# Columbia River Basin Collaborative Data Sharing Strategy: Salmon and Steelhead Population Abundance and Productivity Indicators

DRAFT

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Coordinated Assessments Project

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# List of Acronyms Used in Report

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|---|---|
| AMIP | FCRPS BiOp Adaptive Management Implementation Plan |
| ASMS | NPCC Anadromous Salmonid Monitoring Strategy |
| BiOp | FCRPS Biological Opinion |
| BPA | Bonneville Power Administration |
| CA | Coordinated Assessments Project |
| CBFWA | Columbia Basin Fish and Wildlife Authority |
| CRB | Columbia River Basin |
| CRITFC | Columbia River Inter-Tribal Fish Commission |
| CWA | Clean Water Act |
| DAFD | Data Analysis Flow Diagram |
| DET | Data Exchange Template |
| DPS | NOAA Distinct Population Segment |
| ESA | Endangered Species Act |
| ESU | NOAA Evolutionarily Significant Unit |
| FCRPS | Federal Columbia River Power System |
| HLI | High Level Indicator |
| LSRCP | Lower Snake River Compensation Plan |
| MERR | NPCC Monitoring, Evaluation, Research, and Reporting Plan |
| NED | Northwest Environmental Data network |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NPA | Northwest Power Act |
| NPCC | Northwest Power and Conservation Council |
| NWFSC | NMFS Northwest Fisheries Science Center |
| OWEB | Oregon Watershed Enhancement Board |
| PNAMP | Pacific Northwest Aquatic Monitoring Partnership |
| RIOG | Action Agency Regional Implementation Oversight Group |
| RME | Research, Monitoring and Evaluation |
| RPA | Reasonable and Prudent Alternative |
| SOTR | CBFWA Status of the Resource Report |
| SPS | NOAA Salmon Population Summary database |
| TRT | NOAA Technical Recovery Team |
| VSP | NOAA Viable Salmonid Population |

# Executive Summary

The goal of the Columbia River Basin Collaborative Basin-wide Data Sharing Strategy is to continue to improve basin-wide assessments and management decisions by improving the information on which those decisions are based. There are many basin-wide data consumers who have identified the need for data to support high level indicators for salmon and steelhead including the Northwest Power and Conservation Council, NOAA Fisheries, Bonneville Power Administration, Lower Snake River Compensation Plan, Columbia River Fish Accord partners, Columbia Basin Fish and Wildlife Authority, State of Washington, and the state and tribal fishery co-managers.

To achieve this goal, the agencies and tribes intend to improve accessibility, quality, comparability and administrative efficiency of their data management and sharing practices. This Strategy presents the first in a series of incremental steps towards a data exchange network which would support participating agencies and tribes in developing and using more advanced and automated data transport options. These approaches will range from developing agency/tribal data systems, to shared hosting of indicators and/or supporting metrics, to publishing data and metadata via 'web services' on the Internet. This will ultimately allow the regional data consumers - those conducting assessments and assembling the various high level reports - to directly access the needed data. The Strategy is also intended to inform and aid agency and tribal spending and requests to funding sources for financial support in implementing basin-wide business practices and infrastructures, and to assist in setting priorities for BPA data management funding.

The objectives of this strategy are:

- Promote discussion and understanding at the policy-level within the agencies and tribes on how best to support adequate data management and set priorities for internal funding of data management for sharing data that is necessary to perform basin-wide salmon and steelhead assessments.

- Inform the Council's Category Review for Data Management and Regional Coordination projects. The agencies and tribes acknowledge that BPA funding for data management may require re-prioritization of work elements within existing data management projects, alignment of data management tasks within monitoring projects, and in-kind contributions from the agencies and tribes.

- Inform NOAA funding processes to support recovery monitoring and align data management funding necessary for status assessments, as well as inform other funding processes, in order to better align all these efforts with BPA funding for data management within the Columbia River Basin.

- Over the long-term, realize a sustained flow of high quality abundance and productivity data in order to efficiently support calculation of reliable and transparent salmon and steelhead population indicators.

Several recent planning efforts and collaborative guidelines contain common themes that set priorities for basin-wide data sharing and without strategic action will continue to be gaps in effective data sharing. In summary the biggest gaps for data consumers are:

- The need for data accessibility through automated internal infrastructures at the agency and tribal level that can interact in a standardized manner with regional repositories,
- The need for agreed upon data formatting (data dictionaries and/or data templates),
- The need for fully developed metadata to accompany datasets, and
- The need for coordination of a network of data sharing and the fostering of collaboration and communication through regional forums.

During 2009 federal, state, and tribal fish and wildlife managers that monitor anadromous salmonids in the Columbia River Basin collaboratively worked together through a series of sub-regional and regional workshops to reach agreement on an efficient and effective framework and project specific implementation strategy for anadromous salmon and steelhead monitoring. The Anadromous Salmonid Monitoring Workshops assessed (1) Viable Salmonid Population (VSP) criteria, (2) habitat effectiveness and (3) hatchery effectiveness in the Columbia Basin and resulted in the Northwest Power and Conservation Council's Anadromous Salmonid Monitoring Strategy which was used during the Monitoring and Evaluation Projects Category Review to prioritize and coordinate BPA funded monitoring projects. BPA currently funds over 40 projects that collect data to support calculation of VSP parameters which are implemented by 10 fisheries co-managers, and an additional 40 projects that collect data that address habitat and hatchery effectiveness.

In 2010, the agencies and tribes created the Coordinated Assessments Project in order coordinate the data being collected through the BPA funded monitoring projects. They completed Gaps, Needs, and Priorities assessments in relation to three selected VSP population level indicators for salmon and steelhead in order to develop Individual Data Sharing Strategies. The detailed analysis for each of the agencies and tribes is found in Appendices C through L to this report.

The data sharing gaps identified by the agencies and tribes were very similar across the Basin, regardless of where along the spectrum their data management capabilities fell. Most of the existing data systems were developed to support local, sub-regional (within the agency or tribe) decisions. Although they may be construed as archaic or clunky by the outside observer, they have been adequate to support the appropriate level of decision making within the agency or tribe for which the projects were intended. The gaps arise when the systems are evaluated on the capability to provide data and metadata for higher level analyses and decision support systems. When viewed under this lens, the systems are generally outdated and need significant upgrades. In order to address the regional or basin-wide data sharing needs, the local sub-regional data management infrastructure has to be improved.

Currently the agencies and tribes do not regularly calculate VSP indicators at the population scale needed by NOAA to conduct ESA status assessments. Several agencies intend to prioritize that activity in order to provide the derived indicators on a regular basis to NOAA, while other agencies and tribes are content to provide the metric data and metadata necessary to allow those calculations to be performed by NOAA. Re-alignment of staff to perform the analyses necessary to generate the indicators that are needed for higher level analyses will take time and resources. The agencies and tribes will need to invest in staff to perform the calculations and report high level indicators within their management areas. Funding will come from internal realignment of personnel, existing BPA funding within monitoring projects or from NOAA Fisheries where appropriate. It is important to note, indicators are generated from the same metric level data for different areas of inference; therefore, exchanging indicator information will require some level of metric level data and metadata exchange.

The needs or funding opportunities within the agencies and tribes to improve data management and sharing fell generally within six categories: Data Management Assessments and Planning Support, Updated Data Management Policies, Hardware and Software Infrastructure, IT Support (programmer, web manager, etc.), Data Coordinator (internal and external coordination), and Coordination Forums for Standardized Protocols.

The Strategy resulted in the following recommendations:

1) **Invest in Internal Infrastructure.** The agencies and tribes should prioritize and adopt data management business practices that support internal data sharing and they should invest in data management infrastructure to manage measurement-, metric- and indicator-level data in a consistent, transparent and uniform manner.

2) **Create Data Coordinator Positions.** Invest in data professionals placed within the agencies and tribes who can bridge the gap between biologists and the technical side of data management. This is a likely role for BPA funding (i.e., StreamNet) as this requires flexibility in job specifications and the ability to operate among various projects or regional offices. StreamNet and the CRITFC Tribal Data Network project could be expanded to provide adequate staffing for each of the appropriate agencies and tribes.

3) **Establish Coordination Forums.** BPA, NOAA, and/or NPCC should commission two interacting governance groups, in collaboration with fishery co-managers, to provide guidance for basin-wide data coordination:
    1. Science and Content Forum to specify the content priorities for basin-wide data sharing (New forum), and
    2. Technical Forum to define necessary data mechanisms and formats to support data sharing (Existing through StreamNet Steering Committee, will have to be expanded).

The focus of these groups will be to improve communication between the agencies and tribes and the basin-wide data consumers (link to reporting) and to ensure reporting needs are met in the most cost effective and efficient means possible.

4) **Fund R&D.** Support a research and development forum, such as PNAMP, for investigating new methodologies and exploring alternative strategies for supporting basin-wide data sharing.

In the transition to the coordination forums identified above, BPA, NPCC and NOAAF should continue to support the existing Coordinated Assessments project to bridge the gap between the current efforts and the start-up of the two coordination forums identified above.

DRAFT BPA funded project guidance for data management projects is provided in the following table:

BPA funded data management projects and DRAFT suggested modifications for FY13-15 funding cycle.

| Number | Title | Proponent Orgs | FY 13-15 Comments | Biop Action |
|---|---|---|---|---|
| 1988-108-04 | StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED) | Pacific States Marine Fisheries Commission (PSMFC) | Shift focus from facilitating data compilation within State data bases, to supporting development of corporate databases within the states that support direct data entry and eliminates the need for data compilers for anadromous and resident fish data bases (could take a couple years to complete transition).<br><br>Facilitate communication between state and tribal data bases to ensure consistent data exchange formats and efficient data sharing (Technical Coordination Forum).<br><br>Add 1-2 FTE to support participation and data management for SBT and CCT.<br><br>Manage interim central data base for high level indicators for salmon and steelhead. | RPA 51 Collaboration Regarding Fish Population Status Monitoring, RPA 71 Coordination, RPA 72 Data Management |
| 1996-019-00 | Data Access in Real Time (DART) | University of Washington | Ensure consistency with DETs for appropriate data sharing. This project will likely benefit from the basin-wide data sharing strategy, as a second tier database, but will not necessarily be a major driver in developing the DET or facilitating data exchange. | RPA 72 Data Management |
| 2003-072-00 | Habitat and Biodiversity Information System for Columbia River Basin | Northwest Habitat Institute | See Draft Wildlife Monitoring Strategy | RPA 71 Coordination |
| 2008-505-00 | StreamNet Library | Columbia River Inter-Tribal Fish Commission (CRITFC) | Continue operations consistent with Accords. | RPA 51 Collaboration Regarding Fish Population Status Monitoring, RPA 71 Coordination, RPA 72 Data Management |

| Number | Title | Proponent Orgs | FY 13-15 Comments | Biop Action |
|---|---|---|---|---|
| 2008-507-00 | Tribal Data Network | Columbia River Inter-Tribal Fish Commission (CRITFC) | Participate at the science and technical forums for guiding the next phases of Coordinated Assessments project.<br><br>Provide a liaison to the member tribes' for helping coordinate their biologist/IT interface where they need help (this will require 2 additional FTE).<br><br>Support an IT team that can help write software and provide infrastructure support for helping the tribes with obstacles to housing and sharing their data from tribal databases (creation of metric level data bases, data entry tools, data extraction software, web services, etc.<br><br>Create and maintain mainstem and ocean metric level data bases. | RPA 51 Collaboration Regarding Fish Population Status Monitoring, RPA 71 Coordination, RPA 72 Data Management |
| NEW? | Regional Coordination Facilitation Services | Unknown | Facilitate Science Coordination Forum for guiding data management for sharing high level indicators with fishery co-managers, BPA and NPCC participation (1 FTE).<br><br>Host and maintain basin-wide report for salmon and steelhead high level indicators to support NOAA, BPA and NPCC reporting needs (1 FTE).<br><br>Resident Fish, Wildlife, Lamprey, etc. | |

| Number | Title | Proponent Orgs | FY 13-15 Comments | Biop Action |
|---|---|---|---|---|
| 2004-002-00 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | US Geological Survey (USGS) | Facilitate PNW regional forum for data sharing (Data Management Leadership Team).<br><br>Facilitate development of tools and pilot projects for data management and sharing (R&D for data management and sharing with cost share from appropriate entities).<br><br>State management agencies and tribes will continue to require coordination funding to maintain their capacity to participate. | RPA 51 Collaboration Regarding Fish Population Status Monitoring, RPA 56 Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors, RPA 57 Evaluate the Effectiveness of Tributary Habitat Actions, RPA 59 Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions, RPA 71 Coordination, RPA 72 Data Management |

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# Introduction

The purpose of the Columbia River Basin Collaborative Data Sharing Strategy (Strategy) is to identify and recommend priority actions and investments to develop and support data management business practices and infrastructures – hardware, software, and technical support – that allow for efficient and effective basin-wide data sharing of population level indicators for salmon and steelhead. The Strategy is intentionally limited to salmon and steelhead abundance and productivity indicators; while recognizing additional salmon and steelhead indicators, hatchery, habitat, resident fish and wildlife data sharing needs will be added as the project progresses. Many of the technologies and processes for sharing data that the Strategy supports will easily transfer to other indicators, as well as whole other sectors of information.

The Strategy is a collaborative effort by the Columbia River Basin salmon and steelhead fishery co-managers through the Coordinated Assessments Project and is a starting point for additional future data sharing and collaboration. The Strategy provides a framework to support data sharing across distinct systems from the local level to the regional level; and, ensures that comparable data from different contributing sources can be combined to facilitate assessment at the basin-wide or regional scale. This effort builds upon past efforts for data sharing in the Columbia River Basin. In part it is intended to fulfill the need identified in the October 2, 2007 Northwest Summit briefing paper "Sharing Information to Improve Decisions," that "there is a need for a clear statement of purpose and goals before we'll [executive level deputies] commit resources to a regional data sharing effort."[1]

The core of the Strategy addresses the basin-wide data sharing needs to coordinate the agency and tribal efforts for providing consistent and transparent data at the basin-wide and regional level. The supplemental section includes individual data management plans developed by the agency and tribal fisheries co-managers that collect, analyze and disseminate salmon and steelhead data.

The Strategy includes two main components: 1) A basin-wide data sharing strategy to coordinate efforts for providing consistent and transparent data at the basin-wide and regional level, and 2) Individual agency and tribal data management plans developed by co-managers that collect, analyze and disseminate salmon and steelhead data. These documents describe the essential elements for advancing data management and sharing including a commitment by all parties to share their data, invest in the technical and human infrastructure to support each individual entity's capacity capture (or centralize) and manage their data, planning for performing the analyses necessary to generate the indicators that are relevant at the basin-wide scale, and both internal and external coordination to ensure consistency and transparency in data sharing systems.

# Background

Complying with the Endangered Species Act poses one of the most complex set of legal and technical requirements for resource managers, involving multiple jurisdictions, larger amounts of data, and new

[1] See all briefing materials for the Executive Summit at http://www.pnamp.org/event/2476.

types and combinations of analyses. This will require new and larger data management challenges than present systems were designed to handle.

Through 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 necessary monitoring to provide data needed to answer key management questions related to Viable Salmonid Population (VSP) parameters[2]. The discussion to identify key habitat and hatchery effectiveness assessment indicators is ongoing. Performing these assessments and reporting answers to these management questions on an ongoing basis is critical to assure: 1) effective evaluation of the actions under the FCRPS Biological Opinion (BiOp)[3], 2) progress toward the recovery of anadromous salmonids listed under the Endangered Species Act (ESA)[4], 3) effective implementation of the anadromous salmonid elements of the Northwest Power and Conservation Council's (NPCC) Columbia River Basin Fish and Wildlife Program[5], and 4) informed fishery co-manager decisions and actions[6].

Currently salmon and steelhead goals and objectives are expressed in adult abundance and productivity values, yet in many cases the agencies and tribes only report status in terms of measurements and metrics such as redd count trends, dam counts, carcass surveys, weir counts, etc. Run reconstruction analyses to calculate abundance and productivity at the population scale is not performed on a routine basis except for harvest management and episodic status evaluations by regulatory agencies and/or recovery teams.

Monitoring budgets among the fisheries co-managers are steady, at best, or decreasing. Agencies can respond by reducing monitoring efforts or by improving the efficiency of present operations. The second choice is the better choice and by enhancing data management they can improve the efficiency of monitoring programs.

Salmon cross jurisdictional boundaries (both internal and external to any particular agency) and effective salmon management depends upon the ability of the agencies, tribes and stakeholders to coordinate activities. Coordination will be enhanced through the use of agreed upon data dictionaries, data protocols and delivery mechanisms for sharing data.

Resource managers must comply with many and diverse legal requirements. Decisions must be based upon and supported by credible information and analyses. Well organized and consistent data make it easier to respond to these legal requirements. Climate change impacts will create new and unexpected

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[2] July Draft Anadromous Salmonid Monitoring Strategy: Viable Salmonid Population Criteria and Subset of Tributary Habitat and Hatchery Effectiveness. See http://www.cbfwa.org/ams/files/Anadromous%20Salmonid%20Monitoring%20SubFramework-July%206%202010.pdf.

[3] FCRPS Adaptive Management Implementation Plan. See http://www.salmonrecovery.gov/Files/BiologicalOpinions/AMIP_09%2010%2009.pdf.

[4] Guidance for Monitoring Recovery of Pacific Northwest Salmon & Steelhead listed under the Federal Endangered Species Act. See http://www.nwr.noaa.gov/Salmon-Recovery-Planning/upload/RME-Guidance.pdf.

[5] NPCC Draft Monitoring, Evaluation, Research, and Reporting Plann. See http://www.nwcouncil.org/fw/merr/Default.asp.

[6] As examples, the Columbia Basin Fish Accords and Agencies and Tribes' recommendations to amend the 2000 Fish and Wildlife Program. See http://www.salmonrecovery.gov/ColumbiaBasinFishAccords.aspx and http://www.cbfwa.org/Committees/Members/meetings/2008_0404/2008_Apr4_FWMGRS_CBFWAsubmittal_FINAL.pdf.

challenges to resource managers, as well. Integrating the data required to respond to these challenges with existing systems, distilling it to create new knowledge, and using that knowledge to develop response strategies will require significantly better data management and analysis systems.

For these reasons, the fishery co-managers, NOAA, BPA and NPCC have supported this effort to:

- Improve the efficiency and effectiveness of sharing salmon and steelhead information,
- By agreeing to common standards and definitions for information exchange,
- Which will support ESA implementation and reporting, as well as other fish management requirements, and
- Will help all parties be better able to respond to known fish management challenges and emerging issues.

The Coordinated Assessments project originated in response to wide recognition within the Columbia River Basin that data management and sharing is essential for meaningful basin-wide monitoring activities. In early 2010, the Columbia Basin Fish and Wildlife Authority (CBFWA), NOAA Fisheries, Bonneville Power Administration, Pacific Northwest Aquatic Monitoring Partnership (PNAMP), and StreamNet merged their efforts to create the Coordinated Assessments Project. The Coordinated Assessment Project was developed to address the need for the fishery management agencies and tribes collecting salmon and steelhead data in the Columbia River Basin to be involved in the management and use of their data for calculation of population level metrics and indicators in support of regional scale reporting and population assessments. The activities of the project that resulted in this Strategy are described in Appendix A.

# Goals and Objectives

## Goals

This Strategy aims to improve basin-wide assessments and management decisions by improving access to the information on which those decisions are based. To do this, the agencies and tribes intend to improve accessibility, quality, comparability and administrative efficiency of their data management and sharing practices. The Strategy is intended to inform and aid agency and tribal requests to multiple funding sources for financial support in implementing basin-wide business practices and infrastructures, and to assist in setting priorities for BPA data management funding.

The long term goal of the Coordinated Assessments Project is to develop a basin-wide approach that allows efficient and reliable calculation and sharing of high level indicators and flow of data. Where appropriate, this includes automation of some processes now conducted manually. To meet this goal, the agencies and tribes have begun a series of incremental steps towards developing and participating in a data exchange network based on advanced and automated data transport options. These steps include developing agency/tribal data management systems, shared hosting of indicators and/or supporting metrics, and publishing data and metadata in standardized formats via 'web services' on the Internet. This approach will allow those conducting basin-wide assessments and assembling the various high level reports to directly access the needed data. In the near-term population level assessments will require an ad-hoc approach based on existing data sharing capabilities within the participating agencies/tribes.

## Objectives

The objectives of this Strategy and its related products are:

**Objective 1:** Promote discussion and understanding at the policy-level within the agencies and tribes on how to support adequate data management and prioritize data that support basin-wide salmon and steelhead assessments.

> **Product:** Coordinated, consistent, individual data management plans for each salmon and steelhead manager that can guide investments in infrastructure and support internal and external coordination and funding.

**Objective 2:** Inform the Council's Category Review for Data Management and Regional Coordination projects. The agencies and tribes acknowledge that BPA funding for data management may require re-prioritization of work elements within existing data management projects, alignment of data management tasks within monitoring projects, and in-kind contributions from the agencies and tribes.

> **Product:** Prioritization of BPA funding in the NPCC's data management category review as it relates to salmon and steelhead information.

**Objective 3:** Inform NOAA funding to support recovery monitoring and align data management funding necessary for status assessments, as well as inform other funding processes, in order to better align all these efforts with BPA funding for data management within the Columbia River Basin.

> **Product:** Comprehensive framework that links data management efforts within the agencies and tribes and with data consumers across the Columbia River Basin, in order to support comprehensive and transparent data sharing for reporting salmon and steelhead information.

**Objective 4, Long-term:** Realize a sustained flow of high quality abundance and productivity data in order to efficiently generate reliable and transparent salmon and steelhead population indicators.

> **Product:** A data exchange network for salmon and steelhead metric and indicator data for the Columbia River Basin.

## Guiding Principles and Assumptions

In order to achieve the goal of improved management decisions based on improved sharing of information, the agencies and tribes will:

1) Support local control and management of key primary data, while ensuring consistency with basin-wide assessment and reporting needs,
2) Exchange indicators and agreed-upon supporting metrics in a common format regardless of original format or coding, and regardless of sampling methodologies,
3) Prioritize timely sharing of the data necessary to support basin-wide assessments and reporting,

4) Provide enough information about the data to support understanding and replication of the derivation of indicators for secondary applications and assessment needs, and
5) Develop enterprise database systems which store data across projects on behalf of the entire agency or tribe and with the ability to automate internal data flow, which will increase speed and efficiency of external data sharing and reduce individual work load.

*Data management is key for M&E*

Data management is an often overlooked component of monitoring and evaluation and adaptive management. Evaluations cannot occur without an explicit effort to accumulate appropriate information to support analysis and decision making. For this reason agencies and tribes have a fundamental need for investment in data management and improved data sharing,

This Strategy endorses the guidelines described in a StreamNet white paper titled 'Considerations for Regional Data Collection, Sharing and Exchange' (Appendix B) as part of a comprehensive approach to data management and data sharing:

1. Standardize sampling to the degree possible,
2. Agree to a common set of data management guidance documents,
3. Automate data capture and management, to the degree possible,
4. Use common coding and formatting and describe in a data dictionary,
5. Describe data so that others can understand and use them,
6. Publish the metadata,
7. Assure control over data quality,
8. Prepare a data management plan,
9. Prepare a data analysis plan,
10. Plan to share data,
11. Establish data sharing priorities and policies.

*Effective data sharing involves the entire data stream*

Data sharing involves actions at all levels of data management including: data capture by field biologists, consolidation and management of data within projects and agencies, policy decisions on what data to share and how to share it, and support from funding agencies that require data for project and program reporting.

*Data management and sharing requires diverse funding sources*

Funding for data management and sharing is provided from numerous sources. The desire is to use internal data management funding as efficiently as possible and use external funding as a catalyst to improve data management that supports data sharing for regional demands for information. The intent is also to create a common basin-wide approach to data management and sharing that will inform both internal and external funding to the agencies and tribes, and will support the data needs of the funding agents.

In order to prioritize funding from external sources, the data consumers need to clearly identify the measurements, metrics, or indicators they need at a basin-wide or regional scale.

## Measurements, Metrics, and Indicators

Definitions are important and this Strategy relies on the following definitions for data available at www.monitoringmethods.org.

Measurement - A value resulting from a data collection event at a specific site and temporal period. Measurements can be used to produce metrics using a response design. A measurement is the source of the original data value.

Metric - A value resulting from the reduction or processing of measurements taken at a site and temporal unit at one or more times during the study period based on the procedures defined by the response design. Metrics can be used to estimate an indicator using an inference design. Note that a variety of metrics can be derived from original measurements.

Indicator - A value resulting from the data reduction of metrics across sites and temporal periods based on applying the procedures in the inference design. A reported value used to indicate the status, condition, or trend of a resource or ecological process.

# Salmon and Steelhead Data Sharing Landscape in the Columbia River Basin

## Basin Level Data Consumers

There are many basin-wide data consumers who have identified the need for data to support high level indicators for salmon and steelhead. Implementation of this Strategy will eventually lead to the routine reporting of data to support abundance and productivity indicators by the following entities, and by future reporting groups that may not be identified here. This partial list of data consumers and their reporting needs emphasizes the importance of building the necessary local infrastructure to support reporting of abundance and productivity data.

### *Northwest Power and Conservation Council (NPCC)*

The NPCC is developing a Monitoring, Evaluation, Research and Reporting Plan (MERR), in draft version currently, that will guide their reporting activities including tracking of the status and trends of priority species. The NPCC also annually reports on high level indicators including abundance and return rates of ESA listed salmon and steelhead in the Columbia River Basin. See: http://www.nwcouncil.org/fw/merr/ and http://www.nwcouncil.org/fw/program/hli/2009_10.htm.

### *NOAA Fisheries*

Beginning in 2010, NOAA is conducting 5-year reviews of ESA-listed salmon and steelhead. The Salmonid Population Summary (SPS) database is the primary repository of data for these analyses. In addition,

NOAA would like to have adult abundance and percent natural origin spawner data for all populations on an annual basis. See http://www.nwr.noaa.gov/Salmon-Recovery-Planning/upload/RME-Guidance.pdf.

### *Federal Columbia River Power System (FCRPS)*

The Columbia River Action Agencies – Bonneville Power Administration, Bureau of Reclamation, and the U.S. Army Corps of Engineers – are required to produce an annual progress report on their implementation and progress toward the Reasonable and Prudent Alternative (RPA) actions described in the 2008 FCRPS Biological Opinion and in the Adaptive Management Implementation Plan (AMIP) developed to implement the RPA's. See https://pcts.nmfs.noaa.gov/pls/pcts-pub/pcts_upload.summary_list_biop?p_id=27149 (the BioOp), http://www.salmonrecovery.gov/Files/BiologicalOpinions/AMIP_09%2010%2009.pdf), (the AMIP), and http://www.cbfish.org/FcrpsBiOp.mvc/index (the RPA's).

Other basin-wide data consumers that require Basin-scale abundance and productivity data are the Columbia Basin Fish and Wildlife Authority (CBFWA) for their annual Status of the Resources Report (SOTR); Washington State's State of the Salmon in Watersheds Report; Washington Salmon Recovery Funding Board reporting; the Lower Snake River Compensation Plan (LSRCP) partners, the Columbia River Fish Accord partners, and the state and tribal fishery co-managers for effective decision making.

## Basin Level Data Management Priorities

The reporting needs described in the previous section can only be made possible with the appropriate data management business practices, infrastructure, and resources that support data sharing. The plans and guidelines developed by the various data consumers emphasize areas that may currently be gaps in effective data management and sharing. Following are some specific considerations identified by data consumers:

The NPCC's MERR plan states that project data *will be made accessible, in an agreed upon format, and with accompanying metadata*.

NOAA makes specific recommendations to support data management and sharing in their 'Guidance for Monitoring Recovery of Pacific Northwest Salmon & Steelhead listed under the Federal Endangered Species Act.[7]:'

- *The regional environmental databases should be coordinated such that a common set of metadata and common data dictionaries are used,*
- *The natural resource agencies and tribes should develop automated internal infrastructure to assess and evaluate their data such that all methods and calculations are transparent and repeatable to all interested parties,*
- *All recovery entities should strive to have the elements of the Pacific Coast Salmon Recovery Fund (PCSRF) database dictionary within their databases and/or adequate data mapping to be able to provide data to the database when NOAA is conducting a status review, and*

[7] http://www.nwr.noaa.gov/Salmon-Recovery-Planning/upload/RME-Guidance.pdf

- *The regional salmon recovery partners should build a distributed data system that can communicate between the various agencies and tribes involved in natural resources and report to the public progress in salmon recovery.*

The 2008 FCRPS Biological Opinion contains several RPA's that address data management and sharing priorities. With relationship to data management, RPA 51 states that the Action Agencies *will enhance existing fish populations status monitoring performed by fish management agencies through the following annual collaboration commitments:*

- *Support the coordination, data management, and annual synthesis of fish population metrics through Regional Data Repositories and reports, and*
- *Provide cost-shared funding support and staff participation in regional coordination forums … advance regional standards and coordination for more efficient and robust monitoring and information management.*

RPA 71 states that the Action Agencies *will coordinate RM&E activities with other Federal, State and Tribal agencies on an ongoing annual basis, including, in part:*

- *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.*

RPA 72 states that the Action Agencies *will ensure that the information obtained under the auspices of the FCRPS RM&E Program is archived in appropriate data management systems. Actions include, in part:*

- *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 ….*
- *Contribute funding for data system components that support the information management needs of individual Hydro system, Tributary Habitat, Estuary/Ocean, Harvest, Hatchery, and Predation RM&E. (Initiate in FY2007-2009 Projects)*
- *Participate in Northwest regional coordination and collaboration efforts ….to develop and implement a regional management strategy for water, fish and habitat data*

These guidelines, and others not cited here, contain common themes that set priorities for basin-wide data sharing and without strategic action there will continue to be gaps in effective data sharing. In summary the biggest gaps for data consumers are:

- The need for data accessibility through automated internal infrastructures at the agency and tribal level that can interact in a standardized manner with regional repositories,
- The need for agreed upon data content and formatting (data dictionaries and/or data templates),
- The need for metadata to accompany datasets, and
- The need for coordination of a network of data sharing and the fostering of collaboration and communication through regional forums.

## Salmon and Steelhead Data Collectors

Many federal, state, and tribal programs monitor anadromous salmonids in the Basin. During 2009 federal, state, and tribal fish and wildlife managers collaboratively worked together through a series of sub-regional and regional workshops, collectively referred to as the 2009 Columbia Basin Coordinated Anadromous Monitoring Workshop. A regional workshop was convened by BPA, CBFWA, NOAA and NPCC during October 20-21, 2009 and November 3-5, 2009 in Skamania Washington to develop the coordinated Anadromous Salmonid Monitoring Strategy (ASMS)[8]. The purpose of the Regional Workshop was to reach agreement among participants on an efficient and effective framework and project specific implementation strategy for anadromous salmon and steelhead monitoring to assess (1) Viable Salmonid Population (VSP) criteria, (2) habitat effectiveness and (3) hatchery effectiveness in the Columbia Basin. The agreed-upon framework and strategy addresses the needs of the NPCC's Fish and Wildlife Program, meets the needs of the Federal Columbia River Power System (FCRPS) BiOp (at a minimum), and contributes to the monitoring needs of ESA recovery planning and other regional fisheries management needs. The outcome of this collaboration was the ASMS which was used by the NPCC during their Monitoring and Evaluation Projects Category Review to prioritize and coordinate BPA funded monitoring projects. A quick review of projects recommended for funding that provide data that supports calculation of the three VSP indicators selected for the Coordinated Assessments project identified 40 projects being implemented by 10 fisheries co-managers. The full list of monitoring projects can be viewed at http://www.nwcouncil.org/library/report.asp?docid=286 and includes over 80 projects monitoring salmon and steelhead.

The primary agencies and tribes collecting salmon and steelhead data are listed in the Gaps section of this report.

## Assessment of Gaps and Needs

As part of the Coordinated Assessments Project, the agencies and tribes completed Gaps, Needs, and Priorities assessments in relation to three selected VSP population level indicators for salmon and steelhead in order to develop Individual Data Sharing Strategies. The detailed analysis for each of the agencies and tribes is found in Appendices C through L to this report. The summaries provided here form the basis for data management recommendations on a basinwide scale.

The data sharing gaps identified by the agencies and tribes were very similar across the Basin, regardless of where along the spectrum their data management capabilities fell. Most of the existing data systems were developed to support local, sub-regional (within the agency or tribe) decisions. Although they may be construed as archaic or clunky by the outside observer, they have been adequate to support the appropriate level of decision making within the agency or tribe for which the projects were intended. The gaps arise when the systems are evaluated on the capability to provide data and metadata for higher level analyses and decision support systems. When viewed under this lens, the systems are generally outdated and need significant upgrades. In order to address the regional or basin-wide data sharing needs, the local sub-regional data management infrastructure has to be improved.

[8] See http://www.cbfwa.org/ams/files/Anadromous%20Salmonid%20Monitoring%20SubFramework-July%206%202010.pdf.

## Gaps

The data sharing gaps identified by the agencies and tribes were very similar across the Basin, regardless of where along the spectrum their data management capabilities fell. Most of the existing data systems were developed to support local, sub-regional (within the agency or tribe) decisions. Although they may be construed as archaic or clunky by the outside observer, they have been adequate to support the appropriate level of decision making within the agency or tribe for which the projects were intended. The gaps arise when the systems are evaluated on the capability to provide data and metadata for higher level analyses and decision support systems. When viewed under this lens, the systems are generally outdated and need significant upgrades. In order to address the regional or basin-wide data sharing needs, the local sub-regional data management infrastructure has to be improved.

Data management systems within the Basin range from data managed on desktop computers according to project level needs, to enterprise data systems that support statewide data bases according to regional standards. Even with this broad range of capabilities, the data management gaps and needs fit into a few specific categories.

Following is a brief description of the data management status and Gaps identified for each agency and tribe:

**Columbia River Inter-Tribal Fish Commission (CRITFC):**
CRITFC currently manages and provides some data to its member tribes. They have a backlog of field data to summarize which can support calculation of indicators. This legacy data needs to be entered into new databases to make it useful for regional analyses. CRITFC lacks the programmer time necessary to develop the requested tribal data management applications for its member tribes. They also need a web manager to publish the data that is available to the Internet.

**Colville Confederated Tribes (CCT):**
The CCT currently has a data management plan and is implementing it through their Okanogan Basin Monitoring and Evaluation Program (OBMEP, BPA Project Number 200302200). The CCT does not have a dedicated staff person to coordinated data management external to the tribe. As the CCT continues to build their data system, they are looking for regional guidance on data dictionaries, metadata guidance, basin-wide data priorities, etc. They have secured ½ FTE to address data management and sharing needs through a data steward, but require the other ½ FTE to fund the position.

**Confederated Tribes of the Umatilla Indian Reservation (CTUIR):**
The CTUIR have a comprehensive data management policy in place and are developing an enterprise data system for the fisheries department. The CTUIR are using tasks within BPA monitoring project(s) to cobble together funding for a fisheries data coordinator to implement their data management plan. The CTUIR are working on standardizing data collection and reporting protocols to better facilitate data sharing within the tribe.

**Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO):**
Within the CTWSRO data is currently managed by project leaders to support individual projects within the tribe. Although CRITIFC is providing some level of data management support, the CTWSRO lacks an

agency-wide data management plan that addresses the priorities identified by the Coordinated Assessments Project. The CTWSRO is in the early stages of developing a centralized database for storage and retrieval of fisheries data, but would benefit from an overall data management assessment and planning effort to define a comprehensive roadmap for their development of data management systems.

**Idaho Department of Fish and Game (IDFG):**
IDFG has an enterprise data system that contains much of the metric data necessary to calculate the three indicators (Idaho Fish and Wildlife Information System, IFWIS); however, IDFG does not currently calculate these indicators at this scale on a routine basis and does not include these indicators in the IFWIS portal. IDFG does not have adequate staff to coordinate internally among biologists collecting the data, and externally with regional entities.

**Nez Perce Tribe (NPT):**
The NPT is building internal data management capacity as funds are made available. They have completed a comprehensive data management plan that they are incrementally implementing as funds become available. The NPT currently relies on the IFWIS portal to manage some of their data but desire to manage and maintain data collected by the tribe on tribal systems. The NPT DFRM staff is currently limited to one FTE associated with LSRCP funding.

**Oregon Department of Fish and Wildlife (ODFW):**
ODFW has recently developed the Salmon Recovery Tracker (www.odfwrecoverytracker.org) for sharing population level data; however, only data for Oregon Coast Coho ESU populations are currently available. ODFW's current data sharing capabilities are overly complex, inefficient, and non-standardized. Data is primarily stored in local computers and individual data systems. ODFW has a plan to systematically enter data into the Salmon Recovery Tracker tool, as funds become available, and is currently requesting temporary reprioritization of StreamNet funds for development of systems to organize data and feed them to StreamNet and the Salmon Recovery Tracker. Initial efforts are starting with populations in the lower- and mid- Columbia River and working upstream.

**Shoshone-Bannock Tribe (SBT):**
Within SBT, data is currently managed by project leaders to support individual decision processes within the Tribe. The SBT contributes and relies somewhat on the IFWIS portals to manage some of their data. The SBT lacks an agency-wide data management plan and data back-up strategy. The SBT collects and stores much of the data necessary to calculate the indicators, but only currently performs the analyses for certain Tribal programs.

**Washington Department of Fish and Wildlife (WDFW):**
WDFW manages their population data at a different scale than the TRT defined populations through the SaSI Database. For many populations, WDFW has sufficient data but lacks staff necessary to calculate the indicators. WDFW has corporate data bases for some of the elements used for calculating the indicators, but several elements require development and maintenance of new data bases. WDFW envisions sharing the elements necessary to support calculation of the VSP Indicators through automated data sharing tools such as exchange templates, web services, etc.

**Yakama Nation (YN):**
The YN has data managers for the Yakima and Klickitat Basins and has made a lot of progress toward the development of an "enterprise data system" which includes automated data capture, a substantial

compilation of data for all species in both subbasins, and a report detailing calculation and monitoring indicators for Yakima spring Chinook. The YN lacks dedicated IT support and funding necessary to expand existing hardware and software infrastructure into a comprehensive, integrated agency-wide enterprise data system. The YN is looking for regional guidance on data dictionaries, metadata guidance, basin-wide data priorities, etc.

## Needs

Currently the agencies and tribes generally do not directly calculate VSP indicators used for NOAA status assessments. Several agencies expressed an interest in prioritizing that activity in order to provide NOAA Fisheries the derived indicators, while other agencies and tribes are content to provide NOAA Fisheries the metric data and metadata necessary to allow those calculations to be performed at NOAA. Re-alignment of staff to perform the analyses necessary to generate the indicators that are relevant at the basin-wide scale will take time. The agencies and tribes will need to invest in staff to perform the calculations and report high level indicators within their management authority where appropriate. Funding will come from internal realignment of personnel, existing BPA funding within monitoring projects or from NOAA Fisheries where appropriate. It is important to note, indicators are generated from the same metric level data for different areas of inference; therefore, exchanging indicator information will require some level of metric level data exchange, as well.

The needs or funding opportunities within the agencies and tribes to improve data management and sharing fell generally within six categories (Table 1):

1) *Data Management Assessments and Planning Support*

Several entities currently manage their salmon and steelhead data on essentially a project by project basis. While some of their data are entered into enterprise data systems, or into their own developing systems, or some summarized field data are available through StreamNet, access to the data often requires contacting the project leader and/or accessing annual reports. Several of the tribes would benefit from having a professional consultant assist them with performing an overall data management assessment and develop a long term plan for managing and sharing their salmon and steelhead data consistent with regional guidance and needs. *This is a task that could be completed with FY2012 BPA funding from the Regional Data Management Support and Coordination project. Discussion of this work is ongoing in the PNAMP Data Management Leadership Team and will likely be implemented through the StreamNet or CRITFC Tribal Data Network projects within the next fiscal year.*

2) *Updated Data Management Policies*

Several of the agencies and tribes referenced the need to update their existing data management systems with current data dictionaries, metadata standards, and other regional guidance information that is now available. While funding is not necessarily needed to implement new policies within the agencies or tribes, this effort could be considered a “cost-share” by the agencies and tribes as they adjust their data management systems to address a more clearly defined need by regional data consumers. The costs for implementing new policies is expressed in the need for better regional coordination and in the hardware, software, and IT personnel necessary to make needed changes to adapt their systems to regional needs.

*3) Hardware and Software Infrastructure*

The agencies and tribes require hardware and software infrastructure in order to support reliable data management systems. Most of the systems in place are adequate to support the local and project level decision making that is required by the agencies and tribes. To support basin-wide data needs, in a timely manner, this infrastructure will have to be updated and improved in order to automatically feed enterprise data systems. Automation will reduce compilation errors, provide more standardized data entry and formats, improve and facilitate metadata documentation and use, and provide reliability and accessibility for measurement and metric level data needed for calculation of indicators. For this reason, it may be appropriate for basin-wide data consumers to help fund infrastructure improvements within the agencies and tribes in order to satisfy data access requirements for meeting report obligations.

*4) IT Support (programmer, web manager, etc.)*

Many of the agencies and tribes rely on project level staff to support data management needs for their data, in addition to their normal duties. In order to move some of the agencies and tribes towards modern integrated enterprise data systems, some level of IT support will be required. This activity is different from a data coordinator in that special programming skills are required. IT support will help with standardization, integration, and construction of the additional infrastructure necessary to integrate the agency or tribal data systems.

*5) Data Coordinator (internal and external coordination)*

Effective data management requires data professionals that can bridge the gap between the biologists and the technical side of data management. Hiring data coordinators will ensure that data content priorities are set by the biologists in a way to guide the data technicians to be most efficient and effective in managing data bases. The provision of temporary data coordinators through the Coordinated Assessments Project helped the agencies and tribes realize the value of having a data coordinator to help guide IT development and interactions with biologists. This is a likely role for BPA funding as this requires flexibility in job specifications and the ability to operate across various projects or regional offices. These professionals should support internal data coordination and infrastructure development and coordinate externally to ensure basin-wide data sharing needs and requirements are met. This activity is currently provided through the StreamNet project for specific types of data with good success, but may have to be refocused to support salmon and steelhead indicator data.

*6) Coordination Forums for Standardized Protocols*

The Coordinated Assessments Project relied on two levels of coordination to be successful – coordination with lead field biologists and coordination with agency and tribal data managers. It is proposed that two forums be formed to help continue this coordination.

A Science/Content Forum to specify the content priorities for basin-wide data sharing and to coordinate between basin-wide level data consumers and field level data collectors. The Science/Content Forum would establish the content to be shared through development of a basin-wide Data Exchange

Templates in order to specify what information is needed and on what schedule. This forum could also oversee the contents of a central database for facilitating basin-wide data sharing. Once the forum is established, meeting on a quarterly basis will probably be adequate.

A Technical Forum would also be necessary to define data management mechanisms and formats to support data sharing. Membership in this forum would largely be data professionals; however, in many instances attendance at both this forum and at the Science/Content Forum by the data coordinators would be encouraged to ensure overlap between the two groups. This forum would facilitate discussion between data providers to agree on data exchange template implementation standards and methodologies. This forum would oversee the development of tools to facilitate basin-wide data exchange and could begin by building an interim centralized data base which would serve as the demonstration tool for building a more comprehensive data exchange network into the future.

Coordination needs to continue for developing common data collection methods and investigating better and improved sampling methods and data capture. Efforts should continue through existing forums to conduct research and development on tools and methodologies that can be tested on a pilot scale prior to implementation across the Basin.

Table 1. Summary needs by agency and tribe for sharing three abundance and productivity indicators for salmon and steelhead.

| Agency/Tribe | 1) Data Management Assessments and Planning Support | 2) Updated Data Management Policies | 3) Hardware and Software Infrastructure | 4) IT Support (programmer, web manager, etc.) | 5) Data Coordinator (internal and external coordination) | 6) Coordination Forums for Standardized Protocols |
|---|---|---|---|---|---|---|
| Columbia River Inter-Tribal Fish Commission (CRITFC) | | | X | X | X | X |
| Colville Confederated Tribes (CCT) | | | | | X | X |
| Confederated Tribes of the Umatilla Indian Reservation (CTUIR) | | | | | X | X |
| Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) | X | X | X | X | X | X |
| Idaho Department of Fish and Game (IDFG) | | X | | | | X |
| Nez Perce Tribe (NPT) | | | X | X | X | X |
| Oregon Department of Fish and Wildlife (ODFW) | | X | X | X | X | X |
| Shoshone-Bannock Tribe (SBT) | X | X | X | X | X | X |
| Washington Department of Fish and Wildlife (WDFW) | | X | X | X | X | X |
| Yakama Nation (YN) | | X | X | X | X | X |

# Recommendations

With the completion of the Skamania workshops and the development of the Anadromous Salmonid Monitoring Strategy (ASMS), the agencies and tribes of the Columbia River agreed to data collection in support of regional decision making. While the target indicators are not calculated consistently across the Basin, salmon and steelhead data are being collected and metrics supporting the indicators are calculated on a regular basis. An important step in the collection of these data and calculation of metrics is making them available to those who need them to perform additional calculations and analyses for regional applications such as calculation of VSP indicators or other high level indicators.

While this Strategy's primary intention is to build an approach that can access many funding sources, the NPCC's Data Management Category Review of BPA funded data management projects is currently underway. The objective of the data management review is to improve the value of the raw and derived data that is collected, maintained, and analyzed under the Program to evaluate program effectiveness and also improve the interconnectivity, usability, accessibility, and dissemination of that data for the region. The category review will focus on existing projects and will entertain proposals for restructuring or expansion to fill gaps. Therefore, some specific recommendations for BPA funding are contained in this Strategy and explicitly in Table 2.

The following recommendations should move the co-managers and their partners towards improved data sharing to support local and regional decision making.

A) **Invest in Internal Infrastructure.** Efficient internal data sharing is the foundation for the capability to share data externally. The agencies and tribes should prioritize and adopt data management business practices that support internal data sharing and they should invest in data management infrastructure to manage measurement-, metric- and indicator-level data in a consistent, transparent and uniform manner. Key to this infrastructure is the planning and development of enterprise data systems that manage data on behalf of the entire agency or tribe rather than on a project by project basis. Building agency-wide data bases will help establish internal standardized data sharing protocols. Funding will likely come from internal prioritization of agency and tribal investments (cost share), use of hardware replacement/upgrade budgets to build toward systems, existing monitoring projects that rely on data support from the agencies and tribes (realignment of existing project level funds), or other appropriate sources to purchase hardware and software necessary to meet the demand for the data. This may be an important area of investment for NOAA Fisheries as a driver for improved infrastructure is to provide the agencies and tribes with the capability to provide necessary data for basin-wide assessments of list anadromous fish.

B) **Create Data Coordinator Positions.** Invest in data professionals placed within the agencies and tribes who can bridge the gap between biologists and the technical side of data management. This will ensure that data content priorities are set by the biologists in a way to guide the data technicians to be most efficient and effective in managing data bases. Provision of temporary data coordinators through the Coordinated Assessments project helped the agencies and tribes realize the value of having a data coordinator to help guide IT development and interactions with biologists. This is a likely role for BPA funding as this requires flexibility in job specifications and the ability to operate among various projects or regional offices. These professionals should

support internal data coordination and infrastructure development and coordinate externally to ensure basin-wide data sharing needs are met. This work has been successfully implemented through the StreamNet project in the past, but may need to be expanded, in collaboration with the CRITIFC Tribal Data Network project, to support all of the agencies and tribes. See Table 2 for specific BPA project funding recommendations.

**C) Establish Coordination Forums.** BPA, NOAA, and/or NPCC should support two interacting governance groups, in collaboration with fishery co-managers, to provide guidance for basin-wide data coordination:

Science/Content Forum to specify the content priorities for basin-wide data sharing (NEW):

- Coordination between basin-wide level data consumers and data collectors
- Establish content to be shared through development of a basin-wide data exchange templates – what information is needed, in what format, and on what schedule
- Link central database to basin-wide reporting
- Forum funded by BPA, quarterly meetings would likely be sufficient after initial efforts (See Table 2)
- Participation would include former TRT Members and equivalent level biologists from each of the agencies and tribes and their designated basin-wide data professionals
- Ensure participation by NOAA Salmon Population Summary database staff
- A sub-committee will be required in the beginning to develop the working draft of the DET, which will require extensive effort for several months

Technical Forum to define necessary data transfer mechanisms and formats to support data sharing (EXISTING through StreamNet, but needs expansion):

- Coordination between data providers to agree on data exchange format implementation standards and methodologies
- Develop a dictionary of technical terms to unify terminology
- Oversee the development of tools to facilitate basin-wide data exchange and could begin by building an interim centralized data base which would serve as the demonstration tool for building a more comprehensive data exchange network into the future
- Link to existing data bases
- Forum funded by BPA, likely through coordination funding (See StreamNet and CRITFC Tribal Data Network in Table 2)

The focus of these groups will be to improve communication between the agencies and tribes and the basin-wide data consumers (link to reporting) and to ensure reporting needs are met in the most cost effective and efficient means possible.

In the long-term, an exchange network approach is envisioned, where data can be directly requested and accessed from individual partners as needed. In the interim, however, establishment of a common database into which data (via a Data Exchange Template) is entered is likely to be the most practical way of achieving the goals of the coordinated assessments effort.

**D) Fund R&D.** Support a research and development forum for investigating new methodologies and exploring alternative strategies for supporting basin-wide data sharing. This work has been conducted through the PNAMP Data Management Leadership Team and continues to help

develop and evaluate tools for improving data sharing. Examples include the development and support of the ISTM project, Metadata Guidance, Monitoring Methods.org, etc. This forum operates at a level above the Columbia River Basin and links activities within the Basin to a larger network of data management groups. See PNAMP in Table 2.

Table 2. BPA funded data management projects and suggested modifications for FY13-15 funding cycle.

| Number | Title | Proponent Orgs | FY 13-15 Comments | Biop Action |
|---|---|---|---|---|
| 1988-108-04 | StreamNet - Coordinated Information System (CIS)/ Northwest Environmental Database (NED) | Pacific States Marine Fisheries Commission (PSMFC) | Shift focus from facilitating data compilation within State data bases, to supporting development of corporate databases within the states that support direct data entry and eliminates the need for data compilers for anadromous and resident fish data bases (could take a couple years to complete transition).<br><br>Facilitate communication between state and tribal data bases to ensure consistent data exchange formats and efficient data sharing (Technical Coordination Forum).<br><br>Add 1-2 FTE to support participation and data management for SBT and CCT.<br><br>Manage interim central data base for high level indicators for salmon and steelhead. | RPA 51 Collaboration Regarding Fish Population Status Monitoring, RPA 71 Coordination, RPA 72 Data Management |
| 1996-019-00 | Data Access in Real Time (DART) | University of Washington | Ensure consistency with DETs for appropriate data sharing. This project will likely benefit from the basin-wide data sharing strategy, as a second tier database, but will not necessarily be a major driver in developing the DET or facilitating data exchange. | RPA 72 Data Management |
| 2003-072-00 | Habitat and Biodiversity Information System for Columbia River Basin | Northwest Habitat Institute | See Draft Wildlife Monitoring Strategy | RPA 71 Coordination |

| Number | Title | Proponent Orgs | FY 13-15 Comments | Biop Action |
|---|---|---|---|---|
| 2008-505-00 | StreamNet Library | Columbia River Inter-Tribal Fish Commission (CRITFC) | Continue operations consistent with Accords. | RPA 51 Collaboration Regarding Fish Population Status Monitoring, RPA 71 Coordination, RPA 72 Data Management |
| 2008-507-00 | Tribal Data Network | Columbia River Inter-Tribal Fish Commission (CRITFC) | Participate at the science and technical forums for guiding the next phases of Coordinated Assessments project.<br><br>Provide a liaison to the member tribes' for helping coordinate their biologist/IT interface where they need help (this will require 2 additional FTE).<br><br>Support an IT team that can help write software and provide infrastructure support for helping the tribes with obstacles to housing and sharing their data from tribal databases (creation of metric level data bases, data entry tools, data extraction software, web services, etc.<br><br>Create and maintain mainstem and ocean metric level data bases. | RPA 51 Collaboration Regarding Fish Population Status Monitoring, RPA 71 Coordination, RPA 72 Data Management |
| NEW? | Regional Coordination Facilitation Services | Unknown | Facilitate Science Coordination Forum for guiding data management for sharing high level indicators with fishery co-managers, BPA and NPCC participation (1 FTE).<br><br>Host and maintain basin-wide report for salmon and steelhead high level indicators to support NOAA, BPA and NPCC reporting needs (1 FTE).<br><br>Resident Fish, Wildlife, Lamprey, etc. | |

| Number | Title | Proponent Orgs | FY 13-15 Comments | Biop Action |
|---|---|---|---|---|
| 2004-002-00 | Pacific Northwest Aquatic Monitoring Program (PNAMP) Coordination | US Geological Survey (USGS) | Facilitate PNW regional forum for data sharing (Data Management Leadership Team).<br><br>Facilitate development of tools and pilot projects for data management and sharing (R&D for data management and sharing with cost share from appropriate entities).<br><br>State management agencies and tribes will continue to require coordination funding to maintain their capacity to participate. | RPA 51 Collaboration Regarding Fish Population Status Monitoring, RPA 56 Monitor and Evaluate Tributary Habitat Conditions and Limiting Factors, RPA 57 Evaluate the Effectiveness of Tributary Habitat Actions, RPA 59 Monitor and Evaluate Migration Characteristics and Estuary/Ocean Conditions, RPA 71 Coordination, RPA 72 Data Management |

## Phase III Work Plan

In the transition to the coordination forums identified above, BPA, NPCC and NOAAF should continue to support the existing Coordinated Assessments project to bridge the gap between the current efforts and the start-up of the two coordination forums identified above. In the interim, coordination through the PNAMP/CBFWA/StreamNet forums will continue the progress made in regional data sharing through the development of a Phase III work plan for implementation in FY2012 including:

- Coordinate the DET development team (foundation for Science/Content Forum)
- Begin development of centralized database for indicators (StreamNet)
- Workshops to continue facilitation of Coordinated Assessments
- Initiate agency/tribal data management system assessments where needed (FY2012 Funding)
- Monitoring locator and metadata builder tools (PNAMP)
- Data entry and documentation tool development (PNAMP)
- Coordinate with the Salmon Population Naming Cross-walk and Mapping project (CRITFC Project)
- Collaborate with the Habitat Data Sharing project (PNAMP)

# Appendices