean salmon fishery.

The objectives have been met and the project has been a success to date, although overall catches during the period have remained relatively light and some challenges to maintaining sampling rates in the commercial salmon fishery are yet to be faced. In the 2012 ocean commercial troll salmon fishery through August, we had recovered readable tags from 330 unmarked Chinook (76 from the Columbia River Area), and these tags would not have been recovered without the support from CWTIT. An unexpected benefit has been the recovery of tags from "unmarked" Chinook that were supposed to have been marked (missed clips or regenerated adipose fins may be the cause). Based on the tag recoveries from California stocks these un-clipped recoveries of Chinook made up ~1% of the total recoveries.

Tag recoveries from Pacific Salmon Commission stocks accounted for ~73% of the CWTs recovered in the Columbia River Area and ~29% of the CWTs recovered South of Cape Falcon. Unmarked CWT Chinook make up a decreasing percent of the CWTs recovered to the South, but are still made up $\geq 50\%$ of the CWT recoveries as far South as the Coos Bay Area.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management: The proponents indicate that about 50% of this project is enhanced CWT program benefits because of "full electronic sampling" that is being employed.

Success: Yes, the sampling rates were high, about 45% for sport and troll.

2012 Canada Project Reporting

Project title: Increased CWT Marking of Chinook Indicators

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: \$263,500

Total CWTIT funding approved to date: \$1,132,500

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 2 (Determination of Tagging Levels)

Project Description, Accomplishments, Results and Deliverables:

This project involved increasing coded wire tagging application and release levels on 9 Chinook indicator stocks in British Columbia. Tagging levels were set based on recent survival and fishery sampling rates in order to achieve stated precision objectives in the estimation of fishery-specific exploitation rates. The indicator stocks that received increased tagging through this project were: Robertson Creek, Cowichan River, Big Qualicum River, Quinsam River, Chilliwack River, Harrison River, Nicola River, Lower Shuswap River, Atnarko River

Increased tagging was initiated on selected stocks prior to brood year 2009 (e.g. Quinsam) through other external funding sources, but comprehensive increases in tagging levels began across all stocks in brood year 2009. To date, CWT release targets have been met for all stocks in all brood years, save for the Cowichan River in BYs 2009 & 2010 when poor escapements prevented collection of adequate broodstock for full release targets. Infrastructure improvements at DFO hatcheries that were funded through the first year of CWTIT continue to allow expanded tagging to be completed on an annual basis. Returns of marked 3-yr old adult Chinook to SEP hatcheries in 2012 from the first year of expanded tagging were strong, indicating that increased CWT recoveries are likely to be observed in future years as the releases from the expanded marking mature and enter the various fishery and escapement strata. This project can be considered to have been successful to date. Continued funding will be required to maintain current marking levels, otherwise marking will likely return to pre-2009 levels.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include increased CWT recoveries in all fishery and escapement strata for the 9 Chinook indicators, which will allow for increased precision in the estimation of exploitation rates in the various fishery strata.

Project title: Stikine River Chinook CWT Application and Tag Recovery

Project agency: DFO, Marc Labelle & Peter Etherton

Approved funding for this cycle: \$30,000

Total CWTIT Funding approved to date: \$120,000

Objectives and Relationship to PSC Technical Report 25: Issue 2, Determination of Tagging Levels

Project Description, Accomplishments, Results and Deliverables:

The project was designed to increase the level of coded-wire tagging of Stikine River Chinook salmon smolts. Approximately 35,000 additional wild Stikine Chinook smolts (including the Little Tahltan stock grouping) were tagged annually. In addition approximately 2 per cent were measured for weight and length.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Tagging rates could not have been achieved without this funding source. Approximately 80% of the fishery catch in the Stikine River were sampled for CWTs and heads sent to J.L Thomas Labs Inc. for analysis. Loss of this funding would compromise PST commitments to monitor fishery impacts, i.e. fewer CWT's in US fisheries for exploitation rate analysis; and lack of information to evaluate / refine Chinook escapement goal. In the absence of this funding some baseline biological data (age gender size) would be collected from the fishery catches. However, the resulting small sample size would result in low precision after CWT expansion.

Success: Yes; however, additional data will be available when current / recent year CWT fish return.

Project title: Taku Chinook Fishery Monitoring and CWT Application

Project agency: DFO, Marc Labelle & Ian Boyce

Approved funding for this cycle: \$30,000

Total CWTIT Funding approved to date: \$120,000

Objectives and Relationship to PSC Technical Report 25: Issue 2, Determination of Tagging Levels

Project Description, Accomplishments, Results and Deliverables:

Application of CWTs to wild out-migrating Taku juveniles for use in monitoring of directed Chinook fisheries was established in 2005. 8,000 additional wild Taku Chinook smolts were tagged based on this funding.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Tagging could not have been achieved without this funding source. Prior to tagging, Taku fisheries were not sampled. During this program 20-70% sampling rates have been achieved.

Loss of this funding would compromise PST commitments to monitor fishery impacts, i.e. fewer CWT's in U.S. fisheries for determining exploitation rates; lack of information to evaluate and refine Chinook escapement goal.

Success: Yes; however, additional data will be available when current / recent year CWT fish return.

Project title: Atnarko Chinook CWT Indicator Program: Uncertainty in estimates of escapement and terminal CWT catch

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: \$130,000

Total CWTIT funding approved to date: \$346,500

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issues 1,4,6 & 10 (Representation of Production Regions, Low sample rates in Terminal Fisheries, Uncertainties in Estimates of Escapement or Catch, Incomplete coverage of fisheries or escapement)

Project Description, Accomplishments, Results and Deliverables:

This project began in 2009 with the objective to expand the Atnarko assessment program to a Central Coast Chinook indicator (noted as lacking in Technical Report 25). The only northern indicator, Kitsumkalum, is a stream-type stock; Atnarko is an ocean type stock. Progress included application of 250,000 incremental CWTs, sampling of the terminal commercial, sport, and First Nations fisheries, and reintroduction of a mark-recapture program to improve escapement estimates and CWT recoveries. This project has been successful in improving the sample rates and precision in the estimation of CWTs in escapement and terminal catch.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management: The 2009 escapement mark-recapture program was very successful. 925 tags were applied, 2630 carcasses examined and 24% of tags recovered, to provide a spawning estimate of 10,700 Chinook (CV 5.7%). The commercial fishery sampling rates ranged from 34-72% (and 110 CWT recovered) with the exception that catch in the first week of July was not sampled. The Bella Coola First Nations fishery was sampled at 25% and 57 CWTs recovered.

The 2010 escapement mark-recapture program was impacted by a major flood event at the end of September. Prior to the flooding event, 1008 Chinook were tagged, 1025 carcasses examined, and 87 tags recovered. The preliminary escapement estimate using the standard is 10,900 - 11,760 (CV 10-11%). 86 CWTs were recovered. The Bella Coola River First Nation fishery caught 3,200 fish (preliminary), 775 were examined for fin clips, and 76 heads collected for CWT dissection.

The 2011 escapement mark recapture program was successfully implemented. 833 Chinook were tagged, 775 carcasses examined, and 68 tags recovered, providing a preliminary escapement estimate of 9105 (CV 14%). In 2011 all terminal fisheries were monitored. Greater than 30% of the First Nations

FSC fishery was sampled and 47 CWTs recovered. The commercial gillnet fishery caught 4600 Chinook and the Bella Coola sport fishery caught less than 200 Chinook due to flow conditions.

The 2012 escapement mark recapture program was successfully implemented. 644 Chinook were tagged, 1097 carcasses examined, and 65 tags recovered, providing a preliminary escapement estimate of 10389 (CV 12%). 98 CWTs were observed in the spawning escapement. In 2012 terminal FSC and commercial fisheries were monitored. Greater than 40% of the First Nations FSC fishery was sampled and 147 CWTs recovered. The commercial gillnet fishery caught 3300 Chinook; CWT results are still pending.

Is continuing funding required? Without continued funding, ongoing maintenance of the terminal mark-recapture program to estimate spawning escapement, terminal fishery sampling and increased CWT application will not be possible. Increased numbers of CWTs applied since 2009 may not be recovered in terminal fisheries and escapement without intensive sampling programs.

Project title: Salmonid Enhancement Program CWT Head Data Coordinator/Archival CWT Database Review

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: \$67,000

Total CWTIT funding approved to date: \$67,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issues 10, 13 & 15 (Intra-agency Coordination, Timeliness of Reporting, Uncertainty in catch estimates and CWT expansions, data management)

Project Description, Accomplishments, Results and Deliverables:

This project funded the staffing of a term biologist position in the DFO Regional Salmonid Enhancement Program (SEP) sector for 10 months in 2012/2013. Two main objectives included:

- 1) Development of a formal set of Best Practices for the collection, transfer and management of CWT heads and data at all escapement projects. This includes serving as a Regional Head Data Coordinator for all escapement programs on an in-season basis; and
- 2) Review of archival escapement data from DFO enhancement programs to ensure standardized analytical techniques and data verification procedures have been employed.

Through the Regional Head Data coordinator role, this project served to provide a single point of contact to lead the annual program to collect CWT heads and deliver them to the dissection lab in a timely manner. In the course of this role, a thorough review of the current data and head transfer program was conducted, efficiencies were identified, and a complete set of Best Practices are being developed with

the goal of improving data quality and delivery time, reducing costs at the dissection lab, and streamlining operations for current DFO staff.

The archival data review component of this project involves a systematic review of historic and recent SEP escapement data, including hard copy CWT sampling records, tag decoding, and stratum abundance estimates. As part of the implementation of a new data management system in SEP in recent years, ongoing review of archival data has identified inconsistencies with the current database records that require reconciliation. This project has systematically begun a review of archival hard copy CWT sampling records, updating existing databases with retrieved CWT and stratum abundance estimate data as it has been located and/or corrected. As data updates are made to the new SEP Enhancement Planning and Escapement Database (EPAD), database updates will then be transferred to the CTC CWT database as part of the annual data upload. To date, there have been significant improvements made in the quality of the data that is provided annually for international and domestic data sharing, with future updates expected as this project continues.

To date, significant progress has been made on both key objectives in this project. It is anticipated that the CWT Head Data Coordinator project will be completed successfully over the next few months. It is also anticipated that the historic CWT data review project will continue to make progress, although it was recognized at the beginning of this project that review of all CTC indicator data would not likely be completed in one year.

Qualitative and Quantitative (if appropriate for project) Benefits to Coded Wire Tag Program and PSC Salmon Management: Improvements in reporting of CWT data from escapement projects will directly benefit the CWT program and CTC by ensuring the current return year escapement data are available in time for annual CTC CWT analysis. In addition improvements made in the delivery and CWT dissection system will serve to reduce future costs for processing of escapement heads. These savings will help to offset pressures from increased CWT recoveries expected as an outcome of the CWTI program, and will provide lasting improvements in the quality and timeliness of CWT reporting.

Project title: Regional CWT Data System Programming

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: \$90,000

Total CWTIT funding approved to date : \$350,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 13, 14, 15, 17, & 18 (Timeliness of Reporting, Incomplete / No exchange of CWT Data, Inter/Intra Agency coordination, Updating CWT Data Difficulties, Inadequate CWT Validation)

Project Description, Accomplishments, Results and Deliverables:

This project involves hiring a programmer/analyst to provide systems analysis, design and programming support to Fisheries and Oceans Canada (DFO) coded wire tag program system – the Mark Recovery Program (MRP). The objectives for this year’s funding are to continue ongoing system improvements and new development including:

1. Improve data through improvements to validation, corrections to data, and corrections to historical algorithms
2. Improve data management through new data entry interfaces to central database
3. Improve access to information for DFO users and exports to the Regional Mark Information Centre (RMIS)
4. Improve interfaces with DFO hatcheries system, catch monitoring system, and escapement systems
5. Modifications for new data sources from other CWTIT projects

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

This is the fourth year of funding to support improvements to the MRP system. Prior to CWTIT funding, DFO had a significant backlog of programming issues and was not able to meet the bi-lateral reporting requirements effectively as the MRP system was a legacy fortran system. With this additional resource, DFO has made significant progress in reviewing and converting the legacy system using current technology and in developing new interfaces to improve access to the information within DFO. This has allowed DFO to meet bi-lateral exchange deadlines and to make modifications that have been necessary or will be required in the future.

Is continuing funding required?

Yes, DFO has made significant progress but on-going funding in 2012 and future years is requested in support of the above objectives. Additional programming support is still required to improve data management and automation for all CWT dissection activities, and for data management of First Nations and Escapement sampling.

Project title: Regional Sport and FN Fishery CWT Recovery Coordination

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: \$85,000

Total CWTIT funding approved to date : \$326,400

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 4, 7, 9, 10, & 11 (Low sample rates in terminal fisheries, Low sample rates in Highly Mixed stock Fisheries, Non-representative sampling, Incomplete coverage of fisheries or escapement, Voluntary Sport Fishery Sampling Programs)

Project Description, Accomplishments, Results and Deliverables:

This project involves hiring a senior fisheries technician to implement fisheries sampling improvements within Fisheries and Oceans Canada (DFO) recreational and First Nations fisheries. Objectives are to:

1. Develop protocols and implement sampling programs to adequately represent First Nations fisheries
2. Develop and implement program improvements to Increase participation in the recreational voluntary sport recovery program to increase sample rates representatively
3. Provide technical support, including design, review, implementation, and QA/QC for all aspects of CWT sampling within commercial, recreational, test and First Nations fisheries
4. Promote improvements to catch monitoring and sampling participation through communications promotional material, or improvements to sampling protocols.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

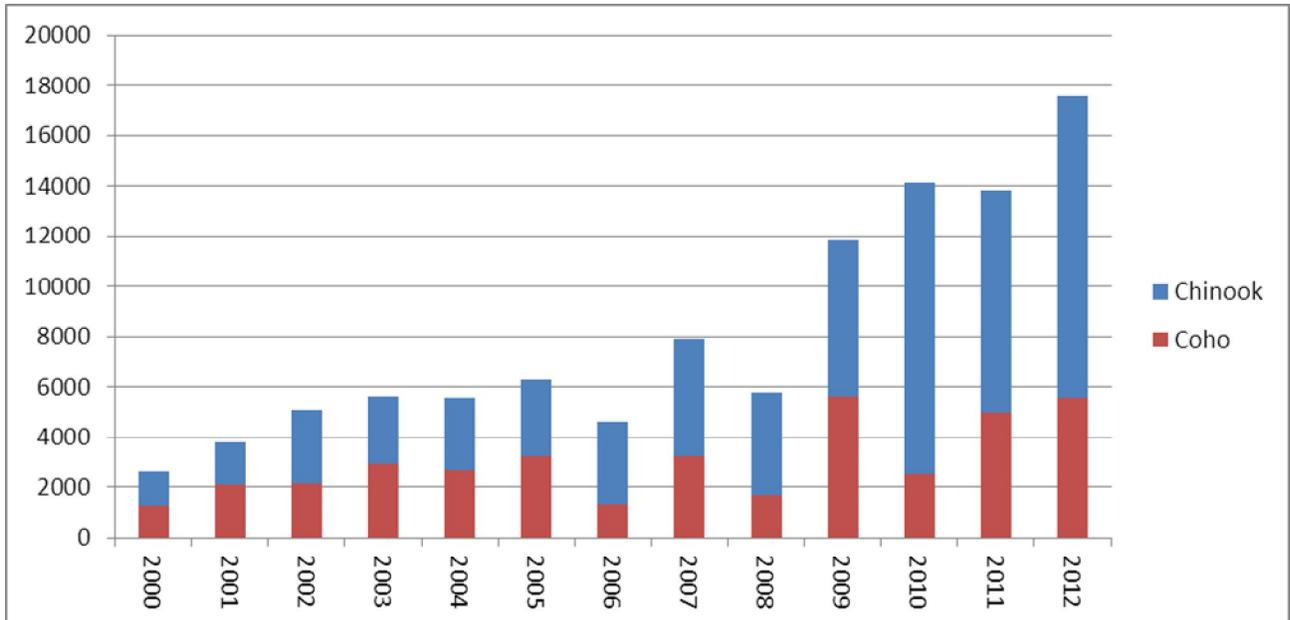
This is the fourth year of funding a fisheries technician to make improvements to sampling of recreational and First Nations fisheries. With the addition of a second fisheries technician, DFO has made significant progress in improving sampling across all CWT fishery sampling programs (recreational, First Nations, Commercial and Test fisheries) in terminal areas and in mixed stock fisheries.

Specific First Nations Achievements include the introduction and increasing progress toward adequate sampling rates in the following fisheries:

- Robertson Indicator - Alberni Inlet Food/Social/Ceremonial(FSC)First Nations fisheries – 2012 preliminary sample rate (2012SR) 52%
- Cowichan Indicator - Cowichan Tribes FSC fisheries sampled – 2012SR – not yet available (tbd)

- Atnarko Indicator –Nuxalk FSC (2012SR 46%)
- WCVI Mixed Stock T'aaquiihak economic fishery – 2012SR 54%
- Lower Fraser – FSC fishery – 2012SR 5-10%
- BC Interior – Kamloops Lake economic fishery – 2012SR 100%, FSC – 2012SR – tbd

Recreational Improvements can be generally viewed by reviewing the impressive increases in recreational samples since this project commenced in 2009 compared to historical results.



Is continuing funding required?

Yes, with the increased workload associated with the oversight and delivery of recreational and First Nations sampling programs, continued funding through 2012 and in future years is imperative to ensure that gains achieved are maintained across all DFO fishery sampling programs.

Project title: Regional CWT and Catch Estimation QA/QC
Agency: Fisheries and Oceans Canada, Bruce Patten
Approved funding for this cycle: \$75,000
Total CWTIT funding approved to date: \$264,700
Continued CWTIT Funding Needed : Yes
Objectives and Relationship to PSC Technical Report 25: Issue 6&8 (Uncertainty in estimates of escapement or terminal fishery catch, Uncertainty in estimates of catch in highly mixed stock fisheries).

Project Description, Accomplishments, Results and Deliverables:

This project provides QA/QC of all catch data associated with CWT recoveries and ensures proper stratification for tag expansions. Checks of current (2012) season's data were maintained as the data were received. Quality assurance of previous seasons' (2007-2011) salmon logbook data has been completed. As time allows, staff will continue checking 2006 and earlier seasons. Importing of historic test fishery data has been contracted out, to be completed by mid-March 2013.

Benefits to Coded Wire Tag Program and PSC Salmon Management:

This project has contributed to the accuracy of the CWT reporting system by systematically checking for, and resolving, errors. Loss of these resources would result in reduced QA/QC and consequently a reduction in data quality.

Project title: Improvements to Commercial Catch Databases (FOS)

Agency: Fisheries and Oceans Canada, Bruce Patten

Approved funding for this cycle: \$60,000

Total CWTIT funding approved to date: \$60,700

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issue 6&8 (Uncertainty in estimates of terminal fishery catch and Uncertainty in estimates of highly mixed stock fisheries)

Project Description, Accomplishments, Results and Deliverables:

This initiative funded a contractor to consult with DFO Area Managers on the Salmon Post-Season Catch and Effort Estimate Finalization Policy. They also developed area-specific procedures to ensure the estimates will be finalized each year. The contractor will compile historical catch and effort data (2005 and later) and import it into the Fishery Operations System (FOS).

Benefits to Coded Wire Tag Program and PSC Salmon Management:

This project is establishing standard procedures and finalizing catch estimates in the FOS, so that final post-season catch and effort estimates are available for use by the CTC in a timely manner. Once complete, this project will contribute to the accuracy of the catch data associated with CWT recoveries and ensure proper stratification for tag expansions. Regionally, this project is very important to ensure consistent post-season catch and effort estimates are available for use by the Mark Recovery Program.

Project title: MRP Archive Data Recovery

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: \$20,000

Total CWTIT funding approved to date : \$20,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 13 & 14 (Timeliness of Reporting, Incomplete / No exchange of CWT Data)

Project Description, Accomplishments, Results and Deliverables:

This project involves hiring two temporary technicians to review over 40 years of archived material associated with the DFO CWT program. The objectives for the funding are to:

1. Create an inventory of archived material including: review and classify, identify gaps in DFO CWT information system vs source documents or CWTs, and identify data recovery projects
2. Develop a strategy for retention. Options include data recovery / data entry, digital conversion of paper forms, CWT reading and digitizing, archive, with retention requirements established, redistribute to appropriate existing DFO staff, or destroy
3. Develop estimates to perform priority data recovery, scanning of paper forms, coded wire tag reading and digitizing for 2013 CWTIT projects
4. Perform priority data recovery, scanning of paper forms, coded wire tag digitizing, as determined as employment period allows.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

It is expected that this project will result in identification of historical sources of data (such as recoveries from test, research or First Nations fisheries) or fields on data records that have never been entered into the CWT system. Additionally, performing this review will result in the development of new protocols for digital management of DFO CWT program records which will improve access to data for QA/QC in the future. Finally, the reduction of archived material will eliminate future expenditures by DFO for the management of large quantities of archive material and allow for these funds to be spent on CWT program delivery. This is year one of a two year project.

Project title: Regional Commercial, Sport and First Nations Fishery CWT Recovery Improvements

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: \$215,000

Total CWTIT funding approved to date : \$585,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 4, 7, 9, 10, 11, & 12 (Low sample rates in terminal fisheries, Low sample rates in Highly Mixed stock Fisheries, Non-representative sampling, Incomplete coverage of fisheries or escapement, Voluntary Sport Fishery Sampling Programs, Sampling methods to facilitate MSF Evaluations)

Project Description, Accomplishments, Results and Deliverables:

This project is a portfolio of many activities being directed at Canadian fisheries to make strategic improvements to CWT sampling programs and CWT data. The focus of these projects is to make improvements that provide a legacy of improvements that can be sustained in the future. Projects include such things as:

1. Replacement, repairs and upgrades to sampling infrastructure requirements such as electronic sampling equipment or sampling tables for commercial fisheries,
2. Expansion of equipment to facilitate increases in recreational and First Nations sampling (ie, freezers, freezer boxes, closed containers for brine solution).
3. Development of communications strategy – participations in meetings, PR events, etc.; development and distribution of communication or promotional materials
4. On-site review of existing sampling programs and introduction of QA/QC through ongoing audits
5. Review, development and production of improved data collection materials (forms, labels, sample kits)
6. Introduction of sampling of freezer troll vessels in BC fisheries to improve representative sampling in this fishery.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

This project has made improvements the quality and quantity of CWT data that is available for use in analysis across all DFO fishery sectors.

Is continuing funding required?

Funding is required through 2012. Projects have been designed to become operational and will not require ongoing funding; however, future funding at a reduced level will be required for life-cycle replacement of equipment.

Project title: CWT Head Lab Processing and Data Management

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: \$70,000

Total CWTIT funding approved to date : \$316,400

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 2, 4, 7, 9, 10, 11, & 12 (Determination of tagging levels, Low sample rates in terminal fisheries, Low sample rates in Highly Mixed stock Fisheries, Non-representative sampling, Incomplete coverage of fisheries or escapement, Voluntary Sport Fishery Sampling Programs, Sampling methods to facilitate MSF Evaluations)

Project Description, Accomplishments, Results and Deliverables:

This project is required to pay for increased costs to ship, dissect and perform data entry for increased quantities of head recoveries from all Fisheries and Oceans Canada (DFO) fisheries and escapement sampling programs. Increases are attributed to the implementation of other CWT improvement projects including the following:

1. Increased tag rates in fisheries as a result of bi-lateral increases to tagging (issues 1-3)
2. Increased deadpitch CWT recovery efforts (issue 5)
3. Increased sampling rates, in commercial, test or research fisheries (issue 4, 7)
4. Introduction of First Nations sampling programs (issue 4, 7, 9)
5. Improvements to Voluntary Sport Head Recovery Program, resulting in increased sampling rates (issue 4, 7, 11)
6. Introduction of sampling of freezer troll vessels in BC fisheries to improve representative sampling in this fishery. (issue 11)
7. Re-introduction of sampling of unmarked Chinook (double index tagged fish) to support assessment of mark selective fisheries (issue 12)

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

This project ensures that funds and effort spent to complete other projects that increase tag recoveries of indicator stocks result in useable CWT data to support analysis.

Is continuing funding required?

With increased head recoveries across all DFO CWT recovery programs, continued funding will be required in 2012 and in future years.

<p>Project title: Chinook Test Fishery CWT and Biosample data import to FOS</p> <p>Agency: Fisheries and Oceans Canada, Bruce Patten</p> <p>Approved funding for this cycle: \$15,000</p> <p>Total CWTIT funding approved to date: \$41,000</p> <p>Continued CWTIT Funding Needed : Yes</p> <p>Objectives and Relationship to PSC Technical Report 25: Issue 10 (Incomplete coverage of fisheries)</p>
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Project Description, Accomplishments, Results and Deliverables:

This project incorporates historic data for Albion and Skeena Tye Test Fisheries into the Fishery Operations System (FOS). The Skeena Tye Test fishery project is complete. Fishery openings, catch data and biodata have been imported back to 1955. Staff are now able to report the in-season comparison with the historic index using an automated process rather than the previous manual one, increasing efficiency and quality control. For the Albion historic data import, 2002 data are currently being imported into FOS, 1997 - 2001 biodata have been imported into FOS and verified, 1990 - 1996 data have been reformatted and are ready to import into FOS, and 1980 - 1989 data are being updated.

Benefits to Coded Wire Tag Program and PSC Salmon Management:

Regionally, this project is very important in that it enabled historical catch data associated with CWT recoveries and tag expansions to be imported and consequently available for use by the Mark Recovery Program, creating a more accurate time series on which to base calculations. Capturing the Albion and Skeena Tye data in FOS has improved the quality of CWT estimates for stocks caught in these test fisheries and for the data used by the CTC for exploitation rate analysis of the Kitsumkalum, Lower Shuswap, Dome, Nicola, Chilliwack, and Harrison River indicator stocks. The data can be used to identify CWT recoveries in terminal net fisheries not previously identified by the CTC. Once data are captured in FOS, it is easier to extract information, do historic analyses, and export data to the MRP program.

Project title: Lower Fraser First Nations (LFFA) Coded Wire Tag Recovery Improvements

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: \$25,000

Total CWTIT funding approved to date : \$80,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 4, & 10 (Low sample rates in terminal fisheries, Incomplete coverage of fisheries or escapement)

Project Description, Accomplishments, Results and Deliverables:

The Lower Fraser Fisheries Alliance (LFFA) is a relatively new organization formed in March 2010 which has been empowered by its 29 member First Nations to establish a First Nation to First Nation (Tier 1) working relationship to address issues of common interest and work with the Department toward resolutions for effective resource and fisheries management.

This project is closely related to the 'Operational Support for First Nations CWT Sampling' Project which provides the DFO resource to the LFFA to support this project. This project is a collaborative project between Fisheries and Oceans Canada (DFO) and the (LFFA) to make improvements to CWT awareness and sampling in the Lower Fraser Area (LFA) through the following activities:

1. Building understanding of the CWT program and the Salmon Head Recovery Program throughout the LFA by engaging First Nations leaders and communities
2. Providing technical support to LFA First Nations monitoring organizations on the collection and provision of biological samples and high quality supporting data associated with the CWT program.
3. Development of a communication plan, identifying the audience, message, strategy, form and timing of communication for First Nations in the LFA.
4. Development of communication presentations and products.
5. Provision of communication, education and awareness sessions with LFA First Nations, targeted to First Nations Community leaders, fisheries managers, biologists and technical staff, and fishers.
6. Provision of training in the collection of CWT biological samples and data to First Nations fishery monitoring programs to support and enhance existing First Nations fishery monitoring programs in the LFA.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

This is the second year of a collaborative project between the LFFA and DFO targeting improvements to CWT sampling in the area addressing low sample rates in terminal fisheries. Both, this project and the related project, benefit the CWT program by increasing awareness within LFA communities, aiding monitoring organizations to implement changes and build tools to support CWT sampling and data collection, and increasing the number of head samples collected from fisheries.

Summary of head recoveries in Lower Fraser First Nations fisheries, 2010-2012

Species	2010 FSC	2011		2012 FSC
		FSC	Econ.	
Chinook	8	14	11	19
Coho	0	3	36	16
TBD	0	0	0	2
Totals :	8	17	47	37

* note that retention of Chinook and coho was not licenced in 2012 fisheries with a sales component

FSC : Food, Social and Ceremonial Fisheries
Econ. : Fisheries with a sales component

Is continuing funding required?

Targeted sampling and directed program discussions by LFFA and DFO staff, supplemented with monitor training sessions and feedback on data quality, are proving to be effective in increasing submission of heads and improving data collected. On-going funding is requested to continue work in support of these objectives.

<p>Project title: Operational Support for First Nations CWT Sampling Projects</p> <p>Agency: Fisheries and Oceans Canada</p> <p>Approved funding for this cycle: \$25,000</p> <p>Total CWTIT funding approved to date: \$25,000</p> <p>Continued CWTIT Funding Needed : yes</p> <p>Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries) and 10 (Incomplete coverage of fisheries or escapement).</p>
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Project Description, Accomplishments, Results and Deliverables:

This project involves hiring a seasonal technician to provide support to Lower Fraser Area (LFA) DFO and First Nations (FN) monitoring groups targeting increased sampling of Chinook and coho for Coded-Wire

Tags (CWTs) and improving collection of supporting mark rate information. The objectives for this year's funding are to:

1. Continue to build the relationship between DFO and the Lower Fraser Fisheries Alliance (LFFA) around CWT sampling in First Nations fisheries.
2. Work with staff from the LFFA on initiatives to increase understanding of the importance of the CWT Program within the LFA FN communities and monitoring organizations.
3. Provide support to LFA DFO and FNs in order to increase the number of head samples collected from LFA FN fisheries and work on improving the systems for collection and quality of data on mark rates from LFA FN monitoring programs.

Qualitative and Quantitative (if appropriate for project) Benefits to Coded Wire Tag Program and PSC Salmon Management:

This is the second year of a collaborative project between the LFFA and LFA DFO targeting improvements to CWT sampling in the area addressing low sample rates in terminal fisheries and was the first year funding was provided for DFO technical support. Both this project and the related LFFA funding provided in 2011-12 and 2012-13 benefit the CWT program by increasing awareness within LFA communities, aiding monitoring organizations to implement changes and build tools to support CWT sampling and data collection, and increasing the number of head samples collected from fisheries (reported in collaborative project).

Is continuing funding required?

On-going funding is requested to continue work in support of these objectives.

<p>Project title: WCVI First Nations Fisheries Chinook Assessment Enhancements</p> <p>Agency : Fisheries and Oceans Canada</p> <p>Approved funding for this cycle : \$6,000</p> <p>Total CWTIT funding approved to date : \$18,000</p> <p>Continued CWTIT Funding Needed : Yes</p> <p>Objectives and Relationship to PSC Technical Report 25: Issue 6 (Uncertainty in estimates of escapement or terminal fishery catch)</p>
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Project Description, Accomplishments, Results and Deliverables:

The objective of this project is to improve survey coverage, biosampling rates, estimates of Chinook mark rates and increase head recoveries from WCVI First Nations fisheries .

This project improved sampling of the Somass First Nation fishery via support for a technician to collect catch data from the First Nations Economic Opportunity fishery and to sample catch for mark rate/head recovery. This sampling provided an estimate of total catch, mark rate of the catch, and recoveries of heads/CWTs from marked Chinook.

Additional activities include:

- Participating in a First Nations fisheries technician training workshop.
- The creation of a Mark Recovery Program/CWT information pamphlet to improve awareness and participation in the program.
- The purchase of freezers and supplies to facilitate sampling and head recoveries.

Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the CWT program and PSC salmon management include improved estimates of Somass First Nations fisheries impacts on Somass Chinook a CTC indicator.

Project title: Central Coast Chinook mark incidence and catch estimation program

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: \$7,000

Total CWTIT funding approved to date: \$10,500

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issues 7 & 10 (Low sample rates in Highly Mixed stock Fisheries , Incomplete coverage of fisheries or escapement)

Project Description, Accomplishments, Results and Deliverables:

The objectives of this project were to increase survey effort for B.C. Central Coast sport fisheries, including lodge and independent catch, to:

- 1) Obtain mark-rate data for Central Coast sport fishery which is stratified both spatially and temporally from late June to late August when the majority of Chinook are caught.
- 2) Estimate independent catch for Areas 7-9 by month using C&P collected independent fisher data.
- 3) Determine under-reporting bias for marked head submission by comparing the lodge logbook mark-rates to those collected by C&P.
- 4) Calculate submission rates for Central Coast sport fishery either through integration of data into MRP or independently.

All objectives were met.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Immediate benefits have been realized as program results have allowed calculation of Central BC (PFMA 7-10) submission rates as well as “estimated” expansion factors. The availability of these data has precluded the use of mark-rates from other areas (global pooling) in DFO’s Mark Recovery Program. The observed submission rates during the past two years are higher than proxy data previously used in MRP and corresponding expansion factors are believed to better represent Central BC sport fishing impacts on CWT stocks. This project has yielded catch estimates for the previously unaccounted for independent angler (non-lodge based) component of the fishery as well as submission rates and corresponding “estimated” expansion factors. This recreational fishery is a significant harvester of Chinook (approx. 6000 in 2012).

Is continuing funding required? Without an annual program to collect Central BC Chinook mark-rate and independent angler catch data, proxy data from other areas would once again be used in MRP to expand CWT recoveries. The deficiencies inherent with this method have been highlighted previously and were the primary reason for initiating this project in 2011.

Project title: Operational Support for Recreational CWT sampling projects

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: \$30,000

Total CWTIT funding approved to date : \$69,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 4, 7, 9, 10, & 11 (Low sample rates in terminal fisheries, Low sample rates in Highly Mixed stock Fisheries, Non-representative sampling, Incomplete coverage of fisheries or escapement, Voluntary Sport Fishery Sampling Programs)

Project Description, Accomplishments, Results and Deliverables:

This project involves hiring 2 seasonal fisheries technicians to support the implementation of fisheries sampling improvements within DFO recreational fisheries. Objectives are to:

1. Perform audit inspections and recommend improvements to Voluntary Sport Head Recovery Program Depots in Southern BC.
2. Implement specific recreational fishery sampling improvement projects in Southern BC to adequately represent recreational fisheries.
3. Perform public relations and communication with Voluntary Sport Head Recovery Program Depots or fishers in Southern BC.
4. Perform QA/QC to improve recreational sampling data.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

This is the second year of funding seasonal fisheries technicians to make improvements to DFO sampling of recreational fisheries. With the addition of a second fisheries technician and seasonal staff, DFO has made significant progress in improving sampling through the voluntary sport head recovery program.

Is continuing funding required?

With the increased workload associated with oversight and delivery of recreational and First Nations sampling programs, continued funding in 2012 is requested, however, long term funding is not required.

Project title: Expansion of Catch Monitoring & Sampling in the Southern BC Sport Fishery (Operational enhancement of the southern BC marine waters recreational creel survey).

Agency : Fisheries and Oceans Canada

Approved funding for this cycle : \$100,000

Total CWTIT funding approved to date : \$280,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issue 4, 6, 7, & 8 (Sampling rates in terminal fisheries, Uncertainty in estimates of escapement or terminal fishery catch, Sampling rates in highly mixed stock fisheries, Uncertainty in estimates of catch in highly mixed stock fisheries)

Project Description, Accomplishments, Results and Deliverables:

This project funded operational enhancements to monitoring of marine recreational fisheries in Southern BC; including the Strait of Georgia, Juan de Fuca Strait, the West Coast of Vancouver Island and Johnstone Strait. Operational enhancements took two forms:

1. Conduct creel surveys at times and locations currently unsurveyed to verify assumptions of low Chinook and coho catches.
2. Increase recreational creel survey intensity (creel survey shifts and flight counts) in areas and times previously shown to be important for Chinook catch to improve estimates.

Operational enhancements in the 2011/12 funding year focused primarily on expanding coverage (#1 above). The results of this work verified assumptions that Chinook and coho catch rates in unsurveyed periods are low and focus for the project in 2012/13 was shifted to increasing survey intensity during peak catch periods (#2 above). Increases in survey interview coverage resulted in higher interview numbers and rates in key recreational fisheries relative to previous years increasing precision in catch per trip estimates. Increases in the number of aerial effort counts improved estimates of effort.

Benefits to Coded Wire Tag Program and PSC Salmon Management:

Direct benefits to the CWT program include improved estimates of Chinook (and coho) catch during peak recreational fisheries in the South Coast of British Columbia, along with updated catch estimates during periods no longer monitored via creel. Indirect benefits include synergy with other CWT funded projects focused on review and improvements to recreational monitoring approaches and flow of data, particularly marked and unmarked Chinook and coho catch estimates, from field programs to analysts.

Funding pressures for recreational catch monitoring continue to be downward. CWT-IT funding through 2012 has assisted in focusing future efforts towards improved cost effectiveness in recreational monitoring while improving our ability to estimate total annual recreational catch in the recreational fishery. Continued CWT improvement funding in this area would be used to support transformative improvements to recreational Chinook catch methods, as well as continued increases to creel coverage in key times and areas based on 2011-2012 results. Transformative recreational monitoring work being considered in 2013/14 include:

- Implementing more cost effective internet-based alternative methods to collect data to estimate Chinook catch, particularly in areas and times where creel surveys are inefficient due to low fishing rates or the remote nature of the fisheries.
- Focusing current monitoring efforts to key areas and times to most effectively estimate and sample Chinook catch.
- Engaging the fore-hire sport sector to improve the catch, effort and biosample data collected from this professional component of the recreational fishery.

Project title : Middle Shuswap Sport Fishery Catch Estimation and CWT Sampling

Agency : Fisheries and Oceans Canada

Approved funding for this cycle : \$16,000

Total CWTIT funding approved to date : \$31,000

Continued CWTIT Funding Needed : yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries) and 6 Uncertainty in estimates of escapement or terminal fishery catch.

Project Description, Accomplishments, Results and Deliverables:

This project is one component of a broader objective to decrease the uncertainty in catch estimates and increase sample rates of terminal fisheries. The aim of this project was to estimate the encounters of Chinook salmon, and other species by clip status, and any other regulation variation that affects the age composition of retained and released catch. 2012 represented the second year of enhanced efforts to survey the recreational and FSC Chinook fisheries as well as promote the Coded Wire Tag program on the Middle Shuswap fishery.

Similar to 2011, there was considerably less effort and catch observed in the 2012 Middle Shuswap Chinook fishery than in past surveys likely due to a management closure implemented to protect

Bessette Chinook in 2011 and 2012, high water levels and late arrival in 2011 and low returns of Chinook to the system in 2012. Although catch and effort has been atypical of past years the project has gained information required to meet objectives. Continued support for a multi-year creel survey would continue to build on a number of CWT improvement objectives that include decreasing the uncertainty in estimates of terminal fishery catch, increasing sample rates in terminal fisheries as well as promoting the CWT program.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include decreasing the uncertainty in estimates of terminal fishery catch, increasing sample rates in terminal fisheries as well as promoting the CWT program. Information from the mid-Shuswap terminal fishery, in combination with other work, provides useful information required to evaluate fishery impacts.

Project title :Expansion Catch Monitoring & Sampling Chilliwack River Recreational Fishery (Chilliwack River Creel Survey Extension)

Agency : Canadian Department of Fisheries and Oceans

Approved funding for this cycle : \$15,000

Total CWTIT funding approved to date : \$30,000

Continued CWTIT Funding Needed : Maybe

Objectives and Relationship to PSC Technical Report 25: Issues 4 & 6 (Sampling rates in terminal fisheries) and 6 (Uncertainty in estimates of escapement or terminal fishery catch)

Project Description, Accomplishments, Results and Deliverables:

The objectives of this project were to expand the coverage of catch monitoring of the Chilliwack River recreational fishery and evaluate the performance of indirectly estimating CWT recoveries during by comparing to direct estimates of CWT recoveries using creel survey data.

The Chilliwack River is an exploitation rate indicator stock used by the CTC. A significant recreational fishery targets fall-run Chinook salmon returning to the Chilliwack River. Historically, CWT recoveries from the Chilliwack River recreational fishery for the first half of September were indirectly estimated using the head recovery data and the submission rate measured with creel survey for the last half of September; the accuracy and prudence of this approach has not been evaluated. In 2011, the CWTIT funded the CDFO to initiate the Chilliwack River Creel Survey project two weeks earlier to allow direct estimates of catch and CWT recoveries for the entire month of September. The study was repeated in 2012. Both the 2011 and the 2012 studies have provided catch estimates, by species and mark status, and an estimate of total angler effort for the September 1st to 15th period. Additional bi-monthly catch

and effort estimates have been provided for the Sep.16th to Nov.15th period by CDFO Fraser Stock Assessment using existing CDFO funding. Work is ongoing to compare the 2011 & 2012 Sep.1-15 period direct and indirect estimates of catch and CWT recoveries; comparison of analytical techniques will occur in early to mid 2013. Deliverables will include a recommendation about the use of indirect estimates of CWT recoveries and catch for any period of the Chilliwack River sport fishery that is not directly assessed. This project should be successful in meeting its objectives.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include an objective assessment on the CWT data for the Chilliwack River recreational fishery and guidance on use of indirect estimation for this fishery. This project will improve the accuracy of the terminal runs for the CWT indicator stock for 2011 and 2012, and provide advice about the suitability of the indirect estimation method for the Chilliwack River recreational fishery.

Project title: 2008-2012 Campbell/Quinsam Chinook Mark Recapture Improvements (assess bias in random mixing of carcass mark recapture)

Program Agency: Fisheries and Ocean Canada

Approved funding for this cycle : \$7,500

Total CWTIT funding approved to date : \$37,500

Continued CWTIT Funding Needed : maybe (continued funding would be of value to maintain the expanded snorkel coverage on Second Island Channel)

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Low sample rates in escapement)

Project Description, Accomplishments, Results and Deliverables:

CWT improvement funding was used to increase the stream area sampled for CWTs specifically the Second Island Channel in the Campbell River (2009-2012) allowing more access to carcasses in deep pools. In addition, this project assessed the assumption in a carcass mark recapture that the tagged and untagged carcasses mix randomly in the population. Two methods were employed and compared:

1. carcasses were tagged and placed back where it was found (random mixing unlikely unless there was some sort of flood event after that placement)
2. carcasses were marked and then placed into the flow of the

Population estimates derived using the old method were 1 to 16% less than new method except in 2011 (16% more). In recent years we had three very dramatically different flow conditions in order to evaluate the various release methods. Additional sampling effort and expanded spatial coverage contributed an increase in CWT recoveries on the Campbell River with only a slight reduction in sampling rate on the Quinsam River.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include:

- an improvement in the accuracy and precision of the mark recapture estimates of escapement
- Increased sampling effort and spatial coverage on the more challenging component of the system resulted in higher CWT recoveries on the Campbell River

Project title: 2011-2012 Phillips River Chinook escapement estimation and increase CWT application

Program Agency: Fisheries and Ocean Canada

Approved funding for this cycle: \$10,000 + 150K CWTs

Total CWTIT funding approved to date : \$38,000

Continued CWTIT Funding Needed: yes. Based on the recent success and increased CWT tagging it will be key to maintain the program to ensure the recoveries of those tags in the escapement in future years.

Objectives and Relationship to PSC Technical Report 25: Issue 1, 2, & 6 (Incomplete representation of production regions, Determination of tagging levels, Uncertainty in estimates of escapement)

Project Description, Accomplishments, Results and Deliverables:

This production area is not represented by a CTC indicator stock. This project supports existing community partnership efforts to develop an indicator. The two main objectives of this project are:

1. To develop a mark recapture program on a southern BC mainland inlet Chinook population to provide accurate and precise estimates of tagged and untagged Chinook escapement.
2. To increase the number of CWT tags released to 150K for this population.

This project involved a 2 stage mark recapture of adult Chinook returning to the Phillips River. Tags were applied via broodstock collection events and seining events. Deadpitch activities were conducted throughout the watershed. There was a significant improvement in the number of tags applied, carcasses recovered, and the precision of the estimate in 2012 relative to 2011. The clipped contribution to the return was estimated at 11.6%.

Preliminary results indicate that escapement estimates have shown improved precision over the last 2 years and brood collection in 2012 will result in the 150K CWT application target being met for release in 2013.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include:

- The development of a low cost indicator program for a Chinook population in the poorly monitored Mainland Inlet Area of the Southern BC coast appears feasible
- Over the duration of this project it has been demonstrated that we can achieve a precise estimate of Chinook escapement to the Phillips River as well as clipped contribution, and
- This project has demonstrated that increased CWT tag releases to the level of 150K are achievable in this remote location.

Project title: Cowichan Chinook Assessment Enhancements

Agency : Fisheries and Oceans Canada

Approved funding for this cycle : \$30,000

Total CWTIT funding approved to date : \$120,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5, 6, & 10 (Sampling rates in escapement, Uncertainty in estimates of escapement or terminal fishery catch and Incomplete coverage of escapement areas).

Project Description, Accomplishments, Results and Deliverables:

The objective of this project was to improve escapement survey effort and coverage, biosampling rates, estimates of Chinook mark rates, and increase head recoveries from escapement to Cowichan River. This improved escapement sampling complements increased tagging rates in Cowichan Chinook.

In 2012 drought conditions resulted in extremely low waters in Cowichan River until mid-October. Low water led to poor migration conditions and increased the potential for Chinook spawning in the lower river. This project supported additional deadpitch monitoring activities in the lower river in 2012 and greater sampling rates of carcasses from a wider area relative to the standard program.

In 2012, 577 carcasses were sampled, resulting in 569 scale samples, 145 adipose fin clipped Chinook (141 heads collected and submitted for processing), and a recapture of 46 marked carcasses. Forty-two carcasses (7.3%) were collected outside of the normal sampling area, and would not have been sampled without this project. Overall, 15% of the 3730 adults and jacks natural spawners estimated to have migrated past the fence were sampled by deadpitch crews.

Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the CWT program and PSC salmon management include improved escapement survey coverage, biosampling and head recovery rates resulting in improved accuracy and precision of escapement estimates for the Cowichan River.

Project title: Improved CWT Recovery, Chilliwack River Indicator Stock Program

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: \$14,000

Total CWTIT funding approved to date: \$56,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Sampling rates in escapement)

Project Description, Accomplishments, Results and Deliverables:

This project provided additional staff on the Chilliwack River Chinook deadpitch program to increase survey frequency and the probability of recovery of carcasses. As a direct result, CWT recoveries were increased relative to expected at base survey frequency, thus increasing the precision of estimation of escapement by tag code.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

It is difficult to quantitatively assess success to the annually variable rates of recovery resulting from different escapements of multiple species and annually variable environmental conditions. Sampling rates are dependent on the number of carcasses present, the prevalence of carcasses of other species, fluctuating water levels, predators and a host of other factors. Carcass sampling rates on the Chilliwack River tend to be hindered by high flows and large escapements of chum salmon, which result in considerable extra effort being required to find and recover carcasses of Chinook. Increased Chinook carcass recoveries result from the increased sampling effort, thus improving CWT recovery rates. The relationship is NOT linear so at any escapement level, the net benefit will differ, but proportional benefits are greater in years of more unstable flows and larger chum salmon returns.

Is continuing funding required?

Loss of continued funding for this project will result in reduced CWT recoveries, thus estimates of return by tagcode will become less precise.

Project title: Improved CWT Recovery, Harrison River Indicator Stock Program

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: \$16,000

Total CWTIT funding approved to date: \$64,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Sampling rates in escapement)

Project Description, Accomplishments, Results and Deliverables:

This project provided funding for additional effort to expand marking and recovery effort during Harrison River Chinook mark-recapture study, thus increasing the sampling rate and precision of the mark-recapture estimates.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

It is difficult to quantitatively assess success to the annually variable rates of recovery resulting from different escapements of multiple species and annually variable environmental conditions. Sampling rates are dependent on the number of carcasses present, the prevalence of carcasses of other species, fluctuating water levels, predators and a host of other factors. Carcass sampling rates on the Harrison River tend to be hindered by high water levels and large escapements of chum salmon, which result in considerable extra effort being required to find and recovery carcasses of Chinook. Increased Chinook carcass recoveries result from the increased sampling effort, thus improving CWT recovery rates. The relationship is NOT linear so at any escapement level, the net benefit will differ, but proportional benefits are greater in years of more unstable flows and larger chum salmon returns.

Is continuing funding required?

Loss of continued funding for this project will result in reduced CWT recoveries, thus estimates of return by tagcode will become less precise.

Project title: Improved CWT Recovery, Nicola River Indicator Stock Program

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: \$8,000

Total CWTIT funding approved to date: \$32,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Sampling rates in escapement)

Project Description, Accomplishments, Results and Deliverables:

This project provided funding for contracting additional staff to expand recovery effort and sampling frequency during the Nicola River Chinook deadpitch. By increasing the frequency at which the entire 50km of river are surveyed, sampling rate was increased as carcasses are sampled prior to predator removal, thus increasing the sampling rate and precision of the mark-recapture estimates.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

It is difficult to quantitatively assess success to the annually variable rates of recovery resulting from different escapements of multiple species and annually variable environmental conditions. Sampling rates are dependent on the number of carcasses present, predators and other factors. Carcass sampling rates on the Nicola River tend to be hindered at escapements less than 10,000 due to the effects of predators. Until predator response is saturated, increasing recovery effort yields increased carcass recoveries by increasing the chances of encountering carcasses before predators, thus improving CWT recovery rates. The relationship is NOT linear so at any escapement level, the net benefit will differ, but proportional benefits are greater at depressed escapements.

Is continuing funding required?

Loss of continued funding for this project will result in reduced carcass and CWT recoveries due to predator removals, thus reducing the precision of the escapement estimate and CWT recoveries.