1988-108-04 EXP STREAMNET
Project # 1988-108-04

FY24 Annual Progress Report
Report covers work performed from: January 2024 – December 2024
Report Created: April 1, 2025

Prepared by

Nancy Leonard, Mari Williams, Mike Banach, Greg Wilke, and Van Hare (PSMFC),
John Arterburn (Colville Tribes) and George Batten (ESA. for Colville Tribes),
Tami Wilkerson, Sheryn Olson (CRITFC),
Evan Brown and Angie Schmidt (IDFG),
Dawn Anderson (MFWP),
Jon Bowers, Jake Chambers, Nadine Craft, and Kasey Bliesner (ODFW),
Jen Bayer, Meg Dethloff, and Sam Cimino (PNAMP),
Todd Gilmore (USFWS), and
Brodie Cox (WDFW).

Pacific States Marine Fisheries Commission
205 SE Spokane Street, Suite 100
Portland, OR 97202

Report covers work performed under BPA Contract # 78040 REL 60
Report was completed under BPA Contract # 78040 REL 60

"This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA."

I. Table of Contents

II. Executive Summary

StreamNet serves as a regional coordination body to support data management and facilitate cooperation across organizational boundaries. The Pacific States Marine Fisheries Commission (PSMFC) hosts the StreamNet project and its databases, which provide access to regional fish and fish-related data by maintaining a coordinated, standardized, web-based distributed information network. The need for regionally coordinated and readily accessible data has been identified by the Bonneville Power Administration (BPA), the National Oceanic and Atmospheric Administration Fisheries Program (NOAA), and the Northwest Power and Conservation Council (NPCC). To ensure access to these data, StreamNet supports technical staff within the agencies (data stewards) who compile and submit these data in standardized, publicly accessible, regional data repositories. StreamNet also collaboratively leads and coordinates a number of initiatives to assure a regional approach to data management among federal, state, and tribal fish and wildlife agencies.

This annual report summarizes the work performed during calendar year 2024, which spans federal fiscal years 2024 and 2025. During calendar year 2024 StreamNet continued to implement the Coordinated Assessments Partnership (CAP) with the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) and engaged in collaborative efforts with all partners to advance the diversity and quality of shared data. Below is a brief highlight of these 2024 accomplishments:

- StreamNet continued to acquire fish data from our partners resulting in a total of 7,119 records submitted to the CAP Fish High Level Indicator (HLI) Coordinated Assessments Data Exchange (CAX) system including data for both hatchery and natural origin fish, and a total of 2,353 records in the Fish Monitoring Data (trends system) during 2024. Shoshone Bannock Tribes, the Nez Perce Tribe (NPT) and the Yakama Nation (YN) continued to engage and submit data, as feasible given they are not directly funded by BPA through the StreamNet project.
- Some specific accomplishments achieved by the individual StreamNet subcontracts related to development or improvement of their organizations' data storage systems include:
    - **The Colville Tribes'** main focus in 2024 was getting data from Chief Joseph Hatchery into the Okanogan Basin Monitoring and Evaluation Program' (OBMEP) database and successfully upload the hatchery HLIs to HCAX. This was accomplished through working with StreamNet staff and making changes to both the hatchery HLI HCAX tables and the C# script used to connect with the HCAX API. Accuracy and efficiency in hatchery data processing were improved through a Shiny app developed by the data steward to assist hatchery biologists in the processing of creel survey data. The Colville Tribes continued to support both natural and hatchery origin CA data flow by participating in the Executive, Steering, Technical, and DES committees as well as reviewing data records from partner agencies.
    - **Idaho Department of Fish and Game's** efforts focused on developing data sources and data exchange structures for Hatchery Coordinated Assessments (HCA) including adult returns, spawning, juvenile releases, and Smolt to Adult Survival Rates (SARs). We finalized the development and implementation of the Spawning Ground Survey mobile application for collection and the desktop application for management sharing, and analyses of redd counts and carcass data.
    - **Montana Fish Wildlife & Parks** continues to manage and maintain existing systems to sustain current data collection, storage, and analysis. MFWP continues to improve hydrography to achieve greater accuracy in data display and analysis. Staff assisted the overall StreamNet program in data quality efforts by reviewing data records from partner agencies. The agency has not had the opportunity to further develop internal data systems as agency application development and database staff are funded by license sales, not by StreamNet.
    - **Oregon Department of Fish and Wildlife** continued to improve upon internal data processing and standardization workflows. Hatchery data compilation was streamlined through the use of Python scripts to extract data from internal applications. Internal ODFW web applications (CAVES) were further improved to support the collection, storage and submission of fish monitoring and natural and hatchery origin CA data to StreamNet. Additionally, ODFW StreamNet staff developed and released a new ODFW Salmon and Steelhead Recovery Tracker (SSRT) public website

(https://nrimp.dfw.state.or.us/RecoveryTracker/) hosted by ODFW. The new web site replaced the previous SSRT web site hosted by PSMFC StreamNet since 2010.
    - **Washington Department of Fish and Wildlife's** work continued to build out our Hatchery Management System (HMS), modernizing the legacy FishBooks application. This system will automate HCAX reporting. WDFW has updated CAX and HCAX records for all populations back to 2010. SAR & RperS continues to be a challenge for CAX.
- StreamNet continued to improve its online queries to better support data consumer needs, including developing the ways that Fish Monitoring Data datasets could be linked to each other by TrendIDs to highlight the data connectivity that exists within the system. StreamNet finalized the collaboratively developed dashboard display of available HLI population estimates as stock group estimates from the Columbia Basin Partnership Task Force (MAFAC) recommendations alongside the data published in the report. PSMFC GIS center staff and StreamNet IDFG data steward co-led a Fish Monitoring Work Group task team to define a consistent approach for developing and naming fish management unit polygons to display data for non-anadromous salmon and steelhead species finalized in 2024. StreamNet provided additional, non-BPA, funding to contribute to advancing tribal data management and sharing capacity to Shoshone Bannock Tribes.

Recommendations to the Executive Committee:

- **Support regional data stewardship.** Assist in securing funding to support StreamNet and CAP task maintenance, data quality, automation of the entire data flow process including calculations, and new tasks to better support the reporting needs of BPA, NOAA, NPCC and USFWS. Adequately support **state and tribal data management personnel and participation by all data providers and regional data consumers** in StreamNet and CAP committees and teams, including engagement in PNAMP Fish Monitoring Work Group (FMWG) and related teams that advance StreamNet and CAP tasks. Support efficient data flow through ongoing maintenance and updates, including adopting advances in data management and reporting technology to improve efficiencies across the entire data life cycle. Confirm with StreamNet partners the status of new tasks, to ensure these are completed before additional new tasks are developed and assigned.
- **Connect regional data systems.** Facilitate access to, and advance metadata documentation within agencies' and tribes' data systems, especially for data of regional importance. Explore options to more efficiently connect metadata residing in other systems with data managed by StreamNet. Support development of data connections across data systems within PSMFC, including GIS connections with PSMFC GIS Center.
- **Enhance and maintain StreamNet as Exchange of Record for BPA and others.** Encourage NPCC, in addition to BPA, to officially recognize PSMFC StreamNet GIS and the StreamNet database systems (Fish HLI and Fish Monitoring Data) as the **exchange of record** for the Columbia River Basin Fish and Wildlife Program.
- **Support increased discoverability and outreach.** Support outreach through workshops and presentations, as well as participation in regional data connectivity discussions and development.
- **Support a broader group of data categories to support regional information needs**. Encourage BPA, NPCC, and USFWS to build on StreamNet/CAP standardized data sharing successes for improving access to fish and related habitat data. Support **expanding data flow for resident and anadromous fish** (hatchery and natural-origin) from agency/tribal data systems to StreamNet data systems to meet the requirements of the NPCC 2020 Addendum and upcoming 2025 Addendum (goals, objectives and indicators for natural-origin and hatchery fish); Identify regional needs for facilitating public access to multiple data sources and information through a shared web-tool such as displaying MAFAC Phase 2 goals with available CAP NOSA data on ESRI tools the MAFAC Phase 2 (Final) Report and Recommendation 2020 and NOAA Fisheries Rebuilding salmon and steelhead in the Columbia River Basin report; and BPA and U.S. Fish and Wildlife Service (USFWS) information needs.

Lessons Learned:

- Communicating the **quality of submitted data** provides data consumers with confidence in their use of these data.
- Improving **access of data** maintained by StreamNet to audiences with different technical knowledge will increase the value and use of these data by the public and for informing decisions.

- Leveraging **special work groups** and FMWG task teams with the required expertise (e.g., data stewards, biologist) to inform addition of data categories is efficient and effective, including coordinating with PNAMP staff for meeting facilitation expertise.
- Proper **documentation** for data integrity is critical to ensure that these valuable data, funded by the public and ratepayers, remain accessible to inform critical uncertainties and decisions into the future.
- **Succession planning and recruitment** of new partners and members that require documenting and publicly communicating information about StreamNet Program and its processes. Succession planning also requires partner agencies and tribes to document new and existing processes used in data management to ensure smooth staff transition.

III. Introduction

The need for effective and timely access of information to inform regional decision-making continues to be prominent in the Columbia River basin (CRB or basin) and the Pacific Northwest as a whole. Specifically, for the StreamNet Program, the Bonneville Power Administration (BPA), the National Oceanic and Atmospheric Administration Fisheries Program (NOAA), and the Northwest Power and Conservation Council (NPCC) have all identified an ongoing need for regionally coordinated, securely stored, and readily accessible data to inform their reporting and decision-making processes. Furthermore, the Northwest Power Act, which established the NPCC, calls for decisions to be made using the best available science, which requires the best available information. StreamNet provides regional standardization and access to data throughout the Columbia River basin through development and maintenance of regional data repositories for fish and habitat data. This work improves data discovery, increases efficiency of data access, and facilitates data reuse – ultimately, adding value to data collection efforts.

III. A. Project Background

StreamNet is a collaborative data sharing project that works with the federal, state, and tribal agencies, and other partners such as PNAMP to locate, assemble, and share, in a standardized manner, specific data and indicators from the local scale to inform regional needs. StreamNet also has an important role in archiving data sets and providing access to historical information, especially those that support policy decisions such as the NPCC's Protected Areas, system and subbasin planning data, wildlife Habitat Evaluation Procedure (HEP), Columbia Habitat Monitoring Program (CHaMP), and US Congress funded Hatchery Reform Group and Hatchery Scientific Reform Group (HSRG) reports and data sets.

Figure 1: StreamNet focuses its data sharing efforts on data within the Columbia River basin. However, data from all Pacific States are exchanged to better support partners' information needs such as the NPCC Protected Areas and NOAA's 5-year salmon and steelhead status assessments.

Data submitted to StreamNet are region-wide in coverage, with recent years being more focused on Columbia River Basin data in response to regional needs. The geographic extent of StreamNet reflects the need to include information from other areas of the Pacific States, such as for the NPCC's Protected Areas and NOAA 5-year status reviews for listed salmonids, to properly address regional reporting and decision-making processes. Information from outside the CRB is also submitted to StreamNet when it is more efficient during the data submittal process because the geographic coverage for many of StreamNet's partners overlaps the CRB but extends well beyond its boundaries. The

overarching goal of StreamNet is to make river-related information collected in the Pacific States, with an emphasis on the Columbia River basin, standardized and accessible, to inform management questions and strategies (Figure 1). The data disseminated represent primarily fish-related data, regardless of the funding sources responsible for supporting the work of field collection. Thus, all data of a given type are included, both those paid for under the BPA-funded Fish and Wildlife Program and similar data that are obtained based on other funding. This is important because to conduct assessments or monitor population status and trends, all data relevant to each population must be used, regardless of funding source or agency and tribe collecting the data.

The most recent NPCC recommendation, the August 2019 programmatic and project recommendations[i], continues to support the StreamNet project. Specifically, the NPCC recommended that StreamNet continue its effort to expand its steering committee membership to agencies managing fish data and that StreamNet initiate work on other priority NPCC program indicators including hatchery indicators. To this end StreamNet continues to seek opportunities for expanding the Coordinated Assessments Partnership (CAP or Partnership) High Level Indicators (HLIs) to other categories and fish species. This intent has also resulted in a stronger relationship between StreamNet and the Pacific Northwest Aquatic Monitoring Partnership, by leveraging the existing PNAMP FMWG to serve as the forum to bring together biologists, data stewards, and other interested parties to refine existing StreamNet and CAP tools and to inform new data categories to be exchanged. StreamNet's prioritization of work continues to be informed by the Five-Year Work Plan for the Coordinated Assessments Partnership.

Figure 2: StreamNet is hosted by PSMFC and largely funded by BPA to promote efficient data sharing from member agencies and tribes in support of the NPCC Columbia River Basin Fish and Wildlife Program. StreamNet committees' members currently include the four states, Colville Tribes, CRITFC and CBF&W Library. StreamNet teams include representatives from additional data providers, such as the Nez Perce Tribe and Yakama Nation Fisheries.

Please see Appendix C: Historical Project Background for more historical project information.

III. B. Coordinated Assessments Partnership

The Partnership's goal is to develop efficient, consistent, and transparent data sharing among the co-managers (fish and wildlife agencies and Tribes) and regulatory/funding agencies (BPA, NOAA Fisheries, and US Fish and Wildlife Service) for fish-related data. The CAP was designed (in part) to assist and streamline state and tribal data contributions to regional decision-making processes (e.g., NOAA 5-yr status assessments) and reports (e.g., NPCC Program Tracker; BPA CRS BiOp reports). The Partnership has been coordinated by PNAMP and the PSMFC StreamNet project since its inception in 2010 (see: https://pnamp.org/projects/cap/). The development of the Coordinated Assessments Data Exchange, called CAX, was partially funded by a 2015 EPA Exchange Network grant (Salmon Coordinated Assessments Data Exchange project #83546401, closed). Close contact with High level indicators (HLIs) users (BPA, NPCC, NOAA, others) and with regional fish and wildlife managers is maintained and is crucial to the success of the project.

The partnership is focused on sharing standardized regional HLIs for the health of fish populations. CAP is a collaborative effort amongst many partners and its scope, both jurisdictionally and species topics, remains flexible to address emerging regional data and reporting needs. The intent is for the CAP to be a collaborative, consensus-based effort. Parties involved in the CAP remain flexible so that participants with the required expertise (e.g., resident fish managers, habitat managers, etc.) will be recruited as needed, as CAP moves to additional indicators. Since 2010, the agencies and tribes within the CRB participating in the CAP have successfully developed the CAX. The CAP Fish HLIs query has effectively communicated and made accessible natural-origin salmon and steelhead population HLIs to decision-makers and other interested parties. The CAP Fish HLIs query is valuable in providing timely access to CRB HLIs used in federal reports and research, as well as reporting needs of the NPCC and BPA (see Appendix B for crosswalk between NPCC populations and CAP Fish HLIs populations). Funding has been the limiting factor for expanding the CAP Fish HLIs query beyond natural origin salmon and steelhead HLIs; however, an EPA Exchange Network grant in 2020 enabled CAP to develop hatchery origin fish HLIs. This represents the first new content in many years.

In November 2023, the revised five-year plan for the CAP (CAP plan) was adopted by the StreamNet Executive Committee[ii]. The plan is revisited annually to ensure alignment with regional priorities and will undergo modifications and updates to a strategic plan document in 2025. The CAP Plan guides the implementation of work by prioritizing data for contribution from partners. The primary data types contained in and disseminated through the CAP are High Level Indicators (HLIs) that relate to the Viable Salmon Population (VSP) parameters for natural origin fish and stock and hatchery program information for hatchery origin fish. These include population scale estimates of natural spawner abundance, smolt to adult ratio (SAR), adult recruits per spawner (spawner to spawner ratio), smolt outmigrants, and presmolt abundance for natural fish, and broodstock spawning, hatchery releases, hatchery return, and hatchery SAR for hatchery fish. In addition to high level indicator data, Fish Monitoring Data (e.g., trends data sets) are also curated by StreamNet, including spawner counts, juvenile counts, redd counts, and dam and weir counts. The CAP Plan also indicates other fish species, e.g., sturgeon, and category of data, e.g., genetic data, as priorities, and these will be explored as additional funding and resources become available. Implementation of the plan will require resources from a diversity of sources to provide access to the data approved by the Executive Committee. For instance, the CAP members secured a USEPA Exchange Network grant in 2015 that was focused on sharing natural origin salmon and steelhead HLIs, and in 2020 the CAP Core Team was awarded an EPA Exchange Network Grant that is funding the development of a data exchange standard and pilot flow of hatchery fish HLI during 2021-2024.

III. C. Policy Guidance

The StreamNet project is implemented following the guidance provided in the 2021-2026 StreamNet Vision and Strategic Plan [iii] (adopted September 2, 2020) and through the collaboratively developed CAP Plan, which are adopted by the StreamNet Executive Committee. The CAP Plan has been structured as a 5-year plan to be reviewed and updated each year but will be rewritten in 2025 as a strategic plan. The CAP Plan considers guidance from NPCC Program and Project Recommendations, which in turn stipulate a need for StreamNet to address the reporting needs of NPCC and BPA. Below are excerpts of the current NPCC Program and related NPCC and BPA data priorities that inform the CAP Plan and the work implemented by StreamNet.

1. Data Management Principles and Measures

StreamNet supports the 2014 NPCC Fish and Wildlife Program's guidance for data management (Program Part Four and its 2020 Addendum) by making information accessible to the public and for decision-making at a regional-scale. The Program guidance implemented by StreamNet includes:

- Manage data in a manner that is searchable and usable by interested parties.
- Properly document metadata associated with data and ensure these are accessible through web links or attached documentation when data are accessed.
- Provide access to categories of data, such as fish abundance, through a single centralized website.
- Produce derived estimates and indicators (e.g., population estimates) from preliminary data collection (e.g., redd counts) and make publicly accessible along with supporting data.
- Work collaboratively to refine indicators that can be used consistently to inform decisions and reporting needs, providing these data in regionally consistent formats to all interested parties in a timely manner, and preserving these data beyond the longevity of a project.
- Facilitate collaboration among agencies, tribes, and tribal consortia, as well as with other monitoring entities in the Basin, which contribute and consume data to inform decisions. To effectively support the Program indicators and objectives, which include hatchery, anadromous and resident fish, it is essential to prioritize which information needs to be addressed first, based on the Program's guidance.
- Refine content of the data management system to align with partners' reporting needs including the NPCC.
- Maintain data and products supporting the NPCC FW Program, both historical and current, in a structured manner that facilitates public access such as information related to Protected Areas information, habitat evaluation procedures, and GIS layers.

2. Priority Data Accessibility

BPA's Environment & Fish and Wildlife Division staff interact on a regular basis with StreamNet staff to communicate their data needs. The data priorities have expanded since the more restrictive 2016 Tier 1 and Tier 2 priority populations that were associated with data needs for the previous FCRPS BiOp. During 2024, BPA staff indicated interest in collaboratively working through the FMWG and its task teams to expand accessibility of standardized data that could be exchanged with StreamNet or other regional systems. StreamNet finalized the collaborative development of a standardized approach to inform how StreamNet would display fish management units for non-ESA listed species groupings. During 2024, StreamNet developed an ESRI dashboard to display multiple data sources related to a specific topic to facilitate BPA Contracting Officer Representatives tasks. Interest in further relying on StreamNet and its support by the PSFMC GIS center to serve as the system of record for fish and facilities GIS layers was communicated by BPA signaling that it was interested in having CBFish.org display GIS layers maintained by PSMFC GIS Center as part of the StreamNet project. In 2024, BPA and comanagers agreed to expand the PSMFC GIS supported fish facilities layer beyond the CRB and reviews for accuracy and alignment by partners and the PSMFC GIS staff occurred throughout the year. This expansion will allow fish facilities that are intentionally operated outside of the CRB to serve as a genetic safeguard for endangered salmonids (e.g., Snake River Sockeye) to receive the same QA/QC and visualization on PSMFC hosted GIS layers as those primary facilities within the basin.

3. High Level Indicators and Metrics Categories

The high level indicators (HLIs) and metrics, which have guided the work of the CAP since its inception, were focused on providing derived indicators to address the Viable Salmon Population (VSP) data needs for NOAA's 5-year status reviews. These also aligned with the specific indicators and metrics for reporting progress on implementation of the reasonable and prudent alternatives (RPAs) identified in the 2008 FCRPS BiOp[iv] and related documents. With the adoption of the 2020 Northwest Power and Conservation Council Columbia River Basin Fish and Wildlife Program, the StreamNet Executive Committee approved StreamNet to work collaboratively with others, leveraging the PNAMP FMWG, to develop recommendations for Executive Committee's review that would better address the NPCC strategic performance indicators. The Hatchery Coordinated Assessments Exchange (HCAX) process initiated in 2021 resulted in the development of hatchery fish indicators and metrics for the data exchange that began receiving data in 2024. These HLIs, as well as others identified in the CAP Plan, continue to be a priority.

4. Fish Monitoring Data (Trends) Data Set Priorities

The 2014 NPCC Fish and Wildlife Program[v] provides guidance on the information needed to track the status of the CRB's fish and wildlife resources (Part Two, section V), report on the Program's approved high-level indicators (see 2014 Program, Appendix D), and assess progress towards Program goals, objectives and indicators (see 2014 Program Appendix C and its draft 2020 Addendum Part 1A). During 2018, the Executive Committee directed the StreamNet project to resume updating selected, traditional data sets, such as long-term sets that support CAP indicators and those that are used to maintain the NPCC program reporting needs. This continues to be a priority for StreamNet as available resources allow. The 2020 addendum to the Northwest Power and Conservation Council Columbia River Basin Fish and Wildlife Program identified a set of Strategy Performance Indicators. NPCC staff lead a regional process that refined the Strategy Performance Indicators and supporting data. This process is clarifying data needs for the NPCC Program Tracker and will serve to specifically identify the fish species and data categories priorities.

5. GIS Data Layers Priorities

PSMFC's GIS Center supports the management and publication of StreamNet's spatial data layers related to fish populations, monitoring sites, fish facilities, and stream survey reaches associated with time-series data stored in the StreamNet database. This centralized GIS provides a comprehensive location referencing system for finding and accessing Columbia River basin fisheries information compiled by StreamNet, CAP, and other PSMFC programs. It enables discovery and display of the CAP Fish HLIs at the population scale and drives the web-based mapping components of the CAP Fish HLI map-based query system and the maps embedded within the Fish Monitoring Data query system that depict the time series data sampling location. StreamNet's core GIS data layers are recognized as BPA's system of record for mapping fish facilities (e.g., hatchery, weirs), fish distribution within the basin, trends features, and non-ESA-listed populations or fish management units. PSMFC's centralized GIS also supports the Columbia Basin PIT Tag Information System (PTAGIS) and the Regional Mark Processing Center (RMPC), providing consistency and synergy across projects. As BPA and NPCC continue to clarify what GIS layers PSMFC can provide to better support their reporting tools, such as NPCC's Program Tracker, BPA PISCES (CBFish.org), and PNAMP's MonitoringResources.org, additional GIS layers are being developed by the GIS Center, as informed and reviewed by a FMWG task team.

III. D. Budget Considerations

Calendar year 2024 spans two fiscal years (FY), FY24 from January to September 2024 and FY25 from October to December 2024. For FY24, the BPA StreamNet baseline budget was $2,318,894. The FY2024 StreamNet budget supports the PSMFC GIS Center, PSMFC StreamNet staff, and contributed to funding a technical subcontract. As the StreamNet Program Manager adds new data management programs and projects to her portfolio (i.e., RMPC/RMIS, Salmon Data Discovery Tool, Klamath Basin Fisheries Collaborative and FINS), funds associated with the manager wages and expenses are reallocated to advance additional tasks, including those requested by BPA, by supporting a few months' time of another PSMFC employee and to increase funding to the technical support subcontract. The partner agencies did receive an increase during the FY2024 portion of CY2024, including the ODFW through their portfolio funding process. In FY2024 (end of calendar year 2024), BPA increased the Colville Tribes budget by $20,725 and increased the overall StreamNet budget by 4.4% COLA. ODFW funding remains uncertain as negotiations with BPA continue.

PSMFC StreamNet staff are continuously seeking alternative funding sources to maintain current work and address new tasks to support priorities. During calendar year 2024, PSMFC StreamNet secured Interjurisdictional Fisheries Act (IJFA) funding to further advance StreamNet by supporting tribal data management and exchange capacity (Shoshone Bannock Tribes), USGS-PNAMP staff time to assist with CAP related tasks and subcontracting for additional technical support. This added funding directed at specific StreamNet tasks complements the PSMFC StreamNet FTE and assisted in making progress on several BPA priority tasks during CY2024 (FY24 and FY25).

Similarly, the CAP Core Team seeks funding from alternative sources as feasible. Their work to advance hatchery indicators led to an EPA Exchange Grant that was awarded in 2020. The grant funding supported the development of the new Hatchery HLI DES that began receiving data in 2024. StreamNet partners also seek and secure additional funding which complement and contribute to advancing StreamNet and CAP tasks, such as the individual EPA Exchange Network Grants.

The overall StreamNet budget remains a constraint as the number of FTEs that can be supported is less than what partners would need to perform all tasks fully and without requiring sequencing. The absence of funding to directly subcontract additional Tribes through the StreamNet Program also remains a constraint to engagement and data exchange. Figure 4 shows the difference in the budget's nominal and real value since 2004. As rates and fees increase over time, PSMFC StreamNet and partners struggle to maintain and recruit staff with required expertise. Furthermore, the ability for PSMFC StreamNet to support short-term data management needs of Tribes not funded through the StreamNet Program are further reduced. The absence of additional funds provided by BPA to PSMFC StreamNet to annually fund Tribes with data that are relevant to BPA and appropriate for StreamNet data systems weakens the reliability of data flow from these providers.

III. E. StreamNet Data Sharing Partners – Providers and Consumers

Current partner agencies funded through this project are: The Confederated Tribes of the Colville Reservation (Colville Tribes); Idaho Department of Fish and Game (IDFG); Montana Fish, Wildlife& Parks (MFWP); Oregon Department of Fish and Wildlife (ODFW); and Washington Department of Fish and Wildlife (WDFW). The Colville Tribes joined in CY2013 (FY2014) when they began receiving funding through StreamNet.

Other partner agencies that are not funded directly through StreamNet include: US Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA), Columbia River Inter-Tribal Fish Commission (CRITFC) and its member tribes, Columbia Basin Fish & Wildlife Library (CBF&W Library or Library), and Pacific Northwest Aquatic Monitoring Partnership (PNAMP). During CY2020, Yakama Nation (YN) and CRITFC completed their subcontracted tasks for improving data management and sharing capacity, and the Shoshone Bannock Tribes subcontract was extended in CY21 and increased to further assist them with data sharing that informs the CAX database. Up until 2017, the USFWS was funded through StreamNet, but no longer receives StreamNet funding. In calendar year 2018 BPA and the USFWS reached agreement on funding these activities through a direct contract focused on integrating USFWS hatchery databases.

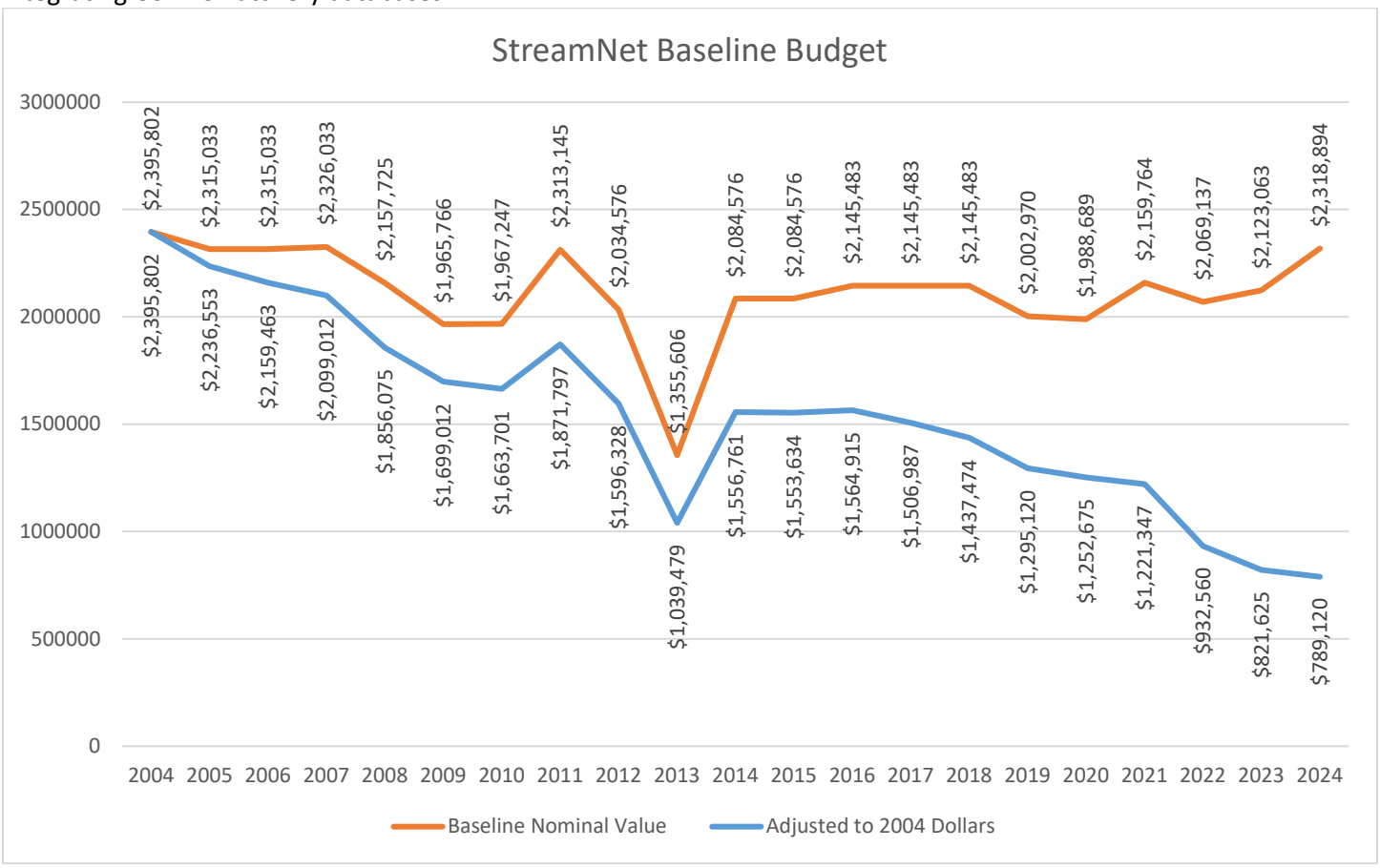

Figure 3: BPA annual budget decision for the StreamNet project between FY2004 and FY2024.

Figure 3 shows the StreamNet budget from 2004-2024, with funding changes and adjusting to inflation over the time period. In 2008, the Library was split from the StreamNet project and assigned its own project number and budget (BPA project # 2008-505-00). The sharp decrease in FY2013 arose from the percent cut made by BPA across all projects to address a BPA financial crisis. The cut in FY2013 resulted in substantial PSMFC staff time being reallocated to other PSMFC projects until the budget was readjusted to a higher amount in FY2014. Additionally, the FY2013 cut resulted in all PSMFC GIS support no longer being funded through the StreamNet budget. The 2019-2020 decrease in the budget reflects the reduction agreed to by the Executive Committee in 2018 to assist BPA with another budget issue. In FY2021, BPA reinstated the StreamNet baseline for one-year (excluding ODFW portfolio funds) budget to $2,145,483, the value recommended by the NPCC in 2019. The FY 2024 BPA budget for StreamNet was adjusted to $2,318,894 (excluding ODFW portfolio additions). When comparing the nominal budget value to the real budget value this further highlights the StreamNet budgetary constraints. The real budget value is adjusted to the 2004-dollar value considering inflation and calculated using https://www.in2013dollars.com/us/inflation/

IV. Approach and Methodology

StreamNet[vi] supports a regional approach to data management, coordination, and standardization by increasing partner capacity and improving access to fish data (Figure 4). The majority of fish-related data originate with the region's state, tribal, and federal fisheries agencies' fish monitoring programs. StreamNet participates in or leads a variety of teams of data management professionals from states, tribes, and agencies that coordinate regional data sharing. Data flow has been streamlined through the implementation of application programming interfaces (APIs) for various data types.

StreamNet facilitates submittal of time-series data and high-level indicators to its regional databases at PSMFC by supporting technical staff inside these agencies to help increase the capacity of partners with managing, standardizing, and providing related GIS layers. PSMFC and StreamNet funded agency employees and subcontractors locate data, standardize data reporting through the cooperative development of data exchange standards, complete Quality Assurance/Quality Control (QA/QC), and assure the flow of data from state, tribal, or agency repositories to StreamNet. StreamNet supports individual agencies and tribes to work collaboratively in the exchange of data contributing to regional decision making.

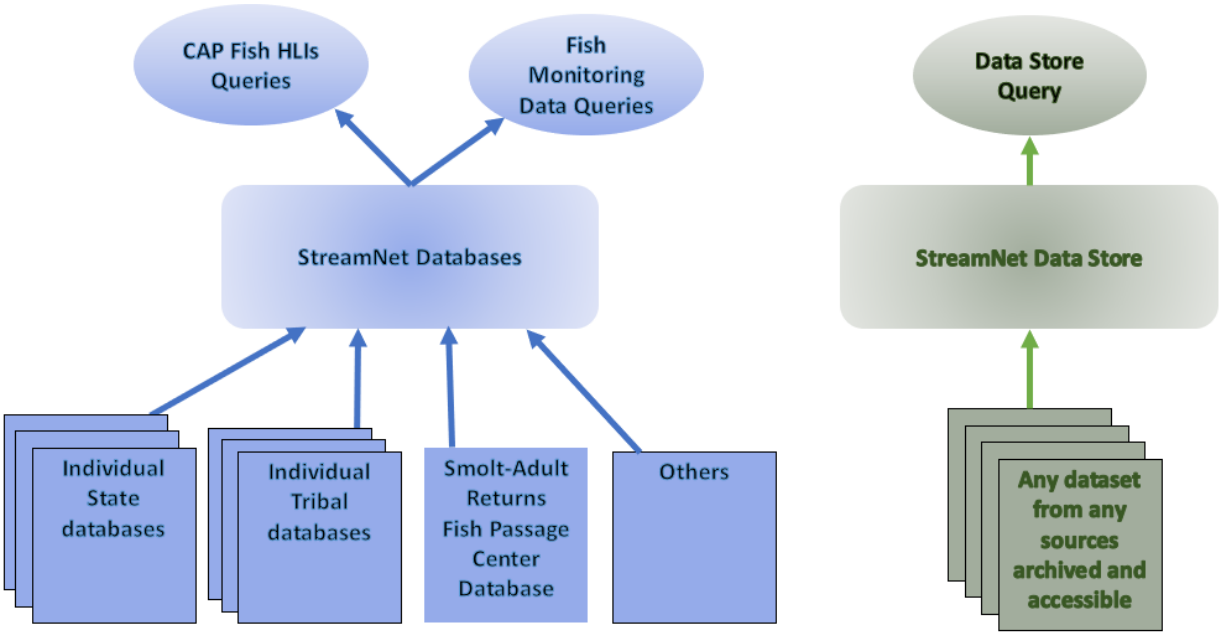

Figure 4: Flow of data from StreamNet members' agency/tribal databases, sub-regional databases, and other sources, to the StreamNet and StreamNet online data access queries.

IV. A. Standing Committees for StreamNet and Coordinated Assessments Partnership

Work Elements:
189: Coordination and Outreach

There are several committees and teams that contribute to the implementation of StreamNet tasks, including an Executive Committee, a Steering Committee, and supporting workgroup and teams, including considerable interaction with PNAMP's Fish Monitoring Work Group (Figure 5). The Coordinated Assessments Partnership (CAP) co-implemented by StreamNet and PNAMP involves a broader set of partners than the StreamNet project alone and provides a broader jurisdictional engagement to address partners' Pacific Northwest information needs.

The CAP and StreamNet are both discussed and considered by the StreamNet Executive Committee when developing the StreamNet annual work plan and the Five-Year Plan for Coordinated Assessments to inform data priorities.

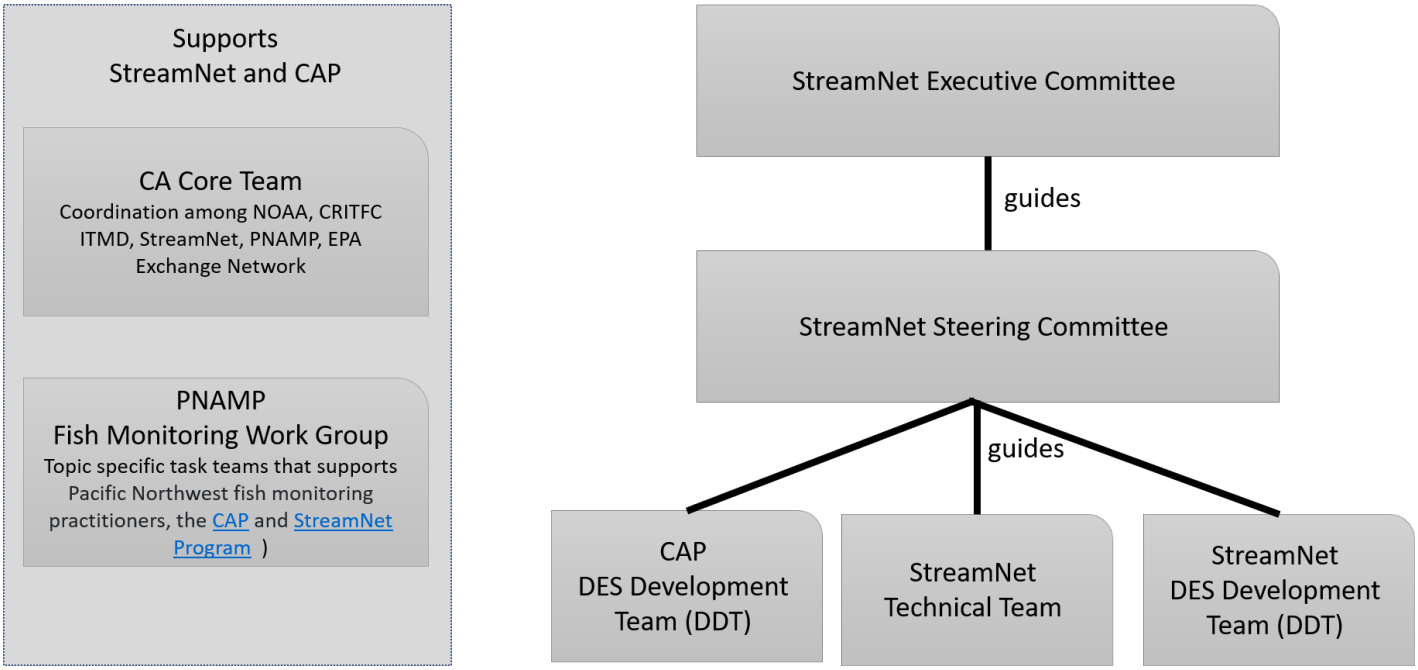

Figure 5: Relationship among the StreamNet organized committees and teams, the CA Core Team, and the PNAMP Fish Monitoring Work Group that all contribute to StreamNet and CAP related work.

1. StreamNet Executive Committee

As part of the effort to improve coordination, in 2014 StreamNet instituted an Executive Committee. This committee is made up of policy staff and project leaders from the StreamNet partner agencies as well as other related organizations involved in managing and using fisheries data, primarily in the Columbia Basin (Table 1, more details on the StreamNet Executive Committee webpage). The chair is the PSMFC Executive Director who is represented by the StreamNet Program Manager. This group provides high-level guidance and decision-making for StreamNet and the Coordinated Assessments Partnership. This guidance includes review of the high-level goals and products of the Coordinated Assessments Partnership, CAP Fish HLI query (CAX data system), Fish Monitoring Data (trends) data system and its queries, and making decisions on priority species, populations, indicators, on a long-term and an annual basis. The Executive Committee reviews and annually approves the Five-Year Plan for the CAP to ensure that the regional data priorities are being addressed with the data exchanged with StreamNet.

Table 1: Calendar Year 2024 members of the StreamNet Executive Committee

Current Members	Affiliation
Barry Thom (Chair, represented by Nancy Leonard) and Stan Allen	PSMFC
Donella Miller and Sheryn Olson	CRITFC
Patty O'Toole	NPCC
Jody Lando and Rodrigo George	BPA
Greg Sieglitz	NOAA-Fisheries West Coast Region
Katie Barnas	NOAA-F Northwest Fisheries Science Center
Tom Stahl and Art Martin	ODFW
Phil Sandstrom	WDFW
John Cassinelli	IDFG
David Schmetterling	MFWP
John Arterburn	Colville Tribes
John Netto	USFWS

2. StreamNet Steering Committee

The Steering Committee helps to implement the decisions of the StreamNet Executive Committee, particularly as it relates to the content of the StreamNet databases and the queries it supports: StreamNet Fish Monitoring Data (trends) and CAP Fish HLI. This committee includes active participation by StreamNet and non-StreamNet members at the data manager level (Table 2, more details on the StreamNet Steering Committee webpage). This includes NOAA, BPA, NPCC, state agencies, and some tribal representatives. The committee is made up of technical project leaders from StreamNet partner agencies and other related organizations involved in managing fisheries data and metadata, with a focus on the Columbia Basin. The chair is the PSMFC StreamNet Program Manager.

Table 2: Calendar Year 2024 members of the StreamNet Steering Committee

Current Members	Affiliation
Nancy Leonard (Chair) and Mari Williams	PSMFC
Sheryn Olson	CRITFC
Tami Wilkerson	CBF&W Library
Kris Holmes	NPCC
Tom Pansky, Russell Scranton, and Matt Schwartz	BPA
Katie Barnas	NOAA-Fisheries NWFSC
Jon Bowers and Cedric Cooney (retired in April 2024)	ODFW
Brodie Cox	WDFW
Angie Schmidt and Evan Brown	IDFG
Dawn Anderson	MFWP
George Batten	ESA representing Colville Tribes
Todd Gilmore	USFWS
Jen Bayer	USGS-PNAMP

3. StreamNet Technical Team

The Technical Committee is composed primarily of PSMFC and state and tribal agency staff from StreamNet partners that implement data management actions (Table 3; more details on the StreamNet Technical Team webpage). The committee is chaired by PSMFC StreamNet staff, with the staff assigned dependent on the team's current task. The team designs and implements the technical details necessary to share data from partner data systems to the StreamNet database and on to end users. The team provides a forum to discuss data, programming, GIS topics, and common issues

among organizations contributing data to the StreamNet data system, focusing on geographic referencing, Fish Monitoring Data (trends), CAP Fish HLIs, fish distribution data, other data types, and metadata submissions to the StreamNet data system.

Table 3: Calendar Year 2024 members of the StreamNet Technical Team

Current Members	Affiliation
Greg Wilke (co-chair) and Mike Banach (co-chair)	PSMFC-StreamNet
Van Hare	PSMFC-GIS Center
Denise Kelsey and Tami Wilkerson	CRITFC
Jon Bowers, Peter Robinson, Jake Chambers, Nadine Craft, and Kasey Bliesner	ODFW
Michelle Groesbeck, Tiffany Warren, and Leslie Sikora	WDFW
Chris Harrington, Evan Brown, Elizabeth Davis, and Rebecca (Bekki) Waskovich	IDFG
vacant	MFWP
Todd Gilmore and David Hines	USFWS
John Arterburn and George Batten (Environmental Science Associates consultant)	Colville Tribes
Michelle Steg-Geltner	Yakama Nation

Currently there are no StreamNet Technical Team members identified for CTUIR, CTWSRO, NPT and SBT.

4. StreamNet Data Exchange Standard Development Team (SN DDT)

The StreamNet DES Development Team (SN DDT) meets as necessary to maintain data-sharing rules for Fish Monitoring Data and documents the rules in the StreamNet Data Exchange Standard (DES). A DES is a set of formal rules for the meaning and structure of shared data. The SN DDT collaborates with the StreamNet Executive Committee (SN ExCom) and StreamNet Technical Team (SN TT) to determine how these data should be presented and made available via online query systems. The SN DDT consists of biologists, data management, and IT technical staff from the federal, tribal, state, and regional organizations submitting and consuming data (Table 4, see SN DDT webpage for details). Most member organizations have more than one individual participating on the SN DDT who contribute to discussions, product development, and decisions. The SN DDT is organized and facilitated by Pacific States Marine Fisheries Commission (PSMFC) StreamNet staff, with the PSMFC StreamNet Regional Fishery Biologist / Database Administrator serving as chair.

Table 4: Calendar Year 2024 members of the SN DDT

Current Members	Affiliation
Mike Banach (Chair) and Greg Wilke	PSMFC-StreamNet
Van Hare	PSMFC-GIS Center
Denise Kelsey, Tami Wilkerson	CRITFC
Jake Chambers, Nadine Craft, and Kasey Bliesner	ODFW
Michelle Groesbeck, Tiffany Warren, and Leslie Sikora	WDFW
Chris Harrington, Evan Brown, Elizabeth Davis, and Rebecca (Bekki) Waskovich	IDFG
Vacant	MFWP
Todd Gilmore and David Hines	USFWS
John Arterburn, George Batten (Environmental Science Associates consultant)	Colville Tribes
Michelle Steg-Geltner	Yakama Nation

Currently there are no StreamNet Technical Team members identified for CTUIR, CTWSRO, NPT and SBT.

5. Coordinated Assessments Partnership Data Exchange Standard Development Team (CAP DDT)

The CAP Data Exchange Standard (DES) Development Team (DDT) meets as necessary to maintain existing data tables and develop new indicator tables. This team consists of both data technicians and biologists that are responsible for calculating indicators. The DDT determines DES content and import/export guidelines. Team membership is fluid and

depends on the species/indicators/geography of the data (Table 5, see the CAP DDT webpage for details). The chair of the DDT is the PSMFC StreamNet biologist.

Table 5: Calendar Year 2024 members of the Natural CA DDT

Current Members	Affiliation
Mike Banach (Chair) and Nancy Leonard	PSMFC
Denise Kelsey	CRITFC
Russell Scranton and Matthew Schwartz	BPA
Mari Williams and Monica Diaz	PSMFC / supporting NOAA-Fisheries data needs
Jake Chambers, Nadine Craft, and Kasey Bliesner	ODFW
Brodie Cox, Tiffany Warren, Phil Sandstrom, and Michelle Groesbeck	WDFW
John Powell, Evan Brown, and Rebecca Waskovich	IDFG
George Batten (ESA consultant for the Colville Tribes)	Colville Tribes
Jay Hesse and Ryan Kinzer	Nez Perce Tribe
Michelle Steg-Geltner	Yakama Nation
Jen Bayer	PNAMP

In 2024, the Hatchery Coordinated Assessments Data Exchange (HCAX) began flowing data. The existing Natural CA DDT met jointly with the establishing Hatchery CA DDT. Led by the CAP DDT chair, the individuals and entities who contributed to the development of the draft HCAX DES and the data type section they focused on are listed below:

Table 6: Hatchery CA DDT Members for 2024

Hatchery CA DDT participants	Affiliation
Denise Kelsey	CRITFC
Russell Scranton and Matthew Schwartz	BPA
Mari Williams	PSMFC
Jake Chambers, Nadine Craft, and Kasey Bliesner	ODFW
Brodie Cox, Tiffany Warren, Phil Sandstrom, and Michelle Groesbeck	WDFW
John Powell, Evan Brown, Elizabeth Davis, and Rebecca Waskovich	IDFG
George Batten (ESA consultant for the Colville Tribes)	Colville Tribes
Jay Hesse and Ryan Kinzer	Nez Perce Tribe
Michelle Steg-Geltner	Yakama Nation
Jen Bayer	PNAMP
Mike Banach	PSMFC

6. Coordinated Assessments Partnership (CAP) Core Team

The CAP Core Team meets regularly to coordinate amongst several BPA-funded projects. The Core Team is made up of representatives from BPA, NOAA, PNAMP, StreamNet, a StreamNet partner agency/ EPA Exchange Network representative, and the CRITFC Inter-Tribal Monitoring Data project representative. The CAP Team (Table 6) are important leaders in ensuring that CAP produces results by facilitating discussion amongst projects, directing requests for work to the appropriate CAP level (as needed), and generally maintaining forward momentum. The team also manages and implements periodic CAP Workshops.

Table 7: Calendar Year 2024 members of the CAP Core Team

Current Members	Affiliation
Nancy Leonard	PSMFC
Denise Kelsey, Sheryn Olson	CRITFC
Russell Scranton	BPA
Mari Williams	PSMFC
Brodie Cox	StreamNet partner representative (WDFW)
Jen Bayer	PNAMP
John Arterburn	Colville Tribes

IV. B. StreamNet Data Specialists within Agencies

Work Elements:
159: DES and Validation Process for Fish Monitoring Data (trends) and CAP Fish HLI (CAX)
159: Transfer of data to secure and accessible repositories
159: CAP Fish HLI (CAX) – DES, API, Database
159: Fish Monitoring Data (Trends) – DES, API, Database
160: StreamNet maintaining and enhancing data management
160: Implement and participate in processes described in the StreamNet QA/QC
189: Supporting Data Requests

The StreamNet project uses subcontracts to support data stewards inside StreamNet member agencies. These data stewards operate within the agency or tribe for which they work, and coordinate with biologists across that organization to identify and collect data of interest to StreamNet.

These data stewards locate and acquire data and metadata, convert these to the DES adopted by StreamNet, perform Quality Assurance/Quality Control (QA/QC, see StreamNet QAQC 2022), provide related GIS information, and assist with development and utilization of database systems within agencies to streamline the data flow process. Once these data are properly formatted and validated, these data are then submitted to the StreamNet database at PSMFC, where they are quality checked and managed so they become available to the StreamNet online data query systems. These data are then made publicly available for viewing and downloading in standardized format through the project website, www.streamnet.org. Data submitted by data stewards may also include data from other agencies and tribes, because state agencies often collect data from partners to summarize Fish Monitoring Data (FMD) (trends) and calculate metrics or indicators that are reported on CAP Fish HLIs queries.

IV. C. Data Store - Archiving Data Sets and Information

Work Elements:
159: Transfer of data to secure and accessible repositories
161: Improving data sharing with and access from StreamNet Data Systems

StreamNet staff continues to maintain public access to structured information for the NPCC FW Program including the CHaMP, Data Store, HEP, the HSRG, Protected Areas and Subbasin Plans. StreamNet's Data Store, the online searchable data archive, continues to provide access to historical and recent data collected by BPA-funded projects as well as other data sets from partners and the CRB.

CHaMP –StreamNet maintains, as requested by BPA, access to archived information from the Columbia Habitat Monitoring Program (CHaMP) including documents, photos, and data sets. StreamNet added a CHaMP page[vii] to its website for this purpose and included a CHaMP Data File Explorer to facilitate searching the files sent to StreamNet. CHaMP was funded as a pilot project by BPA between 2011 and 2017 to assess if it could help address the requirements of the 2008 Federal Columbia River Power Supply (FCRPS, now CRS) BiOp and RPA 56.3. In 2018, the CHaMP project was phased out following an NPCC recommendation. The extensive volume of documents and datasets from Environmental Services Associates' (ESA, formally Sitka Technology Group) champmonitoring.org website are being archived as these are received from ESA on the StreamNet's CHaMP website.

Data Store – StreamNet maintains the Data Store archive service[viii]. The Data Store is a secure location for data storage for projects throughout the region and provides access to non-standardized data. The StreamNet Data Store is a searchable archive of data sets related to fish and other aquatic resources. These data sets come from many different sources and are provided for download in their original formats. StreamNet facilitates data submittal to the Data Store by providing a data publishing service that guides the data submitter in how to describe their data set and submit it. The Data Publishing Service is for submittal of data sets. Those who want to archive a report with summary graphs and tables are directed to the Columbia Basin Fish & Wildlife Library[ix] hosted by CRITFC. Because the Data Store is a data set archive, data sets housed there are generally not updated after the first version is submitted.

HEP – StreamNet also maintains the NPCC's Columbia River Basin Fish and Wildlife Program's (Program) Wildlife Habitat Evaluation Procedures (HEP) documents and data[x]. The NPCC FW Program policy guiding wildlife mitigation to compensate for hydrosystem development relies on the HEP data to support the mitigated habitat unit, where this tool was applied. HEP was used to quantify the impacts of development, protection, and restoration on terrestrial and aquatic habitats by assessing changes, both negative and positive, in habitat quality and quantity. The HEP informed the NPCC FW Program's progress in BPA's mitigation for lost habitat units related to the construction and operations of the hydrosystem dams. StreamNet maintains access to this critical information for the NPCC FW Program and BPA. The NPCC FW Program also relies on settlement agreements between BPA and partners for mitigating for lost habitat and these are tracked by the NPCC.

HSRG – StreamNet staff have begun integrating the content of the Hatchery Reform Project website[xi] to ensure that its content, including the Hatchery Scientific Reform Group's (HSRG) documents remain accessible to the public through the refreshed StreamNet website that was released during 2021. The NPCC FW Program policy guidance for its *Fish Propagation including hatchery programs*[xii] strategy includes in its rationale the HSRG outcomes, and the Program guidance encourages the application of these HSRG recommendations for FW Program-funded hatcheries, thus maintenance of the HSRG website and documents[xiii] is needed to inform implementation of this policy guidance.

Protected Areas – StreamNet maintains access to the NPCC Fish and Wildlife Program's documentation of the river reaches designated as areas protected from hydroelectricity development[xiv]. This protection was assigned by the NPCC FW Program based on the determination from extensive Pacific Northwest river studies conducted during the 1980s that these areas are to be protected to avoid the unacceptable risks of loss to fish and wildlife species of concern, their productive capacity, or their habitat. To this end the NPPC FW Program states that the Federal Energy Regulatory Commission (FERC) cannot license a new hydroelectric development in a Protected Area, and 2) calls on BPA not to acquire the power from such a project should one be licensed by FERC, nor to allow access to the Pacific Northwest-Pacific Southwest Intertie (the "power grid") in a way that would undermine the Protected Areas policy. The last update to the Protected Areas list was promulgated in 1992, and it remains in effect through the current NPPC FW Program.

Subbasin Plans – StreamNet maintains documents and data sets[xv] used in the NPCC subbasin planning process. The NPCC (formerly the Northwest Power Planning Council) led the 2001-2004 effort to develop comprehensive subbasin plans throughout the Columbia River basin. StreamNet provided data to support subbasin planning and also received and distributed compilations of the data used in the plans. After the plans were completed, StreamNet, the Technical Outreach and Assistance to Subbasins Team (TOAST), the CRITFC, and the Northwest Habitat Institute captured new data that were developed for use in the aquatic portion of each subbasin plan. Resources archived by

StreamNet include the spreadsheets, maps, GIS layers, subbasin planning modeling input and results, tools, and databases developed for subbasin planning. Included is a large majority of the Ecosystem Diagnosis and Treatment (EDT) and Qualitative Habitat Assessment (QHA) modeling information used in subbasin planning, as well as GIS layers that define the EDT/QHA reach codes.

IV. D. Fish Monitoring Data (trends)

Work Elements:
159: DES and Validation Process for Fish Monitoring Data (trends) and CAP Fish HLI (CAX)
159: Fish Monitoring Data (Trends) – DES, API, Database
160: StreamNet maintaining and enhancing data management
161: Improving data sharing with and access from StreamNet Data Systems

StreamNet Fish Monitoring Data (trends) query system[xvi] provides access to all data sets submitted to the StreamNet database (excluding content from the Data Store). These data are also georeferenced. The StreamNet Fish Monitoring Data query was refreshed in CY2020 to better integrate with the StreamNet website and supports a simpler filter-based query in a tabular format. During CY2021 a visual map depicting the location of the data set was added by connecting to the PSFMC StreamNet mapper, and work was initiated to improve access to the age data time series. This tabular query allows the user to filter data in different ways to suit their needs and download the resulting data or share a URL to the filtered content. The content of StreamNet's Fish Monitoring Data query system includes fish abundance estimates and indexes of redd and spawner counts at the local scales for native and non-native species, many of which are focal species for the 2014 FW Program, as well as information on hatchery returns, and harvest. Data sets relating to monitoring activities such as redd counts and dam counts are generally updated annually.

Content is updated annually, or less frequently as needed, for data types included in the StreamNet Data Exchange Standard (DES) for Fish Monitoring Data (trend data sets). The StreamNet Program anticipates the need to refine and/or expand the StreamNet DES in future years to accommodate the data needs for the NPCC 2020 Addendum. These edits include improving the quality of bull trout data and additional data categories such as results from snorkeling, rotary screw trap, or electrofishing sampling recommended by the FMWG Task teams.

The StreamNet Application Programming Interface (API) requires that users request access and are issued a unique programming key to interact with Fish Monitoring Data via this method. The API is primarily used to submit records to StreamNet, and the use of unique programming key is a case of programming best practice rather than limiting data access.

IV. E. Maintenance and Access to GIS Layers

Work Elements:
160: StreamNet maintaining and enhancing data management
161: GIS Data and Metadata

There are three mappers associated with StreamNet[xvii]. The first, the StreamNet mapper, allows exploration of regional fish distribution and stream referenced survey data. The second, the Protected Areas mapper, displays streams protected from hydroelectric development by the NPCC. The third, the Fish Facilities mapper, shows locations

and descriptive information about fish facilities located in the Columbia Basin that submit fish data to PSMFC's data projects, including StreamNet. Facilities that are not linked to data housed at PSMFC currently are not included on this map although the need to support these other facilities is being discussed given the information needs of NPCC and BPA.

StreamNet's interactive mapping applications are useful resources for Fish and Wildlife Program-sponsored projects and related watershed and stream-specific projects. The applications enable users to: 1) explore baseline information on fish abundance and distribution, 2) identify the location of surveyed stream reaches and important fish facilities (e.g., dams, hatcheries, weirs, traps, etc.), 3) create custom data and map products, and 4) summarize data by subbasins and areas of interest. The web map services that fuel StreamNet's mapping applications can also be leveraged directly by users with a desktop GIS and by partners that wish to incorporate the layers into their own web applications. All StreamNet's core data layers are available for download in file geodatabase format and include International Organization for Standardization (ISO) compliant metadata.

PSMFC's GIS Center staff maintain and update StreamNet's core GIS layers as new data become available from partners. In general, the GIS Center staff checks about twice a year for available updates from partner agencies. The PSMFC GIS Center staff participate in the FMWG task teams to provide guidance on recommendations that include GIS layers managed by PSMFC for StreamNet. One of these task teams, the Fish Population Names and GIS Boundaries Task that was initiated in 2021, was co-led by the PSMFC GIS Manager to develop a standardized approach for how fish management units (or population names) and boundaries are defined for display on StreamNet tools and was reviewed and published in 2024. This work is informing preliminary layers being developed to support CBFish.org.

IV. F. CAP Fish HLIs

Work Elements:
159: DES and Validation Process for Fish Monitoring Data (trends) and CAP Fish HLI (CAX)
159: CAP Fish HLI (CAX) – DES, API, Database
160: StreamNet maintaining and enhancing data management
161: Improving data sharing with and access from StreamNet Data Systems

CAP Fish HLIs for population level estimates are available through CAP Fish HLIs queries (CAX data system[xviii]). Development of CAP Fish HLIs queries (renamed in 2021, formerly named Coordinated Assessments Indicators of Fish Population Health or CAX Query) was initiated in 2016 with the intent of providing access to HLIs and related (or associated) trends which are housed in the FMD (trends) system. CAP Fish HLIs query provides access to these data by having the user select a species and run, and complements the tabular data with a dynamic map that displays the geographic population distribution and summary information in a pop-up box.

StreamNet coordinates closely with PNAMP in providing technical guidance to the CAP which follows the Five-year Plan for CAP. This technical guidance includes development and modifications to the Data Exchange Standard (DES) document which is needed for submitting standardized data that will be displayed on the CAP Query. The DES document specifically identifies the data elements that are to be shared for each indicator, along with definitions, formats, and business rules for each element. The DES document is used to guide the organization of data to be shared via any specific medium, whether by spreadsheet, CSV file, database file, or web service. The data elements are hosted by the originating agency and exchanged following the DESs using the StreamNet Application Programming Interface (API).

As part of the CAP, staff at PSMFC and along with others participating in CAP coordinate with state, federal and tribal agencies in support of increasing data flow in the region and to encourage increased use of information technology to improve the efficiency of data sharing. The StreamNet API facilitates submittal and access of CAP Fish HLIs through the CAX data system. CAP Fish HLIs and supporting time series data sets in the Fish Monitoring Data query are updated at a minimum of once a year, but as automation advances, more partners are submitting more frequently such as on a daily basis by the source agency.

Users accessing data through the CAP Fish HLIs queries are also required to agree to the Data Use Agreement at the request of data submitting agencies. The Data Use Agreement, updated in 2024, reflects the data sharing agreement conditions agreed to by parties providing data to StreamNet for the CAX data system. The data sharing agreement is presented for agreement as data are uploaded and shared. The purpose of these data sharing agreements are to articulate how data that are shared are to be interpreted, analyzed, and attributed correctly. Furthermore, if users use the StreamNet Application Programming Interface (API) to access the CAX data, the API requires that users request access to be issued a unique programming key to interact with data via this method. Additionally, if a user accesses CAP Fish HLIs query content from the EPA Exchange Network (EN), the EN requires that users register before accessing any data sets. This is a requirement imposed by the EPA and not StreamNet. The EPA Exchange Network for the CAX Node is accessible at http://www.exchangenetwork.net/data-exchange/columbia-river-basin-coordinated-assessment/

IV. G. Validation Process for Data and HLIs Submitted to the StreamNet Database

Work Elements:
159: DES and Validation Process for Fish Monitoring Data (trends) and CAP Fish HLI (CAX)

Data exchange standards, a data sharing agreement, and rigorous QA/QC protocols are all part of the data compilation and reporting process (see Data Exchange Tools webpage and StreamNet Quality Assurance and Quality Control Plan. Data, including reference documents, in the StreamNet and CAX databases must conform to the StreamNet DES and CA HLI DES documents, which precisely defines the data elements, their organization in tables, and required formats. This document serves as the common denominator for the specific data types contained in the database. Adherence to the DES document assures that data can be loaded into the database, can be queried accurately, and are equivalent for further analysis by users. Conversion of agency data to the DES document and assuring that they conform before submission is the responsibility of the project's data stewards/compilers in the data source agencies. Additions or changes to the DES are made following a formal documented procedure adopted by the Steering Committee (see the latest version from the CAP DDT document table Data Exchange Standard Development and Revision Procedures for details).

QA procedures are applied at the agency data steward level. An automated data validation and loading system has been implemented at StreamNet. This system provides real-time feedback on the success (or not) of data validation. Data are submitted to the StreamNet database one record at a time, and real-time data validation is run on them at three levels. First, each field has its own set of rules. Examples include ensuring numeric fields do not contain text, ensuring codes fall within the group of allowable values, and ensuring text strings are within acceptable length ranges. The second level of validation ensures that values in the different fields within a table are compatible. For example, if a record is submitted that says it is for "spring run coho salmon," the record is rejected because there is no such run. The third level of validation looks for data problems between rows of data within a table. This third level prevents duplicate data by enforcing all candidate keys for a table. A useful feature of the automated validation routines is that the data may be run against the validation rules and an error report obtained without submitting the data for inclusion in the database. This feature allows data submitters to check entire sets of data, fix all errors, and then submit an entire data set after it is known it will pass validation. The interface used for data submittals allows for new records, changing existing records, and deleting existing records.

IV. H. Enhanced Metadata Documentation by Connecting to Complementary Data Systems

Work Elements:
160: Infrastructure/equipment and base operations
160: Metadata Documentation

Documentation of metadata for information submitted to the GIS Database, Data Store, and StreamNet database has always been a priority to StreamNet as this ensures the appropriate use of these data outside of the original project that created them. During 2024, StreamNet continued to work on improving the quality of metadata associated with its data records while exploring approaches to reduce the burden on the data provider. Initial work discussing how to leverage documentation of protocols and methods available from other regional data systems (e.g., MonitoringResources.org and CBFish.org) began in 2021 and the StreamNet Technical Team decided to focus on the connection with the Fish Monitoring Data system during 2024. The availability and quality of metadata varies depending on the year the data was collected (older data sets tend to have lower quality metadata) and the documentation requirement associated with the data collection event. At a minimum, StreamNet has gathered the source document or report that detailed the protocols used to collect these data and, working in collaboration with Library staff, have made these accessible through the Library. With the regional recognition that protocols and methods described in reports are not always sufficient for fully understanding the origin and uses of these data, a tool to support full description of methods and protocols was developed through PNAMP (MonitoringResources.org; BPA project #2004-002-00) with support from BPA. In the absence of metadata provided by the Library and/or MonitoringResources.org, the StreamNet database will at a minimum point to the originating agency as the source.

GIS – Metadata for the GIS data comply with the Federal Geographic Data Committee (FGDC) International Organization for Standardization (ISO) standard and are packaged in ArcGIS file geodatabase format for use with desktop GIS software.

Data Store – Metadata for data sets in the Data Store are provided by the entity that uploads the data set. The BPA Data Management Strategy directs StreamNet to store links to associated protocols and designs to ensure data downloaded and used by third parties can be understood and properly used. The Data Store process requests the user to provide a BPA Project number if relevant. When a BPA project number is provided, the Data Store provides the user with options from the BPA www.cbfish.org and the PNAMP www.monitoringresources.org to facilitate connecting the data set to contact information and documented protocols and methods.

StreamNet Database for Fish Monitoring Data – Preferably, metadata for the tabular data should meet the requirements of the FGDC Biological Extension, but we often lack the required level of detail from the source agency for various reasons. Depending on the data being submitted, different levels of metadata are captured. Currently, for the data submitted to the StreamNet Fish Monitoring Data (trends) database that are not related to CAP Fish HLIs Query, there is frequently a lack of formal metadata from the data source agencies. To compensate for the lack of formal metadata, StreamNet obtains source documents for all data in the database, which are subsequently stored in the CBF&W Library's cloud server. Library created URLs for these source documents are presented with all views of the data and with all data downloads. Many source documents contain methods sections that provide detail about how the data were collected. When viewed online, there are links to the Library's online catalog record for the document, which include a link to the digitized version of the document. Initial work exploring how to leverage documentation of protocols and methods available from other regional data systems (e.g., MonitoringResources.org and CBFish.org) began in 2021 and further discussion has continued.

CAP Fish HLIs – Metadata fields are associated with the data submitted for CAP Fish HLIs estimates and the Fish Monitoring Data trends related to populations with HLIs estimates. Some of this metadata content includes URLs that link protocols and methods that are publicly available such as on the data providers website, CBF&W Library and/or on

www.monitoringresources.org, where information on the specific method used for a particular component of data related to population-scale HLIs are documented. Detailed descriptions of each metadata field can be reviewed in the CA DES. The metadata information associated with data is fully downloaded along with any exported data from the CAP Fish HLIs.

1. PNAMP MonitoringResources.org

In 2008, PNAMP began efforts that lead to the development of MonitoringResources.org. PNAMP leveraged work by National Park Service, US Bureau of Reclamation, and USDA Forest Service that developed a tool for documenting protocols[xix]. The further development of this tool aimed to provide detailed information about protocols, methods, sample designs, study plans, and metric documentation to inform the NPCC's project review process, and BPA's Research, Monitoring and Evaluation (RM&E) needs and for project tracking[xx]. The current version of MonitoringResources.org promotes transparency and greater understanding of monitoring through a standard process of documentation and information management, which is facilitated through online tools that provide guidance and support for design and documentation of monitoring projects from beginning to end[xxi].

The StreamNet database contains a field associated with the CAP Fish HLIs data to allow the submitter to include a URL link to metadata. This can include providing a link to the protocols and methods documented in MonitoringResources.org. Work initiated in 2021 is exploring how to improve the use of content in MonitoringResources.org by facilitating the connections with the StreamNet data systems.

This past year the Monitoring Resources staff and StreamNet staff met regularly to discuss improving the connections and interoperability between MonitoringResources.org and the SN data repository. Environmental Science Associates (ESA) produced a report with technical recommendations and a proposed roadmap based on these collaborative discussions.

2. Columbia Basin Fish & Wildlife Library

The Columbia Basin Fish & Wildlife Library (Library) was founded in 1995, to support the StreamNet Project which originated with the consolidation of two projects, NED and CIS. Originally the Library was part of the StreamNet project and was named the StreamNet Library. In 2008 the Library was separated into its own project and is now hosted by the Columbia River Inter-Tribal Fish Commission (CRITFC; project #2008-505-00). To better reflect the scope of the project, the Library was renamed Columbia Basin Fish & Wildlife Library in 2020 and, in 2021, changed the Library's website domain from streamnetlibrary.org to cbfwl.org. The StreamNet project continues to rely on the Library to provide access to documents that provide details related to the data submitted to the StreamNet database. In turn, the Library continues to prioritize making StreamNet source reference documents easily accessible through the Library catalog and ensuring their long-term preservation. In 2024, the Library received 75 new StreamNet source reference documents. These documents were assigned a URL and appropriate metadata and made accessible through the Library catalog. Additionally, Library staff updated approximately 2,000 StreamNet references in the reference table by correcting errors, creating citations, and adding URLs.

IV. I. Data Backup Systems

Work Elements:
159: Transfer of data to secure and accessible repositories
160: Infrastructure/equipment and base operations

The StreamNet databases are backed up on the PSMFC organization-wide system, which includes sending backup copies to the Kennewick PSMFC office.

StreamNet staff send a differential backup to the cloud on a daily basis.

IV. J. StreamNet Relationship with Mainstem and Sub-regional Data Projects

Work Elements:
189: Coordination and Outreach
161: Reporting and Decision-Making Processes

StreamNet collaborates with existing mainstem/sub-regional data management projects to further enhance the flow of information needed to inform decision-making and reporting. These types of projects are tasked with compiling information from a subset of the CRB, in some cases to support collaborative analysis. StreamNet works with these data management projects to access relevant information needed to inform HLIs. This coordination reduces the workload placed on individual biologists and data stewards by not requiring them to resubmit these data to the StreamNet database.

1. CRITFC Inter-Tribal Monitoring Data Project

StreamNet continues to work with CRITFC tribes and specifically with the CRITFC Inter-Tribal Monitoring Data (ITMD) project (BPA Project #2008-507-00) to integrate these two projects, along with the Columbia Basin Fish & Wildlife Library (BPA Project # 2008-505-00), to maximize data discovery and sharing. Some of the data flow during 2024 from the tribes was through a StreamNet member state agency who collaborated with a CRITFC member tribe to collect and process data. Starting in late 2019 through 2024, Nez Perce Tribe (NPT) and the YNF have submitted data to Coordinated Assessments, such as NOSA/escapement and Juvenile outmigrants. It is expected that other CRITFC tribes will be providing their data directly to StreamNet, as those tribes develop the capability to share data with regional repositories. ITMD Project Staff and group members participate in StreamNet and CAX planning and development.

The ITMD Project is the only lower Columbia River Basin data project that serves as a forum for CRITFC member tribes to coordinate and collaborate as they work toward best practices for data management strategies. ITMD Project members comprise approximately 25 data professionals and scientists who are partially funded by the ITMD Project and are positioned at each tribe. Similar to coordination work done through the StreamNet project and PNAMP.org, coordination enables the tribal data professionals to leverage expertise and resources to develop data management strategies; data flow between regional and tribal data repositories; innovative data collection, storage, and access techniques; and centralized database software systems (CDMSs or Yakama Nation's Information Management System/Status and Trends Reporting-IMS/STAR). The Project scope is to serve as a forum for collaboration, coordination, and as a liaison for other regional partnerships, but the Project does not collect, house, or manage data. Collaboration occurs via standing conference calls, educational webinars, and an annual workshop. Project members participate in frequent small group meetings such as for CDMS/GitHub technical teams. ITMD and tribal staff attend many regional coordination meetings for data management and sharing within the Basin, but if tribal staff are not able to attend, the ITMD Project staff serve as liaison between the tribal data professionals and regional entities, regarding data management and data product requirements. ITMD Project staff participate in meetings and conferences in the Columbia Basin including Coordinated Assessments Workshops and Working Groups, StreamNet Executive Committee, StreamNet Steering Committee, CAP Core Team, StreamNet Technical Team, CAP DDT, the EPA sponsored Tribal Exchange Network Group, and PNAMP Fish Monitoring Workgroup that are directly involved in improving Coordinated Assessments. Beginning in 2023 and continuing through 2024, ITMD and CRITFC's CMOP staff participated in the West Coast Ocean Alliance with their Tribal Caucus, assisted by a NOAA grant to enable better engagement of tribes in the WCOA and its West Coast Data Portal (WCODP) and Ocean Indicators Dashboard. In 2024, ITMD project staff served as liaison to assist the WCODP to update their integration with StreamNet's CAX integration. More information about the ITMD Project is available in their presentation at the CRITFC lunch seminar, the ITMD Five-Year Strategic Plan: 2022-2026[xxv] and in their Annual Reports.

2. Fish Passage Center's Comparative Survival Study Database

The Fish Passage Center (FPC, 1994-033-00) provides technical analysis, data summaries, and graphic representations for the state, federal and tribal fishery managers' use in developing their recommendations for fish passage management to the federal operators and regulators. One of the FPC's responsibilities includes management, implementation, and assistance in the analysis of the Comparative Survival Study (CSS; Project 1996-202-00) as directed by the Comparative Survival Study Oversight Committee. StreamNet leverages the FPC database to populate the Smolt to Adult Returns (SARs) population high level indicators in the CAX database and provides the URL to the supporting documentation describing the monitoring and analytical methods. In a previous year, StreamNet staff and FPC staff collaborated to ensure that the CSS data are appropriately assigned to the correct CAX populations because this involves deconstructing the annual CSS fish groups and aggregates back to the individual populations.

CRITFC staff worked with StreamNet staff in a prior year to identify populations appropriate to each SAR group provided by FPC so that the CSS SARs for Chinook and steelhead can be submitted to the CAX. To work out an acceptable way to submit these to the StreamNet/CAX system, StreamNet staff has defined 'superpopulations,' which are aggregates of populations. These SARs are now updated annually by StreamNet staff who access the FPC database, convert the FPC data into CAP format, and upload these into the CAX. An update was completed in February 2024.

3. US. Fish and Wildlife Service Database

The USFWS received funds from the StreamNet Project prior to 2018. In calendar year 2018, BPA and the USFWS reached agreement on funding the USFWS's previous StreamNet activities directly. USFWS has active members of the StreamNet Steering Committee and Executive Committee.

USFWS staff with the Fish and Aquatic Conservation Program (FAC) in Oregon, Washington, and Idaho collect data at 13 National Fish Hatcheries (NFHs). Those data are currently stored in two different databases (CRIS and FINS) that possess different structures. The FAC staff in Oregon and Washington are in the process of evaluating database options that will improve the efficiency of managing those data, which will substantially improve the ability to share NFH data with StreamNet partners in a timelier fashion. The NFHs in Idaho will continue to use the FINS database.

V. Results – Improved Data Sharing and Access

Work Elements:
159: Support transfer of data into secure and accessible repositories
161: Data – dissemination
189: Coordination

StreamNet continued to acquire fish data from our four partner state fish and wildlife agencies (ODFW, WDFW, IDFG, and MFWP) and our tribal partner (Colville Tribes). StreamNet continues to work with other data providers, including one federal agency (USFWS for data from the national fish hatcheries), the Shoshone-Bannock Tribes, the Nez Perce Tribe, a tribal consortium (CRITFC[1]), and the Fish passage Center (FPC), to facilitate access to population-level indicator data for the CAP Fish HLIs. These data have been collected and analyzed using a variety of funding processes and sources, only some of which are funded through BPA or other federal programs. As a regional data coordinator, StreamNet strives to provide access to all data of a given type from all sources. The BPA statement of work and work element summary that guide the work performed by StreamNet PSMFC and its partners (The Colville Tribes, IDFG, MFWP, ODFW, and WDFW) are available in CBFish.

Data submitted to StreamNet are available through multiple web-based data query tools (tabular and map based) as well as multiple data download formats. All data are available to the public from the web tools. Some partners are also provided with "read-only" access through the StreamNet API as recommended by programming best practices, such as NOAA, and to support NPCC and BPA tools. StreamNet metadata are also provided online as web services.

[1] CRITFC member tribes consists of Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Confederated Tribes and Bands of the Yakama Nation.

StreamNet harvests its own web services as part of the new, more efficient approach to querying our data. Some sensitive data, such as specific spawning locations, may be legally withheld by the submitting agency to protect the resource. In such cases, the agency may generalize locations to a larger map section (show a large stream section rather than a point). Users accessing data through the CAP Fish HLIs query system are also required to agree to the Data Use Agreement at the request of data submitting agencies.

In 2024, StreamNet data changes included:[2]

- The total number of Fish Monitoring Data records increased by 2,353 to 197,025.
- The number of redd count records climbed to 25,217 for Columbia Basin populations.
- The number of NCA natural origin spawner abundance records rose to 8,037.
- The new HCA hatchery returns had 1,598 records submitted, 20 by the Coville Tribes, 107 by Idaho, 482 by Oregon, and 989 by Washington.
- The new HCA broodstock spawning had 826 records submitted, 18 by the Coville Tribes, 32 by Idaho, 346 by Oregon, and 430 by Washington.
- The new HCA hatchery releases had 2,642 records submitted, 57 by the Coville Tribes, 95 by Idaho, 1744 by Oregon, and 746 by Washington.
- The new HCA hatchery smolt to adult return rate had 136 records submitted, 84 by the Coville Tribes, 43 by Idaho, and 9 by Oregon.

While little of this is noticeable to end users, these updates improve the smooth functioning of the database and speed up data queries. The updates also provide end users with more standardized data in downloaded spreadsheets.

Use of the API to submit and access data on the StreamNet database has continued to increase since the API became available in 2014 (Figure 8a). Recent improvements to the API have led to more partners using the API instead of the StreamNet website, leading to a decrease in StreamNet website user visits. Thus, as the API has increased in use, there has been a decrease in StreamNet website user visits (Figure 8b), because the API is addressing more of the data submitters' and data users' needs. (Figure 8a and 8b; see Appendix A for previous years).

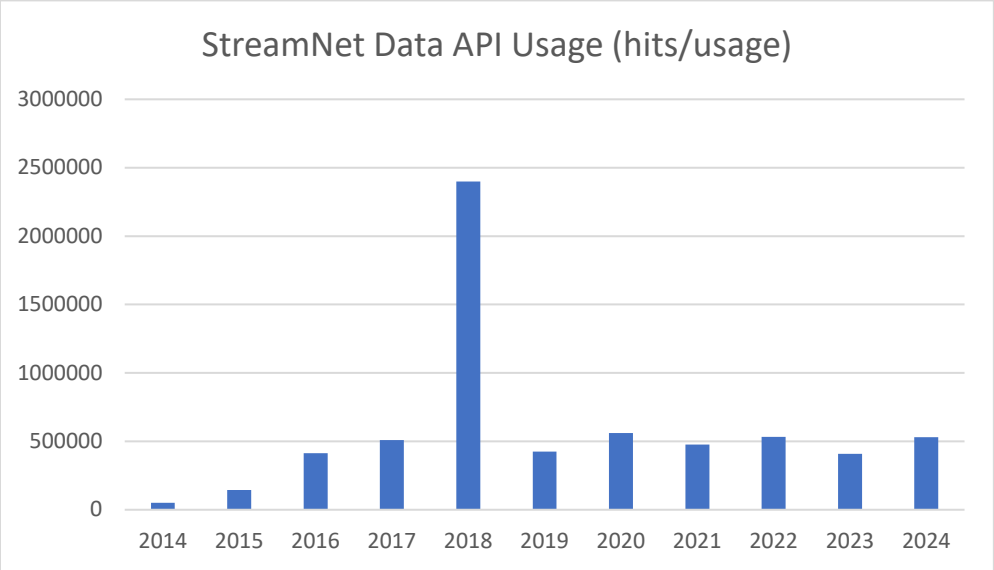

Figure 6: Annual count of times the API was used to submit/use data (2014-2024).

[2] See Tables 7, 8, and 9 for more information.

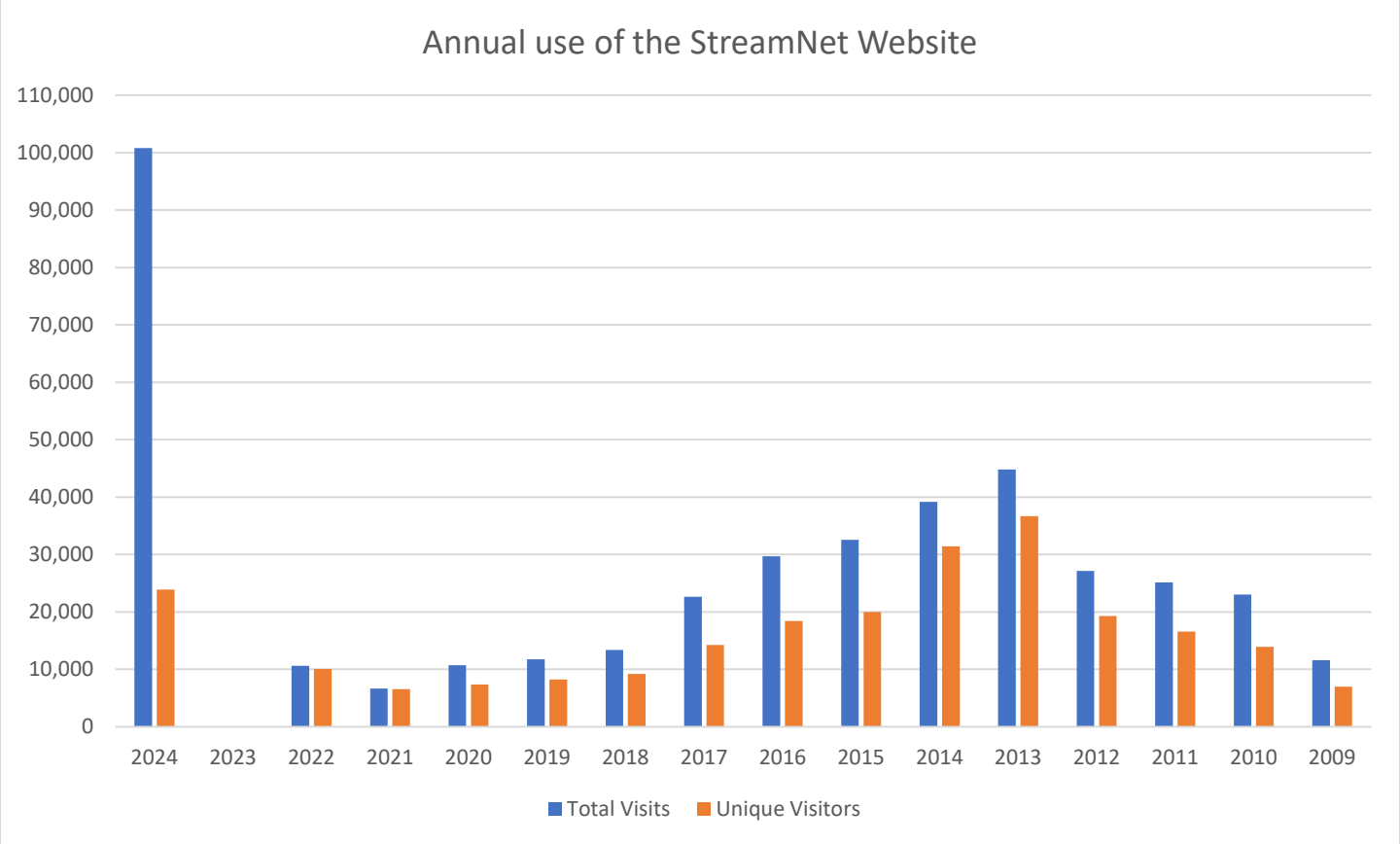

Figure 7: Total number of visits and unique visitors to the StreamNet website. Data was not available for 2023.

V. A. Data Store - Archived Data Sets and Information

Work Elements:
159: Transfer of data to secure and accessible repositories
161: Improving data sharing with and access from StreamNet Data Systems

The StreamNet Data Store serves as the default database for numerous fish population metrics such as fish habitat, and abundance. As recommended in the 2013 BPA Data Management Strategy[3] the Data Store is a repository for any BPA projects where a BPA recognized environmental data repository is not available, and can function as the interim data storage location during the development of databases for new data sets, such as fish species genetics, blood work, and enzyme analysis. BPA relies on the StreamNet Data Store as a core data repository to secure public access to data where not provided in an alternative, publicly accessible system. When a BPA project data set is uploaded to the Data Store, the project number allows pre-populating project attributes housed in the BPA database system (cbfish.org) such as contact information. In general, StreamNet partners encourage BPA project sponsors to secure data in repositories, including the Data Store. The Data Store also supports the Data Management principles of the 2014 Columbia River Basin Fish and Wildlife Program's Adaptive Management[4].

[3] Bonneville Power Administration. 2013. A Framework for the Fish and Wildlife Program Data Management: Issues and Policy Direction for Development of a Data Management Strategy and Action Plan. Bonneville Power Administration, Fish and Wildlife Policy and Planning Division, June 04, 2013.

[4] Northwest Power and Conservation Council. 2014.2014/2020 Columbia River Basin Fish and Wildlife Program. Council Document 2014-12, revised 2020. Portland, Oregon. https://www.nwcouncil.org/sites/default/files/2014-12_1.pdf

During 2024**,** StreamNet staff continued to provide support by phone and email for data contributors to the Data Store, including BPA and non-BPA funded contributors. Twenty new data sets were added to the StreamNet Data Store and approved for sharing. The following organizations provided the data sets to the StreamNet Data Store: IDFG (1 data set); Montana Fish, Wildlife & Parks (2 data sets); NMFS's Northwest Fisheries Science Center (1 data set); and US Geological Survey (16 data sets)

PSMFC also physically hosts other data storage and file repositories as a cooperator with state and tribal agencies, including:

HEP – Data and other resources from the HEP project are archived on StreamNet, at the request of BPA and the NPCC. The data and associated materials from this past program remain accessible for regional use[xxii].

HSRG – StreamNet continues to provide access to the HSRG content that was archived on the StreamNet website during 2021 with the assistance of the Columbia Basin Fish and Wildlife Library. The NPCC 2014 Program refers to the HSRG recommendations and thus keeping this content publicly accessible supports the Program's implementation. NOAA's Hatchery Genetic Management Plan (HGMP) development was informed by the HSRG effort, thus maintenance of the HSRG website and documents is needed to provide the details and rationale used in developing the HGMP[xxiii].

Protected Areas – Documents and data continued to be archived at StreamNet and remain accessible to the public on StreamNet's website and on the Protected Areas mapper.

Subbasin Plans – Documents and data continued to be archived at StreamNet and remain accessible to the public on StreamNet's website.

Over the past several years, under EPA funding, StreamNet worked to develop a new set of tables to capture data about hatchery program success and hatchery fish performance. These data types include:

1. a list of hatchery programs,
2. a list of hatchery stocks,
3. an inventory of which stocks are found in which hatcheries,
4. the number of fish returning to each hatchery,
5. data about spawning fish in each hatchery under each program (including [A] # of females, jacks, and adult males spawned, and [B] number and proportion of hatchery-origin and natural-origin fish spawned)
6. the number of fish released from each hatchery under each program, including release locations and life stages and fish size
7. smolt-to-adult return rates (SAR) of these hatchery fish.

1. The Confederated Tribes of the Colville Reservation

The Colville Tribes continues to communicate with Project Sponsors, inventory data storage and aid in securing data in accessible repositories.

2. Idaho Department of Fish and Game

IDFG StreamNet supported state and tribal project sponsors in the transfer of data to secure and accessible repositories, as well as the archiving of data sets and their metadata like the Kootenai Sturgeon and Burbot database .

3. Montana Department of Fish, Wildlife & Parks

MFWP StreamNet continued to communicate with and support sponsors in the transfer of data to secure and accessible repositories. In addition, staff submitted data types without a formal DES such as population surveys, and genetic sample information to the StreamNet Data Store as independent datasets.

4. Oregon Department of Fish and Wildlife

ODFW StreamNet staff continued to assist and encourage BPA funded, ODFW, and local project sponsors to manage or locate their data within secure and accessible data repositories, including the ODFW Data Clearinghouse and StreamNet. Staff also assisted other projects with uploading reports, that were not BPA funded, to the ODFW Data Clearinghouse.

5. Washington Department of Fish and Wildlife

WDFW continued to communicate with project sponsors, review data storage, and offer assistance to secure accessible repositories.

V. B. Fish Monitoring Data (trends)

StreamNet's Fish Monitoring Data new tabular query released in 2020 was designed so that users can quickly find and access the data they are looking for by using filters. Once located, the users can view the table of data along with metadata and a map of the monitoring location. The user can also choose to download these data into an Excel spreadsheet file or copy the URL to easily reference and share these data with others. The Fish Monitoring Data tabular query pulls data using the API and was designed to better integrate with the StreamNet website. Improvements to the Fish Monitoring Data query were initiated in 2021 to improve access to age data, and that work continued in 2024. Some of the improvements completed include the addition of population and stream name filters.

Work Elements:
159: DES and Validation Process for Fish Monitoring Data (trends) and CAP Fish HLI (CAX)
159: Fish Monitoring Data (Trends) – DES, API, Database
160: StreamNet maintaining and enhancing data management
161: Improving data sharing with and access from StreamNet Data Systems

Updating Fish Monitoring data sets was prioritized by the StreamNet Executive Committee in 2018, with emphasis on time series supporting CAP Fish HLIs and NPCC reporting tools. With the 2020 Addendum to the Columbia River Basin Fish and Wildlife Program, StreamNet updated the Fish Monitoring Data query to support specific data needs for the NPCC's Program Tracker.

StreamNet DES version 2024.1, which contains data submission standards for Fish Monitoring Data, was promulgated and implemented in 2024. A new StreamNet production database that houses the data tables for fish monitoring data, high level indicators data, and hatchery program indicators data was created in 2024. Hundreds (perhaps thousands) of changes were made (relative to the replaced production database). Existing tables were updated, new tables were added, data types were standardized on a small suite of selected types (including abandonment of all UNICODE data types), validation rules were modified as necessary by updating or adding extended properties to individual fields -- to match the new StreamNet DES, triggers were modified as needed, and more. The suite of indexes in use was evaluated; as a result, nearly all indexes were removed due to being unused or redundant, and a new suite of indexes was created with the intention of achieving better performance during data retrieval. A summary of the Fish Monitoring Data trends data sets updated in CY2024 is provided in the below table (Table 7) along with a highlight of the number of records associated with CAP Fish HLIs (Table 8).

Table 8: Summary of the number of time series data sets in the Fish Monitoring Data (trends) and Protected Areas records in the StreamNet database, by data category. This summary represents all data submitted by the end of calendar year 2024 from all geographic areas in Montana, Idaho, Washington, and Oregon (not limited to the Columbia River basin). The number of trends at the end of 2024 equaled 18,195 data sets consisting of 197,025 observations. The number of Protected Areas records has been stable since the NPCC last amended the Protected Areas in 1992. Note: beginning in 2018, fish distribution, barriers, dams, and hatcheries are being managed as GIS layers rather than as tables in a database.

Data Category	Available Data 2024 (2023)	Years 2024 (2023)	Observations 2024 (2023)
Redd counts	5,078 trends (5,060 trends)	1901 – 2024 (1901 – 2023)	58,187 (57,465)
Fish counts	444 trends (444 trends)	1956 – 2024 (1956 – 2022)	2,764 (2,714)
Spawner counts	5,119 trends (5,112 trends)	1944 – 2024 (1944 – 2023)	41,975 (41,014)
Spawning population estimates	3,099 trends (3,099 trends)	1901 – 2024 (1901 – 2023)	20,788 (20,661)
Dam / weir counts	529 trends (526 trends)	1926 – 2024 (1926 – 2023)	15,183 (14,932)
Fish abundance estimates	130 trends (126 trends)	1976 – 2024 (1976 – 2022)	1,405 (1,255)
Hatchery returns	1,091 trends (1,088 trends)	1906 – 2024 (1906 – 2023)	10,608 (10,576)
Freshwater harvest	2,705 trends (2,705 trends)	1894 – 2024 (1894 – 2022)	46,115 (46,055)
Protected Areas (P.A.)	32,997 records	n/a	n/a
TOTALS	18,195 trends (18,160 trends) 32,997 P.A. records	n/a	197,025 (194,672)

Table 9: Summary of Coordinated Assessments Partnership populations with associated time series data sets in the Fish Monitoring Data (trends) as of 12/31/2024. First column is population grouping; second column is the type of data; third column is number of extant populations (includes superpopulations) with associated time series data sets in the Fish Monitoring Data (trends) for the population group and data category indicated; fourth column is the year range for the trends; fifth column is the number of records of data in the group. Fish Monitoring Data time series data (Trends) data are generally at a smaller geographic scale than populations and are generally indexes of abundance.

Population Group	Data Category	Pops	Years	Records
Population of interest*	Redd counts	53	1947 - 2024	16,922
	Fish counts	15	1994 - 2024	1,110
	Spawner counts	14	1985 - 2024	5,467
	Spawning population estimates	7	1958 - 2023	1,250
	Dam / weir counts	12	1963 - 2024	815
	Fish abundance estimates	14	1993 - 2024	513
	Hatchery returns	12	1978 - 2024	525
	Freshwater harvest	9	1894 - 2024	1,199
Columbia River Basin	Redd counts	101	1947 - 2024	25,217
	Fish counts	22	1994 - 2024	1,988
	Spawner counts	54	1948 - 2024	13,724
	Spawning population estimates	42	1943 - 2024	4,577
	Dam / weir counts	46	1928 - 2024	3,860
	Fish abundance estimates	17	1993 - 2024	682
	Hatchery returns	31	1942 - 2024	875
	Freshwater harvest	34	1894 - 2024	3,264
Oregon Coast	Spawner counts	49	1950 - 2023	8,751
	Dam / weir counts	3	1946 - 2023	196
Puget Sound	Spawner counts	53	--	0
	Spawning population estimates	15	--	0
	Dam / weir counts	14	--	0
	Fish abundance estimates	6	--	0

**Population of interest = The 68 BPA Tier 1 and Tier 2 priority populations identified during 2015 by BPA to support their reporting requirements under the Federal Columbia River Power System Biological Opinion. These are now referred to by StreamNet as "populations of interest."*

Columbia River Basin = All population within the Columbia Basin, including the Priority populations.
Oregon Coast = Populations in Oregon coast river systems draining directly into the Pacific Ocean. These are outside the Columbia River Basin and are compiled using alternative funding.

Puget Sound = Populations in Washington draining into Puget Sound / Strait of Juan de Fuca. These are outside the Columbia River Basin. Data sets were removed in 2021 pending further discussion between WDFW and Puget Sound tribes as to which data sets could be exchanged with StreamNet.

1. The Confederated Tribes of the Colville Reservation

The Colville Tribes compiled related trends data for Summer Chinook and uploaded them to StreamNet.

2. Idaho Department of Fish and Game

Idaho compiled and delivered fish data to StreamNet as time and staffing allowed. All metric data used to derive HLIs for NCA and HCA were uploaded to the StreamNet database (e.g., redd counts, hatchery returns, weir counts). The Chinook, steelhead, and sockeye salmon redd counts, weir counts, and hatchery returns were all updated. All HLI data which were available during the year were extracted, transformed, and loaded into the CAX.

3. Montana Department of Fish, Wildlife & Parks

MFWP compiled traditional StreamNet data throughout the year and exchanged trend data consisting of 107 redd counts at 122 locations in the Columbia Basin which identified 1330 redds. Fish population and genetic data were submitted to the StreamNet Data Store as independent data sets. Fish distribution was submitted as a spatial data set and the submission included all fish distribution records in the MFWP dataset to ensure StreamNet has a comprehensive and current dataset.

4. Oregon Department of Fish and Wildlife

Oregon utilized the Trend – Evaluation, Validation, and Submission (TEVaS) internal web application to exchange 9 new and 575 updates to existing traditional trends (including updating and adding 1,113 records for escapement data only) and 19 new and 313 updates to existing references via the StreamNet API. The submissions originated from BPA-funded projects, NPCC dashboards, opportunistic connections to CA data, priority populations within the Columbia Basin, fish habitat distribution, and QAQC conducted by staff.

5. Washington Department of Fish and Wildlife

WDFW StreamNet staff continue to update HLIs for existing populations for Lower and Upper Columbia populations. As well as update any corresponding trend data.

V. C. GIS Layers Updated Content and Access

Work Elements:
160: StreamNet maintaining and enhancing data management
161: GIS Data and Metadata

PSMFC's GIS Center continues to support an integrated Columbia Basin fish facilities GIS data set. This effort eliminates multiple data sets with varying degrees of accuracy for location information and establishes a common layer which is now shared between programs. This integrated GIS data set approach continued to support StreamNet and CAP during 2021. Since BPA reinstated funding to support PSMFC GIS center's StreamNet related task in 2020, the GIS center has engaged in FMWG task groups to advance development of polygons for focal species in a standardized manner that includes manager input, has assisted in improving connections between queries and GIS tools, and is working with StreamNet to improve use of PSMFC GIS layers in NPCC, PNAMP, and BPA tools. Some of the GIS funding provided by BPA is also being applied to scoping new data integration tools, such as a screw trap dashboard that pulls information from multiple regional data systems and its ESRI dashboard prototype version was reviewed by BPA staff to inform further development.

PSMFC StreamNet's Regional StreamNet also provides links to barrier data sets that partner agencies publish publicly. These barriers data are not currently being compiled and standardized regionally. The status of this information reflects that this data category has not been identified as a priority for standardized compilation and distribution at the regional level. However, StreamNet partners are often involved in maintaining these datasets to meet internal state mandates and to inform the fish distribution dataset.

StreamNet's regional GIS Datasets including fish distribution and population boundary datasets are packaged for download and made available on the project website. In addition, spatial data are published as web map services that can be queried and leveraged by project partners via PSMFC's ESRI REST Services endpoint (https://maps.psmfc.org/server/rest/services/StreamNet). In the coming year, we plan to improve the visibility of this

resource and actively coordinate with BPA, NPCC and PNAMP to facilitate use through PSMFC's Enterprise GIS and ArcGIS Online.

The following regional GIS Datasets were updated based on partner data submissions:

- Fish Facilities (updated ~quarterly, mostly edits & additions from PTAGIS)
- Sampling locations/trends (updated as needed, attribute updates are processed via the StreamNet API)
- Fish Distribution (updated as needed, no updates received from partners in 2024. Updates are expected in 2024.)
- Population Boundaries (updates/additions of non-TRT populations as needed, attribute updates are processed via the StreamNet/CAP API)

The GIS center has also been engaged in identifying GIS layers needed to support specific BPA tasks, including:

- Assessing which GIS layers for focal species are needed to support CBFish.org functionalities, which is ongoing in 2024.
- Discussing with PNAMP MonitoringResources.org which PSMFC GIS layers they would want to include and how to make these easily accessible to them.

1. The Confederated Tribes of the Colville Reservation

GIS related tasks are not included in the StreamNet scope of work for the Colville Tribes, and thus none are submitted to StreamNet. However, information on the layout of the research (assessment units, reaches, sites) and location of fish facilities is available in an interactive map on the site okanoganmonitoring.org. The Colville Tribes also collect habitat data for Ecosystem Diagnosis and Treatment (EDT) modelling using handheld GIS tablets, and the resulting shapefiles are stored in the OBMEP database.

2. Idaho Department of Fish and Game

The generalized fish distribution layer was updated per new stream and lake survey data, the Fish Facilities layer was updated per input from IDFG fisheries staff, and the Aquatic Organism Passage aka Fish Barriers was compiled into a new feature class and will be updated annually via direct GIS Exchange with StreamNet.

3. Montana Department of Fish, Wildlife & Parks

MFWP StreamNet staff manage the agency's fisheries spatial data and post GIS layers to the MFWP Maps & GIS Resources site where they are available for viewing and download. Spatial data sets include fish distribution, fish survey locations, genetic sample locations and hatchery locations. StreamNet staff under the guidance of PSMFC submit some data sets as spatial data sets rather than tabular.

In addition to managing StreamNet data sets as GIS layers, MFWP staff outside of StreamNet also make additional fisheries GIS layers and products available to the public and partners such as aquatic invasive species information, fish stocking data, disease information and interactive maps, data dashboards and Story Maps.

4. Oregon Department of Fish and Wildlife

Updates to ODFW's fish habitat distribution (FHD) data occurred throughout the calendar year. Areas of emphasis included updates to historical habitat distribution in eastern Oregon and incremental changes to salmon and steelhead upper extent mapping in the context of a data QA/QC effort comparing against Oregon Department of Forestry managed fish presence data and fish passage barriers.

ODFW's fish habitat distribution data continue to be maintained on the December 2021 version of the National Hydrography Dataset (NHD). Plans are in place to synchronize all FHD data to the "final" September 2023 version of the NHD data during the first half of calendar year 2025. The final version of the NHD forms the foundation of the new national standard 3D Hydrography Product (3DHP) so this migration will support the ultimate transition to the 3DHP.

ODFW's short-term strategy for maintaining FHD data is to continue using ArcGIS Desktop with the Hydrography Event Management tools. Web-based Hydro Addressing tools (HydroAdd 3d) are under development by USGS. ODFW plans to transition to those when they become available – likely in 2026.

Updated fish passage barrier data were published in September 2024 and updated FHD data were published in October of 2024 to the ODFW Data Clearinghouse.

5. Washington Department of Fish and Wildlife

WDFW StreamNet GIS staff continued updates of WA NHD hydro databases and continued to support GIS needs to ensure the flow of StreamNet trend, fish distribution and CA data. In 2024 the GIS work continued to focus on fish distribution, population geometry reviews and supercode, linework and dataflow tools, AND the addition of Hatchery location ID and verification for upcoming HCAX work. With this work we synchronized StreamNet with WDFW's master Statewide Washington Integrated Fish Distribution layer and submitted new trends for new supercode locations to coordinate better with CA data. Work this year also focused on effort to centralize the StreamNet data compiling via an online feature service.

V. D. CAP Fish HLIs

Work Elements:
159: DES and Validation Process for Fish Monitoring Data (trends) and CAP Fish HLI (CAX)
159: CAP Fish HLI (CAX) – DES, API, Database
160: StreamNet maintaining and enhancing data management
161: Improving data sharing with and access from StreamNet Data Systems

The CAP Coordinated Data Partnership aims to build automated HLI sharing capability in all the data source agencies. StreamNet works with the agencies to develop procedures for internal conversion of the data to regional standards defined in the Coordinated Assessments Data Exchange Standards and continues to contribute to the coordination and standardization of monitoring data throughout the basin.

The StreamNet DES, which contains the data exchange standards for fish monitoring data, is a very mature document, leading to infrequent and usually minor changes. In 2024 the new DES version was adopted. The most significant changes were 1) locations for fish monitoring data are now submitted as spatial features rather than as measure along a routed hydrography, 2) the Trend table has new fields for BPA project number (for data collected using BPA funding) and MonitoringResources.org IDs (for data sets that have a corresponding metadata record in MR.org), and 3) we added a new reference type of "Database" for the Reference table because many data now come directly from agency databases rather than from documents. The DES changes became effective in February 2024.

The Natural CA DES, which contains data submission standards for HLI data, is also a mature product and a new official version was established in July of 2024. The most significant changes is the addition of a time series identifier to allow for easier identification of records that belong together in a time series, and a reduction in the number of fields for various population names. Also of more significance is a field in each HLI table for BPA project numbers, to document BPA funding that contributed to each data record.

StreamNet staff and members actively supported improving data sharing capabilities in the region through the CAP, such as by using an exchange network approach and dynamic web services to share data. In 2024, StreamNet supported direct data access from the CAX online tabular query and user-developed automated API downloads. Access to CA data is also facilitated by the CAP Fish HLIs mapping query system, which displays HLIs in the CAX and related Fish Monitoring Data time series stored in the StreamNet database.

With funding secured from an EPA Exchange Network (EN) grant, along with funding from BPA and NOAA IJFA, the CAP completed its work on the Hatchery Data Sharing (HCAX) DES development Project, and data providers began flowing data. The final workshop under the EPA EN grant happened in the spring of 2024, where we discussed the HCAX query system to retrieve data from HCAX, review of the updated Data Use Agreement, and check-in with data consumers to inform further refinements for analysis and reporting needs.

The CAP is closely aligned with the PNAMP Fish Monitoring Work Group (FMWG) so we can efficiently access the right expertise when needed to solve challenges related to collecting and managing data. In 2024, the FMWG helped CAP with improvements to data display for CAP Fish HLI data and using existing CAP Fish HLIs to inform adult abundance estimates for the groups identified by MAFAC and incorporated in NPCC's 2020 Addendum.

To learn more, access HCAX meeting documents on the Hatchery Data Sharing (HCAX) project page and see the draft DES on the StreamNet website here https://app.streamnet.org/ftpfiles/CoordinatedAssessments/DES/

The hatchery fish metrics and HLIs included in the pilot DES consist of four groups:

- Hatchery Program Information — such as program name, facility name, hatchery stock, species, run and agency contact.
- Hatchery Return Information — such as return year, return location, and marked and unmarked returns.
- Broodstock Spawning Information - such as number of natural and hatchery origin fish used as broodstock.
- Hatchery Release Information — such as year, location, date, and number released.
- Smolt to adult return rate Information — such as return and release location, outmigrant year, number released, and total returns.

The project is expected to be completed late in 2024. To learn more, access HCAX meeting documents at Hatchery Data Sharing (HCAX).

During CY 2024, the Shoshone-Bannock Tribes continued improving their data management and sharing capacity to flow data directly to the Coordinated Assessments Data Exchange (CAX) system instead of having IDFG submit on their behalf. The Yakama Nation's STAR data system continues to submit data. We continue to hear about improvements in the data sharing capacity of other CRITFC tribes, and we hope that this will translate to additional data being submitted to the CAX. Overall, during the calendar year 2024 the CAP partners continued to maintain and publish new records to the CAX resulting in a total of 23,434 records by the end of calendar year 2024 (Tables 9 and 10).

Table 10: Number of records of data, by high level indicator and StreamNet partner, as of 12/31/2023 and 12/31/2024. High level indicators of both natural population health and of hatchery program performance are included.

High Level Indicator	Partner*	12/31/ 2023 records	12/31/ 2024 records
Natural Origin Spawner Abundance (NOSA) ***Note that NOSA includes both escapement and true NOSA.***	Colville Tribes	117	127
	IDFG	1,468	1,495
	NPT	389	389
	ODFW	3,152	3,231
	WDFW	2,667	2,515
	YN	280	280
Presmolt Abundance	Colville Tribes	153	163
	ODFW	246	300
	PSMFC	1	1
	Terraqua Inc.	23	23
Juvenile Outmigrants	Biomark	31	0**
	Colville Tribes	101	16
	IDFG	647	700
	NPT	157	170
	ODFW	379	448
	SBT	3	12
	WDFW	527	527
Smolt to Adult Return Rate (SAR)	Colville Tribes	22	25
	FPC	1,264	1,364
	ODFW	299	363
	USFWS	16	16
	WDFW	54	54
Recruits per Spawner (R/S) ***(total value may include both adult and juvenile R/S)***	Colville Tribes	11	11
	IDFG	1,284	1,311
	ODFW	2,479	2,681
	USFWS	29	29
	WDFW	316	316
Proportionate Natural Influence (PNI)	Colville Tribes	17	20
	WDFW	183	183
Hatchery Returns	Colville Tribes	0	20
	IDFG	0	107
	ODFW	0	482
	WDFW	0	989
Hatchery Broodstock Spawning	Colville Tribes	0	18
	IDFG	0	32
	ODFW	0	346
	WDFW	0	430

Hatchery Releases	Colville Tribes	0	57
	IDFG	0	95
	ODFW	0	1744
	WDFW	0	746
Smolt to Adult Return Rate (SAR; hatchery)	Colville Tribes	0	84
	IDFG	0	43
	ODFW	0	9
Total number of records	**All combined**	**16,315**	**21,972**

* Biomark = Biomark, Inc.; Colville Tribes = Confederated Tribes of the Colville Reservation; YN = Confederated Tribes and Bands of the Yakama Indian Nation; FPC = Fish Passage Center; IDFG = Idaho Department of Fish and Game; NPT = Nez Perce Tribe; ODFW = Oregon Department of Fish and Wildlife; PSMFC = Pacific States Marine Fisheries Commission; SBT = Shoshone-Bannock Tribes; USFWS = U.S. Fish and Wildlife Service; WDFW = Washington Department of Fish and Wildlife.

**IDFG took management responsibility for these records.

Table 11: Summary of populations represented in the data as of 12/31/ 2024, by population group and high-level indicator. Groups reported are the combination of the first two columns. First column is population grouping; second column is high level indicator; third column is number of populations represented in the group; fourth column is the number of populations that are represented only as part of one or more superpopulations rather than as data specific to only a single population; fifth column is the number of records of data in the group; sixth column is the year range of the group. The third column minus the fourth column is the number of populations that were represented by data specific to only a single population (i.e., not represented only by superpopulations). The records included in the Priority group are also included in the Columbia River Basin group. Note that the Recruits per Spawner (R/S) total value may include both adult and juvenile R/S).

Population Group*	High Level Indicator	Pops	Superpops Only	Records	Year Range
Population of interest	Natural Origin Spawner Abundance (NOSA) *NOSA includes both escapement and true NOSA.*	67	1	2,920	1949 - 2023
	Presmolt Abundance	9	0	296	1993 - 2023
	Juvenile Outmigrants	44	0	1,140	1987 - 2024
	Smolt to Adult Return Rate (SAR)	58	40	435	1985 - 2021
	Recruits per Spawner (R/S)	51	12	2,306	1949 - 2021
	Proportionate Natural Influence (PNI)	4	0	170	1985 - 2023
Columbia River Basin	Natural Origin Spawner Abundance (NOSA)	170	1	7,068	1938 - 2024
	Presmolt Abundance	26	17	353	1993 - 2024
	Juvenile Outmigrants	71	4	1,640	1978 - 2024
	Smolt to Adult Return Rate (SAR)	99	74	1,640	1985 - 2021
	Recruits per Spawner (R/S)	86	14	3,429	1949 - 2021
	Proportionate Natural Influence (PNI)	5	0	203	1985 - 2023
Oregon Coast	Natural Origin Spawner Abundance (NOSA)**	56	35	969	1990 - 2023
	Presmolt Abundance**	56	56	134	1998 - 2024
	Juvenile Outmigrants	7	0	194	1988 - 2018
	Smolt to Adult Return Rate (SAR)	7	0	182	1988 - 2016
	Recruits per Spawner (R/S)	21	0	919	1986 - 2020
Puget Sound	Juvenile Outmigrants	2	0	32	1999 - 2019

*Population of interest = The 69 BPA Tier 1 and Tier 2 are priority populations identified during 2015 by BPA to support their reporting requirements under the Federal Columbia River Power System Biological Opinion.
Columbia River Basin = All population within the Columbia Basin, including the BPA priority populations.
Oregon Coast = Populations in Oregon coast river systems draining directly into the Pacific Ocean. These are outside the Columbia River basin and are compiled using alternative funding.
Puget Sound = Populations in Washington draining into Puget Sound / Strait of Juan de Fuca. These are outside the Columbia River Basin and are compiled using alternative funding.
** For the Oregon Coast, values shown in Table 10, the unique number of independent populations (21) and superpopulations (9) are reported rather than the total number of populations (56) in the ESU. ODFW does not report dependent populations that are represented in a superpopulation, due to the small scale of the estimates. Rather, the independent (21) and dependent population (35) estimates are summed up and reported together, representing a superpopulation (e.g., Oregon Coast Coho salmon ESU).

1. The Confederated Tribes of the Colville Reservation

The Colville Tribes' HLIs are housed in the OBMEP database, and a C# script syncs these data with the CAX database. In early 2024, the data steward worked with StreamNet staff to resolve remaining issues in the system connecting hatchery tables in the OBMEP database with those in HCAX, and successfully uploaded HCAX HLI data.

2. Idaho Department of Fish and Game

The IDFG StreamNet subproject can currently accomplish nearly automated submittal of data consistent with the DES through their IFWIS databases and APIs, which the Idaho StreamNet project helped to initiate and partially supports in collaboration with FINS and FPC/ACOE staff.

IDFG StreamNet expanded streamlined data flows for CAX HLI data to include new species, populations, and life stages.

Existing workflows were maintained, and/or updated.

3. Montana Department of Fish, Wildlife & Parks

CAP HLIs have not been developed for resident fish species. MFWP staff have been staying aware of work being done for the CAX project and will be prepared as work begins to develop metrics and indicators for resident species. During 2024 MFWP staff participated in testing the HCAX data flow.

4. Oregon Department of Fish and Wildlife

ODFW StreamNet acquired new and maintained existing data sets for population estimates from various contributors in the Columbia Basin. This resulted in the submission of BPA priority populations in Coordinated Assessments DES format for the Lower Columbia, Middle Columbia, Snake River, and Oregon Coast (using alternative funding source) that ODFW committed to in 2024. New fields were added and updates were made that follow new field and record-level validation rules of the DES to standardize methods and website URL's to be more consistent among similar records and populations.

In 2024, ODFW StreamNet staff developed and released a new ODFW Salmon and Steelhead Recovery Tracker (SSRT) public website (https://nrimp.dfw.state.or.us/RecoveryTracker/) hosted by ODFW. The new web site replaced the previous SSRT web site hosted by PSMFC StreamNet since 2010.

In 2024, staff continued enhancements and development of new fields and DES specifications in the internal web applications utilizing the ODFW Fish Monitoring & Data Distribution (FMDD) SQL server database that automates the processes for validation and submission to the StreamNet API. The production and test applications were finalized for the Hatchery X Hatchery Stock, Hatchery Program, Hatchery Returns, Broodstock Spawning, Hatchery Releases, and SAR Hatchery tables. The new functionality was added to support the submission of Coordinated Assessments Hatchery Origin (HCAX) data to StreamNet. Successful application testing of the API was completed and HCAX data is now routinely submitted to StreamNet using the web application. Hatchery data were compiled using improved Python-based workflows to extract data from source files and databases. Quality assurance and control (QA/QC) routines were then run on the data in the DES format for 15 hatchery programs around the state and submitted to StreamNet. In the coming year, staff plan to maintain the existing datasets and submit new hatchery programs as time and resources allow.

Using the web applications for submissions to StreamNet, for both Coordinated Assessments (natural and hatchery) and FMDD data trends, has increased efficiency, reduced potential errors, and eliminated previous methods of DES data transfers to StreamNet. Data stewards with specific familiarity with a population and project enter data directly into the new system. In 2025, staff anticipate continuing to fine-tune and enhance all Coordinated Assessments tables, design and develop the PNI table, and add the functionality for users to bulk update and upload datasets to the FMDD.

5. Washington Department of Fish and Wildlife

WDFW recently implemented the new Salmon Population Indicator database. StreamNet staff spent some time testing the new database, suggesting improvements and changes, then using the data system to enter new data as well

as update existing data. All WDFW StreamNet staff continue to load new or annually updated WDFW CA HLI NOSA data through the API.

6. CAP Co-Lead Update (PNAMP and StreamNet)

In order to ensure that the Coordinated Assessments Data Exchange (CAX) system is meeting the needs of our community, regular engagement with the users both providing and consuming data is needed to provide adaptive management of CAP processes and standards.

CAP 2024 products include:

- Tasks from the CAP workshop feedback, helping guide CAP into future years
- Engaged with several FMWG task group to receive input and, in some cases recommendations, for specific CAP/StreamNet data related topics
- Updated the Natural Coordinated Assessments DES on 7/22/2024

This effort to improve documentation and communication about CAP has also resulted in improved diagrams to describe relationships among groups (see StreamNet CAP webpages). These diagrams are also used in presentations such as presentations to CRITFC ITMD, StreamNet committees, and PNAMP Steering Committee (e.g., see Executive Committee meeting documents) . This work also helped inform the StreamNet Vision and Strategic Plan to ensure alignment in how overlap StreamNet-CAP groups and tasks are described (see StreamNet's CAP Process webpage and committees and teams webpages). Other CAP related work is described in previous sections of this report.

Since 2011, PNAMP and the PSMFC StreamNet program have collaborated to manage the Coordinated Assessments Partnership (CAP). Over time, much has been refined and improved to continue to make progress towards the CAP's overarching goal of improving the timeliness, reliability, flow, and transparency of data necessary for regional assessments and management decisions for improved environmental effectiveness. PNAMP staff work with StreamNet and Bonneville Power Administration to support the CAP. PNAMP facilitates the Coordinated Assessments Core Team meetings and related workshops as requested. PNAMP manages the Fish Monitoring Working Group that pulls together the right expertise when needed to solve challenges related to collecting and managing data. In 2024, the FMWG helped CAP with improvements to data display for CAP Fish HLI data and using existing CAP Fish HLIs to inform adult abundance estimates for the groups identified by MAFAC and incorporated in NPCC's 2020 Addendum. PNAMP also supports StreamNet staff's leadership of the DES Development Team (DDT), which maintains and provides updates to the DES. Participants in the CAP represent four states, six tribes, an inter-tribal consortium, and multiple federal regulatory agencies; all with an interest in collaboratively sharing fish population data for informing decision-making and reporting for fish populations in the Pacific Northwest. This work benefits from the existing facilitation framework provided by StreamNet, PNAMP, and the substantial cost share contributions from the Bonneville Power Administration. In addition, the project has benefited from multi-year grants from EPA to support HLI development and data sharing.

V. E. DES and Validation Process for Data and HLIs Submitted to the StreamNet Database

Work Elements:
159: DES and Validation Process for Fish Monitoring Data (trends) and CAP Fish HLI (CAX)

StreamNet maintains a thorough data validation system as detailed in the approach/methodology section. During CY2024, StreamNet PSMFC staff developed and gathered proposed changes to the DESs for both the CAP HLIs

and for the fish monitoring data (StreamNet trends). These proposals were included in the draft/working copies of the DES versions. The StreamNet trends DES update was implemented at the very beginning of CY2024. During CY2024, the Natural CA DES version adopted in July 2020 (Coordinated Assessments DES documents for current version (20200715)) was updated effective 7/22/2024. The charter adopted for each DDT (see team document table for CAP DDT Charter and SN DDT Charter) remains in effect and along with the updated 2021 version of the Data Exchange Standard Development and Revision Procedures.

The collaboration between StreamNet and PNAMP to leverage the PNAMP Fish Monitoring Work Group (FMWG) to generate recommendations to the StreamNet Executive Committee for improving data display continued to be very active in 2024 (see task group and products). We expect to continue leveraging this collaborative approach to inform tasks that benefit from broader input including DES, new data categories, and data display/queries.

1. The Confederated Tribes of the Colville Reservation

The Colville Tribes provided feedback for CAX and HCAX DESs and continued to apply the CA DES to the processing and submitting of the 6 HLIs. The HCAX DES was applied to the processing and submitting of HLI's for the Chief Joseph Hatchery in 2024.

2. Idaho Department of Fish and Game

IDFG StreamNet staff continued to support the development and maintenance of Coordinated Assessments DES and CAX database, including expansion into the HCAX. They coordinated with development between the proposed DES, the prototype database and application, and the web service data exchange. IDFG StreamNet staff completed, corrected, and standardized data source workbooks for natural origin HLI data, and for hatchery origin HLI data.

IDFG StreamNet staff collaborated with PSMFC staff to update validation rules and used web services to exchange data between IDFG, StreamNet, and the CAX databases. They also helped regional staff test updates to DES and validation.

IDFG StreamNet staff collaborated with PSMFC staff to update validation rules and used web services to exchange data between IDFG, StreamNet, and the CAX databases. They also helped regional staff test updates to DES and validation.

3. Montana Fish, Wildlife & Parks

In 2024, MFWP staff participated in testing the HCAX data flow. MWFP staff will be ready to engage when CAP indicators and DESs are developed for resident fish.

4. Oregon Department of Fish and Wildlife

ODFW staff continued to contribute input to CA DES (natural and hatchery origin) and Fish Monitoring Data (FMD) (trend data) discussions, technical meetings, and email correspondence throughout the year. Significant participation went towards discussions involving the Hatchery Coordinated Assessment Exchange (HCAX) with Regional StreamNet partners testing the pilot hatchery data exchange standard (DES) and database tables, including look-up lists, field names, and associated definitions. ODFW participation in the CAP process for the Quality Assurance Quality Control (QA/QC) Plan (adopted 2022) was suspended by the Steering Committee until 2025. Staff continued involvement with workshops to improve general data display, super population display, screw trap web map and data standards, MAFAC data display, juvenile data standard development, connecting BPA projects and Monitoring Resources Study Plans (MonitoringResources.org) to metadata for FMD (trends), and to standardize terms and definitions across all DES's.

ODFW staff continued participation as a Core Team member of the PNAMP Fish Monitoring Workgroup and in the CA Terms and Definitions Fish Monitoring Workgroup task. Staff also participated in the PNAMP and StreamNet hosted Emerging Technologies Information Sessions as part of the organizing and coordination team.

5. Washington Department of Fish and Wildlife

WDFW participated in CA DES development discussions and meetings with the CA DES Development Team (DDT). WDFW SN Staff continued to map the CA DES to ETL processes in our own internal corporate systems for the three primary CA indicators in 2024. Began work on Hatchery HLI DES. This was successfully tested in Autumn of 2024

V. F. Metadata Documentation

Work Elements:
160: Infrastructure/equipment and base operations
160: Metadata Documentation

During 2024, metadata continued to be captured for data submitted to the StreamNet databases. The metadata captured differed depending on whether the data were submitted to the CAP Fish HLIs (CAX data system) or the Fish Monitoring Data (StreamNet trends data system), as described in Section IV.H. The Data Store online upload process requires that the organization uploading the data set provides descriptive information (metadata) before the data set is accepted. For data from projects funded under the Fish and Wildlife Program, the application pre-fills some project-related metadata fields directly from the BPA CBFish.org database. All metadata are included whenever users download data sets. The amount of detail regarding sampling methodology and other key aspects is dependent on the person providing the metadata and uploading the data set. Data Store metadata constitutes an extension to the FGDC Biological Profile metadata standard.

The metadata requested by the StreamNet data systems is summarized below for each system:

- Fish Monitoring Data

  Due to the very large volume of individual records of fish monitoring data, each independent of all the others, metadata provided, by necessity, are limited.

  Each time series ("trend") has the following time series-level metadata:
  -- associated hatchery, if any;
  -- associated dam, if any;
  -- whether all known historical data are included;
  -- whether the time series is continuing to be added to the StreamNet database, and if not then why;
  -- organization that created the time series and is responsible for updates;
  -- comments associated with a time series;
  -- date and time the time series record was last updated.

  Each record of data for annual counts/estimates contains the following record-level metadata:
  -- general approach to field methods and calculation methods;
  -- comments associated with each individual annual record;
  -- organization that created the record and is responsible for updates;
  -- whether a regularly-scheduled annual measurement is unavailable, and why;
  -- a citation for a reference document where the data come from;
  -- date and time the record was last updated.

  In addition, when a fish monitoring data set is obtained from the StreamNet online query system it is given a time stamp to indicate the time at which the data set was created.

- CAP Fish HLIs

  Each record of data for fish HLI estimates contains the following record-level metadata:
  -- comments associated with each individual annual record;
  -- organization and contact person information for questions about the record;

-- whether the value of that record is considered the providing organization's best available estimate (when multiple reasonable estimates are provided by that organization);
-- protocols used to produce the HLI estimate (provided as name(s), URL(s), or document citation(s));
-- whether the methods cited were adjusted when making this estimate;
-- complete list of organizations that contributed to the estimate;
-- whether a regularly-scheduled annual estimate in a time series is unavailable, and why;
-- status of the data provided (draft, reviewed, or final);
-- location where the source HLI is available;
-- location(s) where "metrics" used to calculate the HLI are available;
-- location(s) where field measurement data used to calculate the metrics are available;
-- a citation for a reference document where the data come from;
-- date and time the record was last updated.

In addition, when a fish HLI data set is obtained from the CAX online query system it is given a time stamp to indicate the time at which the data set was created.

- Data Store

  The StreamNet Data Store uses and enforces the federal FGDC metadata standard, modified for Pacific Northwest fish data sets that are assumed to not have a GIS component.

- GIS Data

  All published GIS Data include FGDC compliant metadata with feature/record level metadata as provided by data compilers and set forth in the DES.

During CY2024 StreamNet staff continued to work with PNAMP staff to explore how metadata documentation could be facilitated by connecting StreamNet data sets to the records in Monitoring Resources (MontoringResources.org) and what options and associated level of effort would be required to achieve this connection.

StreamNet has continued with the success of the QA/QC work to review record metrics and metadata (see QA/QC plan for details on the pilot approach). During 2024, StreamNet staff engaged with partners to expand the previous review to more records per review and more diversity in HLI records. The next QA/QC review will occur in CY2025.

During 2023, personnel from PSMFC and CRITFC worked together to develop a user interface to transfer ownership and maintenance of database records in the Reference table of the StreamNet database at PSMFC to the Columbia River Fish and Wildlife Library at CRITFC. This new user interface, created by PSMFC, allows Library staff to make corrections and other changes to references data. The user interface includes automating creation of citations in standard AFS format, and these standard citations can be modified if necessary. Once a record is changed in any way by the Library, access to make further changes is transferred to the Library, and the original creator of the record can no longer modify or delete it. This tool has proved very useful to ease and accelerate Reference table record updates and management and it's use has continued through 2024.

1. The Confederated Tribes of the Colville Reservation.

The metadata related to the compilation of field data used for HLIs are housed in MonitoringResources.org. Links are provided in the HLI tables uploaded to the CAX (also available on the okanoganmonitoring.org website).

2. Idaho Department of Fish and Game

IDFG continued to create and update metadata for all data submitted to SN and CAX per the DES. Sampling and analysis protocols, and links to data sources were updated. Metadata are included in the GIS data, and in documents for non-GIS data. Hyperlinks to the most current reference documents in the IDFG and CRTFIC libraries were updated.

3. Montana Department of Fish, Wildlife & Parks

MFWP StreamNet staff created and updated metadata for all spatial data sets submitted to StreamNet or posted on the MFWP Maps & GIS Resources site. Metadata was completed for all data submissions to the StreamNet Data Store.

4. Oregon Department of Fish and Wildlife

ODFW StreamNet staff updated and standardized metadata within existing records in the Coordinated Assessments (CA) DES and updated or created metadata and data analysis flow diagrams for in-house datasets used to calculate and report high-level indicators. Additionally, ODFW StreamNet submits references associated with Fish Monitoring Data (FMD), Coordinated Assessments, and fish habitat distribution data to the Columbia Basin Fish and Wildlife Library and contributes references, data, GIS files, and metadata to the ODFW Data Clearinghouse.

In 2024, staff continued reviewing, editing, and validating FMD (trends) and CA records to identify potential improvements to protocol/method name and URL, method adjustments, trend status, historic status, and general comments associated with internal database records and information stored at StreamNet. Work will continue in 2025 in combination with the StreamNet Quality Assurance and Quality Control Plan (2022), CAP QAQC web application tool, and connecting BPA projects and Monitoring Resources Study Plans (MonitoringResources.org) to FMD metadata.

Preparations began for a large effort to add the new DES field TimeSeriesID to all East Region Fish Research records and to improve standardization to other metadata fields.

5. Washington Department of Fish and Wildlife

WDFW StreamNet staff continued to work with contributing biologists to document methodologies and update them within our corporate reporting systems. The development of formal metadata for CAP data and beyond will greatly aid efforts to document data origin, protocols used to collect the data, and uses of the data.

V. G. Data Backup Systems

Work Elements:
159: Transfer of data to secure and accessible repositories160: Infrastructure/equipment and base operations

In 2024, server infrastructure was stable, and backups were performed on all systems and data by the PSMFC IT staff.

The StreamNet staff continued to create supplementary data backups each month. No changes in data backup systems were made in 2024. Annual testing of database restore function was initiated and tested. Previously, this was done only intermittently.

V. H. Supported Reporting and Decision-Making Processes

Work Elements:
189: Coordination and Outreach
161: Reporting and Decision-Making Processes
119: StreamNet project administration
132: Produce annual progress report for CY2023

Regular meetings were held for ExCom and SN SC. Agendas were formulated, issues discussed and resolved where possible, and priorities were set. Reporting and posting of notes and decisions was facilitated via the StreamNet website. Subcontracts were executed and invoices tracked. New SOW and budgets were developed and provided to BPA. An inventory list and cost share report were developed and provided to BPA. All StreamNet funded partners

engaged in meetings and related products, as well as contributed to the contractual reporting requirements. In summary,

- Colville Tribes
  - Participated in StreamNet Technical and Steering committee meetings as well as the DES Development Team. Budgets effectively tracked and managed.
  - Provided input that informed the quarterly status review, the Annual Report and Cost Share report.

- IDFG
  - IDFG StreamNet staff, budgets, and resources were effectively managed to meet all program objectives.
  - Provided input that informed the quarterly status review, the Annual Report and Cost Share report.

- MFWP
  - MFWP StreamNet staff participated in project management, StreamNet Technical and Steering committee meetings. Budgets were effectively tracked and managed. Staff participated in all relevant budget and Statement of Work discussions and provided input to the SOW and budget.
  - MFWP StreamNet staff provided input that informed the quarterly status review, the Annual Report and Cost Share report.
- ODFW
  - ODFW StreamNet staff participated in project management, StreamNet Technical/DES, Steering Committee, and Executive Committee meetings. Staff were effectively supervised, and budgets were tracked and managed throughout the year. ODFW StreamNet staff provided input to Statement of Work and budget discussions and submitted updated inventory reports to Regional StreamNet.
  - ODFW StreamNet staff summarized activities in preparation for completing the Annual Progress Report. Staff provided input for the Annual Report and participated in editing efforts. Staff also provided input that informed the quarterly status review and Cost Share report.
  - The long-time manager of ODFW's Natural Resources Information Management Program and StreamNet Steering Committee member (Cedric Cooney) retired on May 1, 2024. Jon Bowers, ODFW's GIS Coordinator, filled a job rotation as the NRIMP Manager on June 1, 2024 which is scheduled to run until 6/30/25.

- WDFW
  - WDFW StreamNet staff participated in project management, StreamNet Technical and Steering Committee meetings. Staff were supervised, budgets were tracked and managed throughout the year. Staff provided input to the SOW and budget.
  - WDFW StreamNet staff provided input that informed the quarterly status review, the Annual Report, and Cost Share report.

StreamNet continued to support BPA's mandate to have data sets collected using rate payer funding be publicly accessible in a web-based data repository by facilitating submittal of data sets to the StreamNet Data Store. The availability of CAP Fish HLIs estimates through the CAX has facilitated BPA's "One Fish Two Fish" tool to pull information from the CAX database as well as other data sources to display these on an interactive web-tool that communicates the status of ESA-listed salmon and steelhead populations (http://www.onefishtwofish.net/sps/SPS3.html).

BPA also manages a web-based project contracting tool, CBFish.org, which contains annual reports of BPA funded projects, several of which submit their data to the StreamNet Data Store, CAP Fish HLI, and/or as a time-series (trends). To secure access to these supporting project documents that contain information on how data are collected and analyzed, StreamNet PSMFC staff provide the CBF&W Librarian with these documents and the Library provided stable Library URLs for those documents submitted along with a data set. Library URLs for other documents associated with a data set are also being provided.

NOAA staff involved in the data compilation to inform the 5-year status review of Pacific Northwest salmon and steelhead populations continue to participate in the CAP and StreamNet committees and teams to inform the content of the CA Fish HLI data exchange to support their data needs. NOAA Fisheries uses the natural origin salmon and steelhead

data in CAX to inform their status reviews and regulatory management decisions. The CAP Fish HLI data exchange has greatly reduced the time and effort required by NOAA Fisheries staff to obtain and process data for their Pacific Northwest salmonid ESA status assessments. StreamNet staff continued to assist NOAA staff and respond to their requests during this calendar year. StreamNet's use of the PNAMP FMWG to address needed improvements to data accessed from StreamNet is also serving to inform changes to better support reporting and decision-making needs.

StreamNet Staff continued to provide support to NPCC staff and their Program Tracker contractors. NPCC staff continued throughout to use and rely on the Protected Areas mapper and associated database and documentation to inform their decisions related to whether proposed new hydroelectricity development is consistent with the NPCC FW Program policy. Furthermore, StreamNet databases and maps support NPCC FW Program reporting needs related to tracking the status of the basin's fish and wildlife resources (2014 FW Program Part Two, section V), reporting on the program's approved high-level indicators (2014 FW Program Appendix D), and tracking progress towards Program goals, objectives, and indicators (2014 FW Program Appendix C and its draft 2020 Addendum Part 1A). NPCC also has several online reporting tools that rely on StreamNet's Fish Monitoring Data query and the CAP Fish HLIs query including their mapping tools and Program Tracker. StreamNet maintains an API that allows NPCC to retrieve, in an automated way, data from the CAP Fish HLIs and specific sets of detailed Fish Monitoring Data "trend" for use in NPCC online reporting tools. During this calendar year, StreamNet continued developing and published the MAFAC dashboard to display Columbia Basin Task Force Partnership goals for natural origin adult abundance and available estimates for populations within the CBTFP stocks. The MAFAC dashboard also demonstrated how content related to data status for populations without CAP Fish HLIs estimates could be displayed based on recommendations from the FMWG Data Display Task Team.

StreamNet staff are also serving on the PNAMP Fish Monitoring Work Group (FMWG) Core Team, assisting PNAMP in the organization and identification of topics for the FMWG. StreamNet staff engagement and assistance focuses on the tasks that aim to support the Coordinated Assessments Partnership and StreamNet by providing a venue for discussion of topics to inform tasks with appropriate subject matter experts (e.g., fisheries biologists, program managers, etc.). During this CY recommendations were provided to the StreamNet Executive Committee on improving the CAP Fish HLIs display, CA DES terms and definitions review, and other task groups co-lead by StreamNet PSMFC staff were initiated and are ongoing. See the PNAMP FMWG website for more details and access to task group documents.

1. The Confederated Tribes of the Colville Reservation

- Data collected by the Colville Tribes and calculated HLIs are publicly accessible via both the okanoganmonitoring.org website and the 'Colville Tribes Okanogan Monitoring and Evaluation Program Report Card' (https://ecosystems.azurewebsites.net/hstr-okanogan/).
- Both websites are accessed to inform decisions related to habitat management projects and steelhead population restoration efforts.

2. Idaho Department of Fish and Game

- IFWIS and StreamNet data compilation and access tools were used by IDFG and other organizations for research and management purposes.
- Researchers and policy makers used the data to answer research questions in journal manuscripts, annual reports, fishery management plans, updates to status assessments, and ESA compliance.

3. Montana Department of Fish, Wildlife & Parks

- MFWP data and information websites continue to provide access and the ability to share data for resident fish species important to the NPCC FW Program. These include:
- The Fisheries Information System (FIS) is the internal data entry and reporting tool for MFWP fisheries biologists. It is available through the agency internal website and holds survey data, individual fish information, distribution, tagging data and hatchery data to name a few. FIS also contains sophisticated analysis tools which incorporate the use of R statistical code. This application puts the data entry, analysis and reporting in the hands of biologists and data are continually updated.
- FishMT is a public facing web application that provides users with access to vast amounts of fish and fishing information. Through FishMT the public can get information related to fish stocking records, survey data, species distribution, reports, publications and more. In addition, users can find fishing opportunities, report catching tagged fish and link to Montana's fishing regulations.

4. Oregon Department of Fish and Wildlife

- Currently, ODFW maintains and provides access to salmon and steelhead information and data through several websites:
    - Data Clearinghouse (https://nrimp.dfw.state.or.us/DataClearinghouse/default.aspx?p=1) stores natural resource information, including reports, data files, databases, GIS files, maps, and pictures from natural resource projects. This includes agency projects that provide CA data for recovery populations, and Oregon Watershed Council projects funded by the Oregon Watershed Enhancement Board, and other partners implementing the Oregon Plan for Salmon and Watersheds.
    - ODFW Salmon and Steelhead Recovery Tracker website (https://nrimp.dfw.state.or.us/RecoveryTracker/) allows exploring and downloading information related to salmon conservation and recovery in Oregon.
    - Centralized Oregon Mapping Products and Analysis Support System (Compass, https://www.dfw.state.or.us/maps/compass/). This online fish and wildlife habitat map provides coarse-scale, non-regulatory fish and wildlife information, and crucial habitat layers emphasizing areas documented as containing important natural resources. Compass is intended to support early planning for large-scale land-use, development, or conservation projects, helping users make informed decisions related to fish and wildlife habitats as energy, transportation, conservation, and other large projects are planned.
    - Fish Habitat Distribution and Barrier Data Viewer (https://nrimp.dfw.state.or.us/FHD_FPB_Viewer/index.html) facilitates access to ODFW stewarded data sets for fish habitat distribution and fish passage barriers.

- ODFW's Inland Fish Science Program initiated an effort in 2024 to implement data standards, standard operating procedures, and an overarching governance framework to realize efficiencies with data management and decision support.

5. Washington Department of Fish and Wildlife

- Washington Department of Fish and Wildlife (WDFW) manages multiple data resources which provides up-to-date information on populations and provides context for the efforts WDFW and its partners are taking in the arenas of habitat, hatcheries, and harvest to protect and conserve salmon and steelhead in Washington. These databases have benefited from advances funded through StreamNet and include:
- •SCoRe Interactive Map allows the user to explore salmon and steelhead hatchery and population data and related information by salmon recovery region, county, lead entities, and by water resource inventory area (WRIA).
- •SalmonScape delivers the science that helps recovery planners identify and prioritize the restoration and protection activities that offer the greatest benefit to fish. SalmonScape merges fish and habitat data collected by state, federal, tribal, and local biologists and presents them in an integrated system that can be readily accessed by other agencies and citizens. SalmonScape is an interactive mapping application designed to display and report a wide range of data related to salmon distribution, status, and habitats.
- •The Fish Traps & Surveys (FTS) replaces and modernizes the Spawning Ground Survey (SGS) database and is designed as a repository for unexpanded data collected during spawning ground surveys and from adult traps. It is intended to provide a common framework for the collection, storage, retrieval, and dissemination of data collected by public and private entities. It includes status and trends of Coastal, Puget Sound, and Columbia Basin salmonid stocks. WDFW Continues to build out mobile reporting apps to contribute to FTS data collection.
    - •CWTS Recovery Database live updates posted to Data.WA.Gov website.

V. I. Coordination with Partners and Responding to Data and Information Requests

Work Elements:
189: Coordination and Outreach
189: Supporting Data Requests

StreamNet contributed to the sharing of standardized monitoring data throughout the basin by continuing to engage our relatively new partners (the Shoshone-Bannock Tribes) and chairing the DES Development Teams. StreamNet staff continued to work with partners in IDFG, Colville Tribes, MFWP, ODFW, CRITFC, and WDFW to promote data standardization within agencies. In addition, StreamNet participated on several efforts lead by PNAMP, including PNAMP's fish monitoring work group (FMWG). The StreamNet-PNAMP tasks focused on further enhancing the implementation of the tasks developed from the 2023 CAP workshop, along with current funding received from an EPA Exchange Network Grant and Bonneville Power Administration. StreamNet-PNAMP tasks initiated in CY2024 include:

- Support data use and understanding through review and update of CA DES terms and definitions for both natural and hatchery DESs.
- Planning for the 2025 ETIS webinar series
- Support CAP task management, facilitation, and implementation in a manner consistent with the Five-Year Coordinated Assessments Partnership Work Plan.
- Schedule, lead, and attend regional coordination meetings regarding topics supporting CAP tasks and activities.
- Facilitate work sessions with data providers (biologists and data stewards) to improve data integrity (new fields and existing DES) and data fields.
- Further investigate options for improving the connection among CAP Fish HLIs, PNAMP MR.org, and CBFISH.

We continue to adhere to the 2021 updated DES change procedures, which included new DES implementation rules to lengthen to two months the time between DES adoption and implementation. We also adhered to our updated communication practices to data providers, to ensure all parties have a chance to respond to and implement these changes in their systems before they are adopted on the main database / API. The PSMFC StreamNet staff continue to provide partners with release notes when DES changes occur so that the automated exchange process can be updated and ensure the continued flow of data.

PSMFC StreamNet continued to

- engage in the CAP Core Team which serves to coordinate among StreamNet, CRITFC-ITMD, NOAA, BPA, and states.
- organize and chair the StreamNet Steering Committee meetings and update the StreamNet Executive Committee.
- collaborate with and assist with partners submitting data to the StreamNet and CAX databases to improve data flow to the CAX and access to CAX HLI and related data.
- convene and chair DES team meetings and SN Tech Team meetings to inform DES development/improvements.
- coordinate with PNAMP, including leveraging the PNAMP FMWG to convene a broader group of experts, including biologists, to inform tasks to enhance StreamNet products and data flow/access.

PSMFC StreamNet also regularly engages, on an individual basis, with USFWS, NOAA, BPA, CRITFC, PNAMP and NPCC staff to be informed about each entity's needs and how coordination can be enhanced.

Direct requests for information or help have become less frequent over the years, as the StreamNet web site has been more stable, and our online services more robust. Automated validation checks prevent many problematic data

records from being added to the database. The QA/QC review process has also improved the data records both new and existing in the CAX.

1. The Confederated Tribes of the Colville Reservation

The Colville Tribes staff participated in the StreamNet Executive and Steering Committees, StreamNet Technical Team, and DES Development Teams.

The Colville Tribes' anadromous division continued to coordinate with other separately funded Colville Tribes programs such as the Chief Joseph Hatchery and the Resident Fish Department to keep them informed of the efforts and data structure the Colville Tribes use for the Coordinated Assessments Partnership.

The Colville Tribes responded to approximately 35data requests this year which were either met by directing users to appropriate data sources, or by running specific queries in the OBMEP database to fulfill the request. Requests are for tables, charts, and GIS information.

2. Idaho Department of Fish and Game

IDFG StreamNet staff participated in the Steering Committee and Technical Committee. They supported development of DES and streamlined data flows. They provided input prioritizing indicators, metrics, and metadata. They also participated in CA DES development, and Fish Monitoring Work Group (FMWG) meetings and projects. They helped plan and implement the Emerging Technologies Information Session (ETIS).

Staff coordinated data management and analyses with tribal collaborators. Staff also updated and improved data source workbooks and databases in cooperation with research and hatchery staff.

IDFG StreamNet staff responded to data requests coming from internal and external partners, and the general public. The number of data requests continues to decrease as the number of IFWIS, SN, and CAX users increases, and people find data for themselves.

3. Montana Department of Fish, Wildlife & Parks

MFWP StreamNet staff responded to all data and map requests coming from internal staff, partners, and the public. Many external data requesters are referred to the FishMT web query system or the MFWP Maps & GIS Resources site to meet their needs. Internal requests consist of data queries and map requests that internal staff cannot complete themselves. In 2024 MFWP GIS staff received 17 fisheries related map or data requests during the calendar year and all requests were fully satisfied.

4. Oregon Department of Fish and Wildlife

During 2024, ODFW staff participated in and contributed to the CAP DES Development Team (DDT), Hatchery Coordinated Assessments Exchange (HCAX) Development Team, provided a leadership role as part of the Core Team for the PNAMP Fish Monitoring Work Group (FMWG), NPCC webinars, and the StreamNet Technical and Steering Committee meetings, along with state and other regional discussions, workshops and planning efforts related to trend data development and CAX data flow.

Oregon StreamNet staff responded to data requests coming from internal and external partners and StreamNet staff and partners, with GIS, data and technical support requests being the most frequent. Agency staff are also utilizing StreamNet funded staff as a resource for assistance with developing data standards and responding to data requests. The East Region StreamNet staff assisted Fish District staff with knowledge and resources for local and historical data. Staff also responded to requests from StreamNet partners.

ODFW staff continued involvement with workshops related to a juvenile density data standard development, connecting Fish Monitoring Data (FMD) (trends) to BPA projects and Monitoring Resources (MR) Study Plans (MonitoringResources.org), and workgroup standardizing terms and definition across all DES's.

East Region Fish Research conducted a 'Status and Trends' presentation to ERFR biologists, East Region Fish Districts and other ODFW staff. Subjects included updates on CA reported data and trends of ESA listed fish in ODFW East Region. ERFR staff provided HLI data and historical context to ODFW staff for inclusion in the Lower Snake River Compensation Plan Steelhead ISRP review.

5. Washington Department of Fish and Wildlife

WDFW StreamNet continued this year to participate in the CA process. Attention was given to DES development efforts, working with other agencies on overlapping populations, and continued development of data flow. Staff developed the code and processes to update CA tables with final products.

In 2024, WDFW collaborated with CA partners to develop and submit a hatchery CAX grant proposal and preliminary scoping. WDFW StreamNet also participated in PNAMP Fish Monitoring Work Groups, to be informed of what the different work groups are working on as well as informing the work group with the correct people who have the knowledge and can contribute to what they are trying to accomplish.

WDFW StreamNet staff responded to data requests coming from internal and external partners, and the general public, with GIS, data, and tech support requests being the most frequent.

VI. Discussion – Recommendations and Lessons Learned

StreamNet serves as a regional coordination body to support data management and exchange and facilitate cooperation across organizational and administrative boundaries. StreamNet supports coordination through establishing and implementing regional data exchange standards for a specific suite of fish monitoring data (time series trends) and CAP Fish HLIs for natural origin (NCA) and hatchery origin (HCA) data, with a long-term goal of extending coverage to additional metrics of regional importance. These data have traditionally been created and managed disparately by the region's state, Tribal, and federal fish management agencies or programs, and the StreamNet data systems provide access to these data in a consistent format as developed and agreed upon by the data providers. The success of StreamNet relies on its staff and partner and member organizations' support and capacity to submit information per the requested format to facilitate access to information used for regional needs. The dynamic arena of data management and technology provides challenges and opportunities that StreamNet must tackle to be responsive to data providers' and consumers' needs. These needs include improving processes and tools to both enhance access to quality data and strengthen proper use and attribution of data, while lessening the burden on data providers.

The diversity of data maintained by StreamNet addresses the different regional needs ranging from providing access to publicly funded data (such as via BPA ratepayers) to providing a common source of manager-approved data sets to inform regional decisions. With the development of CAP's data exchange, it has become the primary method of access for regional reporting and management decisions for NOAAF, BPA, NPCC, and others for the data it holds. There is consistent interest in expanding the data categories within CA to provide the same level and types of access to more datasets.

In recent years, these regional needs have become clearer and the approach used by StreamNet and CAP has been recognized as highly effective. The StreamNet Executive Committee should leverage this success to continue to improve data access for BPA, NOAA, NPCC, and USFWS assessments and reporting needs, and to assist StreamNet, CAP, and its participants in securing funding to advance this work, whether through short-term grants or contracts or longer commitments (e.g. multi-year agreements or project funding).

As this data exchange expansion occurs, it is important to keep in mind the limited resources available within partner agencies and tribes, to ensure that adequate time and support are provided to maintain the resources that have been developed, and that all new tasks or data categories added are factored into the long-term maintenance and funding plans. These limited resources are further constrained by funding that does not incorporate or plan for inflation and the associated increases in cost of living.

Below we highlight some recommendations and lessons learned to further strengthen the StreamNet Program and its value to regional reporting and decision-making processes.

VI. A. Recommendations

1. Support Regional Data Stewardship

A critical component of StreamNet is being able to financially support data management staff within StreamNet partners (Colville Tribes, IDFG, ODFW, MFWP, and WDFW). These positions, generally called data stewards, establish and maintain data flow from data collection, compilation, analysis, upload, and continued quality control maintenance.

This direct support is instrumental in ensuring that relevant BPA-funded data are submitted on a regular basis to StreamNet data systems in the agreed upon formats. At the same time, integrating data stewards within agencies and tribes allows for development of more efficient internal data flow before any external data sharing agreements are required. The full data life cycle is essential to regional management decision and reporting needs, from collection, compilation, transformation, uploading, and validating to StreamNet data exchange standards. This funding should have cost of living adjustments structured into the contract to promote incumbent retention and development.

BPA's funding of the StreamNet Project and the data steward positions included with it has generally been level and at times reduced. In the NPCC 2019 Mainstem/Program Support, NPCC recommended in their Council Planning Budget an increase to set the StreamNet budget to $2,145,483 as well as stating in their 2020 Program amendment that activities, including public access through centralized database, must continue to be adequately supported to align with their data stewardship, quality, and access needs identified in their Fish and Wildlife Program. Funding for positions must be structured to account for regional cost of living increases per calendar year and recognize the increased value of incumbent staff in positions over time for long-term projects such as StreamNet.

StreamNet staff have endeavored to address level and shortfall funding over the years through resiliency measures and additional funding. The StreamNet Program Manager has taken on additional projects to cover funding gaps and has assigned some StreamNet staff hours to assist on other projects. Additional funding from NOAA IJFA (September 2021-August 2025) and EPA Exchange Network Grant (December 2020-September 2024) were secured. The combined funding from BPA, EPA, and NOAA-IJFA allowed StreamNet to further support data management and sharing capacity of the Shoshone-Bannock Tribes; coordinate with PNAMP to support FMWG task teams that informed improvements to StreamNet data products; develop and implement data exchange standards for hatchery fish HLIs within CAP; and given the small StreamNet PSMFC staff, allowed StreamNet to employ independent contractors to advance several priority tasks including the MAFAC Dashboard.

Recommendations:

- Financially support data stewards throughout the Columbia River Basin, especially for Tribal partners currently without data stewards. Staff positions fulfilling tasks related to data stewards, such as data coordinators, data analysts, data specialists, GIS technicians, software developers, API software programmer/analyst, database administrators, data managers, and project analysts should have time funded to perform work that is required to fulfill contract terms. This funding should complement, and not reduce, existing funding provided through individual projects and or through data management projects including the CRITFC ITMD (2008-507-00) project that partially supports data stewards, and the Intermountain Province / Pend Oreille Subbasin Data Management Project (2011-020-00).
- Support and facilitate the development and maintenance of the data providing partners' information systems and infrastructure that support data flow with StreamNet.
- The Executive Committee should continue to encourage and invite other data providers, including CRITFC member tribes, NWIFC member tribes, SBT, and other Tribes or agencies to participate in and/or become members on both the Executive Committee and Steering Committee. Based on past discussions, funding may be required to secure the participation of tribes in StreamNet and CAP.
- Support StreamNet partner participation in PNAMP Fish Monitoring Work Group (FMWG)/StreamNet joint task groups to ensure proper representation by state and Tribal natural resources experts to work on tasks that contribute to improving or expanding data managed by StreamNet.
- Continue discussions with NOAA about contributing to StreamNet's annual budget to maintain current support for their data needs and explore further enhancement to better address their West Coast Region information needs.

2. Connect Regional Data Systems

To facilitate understanding and access of data accessible from regional systems, we should continue to evaluate the potential to make systems with overlapping data consumers and data providers more similar, whether that be by using similar terms and definitions, or by providing similar interfaces and APIs. To add value to our existing data records we should also assess when it would be relevant to connect these to data in other systems. Leveraging related data

systems through connectivity increases dataset value and provides a more efficient structure for funding monitoring and research to meet regulatory and management needs.

Recommendations:

- Support StreamNet and the PSMFC GIS Center to develop geographical connectivity to internal and external data systems for resident and anadromous, hatchery and natural origin fish groupings, fish facilities, as well as water quality and habitat data. Connecting these datasets spatially will support regional decisions and planning for climate change impacts, offshore wind energy developments, Columbia Basin Restoration Initiate, toxics monitoring, cold water refugia, and estuary restoration and monitoring.
- Encourage partners to develop and improve documentation of their spatial data submitted to StreamNet, including fish distributions, trend features, and fish facilities. These spatial data should be submitted in a manner matching the existing GIS Data downloads files to support tying data together across systems through spatial linkages and conform to existing PSMFC GIS data update and quality control standards.
- Support StreamNet in developing connections through queries or other automation between existing fish related data systems within PSMFC, such as PTAGIS and RMIS, and external systems, such as Monitoring Resources and CBFish.
- Support data providers in assessing the potential benefits of connecting records across internal systems to facilitate submitting consistent, quality data to StreamNet and other data systems.
- Assist in securing funding to support CAP co-leads to collaborate with potential data providers and consumers throughout the Pacific Northwest to better support NOAAF and USFWS data needs and access. StreamNet has previously secured single year NOAA IJFA funding to support this outreach. Participating partners with data outside of the CRB have been submitting data from outside of the Basin. Local management partners, such as Puget Sound Tribes, contribute data used in regional management decisions and supporting their collaboration and coordination in data sharing with StreamNet would improve access to regional data needs for management decisions and public transparency.
- Develop and evaluate data consumer information to look for connections in data needs across systems and whether it would be beneficial to facilitate data access by aligning overlapping fields and terms (e.g., fish management unit names).
- Facilitate discussions among BPA, NPCC, NOAA, and USFWS to develop, discover, and support efforts by StreamNet and PNAMP to secure additional funding opportunities to support new tasks focused on regional data connectivity. Provide letters of support and explore synergies among federal agencies and multi-state compacts that consume StreamNet data.

3. Enhance and Maintain StreamNet as Exchange of Record for BPA and NPCC

CAP Fish HLIs (CAX data system) has been flowing natural origin (NCA) data since 2015 and hatchery origin (HCA) data since 2023. BPA, NOAAF, NPCC, and other data consumers have expanded their use of CAP Fish HLI data to inform their assessments and reporting through both manual and automated methods. Quality data exchange requires maintenance and adaptive management to remain useful and relevant as our technologies and understandings of regional needs grow.

The StreamNet CAP Fish HLI Data Quality Assurance Quality Control Plan for StreamNet funded partners was developed to assess and identify issues with data records, including metadata, submitted across the last decade to ensure that data quality and supporting documentation is maintained over time. Issues identified through this process are then used to inform development and updates to data categories and exchange standards to improve future quality control. StreamNet has leveraged the expertise of partners and the PNAMP FMWG, PNAMP Monitoring Resources staff, and the CRITFC CBF&W Library staff to resolve issues and improve long-term data quality control and access, with the documentation to support responsible and appropriate use.

StreamNet provides a definitive location for Columbia River basin information that is collaboratively informed by partners and facilitates consistency across users. The StreamNet database systems (CAP Fish HLI and Fish Monitoring Data) are used as the Exchange of Record by BPA for contracts collecting and compiling fish data. BPA recognizes the PSMFC StreamNet GIS data as the System of Record for fish facilities funded by the Program (e.g., hatchery, weirs, screens) and for fish distribution. NOAA and NPCC have also been using these data systems to inform tools and reports.

Recommendations:

- Support participation, either by providing in-kind or BPA funding, by all data providers and data consumers in discussions to refine or develop new data categories and exchange standards in PNAMP FMWG/StreamNet task groups to address issues that require input from a broader group of experts including biologists, fisheries managers, and CBF&W librarian.
- Support continued application and development of the CAP Fish HLIs StreamNet Quality Assurance Quality Control Plan for StreamNet funded partners by providing BPA funding for this task.
- Advance implementation of improved metadata documentation within agencies' and tribes' data systems, especially for data of regional importance.
- Support continued funding of PNAMP's Monitoring Resources and continued partner engagement and collaboration with Monitoring Resources as a resource to improve data documentation.
- Support continued funding of CRITFC's CBFW Library and continued partner engagement and collaboration with Library staff on archival storage and citation of supporting literature.
- Recommend that NPCC officially recognizes PSMFC StreamNet GIS as the System of Record and the StreamNet database systems (CAP Fish HLI and Fish Monitoring Data) as the System of Data Exchange for the Council's Fish and Wildlife Program. NPCC should support StreamNet in the upcoming Program Amendment with these recognitions and leverage the skills, expertise, and existing structures and process available in StreamNet to address the data management needs of the Program. Using StreamNet data systems allows for a common set of information used among StreamNet, BPA, and NPCC GIS-based tools ensuring consistency in data display (e.g., hatchery facilities location and crosswalk of non-standardized names) across BPA, NPCC Program, as well as other partners.
- Encourage NPCC, in addition to BPA, to officially recognize PSMFC StreamNet GIS data system as the Program's System of Record for fish related GIS data and the StreamNet database systems (Fish HLI and Fish Monitoring Data) as the Exchange of Record for the Program's fish data needs. NPCC should include within their amendments to the Fish and Wildlife Program support to continue using regional data systems and collaborative efforts, such as StreamNet, to leverage the skills, expertise, and existing structures and processes to address the data management needs of the Program. Using StreamNet data systems allows for a common set of information used among StreamNet, BPA, and NPCC GIS-based tools ensuring consistency in data display (e.g., hatchery facilities location and crosswalk of non-standardized names) across BPA, NPCC Program, as well as other partners. This would ensure that the underlying information informing BPA and NPCC assessments and reporting tools are based on the same information, improving consistency in data display.

4. Support Increased Discoverability and Outreach

StreamNet currently uses webpages, workshops, presentations to professional groups, dataset and data exchange citation, and CAP Newsletters to improve discoverability of data within the StreamNet data systems. BPA recognizes the PSMFC StreamNet GIS data layers for GIS locations related to fish management groups and geographic sites associated with data submitted to the StreamNet database as the System of Record for fish facilities funded by the Program (e.g., hatchery, weirs, screens) and for fish distribution. Establishing StreamNet as the System of Record for these GIS data layers, and associated attributes provides a definitive location for Columbia River basin information that is collaboratively informed by partners and facilitates consistency across users. StreamNet has become the primary data exchange resource for BPA's funded data accessibility requirements and NOAAF's regulatory reporting.

Recommendations:

- Encourage compliance with the Data Use Agreements citation and attribution requirements by citing StreamNet and CAP data exchange as the System of Data Exchange for reporting and publications. Identifying where data used was accessed from improves discoverability, as well as reproducibility and transparency.
- Leverage regional connectivity of external data systems to StreamNet to increase discoverability by providing linkage and connectivity information on multiple platforms and repositories of data systems such as DataOne and GitHub.

- Support StreamNet and CAP co-leads in outreach and discoverability efforts to expand the awareness, understanding, and usage of existing data systems through workshops, presentations, and development of informational materials.
- Support educational opportunities for data consumers to properly comply with the StreamNet and CAP Data Use Agreements through citation and attribution.
- Advance implementation of improved metadata documentation within agencies' and tribes' data systems, especially for data of regional importance. Leverage PNAMP's Monitoring Resources and CRITFC's CBFW Library.
- Support participation, either by providing in-kind or BPA funding, in PNAMP outreach and subject matter expert programming including the PNAMP Fish Monitoring Work Group (FMWG). These opportunities foster engagement and collaboration in areas outside of StreamNet, providing opportunities for StreamNet staff and funded partners to both represent StreamNet and to discover data system connections.

5. Support a Broader Group of Data Categories to Support Regional Information Needs

The diversity of data maintained by StreamNet addresses the different regional needs ranging from providing access to publicly funded data (such as via BPA ratepayers) to providing a common source of manager-approved data sets to inform regional decisions. In recent years these regional needs have become clearer and the approach used by StreamNet and CAP has been recognized as highly effective. The time is ripe for the Executive Committee to expand their guidance to StreamNet to improve data access for BPA, NOAA, NPCC and USFWS assessments and reporting needs, and to assist StreamNet, CAP, and its participants in securing funding to advance this work, whether through short-term grants or contracts or longer commitments (e.g. multi-year agreements or project funding). As this expansion occurs, it is however, important to keep in mind the limited resources available within partner agencies and tribes, and to ensure that adequate time and support is provided to complete new tasks prior to moving on to additional new tasks.

Recommendations:

- Confirm with StreamNet partners the status of new tasks, to ensure these are completed before deciding to add on new tasks. Work with the StreamNet technical committees to ensure that tasks are being completed.
- Support expanding data flow for resident and anadromous fish from agency/tribal data systems to StreamNet data systems that contribute to informing the NPCC 2020 Addendum (goals, objectives, and indicators); and BPA and USFWS bull trout and sturgeon data needs. For instance, some bull trout and resident fish time-series data are submitted to StreamNet's Fish Monitoring Data (trends) system; this could be expanded to be comprehensive and better support BPA, NPCC and USFWS in data requirements for management needs.
- Support StreamNet in identifying datasets not currently available to support regional management decisions by expanding data flow, public data access, and long-term data management. StreamNet data systems support BPA, NPCC, NOAAF, and USFWS needs and some metric level data for resident species such as bull trout is already submitted to the Fish Monitoring Database, but not at a coordinated, regional level. Regional management agencies, including StreamNet partners, are also working on sturgeon management and recovery planning that would benefit from collaborative development towards regional data sharing and public access both within the CRB and across the full geographic distribution of the species.
- Support implementation of the Five-Year Plan for Coordinated Assessments Partnership by strongly encouraging BPA, NPCC and USFWS to build on StreamNet/CAP successes for improving access to fish and related habitat and water quality data and data system connections.

VI. B. Lessons Learned

1. Streamlining Internal Data Submission for Direct Staff Data Submittal to CAP and StreamNet

Ensuring the **integrity and efficiency of data flow** requires ongoing maintenance and updates, including adopting advances in data management and reporting technology (open source and proprietary programs and tools) to improve efficiencies across the entire data life cycle. Several of the data providers are adopting a more automated data flow from field data collection to StreamNet's data systems. This is evolving the roles within an organization as to who ultimately submits the data to regional data systems, including delegating the decision to submit data into the CAX to the staff responsible for that data set. Approaches in place and under development differ in their specific approach,

however, the development of similarly purposed applications for submitting fish data to Fish HLI (CAX) and to Fish Monitoring Data (SN Trends) would be beneficial to all StreamNet data providers. For example, ODFW's new Fish Monitoring and Data Distribution SQL server database and the web applications for Coordinated Assessments and Fish Monitoring Data (FMD) (trends) has enabled ODFW staff responsible for specific data to enter this data directly into the system for validation and submission to the StreamNet API. The new functionality has made ODFW's internal submission process more efficient and allows the staff member responsible to receive real-time data validation. Similar functionality could be beneficial to all StreamNet partners, and we plan to continue identifying improvements and adding new functionality in 2024.

The availability of a **fixed increase in financial support** for a certain number of years, such as the three years of funding secured for HCAX, has shown to be integral in advancing standardization and sharing of specific priority data categories. For example, during 2021 ODFW StreamNet applied some of the HCAX funding from the EPA Exchange Network grant to hire a temporary staff member to inventory potential hatchery indicators, metrics, and hatchery program-related information to guide ODFW participation in the HCAX project. This allowed ODFW StreamNet to (1) lessen the workload on permanent staff; (2) describe the hatchery data types and formats collected by ODFW's Propagation Program such as location and attributes; (3) support timelier data compilation for testing of the hatchery data exchange web service in 2023; and (4) inform the Hatchery Biologist Work Groups development of data fields and controlled vocabulary by leveraging the inventory results. Furthermore, it is anticipated that the HCAX inventory can be leveraged as a model for future projects, such as, a Coordinated Assessments DES for carrying capacity and white sturgeon.

Additionally, during 2023 ODFW StreamNet was able to hire a limited duration data assistant to continue supporting the HCAX Project to conduct data compilation, translate data to fit StreamNet DES standards, and develop plans for data submissions in 2024 using the information gained in 2021. This allowed ODFW StreamNet to (1) again lessen the workload on permanent staff; (2) establish a better functional understanding of the hatchery data types and formats collected by Hatchery Programs; (3) recommend updates to inform HCAX Data Exchange Standard development; and (4) support timelier data compilation and submission in future years through the development of python scripts for data translation between ODFW internal and StreamNet databases. It continues to be true that fixed increases in financial support can potentially be leveraged as a model for future projects. This approach should be endorsed and encouraged for similar activities related to priorities discussed in the CAP Five-Year Plan for all StreamNet partner agencies and tribes (as time and resources allow).

2. Communicating QA/QC and Improving Access to Data Consumers

StreamNet staff have been working on facilitating access to StreamNet data by different audience groups ranging in their technical expertise. To this end, StreamNet staff have developed a filterable API that better meets the custom data requests from the diversity of users accessing the StreamNet data system, and that is harvested to support StreamNet's query tools. Improving access of data maintained by StreamNet to audiences with different technical knowledge will increase the value and use of these data by the public and for informing decisions.

Furthermore, improving communication of the **quality of submitted data** provides data consumers with confidence in their use of these data, remains a priority and this will be further explored during 2024. The increased access to data has increased scrutiny and questions about quality control and assurance, as well as timeliness. This additional scrutiny has increased the overall quality of the data.

3. Efficient Approach to Access Needed Expertise

Leveraging **target work groups** with the required expertise (e.g., data stewards, biologist) to inform the addition of data categories is efficient and effective, including coordinating with PNAMP staff for meeting facilitation expertise. The use of smaller workgroups via the StreamNet-PNAMP collaboration has illustrated the success of this approach as final products and recommendations have rapidly been achieved during 2024 to inform hatchery indicators and metrics, and improvements to data displays. Specifically, the purpose and scope of all StreamNet related meetings and involvement with the PNAMP Fish Monitoring Work Group (FMWG) in 2024 were focused, well organized, and well run. Each of the FMWGs utilized the expertise of biologists who are the subject matter experts in these areas to provide input that can then be further refined by data managers to develop a comprehensive DES for each subject. Another

positive was this approach-built energy and momentum to accomplish tasks and projects. This methodology streamlined efforts and allowed groups to stay focused on specific tasks. It is, however, recommended that the initiation of new tasks be balanced with the ongoing StreamNet tasks so that these new tasks and associated time commitment, including during and after meetings / work groups (assigned or voluntary), do not inadvertently distract from other StreamNet priorities. Thus, it should remain a focus that StreamNet partners complete ongoing work group meetings and tasks before engaging in other projects.

4. Importance of Documentation for Data Integrity and Succession Planning

Proper documentation for data integrity is critical to ensure that these valuable data, funded by the public and ratepayers, remain accessible to inform critical uncertainties and decisions into the future. This applies both for data managed within an organization and for data submitted to regional data systems. Projects such as StreamNet serve a key role in ensuring that this documentation and the data needed to inform the assessment process are accessible and stable during any upcoming transition, such as retirement of core biologists with significant institutional knowledge about the data methods and analysis conducted. Some of the StreamNet partners have acknowledged that they also need better overall documentation of field collection and analysis to improve the quality of their data submissions to CAP Fish HLIs (CAX system) and are exploring how this can be accomplished, including utilizing PNAMP's MonitoringResources.org. StreamNet and PNAMP, with BPA support, continue to work on improving how to facilitate the connection between data submitted to StreamNet data systems and metadata submitted to MonitoringResources.org to reduce the burden on the data provider.

- Documentation is becoming even more crucial as staff with institutional knowledge are lost due to promotion, career changes, and retirements. For example, the Colville Tribes' OBMEP program has a small staff compared with the state agencies and a single person manages the data repository. Documentation is in place for certain OBMEP data processes (e.g., mark-recapture data processing, EDT calculations), but a more complete "handbook" is needed. ODFW is also preparing for the loss of personnel with institutional knowledge who have, and continue, to keep the StreamNet Program functioning smoothly and applying lessons learned over time, by documenting new and existing processes as part of succession planning efforts, and to ensure coverage when needed.
- Documenting data set progress and procedures in accessible documents or project management applications like Asana.com is critical to maintain the integrity and stability of projects and workflows during periods of high personnel turnover.

VII. Appendices

Appendix A: User Statistics for PSMFC-StreamNet Project Information Tools

Table 1: Summary of the number of visitors to the StreamNet website including the number of page-views, average page viewed, and average time on the website. Last two columns on the far right summarizes the combined usage (hits) of the StreamNet Query (SNQ) and the Coordinated Assessments Exchange (CAX), as well as the usage of the API (hits).

Calendar Year:	***Total Visits***	***Unique Visitors***	***Page Views***	***API Usage***	***Map applications Unique Visitors***
2024	100,810	23,871	n/a	530,224	n/a
2023	n/a	n/a	n/a	409,344	5,284

2022	10,620	10,100	37,089	533,448	4,803
2021	6,658	6,533	13,794	475,897	5,470
2020	10,723	7,373	20,338	561,707	5,270
2019	11,774	8,232	23,458	425,710	5,794
2018	13,371	9,197	34,551	2,399,444**	5,659
2017	22,630	14,228	54,677	508,123	5,630
2016	29,708	18,399	83,182	412,504	5,252
2015	32,590	20,014	63,880	144,698	n/a
2014	39,171	31,424	75,112	51,358	n/a
2013	44,798	36,683	89,681	n/a	n/a
2012	27,163	19,291	66,686	n/a	n/a
2011	25,169	16,586	63,186	n/a	n/a
2010	23,029	13,924	49,725	n/a	n/a
2009	11,578	6,983	26,261	n/a	n/a

** Due to modifications of Google Analytics without notice, these numbers are not available for 2023. A new system of visitor statistics is being established and may be accessed by visiting the Statistics menu of the StreamNet.org website.*

*** New API feature allowing internal agency/tribal validation before data submission and new partners starting to use the API resulted in the large increase of usage in 2018 before stabilizing in 2019.*

Table 2: Platform used to access the StreamNet website remains about the same. Pre-2020 data are not available. Data for 2023 was unavailable due to modifications to Google Analytics.

Year	**Desktop**	**Mobile**	**Tablet**
2024	82.3%	16.7%	1%
2022	73%	26%	1%
2021	77%	20%	3%
2020	84%	14%	2%

Appendix B: NPCC FW Program Focal Species and other Fish Species included in StreamNet Query System

NPCC Focal Species	SN Query Trend data
Chinook salmon	Yes
Chum salmon	Yes
Coho salmon	Yes
Green sturgeon	Yes
Pacific lamprey	Yes
Sockeye salmon	Yes
Steelhead	Yes
American shad	Yes
Black crappie	Yes
Bluegill	Yes
Brook trout	Yes
Brown trout	Yes
Bull trout	Yes
Burbot	Yes
Channel catfish	Yes
Coastal cutthroat trout	Yes
Cutthroat trout	Yes
Kokanee	Yes
Lahontan cutthroat trout	Yes
Lake trout	Yes
Largemouth bass	Yes
Mountain whitefish	Yes
Northern pike	Yes
Northern pikeminnow	Yes
Rainbow trout	Yes
Rainbow trout X Cutthroat trout hybrid	Yes
Redband trout	Yes
Sculpins	Yes
Smallmouth bass	Yes
Walleye	Yes
Western brook lamprey	Yes
Westslope cutthroat trout	Yes
White crappie	Yes
White sturgeon	Yes
Yellow perch	Yes
Yellowstone cutthroat trout	Yes
Oregon Chub	No

Appendix C: Historical Project Background

The genesis of StreamNet was the call for standardized information to support the NPCC's 1984 Columbia River Basin Fish and Wildlife Program (Program) and 1983 Northwest Conservation and Electric Power Plan (Plan) Hydro Assessment Study (HAS) to document the environmental health and energy potential of the basin's rivers. When StreamNet began in 1983, albeit under a different name, it was intended to be the region's Rivers Information System. The HAS was a cooperative regional effort by the BPA, the NPCC, the four Northwest states, the region's Indian tribes, and Federal land management agencies. The goal of this effort was to assess the significance of the region's rivers in a standardized fashion with the public's input, and to document those results. The HAS consisted of three distinct, coordinated efforts. For one, BPA, the NPCC, and the U.S. Army Corps of Engineers cooperated to develop the Pacific Northwest Hydropower Data Base and Analysis System (NWHS). For another, the NPCC led the effort to design the region's first anadromous fish data system called the Coordinated Information System (CIS; 1987 Program states needed database content and 1992 Program section 7.6 describes CIS). For the third, BPA began coordinating the inventory and analysis work on the remaining environmental categories, called the Pacific Northwest Rivers Study (PNWRS). Data generated by these efforts covered all four states (comprehensive) and contained the same data elements for each state (consistent structure and content). The HAS efforts resulted in detailed natural resource data sets for the region and the technical and administrative infrastructure to ensure the maintenance and use of the information housed in the Northwest Environmental Database (NED) and in the Coordinated Information System (CIS). These cooperative data collection efforts spanned across agency and state lines with information updates transmitted from the states to the regional system biannually. Source data were maintained at the state level to ensure accuracy and ties to other state data collection efforts.

StreamNet originated following the integration of the Coordinated Information System (CIS) and the Northwest Environmental Database (NED). The NED had previously integrated data from the Hydro Assessment Study (HAS), specifically data from the Northwest Hydropower Database and Analysis System (NWHS) and Pacific Northwest Rivers Study (PNWRS). Over time the original StreamNet project evolved to adopt technology that facilitated data sharing and to respond to information needs from regional decision-making efforts (Figure 1).

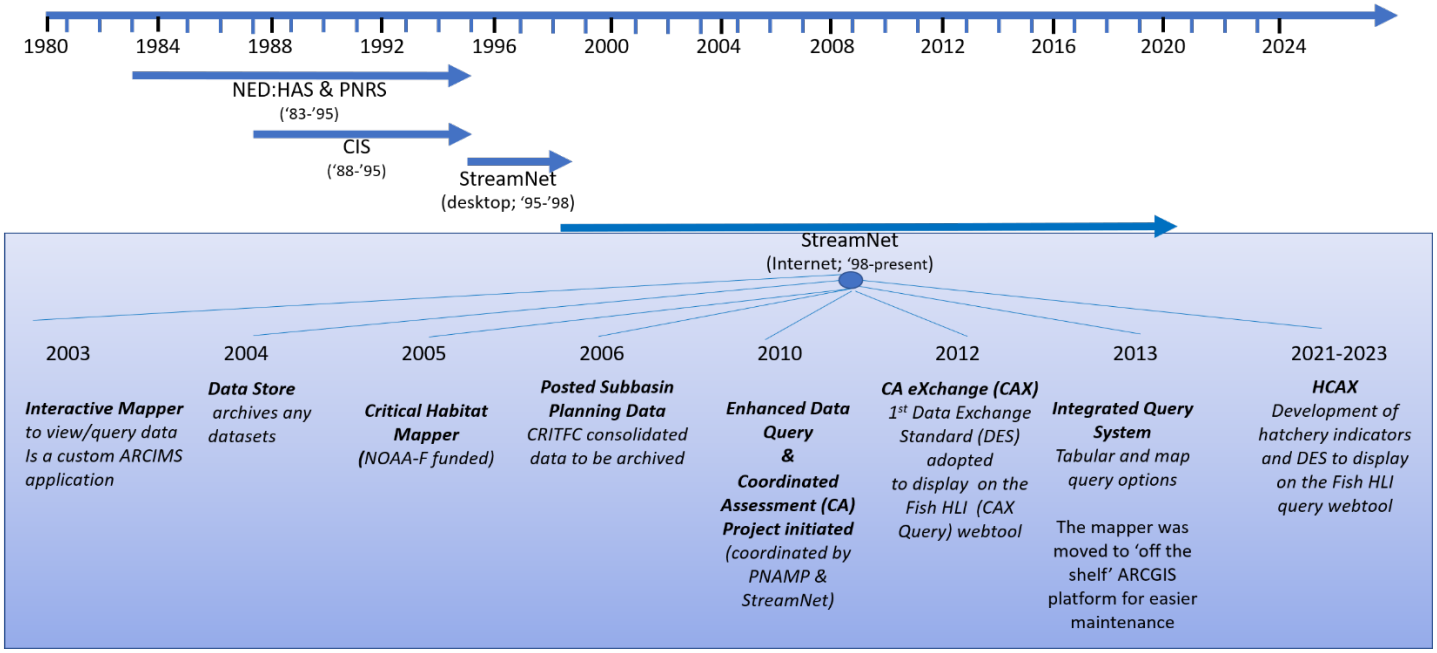

Figure 1: Timeline showing the merging of CIS and NED in 1995 to form the StreamNet project and its subsequent evolution to the current day StreamNet data sharing project.

Following the 2012/2013 NPCC programmatic recommendations for Regional Data Management Projects[xxiv] and those specific to the StreamNet project, as well as the NPCC recommendations generated from the 2012 Program Evaluation & Reporting Committee (PERC) process[xxv], the StreamNet project:

- Established an Executive Committee with representatives of NPCC, BPA and fish and wildlife managers to direct data management direction and priority (Figure 3),
- Prioritized efforts on making synthesized information, such as population estimates, accessible through StreamNet with emphasis on the high-level indicators (HLIs) identified through the Coordinated Assessments (co-led by Pacific Northwest Aquatic Partnership (PNAMP) and StreamNet),
- Continued to evolve towards a more accessible platform for various users and optimize webservices to facilitate coordinated data-sharing and data depiction, including updating its main website and developing an application programming interface (API) that allows different systems to talk to one another and exchange data,
- Expanded its participants to include additional managers and data collecting entities that are not directly funded through the StreamNet project,
- Focused its BPA funds on providing data needed for BPA and NPCC reporting needs such as NPCC HLI reports and BPA Columbia River System (CRS) Biological Opinion (BiOp) reports for priority populations.

Appendix D: Definitions of Terms and Acronyms

API	Application Programming Interface. A published standard format for communicating with applications.
BiOp	Biological Opinion (e.g., Columbia River System BiOp)
BPA	Bonneville Power Administration
CAP	Coordinated Assessments Partnership. A collaborative process to efficiently share and provide access to standardized derived information, such as fish population high level indicators (HLI) and supporting metrics. The geographic scope of the CAP is the Pacific Northwest with a focus on sharing natural and hatchery origin fish information and fish habitat-related information, such as fish population high level indicators (HLIs) and supporting metrics.
CAP DDT	Coordinated Assessments Partnership Data Exchange Standard Development Team. The CAP DDT consists mainly of the data contributing partners' data management professionals and biologists who calculate the HLIs and metrics. The CAP DDT is a team serving under the StreamNet Steering Committee that in turn serves under the StreamNet Executive Committee. The CAP DDT also coordinates, as needed, with the StreamNet Technical Team and the StreamNet DDT.
CBC	Columbia Basin Collaborative
CBPTF	Columbia Basin Partnership Task Force
CAX	Coordinated Assessments Data Exchange. This is the aggregated database of Coordinated Assessments indicators and metrics submitted by data source agencies and housed at StreamNet.
CIS	Coordinated Information System
Colville Tribes	Confederated Tribes of the Colville Reservation
CHaMP	Columbia Habitat Monitoring Program
CRB or Basin	Columbia River Basin
CRITFC	Columbia River Intertribal Fish Commission
CRS BiOp	Columbia River System Biological Opinion 2019

CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
DES	Data Exchange Standard. The DESs is the set of formal rules for the structure of data elements for a data category, and documents agreements on the representation, format, definition, structuring, tagging, transmission, manipulation, use, and management of data in which data are shared. The document that holds the various DES for the different data categories in a database is referred to as the DES Document.
EN	Exchange Network: Nationwide data repository and exchange that resides within the EPA for EPA related data
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionary significant unit
FCRPS BiOp	Federal Columbia River Power System Biological Opinion (now CRS BiOp)
FERC	Federal Energy Regulatory Commission
FMD	Fish Monitoring Data (trends)
FMWG	Fish Monitoring Work Group
GIS	Geographic Information System
HAS	Hydro Assessment Study
HEP	Habitat Evaluation Procedures. HEP are used to evaluate and document habitat losses and habitat gains. HEP is used to quantify the impacts of development, protection, and restoration on terrestrial and aquatic habitats by assessing changes, both negative and positive, in habitat quality and quantity.
HLI	high level indicator representing the estimated value for a group of fish, such as the natural origin spawner abundance estimate for a specific salmon population.
HSRG	Hatchery Scientific Review Group. HSRG is an independent scientific panel under the Pacific Northwest Hatchery Reform Project that reviewed hatcheries and developed comprehensive reform recommendations to improve the hatcheries' role in meeting harvest and conservation goals for Pacific Northwest salmon and steelhead.
IDFG	Idaho Fish and Game's mission is to protect, preserve, perpetuate, and manage Idaho's wildlife resources. A 1938 voter initiative created the Idaho Fish and Game Commission structure that governs the agency today.
ITMD	Inter-Tribal Monitoring Data. The purpose of CRITFC's ITMD project is to assist CRITFC and its member tribes in the timely and accurate capture, storage, processing, and dissemination of data for management of anadromous fish and their habitats. The CRITFC ITMD, by coordinating and integrating appropriate activities with the CAP, ensures consistent data sharing with the CAX data system for Basin salmon and steelhead high level indicators and related trend data.
MAFAC	Marine Fisheries Advisory Committee
MFWP	Montana Fish, Wildlife, and Parks. Fish and Wildlife Program's Mission: Steward the fish, wildlife, parks, and recreational resources for the public, now and into the future.
MR	Monitoring Resources
NED	Northwest Environmental Data Network

NOAA or NOAA-F	National Oceanic and Atmospheric Administration Fisheries, NOAA-F is responsible for the stewardship of the nation's ocean resources and their habitat. NOAA Fisheries provide vital services for the nation: productive and sustainable fisheries, safe sources of seafood, the recovery and conservation of protected resources, and healthy ecosystems—all backed by sound science and an ecosystem-based approach to management.
NOSA	Natural Origin Spawner Abundance. Number of natural origin fish that actually spawn, not necessarily the number of fish returning to a spawning area.
NPCC or Council	Northwest Power and Conservation Council. The 1980 Northwest Power Act authorized Idaho, Montana, Oregon, and Washington to develop a regional power plan and fish and wildlife program to balance the Northwest's environment and energy needs. The heart of the Council's mission is to preserve the benefits of the Columbia River for future generations.
NPT	Nez Perce Tribe
NWHS	Pacific Northwest Hydropower Database and Analysis System
NWIFC	Northwest Indian Fisheries Commission
OBMEP	Okanogan Basin Monitoring and Evaluation Program
ODFW	Oregon Department of Fish & Wildlife. ODFW mission's is to protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations.
OWEB	Oregon Watershed Enhancement Board
PNAMP	Pacific Northwest Aquatic Monitoring Partnership. PNAMP is a forum to facilitate collaboration around aquatic monitoring topics of interest, promote best practices for monitoring, and encourage coordination and integration of monitoring activities as appropriate.
PNI	Proportionate natural influence. PNI is an estimate of the relative selection pressure of the natural environment in an integrated natural / hatchery population.
PNW	Pacific Northwest
PNWRS	Pacific Northwest Rivers Study
PSMFC	Pacific States Marine Fisheries Commission. As stated by the governing compact, PSMFC's purpose shall be "to promote the better utilization of fisheries – marine, shell, and anadromous, which are of mutual concern, and to develop a joint program of protection and prevention of physical waste of such fisheries in all of those areas of the Pacific Ocean over which the compacting states jointly or separately now have or may hereafter acquire jurisdiction." Member states include California, Oregon, Washington, Idaho, and Alaska.
PTAGIS	Passive Integrated Transponder (PIT) Tag Information System
QA	Quality Assurance, the process of ensuring that the development effort will result in the desired product. Quality assurance focuses on defect prevention. Typical quality assurance tools are check lists, project audits, and documented standards. QA activities typically occur up-front in a project.
QC	Quality Control, the process of verifying that product deliverables are complete, correct, and meet expected outcomes. Quality control focuses on defect

	identification. Typical quality control tools include products inspections and testing processes, and peer reviews. QC activities occur at the end of a project.
QA/QC	Quality Assurance/ Quality Control
RperS	Recruit per spawner ratios are specific to the locations and seasons described in each record of data. The number of “recruits” can be defined at any life stage.
REST	Representational State Transfer. For our purpose, this is a simple type of web service that is generally implemented via the common HTTP protocol (browser speak).
RMPC	Regional Mark Processing Center
RMIS	Regional Mark Information System
SARs	Smolt to adult returns. For natural origin fish this is the point estimate of the number of returning natural origin adults, divided by the point estimate of the number of smolts that produced those returning adults. This value is multiplied by 100 to obtain a percentage.
SBT	Shoshone-Bannock Tribes of Fort Hall
SOW	Statement of Work, from BPA contracts to describe Work Elements (WE)
SN ExCom	StreamNet Executive Committee provides policy-level guidance and decision-making for StreamNet and the CAP. The primary role of the SN ExCom is to ensure alignment with regional data management and sharing needs, that tasks are focused on achieving strategic goals, and that resources are allocated to regional and agency priorities.
SN SC	StreamNet Steering Committee. The Steering Committee provides support, guidance, and oversight of progress for the StreamNet Program.
Status and Trends	"Status" describes the current condition of whatever is measured; "trends" describe changes over time
StreamNet	Pacific States Marine Fisheries Commission's StreamNet Program that is a cooperative information management and data dissemination project focused on fisheries and aquatic data and data-related services in the Pacific Northwest, with a focus on the Columbia River Basin
Trend	Long-term temporal pattern (i.e., change over time) in what you are monitoring.
TRT	Technical Recovery Teams
USEPA	United States Environmental Protection Agency
USFWS	United States Fish & Wildlife Service. USFWS is the premier government agency dedicated to the conservation, protection, and enhancement of fish, wildlife and plants, and their habitats. USFWS is the only agency in the federal government whose primary responsibility is the conservation and management of these important natural resources for the American public.
USGS	United States Geological Survey
VSP	Viable Salmon Population
WA GSRO	Washington Governor’s Salmon Recovery Office
Web Services	is platform-neutral, vendor-independent protocols that enable distributed processing to be performed using XML and Web-based technologies. Sometimes instantiated as remote procedures calls in which the request is an XML document. Or as more simply

	defined by StreamNet, an “always-on” function available at a specific World Wide Web address.
WDFW	Washington State Department of Fish & Wildlife. WDFW is dedicated to preserving, protecting, and perpetuating the state’s fish, wildlife, and ecosystems while providing sustainable fish and wildlife recreational and commercial opportunities.
YN	Confederated Tribes and Bands of the Yakama Nation

Appendix E: References / Endnotes

[i] NPCC 2019, Committee Recommendations on mainstem and Program Support Project Review: Project Implementation and Programmatic Issues https://www.nwcouncil.org/sites/default/files/2019_0716_f1.pdf; Council recommendations from August 2019 are similar https://www.nwcouncil.org/fish-and-wildlife/fish-and-wildlife-program/project-reviews-and-recommendations/mainstem-review

[ii] 2019 version of the Five-Year Plan for Coordinated Assessments, revised September 2, 2020 https://www.streamnet.org/20200902-five-year-plan-for-coordinated-assessments-rev20200902-final-12/

[iii] 2021-2026 StreamNet Vision and Strategic Plan, September 2, 2020, https://www.streamnet.org/20200902-streamnet-vision-strategic-plan-final-adopted20200902-4/

[iv] NOAA Fisheries Biological Opinion for operation and maintenance of the Columbia River System Operations and related documents https://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp/2008FCRPSBiOp.aspx; 2019 CRS Biological Opinion

[v] 2014/2020 Columbia River Basin Fish and Wildlife Program https://www.nwcouncil.org/reports/2014-columbia-river-basin-fish-and-wildlife-program/

[vi] For more details see the Project Summary: https://www.cbfish.org/Project.mvc/Display/1988-108-04 and past and current Contract Summary: https://www.cbfish.org/Contract.mvc/Summary/66435

[vii] CHaMP https://www.streamnet.org/home/data-maps/champ/

[viii] StreamNet Data Store https://app.streamnet.org/datastore_search_classic.cfm

[ix] Columbia Basin Fish & Wildlife Library hosted by CRITFC https://cbfwl.org/

[x] Habitat Evaluation Procedures (HEP) https://www.streamnet.org/home/data-maps/hep/

[xixi] Hatchery Reform Project https://www.streamnet.org/home/data-maps/hatchery-reform/

[xii] NPCC FW Program Strategy for *Fish Propagation including hatchery programs* https://www.nwcouncil.org/reports/2014-columbia-river-basin-fish-and-wildlife-program/b-fish-propagation-including-hatchery-programs

[xiii] Hatchery scientific review group's products resulting from the hatchery reform project https://www.streamnet.org/home/data-maps/hatchery-reform/

[xiv] NPCC FW Program Protected Areas documentation, river reach, and online Protected Areas database and interactive map https://www.streamnet.org/home/data-maps/protectedareas/

[xv] StreamNet subbasin plans and achieved datasets used during the NPCC2001-2004 subbasin planning effort https://www.streamnet.org/home/data-maps/subbasin-datasets/

[xvi] StreamNet Fish Monitoring Data (replaces the previous StreamNet Query – Abundance Estimates and Indexes at Local Scales) https://www.streamnet.org/home/data-maps/fish-data/

[xvii] GIS Data & Mapping Applications https://www.streamnet.org/home/data-maps/gis-data-sets/

[xviii] StreamNet Fish HLI query https://cax.streamnet.org

[xix] PNAMP 2009 annual report https://www.cbfish.org/Document.mvc/Viewer/P115609

[xx] PNAMP 2010 annual report https://www.cbfish.org/Document.mvc/Viewer/P120754

[xxi] PNAMP 2018 annual report https://www.cbfish.org/Document.mvc/Viewer/P167990

[xxii] HEP archived data and documents http://www.streamnet.org/hep.

[xxiii]NOAA and USFWS engagement in the hatchery reform project and the hatchery scientific review group https://www.nwfsc.noaa.gov/research/divisions/efs/hatchery/review.cfm ; products produced by the hatchery scientific review group for the hatchery reform project http://hatcheryreform.us/

[xxiv] NPCC 2012/2013 Decision Memorandum: Council recommendations on Resident Fish, Data Management and Regional Coordination Category Reviews – projects and associated programmatic issues https://www.nwcouncil.org/sites/default/files/CouncilDecision_0.pdf

[xxv] NPCC 2012 Program Evaluation and Reporting Committee https://www.nwcouncil.org/fw/program/perc and the November 2012 Council recommendations based on the PERC https://www.nwcouncil.org/sites/default/files/2012_1106_1.pdf