Regional Mark Processing Center – Regional Mark Information System
Annual Progress Report to BPA

Reporting Period: January 1 – December 31, 2021

BPA Project Title: Coded Wire-Tag Pacific States Marine Fisheries Commission (PSMFC)
BPA Project #: 1982-013-01
Work described in the report was conducted under contract number 78040 REL 31 and the report written under contract 78040 REL 42

Introduction

The migratory nature of salmonids necessitated the development of a cooperative coastwide effort for using tag codes, sampling fisheries, tag recovery, data collection, and data exchange among all fisheries agencies in the U.S. and Canada. This Pacific coast-wide cooperative Canada-USA effort is a fully integrated tagging, sampling, and recovery operations along the entire west coast of North America. CWT tagging occurs at over 260 federal, state, tribal, and private hatcheries and rearing facilities on the west coast, including Canada. Wild stocks are also captured and tagged at numerous sites. This effort relies on coded wire tags (CWT) because this is the only stock identification technique for which a historical record, dating back to about the mid-1970s, exists with sufficient resolution to inform stock-specific assessments and index-based management frameworks using indicator stock programs, including Pacific Salmon Treaty, Pacific Fisheries Management Council (e.g., FRAM), and terminal fishery models. The CWT data are used by managers to assess and manage wild stocks; estimate stock-specific exploitation rates by fishery and age; and estimate ocean exploitation rates that are also used to account for confounding effects (i.e., Ocean Harvest) in addressing other management and research questions such as survival (productivity). The CWT system also provides unparalleled information about ocean distribution patterns and fishery impacts for Pacific salmon along the Pacific coast (Nandor et al.2010)[1]. The accessibility of quality CWT data in a standardized manner across the Pacific Coast is made possible by the Regional Mark Processing Center (RMPC).

The RMPC has been operated by the Pacific States Marine Fisheries Commission (PSMFC) since 1977. The RMPC provides regional coordination of tagging programs among 47 Federal, Provincial, State, Tribal, and private entities that release more than 50 million salmonids with the CWT yearly. The RMPC also manages the regional database, called Regional Mark Information System (RMIS), that houses CWT data submitted by fisheries agencies on the West Coast. The RMPC is responsible for RMIS' design, development, implementation, and on-going evaluation of the central database for the storage and retrieval of Pacific Coast wide CWTs and related fisheries information. As part of its responsibilities RMPC validates multi-agency submissions of CWT release, monitoring and evaluation, recovery and related data used for Pacific salmon and steelhead research studies and harvest management (Figure 1). RMPC task also includes managing the data exchange specification, validating data submissions, generating reports, distributing documentation, and providing access to these data through an online query system from: http://www.rmpc.org . As of 1985, the Pacific Salmon Treaty (PST) designated the RMPC as the single site to exchange all United States CWT information with Canada in the Pacific Salmon Commission's (PSC) format. The RMPC Program Manager serves as co-chair to the PSC Data Sharing Committee which informs the data exchange specification for

[1] Nandor, G.F., Longwill, J.R., Webb, D.L., 2010. Overview of the coded wire tag program in the Greater Pacific Region of North America, in Wolf, K.S. and O'Neal, J.S., eds., PNAMP Special Publication: Tagging, Telemetry and Marking Measures for Monitoring Fish Populations—A compendium of new and recent science for use in informing technique and decision modalities: Pacific Northwest Aquatic Monitoring Partnership Special Publication 2010-002, chap. 2, p. 5 - 46. https://www.rmpc.org/files/TTM_Compendium_2010.pdf

RMIS. Canada also submits its CWT data to the RMPC where it is validated and then merged into RMIS.

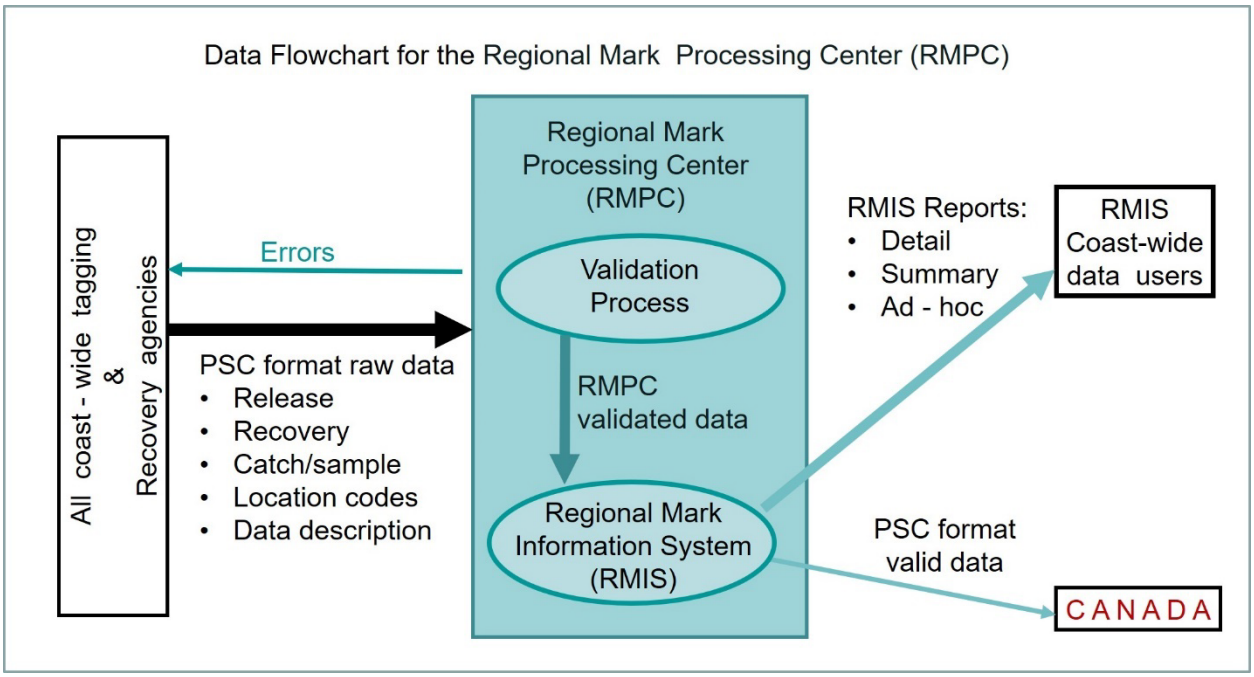

Figure 1: Data exchange process managed by the RMPC.

Primary project partners who provide and use RMIS are the California Department of Fish and Game (CDFG), Oregon Department of Fish and Wildlife (ODFW), Idaho Department of Fish and Game (IDFG), Washington Department of Fish and Wildlife (WDFW), Alaska Department of Fish and Game (ADFG), Northwest Indian Fisheries Commission (NWIFC), Columbia Inter-tribal Fish Commission (CRITFC) and their member tribes, National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the Canadian Department of Fisheries and Oceans (DFO). Each of these entities are represented on the RMPC Mark and Tagging Committee and several are also represented on the PSC Data Sharing Committee. Funding for the RMPC is provided by the U.S. Fish and Wildlife Service (USFWS), and by the Bonneville Power Administration (BPA). The RMPC project is reviewed and receives recommendation from the Northwest Power and Conservation Council's (NPCC) for its Columbia River Basin Fish and Wildlife Program, which is funded by BPA.

Relevance to Endangered Species and to the Columbia River Basin Fish and Wildlife Program

The CWT data managed by RMPC, and related projects funded by BPA to tag, retrieve, and analyze these data, contribute to management and mitigation decisions impacting ESA listed anadromous salmonid in the Columbia River Basin. These data allow for stock level evaluation that allows managers and researchers to monitor and evaluation hatchery fish as well as serve as indicator stocks for wild ESA listed stocks. This information contributes to assessing

hydrosystem mitigation efforts under the Columbia River Basin Fish and Wildlife Program and to understand hatchery impacts on ESA listed populations. Information provided by the CWT data also informs harvest decisions to protect Columbia River Basin populations as well as assessing that harvest mitigation under the Program is occurring. Some specific examples of how these data are used to inform Columbia River Basin management decisions includes Columbia River escapement estimates, Columbia River run reconstruction and forecasts, preseason and in-season run size updates to inform the Columbia River Compact (U.S. v Oregon), hatchery broodstock management, and tracking recovery of ESA listed stocks by BPA, Lower Columbia Fish Recovery Board, and National Marine Fisheries Service. These data also provide the Pacific Fishery Management Council run size forecasts for ocean and in-river salmon fisheries management.

The important contribution of CWT data to the Columbia River Basin Fish and Wildlife Program was also reviewed in-depth during the NPCC Fish Tagging Forum (FTF) during 2012 and 2013. The RMPC's RMIS database on CWT tagging, recovery, and sampling data; which also stores fin mark data such as the mass mark data, and age data, was confirmed as being a necessary data source to answer multiple harvest and hatchery management questions. The FTF found that CWT were the primary tag type for 100% of the harvest estimate related management questions identified by the FTF, as well as the primary tag type for 54% of the hatchery management question, and the primrary tag type used to address about 30% of the population status monitoring management questions (Fish and Wildlife Committee April 30, 2013 memo, Appendix 2a). The RMIS database also contributes to several critical research uncertainties identified in the NPCC Research Plan[2] such as the questions under the Fish propagation theme, Estuary, plume and ocean theme, Populations structure and diversity theme, and Harvest theme.

1. Data Management Accomplishments:

Work Element R: 160 - Manage Regional CWT Database & RMIS System

In addition to the normal flow of on-going modifications to data management applications, there continue to be improvements made to expedite the RMPC's data management operations.

- Database migration from Oracle to PostgreSQL

In 2016, the RMPC migrated the RMIS database from Oracle to the PostgreSQL software. This past year was the fifth full year of operating the database on PostgreSQL and all database functions continued worked flawlessly. RMPC staff continued making some modifications to the set-up and operations of the database to enhance its efficiency and to strengthen data

[2]Northwest Power and Conservation Council. 2017 Research Plan. NPCC Document 2017-4. https://www.nwcouncil.org/sites/default/files/2017-4.pdf

validation procedures. This change in database software is saving the project about $8,000 per year in licensing and support fees. When the database software was changed, the RMPC also moved the database from a dedicated server to a virtual server at the PSMFC HQ office. This allows greater flexibility in managing computer resources within the PSMFC and has worked out very well and has also resulted in further cost savings.

- Database Specifications Document:

The Specifications and Definitions for the Exchange of Coded Wire Tag Data for the North American Pacific Coast was updated to the most current specifications. Most of the recent edits were added Gear Codes. The Specifications Document can be seen at: http://www.rmpc.org/files/PSC_V41_Specification.pdf

- Data Validation:

The CWT data load programs were upgraded to do more rigorous cross-table checks of tag releases in format version 4.1 when validating newly submitted tag recovery datasets. This is an ongoing project as data uploading errors are identified and corrected. Data anomalies continue to be identified and submitted to the reporting agencies for correction.

- Data Integrity:

The number of errors was very small and they were easily corrected by the specific reporting agencies. This is ongoing with quarterly reports that are checked and verified with the reporting agencies.

- GIS based mapping of Regions and Basins

The mapping tool for viewing maps of specific CWT codes as points on a map that show the hatchery, release location and subsequent recovery locations was updated and enhanced for use in PostgreSQL. This is available for release queries in RMIS. Lat./Long. of all release and recovery locations for the United States have been entered in the database having been identified using GIS mapping tools. Staff completed the Canadian locations in 2019 and added these Lat./Longs to the database. This is an ongoing project to enhance the mapping of CWT release locations and also recovery locations. Region and Basin maps are available at: http://www.rmpc.org/rmpc-domain-region-basin-maps.html

- Routine Data Management:

Work continued full time on expediting the processing of new data sets (CWT releases, recoveries, catch/sample, etc.) as they were supplied by the various reporting agencies.

Number of new data rows in RMIS database tables added during calendar year 2021 and current total number of rows overall:

DATA CATEGORY	# OF NEW ROWS ADDED BETWEEN JAN 2021 AND 2022	TOTAL ROWS IN RMIS AT THE END OF JANUARY 2022
RELEASES	3,913	174,834
RECOVERIES	165,757	9,837,654
CATCH/SAMPLE	21,243	421,356
LOCATIONS	595	36,818

Use of the RMIS database remains strong in the fisheries community. During 2021 there was a total of 4,815 log-in events representing 631 unique email accounts. Many of those people logged-in multiple times, with 417 people logging-in more than once and 100 people who logged-in ten or more times over the year.

Based on the email accounts, the majority of the 4,815 log-in events were made by individuals working with a state agency from Alaska, California, Idaho, Oregon and Washington (2,440 log-in event Figure 2). This is followed by 723 log-in from individuals from tribes and first nations and representative tribal/first nation organizations such as council, consortium, community, commission.

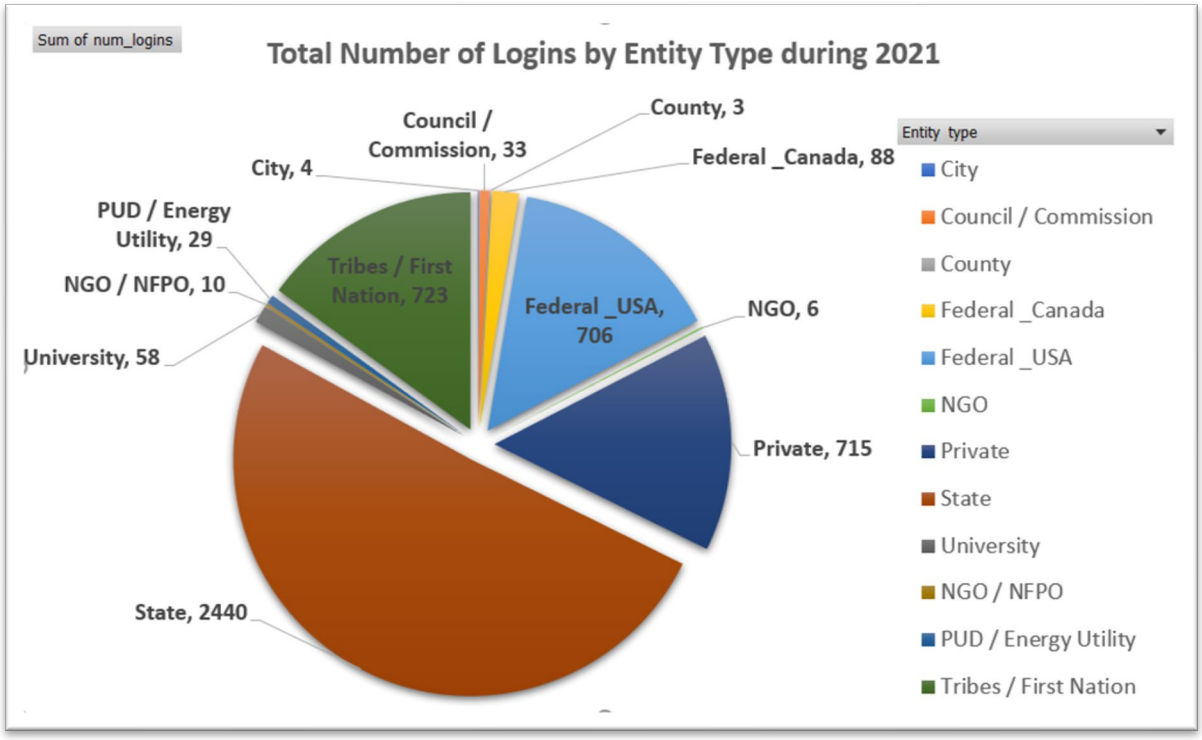

Figure 2: Number of total log-in events by type of entity. The majority of the log-in events during 2021 were from individuals working for a state agency.

- Specialized Data Requests:

Throughout the year, specialized requests were received and processed for all CWT recoveries for specific sets of tag codes. These "brood reports" summarized tag recoveries across all fisheries, agencies, and recovery years. In addition, numerous data users were assisted in retrieving "raw" recovery records. These data subsets were then processed by the respective data users in a variety of ways to build their own in-house databases and generate customized reports, etc.

2. Regional Coordination Accomplishments

Work Element S: 189 - Regional Coordination of Columbia Basin CWT Marking Programs

- PSC Data Sharing Committee

The PSC Data Sharing Committee meet virtually during 2021 and the co-chairs developed a 2021-2022 work plan. Active proposals to improve the data specifications are being prepared for discussions with the PSC technical committees and Data Sharing Work Group. Virtual meetings are scheduled for January, April, June, September and October 2022. As of 2022, Nancy Leonard has been added as co-chair of the Data Sharing Committee.

- Data Standards Work Group Meeting

The US members of the Data Standards Work Group last met via telephone conference call in 2017. The members affirmed the proposals to be presented to the Data Sharing Committee for approval and eventual implementation. The Canadian members met separately and affirmed the proposals for future implementation. As of 2022, Jim Longwill has been added as co-chair for the Data Standards Work Group. A revised data specification version is scheduled to be delivered by the Data Standards Work Group by October 2022.

- Annual Mark Meeting:

The 2021 Mark Meeting was held as a virtual meeting due to the COVID pandemic On May 4-5, 2021. The meeting was attended by 25 participants with representation from ADFG, Colville Tribes, CRITFC, DFO, IDFG, ODFW, NOAA, NWIFC, NWT, PSMFC, and USFWS. Updates were also provided by NPT, YN, and CDFW. Meeting agenda, meeting notes, and other meeting documents are available on the RMPC website at https://www.rmpc.org/rcmt-2021-meeting-announcement.html .

3. Management and Administration Accomplishments

Work Element U: 119 - Manage and Administer Project

Coordinated the development of the 2022 Statement of Work, for this program through Pisces at cbfish.org. Coordinated the budget development for this project. Provided an updated inventory list as part of the budget package. Worked closely with the COR, to finalize the complete funding package.

4. Other issues:

- Regional Mark Processing Center Funding

Partial funding for the RMPC through NOAA Fisheries and the USFW is in place for FY 2022.

The BPA budget was submitted and the SOW entered in CBFISH.org for the RMPC. The FY 2022 BPA contract has been issued.

- Missing Release Data

RMPC staff continues to work closely with releasing agencies to follow-up on unreported tags that have been reported as recovered. This usually occurs when a tagged release group fails to get reported as released and then a tag is recovered and found to be missing in the database. This takes a fair amount of detective work to identify the responsible agency for reporting the release data. Most of the missing data ends up getting reported, except for a small number of tag codes that are probably reading errors when they were recovered. This is an ongoing project that has resulted in ensuring that very little data is missing and eventually gets reported.

- Missing Recovery Data

Lack of freshwater CWT recovery data for the Klamath Basin in California is still a problem. The RMPC continues contacting the responsible agencies to coordinate the filling of those data gaps. Funding has been identified as the problem for the lack of reporting in certain areas of California.

5. Personnel

George Nandor, PSMFC Program Manager for RMPC, retired at the end of December 2021. Nancy Leonard, PSMFC Program Manager is now leading the RMPC project and serving on the PSC Data Sharing Committee. Jim Longwill is now serving on the PSC Data Standards Work Group. Lara Erikson, PSMFC Program Manager, is now leading some of the CWT project in Washington State and Idaho State. Braden Buttars, PSMFC, is leading the other CWT projects in Idaho and California. No staff changes occurred at PSMFC's Regional Mark Processing Center.

Sampling sport-caught salmon for CWTs on the Oregon coast.

6. Summary of Data Processed and Stored in the RMIS Database as of morning of 10am February 24, 2022

Version: February 24, 2022

North American Pacific Coast Anadromous Salmonids - All Combined

Juvenile Releases

Area	Year	No. of Tag Groups Rel.	CWT's Released	Blank Wire Tags Released	Non-CWT's Released	Total Released
Columbia R Basin	2015	334	27,757,263	752,835	110,085,770	138,595,868
All Other Areas	2015	603	33,268,669	47,857	1,919,893,246	1,953,209,772
Totals		937	61,025,932	800,692	2,029,979,016	2,091,805,640
			2.92%	0.04%	97.04%	
Columbia R Basin	2016	340	27,914,395	260,273	101,352,092	129,526,760
All Other Areas	2016	648	36,470,967	73,305	1,702,216,450	1,738,760,722
Totals		988	64,385,362	333,578	1,803,568,542	1,868,287,482
			3.45%	0.02%	96.54%	
Columbia R Basin	2017	338	28,613,700	392,979	106,620,536	135,627,215
All Other Areas	2017	620	34,999,198	79,833	1,998,496,559	2,033,575,590
Totals		958	63,612,898	472,812	2,105,117,095	2,169,202,805
			2.93%	0.02%	97.05%	
Columbia R Basin	2018	346	30,426,656	537,638	104,169,993	135,134,287
All Other Areas	2018	657	35,722,702	78,342	1,881,426,183	1,917,227,227
Totals		1,003	66,149,358	615,980	1,985,596,176	2,052,361,514
			3.22%	0.03%	96.75%	
Columbia R Basin	2019	336	30,504,625	410,263	97,829,324	128,744,212
All Other Areas	2019	684	39,444,828	71,365	1,816,635,776	1,856,151,969
Totals		1,020	69,949,453	481,628	1,914,465,100	1,984,896,181
			3.52%	0.02%	96.45%	
Columbia R Basin	2020	312	27,390,954	190,466	99,806,677	127,388,097
All Other Areas	2020	539	34,664,772	97,024	1,598,707,909	1,633,469,705
Totals		851	62,055,726	287,490	1,698,514,586	1,760,857,802
			3.52%	0.02%	96.46%	

Recoveries and Catch

Area	Year	Total Catch*	Hatchery & Spawning	Total	Number of Fish Recovered with Tags
Columbia R Basin	2015	845,859	784,304	1,630,163	83,479
All Other Areas	2015	209,143,228	673,938	209,817,166	184,891
Totals		209,989,087	1,458,242	211,447,329	268,370
Columbia R Basin	2016	567,722	485,249	1,052,971	66,606
All Other Areas	2016	69,070,065	827,554	69,897,619	188,462
Totals		69,637,787	1,312,803	70,950,590	255,068
Columbia R Basin	2017	400,431	351,821	752,252	59,067
All Other Areas	2017	150,609,660	785,768	151,395,428	184,814
Totals		151,010,091	1,137,589	152,147,680	243,881
Columbia R Basin	2018	230,912	284,102	515,014	53,713
All Other Areas	2018	71,737,974	715,979	72,453,953	171,664
Totals		71,968,886	1,000,081	72,968,967	225,377
Columbia R Basin	2019	216,448	304,046	520,494	44,087
All Other Areas	2019	135,384,156	677,999	136,062,155	173,317
Totals		135,600,604	982,045	136,582,649	217,404
Columbia R Basin	2020	89,482	420,088	509,570	62,712
All Other Areas	2020	72,877,733	521,391	73,399,124	124,485
Totals		72,967,215	941,479	73,908,694	187,197

*Total catch as reported by the reporting agencies as "Number Caught" = PSC Format 4.1 field # 24 in the Catch/Sample Data records but does not include fishery codes 50, 51, 52, 53, 54, 57, 59 (hatchery returns, remote site traps, spawning ground counts, diversion screens, etc. which are displayed as Hatchery & Spawning)

Note: Due to the delay that reporting agencies experience in compiling release and recovery data, 2020 data is still preliminary and subject to changes.

Version
February 24, 2022

North American Pacific Coast Anadromous Salmonids - Chinook, Coho & Steelhead

Area	Year	No. of Tag Groups Rel.	CWT's Released	Blank Wire Tags Released	Non-CWT's Released	Total Released
Columbia R Basin	2015	334	27,757,263	562,647	106,390,481	134,710,391
All Other Areas	2015	602	33,244,067	47,857	178,694,892	211,986,816
Totals		936	61,001,330	610,504	285,085,373	346,697,207
			17.59%	0.18%	82.23%	
Columbia R Basin	2016	340	27,914,395	260,273	98,614,502	126,789,170
All Other Areas	2016	647	36,444,049	73,305	182,930,483	219,447,837
Totals		987	64,358,444	333,578	281,544,985	346,237,007
			18.59%	0.10%	81.32%	
Columbia R Basin	2017	338	28,613,700	392,979	99,193,426	128,200,105
All Other Areas	2017	619	34,974,472	79,833	171,863,110	206,917,415
Totals		957	63,588,172	472,812	271,056,536	335,117,520
			18.97%	0.14%	80.88%	
Columbia R Basin	2018	346	30,426,656	537,638	101,070,710	132,035,004
All Other Areas	2018	656	35,696,817	78,342	186,108,371	221,883,530
Totals		1,002	66,123,473	615,980	287,179,081	353,918,534
			18.68%	0.17%	81.14%	
Columbia R Basin	2019	336	30,504,625	410,263	95,446,629	126,361,517
All Other Areas	2019	682	39,394,636	71,365	191,674,796	231,140,797
Totals		1,018	69,899,261	481,628	287,121,425	357,502,314
			19.55%	0.13%	80.31%	
Columbia R Basin	2020	312	27,390,954	190,466	97,387,888	124,969,308
All Other Areas	2020	537	34,621,362	97,024	199,555,577	234,273,963
Totals		849	62,012,316	287,490	296,943,465	359,243,271
			17.26%	0.08%	82.66%	

Recoveries and Catch

Area	Year	Total Catch*	Hatchery & Spawning	Total	Number of Fish Recovered with Tags
Columbia R Basin	2015	825,198	781,084	1,606,282	83,065
All Other Areas	2015	5,822,427	532,210	6,354,637	184,830
Totals		6,647,625	1,313,294	7,960,919	267,895
Columbia R Basin	2016	553,530	483,221	1,036,751	66,572
All Other Areas	2016	5,579,091	673,626	6,252,717	188,432
Totals		6,132,621	1,156,847	7,289,468	255,004
Columbia R Basin	2017	397,200	350,645	747,845	59,059
All Other Areas	2017	6,774,129	607,885	7,382,014	184,794
Totals		7,171,329	958,530	8,129,859	243,853
Columbia R Basin	2018	224,527	282,383	506,910	53,711
All Other Areas	2018	5,197,533	557,116	5,754,649	171,625
Totals		5,422,060	839,499	6,261,559	225,336
Columbia R Basin	2019	215,790	301,970	517,760	44,083
All Other Areas	2019	5,154,885	611,159	5,766,044	173,298
Totals		5,370,675	913,129	6,283,804	217,381
Columbia R Basin	2020	89,482	420,088	509,570	62,712
All Other Areas	2020	3,618,948	521,391	4,140,339	124,478
Totals		3,708,430	941,479	4,649,909	187,190

*Total catch as reported by the reporting agencies as "Number Caught" = PSC Format 4.1 field # 24 in the Catch/Sample Data records but does not include fishery codes 50, 51, 52, 53, 54, 57, 59 (hatchery returns, remote site traps, spawning ground counts, diversion screens, etc. which are displayed as Hatchery & Spawning)

Note: Due to the delay that reporting agencies experience in compiling release and recovery data, 2020 data is still preliminary and subject to changes.