PNAMP 2023 Annual Report

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Authors: Sam Cimino, Megan Dethloff, Quinnell Flanagan, Amy Puls, Jennifer Bayer

pacific northwest aquatic monitoring partnership

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Photo: Jen Bayer

Executive Summary – Thanks for another busy year of collaboration!

As a collaborative community that intentionally comes together to improve monitoring and access to data that results from monitoring (learn more about PNAMP), strengthening old connections while also building new ones is essential. I am pleased to say 2023 was a great year for connections!

The collaboration between PNAMP and PSMFC StreamNet continued to grow as we strive to efficiently support partners' needs for monitoring and access to data resulting from monitoring. It was great to see many colleagues when we reconvened the Coordinated Assessments Partnership (CAP) for a 2-day workshop after a 5-year hiatus. We are using the input we received to better support data providers and to improve user interfaces to access data. PNAMP and StreamNet also partnered to enable the creation of a new data flow for hatchery-origin fish (HCAX Project), our first expansion to the CAX data system in some time. We look forward to data consumers accessing this information using StreamNet's query tools in 2024.

PNAMP embarked on a new relationship in 2023 to support the EPA's Columbia River Basin Restoration Program (CRBRP) by facilitating the new CRBRP Toxics Monitoring Subgroup (TMS). It is exciting to foster collaboration and coordination across toxics monitoring practitioners and we are looking forward to more interactions between this group and our longstanding work groups such as the PNAMP Fish Monitoring Work Group (FMWG). For example, we had a great turnout when the FMWG featured NOAA's current stormwater contaminants research, a connection we made through the TMS. In case you missed this or any of the other great FMWG meetings' Tech Talks, you can catch up via the PNAMP YouTube channel.

I thank everyone for their contributions that allow PNAMP to continue to grow and address partners' needs. This report represents the work of hundreds of individuals contributing thousands of hours to activities facilitated by PNAMP staff. You can find more details about each project in this report and on each project's webpage at www.PNAMP.org.

Contact information is provided for each topic in this report; please reach out to PNAMP staff individually or email us at gs-pnamp_contact@usgs.gov if you have any questions or would like to join an activity.

Sincerely,

Jen Bayer

PNAMP Coordinator, U.S. Geological Survey

Photo: Quinnell Flanagan

PNAMP Coordination Team Supports Partners' Collaboration

The PNAMP Coordination Team provides essential facilitation and technical expertise to benefit the myriad of activities that PNAMP undertakes each year. We constantly strive to stay abreast of the latest scientific developments related to monitoring and data management from our partners and beyond to bring this information to the PNAMP community.

In addition, the Team works hard to provide an inclusive environment, which means developing and maintaining relationships with entities that contribute a diversity of skills and perspectives and also means being experts in the latest collaboration tools for virtual meetings, such as video conferencing and mastering new web tools to engage gather participants' input. We strive to make everyone feel welcome and make it easy to collaborate.

In 2023, we welcomed Quinnell Flanagan to the Coordination Team. Quinnell brings a fresh perspective to our work, as she is currently an undergraduate at Portland State University. Quinnell will assist with our communications products such as the PNAMP Newsletter and help manage content in MonitoringResources.org .

The Coordination Team manages PNAMP.org, our essential tool for communicating information about PNAMP events and projects. In addition to PNAMP.org, the Coordination Team also manages the development of MonitoringResources.org.

If you have feedback or questions related to staff support or PNAMP resources, please let us know.

The PNAMP Coordination Team is employed by the U.S. Geological Survey (USGS) Forest and Rangelands Ecosystem Science Center (FRESC).

- Jennifer Bayer - PNAMP Coordinator, jbayer@usgs.gov
- Amy Puls - Deputy Coordinator, apuls@usgs.gov
- Sam Cimino - Staff Biologist, scimino@usgs.gov
- Megan Dethloff - Staff Biologist, mdethloff@usgs.gov
- Quinnell Flanagan - Staff Biological Technician, qflanagan@usgs.gov

Coordinated Assessments Partnership (CAP) and Hatchery Indicators Project (HCAX)

We were thrilled to host the 2023 CAP workshop, which brought together 60+ data experts and biologists to provide valuable feedback on CAP data systems. Some great ideas emerged, including: develop a resource library to support communication of data exchange specifications and to share products and solutions across CAP partners; provide training in CAP Fish HLIs data submittal, QA/QC, and access; improve automated data set citations to support proper attribution; and conduct an assessment of existing CAP Fish HLIs terms and definitions to confirm these are consistent with submitted data. Partners also asked for help in keeping abreast with new technologies, skills, and approaches for data publishing and access, which PNAMP is looking forward to providing in 2024, in part through the ETIS Webinar Series.

Another aspect of PNAMP's collaboration with StreamNet is the Hatchery Data Sharing (HCAX) Project, which made great progress in 2023 with the completion of the HCAX DES and implementation testing. Stay tuned for our final workshop in spring of 2024, where we will discuss 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 2023, 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.

See the Fish Monitoring Work Group section of this report for more details of progress from 2023.

Learn more PNAMP Project Page; CAP 2023 Winter Newsletter; CAP 2023 Fall Newsletter; 2023 Accomplishments

Contacts: Jen Bayer (jbayer@usgs.gov) and Nancy Leonard (nleonard@psmfc.org)

Photo: USGS

Photo: Jen Bayer

Stream Habitat Metric Integration Project

We are very excited to share products from the Stream Habitat Metric Integration (SHMI) Project. This has been a journey that included learning about programs' monitoring methods and designs as well as their data management approaches. While our goal was to create a data standard for instream habitat metrics so that interoperable data could be aggregated, we also wanted to promote data sharing through the introduction of FAIR principles, a policy that encourages Findability, Accessibility, Interoperability, and Reusability (learn more about FAIR).

We looked at the four participating programs' (AIM, AREMP, NRSA, PIBO MP) datasets against the FAIR data principles and offer recommendations and lessons learned in this paper: *Sharing FAIR monitoring program data improves discoverability and reuse. Bayer et al. Environ Monit Assess 195, 1141 (2023) https://doi.org/10.1007/s10661-023-11788-4*.

We found that all four programs are continuously striving to improve data management, data products, and metadata; however, we concluded that more guidance and resources are needed to support data publishing and documentation to make monitoring data FAIR.

We also published an integrated dataset and the code needed to create this dataset, wherein wadeable stream habitat data from these four programs were obtained, pre-processed, transformed, and combined using R code following the SHMI Data Exchange Standard. The dataset includes 26 stream habitat metrics collected between 2000 and 2022 across the United States at ~12,000 locations from ~19,000 data collection events for a total of ~200,000 measurements.

You can find these products here:

- Scully, R.A., Dlabola, E.K., Heaston, E.D., Bayer, J.M., Courtwright, J.L., Snyder, M.N., Hockman-Wert, D.P., and Saunders, W.C., 2023, Wadeable stream habitat data integrated from multiple monitoring programs for the US from 2000-2022: U.S. Geological Survey data release, https://doi.org/10.5066/P9J3P7SN
- Scully, R.A., Heaston, E.D., and Dlabola, E.K., 2023, Stream Habitat Metrics Integration Data Exchange Standard (SHMI-DES): U.S. Geological Survey Software Release. https://doi.org/10.5066/P9KON2PK

Learn more PNAMP Project Page; 2023 Accomplishments
Contact: Jen Bayer (jbayer@usgs.gov)

Fish Monitoring Work Group

In 2023, the FMWG convened in January, April, and October. These meetings included updates from FMWG task teams and a "tech talk" showcasing work from regional experts. Tech Talks covered a variety of interests: a tool for processing and analysis of PIT-tag data from PTAGIS; an integrated statistical life cycle model; and research on fish health contaminants in the region. Task Team Leads, with support from PNAMP staff, continued these tasks:

- Carrying Capacity Standards led by Morgan Bond (NOAA), Tim Copeland (IDFG), and Russ Scranton (BPA) focuses on describing current approaches, and how to better document and share carrying capacity products. A peer-reviewed paper is in development; expected in late 2024.
- Rotary Screw Trap (RST) Data Collection led by Kasey Bliesner (ODFW), Marika Dobos (IDFG), and Russ Scranton develops data collection recommendations for rotary screw trapping efforts to support a variety of analyses. A new component was added in 2023 to support StreamNet's new Rotary Screw Trap Dashboard by gathering the FMWG's feedback on the tool. Nancy Leonard (PSMFC) presented to FMWG, PNAMP's Steering Committee, and StreamNet's Steering and Executive Committees.
- PIT Tag Array Data and Related Data Analyses led by Marika Dobos and Russ Scranton focuses on identifying needs for data management and analytical methods for PIT tag array data. Leads worked with PTAGIS IPTDS to present the task during the 2024 PTAGIS Workshop and helped identify highest priorities to support the PIT tag data community.

Completed in 2023

- Fish Population Names and GIS Boundaries led by Van Hare (PSMFC) and Evan Brown (IDFG) developed recommendations for spatial boundaries and naming conventions referring to regional fish units. Completed in July, leads produced recommendations for fish management unit boundaries and attributes to be used by StreamNet tools.
- Juvenile Density (Snorkel & Electrofishing) led by Kasey Bliesner (ODFW) and Russ Scranton (BPA) provided recommendations for controlled vocabulary and standard field names.

Current task teams will continue progress in 2024 with the goal of accomplishing proposed products and future tasks will begin as priorities are established.

Learn more PNAMP Project Page; 2023 Accomplishments
Contact: Meg Dethloff (mdethloff@usgs.gov)

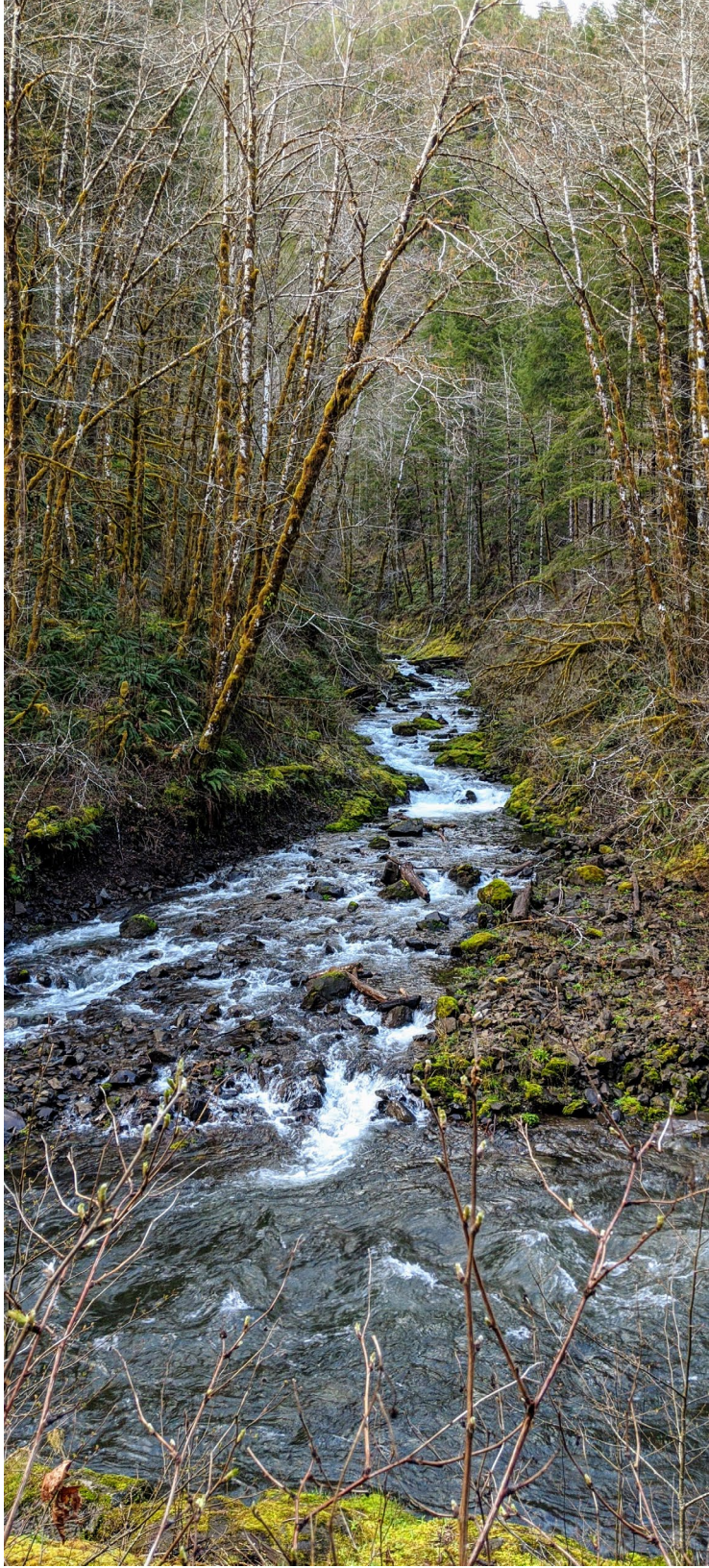
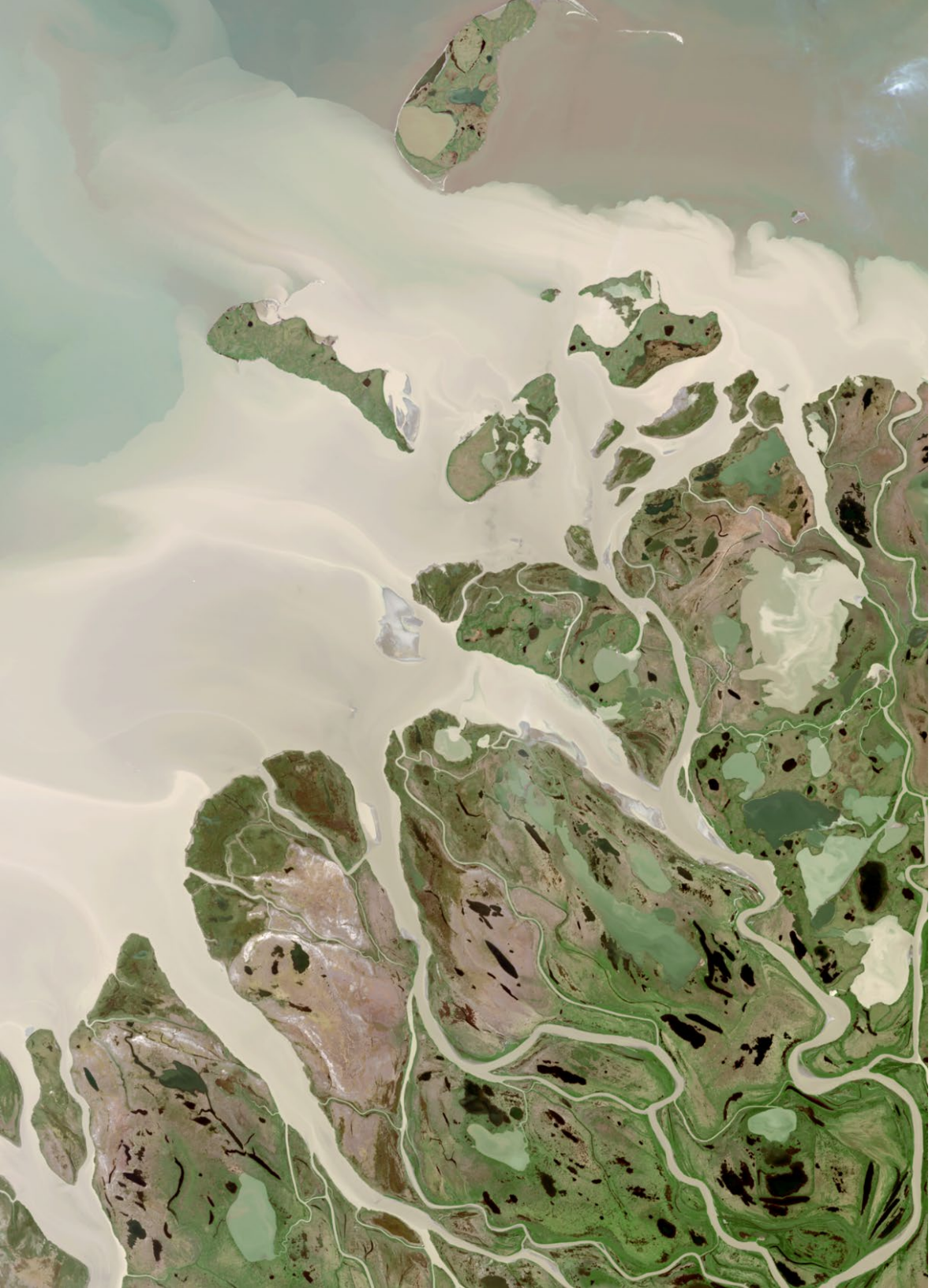


Photo: Meg Dethloff



Remote Sensing Forum

The PNAMP Remote Sensing Forum continued to meet in 2023 with the following goals in mind:

- Provide equitable opportunities for professional development or advancement of programmatic needs as it relates to remote sensing in the fields of fisheries and water resources in the Pacific Northwest.
- Collaborate on the creation of regionally specific standardized methods for collecting and analyzing remotely sensed data.
- Reduce the barrier to entry/adoption of implementing remote sensing practices by providing technical expertise and feedback in an online forum setting.

The forum typically meets a few times a year to share announcements and relevant news, and each meeting features two presentations from subject matter experts on remote sensing topics of interest. Recordings of past presentations can be found in the Remote Sensing Forum playlist on PNAMP's YouTube channel.

In 2023, the forum convened twice. The March session featured presentations and discussions centered on remote sensing data management, while the July session delved into wetland and nearshore eelgrass habitat mapping. Since these sessions, the recordings have garnered over 400 views on YouTube.

Learn more PNAMP Project Page; 2023 Accomplishments

Contacts: Amy Puls (apuls@usgs.gov) and Lauren Burns (lburns@ecofishresearch.com).

Image: USGS

MonitoringResources.org Outreach

One of the highest priorities for the Monitoring Resources team is to provide the tools and assistance necessary for users to thoroughly document their metadata with ease. Because metadata documentation is a relatively young practice, MonitoringResources.org is constantly adapting to emerging needs. MonitoringResources.org outreach aims to meet novel documentation needs while addressing FAIR (Findable, Accessible, Interoperable, and Reusable) data principles and fulfilling any contracting requirements. The outreach team addressed the needs of project sponsors through:

- One-to-one webinar project reviews with project sponsors
- Regularly updating training resources and creating new training resources (modules, short videos, guidance documents)
- A one-hour MonitoringResources.org Orientation training video introducing the new Bonneville Power Administration (BPA) Workflow for Project Sponsors
- Participating in discussions with other PNAMP work groups and projects like the Coordinated Assessments Partnership, the Stream Habitat Metric Integration project, and the Salmon Data Mobilization group
- Coordinating with StreamNet and BPA to identify improvements in connecting large, long-term datasets with BPA projects and metadata documentation
- Reaching out to project sponsors to finalize products within MonitoringResources.org and assisting with questions and concerns

Additionally, we provided specific outreach to California Department of Water Resource's (CA DWR) DELVE subject matter experts documenting their metadata in MonitoringResources.org. Specific support in this collaboration included:

- Coordinating Bi-weekly meetings with CA DWR subject matter experts to help document their metadata
- Finalizing and providing feedback on methods and template protocols
- Creating a guidance document specifically for DELVE subject matter experts on the documentation of template protocols

The ongoing success of MonitoringResources.org relies on the support of our partners who share our vision for better documentation and information sharing.

Learn more PNAMP Project Page; 2023 Accomplishments
Contact: Sam Cimino (scimino@usgs.gov)

Photo: Sam Cimino

MonitoringResources.org Development

The development team for MonitoringResources.org aims to streamline, simplify, and improve the documentation and discovery of monitoring metadata. Updates and the addition of new features to the suite of tools in MonitoringResources.org are primarily the response to user feedback from contract managers, subject matter experts, policy advisors, review panels, and data consumers.

In 2023, the development team added and updated features that make the documentation of metadata simpler, easier to find, and more accessible to reuse. The *BPA Workflow*, a new user interface, allows users to create all the documentation needed to fulfill BPA contracting requirements (a study plan, a protocol with its methods, and any associated sample designs) all in one seamless workflow. In addition, we updated the sample design validation tool, which allows users to validate which planned data collection events they actually visited after their field season. Once the data collection events are validated, they are then uploaded to the MonitoringExplorer.org map providing a metadata record that's more findable, accessible, interoperable, and reusable.

Other key developments to MonitoringResources.org in 2023:

- Cleaned up the user interface by hiding comments on all finalized content
- Simplified content discovery by increasing the size of the drop-down carets that reveal more information on the document search lists
- Updated the "Training Resources" page to house training videos, training modules, and guidance documents all in one place
- Made captions mandatory for all images, figures, and forms encouraging more thorough metadata documentation

PNAMP believes the success of this toolset relies on the input and participation of users. In 2024, we will continue to gather feedback from users to help prioritize future development.

Learn more: PNAMP Project Page; 2023 Accomplishments
Contact: Sam Cimino (scimino@usgs.gov)

Photo: Sam Cimino

Columbia River Basin Restoration Program Toxics Monitoring Subgroup

In 2023, the Environmental Protection Agency (EPA) and the US Geological Survey (USGS) established the Toxics Monitoring Subgroup (TMS) to support the Columbia River Basin Restoration Program and asked PNAMP to provide facilitation support similar to our other communities of practice. The TMS provides a forum to exchange toxics monitoring information, discuss challenges, coordinate monitoring activities, and support collaborative projects to benefit the community. Currently our focus is on three key projects that contribute to our ability to collectively scale up data: 1) identification of data gaps and areas of synergy for sampling and data management; 2) developing recommendations for common collection and analytical methods to enable cross-project data comparisons; 3) discussion of screening values/thresholds for specific constituents to be monitored.

The TMS participants have expressed a strong desire to share their work and learn about others' work, so we structured our 2023 meetings and workshop to create opportunities for peer-to-peer learning, including lightning talks (recordings available upon request), an open opportunity to bring questions to the TMS we call "Ask the Audience", and developed a matrix of project information . Leveraging the Project Tracking Matrix, EPA staff have developed a prototype Toxics Monitoring Information Dashboard, which spatially represents the information in a map-based viewer. We look forward to completing the Dashboard and increasing the number of projects described in the Dashboard and Matrix. TMS meetings also included informational presentations on topics such as: development of Quality Assurance Project Plans (QAPPs), how to publish data to the Water Quality Exchange, and how to access data in the National Water Quality Portal. These presentations on national programs provide important building blocks for developing the capacity to monitor water temperatures at cold water refuges within the Northwest region.

Learn more: PNAMP Project Page; 2023 Accomplishments. Contacts: Jen Bayer (jbayer@usgs.gov) and Amy Puls (apuls@usgs.gov).

Photo: Ruvim Miksanskiy


Photo: Sam Cimino

Outreach & Communication

The PNAMP.org website is the central hub from where our coordination staff communicates with the wider aquatic monitoring community. PNAMP activities are conducted by participant working groups and teams as endorsed by a partner-based steering committee, and these activities are detailed on PNAMP.org as past and present projects. Additionally, PNAMP.org houses thousands of documents related to PNAMP projects and events to promote participation by providing background information, meeting materials, and notes. The PNAMP team coordinates and hosts many events, but we also provide a platform for partners and other regional organizations to promote their own activities and accomplishments. A list of upcoming Events from around the region and a list of recent Announcements from PNAMP and its partners are prominently displayed on PNAMP.org and updated regularly.

The PNAMP.org website provides an abundance of communication and outreach that helps bring the community closer together. And yet, sometimes it helps if that information was even more accessible, like in an email inbox. Therefore, PNAMP also provides outreach through a monthly newsletter that reaches over 1,300 subscribers. The Newsletter delivers details on upcoming events, highlights the latest news from PNAMP and our partners, recaps past PNAMP and regional activities, and provides updates on MonitoringResources.org developments. We regularly hear from readers about how the newsletter helps them stay informed on events and news from around the Pacific Northwest.

The newsletter and PNAMP.org provide great outlets for passively connecting with the aquatic monitoring community; however, the PNAMP team also participate in active outreach and communication. We provide presentations to interested groups and organizations, we sit on panels and decision-making committees, and we produce fact sheets describing PNAMP and individual projects. We are continuously growing and building our community by showcasing new tools and publications and reaching out to potential participants. For instance, discussions on the next Emerging Technologies Information Sessions webinar series, aimed for Winter 2025, began at the end of 2023.

Actively attending meetings and workshops in-person is often difficult; that's why PNAMP staff has been meticulous in posting content on PNAMP's YouTube channel. This past year, our posted recordings have been viewed over 700 times. These videos have helped us reach new community members and reengage old ones.

Learn more: PNAMP Contact Us; 2023 Accomplishments
Contact: Sam Cimino (scimino@usgs.gov) and Jen Bayer (jbayer@usgs.gov)

Steering Committee

The PNAMP Steering Committee (SC) are representatives from signatory and courtesy partners. The SC provides the science-policy interface between the signatory partner's executives and project work teams and is responsible for communicating their respective organizations' work and needs to PNAMP, as well as communicating PNAMP progress and challenges to their organizations.

The PNAMP Steering Committee appreciates all the contributions from our partners during 2023. We gained some new collaborators and celebrated a few chapters closing. Happy retirement to Keith Dublanica (Washington Governor's Salmon Recovery Office) and Leslie Bach (Northwest Power and Conservation Council)! We thank you for your service over the years. Congratulations to Scott Donahue (Bonneville Power Administration), Stephanie Powers (Oregon Watershed Enhancement Board), and Jenna Judge (Puget Sound Ecosystem Monitoring Program) on their new roles. We welcome Greer Maier, Washington Governor's Salmon Recovery Office; Courtney Shaff, Oregon Watershed Enhancement Board; Katie Barnas, National Oceanic and Atmospheric Administration; Jonathan McCloud, Bonneville Power Administration; Patty O'Toole for Northwest Power and Conservation Council; as well as additional courtesy participants, Lara Erikson and Mari Williams of Pacific States Marine Fisheries Commission.

In 2023, the SC met virtually in February; featuring a presentation from Mark Saunders about the International Year of the Salmon, the IYS Synthesis Symposium, and BECI-Basin Scale Events to Coastal Impacts. In June, we held our first hybrid meeting of the year to discuss 2024 planning. In November, after the success of last year's two-day hybrid joint session, we joined forces again with the Pacific States Marine Fisheries Commission to gather both the PNAMP SC and StreamNet Executive Committee to facilitate collaboration for our overlapping participants and other interested parties.

Learn more: PNAMP Steering Committee

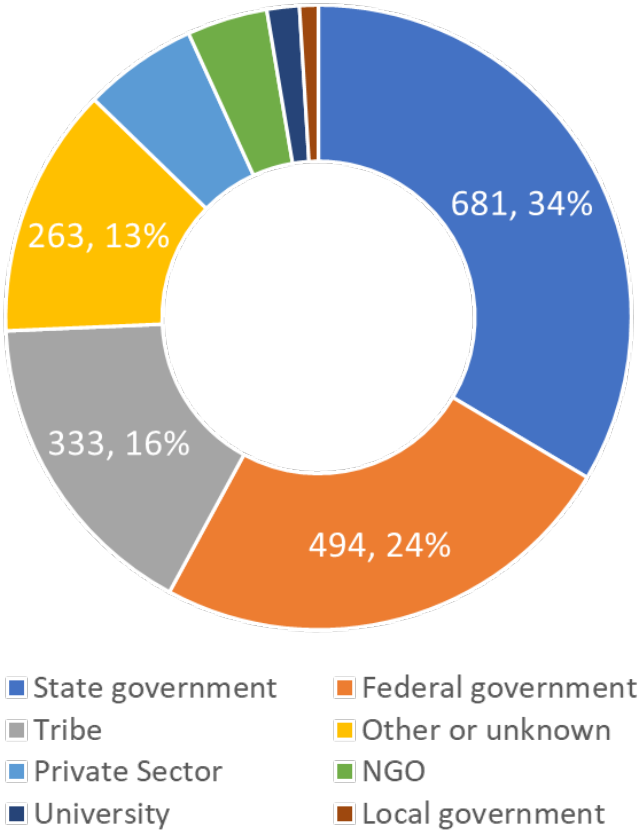
Contact: Meg Dethloff (mdethloff@usgs.gov)

Logos of PNAMP Steering Committee signatory partners

Participation

PNAMP's success depends on the voluntary participation of hundreds of people. The participants of PNAMP represent many perspectives, affiliations, geographic boundaries, and expertise. Together with the USGS staff that serve as the PNAMP Coordination Team, PNAMP participants collectively strive to improve monitoring methods and design, assessments, and reporting across the Pacific Northwest. Although managing projects in this volunteer-based environment is challenging, the results are very rewarding.

We feel it is important to acknowledge the generous contributions of time from participants. Keeping track of the time participants spend on PNAMP tasks sounds easy enough, but in practice has proven to be difficult, so for ease and consistency we report meeting participation. For 2023, we calculated 2028 hours of meeting participation from 356 people representing at least 94 organizations. Time contributions grouped by entity type are shown below. While tracking meeting participation is an imperfect measure of actual participation time, it remains our best option.



Above: Hybrid meeting tools helped keep us connected in 2023.

Left: Estimated hours contributed to PNAMP meetings for 2023 grouped by entity type. Graph labels represent number of hours and percent of total.

Acknowledgements

Thank you to our 2023 funding partners: Bonneville Power Administration, US Environmental Protection Agency, US Geological Survey, US Bureau of Reclamation, US Bureau of Land Management, Pacific States Marine Fisheries Commission, and the Washington Governor's Salmon Recovery Office. Your generous support helps advance monitoring and improve data sharing in the region.

We also thank all the task leaders, work group participants, meeting presenters, newsletter contributors, and steering committee representatives; we couldn't do it without you!

PNAMP Steering Committee Representatives

Bonneville Power Administration: Jody Lando, Russell Scranton*, Scott Donahue*, Jonathan McCloud*
California Department of Fish and Wildlife: Vacant
Columbia River Inter-Tribal Fisheries Commission: Denise Kelsey, Sheryn Olson*
Columbia River Inter-Tribal Fisheries Commission – Columbia Basin Fish & Wildlife Library: Tami Wilkerson+
Confederated Tribes of the Colville Reservation: John Arterburn
Idaho Department of Fish and Game: Tim Copeland, John Cassinelli*
Idaho Governor's Office of Species Conservation: Mike Edmondson+
Natural Resources Conservation Service: Timmie Mandish+
NOAA- NW Fisheries Science Center: Chris Jordan, Katie Barnas*
NOAA-West Coast Region: Greg Sieglitz
Northwest Indian Fisheries Commission: Bruce Jones
Northwest Power and Conservation Council: Leslie Bach, Patty O'Toole
Oregon Department of Environmental Quality: Vacant
Oregon Department of Fish and Wildlife: Jamie Anthony+
Oregon Watershed Enhancement Board: Courtney Shaff, Ken Fetcho*
Pacific States Marine Fisheries Commission: Nancy Leonard, Mari Williams+, Lara Erikson*
Puget Sound Ecosystem Monitoring Program: Jenna Judge+
US Army Corps of Engineers: Vacant
US Bureau of Land Management: Mike Brown
US Bureau of Reclamation: Jeff McLaughlin
US Environmental Protection Agency: Lisa Kusnierz
USDA Forest Service: Christine Hirsch
US Geological Survey: Steve Waste
Washington Department of Fish and Wildlife: Dan Rawding, Brodie Cox*
Washington State Department of Ecology: Scott Collyard
Washington Governor's Salmon Recovery Office: Keith Dublanica, Greer Maier
Yakama Nation Fisheries Program: Tom Iverson+

* Alternate Representatives , + Courtesy Representatives

Appendix A: PNAMP 2023 Accomplishments

pacific northwest aquatic monitoring partnership

Coordinated Assessments Partnership & HCAX Project

- Testing began mid-year for the data flow using the first version of the HCAX Data Exchange Standard (DES). To complete the review, StreamNet staff led a small group of data providers to test to identify any needed changes, find small errors and overlooked items, etc. HCAX data flow implementation testing is now complete, with successful data submission via the API from several partners. More details available from the HCAX events page: https://www.pnamp.org/project/hatchery-data-sharing-hcax
- During the StreamNet Steering Committee meetings, EPA funded data stewards (IDFG, WDFW, ODFW, CCT) and the CAP co-leads (PNAMP and StreamNet) discussed progress in preparing for data flow testing using the pilot HCAX DES (access 20-21 Feb 2023 meeting agenda, slides, and meeting notes from the document table https://www.streamnet.org/committees/sn-steering-committee/)
- The 2023 CAP Workshop (April 12 – 13, 2023) was attended by 57 participants representing 24 agencies and tribes. CAP Workshop Summary available here.
- PNAMP contributed to development and review of several new data dashboards that are hosted by StreamNet.
- PNAMP and StreamNet staff are beginning to address input from the 2023 CAP Workshop and have incorporated needs into FY24-25 work plans, following review and vetting with the PNAMP Steering Committee and StreamNet Executive Committee.
- HCAX data flow implementation testing is complete, with successful data submission via the API from several partners. StreamNet staff are identifying any needed alterations and will share that with partners in January 2024.

Coordination and Communication

- Completed all monthly newsletters; see newsletters here
- Hosted PNAMP Steering Committee Meeting, including focused discussion with Canadian colleagues Mark Saunders, Director of the International Year of the Salmon, and Tom Bird, CA DFO, around collaboration across borders
- Published the PNAMP 2022 Annual Report to PNAMP.org
- Continued support for StreamNet, including collaborative projects that link the PNAMP Fish Monitoring Work Group and MonitoringResources.org to StreamNet resources.
- On July 25, 2023 Jen Bayer and Nancy Leonard presented to the Upper Columbia River Blocked Area Anadromous Fish Working Group Studies and Actions Working Team (UC BAAF: SA) Working Team on approaches for data publishing and sharing.
- USGS has largely completed the administrative process needed to realign the PNAMP Coordination Team within USGS so that these staff are now part of the USGS Forest and Rangeland Ecosystem Science Center (FRESC). The PNAMP Coordination Team provided an overview presentation to a FRESC all-hands meeting to introduce themselves and encourage more participation by FRESC science staff in PNAMP activities.

CRBRP Toxics Monitoring Subgroup (TMS)

- March 23, 2023 Toxics Monitoring Subgroup Meeting; Link to materials on EPA website; link to PNAMP event.
  - At the meeting, we reviewed the purpose of the TMS, the TMS meeting schedule for the next year, and the tasks that the Core Team, with help from TMS members, will work on in the coming year.
  - Tasks came from TMS meeting participant feedback over the last couple of years and were identified as the top priorities at the December 14, 2022, TMS meeting. The tasks are 1) Identify data gaps and areas of synergy for sampling and data management, 2) Develop recommendations for common collection and analytical methods to enable cross-project data comparisons, and 3) Discuss and agree on screening values/thresholds for specific constituents to be monitored.
  - To support the subgroup's goal to provide a forum to exchange toxics monitoring information, discuss challenges, and coordinate monitoring activities, the meeting featured five lightning talks from subgroup members.
  - A link to the meeting recording is available by request.
- June 6, 2023 Jen Bayer provided assistance to the Northwest Toxics Summit hosted by the Environmental Law Education Center. Bayer presented a background of toxics monitoring in the region and moderated a panel of experts from federal and Tribal entities currently conducting monitoring for toxics in the Columbia River basin.
- The Columbia River Basin Toxics Monitoring Project Tracking Matrix version 1 was completed and published to EPA's website on September 21, 2023.
- July 11, 2023 Toxics Monitoring Subgroup Meeting; Link to materials on EPA website; link to PNAMP event.
  - 40 participants from state, tribal, federal, and other organizations
  - At the meeting, we discussed the status and future plans of the Columbia River Basin Toxics Monitoring Project Tracking Matrix; initiated planning for the winter workshop; and featured five lightning talks from subgroup members.
  - A link to the meeting recording is available by request.
- September 26, 2023 Toxics Monitoring Subgroup Meeting; Link to materials on EPA website; link to PNAMP event.
  - 48 participants from state, tribal, federal, and other organizations
  - At the meeting, Jill Fullagar (EPA) presented an introduction to the Water Quality Exchange (WQX); we initiated planning for a potential project and/or data dashboard; engaged the meeting participants to help answer a question submitted by a TMS member about fish tissue toxicity reporting and criteria to measure against; and featured two lightning talks from subgroup members.
  - A link to the meeting recording is available by request
- December 5, 2023 Toxics Monitoring Subgroup Workshop; Link to materials on EPA website; link to PNAMP event.
  - 53 participants from state, tribal, federal, and other organizations
  - The workshop included presentations on the Columbia River Basin Restoration Program, a summary of Columbia River Basin toxics monitoring project information, a prototype geospatial tool to display toxics monitoring project information, a comparison of methods being used by CRB toxics monitoring projects, and recommendations for project reporting. There were also multiple group discussions following the presentations, live polling to get feedback on various topics, and a brainstorming exercise to help build a shared understanding of gaps and needs.
  - A link to the meeting recording is available by request

Data Management and Sharing Best Practices – Data Visualization

- Participated on the CDI Data Visualization Collaboration Area organizing team to implement quarterly webinar series. The March 21, 2023, webinar was attended by at least 135 people. Featured presentation by Allison Horst (Observable) Fast, fun, interactive data visualizations in JavaScript with Observable Plot (abstract here). The webinar recording is available via SharePoint to CDI Data Visualization Collaboration Area members only – all are welcome, here's the form to join

Fish Monitoring Work Group

- The full work group convened for updates on tasks and a Tech Talk from Brian Maschhoff (Salmonetics) on PIThy: PTAGIS for the Unwashed Masses on January 19, 2023 (event page, meeting recording)
- The FMWG project updates were presented to the StreamNet Steering Committee on February 22, 2023
- PIT Array and Related PIT Tag Analysis Task leads met once in February and twice in March to discuss task development and coordinating potential discussion at Western Division/Idaho American Fisheries Society Meeting in May
- On April 20, 2023, the full work group convened for updates on tasks and a Tech Talk from Ben Staton, a Quantitative Fisheries Scientist with Columbia River Inter-Tribal Fish Commission. Ben presented some current work from the Grande Ronde: "Integrated Population Modeling of Grande Ronde Spring Chinook Salmon: Linking Dynamics and Habitat to Monitoring Data via SSMs" (event page, meeting recording)
- At the end of July, the Fish Management Units Boundaries and Attributes Task completed a recommendations document based on feedback received from the FMWG as well as other regional experts. These recommendations were provided to StreamNet for use in how StreamNet defines fish management units (e.g., population, core area, migratory corridor), names, and boundaries for more effective, standardized analyses, and communication/display of data via the StreamNet data tools and GIS layers (document link)
    - The recommendations were presented to the PSMFC StreamNet Steering Committee on September 20
- Nancy Leonard (PSMFC/StreamNet) reviewed feedback received at the June 27th meeting for StreamNet's development of an ESRI Dashboard intended to display a variety of content from existing sources that relates to screw traps (i.e., StreamNet, PNAMP's MonitoringResources.org, BPA's CBFish.org, and PTAGIS)
- The draft dashboard was presented to the PSMFC StreamNet Steering Committee on September 20
- PNAMP staff participated in the bi-annual StreamNet Steering Committee meeting September 19-20, 2023 and contributed updates on FMWG collaborative tasks PNAMP and StreamNet manage together
- The FMWG Core Team met monthly to plan and coordinate future work, discuss task progress, and develop agenda for January, April, and October full work group meetings
- On October 19, 2023, the full work group convened for updates on tasks and a Tech Talk from Nat Scholz, an Ecotoxicology Program Manager with NOAA Fisheries at their Northwest Fisheries Science Center. Nat presented research on fish health contaminants in the region: " An update on NOAA-F stormwater science in Puget Sound". (event page, meeting recording)
- Presented current work at the PNAMP Steering Committee and StreamNet Executive Committee joint session November 8-9, 2023 and contributed updates on FMWG collaborative tasks PNAMP and StreamNet manage together
- Symposium abstract accepted for 2024 WA/BC and Idaho Chapter Annual Meeting

Intensively Monitored Watersheds

- Held a virtual meeting on June 28 to brainstorm ideas for an IMW session at the 2024 River Restoration Northwest Symposium.
    - The meeting was attended by at least 20 people and resulted in ideas for two sessions and ten potential talks
    - Worked with Amelia Johnson (LCFRB), Bob Bilby (SRFB Monitoring Panel), and other IMW PIs to refine and submit the 2024 River Restoration Northwest session proposal entitled Key Results from Intensively Monitored Watersheds: Incorporating Lessons Learned into Restoration Programs and Project Design. The proposal was accepted by conference organizers, and speakers have submitted abstracts for 4 talks and 1 poster.

MonitoringResources.org

- Finalized and provided feedback to 15 protocols and 51 methods from January 1 to December 31, 2023
- Presented a Project Spotlight on MonitoringResources.org to the PNAMP Steering Committee at the February Steering Committee meeting which included our new collaboration with CA Department of Water Resources' DELVE tool, the new BPA Workflow, and the Data Discovery updates via MonitoringExplorer.org
- Coordinated weekly/biweekly meetings with ESA Sitka to discuss current and future development
- Coordinated monthly meetings with BPA COR and BPA subject matter experts
- Coordinated with BPA staff to determine priorities for 2023 development
- Coordinated with StreamNet technical team and StreamNet Steering committee members to determine the next steps for StreamNet data linking to Monitoring Resources metadata
- Presented a quick background on the linkages of MonitoringResources.org Study Plans and BPA project numbers at the StreamNet Steering Committee meeting
- Finalized a DELVE/MonitoringResources.org protocol template and used that template protocol to create a guidance document specifically for DELVE subject matter experts
- Created the BPA Workflow Guidance Document which helps users with BPA contracts navigate MonitoringResources.org and document content (Study Plans, Protocols, Sample Designs) in a more streamlined and efficient manner
- Provided the MonitoringResources.org schema (and APIs for access to content in MonitoringResources.org) to Canada DFO in order to begin discussions about creating graph databases to better understand the MonitoringResources.org use cases and inform future development
- Presented a virtual MonitoringResources.org training/orientation to new and returning MonitoringResources.org users highlighting the BPA Workflow and published the orientation video to the PNAMP YouTube channel and MonitoringResources.org
- Updated the guidance document for DELVE subject matter experts
- Updated training modules specific to documenting methods, protocols, sample designs, and study plans
- Finalized the development work of validating which of the planned sampling locations were actually visited ("Actuals") and released this function to the MonitoringResources.org production site
    - Demonstrated this tool to project sponsors and BPA staff

MonitoringResources.org Continued

- Met regularly with BPA staff to walk through and discuss MonitoringResources.org development and progress in FY23 and FY24 and prioritized future development
- Provided one-to-one guidance and assistance to MonitoringResources.org users at CA DWR, IDFG, WDFW, ODFW, Confederated Tribes of the Colville Reservation, Nez Perce Tribe, Confederated Tribes of the Warm Springs Reservation, ESA, Cramer Fish Sciences, BPA, and the USGS

MonitoringResources.org List of Development Released

- Finalized the development and user experience of the BPA Workflow
- Updated the "Training Resources" page to house training videos and training documents all in one place
- Simplified content discovery by increasing the size of the drop-down carets that reveal more information on all document search lists (methods, protocols, sample designs, study plans)
- Hid comments on all published/finalized content to reduce clutter
- Made providing captions mandatory for all attached images, figures, and forms
- Corrected and clarified the help text associated with validating data collection events
- Updated the functionality of importing CSV files in the sample design tool
- Simplified the user interface when validating data collection events
- Improved the documentation of "actual" sampling locations in the Sample Design tool within MonitoringResources.org
- Improved the navigation to validating data collection events
- Enabled users to easily validate planned and unplanned sites
- Created a pathway for validated sites to be displayed on MonitoringExplorer.org with their associated metadata

Remote Sensing Forum

- With Lauren Burns (Ecofish Research), co-led the organization and implementation of the RSF quarterly meeting. The meeting was attended by at least 33 people. Meeting recording here. Featured presentations by:
    - Dr. Sarah Hoffmann (Merck Animal Health): Smart Salmon Database: A collaborative platform for salmon habitat data sharing and insights (abstract here)
    - Chris Crosby (OpenTopography): OpenTopography: Enabling Access to High Resolution Topography (abstract here)
- With Lauren Burns (Ecofish Research), co-led the organization and implementation of the RSF quarterly meeting July 12, 2023. The meeting was attended by at least 27 people, and the meeting recording has 276 views as of September 29, 2023. Link to PNAMP event, link to meeting recording. Featured presentations by:
    - Natasha Nahirnick (Ecofish Research): Mapping with confidence; delineating seagrass habitats using Remotely Piloted Aerial Systems (RPAS)
    - Tara Blackman and Tulley Mackey (Mount Hood Environmental): Oregon Spotted Frog Habitat Suitability Monitoring in Central Oregon Wetlands

Stream Habitat Metric Integration

- Key products were completed this year, including a peer-reviewed journal article, dataset version 1.0, and code for creation of the dataset. The full methods and data standard will be published via a USGS series report, which is currently under review at USGS and is expected mid-year 2024.
- Lessons learned manuscript was published in the journal Environmental Monitoring and Assessment
    - Bayer et al., 2023 Sharing FAIR monitoring program data improves discoverability and reuse. Environ Monit Assess 195, 1141, https://doi.org/10.1007/s10661-023-11788-4
- The novel integrated data products are published on the USGS ScienceBase data repository and code is published via USGS GitLab repository. The dataset and code are available here:
    - Scully, R.A., Dlabola, E.K., Heaston, E.D., Bayer, J.M., Courtwright, J.L., Snyder, M.N., Hockman-Wert, D.P., and Saunders, W.C., 2023, Wadeable stream habitat data integrated from multiple monitoring programs for the US from 2000-2022: U.S. Geological Survey data release, https://doi.org/10.5066/P9J3P7SN
    - Scully, R.A., Heaston, E.D., and Dlabola, E.K., 2023, Stream Habitat Metrics Integration Data Exchange Standard (SHMI-DES): U.S. Geological Survey Software Release. https://doi.org/10.5066/P9KON2PKB

Steering Committee Meeting Series

- Organized and facilitated the February 8, 2023 PNAMP Steering Committee Meeting (event page, meeting notes) which included focused discussion with Canadian colleagues Mark Saunders, Director of the International Year of the Salmon, and Tom Bird, Fisheries and Oceans Canada, around collaboration across borders
- Organized and facilitated the June 21, 2023 PNAMP Steering Committee Meeting (event page, meeting notes) which focused on annual work planning
- Highly successful collaborative hybrid StreamNet Executive Committee and PNAMP Steering Committee meetings were held November 8-9, 2023, in Portland, OR (event page)
    - November 8th Notes
    - November 9th Note

Appendix B: Acronym Key

AFS	American Fisheries Society
AFS FITS	American Fisheries Society – Fisheries Information & Technology Section
AI	Artificial Intelligence
AIM	Assessment, Inventory, and Monitoring Strategy
AREMP	Aquatic and Riparian Effectiveness Monitoring Program
BLM	United States Bureau of Land Management
BPA	Bonneville Power Administration
CA DWR	California Department of Water Resources
CAP	Coordinated Assessments Partnership
CASC	Climate Change Adaptation Science Centers
CBF&W	Columbia Basin Fish and Wildlife Library
CDFW	California Department of Fish and Wildlife
CDI	USGS Community for Data Integration
CCT	Confederated Tribes of the Colville Reservation
CRITFC	Columbia River Intertribal Fish Commission
CRBRP	Columbia River Basin Restoration Program
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
DELVE	Data Explorer for Learning, Visualization, and Export tool
DES	Data Exchange Standard
DFO	Fisheries and Oceans Canada
DOI	United States Department of the Interior
EMA	Environmental Monitoring and Assessment Journal
EPA	United States Environmental Protection Agency
ESA	Environmental Science Associates (ESA Sitka)
ETIS	Emerging Technologies Information Sessions
FAIR	Findable, Accessible, Interoperable, and Reusable
FDAT	Fish Density Analysis Tool
FINS	Fisheries Inventory Systems
FMWG	Fish Monitoring Work Group
FRESC	Forest and Rangeland Ecosystem Science Center
GIS	Geographic Information System
HCAX	Hatchery Coordinated Assessments Exchange
HLI	High Level Indicator
Idaho OSC	Idaho Governor's Office of Species Conservation
IDFG	Idaho Department of Fish and Game
IMW	Intensively Monitored Watershed

Acronym Key Continued

IPTDS	Instream PIT Tag Detection System
ISRP	Independent Scientific Review Panel
IYS	International Year of the Salmon
MAFAC	Marine Fisheries Advisory Committee
NARS	National Aquatic Resources Surveys
NGO	Non-governmental Organization
NOAA	National Oceanic and Atmospheric Administration
NOSA	Natural Origin Spawner Abundance
NPCC	Northwest Power and Conservation Council
NPCC SPI	Northwest Power and Conservation Council's Strategy Performance Indicators
NRCS	Natural Resources Conservation Service
NRSA	National Rivers & Streams Assessment
NWIFC	Northwest Indian Fisheries Commission
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OWEB	Oregon Watershed Enhancement Board
PIBO MP	PACFISH/INFISH Biological Opinion Monitoring Program
PNAMP	Pacific Northwest Aquatic Monitoring Partnership
PSMFC	Pacific States Marine Fisheries Commission
PTAGIS	PIT Tag Information System
QA/QC	Quality Assurance / Quality Control
QAPPs	Quality Assurance Project Plans
RSF	Remote Sensing Forum
SC	Steering Committee
SHMI	Stream Habitat Metric Integration
TEK	Traditional Ecological Knowledge
TMS	Toxics Monitoring Subgroup
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish & Wildlife Service
USGS	United States Geological Survey
WA ECY	Washington Department of Ecology
WA GSRO	Washington Governor's Salmon Recovery Office
WA SRFB	Washington Governor's Salmon Recovery Funding Board
WDFW	Washington Department of Fish and Wildlife
YN	Confederated Tribes and Bands of the Yakama Nation