PACIFIC NORTHWEST AQUATIC MONITORING PARTNERSHIP

Annual Report for 2011

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PNAMP Coordination Team

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Executive Summary

The Pacific Northwest Aquatic Monitoring Partnership (PNAMP) continued promoting integration of monitoring resources and building tools to support monitoring in 2011. Integration of the different monitoring focal areas, of practitioners from a variety of organizations, and of monitoring programs goals and objectives is essential to improving the quality and consistency of monitoring in the region.

PNAMP operates through inter-organizational teams to make progress on a variety of projects identified to support partner needs and PNAMP goals. These teams are largely ad hoc and formed for the specific purpose of achieving the objectives of the identified projects. For each project, the PNAMP Coordination Team identified interested Steering Committee (SC) members and subject matter experts to form the working teams that provide guidance and leadership. In addition, the teams acted as an intermediate between the larger group of interested participants and the SC, thus maintaining the concept of better SC/participant exchange. The PNAMP Coordination Team continued to facilitate dialog among experts to move forward with ongoing and new projects. In addition, the Coordination Team continued their efforts to track in kind contributions at meetings, workshops, and other PNAMP hosted events.

PNAMP focused on projects related to these topics in 2011: data management, integration of monitoring, monitoring design, species and watershed monitoring, and technologies to advance monitoring. PNAMP advanced its coordination goals and objectives for these topics by hosting workshops, work sessions, and meetings. Steering Committee members and subject matter experts participated in these meetings to exchange information about their own programs, coordinate on existing projects, and initiate new tasks, including:

- supporting overall data management for monitoring;
- planning and co-hosting a continuing series of workshops for coordinating data management and exchange to support improved assessments and reporting in the Columbia River Basin;
- continuing development of a regional data management strategy;
- working to implement metadata recommendations;
- continuing work to demonstrate a “master sample” based integrated status and trend monitoring project in the Lower Columbia River recovery area;
- planning for development of an online tool to support monitoring design and site management;
- managing a monitoring protocol and method library;
- moderating a community forum to discuss protocols and methods;
- planning and co-hosting a series of work sessions for coordinating data management and exchange of habitat data;
- maintaining the structure of the PNAMP website for better information discovery and delivery; and
- planning additional work related to web tools and resources, such as integration of all web resources, development of a tool to support metadata creation, development of

a data steward community of practice, and supporting websites that provide much needed educational guidance about monitoring.

Lastly, in addition to specific projects, PNAMP continued to emphasize communication as a tool to support collaboration and provided a forum where monitoring practitioners and policy staff could interact and exchange information. PNAMP operates by open, inclusive processes and all meetings and documents are readily accessible on the PNAMP website.

The opportunity provided by the PNAMP forum to allow its partners and participants to collectively focus on issues, results, and future needs related to monitoring increases coordination and collaboration in the near term, and increases effectiveness and efficiency of aquatic resource monitoring on a regional scale in the long term.

Background

Federal, state, tribal, local, and private aquatic monitoring programs in the Pacific Northwest have evolved independently in response to different organizational mandates, jurisdictional needs, issues and questions. Planning and coordination of federal, state and tribal monitoring activities have evolved slowly but steadily over the past ten years. The Pacific Northwest Aquatic Monitoring Partnership (PNAMP) became a formal institution in 2004, charged with providing a forum for coordination of aquatic monitoring efforts in the region. The geographic area of this coordination includes the Pacific Northwest region from Northern California to Canada where participating entities are implementing monitoring efforts. As of 2011, 20 state, tribal, federal, and regional entities signed the PNAMP Charter (Appendix A).

The guiding principles behind PNAMP are that monitoring will be improved if all programs:

- use consistent monitoring approaches and protocols,
- follow a scientific foundation,
- support monitoring policy and management objectives, and
- collect and present information in a manner that can be shared.

These goals require considerable effort and commitment to collaboration by many entities and individuals. PNAMP strives to provide the forum where this collaboration can occur and to facilitate the exchange among subject matter and policy experts that is necessary to accomplish these goals. Although we are always supportive of more participation, we believe PNAMP has a good combination of participants to address these goals. PNAMP's organizational structure includes a Steering Committee (SC), staff to serve as coordinators and facilitators for specific topics of interest (Coordination Team), and a number of subject matter experts participating in working teams that focus on specific projects and their related tasks. The SC is composed of representatives from all entities that are signatory to the Charter (link to PNAMP Charter page) and working team leads, a combination that allows the interface of technical and policy interests. The agency representatives are responsible for communication to PNAMP regarding their respective organizations' work and needs, as well as delivering PNAMP progress and challenges to their organizations. Participants from the working teams largely contribute in-kind hours to support PNAMP projects. PNAMP has found that in some cases it is necessary to secure dedicated time from individuals in order to move forward quickly on the tasks related to a project. In these instances, time may be supported by PNAMP funding, usually for a person to serve as a lead for a particular task.

Over the years, PNAMP has developed a better understanding of how the goals of each project are inherently interdependent on each other, as well as the goals of our partners. PNAMP has been working on a number of projects that support integration, which is important for establishing a regional partnership for aquatic resource monitoring that bridges the technical focus and individual organizations. There are core features of all

monitoring programs that, if well documented and shared, can lead to better integration in the region. These features include monitoring design (including objectives, methods, study design, location, etc.) and data management and exchange. In addition, PNAMP has realized that regional monitoring efforts would be better integrated and coordinated if they were well documented and had agreed upon reporting standards.

The different mandates driving monitoring and subsequent management, policy and reporting response requires collaboration with other regional and national organizations, as well as many individual participating organizations. Regardless of the complexity involved, PNAMP believes that support of coordination and collaboration based on the four guiding principles is important for a successful regional monitoring network.


USGS

The PNAMP Steering Committee, Coordination Team, and participants share the responsibility to work across PNAMP to accomplish our goals efficiently and consistently. We encourage those in the region who seek assistance with aquatic resource monitoring issues to contribute to PNAMP.

Coordination on complex topics with many partners takes time and hard work. Since PNAMP is a voluntary organization, our progress is directly correlated to participation. Support and open communication are essential for PNAMP to be able to respond to needs of the region; we need to hear from both subject matter and policy experts on what is needed for better coordinated aquatic resource monitoring.

Coordination Team Activities

PNAMP Coordination Team is employed by the U.S. Geological Survey (USGS), Northwest Area Regional Executive Office. The PNAMP Coordination Team includes the Coordinator (Jennifer Bayer), the Assistant Coordinator (Jacque Schei), and the Information Management Liaison (Kathryn Thomas). PNAMP occasionally hires staff on detail positions to support PNAMP work. In 2011, staff on detail included Amy Puls (to provide project management for specific projects) and Rod Polintan (to support meeting logistics and provide administrative support). In the future, PNAMP will look for longer term administrative support options, as well as consider longer-term staff positions as necessary versus detail positions.

The Coordination Team's goals are to facilitate the transfer of information within PNAMP and across all relevant organizations, work to support relationships between science and monitoring and to promote communication among organizations to help assure that monitoring plans and information are

coordinated across the Pacific Northwest. The Coordination Team works to initiate and facilitate the development, presentation, and distribution of products aimed at heightening understanding of PNAMP issues, successes, and problems and to serve as a clearinghouse for PNAMP activities and products.

The Coordination Team is responsible for administrative requirements of PNAMP activities (e.g. meeting logistical support, record keeping, and maintenance of participant information). At least one member of the Coordination Staff serves as a lead or co-lead for all PNAMP projects to ensure the project moves along in a timely manner. In addition, the Information Management Liaison chairs the Data Management Leadership Team and is responsible for planning and convening their quarterly meetings. The PNAMP Coordinator is responsible for planning and convening quarterly Steering Committee meetings as well.

In 2011, organizational support was provided by developing and negotiating fiscal support with government and non-government entities and managing budgets and associated contracts with those entities. Required progress reporting regarding the Coordination Team's activities (within PNAMP) and PNAMP activities to interested external parties was completed. The Coordination Team represented PNAMP at several external meetings, workshops, and conferences in 2011. In addition, the Coordinator conducted briefings at meetings and for individual organizations and their executives throughout the region as requested regarding PNAMP activities.

The Coordination Team continues to seek appropriate outlets for communicating PNAMP's work beyond required progress reporting. In 2011, PNAMP again sought expertise from Montana State University (MSU) through a Cooperative Ecosystem Studies Unit (CESU) agreement to support our website (www.pnamp.org). MSU continued to provide technical assistance in developing and maintaining the PNAMP website to support delivery of scientific information and increase the availability of biological and natural resources information at the regional and national level. With their help, we deployed a new version of the PNAMP website in early 2011. With this new version, we have made advancements with respect to the integration of information on the website and improved the display of information and access by users such as researchers and natural resource managers. Ultimately, the working collaboration between PNAMP and MSU has been beneficial to both parties at a variety of levels.

In addition to the main PNAMP site, the Coordination Team also managed several other sites that are in development for the various web resource projects described in the Project Activities section below.

Beyond communicating PNAMP's work via online resources, the Coordination Team participated in several outreach activities in addition to regular PNAMP activities. The PNAMP Information Management Liaison coordinated with NOAA to co-lead a symposium at the 2011 AFS Annual meeting in Seattle. The symposium "Advances in data management and dissemination: The view

from the edge of a new frontier" featured 28 speakers covering a wide-range of data management, sharing, visualization, and documentation topics (link to symposium flyer). It was a well-attended, all day symposium. The PNAMP Assistant Coordinator presented a talk on MonitoringMethods.org for this symposium, as well as for a large rivers symposium at the same conference. The PNAMP Assistant Coordinator also presented an overview of MonitoringMethods.org at a State of the Salmon conference, "Salmon in a Changing Climate", in November 2011. The PNAMP coordinator presented overview presentations for the Puget Sound Stormwater Workgroup, the Northwest Biological Assessment Workgroup, the Columbia River Federal Caucus, and for attendees at a USGS Monitoring Framework Workshop in Reston, VA.


USGS

Coordination Team Activities: Organizational Development

PNAMP is a dynamic, growing association of state, federal, and tribal partners, as well as a variety of other participants from other organizations. Projects are supported by staff and working teams, who are almost entirely supported by in-kind contributions from their organizations. While managing projects in this volunteer-based environment is challenging, the results are very rewarding. One concern is our ability to account for these in-kind contributions from participants. Over the years, the Coordination Team has tried various ways to track in-kind contributions. We have found it to be relatively easy to track meeting hours and assign in-kind contributions based on attendance at PNAMP meetings and an estimate of meeting prep or driving time (Table 1, 2). The Coordination Team has attempted to track time participants spent working on PNAMP projects outside of meetings, but this is challenging because it requires input directly from participants. It has been difficult to get a comprehensive tally for the year from participants and task leads. Requests have been made to participants asking them to track hours spent on PNAMP activities during the year; however, relatively few participants actually do. Since we were not able to come up with an accurate assessment of these hours in 2011, we are not reporting any estimates here. The Coordination Team plans to continue requesting in-kind estimates from participants in the future.

Table 1. Estimated hours contributed by entities to PNAMP meetings. Hours were assigned to each meeting attendee for every PNAMP meeting from January 1 to December 31, 2011. Meeting times were assigned at time and a half to account for travel and prep times. For example, if a meeting lasted 6 hours, participants were assigned 9 hours. Teleconference times were counted as recorded. These estimates assign the full meeting time to each meeting attendee, regardless of if they attended the whole meeting or not. Note: Contractors/consultants were assigned to the funding agency where possible (noted in entity name). The rest of the contractors/consultants were grouped as one entity.

Entity	Total Hours	Hours for Steering Committee Only
Bonneville Power Administration and contractors	353.00	75.75
Columbia Basin Fish & Wildlife Authority	89.25	31.50
Clark County	5.00	
Colville Confederated Tribes	31.50	25.50
Confederated Tribes and Bands of the Yakama Nation	72.00	
Confederated Tribes of the Warm Springs Reservation	25.00	
Consultants (grouped)	31.50	
Conservation Reserve Enhancement Program	2.00	
Columbia River Inter-Tribal Fish Commission	193.50	51.75
Confederated Tribes of the Umatilla Indian Reservation	45.75	
Ecotrust	27.75	9.00
Environmental Protection Agency	16.50	
Idaho Department of Fish and Game	112.50	16.50
Independent Scientific Review Panel	24.00	
Lower Columbia River Estuary Partnership	4.50	
Lower Columbia River Fish Recovery Board	56.50	
NASA	1.50	
Nez Perce Tribe	62.00	
NOAA Fisheries	115.75	24.75
Northwest Power and Conservation Council	99.75	36.75
Northwest Habitat Institute	21.75	
Oregon Department of Environmental Quality	5.00	
Oregon Department of Fish and Wildlife	265.25	28.50
Oregon Watershed Enhancement Board	9.00	9.00
Shoshone-Bannock Tribes of Fort Hall	24.00	
StreamNet	111.00	36.75
Upper Columbia Salmon Recovery Board	35.25	

Table 1 Continued. Estimated hours contributed by entities to PNAMP meetings.

Entity	Total Hours	Hours for Steering Committee Only
U.S. Army Corps of Engineers	5.25	
U.S. Bureau of Reclamation	67.50	33.75
U.S. Forest Service	24.00	9.00
U.S. Fish and Wildlife Service	16.50	16.50
U.S. Geological Survey	72.75	25.50
University of Washington	28.50	
Washington Department of Ecology	66.00	36.75
Washington Governor's Salmon Recovery Office	76.50	30.75
Washington Recreation and Conservation Office	9.00	9.00
Washington Department of Fish & Wildlife	196.50	48.75
Wild Salmon Center	4.50	

Table 2. Estimated hours contributed by topical category to PNAMP meetings. Hours were assigned to each meeting attendee for every PNAMP meeting from January 1 to December 31, 2011. Meeting times were assigned at time and a half to account for travel time and prep times for the meeting. For example, if a meeting lasted 6 hours, participants were assigned 9 hours for that meeting. This was only done for on-site meetings. Teleconference times were counted as recorded. In addition, these estimates assign the full meeting time to each meeting attendee, regardless of if they attended the whole meeting or not.

Topical Category	Total Hours
Data Management Topics (Leadership Team, Coordinated Assessments, Metadata, Habitat Data Sharing)	1579.50
Web Resources (MonitoringMethods.org, Master Sample, etc.)	90.00
Integrated Status and Trends Monitoring Demonstration Project	195.00
Steering Committee	555.75

In 2011, PNAMP also surveyed the SC and all participants to get feedback on how PNAMP operates. The results helped with strategic planning for future work, as well as with planning for updates to communications. Details of the survey questions and responses can be found on the PNAMP website (link to survey results). PNAMP plans to conduct a similar organizational survey at least once every two years in the future.

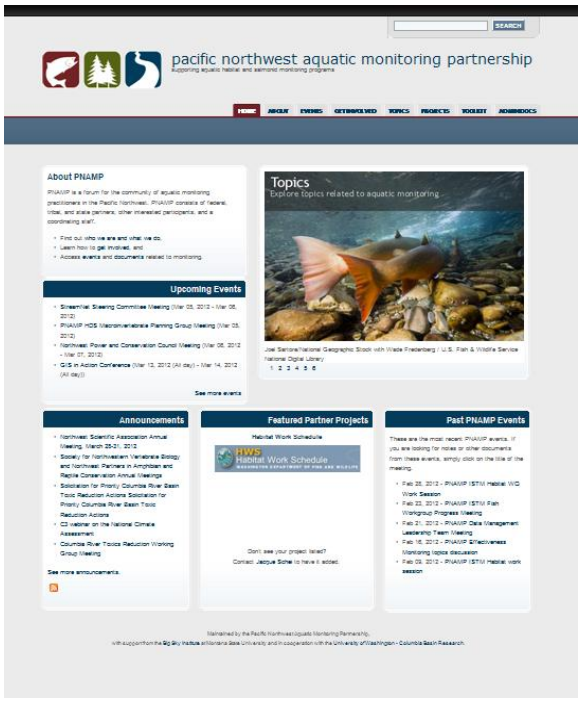
Project Activities

For several years, PNAMP's work and associated meetings and work sessions have been driven by ongoing and new projects. This

is in contrast to the previous approach of standing work group meetings (organized around topics) throughout the year. The project-focused structure allows for better information distribution among participants in cases where a project cuts across multiple topical areas. The only topical meeting that was scheduled on a regular basis during 2011 was the Data Management Leadership Team meeting series.

Using a project-focused structure, PNAMP is able to gather interested SC members and subject matter experts to form working teams that focus on completing specific tasks for the project. These teams guide the progress of the project and act as intermediaries between the larger workgroup and the SC. We have found that this structure allows better SC/workgroup exchange without asking every SC member to track every activity. It also allows support from a larger forum of subject matter experts who are able to contribute to an open, inclusive process if they choose. The project-focused structure recognizes the smaller, work teams while maintaining the framework of a larger forum of interested participants and provides for open participation.

In addition, PNAMP has found that it is important to have a dedicated lead for all projects, whether it is someone from the Coordination Team, a SC member, or subject matter expert who participates in PNAMP. In the absence of a lead who can dedicate time to moving things along, PNAMP has found that final products can be significantly delayed, much to the frustration of interested parties. In cases where no volunteer lead has been identified via in-kind time contribution, PNAMP has distributed funds, as the budget allows, to support the time of a lead.



PNAMP meetings and work sessions in 2011 focused on tasks related to these main projects: Coordinated Assessments, Regional Data Management and Sharing Roadmap, Regional Metadata Guidance, Habitat Data Sharing, Integrated Status and Trends Monitoring Demonstration Project, Master Sample Tool development, MonitoringMethods.org, other web resources, Remote Sensing Forum, and the Salmon Population Crosswalk Database. Several smaller work teams met regularly to focus on specific tasks identified with these projects. Additional details are described below. Also described below is the series of regular meetings PNAMP hosted to address the topic of data management. Other topics or projects mentioned in previous PNAMP annual reports are still being tracked, but largely did not make much progress in 2011. These topics and projects, and plans for the

future, are described briefly at the end of this section.

Data Management

In recent years, there has been significant attention on advancing data management in the region. PNAMP recognizes the importance of data management to regional monitoring activities and the highly technical nature of data management discussions. To facilitate dialog between PNAMP work teams, regional information management groups, and regional application development teams, PNAMP continues to support a member of the Coordination Team to help guide and move these projects along. In 2011, the Coordination Team developed a new position, the Information Management Liaison, to replace the Data Steward. The PNAMP Information Management Liaison is responsible for support to specific projects; coordinating and facilitating meetings related to regional data management efforts; providing recommendations to the PNAMP Coordinator and SC on regional data management issues, tools, and procedures; communicating with monitoring practitioners to identify needs; and communicating user requirements to development teams (link to PNAMP Data Management page).

PNAMP Data Management Leadership Team

As mentioned above, PNAMP has moved to a more project-focused meeting schedule, with the exception of the topic-driven data management meeting series. Many organizations throughout the region are discussing and working on data management issues. Because of the breadth of these activities, it was difficult for PNAMP SC members and PNAMP partners to stay informed on details of these discussions and activities. In response to the need to keep informed and to promote data management best practices, PNAMP formed the Data Management Leadership Team (DMLT) to discuss and initiate data management projects specific to PNAMP's needs.

The DMLT met four times in 2011. The meetings focused on projects described below in addition to emerging regional data management issues. The DMLT will continue to meet on a regular basis in 2012 to address regional data management needs.

Coordinated Assessments Project

As described in the Columbia River Basin Anadromous Salmonid Monitoring Strategy (ASMS), the Federal Columbia River Power System (FCRPS) Action Agencies and fishery co-managers agreed to the monitoring necessary to provide data to answer key management questions related to Viable Salmonid Population (VSP) parameters. Performing these assessments and reporting answers to these management questions on an ongoing basis is needed to support 1) federal reporting for the Federal Power System Biological Opinion (BiOp), 2) federal recovery group reporting for the Endangered Species Act (ESA), 3) state agency mandated reporting, and 4) tribal Accord reporting needs.

In 2010, PNAMP and Columbia Basin Fish and Wildlife Authority (CBFWA) initiated a collaborative effort to gather co-managers and other key organizations within the sub-regions of the ASMS to develop assessment and data

sharing strategies for meeting regional reporting requirements (link to overall work plan). A Coordinated Assessments (CA) Planning Group convened to guide the implementation of the project. PNAMP contracted with Ross & Associates to provide facilitation expertise during this effort.

In October 2010, PNAMP and CBFWA hosted a workshop to present the Phase I efforts of the project and to initiate efforts for Phase II of the project. Phase II consisted of extended efforts to inventory the available data that would support a VSP data exchange in a standard format adhering to a Data Exchange Template (DET), develop data analysis flow diagrams for these data to clarify data locations and pathways, and assess the gaps, needs and priorities for developing data sharing capabilities of the state agencies and tribes participating in the effort. At the end of the 2010, ten data technicians were hired to work at 11 key locations in nine state and tribal fisheries management agencies that collect and manage these data

In the winter and early spring of 2011, the data technicians worked with the CA Planning Group to collect data using a spreadsheet in a draft DET format, develop data analysis and flow diagrams, and begin the assessment of data management business needs to accomplish coordinated assessments. The status of the project was reviewed and lessons learned presented to the project participants at an April 2011 workshop (link to workshop page).

After the April workshop, CA activities focused on developing an overall strategy that would guide the participating organizations in: 1) developing their capacity for managing the data supporting VSP indicators and 2) developing a process to organize and share the VSP and supporting metrics in DET format. The participating state agencies and tribes developed individual data management strategies to support sharing of the VSP indicators as part of the overall strategy. Another workshop was hosted in September 2011, during which participants provided input on the draft strategy. The final draft "Columbia River Basin Collaborative Data Sharing Strategy: Salmon and Steelhead Population Abundance and Productivity Indicators" was published after a follow-up review period (link to final report).

The CA Planning Group developed a Phase III work plan to guide activities in 2012 (link to Phase III work plan). Phase III will focus on the development of the DET for the VSP indicators and refining the governance process necessary for continuing work on the data management activities that support data sharing across the region. In addition, the group will begin addressing data sharing beyond the three pilot VSP indicators (link to Coordinated Assessments project).

Regional Data Management and Sharing Roadmap

The SC and DMLT identified in early 2010 the need for a PNAMP document that described the data management and sharing components that should support regional monitoring efforts. Several early drafts of the Roadmap were developed in 2010, but the effort was suspended when the lead for the effort left the Coordination Team. The Roadmap was

intended to provide overall guidance and common language that can be used by policy makers, natural resource managers, and data professionals to develop the organizational systems that support effective data sharing. The task to finalize the Roadmap was reassigned to the Information Management Liaison and a draft was submitted to the DMLT in December 2011 for review. In early 2012, the Information Management Liaison will incorporate review comments and, after DMLT approval, the Roadmap will be submitted to the SC for final approval.

Regional Metadata Guidance

Metadata describe the content, quality, condition, and other characteristics of data. A standard metadata report can be used to enhance searching and discovery of data sets and to facilitate understanding of the meaning and proper use of datasets. For organizations that collect data, metadata help enhance the quality, usability and value of data for internal and external users. Organizations should view metadata creation as integral to their workflow and metadata as integral to datasets.

To facilitate better metadata documentation in the region, PNAMP's Metadata Working Group has worked with a contractor, Environmental Data Services, to write a regional guidance document on metadata standards for ecological data (link to final 2010 report). PNAMP again worked with the contractor to scope requirements for one or more of the implementation recommendations identified in the guidance document. The Metadata Working Group provided comments and recommendations and the contractor presented the final report, "Regional Metadata Tool Recommendations", in May 2011 (link to report).

The Metadata Working Group met three times in 2011. In addition to a meeting dedicated to the recommendations report, the group met to discuss and make recommendations to the PNAMP DMLT for fiscal year 2012 activities that promote metadata regionally. Some of the identified activities were discussed for funding via Bonneville Power Administration through funds designated to support data management. The group also started work on a list of basic metadata elements that should be associated with a dataset; work on that will continue in 2012 (link to Regional Metadata Guidance project).

Habitat Data Sharing

Organizations throughout the region collect habitat condition data for a number of purposes including management and regulation of activities that affect fish habitat, assessment of watershed health, Clean Water Act applications and landscape metrics to support BiOp requirements. One important driver for the sharing of habitat data is the need of tribes and organizations at all levels to report on status and trends of fish and habitat condition and action effectiveness of restoration work at the project and watershed scales.

In the Columbia River Basin, the Federal Columbia River Power System BiOp reporting requirements are a specific and encompassing driver for monitoring. The Northwest Power and Conservation Council also looks to improve understanding of fish habitat in the Columbia River Basin as part of their Fish and Wildlife Program. Region-wide, habitat is a limiting factor for many listed species and NOAA Fisheries requires habitat related data for fishery status assessments.

PNAMP initiated the Habitat Data Sharing (HDS) project in mid-2011 with the formation of a project work team consisting of PNAMP and CBFWA staff. PNAMP contracted with Ross & Associates to provide facilitation expertise during this effort. In the fall, the HDS Leadership Team was assembled to guide the project's activities. They held their first meeting in December of 2011.

The HDS work team developed descriptions of potential activities for the project based on interviews, a workshop, input from the PNAMP SC, and comment on an initial prospectus. The interviews were conducted by members of the work team in June and July 2011, with 11 people representing federal, state, tribal, and NGO interests in aquatic resource management. A workshop was held on July 26, attended by nearly 20 invited participants, and a broad scoping activity was conducted (link to workshop page). Following the workshop, the HDS work team developed an initial prospectus describing three activities participants had identified as potential new tasks. The PNAMP SC reviewed and discussed additional topics of habitat data sharing interest. The HDS Leadership Team and the DMLT also provided feedback.

Based on feedback received, the prospectus was expanded to a work plan that identified seven different activities that will be implemented by the HDS teams in 2012:

A. Identification of a short list of priority habitat characteristics;
B. DET prototype for selected habitat characteristic data;
C. Creating habitat indices for improved sharing using normalization of habitat metrics and measurements;
D. Needs assessment for habitat data sharing;
E. Macroinvertebrate data as a component of habitat characterization data for sharing;
F. Remote sensing as a new/improved source of habitat characterization at multiple scales; and
G. Habitat data discovery.

Activity A is the basis for activities B, C, and D. The output of the Integrated Status and Trends Monitoring Demonstration Project – Tributary Habitat Monitoring Component (see below) will be a primary input to this suite of activities. Activity E brings a topic to the

discussion that potentially links water quality monitoring with monitoring conducted for habitat restoration effectiveness and for fish productivity. Activity F provides for collaboration with the HDS participants and the Remote Sensing Forum (described below) and, likewise, activity G provides for collaboration with the HDS participants and the scoping of a monitoring activity inventory/site management tool in 2012 (see below)
(link to Habitat Data Sharing project).

Integrated Status and Trends Monitoring Demonstration Project

The Integrated Status and Trends Monitoring Demonstration Project (ISTM demo project) has been developed over the past several years with collaborative effort involving PNAMP partners and other local partners in the Lower Columbia River (LCR). The ISTM demo project is intended to demonstrate an approach and utility of an integrated design framework for the collection of information to address questions on the status and trends of physical, chemical, and biological attributes in stream networks.

After many discussions to scope and refine the project, the group decided to conduct a demonstration in the LCR recovery area. The ISTM demo project will provide entities tasked with monitoring fish populations and aquatic habitat in the Pacific Northwest with a roadmap for integration of scientifically sound monitoring programs intended to meet the needs of decision-makers and managers. Specifically, it will apply this approach and develop recommendations for integrated monitoring plans (based on monitoring conducted by the Oregon Department of Fish and Wildlife (ODFW), the U.S. Forest Service (USFS), NOAA Fisheries (NOAA), the Lower Columbia Fish Recovery Board (LCFRB), the Washington Department of Fish and Wildlife (WDFW), and the Washington Department of Ecology (WDOE)) for salmon, steelhead, and potentially bull trout populations listed under the ESA, and their habitats in the LCR.

Among the many monitoring components, key features of this effort are improved understanding of the extent and qualities of existing information, key gaps, and how a region-wide "master sample" concept can be applied to select sampling locations where appropriate. Generic objectives in the ISTM demo project for both habitat and fish are:

1) Identify and prioritize management decisions, questions, and objectives;
2) Evaluate the extent to which existing programs align with these management decisions, questions, and objectives;
3) Identify the most appropriate monitoring design(s) to inform priority management decisions, questions, and objectives;
4) Use trade-off analysis to develop specific recommendations for monitoring based on outcomes of objectives 1-3; and
5) Recommend implementation and reporting mechanisms.

The PNAMP Coordination Team has facilitated development of the ISTM project as part of PNAMP activities in conjunction with other PNAMP tasks in order to fully capitalize on partners' in-kind contributions of staff time.

In-kind contributions have largely been the primary mechanism to advance this work to date, but in 2011, several specific tasks continued on funding from Bonneville Power Administration (BPA) in order to complete the work in the absence of a technical lead.

Progress on the project has been broken out into components and detailed below. Each component is in a different state of maturity, but the Coordination Team facilitated progress to ensure that all were linked as necessary to benefit the project as a whole.
(link to ISTM Demonstration project)

Fish Monitoring Component
(Task leads: Dan Rawding, Jeff Rodgers, Bernadette Graham Hudson)

The specific goal of the fish sub-workgroup of the ISTM project is to develop a coordinated VSP monitoring program that addresses key regional (priority) monitoring questions and develops study designs of sufficient quality and quantity to determine status and trend of LCR salmon and steelhead. This will provide entities tasked with monitoring salmon and steelhead populations in the Pacific Northwest with a roadmap of the steps needed to develop an integrated, scientifically sound monitoring program that meets the needs of regional decision-makers and managers. The intent is to apply this approach to develop a specific monitoring plan for ESA listed salmon and steelhead populations in the LCR, concentrating on the monitoring of VSP parameters. It is anticipated that this project will ultimately lead to a transparent, scientifically credible, and cost-effective fish monitoring program in the LCR, which can be used as a model for the remainder of the Columbia Basin.

In 2010, staff from ODFW, WDFW, and the LCFRB led an effort to host a series of workshops with monitoring program managers, ISTM participants, and the Joint Salmon Science Team (JSST) to prioritize fish monitoring needs. Task leads used the information gathered at the workshops to identify and prioritize management decisions, questions, and objectives for integrated status and trend monitoring of salmon and steelhead populations in the LCR planning domain (Objective 1). In addition, work related to the Data Management component of ISTM supported this task (see the Data Management Section below for more details). Details of this work that completed Objective 1 for the fish component can be found in the final report (link to Objective 1 report).

A draft report on Objective 2, which is an evaluation to the extent to which existing programs align with these management decisions, questions, and objectives, will be completed in early 2012. At that time, the

group will proceed with a final review step with managers and policy representatives.

The purpose of Objective 3 is to identify the most appropriate monitoring design(s) to inform priority management decisions, questions, and objectives. This objective has three parts, which include a review of current monitoring, development of spatial sampling frames for adult VSP monitoring, and simulations of various sampling strategies to address bias, precision, and cost tradeoffs. The review of various monitoring designs was incorporated in the evaluation of the alignment of existing programs (Objective 2). A draft distribution model for Chinook, coho, chum, and steelhead is completed and awaiting review by the mangers and has been used by NOAA to assess fall Chinook recovery actions. The sampling strategies have been developed and are being assessed using census data and simulations. A workshop has been scheduled with managers to present these results and receive comments before finalizing the reports for these objectives.

Based on draft reports for Objectives 2 and 3, informal trade-off analyses have been used to develop specific recommendations for monitoring (Objective 4). These preliminary recommendations can be found as part of a gaps assessment and are scheduled to be presented to policy representatives and managers in 2012.

The final objective includes implementation and reporting recommendations. The implementation recommendation will be derived from the gaps analysis in Objective 2, evaluation of monitoring designs in Objective 3, and the informal trade-off analysis in Objective 4. The reporting mechanisms will be the result of the data management strategy described in the following section. Completion of this objective is scheduled to occur in 2012. (link to Fish Component project)

Data Management Component
(Task leads: Cedric Cooney, Brodie Cox)

Both ODFW and WDFW were funded in 2010 through 2011 to complete data management tasks to support ISTM. These tasks also support the Coordinated Assessments effort and the Data Management strategy for each of the Columbia River fish management agencies described above in the Coordinated Assessments effort.

Since ODFW and WDFW are primary conductors of status and trends monitoring of salmon and steelhead in LCR, it is critical for them to catalog, manage and share monitoring data in order to support ESA status determinations and to evaluate the response of fish populations to the implementation of the 2008 FCRPS Biological Opinion. In 2010, the ISTM data management effort had a goal to support Objective 2 of the fish monitoring component by pursuing completion of the data management development steps for one of the three VSP parameters - adult abundance. However, monitoring of the remaining indicators provides little value unless the data collection can be efficiently stored, managed, queried, analyzed, and reported to managers. There are data management challenges in reporting the status and trends of populations by indicator within the LCR because there are multiple entities involved in monitoring. Some of these issues have been noted including:

1) Databases should be coordinated such that a common set of metadata and common data dictionaries are used to track information so that it can be shared among monitoring partners;
2) Monitoring agencies should develop automated internal infrastructure to assess and evaluate their data such that all methods and calculations are transparent and repeatable;
3) The regional salmon recovery partners should build distributed data systems that can communicate between monitoring partners and report to the progress in salmon recovery; and
4) The monitoring partners should coordinate their sampling programs to fit within an integrated sampling program.

This led ODFW and WDFW to evaluate the collection, storage, and management for the Lower Columbia River Salmon and Steelhead monitoring program data. We used a similar approach to assessing the alignment of fish monitoring data to priorities based on filters for different components of the prioritization of data management. This draft report is currently under review by regional policy representatives and mangers.

During 2011, ODFW identified an additional 112 Lower Columbia inventory records from a total of 55 individual datasets, bringing the total number of records to 398. ODFW has all datasets, either as electronic, hardcopy, or a corporate database reference. Data Analysis Flow Diagrams (DAFD) representing 61 inventory records have been completed and reviewed. Diagrams for 96 other records are ready to be reviewed. These diagrams will be used to evaluate and refine data flow within the respective monitoring efforts.
Metadata for one dataset is currently under review by staff biologists, metadata for 32 datasets are ready to be reviewed, and development is in progress for four datasets. Currently, ODFW follows a modified version of the Federal Geographic Data Committee (FGDC) standard for metadata development. Complete metadata means all appropriate fields being populated.

ODFW did not prioritize completion of indicator and metric spreadsheets in DET format with ISTM funding but focused on creating DAFDs and metadata; however, the Coordinated Assessments project generated spreadsheets in DET format for 65 populations. Many of the spreadsheets only contained natural origin spawner abundance information while information for the other two focus indicators (smolt to adult return and recruits per spawner) were generally unavailable for documentation.

Due in part to the work conducted for the ISTM project, ODFW was able to develop a schematic of desired future design for data management and sharing, including a clear structure to data flow. ODFW is committed to pursuing this design, or adapting the design as necessary to meet agency and regional needs.

WDFW has continued to build on the data management tasks completed in 2010 for fisheries, spawning ground survey (SGS), age and scales (A&S), and juvenile migrant (JMX) databases. These data contributed to the completion of objectives 2-5. The spatial data

from SGS was used to develop adult salmon and steelhead sampling frame and these spatial locations were used to evaluate sampling designs (Objective 3). WDFW continues to populate these databases and develop data entry forms to facilitate their use.

Tributary Habitat Monitoring Component
(Task leads: Jeff Rodgers, Bernadette Graham Hudson, Amy Puls)

In response to ESA listings for salmon and steelhead, federal and state agencies, local governments, private industry, and the tribes have invested substantial resources to restore and protect the ecological function of rivers and streams in the Pacific Northwest. One of the important salmon recovery needs is the ability to describe, with known certainty, the status and long-term trends of the habitat conditions (physical, chemical, and biological conditions) of these aquatic resources. The goal of this component is to develop a coordinated habitat monitoring program for the LCR ESU that meets these information needs and ultimately answers the question: "Are the primary habitat factors limiting the viability of the salmon and steelhead populations and ESU increasing, decreasing, or stable?"


USGS

In 2011, the tributary habitat monitoring working group focused on reviewing existing programs and comparing information among the programs. The number of programs being analyzed increased to include Clark County (WA) Stormwater Needs Assessment Program, Columbia Habitat Monitoring Program (CHaMP), ODFW Aquatic Inventory, ODEQ National Rivers and Streams Assessment, WA Salmon Recovery Funding Board (SRFB) Action Effectiveness Monitoring, USFS Aquatic and Riparian Effectiveness Monitoring Plan (AREMP), and WA Department of Ecology Monitoring for Watershed Health and Salmon Recovery. Program managers provided information on the scope and scale of each program, as well as the specific habitat attributes measured by each program, including detailed descriptions of the collection and analysis methods.

The compilation of this data required several iterations to make sure that the information was complete and the collection took longer than expected due to lack of availability by the participants. Once the data were compiled, the group held several work sessions to review and determine what data could potentially be shared. The group started with attributes measured by all programs. After reviewing the collection/analysis methods for a given attribute, each program identified with whom they could share data, as well as differences in methods that prohibited data sharing. These online work sessions were informative and allowed for documentation of current program similarities, as well as areas that need to be addressed to increase compatibility.

In 2012, the group will finish their evaluation on how the programs can share attribute data and report the results. Next steps include performing a gap analysis to determine how well existing programs meet monitoring priorities across the region, making recommendations for filling monitoring gaps (including looking for ways to share data that are not currently sharable through development of an index system or transformation of data), conducting a trade-off analysis, and developing final recommendations for implementation. This project will inform both salmon recovery and watershed plan monitoring in the Lower Columbia River Basin. In addition, if funding becomes available, the resulting monitoring design may be expanded to incorporate the status and trends monitoring efforts being developed through municipal stormwater permit process in southwest Washington. (link to ISTM Habitat Component project)

Mainstem Component
(Task leads: Tim Counihan, Jill Hardiman)

Similar to what is proposed for tributary habitat in the LCR, the inclusion of a component to demonstrate what is needed to implement an integrated monitoring program for estuaries and non-wadeable streams and rivers would be beneficial to the ISTM demo project. Co-locating this work in the area proposed for the ISTM demo has advantages; similar to what has been described in this report for tributary streams. There are multiple jurisdictions that could be involved and multiple existing monitoring efforts that could be integrated.

Previous work by the USGS-Columbia River Research Laboratory has utilized Digital Elevation Models (DEMs) of the river channel and upland areas to generate a "master sample(s)" for the Columbia and Snake River reservoirs using a Generalized Random-Tessellation Stratified (GRTS) algorithm for an areal-based resource. They have compiled and are continuing to process geospatially referenced data representing the aquatic habitats of the mainstem Columbia River from Bonneville Dam upstream to the Canadian Border and the Snake River from its confluence with the Columbia River upstream to the border of the State of Wyoming.

In 2011, PNAMP worked with USGS and Sitka Technology Group to develop a plan to align and integrate the mainstem master sample into the Master Sample Tool. The areal-based master sample is different from the existing linear master samples in the prototype tool for the tributaries. To define the sampling frame for the river channel and upland areas of the Columbia and Snake Rivers, USGS used the presence of hydroelectric projects to delineate discrete geographic units. For example, they defined the sample frame for Bonneville Reservoir as the area bounded by Bonneville Dam at the downstream extent and The Dalles Dam as the upstream extent. They used the forebay elevation of the upstream hydroelectric project (The Dalles Dam in this example) as a benchmark to define the maximum elevation for the floodplain extent. They then used the GRTS algorithm to generate a master sample list of sites for this area. This technique was chosen to define the floodplain because the extents of the current and historic floodplains are currently

undefined and because it was the same technique to define the floodplain for the master sample previously formulated for the Columbia River Estuary.

As part of the integration, the group discussed the benefits and drawbacks associated with presenting USGS' efforts as one comprehensive master sample (for the entire Columbia River Basin) or as discrete units as described above. Ultimately, how the master sample is grouped or divided will be based on the user's needs with respect to allocating samples over an area that encompasses their monitoring program requirements, but the decision was made to present multiple master samples corresponding to discrete geographic units. That is, USGS will provide a master sample for Bonneville Reservoir, The Dalles Reservoir, etc., to incorporate into the Master Sample Tool. The group also decided that USGS would provide a basic level of information that will allow some stratification by users if desired. Attributes that include State, County, Hydrologic Unit Codes, etc., will be associated with the mainstem master sample files. Further, the group discussed more fully developing the framework for an ISTM for a smaller section of the Columbia River; the Bonneville Reservoir. We chose this area because it is an area where USGS is data rich and because there are other efforts underway that would provide an opportunity to integrate monitoring of the mainstem and tributary systems. The Bonneville Reservoir is also contained within the Columbia Gorge National Scenic area and several important salmonid bearing tributaries (e.g., Hood River, Klickitat River, Wind River) empty into this reach of the Columbia River. For this area of the Columbia River, we will incorporate attributes such as high resolution bathymetry, output from hydrodynamic modeling runs, and other habitat information currently housed at the Columbia River Research Laboratory. USGS will continue the work to attribute the master sample files into 2012 before sending the files to Sitka to incorporate into the Master Sample Tool.


USFWS Cheri Anderson

USGS also began working toward the development of a framework for the integrated monitoring of the mainstem Columbia and Snake Rivers and their associated floodplains. In 2011, they initiated contact with a diverse array of stakeholders that could potentially participate in the development of a mainstem ISTM. They contacted 19 stakeholders to enlist their input and received confirmation of willingness to be involved in this process from a number of these organizations. Further, USGS has been involved in the Lower Columbia River Science Work Group discussions regarding the establishment of a monitoring program for the Columbia River Estuary. They worked to coordinate their efforts with the Lower Columbia River Estuary Partnership to ensure that the efforts for the Columbia River Estuary and the mainstem Columbia and Snake Rivers are as consistent as possible.

Oregon State University (OSU) Master Sample Tracking Tool

(Task leads: Don Stevens, Lisa Madsen, Phil Larsen)

The purpose of this component was to develop a prototype of a master sample management tool using the LCR region as a proof of concept and to provide the necessary statistical support for the development. The prototype was to be developed in a manner to make it easily extendable to a larger region. It would be web-based and support sample selection from the population domain. It would also allow users to know who else had selected sites from the master sample covering stream networks in their domains; to design individual or integrated monitoring programs; to know how existing sites related to a common master sample; and what information was collected at a site over time. The goal was also to allow users access to basic statistical analysis tools in order to perform a valid statistical analysis of data. Bonneville Power Administration funded the development of the prototype in July of 2009, as well as dedicated analytical support during prototype development for design and utilization of results of the monitoring design based on the master sample. At the end of 2010, a prototype was available from OSU, along with a draft user guide. WDFW staff, working with OSU, used the prototype to develop a GRTS sampling design to estimate adult Coho salmon. Some of the software tools for sample selection and analysis and their associated web interface were not in place at the end of 2010 and were planned to be completed in 2011. Based on initial user feedback, PNAMP felt the prototype achieved its proof-of-concept intent and started thinking about using the prototype tool as a base to develop a more robust tool that encompassed the entire region.

In 2011, OSU focused on completing the statistical and analysis tools. Due to unforeseen circumstances, the OSU web developer had other commitments and was not able to provide his services in developing the remaining pieces of the web interface. PNAMP decided that rather than use remaining funds to develop a user interface that would likely be changed in a region-wide tool, the group should focus on tasks that would help transition to development of the region-wide tool. Accordingly, OSU requested a contract modification from BPA to use some of the remaining funds to expedite the transition to a production-level system. With BPA's approval, OSU (1) subcontracted with an outside firm, Sitka Technology Group, to begin planning for the transition to a production-level system and assist with some web development tasks; (2) re-allocated the budget to increase the level of statistical support; and (3) added a Graduate Research Assistant (GRA) to the project to assist in developing the R code for the analysis task.

At the end of OSU's contract in September 2011, the prototype had the capability to select sites based on county, salmon recovery region, USGS hydrologic code, or WRIA (Water Resource Inventory Area). Preliminary search results can be further refined by imposing additional criteria, e.g., owner type. In addition, OSU developed an interface to the R language to select a sample of specified size from the subset of sites that meet screening criteria, create panels if desired, and provide stratification and variable probability options.

An option to incorporate legacy sites into selection from the master sample was also added. The legacy sites are merged with selected master sample sites to preserve spatial balance of the composite sample.

OSU also completed the R tool for conducting basic statistical analysis. This tool uses site evaluation information and metric results as input. The site evaluation information is used to adjust probability weights, and to calculate proportions (with confidence limits) in all evaluation classes. The basic analysis calculates estimates of population attributes for both categorical and continuous variables. For categorical response variables, the proportions in each response category are estimated and confidence intervals are provided. For continuous responses, the population cumulative distribution function is estimated, as are population statistics, such as mean, variance, and selected percentiles.

Sitka Technology Group's work focused on reviewing the code and underlying structure of the prototype website, transferring the website from OSU servers to PNAMP hosted and managed servers, and beginning development of a user task list and broadsheet for the regional master sample management tool. Further details of this can be found under the Master Sample Tool development section under Project Activities.
(link to ISTM Master Sample project; link to prototype tool)

Master Sample Tool development

As describe above, PNAMP, working with Oregon State University, developed a prototype web-based master sample tracking and management system to support PNAMP's ISTM demo project for the LCR ESU. The results showed the prototype to be useful to the community, but since it was not intended to be production level application, PNAMP started making plans for development of an application that can support the needs of the entire PNW in 2011. The plan is to develop an online application that supports users with documented protocols in drawing samples using a probabilistic site selection (using an algorithm called GRTS- see Stevens and Olsen 2004 (link to report)) to generate a spatially-balanced set of sites for status and trends monitoring. For additional background on the master sample concept, please see a recent PNAMP white paper describing use of a master sample for integrating status and trends monitoring (link to white paper). The application will be based on the prototype, as well as knowledge gleaned from other regional efforts supporting probabilistic based site selection. The application will:

1) Draw survey design information from user's documented protocol;
2) Collect and store 'master sample' draws for the PNW (from both linear stream networks and area- based water bodies such as the mainstem and estuary);
3) Collect and store attribute information for sites in each master sample, at a minimum to include: unique site ID, geographic location, and the site's initial statistical weight;
4) Support users in selecting sites from a master sample relevant to the user's domain, monitoring objectives, target population, and any institutional constraints (such as budgets);

a. Part of site selection will include refining the frame - determining how to allocate sampling effort using site attributes, including how to stratify or select panels if necessary;
b. Part of site selection will include site evaluation - allowing users to upload information about their evaluation of the sites they selected giving future users insight into the history of sites selected within their domains;

5) Support users in determining what sites have been selected by others from the master sample covering their domains; to design individual or integrated monitoring programs; to know how their existing sites relate to a common master sample; and to know what others are collecting at the site over time;
6) Store site history information;
7) Allow users to upload results related to the sites they sampled; and
8) Support basic statistical analysis for users.

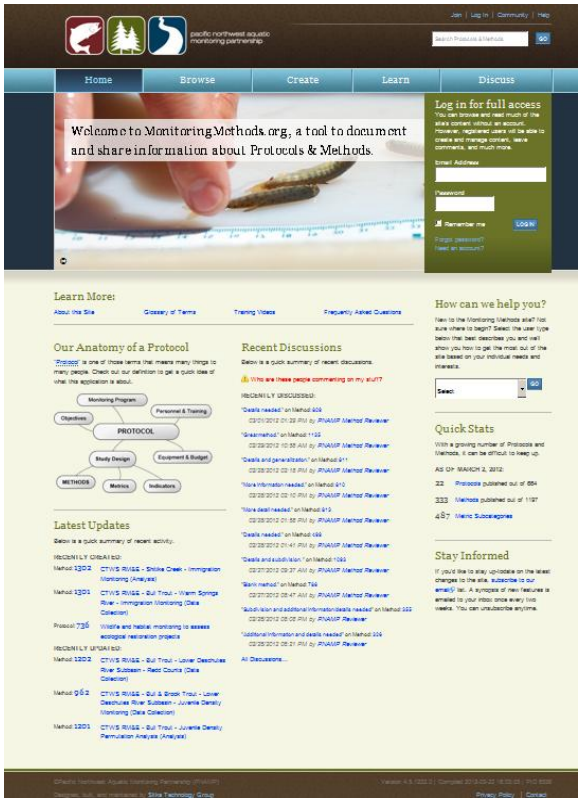
This application is not intended to replace the need for statistical expertise in designing a monitoring program, but instead is intended as a tool to support users in selecting sampling sites, coordinating, and tracking site usage. There will be statistical support during the development and PNAMP intends to provide some level of statistical support on a long-term basis once we determine needs.
The PNAMP Data Management Leadership Team recommended this project for funding in the fall of 2011. Since that recommendation, PNAMP staff worked to finalize a contract with a software development firm, Sitka Technology Group, to work with the community to design and develop the online tool. Sitka worked with OSU on the ISTM demo prototype and had already developed a list of basic requirements and potential user tasks to support in the new tool, as well as layouts of the user interface for the new tool. Since PNAMP's contract with Sitka was not finalized until early December, additional progress on this project in 2011 was minimal.

In 2012, we plan to fully develop the new tool, with the support of interested PNAMP participants. It is expected that the tool will be fully functional by November 2012. In addition, we will integrate this tool with the Monitoring Methods library, as well as other upcoming PNAMP web resources. PNAMP plans to make information from the Master Sample Tool available to other regional systems via web services.
(link to Master Sample Tool Development project)

MonitoringMethods.org

In an effort to move forward with promoting improved business practice around documentation and to support standards development, PNAMP developed MonitoringMethods.org.
MonitoringMethods.org is a free, online resource where monitoring practitioners can document methods and protocols or find information about others' information, as well as definitions of monitoring terminology that are important to them. MonitoringMethods.org also hosts a Community Forum to promote information exchange and collaboration

between regional monitoring practitioners about topics of interest to this community. PNAMP makes information from MonitoringMethods.org available to other regional systems via web services.



In 2011, PNAMP received additional funds to add more features to MonitoringMethods.org, as well as provide staff to review content and provide general system support. Some of the improvements and new features that were implemented in 2011 included: bookmark option; photo thumbnails; additional details for organizations, monitoring programs, data repositories and user profiles; ability to associate metrics with methods; tags; print option protocols and methods; improved search algorithms throughout the site; highlighted Draft methods and protocols; ability to delete protocols even if they have associations to methods or metrics; panel builder in the temporal design page; ability to add photos, figures and forms to methods and protocols; ability to clone (copy) a protocol; added abbreviated view to draft items so any user can see limited details of all information in the system; added "Completeness" rating to protocols and methods; ability to request being a colleague of someone else; added Quality Rating scale; added subscriptions; and improved commenting features.

PNAMP staff provided training as necessary for MonitoringMethods.org in 2011, including one-on-one training support and larger group trainings. PNAMP staff conducted several training sessions for BPA project sponsors in conjunction with Pisces training sessions. PNAMP staff also responded to support requests received via the site help or email requests. In addition, using the standard PNAMP training, Sitka developed short training videos for each section of MonitoringMethods.org that can be found under the Learn menu on the site. MonitoringMethods.org was also used to support method and metric documentation for the Northwest Power and Conservation Council's science review process and the Fish and Wildlife Program proposal cycle.

In 2011, PNAMP contracted with staff at MSU to review all methods in MonitoringMethods.org for completeness (repeatable step-by-step instructions, one technique per method, etc.), identify potential duplicates, and identify instances where methods were specific to a particular location or organization. MSU will complete this task in 2012. In addition, MSU added method-metric relationships for existing methods in the system at the method level. This relationship

will be available to all users in 2012 and will help users in selecting metrics when a method is added to a protocol in the future.

In 2012, PNAMP will continue to improve the features and functionality of MonitoringMethods.org based on feedback received and funds available. PNAMP will also continue to provide staff to conduct training as requested and provide general site support on a regular basis. In addition, PNAMP plans to use the content and community forum to support an upcoming Methods Review project in 2012. Finally, PNAMP will work with Sitka to integrate this resource with other PNAMP web resources and will continue to provide linkages to regional project tracking systems as requested. (link to Monitoring Methods project; link to MonitoringMethods.org)

Other Web Resources

We believe PNAMP is uniquely poised to bring together a number of web resources to create a network of information and tools to support many facets of monitoring. These resources currently include MonitoringMethods.org, the redeveloped Master Sample Tool, and the PNAMP website. In addition, PNAMP investigated several opportunities for additional online resources or support tools in 2011. These include the Salmon Monitoring Advisor Website, a Metadata Builder tool, and a Monitoring Site Management tool. In addition, PNAMP realized that thoughtfully considering how to integrate our web resources was imperative to their longevity, as well as planning for their long-term support and maintenance.

Salmon Monitoring Advisor

In 2011, PNAMP, working in partnership with Wild Salmon Center's State of the Salmon Project (SoS), was asked to consider assuming ownership and maintenance of the Salmon Monitoring Advisor website. The Salmon Monitoring Advisor site was developed by a working group of scientists through a series of workshops from March 2008 to March 2010. A grant from the Gordon and Betty Moore Foundation funded the work. The United States National Center for Ecological Analysis and Synthesis (NCEAS) in Santa Barbara, California, administered the grant and provided logistical support for the workshops. The working group was composed of 14 scientists with extensive experience in a variety of governmental and non-governmental organizations, many of which are involved in PNAMP.

PNAMP would host the site and promote use of the tool in the PNAMP community; SoS would share responsibility for marketing/outreach and continued input and development, reaching out to their community of salmon conservationists around the Pacific Rim. PNAMP proposed the idea to the SC and received acknowledgement that it would be constructive for PNAMP to support this resource. It was further acknowledged that electronic resources are more easily updated and expanded, meaning PNAMP could update the content as needed, link to other resources (helping to avoid duplication of effort of developing this type of resource) and expand content as we desire (including more about habitat monitoring, for example).

The SC was appreciative of the Wild Salmon Center's State of the Salmon Project's willingness to support the site and interest in collaborating with PNAMP. This is an opportunity for PNAMP to connect with monitoring practitioners outside the PNW, as well as better connect with the non-profit community in the PNW. However, the SC described some concern over some content in the current site. PNAMP staff committed to making minor changes to the site once the site was transferred to PNAMP hosted servers, then forming a work team to further review the current content and develop addition content in 2012.

PNAMP corresponded with NCEAS staff through much of the fall and winter of 2011 about the site transfer. Due to unforeseen delays, NCEAS staff was not able to transfer the site to PNAMP in 2011. We expect that the site will be transferred in early 2012, at which time we can progress with the content review tasks.

Metadata Builder

While drafting the Regional Metadata Tool Recommendations report, the Metadata Working Group recommended the concept of a 'metadata builder'. This recommendation did not make it into the final draft of the report as a key recommendation, but PNAMP felt the idea should still be pursued.

In addition, BPA issued new mandate in 2011 for project sponsors to provide a metadata record for all new datasets developed through BPA funding. To support this requirement and the idea from the Metadata Working Group, BPA agreed to fund a pilot effort to develop a prototype metadata builder. The metadata builder would identify elements of a standard metadata record that are currently documented through separate project management or other documentation tools, such as Pisces, cbfish.org, and MonitoringMethods.org. Using web services and an agreed upon metadata template, the metadata builder would serve to integrate these currently disparate elements of a metadata record into one metadata report. While not all elements of a standard metadata report are contained within BPA project databases, the builder would maximize efficiencies where the elements do exist.

PNAMP received funds from BPA in early December 2011 to develop a prototype metadata builder and conduct a scoping exercise to determine options and value of a more robust regional metadata builder. Because funds were received so late in the calendar year, not much progress was made on this project. PNAMP staff contracted with a software developer, Sitka Technology Group, to develop the pilot metadata builder. BPA staff reviewed the full list of FGDC metadata elements to determine priority elements for metadata records developed for projects they fund. The next step for 2012 is to meet with the developers to discuss initial prototype development. Once the development for the prototype is complete or mostly complete, the developer will present the product and some lessons learned about costs and process to the Metadata Working Group to get feedback and kick off the discussion about a more robust regional tool.

Monitoring Site Management

During 2011, PNAMP participants often expressed the need for a web based tool that

provided geographic information linked with information about the 'who and what' of monitoring activities. The need for the tool was described in the Regional Metadata Tool Recommendations report and by the participants in the initial Habitat Data Sharing workshop (link to workshop materials). But, this idea is not a new one. The concept and need for this tool was first identified in the 2005 PNAMP Strategy (link to Strategy). In 2006, StreamNet and NOAA contractors worked with PNAMP to develop a pilot inventory of aquatic monitoring activities in the region. However, attempts to produce an always 'up-to-date' inventory of monitoring projects have always fallen short.

Given recent technological advances and the repeated requests from participants, in 2011, PNAMP decided to pursue the idea again. PNAMP staff made plans to conduct a scoping exercise for a monitoring site management tool in 2012. The scoping exercise will include definition of tool features, identification of additional use cases by a range of potential users, and further examination how the features relate to other existing and planned tools. We expect that this tool will need to provide a current inventory of monitoring site locations across the region, including geographic information, contact information, and some level of detail about what was monitored at each site, including the sampling design and where the data are stored. By nature, this tool closely aligns with the Master Sample tool that is currently in development, so some aspects of the site management will need to be considered while developing the Master Sample tool. To that end, PNAMP again contracted with Sitka Technology Group to conduct this scoping exercise in order to efficiently maintain the linkages between these two projects. The contract was finalized in December on 2011, so not much progress was made on this project in 2011.

In 2012, PNAMP will review past and ongoing work related to this project and develop a communication plan to ensure information is distributed to all interested parties. We will work with Sitka to conduct the scoping exercise and expect to have results by the end of June 2012.

Integration of Web Resources

As mentioned above, PNAMP realizes that thoughtfully planning these web resources so they work together to provide an efficient interface for users is important. Asking users to log into multiple systems would be tedious and ultimately result in a lack of interest for using the products. In addition, asking users to enter the same information about their monitoring in multiple places is what we are trying to avoid with these systems, so integration is key. To avoid these issues, PNAMP has been discussing details about integrating existing and future PNAMP web resources into a hub with central user/organizational management. What this means is that while each individual PNAMP resource could still be accessed at its current URL, there would also be a central homepage that connected all the pages together. When a user logs in, they would be logged in to each

individual system and would be able to navigate between the systems with ease and little notice that they are leaving one system and going to the next. The benefit would be that monitoring practitioners could provide information once and have it shared many times. Funders and managers would be able quickly review existing and proposed monitoring projects and programs, better understand gaps and overlaps in monitoring at a regional scale, and make more timely decisions based on best available information.

PNAMP worked with Sitka Technology Group on some of these details in 2011. We intend to line out more details and do some initial framework development during the development of the Master Sample tool in 2012, but additional costs will be associated with this integration beyond what is allowed for in that project. The work identified during the Master Sample tool development will help us refine estimates for costs. This integration would involve MonitoringMethods.org, the Master Sample tool, the Salmon Monitoring Advisor, the prototype Metadata Builder, the monitoring site management tool, and potentially existing CHaMPmonitoring.org tools.

Remote Sensing Forum

Remotely sensed data are of increasing interest to resource managers. Both data availability and advances in interpretation methodologies and technology continue to evolve rapidly. Previously PNAMP hosted a special session on remote sensing applications at the 2008 American Society of Photogrammetry and Remote Sensing **(**ASPRS) annual conference. PNAMP published a compilation of papers from that session in 2009 (link to remote sensing special publication). Since that time there has been little activity with the remote sensing forum.

In late 2011, PNAMP started working with WDFW and the Washington Governor's Salmon Recovery Office to reactivate a remote sensing work group. In late December, a call was made to all PNAMP members to provide input on the types of management questions they have that might be informed by remote sensing. The planning group will continue defining the direction and implementing activities of the forum in 2012.

Assistance with CRITFC Salmon Population Crosswalk Database Project

In late 2011, Columbia River Inter-Tribal Fish Commission (CRITFC) received funding for the "Columbia River Basin Population Crosswalk Geodatabase and Online Interactive Mapping Application". This project will develop a crosswalk of fish population/units using data that have been already defined by the managing organizations within the Columbia Basin. The crosswalk, in the form of a geodatabase, will be available online with an associated interactive mapping application. PNAMP, through the Information Management Liaison, will assist CRITFC in 2012 with assembly of project oversight teams, data discovery, and facilitating testing of draft products.

Other PNAMP Projects/Topics

As mentioned above, other topics or projects mentioned in previous PNAMP annual reports

are still being tracked and accounted for, but did not make substantial progress in 2011.

Effectiveness Monitoring Coordination & Assessment

This project is an effort to integrate and align existing and new regional effectiveness monitoring efforts, provide more scientifically robust data for use in management decisions, and improve cost efficiency in the implementation of monitoring programs. The focus of this effort is on coordinating approaches, monitoring design, and data management systems to allow alignment and reporting of results; informing a regional network of effectiveness monitoring coverage; and encouraging programmatic-level planning consistency across the region for Intensively Monitored Watersheds (IMW) and effectiveness monitoring projects and programs. The plan is to facilitate moving away from "one-at-a-time", project-by-project decision making and moving toward coordinated efforts.

The last substantial progress on this project was in 2010 when PNAMP hosted a series of work sessions to communicate the then-current state of effectiveness monitoring, map out where we need to go, and create a plan for how to get there. Bonneville Power Administration, the Washington Forum on Monitoring, and others used results of the information gathering effort in planning effectiveness monitoring activities.

Upcoming efforts for this project include finalizing the strategy for coordinating effectiveness monitoring; initiating data exchange template development for effectiveness monitoring data (this is an aspect of the Habitat Data Sharing project as well); updating the inventory and doing additional gap assessments. In addition, PNAMP would like to expand its efforts to different types of projects and information and include information pertinent to the needs of additional partners.

In the December 2011 Steering Committee meeting, PNAMP discussed BPA's planned survey of Fish and Wildlife Program habitat action effectiveness projects and a request to PNAMP to perform a parallel survey for non-BPA funded habitat project. This work is needed to support BPA and regional level prioritization of project level action effectiveness across the different categories of habitat actions, and the standardization of metrics and designs for roll-up assessments. **(**link to Effectiveness Monitoring project**)**

Implementation Tracking

PNAMP is interested in identifying opportunities to crosswalk information between implementation tracking systems and indicators commonly used for reporting. PNAMP also supports identifying tools that could be used to share information between systems and would like to help others explore the use of these tools (as the needs arise) beyond their current focus.

PNAMP hosted a workshop in 2009 to highlight this topic, but progress since has been minimal. Recently, PNAMP has been asked to be part of a national team to define project tracking/ implementation monitoring for habitat restoration projects for the National Fish Habitat Action Plan and Partnership (NFHAP and NFHP). NFHP is interested in defining metrics and data standards for NFHP partnerships in order to better track

conservation actions and inform the habitat assessment conducted every five years by NFHP partners.

Steering Committee Activities

The PNAMP SC provides the science-policy interface between the Executive partners and project work teams, reviews work team progress, obtains resources needed to accomplish projects, and directs the activities of the Coordination Team. The SC provides assistance to PNAMP initiatives by participating in the formulation, development, and review of recommendations for activities of PNAMP work teams and integrating these activities with their own organizational activities. The SC facilitates the transfer of information between PNAMP and their respective organizations. By promoting communication among organizations, the SC strives to assure that monitoring plans and information are coordinated across the Pacific Northwest.

The SC met three times in 2011 for regular meetings and once for a two-day strategic planning retreat. It was concluded in early 2010 that monthly meetings seemed to be too frequent and too much time for the group to commit to each month, so we adopted a quarterly schedule, with meeting times dependent on group availability. The primary activity at the regular meetings was tracking the progress of current activities and discussion of new tasks or projects that align with PNAMP's goals. These meetings also facilitated information exchange between SC members and work team leads. The PNAMP Coordinator facilitated meetings and the Coordination Team prepared materials before the meetings and notes following the meetings. The SC also continued to discuss priorities for current and new projects appropriate to advance to BPA for funding.

The strategic planning retreat (link to retreat documents) took place on August 23-24, 2011, and was facilitated by Louis Sweeney of Ross & Associates. The group worked through exercises to identify PNAMP's successes and the strengths to focus on in the future. We received a lot of great feedback from the SC. However, the SC also expressed concern about timeliness of products. A common theme in the discussion of remedies for this situation was to be transparent and perhaps more selective in topics that we pursue. The group briefly reviewed current projects, discussed new ideas (liaison role and modeling workshop in particular) and considered how to improve processes in general. Based on SC feedback, the Coordination Team began developing a new way to track PNAMP project information. This new work planning tool will be presented to the SC in early 2012.

Appendices

Appendix A. Entities signatory to the PNAMP Charter as of December 2011.

PNAMP Partners	PNAMP Steering Committee Rep	PNAMP Executive Network Representative
Bonneville Power Administration	Jim Geiselman	Lorri Bodi VP Environment, Fish and Wildlife
California Department of Fish and Game	Scott Downie	Neil Manji Northern Regional Manager
Columbia Basin Fish and Wildlife Authority	Tom Iverson	Nathan Small Chair
Columbia River Intertribal Fish Commission	Phil Roger	Paul Lumley Executive Director
Confederated Tribes of the Colville Reservation	John Arterburn	Joe Peone Director, Fish and Wildlife Department
Environmental Protection Agency	Gretchen Hayslip	Dennis McLerran Regional Administrator
NOAA Fisheries	Scott Rumsey	William Stelle, Jr. Regional Administrator
Northwest Indian Fisheries Commission	Bruce Jones	Mike Grayum Executive Director
Northwest Power and Conservation Council	Nancy Leonard	Tony Grover Director of Fish and Wildlife Division
Oregon Watershed Enhancement Board	Greg Sieglitz	Tom Byler Executive Director
Pacific States Marine Fisheries Commission	Bruce Schmidt	Randy Fisher Executive Director
U.S. Army Corps of Engineers	David Clugston	Colonel Steven R. Miles, P.E. U.S. Army Commander and Division Engineer
U.S. Bureau of Land Management	Al Doelker	Edward W. Shepard State Director, Oregon/Washington
U.S. Bureau of Reclamation	Michael Newsom	Lorri Gray Regional Director
U.S. Forest Service	Linda Ulmer	Kent Connaughton Regional Forester PNW Region
U.S. Geological Survey	Steve Waste	Leslie Dierauf Northwest Area Executive
Washington Department of Ecology	Bob Cusimano	Rob Duff Environmental Assessment Program Manager
Washington Department of Fish and Wildlife	Erik Neatherlin	Phil Anderson Director
Washington Governor's Salmon Recovery Office	Jennifer Jones	Megan Duffy Executive Coordinator
Washington Recreation and Conservation Office	TBA	Kaleen Cottingham Director

Appendix B. List of documents referenced in this report and associated hyperlinks.

Page 3:

- PNAMP Charter: http://www.pnamp.org/charter

Page 5:

- PNAMP website: http://www.pnamp.org/

Page 6:

- 2011 AFS Symposium Flyer: http://www.pnamp.org/document/3521

Page 8:

- PNAMP Operations Survey: http://www.pnamp.org/document/3601

Page 10:

- Data Management webpage: http://www.pnamp.org/topics/2
- Columbia River Basin Anadromous Salmonid Monitoring Strategy: http://www.cbfwa.org/ams/

Page 11:

- Coordinated Assessments Work Plan: http://www.pnamp.org/document/3033
- Coordinated Assessments Workshop: http://www.pnamp.org/event/3345
- CRB Collaborative Data Sharing Strategy: Salmon and Steelhead Population Abundance and Productivity Indicators: http://www.pnamp.org/document/3564
- Coordinated Assessments phase III work plan: http://www.pnamp.org/document/3537
- Coordinated Assessments project: http://www.pnamp.org/project/3129

Page 12:

- PNAMP 2010 Metadata final report: http://www.pnamp.org/document/2771
- Regional Metadata Tool Recommendations Report: http://www.pnamp.org/document/3296
- Regional Metadata Guidance project: http://www.pnamp.org/project/3139

Page 13:

- HDS workshop: http://www.pnamp.org/event/3452

Page 14:

- HDS project: http://www.pnamp.org/project/3266

Page 15:

- ISTM demo project: http://www.pnamp.org/project/3132
- ISTM Objective 1 report: http://www.pnamp.org/document/3169

Page 16:

- ISTM Fish project: http://www.pnamp.org/project/3151

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- ISTM Habitat project: http://www.pnamp.org/project/3152

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- ISTM Master Sample project: http://www.pnamp.org/project/3150
- Master Sample prototype tool: http://www.mastersample.org/pnamp/
- EPA GRTS site selection report: http://epa.gov/NHEERL/arm/documents/grts_asa.pdf
- Integrating Aquatic Ecosystem and Fish Status and Trend Monitoring in the Lower Columbia River: Using the Master Sample Concept: http://www.pnamp.org/document/2666

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- Master Sample tool development project: http://www.pnamp.org/project/3263

Page 25:

- Monitoring Methods project page: http://www.pnamp.org/project/3134
- MonitoringMethods.org: http://www.monitoringmethods.org/

Page 27:

- Habitat Data Sharing workshop materials: http://www.pnamp.org/event/3452
- 2005 PNAMP Strategy: http://www.pnamp.org/document/2056

Page 28:

- Remote Sensing publication: http://www.pnamp.org/document/2546

Page 29:

- Effectiveness Monitoring project: http://www.pnamp.org/project/3137

Page 30:

- Strategic planning retreat: http://www.pnamp.org/event/3450

Appendix C. Bonneville Power Administration Reporting Requirements for RM&E Work Elements

Per a September 26, 2011 communication from Bonneville Power Administration, PNAMP is required to report information regarding:
1) The project's objectives and contract deliverables for RM&E Work Elements by Fish and Wildlife Program strategies and management questions;
2) RM&E Work Element implementation, and when appropriate; and
3) Endangered Species Act BiOp Reasonable and Prudent Alternatives (RPAs).

Specific questions are outlined below, with responses following:

I. **Identify how your project supports Fish and Wildlife Program Strategies.** http://www.nwcouncil.org/library/2000/2000-19/strategies.htm
   A. For each Fish and Wildlife Strategy provide project/contract data, results, synthesis and conclusions, as relevant to your deliverables.
      i. Provide lessons learned or cost effective use of various implementation methods for each RM&E Work Element.

II. **If your project also supports BiOp RPAs, you'll also be asked to address the following questions for each RPA:**
   A. Identify how your project contributed to meeting RPA objectives/questions.
   B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA.
   C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.

III. **List all publications and reports created, and data repositories used by this project/contract in the time frame reported. When appropriate, upload technical documents, i.e., reports, posters, in Pisces as "Public."**
   A. Identify citations for other technical documents produced/published by the project in the calendar year for potential review.
   B. Identify the database web-links or documented sources for related data sets for the project.

PNAMP Responses:
I.A. The Fish and Wildlife Program (Program) Strategies are action plans aimed at accomplishing the identified biological objectives of the Program. In a broad sense, the PNAMP project supports all Program strategies by promoting coordination and collaboration between monitoring projects and supporting data management and sharing efforts. PNAMP's role is not to collect data or provide analysis of data, but provide coordination. PNAMP does this by facilitating discussions, developing guidelines and recommendations, and developing tools that support practitioners in their work. PNAMP has learned that in order to support change related to best practice recommendations, it is important to develop the means by which monitoring practitioners can easily make those

changes. Below are tasks that PNAMP worked on in 2011 to support coordination, collaboration, data management, and data sharing.

PNAMP has fully developed one web based tool, MonitoringMethods.org, where monitoring practitioners can find a catalog of methods, protocols, and definitions of monitoring terminology. Monitoring practitioners and researches that are collecting or analyzing observational data can enter their own protocols and methods into the system, or use information already in the system. In addition, MonitoringMethods.org hosts a Community Forum to promote information exchange and collaboration between regional monitoring practitioners about methods and other topics of interest to this community. PNAMP has also developed a prototype Master Sample Tracking and Management Tool for the Lower Columbia ESU, with plans to redevelop into a production level, regional scale web based tool in 2012. This system will allow users 1) to know who else has selected sites from the master sample covering the mainstem Columbia and Snake Rivers or tributary stream networks in their domains; 2) to design individual or integrated monitoring programs and support selection and sampling sites; 3) to know how existing sites relate to a common master sample; and 4) what they are collecting at the site over time (site history).

PNAMP has plans to support additional web based tools as funding allows. PNAMP began planning for development of a prototype 'metadata builder' at the end of 2011. The concept is that this tool will collect project level metadata elements from various project tracking systems in the region, as well as other web resources such as MonitoringMethods.org, and integrate these currently disparate elements of a metadata record into one metadata record. While not all elements of a standard metadata record are also contained within online systems, the builder would look to maximize efficiencies where the elements do exist. The prototype's focus is BPA project tracking systems and the effort will be used to inform recommendations for region wide use. Because the various project tracking systems are all built differently, a production-level, regional tool would not be able to provide 'one stop shopping', but instead would need to support integration with individual systems throughout the region. Consistent creation of metadata records for individual datasets is lacking in the region and we think a tool that can automate much of the entry process would support future efforts.

Second, PNAMP will begin formal scoping exercise to line out requirements for a monitoring site management tool. The idea for this web based tool is to provide historical and up to date geographic information linked with information about the 'who and what' of monitoring activities on an individual site basis. We expect that this tool will need to provide a current inventory of monitoring site locations across the region, including geographic information, contact information, and some level of detail about what was monitored at each site, including the sampling design and where the data is stored. The ability to dynamically summarize current and historic monitoring activities is essential for coordination of future monitoring activities and for reporting activity to-date. Similarly, selection of sites for inclusion in a monitoring program may be dependent on prior monitoring activities at the site. Compilation of data to address specific monitoring questions requires an understanding of monitoring history across the region. This tool

will support these business needs by providing a single regional system of record for tracking the history of monitoring activities at individual sites throughout the region.

PNAMP also develops guidance for partners related to various components of data management and sharing. The Coordinated Assessments project has developed a strategy to guide Columbia River Basin state and tribal fish managers in developing data management systems that will support sharing of VSP salmon and steelhead population abundance and productivity indicators. This guidance is intended to inform within agency and tribal actions in upcoming years as the project continues with facilitating the development of data exchange templates and procedural mechanisms to implement data sharing among the agencies and tribes. Focus is on VSP indicators initially, but can expand potentially to indicators for hatchery effectiveness and for resident fish. Another effort, the Habitat Data Sharing project is developing recommendations and guidance for regional sharing of habitat attributes. This project builds on efforts in the Lower Columbia River to identify commonly collected habitat attributes and looks to develop regional guidance on exchange templates and mechanisms for data sharing, the scale of data sharing, and the relationship of habitat data to fish and effectiveness monitoring.

All data sharing should be supported by adequate metadata. Through the PNAMP Metadata Work Group, recommendations have been made for different approaches to metadata development. However, standard approaches for dataset metadata have not been embraced within the Northwest aquatic monitoring community. Additional recommendations and guidance for regional standard dataset and potentially project and protocol metadata reporting is anticipated in coordination with the building and potential regionalization of the metadata builder tool described above.

Finally, PNAMP has drafted a Roadmap for Implementation of Data Management and Sharing that summarizes the actions needed to enhance the effectiveness and efficiency of regional data flow within and among aquatic monitoring programs. After the Roadmap is reviewed and finalized (estimated in March 2012), it is anticipated to be annually updated as progress is made along the 'regional road'.

II. RPA 51.1 - Synthesize fish pop metrics thru Regional Data Repositories

Description: Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports such as the CBFWA State of the Resource. (Annually)

A. Identify how your project contributed to meeting RPA objectives/questions.

PNAMP's Coordinated Assessments Project, a collaboration with CBFWA, is an effort to develop integrated data-sharing for anadromous fish related data among the co-managers (state fish and wildlife agencies and Tribes) and action agencies of the Columbia Basin. The initial focus of the project is on three VSP abundance indicators for salmon and steelhead: Natural Origin Spawner Abundance, Smolt to Adult Return, and Recruit per Spawner (link to overall work plan). The intent of this data sharing strategy is to provide the framework and technical tools to support data sharing across disparate systems from

the local level to the regional level; and, ensure that comparable data from different sources can be combined to facilitate assessment at the regional scale.

PNAMP's Integrated Status and Trends Monitoring Demonstration (ISTM demo) project is intended to demonstrate the approaches and utility of integrating the collection of information to address multi-scale questions about the status and trends of fish (salmon, steelhead, and potentially bull trout), and physical, chemical, and biological attributes in stream networks. The overall intent is to assist PNAMP's participating members in developing strategic action plans for monitoring in the bi-state lower Columbia (LC) river demonstration area, as well as to demonstrate the general approach to developing such plans for other areas in the Pacific Northwest. The ISTM effort will provide entities tasked with monitoring fish populations and aquatic habitat in the Pacific Northwest with a roadmap for integration of scientifically sound monitoring programs intended to meet the needs of decision-makers and managers. Specifically, it will apply this approach and develop recommendations for integrated monitoring plans for salmon, steelhead, and potentially bull trout populations listed under the ESA, and their habitats in the LC area. Among the many monitoring components, key features of this effort are improved understanding of the extent and qualities of existing information, key gaps, and how a region-wide "master sample" concept can be applied to select sampling locations where appropriate. The ISTM effort is being accomplished using a collaborative approach involving PNAMP participants and other local partners. Anticipated PNAMP products include development of design, analysis and implementation tools, coordination to integrate actions into planning and implementation of efforts addressing fish recovery and watershed health in the demonstration area, and products summarizing the approaches, tools, guidance, and results from the demonstration project for possible use in other parts of the Pacific Northwest.

Finally, PNAMP is developing a number of web resources that will support monitoring practitioners in developing monitoring design, documenting their work, and coordinating with other programs in the region. In an effort to move forward with promoting improved business practice around documentation and to support improved data management strategies and sharing, PNAMP developed MonitoringMethods.org. MonitoringMethods.org provides a place where monitoring practitioners can document methods and protocols or find information about others' information, as well as definitions of monitoring terminology (metrics and indicators) that is important to them. MonitoringMethods.org also hosts a Community Forum to promote information exchange and coordination/collaboration between regional monitoring practitioners about topics of interest to this community. PNAMP makes information from MonitoringMethods.org available to other regional systems via web services. Several other web resources are being considered by PNAMP or are currently in development, such as the Master Sample Tool.

B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA.

PNAMP's role is not to collect data or provide analysis of data, but provide coordination. You can find documents and work plans related to the Coordinated Assessments project

and the ISTM demo project on the PNAMP website (link to Coordinated Assessments project; link to ISTM Demonstration project).
You can also review content related to methods, protocols, descriptions of regional data repositories, and a glossary of metrics and indicators on MonitoringMethods.org (link to MonitoringMethods.org).

C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.
N/A

II. RPA 51.2 - Develop a regional strategy for status/trend monitoring

Description: Facilitate and participate in an ongoing collaboration process to develop a regional strategy for status and trend monitoring for key ESA fish populations and an associated regional agreement for joint funding and implementation. This monitoring strategy will be coordinated with the status monitoring needs and strategies being developed for hydrosystem, habitat, hatchery, harvest, and estuary/ocean. (Initiate in FY 2008)

A. Identify how your project contributed to meeting RPA objectives/questions.
PNAMP's Coordinated Assessments Project, a collaboration with CBFWA, is an effort to develop integrated data-sharing for anadromous fish related data among the co-managers (state fish and wildlife agencies and Tribes) and action agencies of the Columbia Basin. The initial focus of the project is on three VSP abundance indicators for salmon and steelhead: Natural Origin Spawner Abundance, Smolt to Adult Return, and Recruit per Spawner (link to overall work plan). The intent of this data sharing strategy is to provide the framework and technical tools to support data sharing across disparate systems from the local level to the regional level; and, ensure that comparable data from different sources can be combined to facilitate assessment at the regional scale.

PNAMP's Integrated Status and Trends Monitoring Demonstration (ISTM demo) project is intended to demonstrate the approaches and utility of integrating the collection of information to address multi-scale questions about the status and trends of fish (salmon, steelhead, and potentially bull trout), and physical, chemical, and biological attributes in stream networks. The overall intent is to assist PNAMP's participating members in developing strategic action plans for monitoring in the bi-state lower Columbia (LC) river demonstration area, as well as to demonstrate the general approach to developing such plans for other areas in the Pacific Northwest. The ISTM effort will provide entities tasked with monitoring fish populations and aquatic habitat in the Pacific Northwest with a roadmap for integration of scientifically sound monitoring programs intended to meet the needs of decision-makers and managers. Specifically, it will apply this approach and develop recommendations for integrated monitoring plans for salmon, steelhead, and potentially bull trout populations listed under the ESA, and their habitats in the LC area. Among the many monitoring components, key features of this effort are improved understanding of the extent and qualities of existing information, key gaps, and how a region-wide "master sample" concept can be applied to select sampling locations where appropriate. The ISTM effort is being accomplished using a collaborative approach

involving PNAMP participants and other local partners. Anticipated PNAMP products include development of design, analysis and implementation tools, coordination to integrate actions into planning and implementation of efforts addressing fish recovery and watershed health in the demonstration area, and products summarizing the approaches, tools, guidance, and results from the demonstration project for possible use in other parts of the Pacific Northwest.

Finally, PNAMP is developing a number of web resources that will support monitoring practitioners in developing monitoring design, documenting their work, and coordinating with other programs in the region. The Master Sample Tool is one such resource. A prototype was developed for the ISTM demo project and PNAMP is currently developing a more robust tool for regional use. A key objective of the ISTM project, as mentioned above, is to apply a region-wide "master sample" concept to the selection of sampling locations in the Lower Columbia River area. Using a probabilistic-based approach to monitoring design will support the integration of monitoring results across programs. The tool will allow users to know who else has selected sites from the master sample covering stream networks in their domains; to design individual or integrated monitoring programs; to know how existing sites relate to a common master sample; and what they are collecting at the site over time.

B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA.
PNAMP's role is not to collect data or provide analysis of data, but provide coordination. You can find documents and work plans related to the Coordinated Assessments project and the ISTM demo project on the PNAMP website (link to Coordinated Assessments project; link to ISTM Demonstration project).
You can also review information about the Master Sample Tool development project on the PNAMP website (link to Master Sample Tool Development project).

C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.
N/A

II. RPA 51.3 - Provide funding support/staff participation in regional forums

Description: Provide cost-shared funding support and staff participation in regional coordination forums such as the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) fish population monitoring workgroup and the Northwest Environmental Data Network to advance regional standards and coordination for more efficient and robust monitoring and information management. (Annually)
A. Identify how your project contributed to meeting RPA objectives/questions.
PNAMP provides staff time to plan and host regional coordination forums, as well as attend other forums that will support our work. In addition, PNAMP provides cost-shared funding support for travel costs to get to and from these meetings and workshops. PNAMP provides staff time to set up travel arrangements for participants outside of

USGS who request travel support to attend regional meetings and workshops. For those participants unable to attend events in person, PNAMP dedicates a portion of its annual operating costs to online meeting software, such as WebEx, and phone bridges. Documents distributed at meetings are efficiently distributed ahead of time to remote participants via the PNAMP website (www.pnamp.org), which is also supported via cost share funds from PNAMP partners.

B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA.
PNAMP's role is not to collect data or provide analysis of data, but provide coordination.

C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.
For data management tasks that were largely overseen by the Northwest Environmental Data-Network (NED) in the past, PNAMP has taken on the role of coordinating the forum to discuss current issues since NED has dissolved. To that end, PNAMP has regular Data Management Leadership Team meetings throughout the year to inform the community of current topics of interest. PNAMP also has several ongoing projects related to data management and sharing. Please see the PNAMP website for more information (www.pnamp.org).

II. RPA 56.3 - Develop strategy for hab stat/trend monitoring for ESA fish

Description: Facilitate and participate in an ongoing collaboration process to develop a regional strategy for limited habitat status and trend monitoring for key ESA fish populations. This monitoring strategy will be coordinated with the status monitoring needs and strategies being developed for hydropower, habitat, hatchery, harvest, and estuary/ocean. (Initiate in FY 2008)

A. Identify how your project contributed to meeting RPA objectives/questions.
PNAMP's Integrated Status and Trends Monitoring Demonstration (ISTM demo) project is intended to demonstrate the approaches and utility of integrating the collection of information to address multi-scale questions about the status and trends of fish (salmon, steelhead, and potentially bull trout), and physical, chemical, and biological attributes in stream networks. The overall intent is to assist PNAMP's participating members in developing strategic action plans for monitoring in the bi-state lower Columbia (LC) river demonstration area, as well as to demonstrate the general approach to developing such plans for other areas in the Pacific Northwest. Currently, there are at least five different programs proposed or underway for monitoring of aquatic resources in the LC. Often there is significant overlap in questions being addressed, methodology, and spatial domains of inference of these habitat monitoring programs. Despite this overlap, it is often difficult to share data among habitat monitoring entities because of potentially rectifiable differences in study designs. The premise of the ISTM demo project is that better coordination among the habitat monitoring programs will lead to more efficient and effective aquatic resource monitoring throughout the region. For this to occur, monitoring entities need to compare goals, objectives, protocols, and inference domains.

By identifying commonalities and rectifiable differences, it will be possible to develop more coordinated, effective, and efficient multi-agency aquatic monitoring programs for the Pacific Northwest.

The ISTM habitat group will finish their evaluation on how the programs can share attribute data and report the results. Next steps include performing a gap analysis to determine how well existing programs meet monitoring priorities across the region, making recommendations for filling monitoring gaps (including looking for ways to share data that are not currently sharable through development of an index system or transformation of data), conducting a trade-off analysis, and developing final recommendations for implementation. This project will inform both salmon recovery and watershed plan monitoring in the Lower Columbia River Basin. In addition, if funding becomes available, the resulting monitoring design may be expanded to incorporate the status and trends monitoring efforts being developed through municipal stormwater permit process in southwest Washington.

B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA.

In 2011, the ISTM habitat working group focused on reviewing existing programs and comparing information among the programs. The number of programs being analyzed increased to include Clark County (WA) Stormwater Needs Assessment Program, CHaMP, ODFW Aquatic Inventory, ODEQ National Rivers and Streams Assessment, WA Salmon Recovery Funding Board (SRFB) Action Effectiveness Monitoring, USFS Aquatic and Riparian Effectiveness Monitoring Plan (AREMP), and WA Department of Ecology Monitoring for Watershed Health and Salmon Recovery. Program managers provided information on the scope and scale of each program, as well as the specific habitat attributes measured by each program, including detailed descriptions of the collection and analysis methods.

The compilation of this information required several iterations to make sure that it was complete and the collection took longer than expected due to lack of availability by the participants. Once the data was compiled, the group held several work sessions to review and determine what data could potentially be shared. The group started with attributes measured by all programs. After reviewing the collection/analysis methods for a given attribute, each program identified with whom they could share data, as well as differences in methods that prohibited data sharing. These online work sessions were informative and allowed for documentation of current program similarities, as well as areas that need to be addressed to increase compatibility.

PNAMP's role is not to collect data or provide analysis of data, but provide coordination. PNAMP staff facilitated these work sessions and the compilation of information from each program. More information can be found on the PNAMP website (link to ISTM Habitat Monitoring Component project).

C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.
N/A

II. RPA 57.5 - Refine models relating habitat actions to ecosystem function

Description: Action Agencies will convene a regional technical group to develop an initial set of relationships in FY 2008, then annually convene the group to expand and refine models relating habitat actions to ecosystem function and salmon survival by incorporating research and monitoring results and other relevant information. (Initiate in FY 2008)

A. Identify how your project contributed to meeting RPA objectives/questions.
PNAMP staff participated in a U.S. Bureau of Reclamation modeling workshop in 2011. In addition, PNAMP hosted discussions about this topic in several other project meetings, such as the Habitat Data Sharing and Integrated Status and Trends Monitoring (ISTM) demonstration projects.

B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA. While PNAMP did not make substantial progress related to refining models relating habitat actions to ecosystem function, the use of models in monitoring design and evaluation of monitoring results was a primary topic that emerged from our strategic planning session with our SC. Specifically, we discussed model based design for specific monitoring needs, as well as ecosystem decision models and potential application to emerging needs for climate change studies. After discussion of PNAMP role, the idea that PNAMP could sponsor review of modeling tools used (or potential to be used) in monitoring emerged as the highest priority for potential new task. The idea is for PNAMP to host a workshop to focus on use of models to inform monitoring design, not to develop a new model(s) for partners' use.

This work would be a good follow on to the ISTM project to build ecosystem/decision support model for habitat data. SC suggested that they are interested in models that incorporate all available data of ecosystem health (in addition to fish response). The workshop could serve as a forum to help inform what information needs to be shared and how to share - not for PNAMP to guide the development of models.
Three specific ideas emerged:

1) Normalizing indicators to support sharing (being pursued through HDS Project);
2) Information needs assessment to support modeling (e.g., CA); and
3) Facilitate review of model results (diff models, same data) - expert to write up, not SC or PNAMP staff.

PNAMP expects this workshop to occur in 2012.

C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.

N/A

II. RPA 71.3 - Support standardization of tagging and monitoring efforts

Description: Supporting the standardization and coordination of tagging and monitoring efforts through participation and leadership in regional coordination forums such as PNAMP.

A. Identify how your project contributed to meeting RPA objectives/questions.

PNAMP is a forum for the community of aquatic monitoring practitioners in the Pacific Northwest. PNAMP Coordination Team hosts the forum to facilitate collaboration around aquatic monitoring topics of interest, promote best practices for monitoring, and encourage coordination and integration of monitoring activities appropriate. The forum's activities are conducted by participant working groups and teams as endorsed by the partner-based steering committee. All PNAMP activities are open to anyone who wishes to participate.

Much of the work PNAMP does is related to improving monitoring efforts and improving the coordination and collaboration between monitoring efforts, which sometimes leads to support for standardizing, or at the very least, making sure resulting data is comparable. In 2010, one of PNAMP's efforts to support a forum of tagging, telemetry, and marking experts resulted in a publication: "Tagging, Telemetry, and Marking Measures for Monitoring Fish Populations" (link to publication). In addition, in an effort to move forward with promoting improved business practice around documentation and to support standardized methodologies, PNAMP developed MonitoringMethods.org. MonitoringMethods.org provides a place where monitoring practitioners can document methods and protocols or find information about others' information, as well as definitions of monitoring terminology (metrics and indicators) that is important to them. MonitoringMethods.org also hosts a Community Forum to promote information exchange and coordination/collaboration between regional monitoring practitioners about topics of interest to this community. Content from MonitoringMethods.org will be used to help develop 'Methods Review' sessions with practitioners that PNAMP will plan in 2012.

B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA.

PNAMP's role is not to collect data or provide analysis of data, but provide coordination. You can find documents related to all of PNAMP's projects on the PNAMP website (www.pnamp.org). You can also review content related to methods, protocols, descriptions of regional data repositories, and a glossary of metrics and indicators on MonitoringMethods.org (link to MonitoringMethods.org).

C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.

N/A

II. RPA 71.4 - Implement std metrics, biz practices, & info collection

Description: Working with regional monitoring agencies to develop, cooperatively fund, and implement standard metrics, business practices, and information collection and reporting tools needed to cooperatively track and report on the status of regional fish improvement and fish monitoring projects.

A. Identify how your project contributed to meeting RPA objectives/questions.

PNAMP is a forum for the community of aquatic monitoring practitioners in the Pacific Northwest. PNAMP Coordination Team hosts the forum to facilitate collaboration around aquatic monitoring topics of interest, promote best practices for monitoring, and encourage coordination and integration of monitoring activities appropriate. The forum's activities are conducted by participant working groups and teams as endorsed by the partner-based steering committee. All PNAMP activities are open to anyone who wishes to participate. Beyond that, this RPA is support specifically by the projects mentioned below.

PNAMP's Coordinated Assessments Project, a collaboration with CBFWA, is an effort to develop integrated data-sharing for anadromous fish related data among the co-managers (state fish and wildlife agencies and Tribes) and action agencies of the Columbia Basin. The initial focus of the project is on three VSP abundance indicators for salmon and steelhead: Natural Origin Spawner Abundance, Smolt to Adult Return, and Recruit per Spawner (link to overall work plan). The intent of this data sharing strategy is to provide the framework and technical tools to support data sharing across disparate systems from the local level to the regional level; and, ensure that comparable data from different sources can be combined to facilitate assessment at the regional scale.

PNAMP's Integrated Status and Trends Monitoring Demonstration (ISTM demo) project is intended to demonstrate the approaches and utility of integrating the collection of information to address multi-scale questions about the status and trends of fish (salmon, steelhead, and potentially bull trout), and physical, chemical, and biological attributes in stream networks. The overall intent is to assist PNAMP's participating members in developing strategic action plans for monitoring in the bi-state lower Columbia (LC) river demonstration area, as well as to demonstrate the general approach to developing such plans for other areas in the Pacific Northwest. The ISTM effort will provide entities tasked with monitoring fish populations and aquatic habitat in the Pacific Northwest with a roadmap for integration of scientifically sound monitoring programs intended to meet the needs of decision-makers and managers. Specifically, it will apply this approach and develop recommendations for integrated monitoring plans for salmon, steelhead, and potentially bull trout populations listed under the ESA, and their habitats in the LC area. Among the many monitoring components, key features of this effort are improved understanding of the extent and qualities of existing information, key gaps, and how a region-wide "master sample" concept can be applied to select sampling locations where appropriate. The ISTM effort is being accomplished using a collaborative approach involving PNAMP participants and other local partners. Anticipated PNAMP products include development of design, analysis and implementation tools, coordination to integrate actions into planning and implementation of efforts addressing fish recovery and watershed health in the demonstration area, and products summarizing the

approaches, tools, guidance, and results from the demonstration project for possible use in other parts of the Pacific Northwest.

Finally, PNAMP is developing a number of web resources that will support monitoring practitioners in developing monitoring design, documenting their work, and coordinating with other programs in the region. In an effort to move forward with promoting improved business practice around documentation and to support improved data management strategies and sharing, PNAMP developed MonitoringMethods.org. MonitoringMethods.org provides a place where monitoring practitioners can document methods and protocols or find information about others' information, as well as definitions of monitoring terminology (metrics and indicators) that is important to them. MonitoringMethods.org also hosts a Community Forum to promote information exchange and coordination/collaboration between regional monitoring practitioners about topics of interest to this community. PNAMP makes information from MonitoringMethods.org available to other regional systems via web services. Several other web resources are being considered by PNAMP or are currently in development, such as the Master Sample Tool.

B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA.
PNAMP's role is not to collect data or provide analysis of data, but provide coordination. You can find documents and work plans related to the Coordinated Assessments project and the ISTM demo project on the PNAMP website: (link to Coordinated Assessments project; link to ISTM Demonstration project).
You can also review content related to methods, protocols, descriptions of regional data repositories, and a glossary of metrics and indicators on MonitoringMethods.org (link to MonitoringMethods.org).

C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.
N/A

II. RPA 71.5 - Coordinate further dev & implementation of the other Hs

Description: Coordinating the further development and implementation of Hydrosystem, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E through leadership and participation in ongoing collaboration and review processes and workgroups.

A. Identify how your project contributed to meeting RPA objectives/questions.
PNAMP is a forum for the community of aquatic monitoring practitioners in the Pacific Northwest. PNAMP Coordination Team hosts the forum to facilitate collaboration around aquatic monitoring topics of interest, promote best practices for monitoring, and encourage coordination and integration of monitoring activities appropriate. The forum's activities are conducted by participant working groups and teams as endorsed by the partner-based steering committee. All PNAMP activities are open to anyone who wishes

to participate. Beyond that, this RPA is support specifically by the projects mentioned below.

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PNAMP initiated the Habitat Data Sharing project in 2011 to facilitate a discussion on actions needed to effectively share habitat and effectiveness monitoring results. It augments the on-going Coordinated Assessments project, which is currently focusing on the sharing of fish abundance data in the Columbia Basin, and will be informed by the ongoing Effectiveness Monitoring Coordination Task and Integrated Status and Trends Monitoring (ISTM) project. The project embraces five new activities (Activities A-E) and connects with two activities being run parallel to the project (Activities F&G). These activities, listed here, are described more fully in the project workplan:

Activity A: Identification of a short list of priority habitat characteristics;
Activity B: DET prototype for selected habitat characteristics;
Activity C: Creating habitat indices for improved sharing using normalization of habitat metrics and measurements;
Activity D: Needs assessment for habitat data sharing;
Activity E: Macroinvertebrate data as a component of habitat data sharing;
Activity F: Remote sensing as a new/improved source of habitat characterization data at multiple scales; and
Activity G: Habitat data discovery.

PNAMP's Integrated Status and Trends Monitoring Demonstration (ISTM demo) project is intended to demonstrate the approaches and utility of integrating the collection of information to address multi-scale questions about the status and trends of fish (salmon, steelhead, and potentially bull trout), and physical, chemical, and biological attributes in stream networks. The overall intent is to assist PNAMP's participating members in developing strategic action plans for monitoring in the bi-state lower Columbia (LC) river demonstration area, as well as to demonstrate the general approach to developing such plans for other areas in the Pacific Northwest. The ISTM effort will provide entities tasked with monitoring fish populations and aquatic habitat in the Pacific Northwest with a roadmap for integration of scientifically sound monitoring programs intended to meet the needs of decision-makers and managers. Specifically, it will apply this approach and develop recommendations for integrated monitoring plans for salmon, steelhead, and potentially bull trout populations listed under the ESA, and their habitats in the LC area. Among the many monitoring components, key features of this effort are improved understanding of the extent and qualities of existing information, key gaps, and how a

region-wide "master sample" concept can be applied to select sampling locations where appropriate. The ISTM effort is being accomplished using a collaborative approach involving PNAMP participants and other local partners. Anticipated PNAMP products include development of design, analysis and implementation tools, coordination to integrate actions into planning and implementation of efforts addressing fish recovery and watershed health in the demonstration area, and products summarizing the approaches, tools, guidance, and results from the demonstration project for possible use in other parts of the Pacific Northwest.

B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA.
PNAMP's role is not to collect data or provide analysis of data, but provide coordination. You can find documents and work plans related to the Coordinated Assessments project, the Habitat Data Sharing project, and the ISTM demo project on the PNAMP website (link to Coordinated Assessments project; link to Habitat Data Sharing project; link to ISTM Demonstration project).

C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.
N/A

II. RPA 71.6 - Coordinating implementation w/ oth reg collaboration processes

Description: Coordinating implementation with other appropriate regional collaboration processes. This includes coordination related to statutory provisions for the Federal government (BPA/Council), voluntary coordination among Federal agencies (Federal Caucus), and coordination with regional processes for Federal/non-Federal engagement [Technical Management Team (TMT), System Configuration Team (SCT), PNAMP, Northwest Environmental Data- Network (NED), and others).
A. Identify how your project contributed to meeting RPA objectives/questions.
PNAMP is a forum for the community of aquatic monitoring practitioners in the Pacific Northwest. PNAMP Coordination Team hosts the forum to facilitate collaboration around aquatic monitoring topics of interest, promote best practices for monitoring, and encourage coordination and integration of monitoring activities appropriate. The forum's activities are conducted by participant working groups and teams as endorsed by the partner-based steering committee. All PNAMP activities are open to anyone who wishes to participate.

For data management tasks that were largely overseen by the Northwest Environmental Data-Network (NED) in the past, BPA has asked that PNAMP and others take on the role of coordinating the forum to discuss current data management topics since NED has dissolved. To that end, PNAMP has regular Data Management Leadership Team meetings throughout the year to inform the community of current topics of interest. PNAMP also has several ongoing projects related to data management and sharing.

PNAMP staff also serve as liaisons to many other regional groups by participating in activities for groups such as the Washington Forum on Monitoring, Puget Sound Partnership, BPA, Northwest Power and Conservation Council, Columbia River Federal Caucus, Landscape Conservation Cooperatives, etc.

B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA.
Please see the PNAMP website for more information on PNAMP activities (www.pnamp.org).

C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.
N/A

II. RPA 72.1 - Participate & jointly fund support in reg coordination forums

Description: Continue to work with regional Federal, State and Tribal agencies to establish a coordinated and standardized information system network to support the RM&E program and related performance assessments. The coordination of this development will occur primarily through leadership, participation, and joint funding support in regional coordination forums such as the NED workgroup, and PNAMP and the ongoing RM&E pilot studies in the Wenatchee River, John Day River, Upper Salmon River, and Columbia River Estuary. (Initiate in FY 2007- 2009 Projects)

A. Identify how your project contributed to meeting RPA objectives/questions.
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Spawner (link to overall work plan). The intent of this data sharing strategy is to provide the framework and technical tools to support data sharing across disparate systems from the local level to the regional level; and, ensure that comparable data from different sources can be combined to facilitate assessment at the regional scale.

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PNAMP's Integrated Status and Trends Monitoring Demonstration (ISTM demo) project is intended to demonstrate the approaches and utility of integrating the collection of information to address multi-scale questions about the status and trends of fish (salmon, steelhead, and potentially bull trout), and physical, chemical, and biological attributes in stream networks. The overall intent is to assist PNAMP's participating members in developing strategic action plans for monitoring in the bi-state lower Columbia (LC) river demonstration area, as well as to demonstrate the general approach to developing such plans for other areas in the Pacific Northwest. The ISTM effort will provide entities tasked with monitoring fish populations and aquatic habitat in the Pacific Northwest with a roadmap for integration of scientifically sound monitoring programs intended to meet the needs of decision-makers and managers. Specifically, it will apply this approach and develop recommendations for integrated monitoring plans for salmon, steelhead, and potentially bull trout populations listed under the ESA, and their habitats in the LC area. Among the many monitoring components, key features of this effort are improved understanding of the extent and qualities of existing information, key gaps, and how a region-wide "master sample" concept can be applied to select sampling locations where appropriate. The ISTM effort is being accomplished using a collaborative approach involving PNAMP participants and other local partners. Anticipated PNAMP products include development of design, analysis and implementation tools, coordination to integrate actions into planning and implementation of efforts addressing fish recovery and watershed health in the demonstration area, and products summarizing the approaches, tools, guidance, and results from the demonstration project for possible use in other parts of the Pacific Northwest.

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C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.
N/A

II. RPA 72.3 - Develop a regional management strategy for water, fish & habitat data

Description: Participate in Northwest regional coordination and collaboration efforts such as the current PNAMP and NED efforts to develop and implement a regional management strategy for water, fish and habitat data. (Initiate in FY 2007-2009 Projects)
A. Identify how your project contributed to meeting RPA objectives/questions.
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PNAMP's ISTM demo project is intended to demonstrate the approaches and utility of integrating the collection of information to address multi-scale questions about the status and trends of fish (salmon, steelhead, and potentially bull trout), and physical, chemical, and biological attributes in stream networks. The overall intent is to assist PNAMP's participating members in developing strategic action plans for monitoring in the bi-state lower Columbia (LC) river demonstration area, as well as to demonstrate the general approach to developing such plans for other areas in the Pacific Northwest. The ISTM effort will provide entities tasked with monitoring fish populations and aquatic habitat in the Pacific Northwest with a roadmap for integration of scientifically sound monitoring programs intended to meet the needs of decision-makers and managers. Specifically, it will apply this approach and develop recommendations for integrated monitoring plans for salmon, steelhead, and potentially bull trout populations listed under the ESA, and their habitats in the LC area. Among the many monitoring components, key features of this effort are improved understanding of the extent and qualities of existing information, key gaps, and how a region-wide "master sample" concept can be applied to select sampling locations where appropriate. The ISTM effort is being accomplished using a collaborative approach involving PNAMP participants and other local partners.

Anticipated PNAMP products include development of design, analysis and implementation tools, coordination to integrate actions into planning and implementation of efforts addressing fish recovery and watershed health in the demonstration area, and products summarizing the approaches, tools, guidance, and results from the demonstration project for possible use in other parts of the Pacific Northwest.

PNAMP also develops guidance for partners related to various components of data management and sharing. All data sharing should be supported by adequate metadata. Through the PNAMP Metadata Work Group, recommendations have been made for different approaches to metadata development. However, standard approaches for dataset metadata have not been embraced within the Northwest aquatic monitoring community. Additional recommendations and guidance for regional standard dataset and potentially project and protocol metadata reporting is anticipated in coordination with the building and potential regionalization of the metadata builder tool described above.

Finally, PNAMP has drafted a Roadmap for Implementation of Data Management and Sharing that summarizes the actions needed to enhance the effectiveness and efficiency of regional data flow within and among aquatic monitoring programs. After the Roadmap is reviewed and finalized (estimated in March 2012), it is anticipated to be annually updated as progress is made along the 'regional road'.

B. Include results of data collection and conclusions from analysis, data management, and regional coordination for the RPA.
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C. When applicable, describe adaptive management activities that were implemented or are recommended to inform future implementation of actions for the RPA in relationship to the BiOp Implementation Plans.
N/A

III. List all publications and reports created, and data repositories used by this project/contract in the time frame reported. When appropriate, upload technical documents, i.e., reports, posters, in Pisces as "Public."

Data Repositories:
PNAMP manages the following data repositories:
www.pnamp.org
www.monitoringmethods.org
www.mastersample.org/pnamp/

Links to Reports, Work plans, White papers, posters, and presentations produced January 1, 2011 – December 31, 2011

- PNAMP Budget History 2005-2011 - http://www.pnamp.org/document/3600
- PNAMP 2011 Organizational Survey: Summary of Responses http://www.pnamp.org/document/3601
- CRB Collaborative Data Sharing Strategy: Salmon and Steelhead Population Abundance and Productivity Indicators - http://www.pnamp.org/document/3546
- PNAMP Metadata Tool Recommendations - http://www.pnamp.org/document/3296
- PNAMP 2010 Annual Report - http://www.pnamp.org/document/3280
- AFS 2011 Data Management Symposium Abstract - Advances in Data Management and Dissemination - http://www.pnamp.org/document/3294
- PNAMP 2011 Work Plan in Brief - http://www.pnamp.org/document/3275
- Overview of the PNAMP ISTM Habitat Group - Goals, Objectives, Approach and Timeline - http://www.pnamp.org/document/3278
- Coordinated Assessments for Salmon and Steelhead Phase III Workplan - http://www.pnamp.org/document/3537
- PNAMP Habitat Data Sharing Prospectus - http://www.pnamp.org/document/3609
- Coordinated Assessments Core Team Work Plan - summer 2011 - http://www.pnamp.org/document/3448
- Phase II Work Plan For Coordinated Assessments for Salmon and Steelhead – DRAFT - http://www.pnamp.org/document/3258
- ISTM Workgroup: Developing Tools to Assist in the Regional Development and Coordination of Large-Scale Aquatic Monitoring Programs - http://www.pnamp.org/document/3489
- Habitat Data Sharing – Context - http://www.pnamp.org/document/3504
- High Level Indicators for Habitat Data Sharing - http://www.pnamp.org/document/3505
- Coordinated Assessments - Gaps, Needs, and Priorities - http://www.pnamp.org/document/3391
- Coordinated Assessments - Reports from the Field: Preliminary results - http://www.pnamp.org/document/3393
- Coordinated Assessments Data Gathering - Preliminary Results - http://www.pnamp.org/document/3393
- Data Sharing Workshop to Support Coordinated Assessments - Phase II presentation - http://www.pnamp.org/document/3360
- PNAMP Presentation to the Great Northern Landscape Conservation Cooperative - http://www.pnamp.org/document/3370
- OSU Master Sample docs – guidance doc, tutorial guide – see documents in Pisces