

Smolt Monitoring Protocol at COE Dams On the Lower Snake and Lower Columbia rivers

1.0 Introduction

There are two primary goals of the Smolt Monitoring Program (SMP); to provide real-time data on juvenile fish migration to support in-season fisheries management decisions; and to provide a long-term time series of consistently collected data that allow for comparison of the impacts of changing river conditions among years, particularly with respect to juvenile fish survival. To achieve these goals, there are three components to the SMP; PIT-tag marking at hatcheries; PIT-tag marking and monitoring at Snake River Basin traps and Rock Island Dam; and fish sampling at COE bypass facilities at Lower Snake River, and Columbia River dams.

This Protocol Manual addresses the data that are collected for the Smolt Monitoring Program at COE bypass facilities at Lower Snake River and Columbia River dams. The sampling sites covered by this protocol include; Lower Granite Dam, Little Goose Dam, Lower Monumental Dam, McNary Dam, John Day Dam and Bonneville Dam. For the remainder of the document these sampling sites will be referred to as **main-stem monitoring sites**. This protocol is meant to compliment the **FPC32.net Data Entry Manual** as well as the **Condition Sampling Protocol** and provides overall guidelines for sampling and data to collect.

The primary data gathered at these main-stem monitoring sites is count data on juvenile salmonids sampled from the bypass system. Migrant juvenile salmon are the target species for sampling, and all fish are identified to species and any clips and marks/tags are also recorded. Based on these count data or sample counts, an estimate of daily collection can be generated at each project. From estimates of collection passage and population indices can be generated if the sample data are representative based on 24-hour sampling that is systematic and sample rates are known throughout that period.

In addition to sample counts, data on fish condition are also collected. Two levels of condition data are collected based on the level of detailed information to be collected. For the full sample, fish are examined for descaling based on FTOT criteria. A subsample of the full sample is examined for detailed condition information, including descaling, injury, and disease. The protocol for examination of fish for detailed condition monitoring can be found in a separate document entitled **Condition Sampling Protocol**.

2.0 Summary of Data to be collected for SMP

Target species: are Chinook (*Oncorhynchus tshawytscha*) both age 0 and age 1, Sockeye (*O. nerka*), Coho (*O. kisutch*), and Steelhead (*O. mykiss*).

SMP Sample Size Targets: 300 to 500 juvenile salmon of all target species combined.

Recommended Sample Rates: Use sample rates that are necessary to achieve target sample numbers. During high passage numbers use “emergency rates” to increase sample rate as necessary for research. **FPC recommends using sample rates less than or equal to 12% or greater than or equal to 25% whenever possible.** In other words FPC recommends that sample rates between 12% and 25% (12.5 to 20% in Table 1) be used as little as possible to minimize bias to SMP samples and impacts to PIT-tag studies.

Additional Species Specific Data to Collect:

Age Code: for Chinook only assign age based on morphology and size. A discussion of the morphological criteria can be found in the **FPC32.net Data Entry Manual**. Fry are age 0.

Special Species Codes:

Assign (**EF**) for unmarked steelhead with eroded fins
Assign (**LF**) for Lyons Ferry yearling Fall Chinook releases if possible
Assign (**HO**) for hold-over fall Chinook based on size and morphology
Assign (**FR**) for fry based on size (less than 60mm)

Marks/Clips/Tags

Record **Elastomer tag** information on all yearling Chinook and steelhead
Record **Fin Clips** on all target species
Record **Coded Wire Tag** presence in all unclipped Chinook (age 0 & 1), unclipped coho, and unclipped sockeye **at LGR, LGS, LMN**

Mortality Data: record dead fish that are present in the sampling facility either due to SMP sampling or due to COE facility operation

3.0 Fish sampling at Main-stem Monitoring Sites

3.1 Sample size Targets for main-stem Monitoring Sites

Fish Passage Center recommends collecting between 300 and 500 fish for the smolt monitoring program at main-stem sites. These target sample sizes correspond with the goal of achieving accurate and precise estimates of total collection at the dams. These sample sizes have been reduced from historic sampling targets in an attempt to reduce fish handling. The above target **includes** fish that are examined for detailed condition monitoring.

3.2 Summary of Sample Rate Recommendations

Sites should use Table 1 to determine sample rates. Use a rate that achieves the target sample sizes of 300 to 500 fish (when possible). Typically, Lower Columbia sites should limit sample rates to at or below 25% except when increased numbers of fish may be needed for research or to address immediate management needs. Avoid using sample rates between 12% and 25% whenever possible to avoid impacts to sample accuracy as well as to minimize impacts to PIT-tag studies near the divert during sample (DDS) trigger of 20%. Also, minimize the number of times per season sample rates switch from above to below 20%, or from below to above 20% to minimize the number of times the DDS is turned on or off.

Table 1. Sample rate recommendations at John Day, Bonneville, McNary, Lower Monumental, Little Goose, and Lower Granite Dams

Recommended electronic timer-controlled sample gate settings.

Estimated Daily Collection	Sample Rate (%)	Equivalent Multiplier 1/sample rate	Sample Sec/ hour	Subsamples per hour	Subsample Duration in seconds	Estimated number of fish in Sample
Emergency	0.50%	200	18	2	9	
> 75,000	0.70%	143	25.2	2	12.6	> 525
50,000 - 75,000	1.00%	100	36	3	12	500 - 750
35,000 - 50,000	1.50%	66.6	54	4	13.5	525 - 750
25,000 - 35,000	2.00%	50	72	6	12	500 - 750
16,500 - 25,000	3.00%	33.3	108	6	18	495 - 750
12,500 - 16,500	4.00%	25	144	6	24	500 - 660
10,000 - 12,500	5.00%	20	180	6	30	500 - 625
7,500 - 10,000	7.00%	14.3	252	6	42	525 - 700
5,000 - 7,500	10.00%	10	360	6	60	500 - 750
4,000 - 5,000	12.50%	8	450	6	75	500 - 625
3,000 - 4,000	15.00%	6.66	540	6	90	450 - 600
2,500 - 3,000	20.00%	5	720	6	120	500 - 600
1,500 - 2,500	25.00%	4	900	6	150	375 - 625
500 - 1,500	50.00%	2	1800	6	300	250 - 750
< 500	100.00%	1	3600	1	3600	< 500

For Lower Columbia River sites, the max sample rate is 25% except when a higher rate is needed for several hours to collect fish for tagging studies.

Carry multipliers to 3 digits total, then round(1/multiplier,3) will provide sample rate to nearest 10th place that is correct.

During periods of peak juvenile shad passage, lower sample rates than needed to meet salmonid sample goals may be used to reduce handling and mortalities on shad.

3.3 Anesthetic

Recent research funded by COE has shown that MS-222 can degrade relatively rapidly causing added stress to fish as a result. Degradation was found to occur within a few weeks of mixing the dry powder with water. In order to minimize stress to fish it is recommended that batches of MS-222 be mixed in quantities to assure that these mixed (i.e. liquid) batches will be used within 1 week to 2 weeks of being prepared. It is unclear what impacts degradation will have on fish, but to be conservative, mix as small a batch as is practical to avoid impacts of anesthetic.

4.0 Data collection for species identification and counts

Monitoring targets juvenile migrants of four anadromous fish species; Chinook (*Oncorhynchus tshawytscha*), Sockeye (*O. nerka*), Coho (*O. kisutch*), and Steelhead (*O. mykiss*). These species make up most fish collection at the sites, but incidental species are also of interest; particularly pacific lamprey (*Lampetra tridentata*) and bull trout (*Salvelinus confluentus*). Other species of incidentals should also be identified and counted. In addition to species identification, SMP sites are also asked to provide data on clips, marks, and tags. Other data codes (e.g., Special Species Codes) have been introduced to the SMP in order to provide greater detail on species of interest.

Since the Smolt Monitoring Program targets juvenile salmon, the following sections focus on detailed information to be collected on these target species.

4.1 Species identification

Fish Passage Center recommends using the “*Columbia River Basin Juvenile Fish Field Guide*” published by Pacific States Marine Fisheries Commission for identifying juvenile fish.

4.1.5 Age Code for yearling Chinook

In addition to identifying migrant juvenile salmonids to species, SMP also requires age be determined for Chinook salmon. The age determination is based upon morphologic features of the fish. See the **FPC32.net Data Entry Manual** for details of these morphological criteria.

4.2 Special Species Codes

Other information that is requested includes special species codes (SSCs). These SSCs are codes developed for the SMP to further differentiate groups of fish commonly collected at the dams. In steelhead, the presence of eroded fins or (EF) is used to identify hatchery steelhead that are not otherwise clipped or marked. Yearling Fall Chinook released from Lyons Ferry that can be positively identified can be represented with a special species code (LF). In addition, SMP requires that sites identify holdover fall Chinook (HO) based on size and morphology. Finally, fry (FR) are considered any salmon 60mm or less in fork length.

4.3. Mark and Clip data

Marks and Clips can also be used to determine information on origin of fish. See **FPC32.net Data Entry Manual** for detailed information on how to record mark and clip data.

4.3.1 Fin Clips

Fin clips should always be recorded on all target species. See the **FPC32.net Data Entry Manual** for detailed descriptions.

4.3.2 Coded Wire Tags (CWTs)

In addition to clip and other mark information, FPC requests that those sites that have CWT detectors interrogate target species for the presence of wire tags. For SMP purposes, smolts that are otherwise unmarked should be scanned for CWTs. In 2010, there are four target groups: yearling Chinook, subyearling Chinook, Coho, and Sockeye. This request was based on the proportion of the hatchery releases that were otherwise unclipped or unmarked. By including CWT data, SMP can differentiate many unmarked hatchery fish from wild origin fish. This is important for use in run-reconstruction, wild fish population estimates, timing data and other analyses of wild origin stocks.

4.3.3. Elastomer tags and other marks

SMP also requests that all sites collect information on Elastomer tags. These are the only mass marking presently occurring in the Basin. Most of the tag studies are for brood selection information. However, FPC was requested to continue to gather elastomer data for Snake and Mid-Columbia river origin fish.

For 2010, SMP sites are requested to collect all elastomer tag information on yearling Chinook and Steelhead.

4.3.4 Descaling

Descaling data will be collected on all juvenile salmonids of the target species in the sample. *Fish that are part of the detailed condition sample will be examined for descaling as well as other indices of fish health status (See the **Condition Sampling Protocol** for more information).* Other fish that are sampled, those not part of the detailed condition sample, will be referred to as non-condition sample fish. These non-condition sampled fish will be examined for descaling. The descaling criteria for non-condition fish are based on the FTOT protocol. A fish will be recorded as descaled if at least 20% of either side of the fish is descaled.

Descaling is defined as areas of the fish where scales have been removed by mechanical or other means (including predators) and it cannot be determined that scales have regenerated or healing has occurred. When in doubt examiner should report the fish as descaled. Consistency is important since changes in descaling rate are what triggers management action.

4.3.5 Mortality

Fish that are found dead in the sample or die during or after handling should be recorded as mortalities in the non-condition sample. See the **FPC32.net Data Entry Manual** for details about what data to record.