## FISH INVENTORY SYSTEM OVERVIEW

Fish Inventory System (FINS) database project is a collaborative data management project that is developed and administered by Pacific States Marine Fisheries Commission (PSMFC). FINS was initiated in 2011 to help partners in the Lower Snake River Basin improve real-time access to standardized hatchery fish data. FINS was developed by leveraging what was learned from the Idaho Department Fish and Game's Hatchery Data Management System (HDMS) and has replaced the HDMS for IDFG production data needs. The FINS program has evolved since it first started in 2011 from an installed desktop application that required users to download a program to currently an online, real-time system that allows access from anywhere with access to the internet. Additionally, there is a Web portal, FINSNet.org, which serves multiple purposes including providing a data entry interface, data query tools, and access to training products.

FINS currently contains standardized, as well as custom data fields, to support hatchery management decisions across the entire hatchery production cycle. FINS also informs assessments of mitigation for the fisheries losses caused by the construction and operation of Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams (four lower Snake River dams) and the Hells Canyon Complex consisting of Brownlee, Oxbow, and Hells Canyon hydroelectric projects. A video providing an overview of how FINS supports its users' data needs is located at the bottom of the FINS Modules webpage.

## PROCESS GUIDING FINS

The features and functionality of FINS are always developed through collaboration with Snake Basin users from varying perspectives and across multiple agencies. This ensures broad coverage of programs and widespread applicability, on what data and features to be included in FINS, their prioritization, and related project tasks such as user support and training. Specifics on the process guiding FINS are outlined in the FINS Charter (available on FINS Document page) and briefly described below.

Presently, the FINS project structure consists of the FINS Team, Steering Committee, and Technical Advisory Committee. The FINS team manages and is responsible for the design and implementation of the database and user applications. The work performed by the FINS Team is guided by the Steering Committee and Technical Advisory Committee.

The FINS Steering Committee provides management-level guidance to ensure requests are aligned and prioritized with needs, and that coordination and funding issues are addressed. The committee review and assist with refining PSMFC's annual statement of work for the FINS project. Members represent entities utilizing FINS on a regional or program level, which currently consists of 6 entities: Idaho Power, Idaho Department of Fish and Game, Nez Perce Tribe, Oregon Department of Fish and Wildlife, Pacific States Marine Fisheries Commission, and USFWS Lower Snake River Compensation Plan Office. All parties participating on the Steering Committee commit to working together in good faith and to have respectful, productive conversations.

The FINS Technical Advisory Committee (TAC) provides technical input on functionality and provides feedback on beta and final products. Members discuss FINS use cases and provide feedback to the Steering Committee on need and priority. TAC members include hatchery managers, hatchery monitoring and evaluation biologists, hatchery specific technical experts and data entry coordinators. Membership is developed collaboratively and reviewed annually by the PSMFC FINS Team Project

Manager and Steering Committee. There are currently 8 entities with representatives on the TAC: Confederated Tribes of the Umatilla Indian Reservation, Idaho Department of Fish and Game, Idaho Power, USFWS Lower Snake River Compensation Plan Office, Nez Perce Tribe, Oregon Department of Fish and Wildlife, Pacific States Marine Fisheries Commission, and Washington Department of Fish and Wildlife.

FINS Steering Committee Members are identified as their Agency's designated Officials and have collaboratively developed and agreed to the following data use agreement and data sharing policy as guidelines for use of FINS data:

Those who submit FINS data:

- Data contributors recognize and accept that data submitted to FINS is immediately available to anyone who is a registered FINS user.
- FINS Data contributors should ensure data accuracy to the extent possible prior to submittal. Corrections, if necessary, should be made in a timely manner.
- All FINS data is associated with an Agency Official, whose contact information is made available to FINS data users so that Agency Officials may be contacted regarding their FINS agency data.
- FINS data is assumed to be preliminary and will not be made available to the public until 'Finalized'.

Those who use FINS data:

- Are expected to contact the appropriate Agency Official(s) prior to significant use of data from any release group in any publication or presentation for other than internal distribution.
  - This includes both peer-reviewed and non-reviewed documents.
- FINS Data Users will contact Agency Officials in order to:
  - Obtain verification and context for data.
  - Arrange appropriate acknowledgements, citations, and/or authorships.

## FINS DATA AND ARCHITECTURE

FINS contains standardized data that span the entire hatchery production cycle, from the adult brood stock collection to the egg/fry/fish release. Data in FINS are collected across a number of hatchery programs and facilitate coordination among partners, including in tracking transfer of eggs/fry/juveniles and fish among different agencies and facilities as well as outside of FINS. Currently, FINS uses an open architecture to safeguard support and growth of future development goals, and provides data entry users with the ability to record data using the internet using a web application data entry tool for adult trapping, holding, transfer and spawning events, as well as incubation, rearing, and egg/fry/juvenile release events. Offline data entry is provided for users without internet for adult trapping and spawning events. In addition to recording data at each life stage, users can also document the actions taken that affect inventory, including rearing metrics. FINS securely stores data from hatchery programs, with a focus on those in the Snake River Basin. The FINS Data Entry Console and query tools provides access to up-to-date essential data that are used for fish management. The FINS team actively seeks input from FINS users and FINS Technical Advisory Committee to inform refinements and are guided by the FINS Steering Committee in prioritization of new features to further support hatchery decisions and mitigation efforts. More details on FINS technical aspects are described in the FINS Technical Summary white paper that is available on FINS Document page.

Data in FINS are organized into six modules reflecting the main phases of the hatchery production cycle. Information on an individual fish or a group of fish can be tracked across all modules. These six modules consist of:

Trapping Module: Data for this module can be submitted by using the FINS Online tool, Trapping Import tool and FINS Offline desktop application. Data on fish that are collected and for what purpose. The Trapping Data queries provide access to both summarized trapping and individual fish trap data such as: total number of fish trapped; fish species and mark, tag and condition status; length age calculations or visual age designations; death discernment of whether trap mortalities or dead on arrival; and, whether the fish were kept, released, distributed or other.

Holding Module: Data for this module can be populated using the FINS Online tool, FINS Trapping and Spawning Import Tool, FINS Offline desktop application and is managed using the FINS Online tool. Information on active fish inventory. The Holding Data queries generate individual fish transactional records for review and summary information such as: maturation history; facility/trap-of-origin; and if the fish died, were killed for distribution or were transferred.

Spawning Module: Spawning data can be submitted to FINS using the FINS Online tool, FINS Spawning, Incubation and Rearing Import tool and FINS Offline desktop application. Information on unique spawn crosses, resulting egg takes, split eggs/milt. The Spawning data queries can generate individual fish and cross specific summaries, such as: total spawned, total estimated number of eggs collected; total females spawned; which female and male used; why broodstock not spawned; and parental base tagging information.

Incubation Module: Data for this module can be submitted using the FINS Online tool, FINS Incubation and Rearing Import tool. The Incubation and Rearing Import tool will auto populate the Spawning module. Information about what happens to the eggs during incubation is submitted to FINS. The incubation data is organized by container hierarchy, and individual female. Some information accessible in the associated Incubation queries include: egg inventory vs live count; loss at enumeration; actual green take; egg stage/living status; percent survival and percent mortality; eye up rate; and mortalities picked by female/container.

Rearing Module: Data for this module is entered directly using the FINS Online tool or the Rearing Import tool. The Rearing Import tool will auto populate the Incubation and Spawning modules. Information on what happens to juveniles while they are rearing inside tanks and pond. Data includes current inventory; how much food was provided; mortality; fish per pound; how the fish were marked/ tagged; and percentage of tags shed.

Release Module: Release information is entered directly using the FINS Online tool. Information related to how, when, and where a group of fish was either released directly from the hatchery, transferred or transported. The FINS Release Data queries provide access to information related to how, when, and where a group of fish was released. Some of the information accessed from Release queries include: life stage at release, number released and size; release location, latitude/longitude; date and time; purpose of the release; expected first year of return, expected survival; and spawn cross genetic sample details.

## 2022 FINS LSRCP Chinook Data Status

FINS currently contains data for 9 Spring/Summer Chinook Brood Years (2014 through 2022; Brood Year is designated at spawning). These Chinook are trapped from, and spawned at, over 10 facilities/programs, that involve 5 agencies/tribes. The trapping and spawning sources are summarized below:

| Trapping Facilities/Programs | Spawning Facilities/Programs |
|---|---|
| IDFG<br>• Clearwater Fish Hatchery<br>• McCall Fish Hatchery<br>• Oxbow Fish Hatchery<br>• Pahsimeroi Fish Hatchery<br>• Rapid River Fish Hatchery<br>• Sawtooth Fish Hatchery<br><br>NPT<br>• Dworshak National Fish Hatchery<br>• Nez Perce Tribal Hatchery<br>• NPT JCAPE Program<br>• NPT M&E Program<br><br>NPT/USFWS<br>• Kooskia National Fish Hatchery<br><br>ODFW<br>• Lookingglass Fish Hatchery<br><br>SBT<br>• Shoshone-Bannock Tribes | IDFG<br>• Clearwater Fish Hatchery<br>• McCall Fish Hatchery<br>• Pahsimeroi Fish Hatchery<br>• Rapid River Fish Hatchery<br>• Sawtooth Fish Hatchery<br><br>NPT<br>• Dworshak National Fish Hatchery<br>• Nez Perce Tribal Hatchery<br>• NPT JCAPE Program<br><br>NPT/USFWS<br>• Kooskia National Fish Hatchery<br>• Little White Salmon National Fish Hatchery<br><br>ODFW<br>• Lookingglass Fish Hatchery |

Data for the 2014 through 2022 Spring/Summer Chinook brood years are submitted from five of the seven hatcheries contributing to the Lower Snake River Compensation Plan (LSRCP) that was established in 1976 by Congress to mitigate for fisheries losses caused by the construction and operation of Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams.

These hatcheries, and whether data are being submitted (yes) or pending submittal to FINS, consist of:

| | FINS MODULE SPRING/SUMMER CHINOOK DATA STATUS | | | | | |
|---|---|---|---|---|---|---|
| **HATCHERY** | **Trapping** | **Holding** | **Spawning** | **Incubating** | **Rearing** | **Release** |
| CLEARWATER FISH HATCHERY | Yes | Yes | Yes | Yes | Yes | Yes |
| DWORSHAK NATIONAL FISH HATCHERY | Yes | Yes | Yes | Yes | Yes | Yes |
| LOOKINGGLASS HATCHERY | Yes | Yes | Yes | Yes | Yes | Pending |
| LYONS FERRY HATCHERY | Pending | Pending | Pending | Pending | Pending | Pending |
| MCCALL FISH HATCHERY | Yes | Yes | Yes | Yes | Yes | Yes |
| SAWTOOTH FISH HATCHERY | Yes | Yes | Yes | Yes | Yes | Yes |
| TUCANNON FISH HATCHERY | Pending | Pending | Pending | Pending | Pending | Pending |

FINS also manages data for the hatcheries and associated trapping facilities contributing to the 1980 Hells Canyon Settlement Agreement that guides Idaho Power investments in hatcheries. This settlement agreement mitigates for the impact of the construction and operation of the Hells Canyon Dam Complex had on salmon and steelhead. The Hells Canyon Dam Hydroelectric Complex consists of Brownlee, Oxbow, and Hells Canyon hydroelectric projects.

Lastly, individual state and tribal cooperators can also submit data for their other hatchery programs. For example, Nez Perce Tribe currently submits data from their Johnson Creek Artificial Propagation Enhancement (JCAPE) Project, Nez Perce Tribal Hatchery, and Grande Ronde Supplementation on the Lostine River. Idaho Fish and Game also submit data from their Idaho Steelhead Research Weirs and Snake River Sockeye Artificial Propagation program.

## PSMFC FINS TEAM

The PSMFC FINS Team currently consists of five positions, a project manager, a web architect, a developer, a support specialist, and a training specialist. The team operates following the Scrum Agile methodology which provides the process framework that facilitates cross-functional teams to develop complex products through collaboration, iteratively while continuously improving. Scrum relies on transparency and accountability and encourages team focus on getting things done. It is structured to warrant flexible priority and quicker delivery of useful desired software. It also provides the team with the opportunity for consistent review/retrospectives and opportunity to improve and increase efficiency. Scrum applies an adaptive management approach that allows quick turn-around of features in an incremental fashion to allow for maximum feedback from users, cooperators and sponsors with

minimal waste. To ensure tools and added functions are responsive to user requests, the FINS team's planned project implementations have Beta releases built into the schedule to solicit and confirm with FINS users and volunteer TAC Members that needed elements are included and to test the performance and features delivered.

## FINS ALIGNMENT WITH ISRP AND NPCC RECOMMENDATIONS

In preparing for the 2022 ISRP review of the Lower Snake River Basin Chinook review, we reviewed the ISRP 2014 LSRCP Recommendations (ISRP 2014-6), as well as other database / regional data system relevant recommendations from the 2019 ISRP review **(ISRP 2019-2)** and 2013 NPCC Decision Memorandum. Below we provide a brief summary that illustrates how well FINS aligns with these recommendations:

ISRP 2014 LSRCP Recommendations*: Additionally, if it does not already exist, the ISRP recommends that in-hatchery performance metrics for fish cultured in LSRCP hatcheries be imported into a centralized database where data from all of the hatcheries could be housed and made available to the cooperators.*

- FINS is a web-based standardized data system that houses hatchery metrics that covers the entire hatchery production cycle. These data are accessible to cooperators and are used to asses hatchery performance and progress towards mitigation goals.

2019 ISRP Programmatic Comments on Data Analysis and Database Management, Recommendations for data analysis and database management: (ISRP 2019-2): **[…]** *Require that all database management projects in the Fish and Wildlife Program routinely monitor and evaluate database usage, user identity, user satisfaction, and user requests for added features and services. […] Include available information on non-salmonid species (e.g., Pacific lamprey, white sturgeon, American shad) in databases like StreamNet to broaden their value and usage, as is accomplished for salmonids through the Coordinated Assessments.*

- FINS Includes non-salmonid species such as white sturgeon. FINS gauges user, sponsor and committee satisfaction from all cooperators during quarterly meetings, committee sessions as well as daily during support request events (calls/emails) and during training events. User requests are defined, assessed and proposed for consideration to committee members for vetting. User input is received from email, phone calls, training events, TAC meetings, and Beta testing.

2013 NPCC Decision Memorandum's section on Data Management Programmatic Issues and Council Recommendations identified six Council Recommendations to address general data management and sharing needs within program funded projects. These are briefly summarized below along with how FINS aligns with these six recommendations:

1) *All data collected by program funded projects must be publicly available […and …] all data be available upon request annually and within 6-months of project completion or following completion of a significant phase of research. […] projects collecting data [should] to store and manage their data and its metadata in a manner that facilitates accessibility to the public, such as through the use of web-services, regional data-management projects, and sub-regional databases.*

- FINS data and supporting metadata is currently restricted to authorized users. However, FINS cooperators can easily provide data upon request given the standardized structure of FINS, the ease of running queries and exporting the generated output. An API (webservice) also exists to facilitate cooperators accessing their data to import within their own system that includes a public interface, and FINS assists cooperators in organizing their data to the specification required for submittal to the sub-regional public databases Regional Mark and Information System (RMIS) and PTAGIS.

2) *All projects collecting data can provide user-limited access to different levels of synthesized data to ensure appropriate use of data while providing easy access to more highly synthesized data to a wider array of users. […]*

    - FINS users have different level of permissions depending on their assigned role that contributes to the integrity of data submitted to FINS

3) *All projects collecting data through the Program should ensure the longevity and usefulness of the collected data be using data management approaches and tools that facilitates its sharing such as by providing comprehensive documentation of metadata […]*

    - FINS complies with this recommendation by capturing essential metadata to ensure longevity and preserve the value and usefulness of these hatchery program data.

4) *All regional data management projects publish their data electronically on a regular basis (i.e., not a static PDF or Word document), and consider using a dynamic data-sharing system for regularly requested information. […]*

    - FINS provides access to the submitted data for authorized users through the FINS web-based query tools and API.

    - FINS data inputs are easily exported to Excel from any grid within FINS Online and/or the Query Tool.

5) *All sub-regional databases should use web-services to provide access to priority data for broad-scale evaluation and reporting needs, such as for the program. Other data should be published electronically on a regular basis (i.e., not a static PDF or Word document) through a website (see Council recommendation #2 below for program priority data).*

    - FINS data do support the assessments and reporting needs for USFWS LSRCP and Idaho Power.

6) *All individual project data that are required for program evaluation and reporting should be made accessible by making these data web-services accessible or by submitting these data to a sub-regional databases or regional data-management project [..]*

    - FINS cooperators submit additional hatchery program data, some of which as are funded through the NPCC Fish and Wildlife Program.