StreamNet 2014

Annual Report

BPA Project # 1988-108-04

Report covers work performed under BPA contracts 63021 & 66435

Report was completed under BPA contract 66435

1/1/2014 - 12/31/2014

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Report Created 03-2015

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

This report should be cited as follows: StreamNet 2014, 1/1/2014 - 12/31/2014 Annual Report, 1988-108-04

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1. Executive Summary

The Pacific States Marine Fisheries Commission (PSMFC) hosts StreamNet, which provides access to regional fish data by maintaining a coordinated, standardized, web-based distributed information network. The need for regionally coordinated and readily accessible data has been identified by the Northwest Power and Conservation Council (NPCC), the Bonneville Power Administration (BPA), and the National Oceanic and Atmospheric Administration Fisheries Program (NOAA). StreamNet works cooperatively with the agencies that create the data through StreamNet supported technical staff inside these agencies and by leading or coordinating a number of initiatives to aid in assuring a regional approach to data management.

During 2014 StreamNet continued to help lead implementation of the Coordinated Assessments (CA) project. Accomplishments included completion of the initial pilot effort and development of Data Exchange Standards (DES). In 2014 updates to standard data types were again largely put on hold in order to focus on the CA project. However, the new SOW implemented October 1, 2014 anticipates some updates to standard data if the CA project remains on track. CA focuses on the key indicators and metrics that have been identified as priorities for reporting progress on implementation of the FCRPS Biological Opinion (BiOp). During the year new funding was sought for the CA project; a $500,000 grant from the EPA to StreamNet subcontractor WDFW was received in 2014, and a second application for a new round of EPA funding was also submitted.

Staff at PSMFC and subcontracting agencies also provided leadership in other projects in 2014, including implementation of a BPA initiative to ensure that data were protected in secure data repositories. StreamNet made revisions to the Data Store to make it more accessible as a "Repository of Last Resort" for any BPA projects without identified repositories that were identified in the 2013 Database Backup Assessment and Inventory. Staff also provided leadership and support for a successful workshop on hand held technology for fish data projects in collaboration with PNAMP and Sitka Technologies. This was a direct outgrowth of the Device Trials project which was instituted to test automated data flow and hardware capability in field projects. StreamNet staff also led a database integration workshop involving the BPA-sponsored data management projects located at PSMFC. Improvements were made to multiple systems as a direct result.

The StreamNet subprojects in the state agencies all contributed to development or improvement of agency data storage systems in 2014. Additional resources were allocated to partners at ODFW, IDFG, and WDFW through cost savings made at PSMFC. This was made possible in part through PSMFC assumption of additional BPA contract management, which may also help to further integrate some data functions regionally. In addition to CA, focus continues to be on increasing the speed and efficiency of data conversion to the regional standard StreamNet DES, and then submission to the StreamNet database. The long term goal is to develop the capacity for the agencies to host data in the regional standard and share it via web services and/or to transfer data to StreamNet via web services.

A wide variety of data types were disseminated through the StreamNet website in 2014 (www.streamnet.org). Improvements to the appearance and accessibility of data on the website were made in 2014. Overall use of the site declined slightly, to just over 140,000 pageviews. We provided several data query approaches used to locate, display and download data from the StreamNet main database, including the Integrated Query System (IQS) which integrates both tabular and map based query approaches into a single system. The Data Store online data archive provides access to non-standardized data from any source, and is a data repository identified as a secure location for data storage for projects throughout the region. The StreamNet website was upgraded, with new design and

functionality elements designed to modernize the look and appeal of the site. The goal of the project is to facilitate the flow of data “from the stream to the screen”.

In implementing the CA project, substantial progress was made in 2014. However, during the process of inventorying data repositories, it became clear that improvements may be needed to prioritize identifying repositories for data. The various state and tribal agencies are at significantly different stages in developing the capabilities of their data management infrastructure, so developing a region-wide approach to sharing these indictors will continue to require more time and/or more resources. For purposes of data sharing at the regional level, the significant institutional knowledge of an experienced cadre of biologists that have been assessing fish populations and sharing data for many years may need to be replaced with a more automated and documented system in order to assure continuity of population assessments as these highly experienced biologists begin to retire in the coming years. Projects such as StreamNet could serve a key role, both within agencies and in regional coordination, in assuring that this documentation and the data needed to inform the assessment process is accessible and stable in the future.

2014 was the first year of the project’s Executive Committee. Management and policy level specialists at tribes, states, and federal agencies were recruited to serve on this group. Their primary function is to provide guidance and leadership to the StreamNet project to ensure that data management resources and work efforts are aligned with agency and regional priorities. The initial accomplishments of the group included drafting of a Strategic Plan for StreamNet and establishing FY 2015 priorities for the CA project.

Summary of Recommendations

1. The StreamNet Executive Committee should be used to focus and prioritize the CA Project.
2. The StreamNet Executive Committee should also evaluate and prioritize updating traditional StreamNet data sets to reflect an emphasis on those that add value to ongoing regional O&M efforts.
3. StreamNet should provide accessible and useful displays of information at the regional scale, with special focus on the CA project.
4. While focusing the CA project on high level indicators that support regionally significant monitoring efforts, clear direction and consensus should be used to guide agencies and tribes to submit data that support population level assessments.
5. Where data is needed in support of regional StreamNet should prioritize infrastructure and data management assistance needed to support such indicators.
6. CA methodologies for calculation of high level indicators should be fully documented.
7. StreamNet should continue to play a role in the development and deployment of emerging technologies in fisheries data collection, including purchase and deployment of devices.
8. StreamNet should continue to seek out efficiencies and new sources of revenue in order to fund agency operations that support regional data management priorities.
9. BPA should fund Data Steward positions in support of Upper Columbia and Snake River biologists in order to ensure data flow to the CA project.

2. Introduction

The majority of fish-related data originate with the region's state, tribal and federal fisheries agency sampling programs. These data are generally used internally, and may be difficult to access across organizational boundaries. The need for regionally coordinated, securely stored, and readily accessible data has been identified by the Northwest Power and Conservation Council (NPCC), the Bonneville Power Administration (BPA), and the National Oceanic and Atmospheric Administration Fisheries Program (NOAA). StreamNet supports a regional approach to data management, coordination, and standardization. We work cooperatively with the agencies that create the data (Figure 3) by supporting technical staff inside these agencies to help manage, standardize, and georeference the data to the regional stream network (hydrography). These data are used internally by each agency and also submitted to a central database at Pacific States Marine Fisheries Commission (PSMFC). StreamNet provides access to these data by maintaining a coordinated, standardized, web-based distributed information network. At StreamNet data collected by partners are stored and made publicly available through the StreamNet website.

www.streamnet.org

Figure 1. StreamNet Website Infographic

Primary Focal Species: Chinook - Deschutes River Summer/Fall ESU, Chinook - Lower Columbia River ESU (threatened), Chinook - Mid-Columbia River Spring ESU, Chinook - Snake River Fall ESU (threatened), Chinook - Snake River Spring/Summer , Chinook - Snake River Spring/Summer ESU (threatened), Chinook - Upper Columbia River Spring ESU (endangered), Chinook - Upper Columbia River Summer/Fall ESU, Chinook - Upper Willamette River ESU (threatened), Chum - Columbia River ESU (threatened), Coho - Lower Columbia River ESU (threatened), Cutthroat Trout, Coastal - Southwest Washington/Columbia River ESU, Cutthroat Trout, Coastal - Upper Willamette River ESU, Cutthroat Trout, Westslope , Cutthroat Trout, Yellowstone , Kokanee , Sockeye - Deschutes Subbasin, Sockeye - Lake Wenatchee ESU, Sockeye - Okanogan River ESU, Sockeye - Other, Sockeye - Snake River ESU (endangered), Steelhead - Lower Columbia River DPS (threatened), Steelhead - Middle Columbia River DPS (threatened), Steelhead - Snake River DPS (threatened), Steelhead - Upper Columbia River DPS (threatened), Steelhead - Upper Willamette River DPS (threatened), Trout, Bull (threatened), Trout, Interior Redband , Trout, Rainbow, Whitefish, Mountain

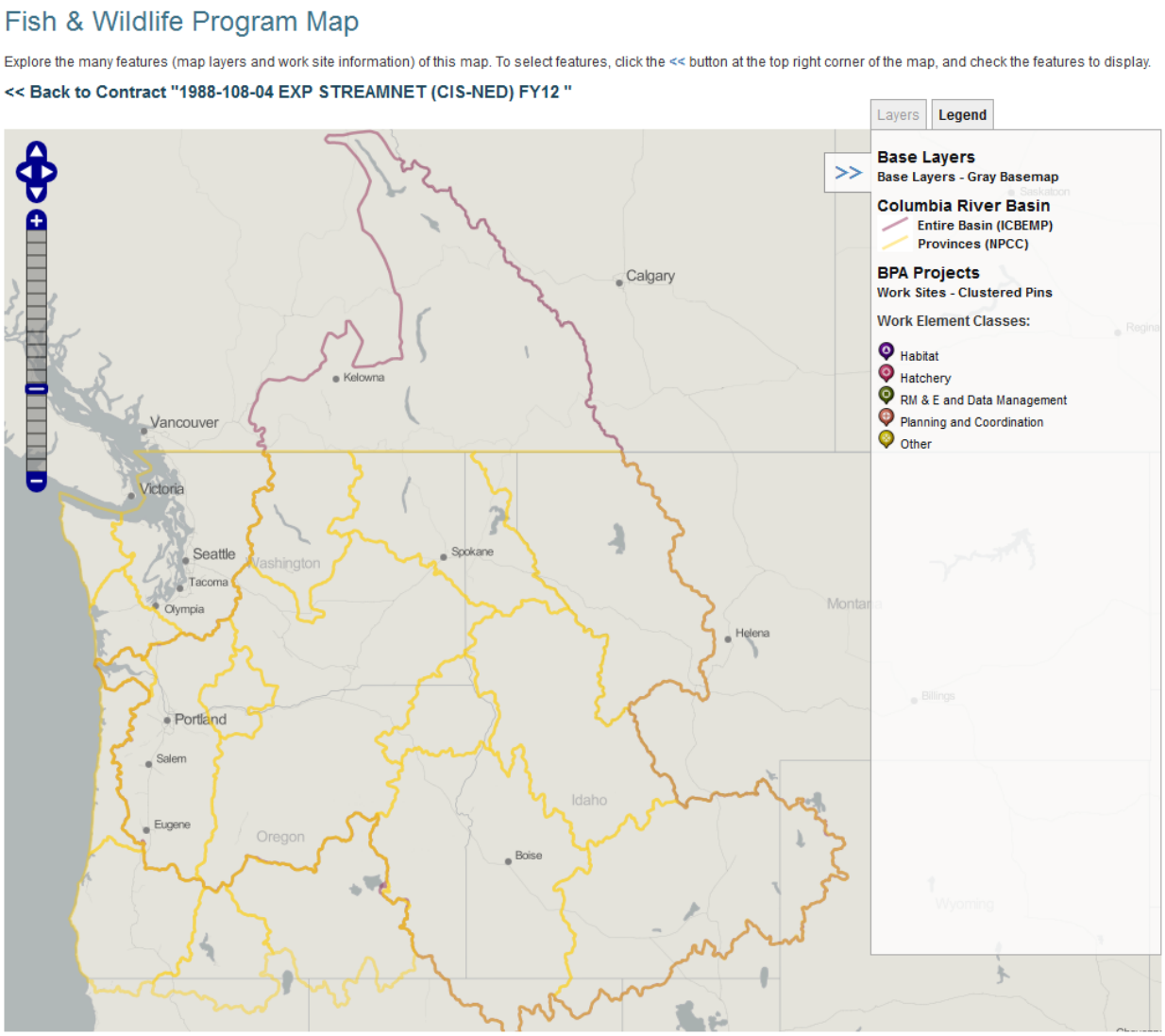

Figure 2. StreamNet Project Area: Columbia Basin

Project Map: *http://www.cbfish.org/Project.mvc/Map/1988-108-04*

Contract Map(s): *http://www.cbfish.org/Contract.mvc/Map/60412*

This project supports the 2014 Northwest Power and Conservation Council Fish and Wildlife Program. Specifically:

Reporting on the program's approved high-level indicator categories and fish and wildlife indicators (page 101).

Data management Principles (page 104);

- Public accessibility, search-ability, and usability of data are important. All monitoring and research data collected under the program must be readily accessible in regionally consistent formats to all interested parties in a timely manner, and these should be preserved beyond the longevity of a project.
- Program reporting relies on coordinated data sharing that is facilitated using regional data systems that provide access to data from federal and state agencies and tribes, and other data gathering entities in the Columbia Basin.
- Refinement of coordinated data management systems should be guided by program evaluation and reporting needs.
- Collaboration among agencies, tribes, and other monitoring entities in the Basin is essential to prioritize regional data coordination efforts to support program indicators and objectives, and this prioritization should be informed by the goals and objectives identification and refinement process and program guidance.
- The region should work collaboratively through established forums to continue to refine metrics, methods, and indicators which can be used consistently to evaluate and report on program progress, focal species, and their habitats.

General measures (page 105);

- Bonneville should ensure that data associated with broad categories of information (fish abundance, productivity, genetic diversity, geographic distribution, habitat conditions) are identified and accessible from a single, centralized website. Data users should be able to find references, data descriptions, and links to all the data collected in the program on fish abundance in such a website.
- Bonneville should ensure that all information about anadromous fish is summarized by specific life-cycle stages and made accessible from a single gateway location.
- Bonneville should contract for complete data products (e.g., annual population estimates for adult and juvenile spring Chinook in the Entiat) and not only collaborative processes and preliminary data collection (e.g., redd counts or weir counts of fish). And when Bonneville pays for the development of standards or protocols the contracts should include a viable strategy for adoption.

StreamNet serves as a regional coordination body to support data management and facilitate cooperation across organizational boundaries. StreamNet staff are involved in standardization and coordination efforts on a wide variety of data management issues. We work closely with states, tribes, agencies, and with organizations such as the NPCC, Columbia River Intertribal Fish Commission (CRITFC), and the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) to ensure that the infrastructure of data management can communicate, share, and interpret data effectively across boundaries. The StreamNet project supports coordination through establishing and implementing basin-wide data reporting standards for a specific suite of fish related measures, including abundance, distribution, and productivity, with a long term goal of extending coverage to additional metrics of regional importance.

Figure 3. Formal partners and agencies participating in the StreamNet project.

In recent years there has been a regional initiative to streamline and coordinate RM&E work due to the complexity, scale, and cost of these efforts. Direction from the NPCC, the BPA Data Management Strategy, and the PNAMP RM&E Strategy Implementation Road Map led StreamNet to concentrate on coordination and efficiencies as our priority in 2014. The goal is to make information collected in the Columbia Basin standardized and accessible, in order to inform management questions and strategies. StreamNet can serve an important function in this effort both by building and maintaining data management infrastructure and by coordinating data management to foster effective data transfer across structural lines. The primary focus of StreamNet staff in 2014 has continued to be implementation of the Coordinated Assessments project, a regional cooperative effort to standardize and automate data reporting on key indicators for salmon and steelhead populations. Due to this focus, regular updates of more traditional trend data in StreamNet has been largely deferred for the last two years.

Data standardization and sharing are accomplished by StreamNet data specialists within the agencies. These data specialists locate and acquire data, convert them to standard (DES) format, perform QA/QC, add georeferencing to tie the data to the stream network (hydrography), assist with development and utilization of database systems within agencies, and then transmit the data to the central StreamNet database at PSMFC for inter-agency and public dissemination. It should be stressed that StreamNet and BPA funding provided to agencies and tribes through StreamNet supports data management infrastructure and public accessibility of data through many portals in addition to the StreamNet database. Following is a list of some of the data resources supported (at least in part) via StreamNet;

The **Okanogan Basin Monitoring and Evaluation Program (OBMEP)** is a monitoring program created in 2004 that collects long-term data on summer steelhead and spring Chinook salmon in the Okanogan River Basin. OBMEP is a program within the Confederated Colville Tribes' Fish and Wildlife Department

and is funded primarily by BPA through the Columbia Basin Fish Accords.

Follow Idaho Salmon Home (FISH) provides access through IDFG to information on Idaho's wild and hatchery steelhead and Chinook salmon populations. If you've ever wondered how many Steelhead came back last year, how old those fish were or simply how the wild salmon run from 2012 compared to previous years this is the place for you. We've also got distribution maps, juvenile abundance, and age data.

The **Idaho Fish and Wildlife Information System (IFWIS)** is IDFG's comprehensive information system for standardizing data on fish, wildlife, and plants in Idaho. Discover what we offer by browsing our Fisheries, Wildlife, Species Diversity, Lands and GIS resources. View our IFWIS applications, keep updated on our latest releases by following the IFWIS Blog, or learn more about IFWIS.

The **Montana Fisheries Information System (MFISH)** is a database containing information on fish species distribution, supporting data for distribution, and information related to the management of aquatic resources in Montana. The database is managed and maintained by the Data Services Bureau (DS) of Montana Fish, Wildlife, and Parks (FWP). Data is continually updated and sources include FWP, US Forest Service (USFS), US Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM) and tribal fisheries biologists and supplemented with information provided in technical documents and reports.

The **Crucial Areas Assessment** evaluated the fish, wildlife and recreational resources of Montana in order to identify crucial areas and fish and wildlife corridors. The Assessment is part of a larger conservation effort that recognizes the importance of landscape scale management of species and habitats by fish and wildlife agencies. The Web-based Crucial Areas Planning System (CAPS) mapping service is aimed at future planning for a variety of development and conservation purposes so fish, wildlife, and recreational resources can be considered earlier.

The **Natural Resources Information Management Program (NRIMP)** supports the efforts of ODFW by:

- Identifying and prioritizing natural resource information needs for fish and wildlife management.
- Developing and promoting the use of modern data collection and analysis techniques.
- Promoting the use of technology that will benefit the department's natural resource data collection and management needs.
- Developing and providing consistent, accessible, high-quality information.
- Encouraging the synthesis and transfer of scientific information into management recommendations.
- Developing and promoting a multidisciplinary approach to fish, wildlife, and habitat management.
- NRIMP provides GIS data, maps and reports, data standards and protocols, information on angling opportunities within Oregon, and links to other state agencies.

The ODFW S**almon Recovery Tracker** website provides information on the health of Oregon's anadromous salmon and steelhead populations. Website users can explore and download information related to salmon conservation and recovery in Oregon. The Salmon Recovery Tracker was built to make it easier for the public to explore the health of salmon populations and access critical underlying data. It's a first step in helping the state open its information to the public in an easy-to-use medium.

The ODFW **Data Clearinghouse** stores natural resource information, including reports, data files, databases, GIS files, maps and pictures from natural resource projects; especially those funded by the Oregon Watershed Enhancement Board, from **Oregon Watershed Councils**, and **Oregon Plan** partners.

The goal of the Data Clearinghouse is to make Oregon's natural resource information more accessible and to provide a centralized accumulation and distribution service for Oregon's natural resource data. The increased availability of data provided by the Data Clearinghouse will support the Oregon Plan Assessment process, as well as other resource management efforts.

Compass, the first-of-its-kind online fish and wildlife habitat map charts Oregon's crucial landscapes helps users make informed land use decisions related to fish and wildlife habitats as you plan energy, transportation, conservation and other large projects.

WDFW manages multiple data resources, including **SCoRE**, which provides up-to-date information on populations, and provide context for the efforts WDFW and its partners are taking in the arenas of habitat, hatcheries, and harvest to protect and conserve salmon and steelhead in Washington.

SalmonScape delivers the science that helps recovery planners identify and prioritize the restoration and protection activities that offer the greatest benefit to fish. The site also offers a significant environmental education tool for middle school and high school students. SalmonScape merges fish and habitat data collected by state, federal, tribal and local biologists and presents them in an integrated system that can be readily accessed by other agencies and citizens.

SalmonScape is an interactive mapping application designed to display and report a wide range of data related to salmon distribution, status, and habitats. The data sources used by SalmonScape include stream specific fish and habitat data, and information about stock status and recovery evaluations.

Washington's eleven species and subspecies of native salmonid fish constitute a biological resource of spectacular commercial and cultural importance. Unfortunately, this resource is under heavy pressure from human population growth and development. Urban and industrial land conversion, forestry and agricultural practices, water diversion, municipal water demands, overfishing, and hydropower development have contributed to the decline of several salmonid stocks. A large recovery effort at the local, state, and federal level is currently underway to prevent further declines and improve the condition of already imperiled stocks.

The overall objective of **SGS** is to help monitor status and trends of Coastal, Puget Sound, and Columbia Basin salmonid stocks. The Spawning Ground Survey database (SGS) was designed as a repository for raw, unexpanded data collected during spawning ground surveys and from adult traps. It is intended to provide a common framework for the collection, storage, retrieval, and dissemination of data collected

by public and private entities. WDFW maintains a centralized copy of the database, which contains historic and current spawning ground survey data from throughout Washington.

The USF&WS **Pacific Region Fishery Resources Program** has 26 offices and staff located in Idaho, Oregon, Washington, and Hawaii. They work with partners to protect the health of aquatic habitats, recover and restore fish and other aquatic resources, and provide people with opportunities to enjoy the many benefits of healthy aquatic resources in the Pacific Northwest and Pacific Islands. The foundation of the site – and their work – is based on the **Pacific Region Fisheries Strategic Plan**.

In addition to these StreamNet supported programs, Bonneville separately contracts operation of **Cbfish.org**, an interactive website that provides the public an unprecedented view into **Bonneville Power Administration**'s implementation of the **Columbia Basin Fish and Wildlife Program**, which stretches across a four-state region and is the largest program of its kind in the world. Developed by the **Northwest Power and Conservation Council** pursuant to the Northwest Electric Power Planning and Conservation Act of 1980, the Program consists of measures for the purpose of protecting, mitigating, and enhancing fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries. Cbfish.org is also a web application that enables BPA and its regional partners to manage the program's activities and accomplishments, and to define, evaluate, fund, and review portfolios of projects.

The Council adopted **high level indicators** to track the progress of fish and wildlife efforts in the Columbia Basin. The collective efforts of many entities, including the Council, contribute to improving habitat and migration while protecting and enhancing fish and wildlife. These measures cannot be interpreted as a performance measure for any single entity but instead provide a high level overview of outcomes that reflect regional headway.

Subbasin plans are complex documents. To show key elements of these plans simply and efficiently, NPCC has made these "**dashboards**" for those subbasins with plans. They show extracts of the plans and links to related management plans, local maps, and contact information. StreamNet data is widely used in support of Cbfish, high level indicators, and dashboards.

Data disseminated through the project are primarily focused on the Columbia Basin (Figure 2), but other data are included when they are obtained through other contracts or are consolidated in agency databases. Much of the tribal data flow is through the respective state StreamNet projects or through the Columbia River Inter-Tribal Fish Commission (CRITFC), which is a full partner in the StreamNet project but which is supported through a separate contract.

During 2014 project data collection and coordination focused on leadership of the Coordinated Assessments (CA) project with PNAMP. CA is an effort to locate and obtain derived data on high level viable salmonid population (VSP) indicators, and to develop Data Exchange Standards (DES) for these indicators and supporting information.

In addition to this work, StreamNet also serves as a searchable archive and approved environmental data repository for data sets that fall outside the scope of the StreamNet DES, ensuring that they are protected for the long term and remain accessible for use. These data sets include the NPCC Protected

Areas list, data sets from subbasin planning, the Hatchery Scientific Review Group (HSRG), and all other data sets submitted to the Data Store, the StreamNet online data archive.

3. Results

Regional Coordination

StreamNet contributed to the coordination and standardization of monitoring data throughout the basin in 2014. We actively supported improving data sharing capabilities in the region through the Coordinated Assessments project. This project uses an exchange network approach and dynamic web services to share data. With the leadership of StreamNet cooperators in WDFW, a grant was obtained from the EPA in January, 2014, specifically to work towards automated data sharing of key high level indicators for the region. A second EPA grant application (also led by WDFW) was completed and submitted to EPA in November, 2014.

We continued to work with our partners in IDFG, CCT, MFWP, ODFW, CRITFC, and WDFW to promote data standardization within agencies by assisting them with development of database systems designed to ultimately have the capability to share data directly in regional format. As part of the effort to improve coordination, in 2014 StreamNet instituted an Executive Committee structure, with the intent of having policy-level staff from partner agencies and primary data consuming organizations directly involved in setting priorities for the technical data management staff. The Executive Committee revised the StreamNet Strategic Plan and provided direction on program priorities in 2014. The StreamNet Steering Committee remains an essential part of the organizational structure of the program as the implementation team for these priorities.

Current Members: StreamNet Executive Committee

Randy Fisher, PSMFC
Stan Allen, PSMFC
Zachary Penney, CRITFC
Tony Grover, NPCC
Bryan Mercier, BPA
Russell Scranton, BPA
Tom Cooney, NOAA- Fisheries
Rich Carmichael, ODFW
Dan Rawding, WDFW
Pete Hassemer, IDFG
Don Skaar, MFWP
John Arterburn, CCT
Roy Elicker, USFWS

Current Members, StreamNet Steering Committee

Tom Pansky, BPA
Phil Rogers, CRITFC
Nancy Leonard, NPCC
Bart Butterfield, IDFG
Dawn Anderson, MFWP
Cedric Cooney, ODFW
Steve Pastor, USFWS
TBD, CCT
Brodie Cox, WDFW
Tom Iverson, Coordinated Assessments Project Contractor
Jen Bayer, PNAMP

Table 1. Current members, StreamNet Executive and Steering Committees

StreamNet coordinated closely with PNAMP in providing technical guidance to the Coordinated Assessments project, including completion of the initial pilot effort and development of Data Exchange Standards (DES). Staff at PSMFC and subcontracting agencies also coordinated with state, federal and tribal agencies in support of increasing data flow in the region and to encourage increased use of information technology to improve the efficiency of data sharing.

Data sharing is associated with concerns over interpretation, analysis, and attribution in many cases. As part of the project's focus in 2014, Data Sharing Agreements for both Coordinated Assessments and the Data Store were drafted and circulated for review. After multiple iterations, these documents are now ready for use as data is uploaded and shared. It is expected that increased usage (the Data Store) and actual flow of indicator and metric data (the Coordinated Assessments project) may lead to additional discussion and new versions of the Data Sharing Agreements over time.

The StreamNet project performed its planned data management and coordination activities during the period. Details on use of the StreamNet data delivery systems and responses to direct requests for data and information are presented in Appendix A.

Coordination is still needed in the GIS arena, particularly surrounding hydrography management and maintenance. At the end of 2014, ODFW was still in the process of finalizing a long-term hydrography data management strategy as it relates to the National Hydrography Dataset (NHD) and the StreamNet regional hydrography data set. While maintaining aquatic resource data on the NHD is the preferred approach, the StreamNet project and other funding constraints may dictate an alternative hydrography data management strategy. Within PSMFC, as a direct result of the PSMFC database integration workshop held in 2014 an integrated Columbia Basin fish facilities GIS dataset was developed. This effort eliminates multiple datasets with varying degrees of accuracy for location information, and establishes a common layer which is now shared between programs. The dataset is under testing now, and shows promise for broader application, such as use in the NPCC/BPA O&M review.

The IDFG StreamNet subproject continued assistance with development of the Idaho Fish and Wildlife Information System (IFWIS), and was able to download data directly from the system in a single step in order to simplify standardization of the data and speed submission to the StreamNet database, saving significant time from the previous approach. The MFWP StreamNet subproject continued working with the Fish Division to scope out a new data management system. The ODFW StreamNet subproject continued work to construct a more efficient data management system for posting recovery population data to the ODFW Salmon & Steelhead Recovery Tracker interface for distribution to StreamNet, NOAA and other management partners. Oregon StreamNet staff also coordinated internally and externally to ensure priority Coordinated Assessments (CA) and recovery related efforts were addressed. Coordination with ODFW, other agencies, tribes, regional groups, non-profits, efforts outside the FWP, etc. beyond the CA process was limited in CY-2014. The WDFW StreamNet subproject coordinated with the Biological Data Systems Program in WDFW on ongoing development of the Juvenile Migrant Exchange and the SCoRE data delivery system, which will be able to serve data to StreamNet in the future.

StreamNet continued to coordinate with partner agencies to build systems with regional data sharing capability. The goal is to make it possible to harvest data directly for loading into StreamNet through automated means. When implemented, this will significantly speed the process of obtaining annual data updates, and allow our data stewards to expand to the acquisition of additional priority data types. The IDFG StreamNet subproject can currently accomplish this through their IFWIS database, which the Idaho StreamNet project helped to initiate and

partially supports. The Coordinated Assessments project is designed to build this capability in all the data source agencies for a few key indicators. StreamNet worked with the agencies to develop procedures for internal conversion of the data to regional standards through a DES, and developed an automated data dissemination approach modeled after the EPA Exchange Network approach. The ODFW StreamNet subproject modified the StreamNet Coordinated Assessment web interface to create a process to transfer CA indicator and metric data from the ODFW SQL database to StreamNet in a single step. WDFW is in the process of modifying their Salmonid Stock inventory (SaSI) to carry CA indicator data and deliver it to CA StreamNet aggregate databases using the StreamNet API.

Data Management

StreamNet continued to acquire fish data from our four partner state fish and wildlife agencies (ODFW, WDFW, IDFG and MFWP), one federal fisheries agency (USFWS for data from the national fish hatcheries), and one tribe (CCT). These data have been created through a variety of funding processes and sources, only some of which are through BPA or other federal programs. As a regional data coordinator StreamNet strives to provide all data of a given type from all sources. The project uses subcontracts to support data stewards inside these agencies to acquire, quality check, develop metadata, convert when necessary, and update data of types routinely disseminated through StreamNet, and to convert these data to the regional data standard. The data are then submitted to the StreamNet database at PSMFC, where they are quality checked and managed so they become available to the several StreamNet online data query systems. The data are then made publicly available for viewing and download in standardized format through the project website, www.streamnet.org.

Oregon StreamNet staff continued efforts to develop and institute a file naming standard related to recovery data that could be expanded to the agency to improve overall data flow. Significant time was spent participating in the development, update and maintenance of the CA and StreamNet CA DES's throughout the year, and developing/modifying a database for exchanging the four CA DES indicators. NHD hydrography migration continued, and the hydrography was maintained throughout the year. ODFW continues to encourage the implementation of data management best practices related to standards in field and file names, metadata, folder organization, data sharing agreements and data management plans, etc. as time and resources allow, particularly as they relate to priority CA and Recovery Planning efforts.

WDFW is moving forward with our work to standardize regional and central fish data systems with particular emphasis on data informing or contributing directly to the CA high level indicator data flows. In addition to CA systems development WDFW StreamNet worked with agency HQ staff to implement mobile data collection platforms, staging databases and automated transfer mechanisms for sport and commercial, adult survey, and juvenile data systems, again, ultimately informing the CA exchange as well as other consumers. WDFW continued hydrography mapping to NHD framework. Final adoption of WDFW's draft new stream layer has repeatedly been delayed. When it is adopted, the StreamNet Location Manager will fully scope the layer & draft a proposal to integrate MSH with the new line work.

Database Backup Assessment and Inventory

At BPA's request, during 2013 StreamNet staff at PSMFC and all of the partner agencies spent considerable time conducting a data inventory to determine the location of project data. When responses indicated that the location and accessibility of data was problematic, StreamNet staff crafted an outreach strategy with BPA to be implemented across contract and project lines. The StreamNet Data Store is part of this strategy, with updated programming that pre-populates attributes from CbFish when project sponsors use the Data Store as a repository to secure their data.

The final accounting and outreach strategy for 2014 projects which collected data and have not indicated a repository is underway as of the writing of this report. It appears that this is fewer than 100 projects. BPA has changed Pisces programming to remove "NONE" as a data repository selection for projects with metrics where data will be collected. Going forward, this should reduce or eliminate the repository-data mismatch through the validation process during contracting. StreamNet staff will continue to offer the Data Store as a repository for all BPA-sponsored projects, as needed. To aid project sponsors in finding the recommended repository for their agency or entity, StreamNet partners identified and prioritized repositories by metric subcategory (data type) along with corresponding URL's where available. This tool will greatly reduce misidentification of appropriate repositories for each data type.

Identification of Management Questions and Strategies

A regional data management and coordination approach is necessary if the many data collectors in the basin wish to cooperate and share information. StreamNet serves this regional coordination function. The StreamNet Executive Committee brings together policy level fish and wildlife managers from across the region. The Committee reviews data management issues, sets priorities, and directs the StreamNet partners at a policy level. The StreamNet Steering Committee, made up of data management professionals from within partner agencies, as well as technical experts representing many primary data consumers, then works to ensure implementation of the established regional data management objectives. Data managers from a diverse set of agencies and tribes are called together in regional forums to discuss topics of interest. These forums serve to identify data management questions that otherwise would be handled on an individual basis. Strategies can then be identified to address these questions and concerns, and data management considerations can be incorporated early in the development of monitoring plans and approaches.

The Coordinated Assessments project is a result of identifying a key deficiency in regional data management -- the potential inability to share and compare information on fish populations across structural boundaries due to differences in data collection and management practices. This has generally required decision makers to establish individual networks of biologists and staff to ensure the flow of data needed to assess fish populations. The CA project is designed to structure this flow so that it becomes standardized, automated, and sharable throughout the region; first on key VSP indicators, then expanding to other data as time proceeds. The BPA Data Management Strategy supports the Coordinated Assessment project to support sharing and proper management of data.

During 2014 the StreamNet Executive Committee established the priority of focusing on collection, review, and reporting of the Natural Origin Spawner Abundance (NOSA) indicator for populations (Figure 4). Working with the Steering Committee, biologists were polled and best estimates of data flow were listed for the collection of NOSA, Recruits per Spawner (RperS), and Smolt to Adult (SAR) indictors for 218 Technical Recovery team (TRT) populations in the next (FY 2015) contract. The estimated data flow for these indicators is shown in Figure 4. It should be noted that this reporting is comprehensive only for StreamNet partners. Other organizations and tribes may have additional data that may be reported as well.

Coordinated Assessments Data Flow in 2015

216 TRT populations listed in the **Interior Columbia & Lower Columbia/Willamette** Recovery Domains						
Predicted reporting for TRT populations in FY 2015						
Indicator	**Predicted/** Total TRT	Pred./Ttl **%**	**ODFW**	**IDFG**[x]	**WDFW**	**Tribes***
Natural **O**rigin **S**pawner **A**bundance	**133**/216	61.6	40	29	63	1
Recruits **per S**pawner	**34**/216	15.7	19	15		
Smolt to **A**dult **R**atio	**3**/216	1.4	1	1	1	
Juvenile **A**bundance	**25**/216	11.6				
Reported TRT populations/annual estimates as of **April 1, 2015**						
Indicator	**Reported/** Predicted	Rep/Pred **%**	Pops/Yrs **ODFW**	Pops/Yrs **IDFG**[x]	Pops/Yrs **WDFW**	Pops/Yrs **Tribes***
Natural **O**rigin **S**pawner **A**bundance	**24**/133	18.0	23/469			1/9
Recruits **per S**pawner	**3**/34	8.8	3/89			
Smolt to **A**dult **R**atio	**1**/3	33.3	1/14			
Juvenile **A**bundance	**0**/25	0.0				

[x]Includes estimates coordinated with ISEMP and/or NPT

*Comprehensive only for StreamNet Partners. Includes late 2014 CCT

Figure 4. Coordinated Assessments Project FY 2015 Priorities

Documentation of Protocols and Methods

Protocols and methods used in the creation of data generally are documented through formal reports, at varying levels of detail, and for that reason StreamNet has always gathered the source documents for all data in the database and asked that they be made available in the StreamNet Library, with direct links to the documents from the actual data. With the regional recognition that protocols and methods described in reports are not always sufficient for fully understanding the origin and uses of the data, a tool to support full description of methods and protocols was developed through PNAMP with support from BPA. Use of this tool (www.monitoringmethods.org) to describe sampling methodology is increasing, and StreamNet built a link to the website for the CA project to specify the protocols used to calculate the indicators and metrics in the data. We are working to add similar capability to the Data Store and potentially the main StreamNet database in the future. Providing a link to protocols

and methods could easily be added to the current links to data source documents in the main StreamNet database. This will require new work on the part of the StreamNet data stewards, however, so this will have to be prioritized in the future. Oregon StreamNet continues to promote the adherence to the agency's simple metadata standard along with the development of full FGDC compliant metadata when warranted. Additionally, WDFW StreamNet staff continued to work with contributing biologists to document methodologies and update them within our corporate reporting systems. The development of formal metadata for CA data and beyond will greatly aid efforts to document data origin, protocols used to collect the data, and uses of the data.

Data Entry

Database development and management, including data loading and QA, was performed by PSMFC central staff and the project staff in the participating agencies in order to manage the data that are obtained, standardized and disseminated through the project. Data were obtained, loaded and quality checked, georeferenced, and converted to the DES for transmittal to the project database at PSMFC. In 2014 PSMFC instituted cost savings to StreamNet through shifting staff on to indirect funding and assumption of additional projects which came with funding. The StreamNet Executive Committee, with Bonneville's approval, shifted these resources to increase direct funding to ODFW and IDFG to increase activities in those agencies, including increasing data entry. Funding was also used to hire a PSMFC temporary employee, stationed at WDFW offices in Wenatchee, to help that agency with such activities. At Bonneville's request, in 2014 StreamNet also initiated field trials of hand held data devices, to investigate their utility in facilitating more automated data flow of field level data. The StreamNet Data Store also has some built-in metadata QA/QC features that will be expanded to support proper QA/QC practices to store published data sets.

Devices (tablet computers) were purchased, a software vendor was contracted, and outreach conducted to field project sponsors to identify projects where devices were then tested in 2014. The objectives of the automated data flow tests were to examine our ability to increase timeliness of data availability, improve data security, and improve the overall efficiency of the data collection / entry / quality assurance process. A total of eight projects received devices and programming assistance the calendar year. (Another three projects were not pursued because it was determined the tablet computer systems we could create would be insufficient for their needs due to complex data, rapid data entry, or both.) The StreamNet project developed automated means of capturing data from the eight field sources and inserting the data directly into the destination database

As part of the project, coordination with PNAMP and private vendor Sitka Technologies, Inc. was instituted as it became clear that all of us were operating in the same business space. A productive partnership resulted, leading us to combine our efforts to look for organizational strengths within each partner that could best be utilized to foster the common goal of technological improvement in field data collection. A web-based survey was conducted regarding emerging technology usage in fisheries projects in the basin. This was followed by a workshop in October hosted by us (StreamNet, PNAMP, and Sitka Technologies) where more than 100 attendees made or heard presentations, demonstrations, and panel discussions on technology. Following up from the workshop, the partnership is now focusing on the possibility of working together to facilitate regional development of a snorkel survey app or apps that could be used to improve data collection, storage, and transfer across organizational boundaries.

StreamNet currently utilizes centralized databases due to the current capabilities of agency infrastructure. A longer term goal is to support the agencies in development of internal data infrastructure that will allow automated data dissemination from the agencies via web services in regionally standardized format. Data were managed and stored

at the subcontracting agency level to support this data entry/development process, and in the consolidated regional scale database at PSMFC, where the data are stored, managed and backed up for use through the StreamNet data query systems.

ODFW StreamNet acquired 8 datasets for population estimates from various contributions in the Columbia basin. This resulted in indicator estimates for 23 NOSA, 1 SAR, and 3 adult and 1 juvenile RperS populations in the Coordinated Assessments (CA) DES. The portion of this data that was ready for public distribution was exchanged with Regional StreamNet, along with trends originating from the BPA Inventory effort, opportunistic connection to CA data, priority species within the Columbia basin, QC information from StreamNet staff and linear referencing conducted on historic spatial data. Oregon also submitted a significant number of updated trends resulting from updated hydrography and NRD alignment, as well as new and update distribution and barrier information.

WDFW StreamNet staff loaded the WDFW CA database with NOSA (2010-2012) and SAR (2003-2010) data to test exchanging data with PSMFC through the API. Although the test was successful, this data was not published as at that time PopFit and TRTmethod needed to be documented further to accurately reflect the data. The Upper Columbia Data Steward conducted a regional WDFW review to identify CA metric data and associated time series for Coordinated Assessments in the upper Columbia Basin. These data were identified and compiled for future integration into the CA database. All StreamNet staff contributed to the new design of the TWS (Traps, Weirs, Surveys restructure and to ensure all measurements were being collected to support metrics needed to create focal indicators. The Location Data Manager converted cutthroat SGS (Spawner Survey Database) historic routes to more current routes. Further work continues to equate the route measures with current route measures. This data was targeted to scope how difficult it would be to use automation for all the historic routes in SGS.

Agency Data Storage

StreamNet maintains a central database containing summarized fish data for the Columbia Basin. BPA relies on the StreamNet database and StreamNet Data Store as a core data repository to secure public access to data where not provided in an alternative, publically accessible system. The StreamNet Data Store serves as the default database for numerous fish population metrics, as indicated in the BPA Data Management Strategy. In addition, StreamNet can function as the interim data storage location during the development of databases for new data sets, such as fish species genetics, blood work, and enzyme analysis. PSMFC also physically hosts other data storage repositories as a cooperator with state and tribal agencies. StreamNet staff now also work to ensure that data not located in the StreamNet database are secure and regionally accessible in other approved environmental data repositories. During 2014 StreamNet led an effort to identify exactly where such data sets were located by inventorying data repository locations for all Bonneville funded projects and contracts.

The StreamNet subprojects in the state agencies all contributed to development or improvement of agency data storage systems in 2014. Focus continues to be on increasing the speed and efficiency of data conversion to the regional standard StreamNet DES, and then submission to the StreamNet database. The long term goal is to develop the capacity for the agencies to host data in the regional standard and share them via web services and/or to transfer data to StreamNet via web services. Because each state uses different approaches to their data management, actions taken by the state subprojects differ accordingly.

IDFG StreamNet staff assisted BPA project biologists to identify and prioritize data available for entry into the Idaho Fish and Wildlife Information System (IFWIS), or an alternative accessible, backed up information system. IDFG StreamNet staff participated in meetings of the Coordinated Assessments (CA) planning and development groups.

They provided input prioritizing indicators, metrics, and metadata. They coordinated with development between the proposed DES, the prototype database and application, and the web service data exchange. Multiple sources of CA data were consolidated into complete, standardized, workbooks on a secure and backed up network drive. SQL queries were written to select, extract, and transform those data into the draft DES for NOSA and RperS. IDFG staff wrote web service routines to enable the transfer of CA data to PSMFC and NOAF databases. Those services were successfully tested and results shared with the CA Exchange Team. After appending into the IFWIS CA database, those data were then transferred to the PSMFC CA database. IDFG StreamNet staff compiled and submitted hatchery return data for 2012-2014 chinook, and 2014 steelhead and the 2014 chinook index redd counts.

MFWP StreamNet staff, in addition to maintenance and update of existing databases, assisted the Fisheries Division in continued scoping of the internal centralized fisheries data system being built by MFWP Application Development staff. StreamNet staff is involved to ensure that data being collected and stored conform to existing StreamNet DES guidelines and that the exchange of data with the StreamNet central database is efficient. The system has been designed to replace individual databases residing on biologists' computers, thus making truly centralized data a reality. In addition the system includes analysis tools giving the user the ability to calculate various population estimates and other metrics needed by staff for reporting purposes, which will benefit BPA projects. Staff assisted in a training session for biologists and technicians, including those receiving BPA funds, on the use of the system focusing on data entry. StreamNet staff also developed a process which allows historic data files residing with individual biologists to be converted from one file type to another to allow for uploading into the new system. This has resulted in thousands of individual fish records being uploaded to the database, resulting in historic data available in the new system much sooner and with far less effort than anticipated. Additional StreamNet staff efforts related to the system design and development have resulted in eight of the nine data categories MFWP submits to StreamNet housed in the centralized database with the ninth slated to be complete next year. The database currently houses over 2 million raw fish records statewide. In 2014, 698 redd counts were added in the Columbia Basin including both current and historic data, approximately 500 fish survey location were added in the Columbia resulting in over 34,000 individual fish records. Statewide 1,200 survey locations were added resulting in 96,000 individual raw fish records. This demonstrates that the system is serving its intended purpose and staff are contributing their data. An additional task moving forward will be to investigate the potential to deliver data as web services. These efforts are leading to a significantly enhanced ability for MFWP to share fisheries data in standardized format with regional entities.

An additional, unanticipated task of moving all MFWP fisheries data from a SQL server to an MFWP Oracle server had to be done during the year. The data were on a failing server and it was imperative that the data be moved to a secure location. An additional result and benefit is now all MFWP fisheries data is contained on one central server which will allow for streamlined future development and a more stable infrastructure.

ODFW StreamNet performed routine maintenance and updates on existing core databases. In addition, efforts to improve overall agency data storage and flow from the field continued by ongoing development and maintenance of the ODFW Data Clearinghouse (DC), making Oregon's natural resource information more secure and accessible by providing a centralized storage and distribution service. During the year, 27 new DC records were created and 81 existing records were updated. StreamNet staff worked with ODFW Recovery Plan staff throughout the year to coordinate efficient exchange of CA and Recovery data to StreamNet and the ODFW Salmon & Steelhead Recovery Tracker, standardization, DES needs and changes, flow configuration and data sharing documents, metadata, and data system development. Enhancements to the data structure and user interface for Oregon's Trend database

were primarily to more efficiently address Coordinated Assessment data needs, and to accommodate DES requirements.

WDFW focused some SN resources on the building, testing and refinement of several systems to store data captured from field biologists and analyzed by regional biologists. Database systems under development and implementation include those for: adult age and scales; traps, weirs & surveys; spawning ground survey; and juvenile migration. These systems are being developed with the intent of holding BPA project data in a secure and transferable location and informing the Coordinated Assessment indicator data sets as well as the standard StreamNet data sets. These data sets are being prototyped at WDFW headquarters and in Washington's Lower Columbia Region, but will eventually be rolled out to other regions statewide. Additionally, WDFW has been concentrating resources when available to the development of our Salmon Conservation Reporting Engine (SCoRE) which will enable on-demand data access via services from the data.wa.gov open data platform. Contingent on funding, we anticipate further development of these and other systems in 2014.

The USFWS StreamNet project continued to benefit from the fact that most data from the national fish hatcheries in the Basin are already managed in the centralized CRiS database, making conversion to the StreamNet DES format straightforward. No additional work was done to support FWS data storage by this StreamNet subproject.

Regional Sharing

Regional sharing of fish management data is StreamNet's primary purpose (Figure 5.). In 2014, significant effort was expended to improve sharing of the Coordinated Assessments indicators and metrics. StreamNet led the team that developed the Data Exchange Standard for the project, and developed an initial database to contain any data that the state and tribal agencies will be able to provide. The DES specifically identifies the data elements that are to be shared for each indicator, along with definitions, formats, and business rules for each element. The DES will initially be used to guide the organization of data to be shared via any specific medium, whether by spreadsheet, CSV file, database file, or web service. Ultimately, the project envisions the data elements being hosted by the originating agency in DES format and shared via web services that can be accessed by an exchange network hosted by the Environmental Protection Agency (EPA).

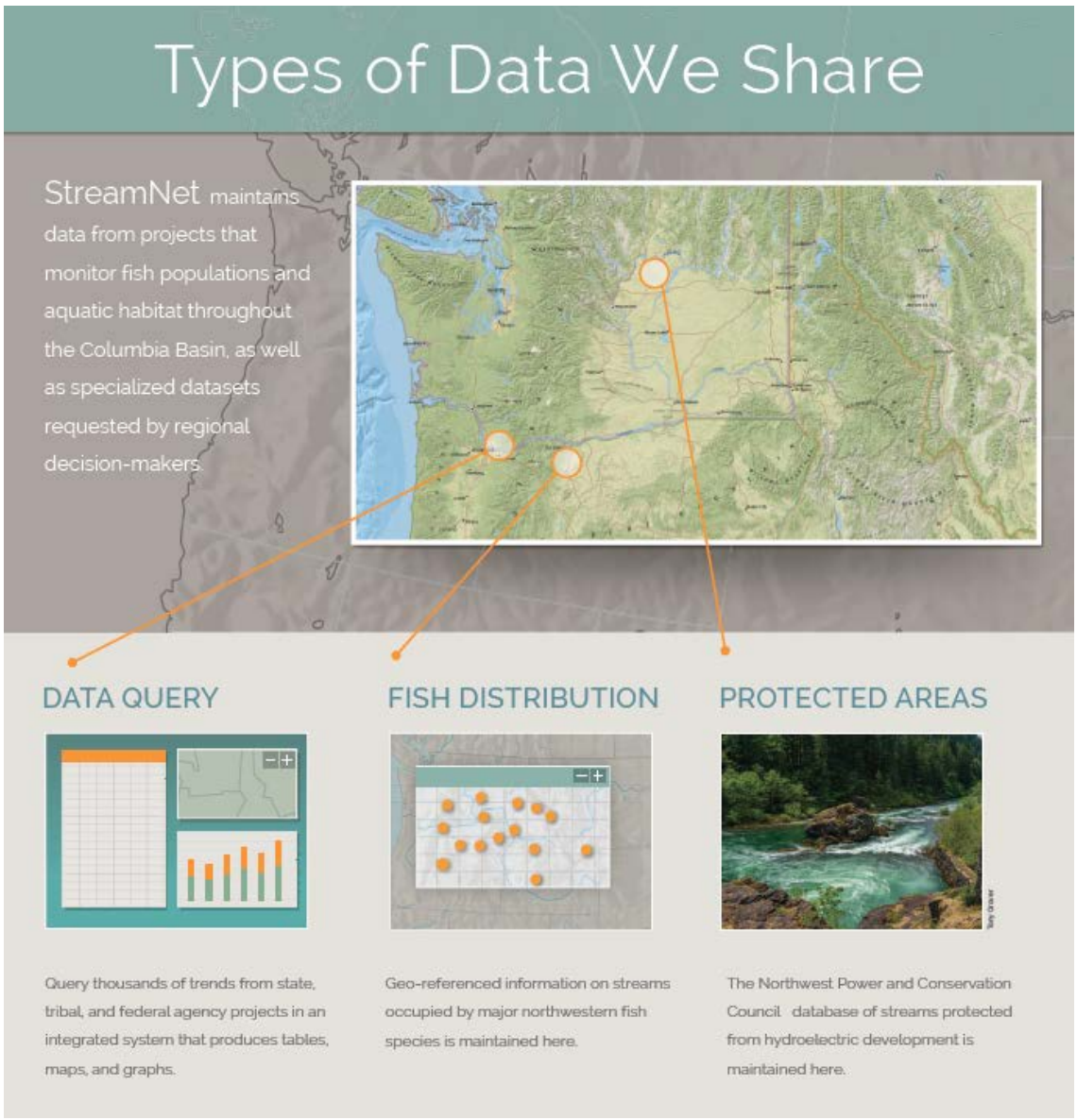

Figure 5. Data sharing Infographic from new website

StreamNet also continued its role as a primary data sharing project in the Columbia Basin, providing ready access to fisheries data. These data have traditionally been created and managed internally by the region's state, tribal and federal fish management agencies or programs, and have not been shared widely in a consistent format, except through StreamNet. We maintained and updated a central database containing these data and then shared the data through the StreamNet website. Each StreamNet sub-project compiled state or agency specific data for the data categories and submitted them to the central database at PSMFC to add the most recent data. The flow of updated data of these types was impacted by the prioritization of the CA project in 2014.

During 2014 substantial improvements to the StreamNet website were made in order to improve the user experience and access to StreamNet data. Work included a new logo, infographics, simplified site design with increased use of photographs, and integrated design elements unifying the site. A wide variety of data types primarily related to fish were disseminated through the StreamNet website at www.streamnet.org and by the agency subcontractors. We provided several data query approaches used to locate, display and download data

from the StreamNet main database for standardized data and from the Data Store for data that fall outside the scope of the StreamNet DES (Figure 1).

The standard data query utilizes a tabular approach for requesting and viewing or downloading data from the main database. An interactive map application allows location of data from the main database by navigating to an area of interest, then using a 'get data' tool to view and download all data that are associated with features at that location, such as for a stream, county, HUC or hatchery. Maps and GIS layers are also available.

The Integrated Query System (IQS) integrates both tabular and map based query approaches into a single system. This allows viewing and obtaining data within multiple data types by filtering or sorting on column headings in a table and also selecting on a location basis by using a map query. The IQS was designed specifically so that additional data types can be added to the same query approach easily in the future, and it may be able to serve as a consolidated platform for sharing many kinds of data across the basin.

The Data Store online data archive provides access to non-standardized data from any source, within or outside the StreamNet project, in native format. As previously mentioned, the Data Store serves as an approved environmental data repository for a wide variety of data collected in the basin, maintaining security and accessibility long term. The Data Store interface allows data producers to upload their data sets for secure storage and dissemination along with descriptive metadata. The BPA Data Management Strategy directs StreamNet to store links to associated protocols and designs to ensure data downloaded and used by third parties can be understood and properly used. The Data Store upload procedure obtains project information directly from the BPA Taurus database through www.cbfish.org, and additional links with Taurus and www.monitoringmethods.org are planned. StreamNet data and metadata were provided online as web services, allowing users to locate and obtain data through automated means such as national or regional clearinghouses, and in fact, the new IQS harvests our own web services as part of the new, more efficient approach to querying our data.

Analysis and Reporting

The StreamNet project displays and provides online access to all legacy data and data updates as soon as they are received from the source agencies, quality checked and validated, and disseminated through the various data query systems. Annual time series data are presented as 'trends', while other data sets are updated on a less regular basis as the agencies generate new information, such as for distribution, facilities, diversions, and barriers. Trend type data disseminated through the StreamNet website, such as various fish counts and abundance estimates, are summarized on an annual basis by the StreamNet data technicians working within the data source agencies. StreamNet is a data sharing and reporting repository, so further analysis is not our purview. Where derived data, such as estimates of spawning populations, are disseminated through the project, they are obtained from the source agencies for inclusion in the project's data systems.

Data from the StreamNet database are made available through the online data query systems (Figure 1). During 2012 we initiated planning with NOAA Fisheries to develop automated means of feeding indicators and metrics from the Coordinated Assessments project to the Salmon Population Summary (SPS) database. During 2014 we continued discussions with NOAA and state and tribal management agencies, with the intent of assisting them in automating data flow for their decision making needs. In 2014, StreamNet used Oregon's CA data submission to test the web services data exchange between the StreamNet Database and NOAA Fisheries SPS Database.

In 2014 updates to standard data types continued to largely be put on hold in order to focus on the CA project. The CA project is directing StreamNet's focus to the key indicators and metrics that have been identified as priorities for

reporting progress on implementation of the FCRPS Biological Opinion (BiOp). The data will be published online as part of the EPA grant StreamNet is implementing with our partners. Reporting on the progress of the CA project is part of the EPA grant.

StreamNet periodically issues reports on topics of interest to various users, as staff time is available. These include reports on the geographic distribution of fish, fish marking and hatchery releases, and other topics for which StreamNet holds data, or where StreamNet can serve a facilitating role with other PSMFC projects and databases.

As a BPA funded project, StreamNet regularly issues required reports through Pisces and Cbfish. In 2014 these included the 2014 and 2015 quarterly progress reports and the 2013 BiOp report. At BPA's request, in 2013 StreamNet also undertook a project to inventory data repository locations by BPA project, contract, and work element. This project resulted in contractor data entry improvements to Pisces. A final communication to contractors who had yet to indicate an environmental data repository was underway at the end of the calendar year. Results are anticipated in 2015.

4. Synthesis of Findings: Discussion/Conclusions

In 2012 StreamNet received significant input from the NPCC and BPA. Among their recommendations were:

- Data management should focus on addressing priority data needs. Specific guidance for StreamNet included;
    - Focus on a number of additional priority data types, including Coordinated Assessments indicators and supporting metrics and juvenile abundance data, and Single Nucleotide Polymorphisms (SNPs) genetics data
    - Assess the security and accessibility of data developed by BPA funded projects
    - Participation with integrating data discovery through MonitoringResources.org.
- Increased coordination among database projects is needed to avoid potential redundancy.
- Expanded use of information technology is needed to improve efficiency in data management and sharing.
- StreamNet should take on work with and dissemination of a number of additional priority data types. These included the CA indicators and supporting metrics, information on security and accessibility of BPA funded data, juvenile abundance data, resident fish data, SNPs genetics data, and data coordination through MonitoringResources.org.

During 2014 many of these instructions were carried out (Figure 6.), and have been reported in the Results section of this report. In completing those tasks, a number of lessons have been learned. On one end of the spectrum, it takes significant time to compile CA data in DES format. Although CA participants are moving ahead creating new DES's, data analysts and CA data compilers are not able to put time toward new data types, and instead are focusing on completing the four initial indicators for all available populations. On the opposite end of the spectrum, StreamNet has for years provided access to updated trends (time series of data) and other traditional data sets, serving as a secure repository and the only publicly available source for these data in regionally standardized, georeferenced format. These data sets may not be used by decision makers in real time, and comprehensive use of the data has already been made at the state, tribal, and federal agency level for decision-making and for population assessments. However, having the data accessible in standard format and geo-referenced across the basin may in future serve a useful function. For instance, if habitat data on the PNAMP monitoring explorer and StreamNet population trend data from the same watershed are superimposed on the same landscape interesting relationships

may be evident. The higher level assessments that are derived from these data have not historically been posted on StreamNet. Plans are being made to implement display of the CA data on StreamNet in 2015.

A lesson learned has been that StreamNet cannot continue to serve an archival role to ensure safekeeping of large volumes of data while also focusing efforts on CA and key VSP indicator information in such a way that it helps regional decision makers, ultimately in real time, within existing resources. Keeping the flow of traditional StreamNet data current within the StreamNet database, ensuring data flow for existing CA indicators, and development of new DES and indicators within the CA project must be prioritized. Given existing resources StreamNet and the data management infrastructure within StreamNet partners cannot serve all of these functions simultaneously. If the current focus on the CA project continues and traditional StreamNet data sets are not updated, they will lose their utility over time.

A related lesson is datasets that indirectly support priority recovery and CA data such as hydrography, distribution and barriers will also lose their utility over time if not prioritized and supported appropriately. It would be appropriate to identify and evaluate the need to maintain these datasets as alongside new indicators and metrics.

Figure 6. Project overview infographic from the new website

Cooperating subcontractors have made use of assets provided by BPA through the StreamNet program to build infrastructure that contributes directly to their own decision-making capability, to degrees that vary from agency to agency. In general, agencies that have made the development of a centralized data management capability a

priority have integrated StreamNet staff into their programs, and effectively use the staff to both feed data into the StreamNet database and to complete their own internal data management priorities. In general, agencies that have a more dispersed data management process use StreamNet staff primarily to feed data into the StreamNet database. Other staff separately and independently manage data for decision making. StreamNet has integrated discussions with agency partners on how best to deploy program assets within agencies through the Executive Committee, with the goal of simultaneously assisting agency decision-makers and assuring data security and regional sharing of data.

One of the lessons learned in this project has been that embedded data management staff paid for through the StreamNet project serve an important and often unrecognized role within the agencies. So long as the flow of traditional data, and now CA information, has continued, agencies have been free to structure their data systems and use embedded staff in any structural assemblage that works for them. While this flexibility can be an asset, it is incumbent on the program to ensure that these assets are deployed to best implement regional RM&E programs. During the next year, StreamNet staff will continue to focus on aligning the program with regional RM&E through discussions with the Executive and Steering Committees.

When the updating of traditional data sets was postponed in 2012 in favor of focusing on the high level indicators selected in the CA project, staff time at PSMFC was adjusted to focus on developing the DES and database for Coordinated Assessment indicators and metrics. New funding, in the form of a $500,000 grant from the EPA to WDFW, was received in 2014. An additional grant application to expand CA data sharing has also been applied for. One lesson learned is that additional sources of funding to improve data sharing and infrastructure are available, and should be sought out to supplement the essential funding provided by BPA. While BPA funds the majority of projects that collect fish metric data in the basin, does not fund all of this work. Combining resources at the state, tribal, and federal level can lead to more effective and comprehensive RM&E management in the future. Another lesson learned during the CA Project is that DES changes should be made on a routine basis, to allow data managers to adjust systems and processes prior to initiating further compilation and delivery efforts.

During the process of inventorying data repositories in 2013 it became clear that improved early communication would help BPA and contractors prioritize locating and identifying repositories for their data. Bonneville improved communications and now clearly include expectations for the location of approved repositories through the contracting and reporting process. All contractors collecting RM&E data now identify approved repositories as part of their project planning. StreamNet now serves as a coordinator to assist BPA in identifying and publicly listing the data repositories for project information, as well as serving as a repository for data through the StreamNet Data Store.

In implementing the CA project, substantial progress was made in 2014. However, the caveats identified in 2012 remain an impediment that will impact the region's ability to implement more efficient data flow to decision makers. The indicators are not calculated for all defined populations. Many indicators, particularly those related to productivity, are calculated for far fewer populations than others. Indicators are not always calculated to represent an entire population. The various state and tribal agencies are at significantly different stages in developing the capabilities of their data management infrastructure, so developing a region-wide approach to sharing these indictors will continue to require more time and/or more resources for some agencies. One lesson learned through this project is that the existing system of decision making is reliant on a small, core network of biologists with a long history and significant institutional knowledge that is largely irreplaceable. As these professionals retire, a more automated and documented system will be essential to assure continuity of population assessments. Projects such as StreamNet could serve a key role in assuring that this documentation and the data needed to inform the

assessment process are accessible and stable during any upcoming transition. Analytical method documentation for the CA project will be a priority for StreamNet in 2015.

Documenting the history of population assessments is key to understanding and evaluating past and present data. The goal is to provide a citable reference for co-managers and interested parties when referencing abundance and productivity data in their own reports and analysis, including detailed methods on the datasets for indicators and metrics that are in the CA DES, and document changes to methods for those indicators and metrics. This work requires a detailed examination of methods documents and datasets, which, on occasion, illuminates QA/QC issues in VSP datasets, resulting in an intensive review of analytical methods and recalculation of VSP metrics and indicators. This often requires an enormous amount of time and coordination and therefore needs to be considered when thinking about compiling and/or documenting current or VSP metrics and indicators into DES format.

Recommendations;

1. The StreamNet Executive Committee should be used to focus and prioritize the CA Project. This should specifically include prioritizing selection of new high level indicators, taking into account regional data needs, such as NOAA status assessments and NPCC high level indicators and dashboards. Priorities should incorporate realistic assessments of available staff, and other agency priorities.
2. The StreamNet Executive Committee should also evaluate and prioritize updating traditional StreamNet data sets to reflect an emphasis on those that add value to ongoing regional O&M efforts. For example, updating geo-referenced surveys that take place in proximity to habitat restoration efforts. Support of agency GIS systems and maintenance of regional databases such as fish distribution, barriers, and hatchery information should be considered and prioritized within the StreamNet program.
3. StreamNet should provide accessible and useful displays of information at the regional scale, with special focus on the CA project. Improvements to the StreamNet website should include GIS-based, population level graphical presentation of the high level indicators as they are developed. StreamNet should also assist in supporting the efforts of others (NOAA, NPCC, etc.) who are engaged in similar efforts by focusing on automating and streamlining the flow of data for these efforts.
4. While focusing the CA project on high level indicators that support regionally significant monitoring efforts, clear direction and consensus should be used to guide agencies and tribes to submit data that support population level assessments. Where such data is lacking, care should be used to avoid cluttering the CA data sets with lower-level information simply because that is all that is available. The Executive Committee should provide direction on when such lower level or even higher level information is acceptable and beneficial to be incorporated into the CA database. The StreamNet Executive Committee should also periodically evaluate whether regional data collection and management efforts are aligned with the high level data needs identified by the users of CA data, and recommendations for funding and support provided to BPA, NPCC, NOAA, and others from a regional perspective.
5. Where data is needed in support of regional prioritization (i.e. resident fish data for NPCC indicators and dashboards), StreamNet should prioritize infrastructure and data management assistance needed to support such indicators. This will require advance planning in order to potentially shift resources or request additional support, as agencies are currently fully committed to ongoing efforts. BPA and the StreamNet Executive Committee should clearly convey to agencies the importance of contributing to regional efforts. This will assist in gaining acceptance and buy-in from agency managers and biologists.
6. CA methodologies for calculation of high level indicators should be fully documented.

7. StreamNet should continue to play a role in the development and deployment of emerging technologies in fisheries data collection through sponsorship of workshops and through funding the engagement of agency-embedded staff in purchasing, development and testing of these technologies, with the objective of making data collection and transfer more efficient and secure across the region.
8. StreamNet should continue to seek out efficiencies and new sources of revenue in order to fund agency operations that support regional data management priorities (i.e. field data stewards that compile and provide CA data). Where appropriate, the StreamNet Executive committee should recommend increases in traditional funding and support, as needed to complete the priorities they have established.
9. In order to facilitate Upper Columbia River Data Management, BPA should fund a WDFW Data Steward position in Wenatchee. Deliverables include: further refinement of aggregator databases to meet the additional data collection needs in the Upper Columbia along with provide training and data management support to Upper Columbia biologists. Deliverables include working with Upper Columbia biologists to: 1) identify infrastructure needs for Traps, Weirs Surveys & Juvenile Migrant Exchange databases through standardization of data collection, protocols, and forms, 2) create standardized and customized database queries and summaries to facilitate analysis needed to estimate CA metrics and indicators, and 3) develop automated data transfer of adult and juvenile PIT tag insertions, and recoveries into PTAGIS.
10. In order to facilitate Snake River Data Management, BPA should fund a WDFW Data Steward position in the Snake River Basin. Deliverables include further refinement of aggregator databases to meet the additional data collection needs in the Snake region along with provide training and data management support to Snake River biologists. Deliverables include working with Snake River biologists to: 1) identify infrastructure needs for Traps, Weirs Surveys & Juvenile Migrant Exchange databases through standardization of data collection, protocols, and forms, 2) create standardized and customized database queries and summaries to facilitate analysis needed to estimate CA metrics and indicators, and 3) develop automated data transfer of adult and juvenile PIT tag insertions and recoveries into PTAGIS.
11. The use of electronic data collection devices is likely to save time and money, reduce transcription errors, and allow for more efficient data transfer of biological and environmental data into WDFW databases. BPA should fund the outfitting of fixed data collection sites such as adult and juvenile fish traps in the Lower Columbia, Upper Columbia, and Snake regions with waterproof, ruggedized tablets that interface with existing radio frequency identification (RFID) readers for PIT tag detection. This will permit WDFW to automate data transfer from these collectors to HQ systems of record and receiving customers like StreamNet and BPA via subscriptions cloud service base mobile application.

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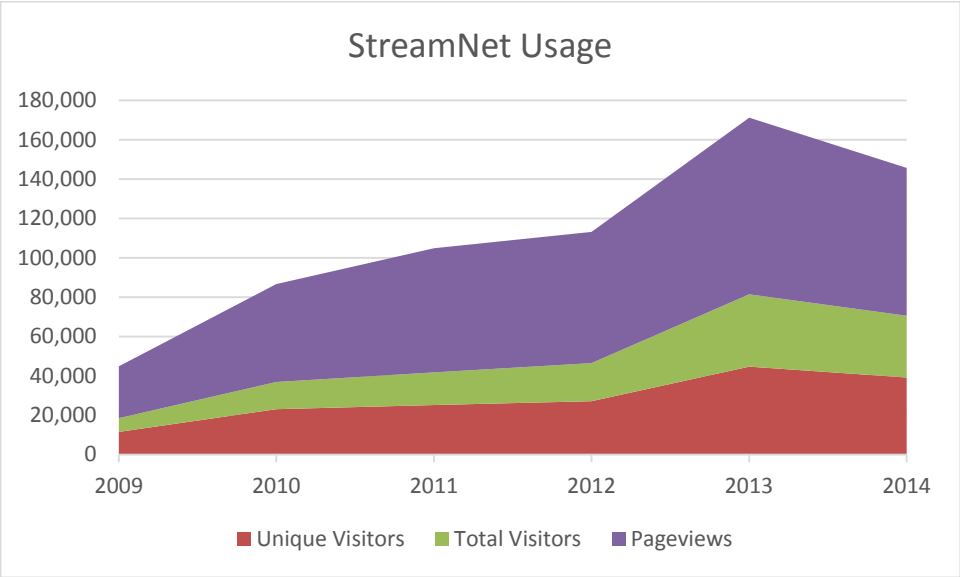
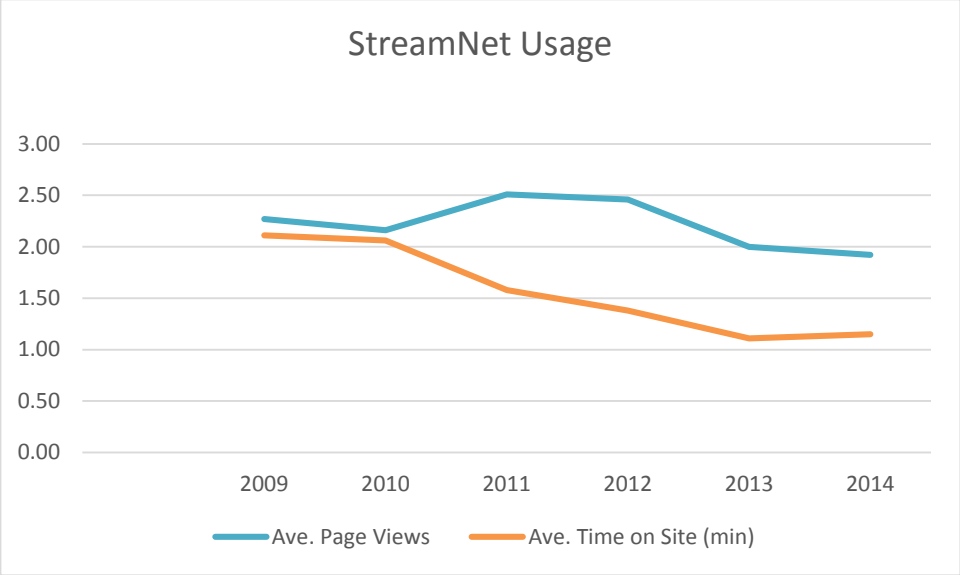
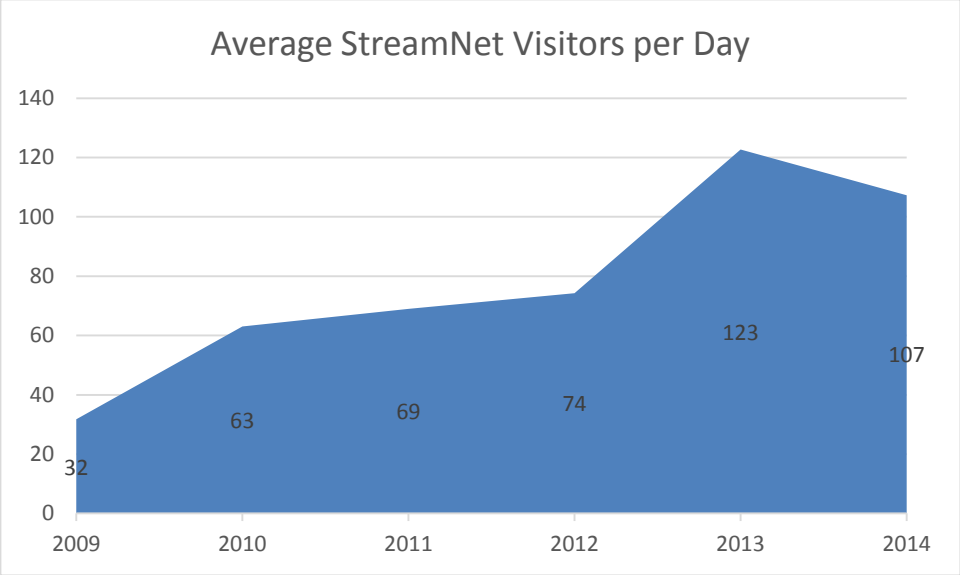
10. NPCC 2014 Columbia River Basin Fish and Wildlife Program

Appendix A: Use of Data & Products







StreamNet Website Use Statistics						
Table A1. Annual use of the StreamNet website	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
Total Visits	39,171	44,798	27,163	25,169	23,029	11,578
Unique Visitors	31,424	36,683	19,291	16,586	13,924	6,983
Page views	75112	89681	66,686	63,186	49,725	26,261
Ave. Page Views	1.92	2	2.46	2.51	2.16	2.27
Ave. Time on Site (min)	1.15	1.11	1.38	1.58	2.06	2.11
Table A2. Top users of the StreamNet website (no. of visits)	**2014**	**2013**	**2012**	**2011**	**2010**	**2,009**
Internet service providers (Comcast, Verizon, etc.)	17,862	17,711	12,515	4,200	8,369	2,530
State of Oregon	640	600	961	881	974	594
Headquarters USAISC (US Army)	360	462	342	96	515	277
National Oceanic and Atmospheric Administration	349	309	385	144	572	306
Washington School Information Processing Cooperative	250	274	229	0	89	65
U.S.D.A. Forest Service	241	393	443	0	593	339
Bonneville Power Administration	213	220	258	141	296	150
U.S. Fish and Wildlife Service, IRM/BFO hq	201	109	182	111	262	185
Washington State Department of Fish and Wildlife	165	89	156	36	584	261

Oregon State University	158	186	152	40	148	64
Province of British Columbia	159	115	69	0	0	0
USDA Office of Operations	122	148	130	58	244	201
U.S. DOI Bureau of Land Management	122	139	186	81	155	95
University of Washington	114	91	109	24	169	70
State of Idaho	118	120	132	63	166	128
State of Montana	77	67	75	8	102	45
HDR	75	75	82	18	58	61
Portland State University	70	73	88	0	55	39
Colville Confederated Tribes	68					
Ch2m Hill Inc.	57	62	65	0	0	0
University of Idaho	46	96	0	0	0	0
National Wetlands Research Center, USGS	45	59	82	23	70	38

Appendix B: Detailed Results

Appendix B: Detailed Results

StreamNet Annual Report Details - Calendar Year 2014

A Support transfer of data into secure and accessible repositories

Support transfer of data into secure and accessible repositories 159. Transfer/Consolidate Regionally Standardized Data

Deliverable: StreamNet participants assist sponsors in securing data in appropriate repositories, as requested. Data are stored in appropriate repositories.

CTCR	CTCR continues to communicate with Project Sponsors, inventory data storage and offer assistance to secure accessible repositories.
FWS	There has been no activity on this item.
IDFG	IDFG StreamNet staff continued to assist and encourage IDFG project sponsors to manage their data within secure and accessible data repositories.
MFWP	MFWP continues to communicate and support BPA projects fish biologists in MFWP with data entry, inventory data storage, and manage their data in secure and accessible repositories.
ODFW	ODFW StreamNet staff assisted and encouraged BPA and ODFW project sponsors to manage or locate their data within secure and accessible data repositories.
PSMFC	Gathered suggested repository information from StreamNet partners. Readied Data Store for repository function. Worked with BPA to identify projects where data sets are created but no repository identified.
WDFW	WDFW staff continued their efforts to secure field and regional data when found or identified by BPA. Most of this work was accomplished in the previous year.

B Maintain StreamNet Data Store as a secure and accessible repository

Maintain StreamNet Data Store as a secure and accessible repository 160. Create/Manage/Maintain Database

Deliverable: The Data Store data submission procedure in improved and more efficient and is increasingly used as an archive for unstructured data, particularly from BPA project sponsors. The Data Store tools integrate with mm.org and cbfish.org.

PSMFC	Improved functionality of the Data Store by linking it to existing BPA contract systems and auto-populating fields, where possible. Increased functionality could be obtained with additional coordination with the Pisces system.

C CA data - coordination

CA data - coordination 189. Coordination-Columbia Basinwide

Deliverable: StreamNet provides leadership and coordination for the Coordinated Assessments project, including participation in the CA core team and planning group, leadership of the DES Development Team, leadership of the technical aspects of the project, and overall project participation and coordination. An exchange node on the EPA network is created.

CTCR	CTCR Data Steward participated in CA Planning Group, Exchange Configuration Team, and Hatchery Indicators Teams for DES development, provided feedback on the DES.
FWS	FWS participation has begun now that CA has begun more actively addressing hatcheries.
IDFG	IDFG StreamNet staff worked with IDFG Fisheries staff at all levels of the CA project by participating in planning, DES development, database development, and exchange group meetings.
ODFW	Oregon StreamNet continued to participate in CAPG, DES Development Team, XCT, and StreamNet Technical Committee meetings, along with state and other regional discussions and planning efforts related to CA data flow.
PSMFC	Regular activities during the year included CA Core Team, CAPG, DES development, and XCT. A CA workshop was co-sponsored with PNAMP in April. Project administrative duties were completed. The existing EPA grant was administered, and assistance provided to WDFW in order to complete a new grant application. Project goals and objectives were reviewed with the Executive Committee, and quantitative targets set for obtaining NOSA data in FY 2015.
WDFW	WDFW staff created draft cross-reference of the relevant streams in the Interior Columbia and Willamette recovery domains. Staff developed the code and process to update CA tables with final products.

D CA data - DES and database

CA data - DES and database 160. Create/Manage/Maintain Database

Deliverable: The CA DES is maintained and updated to include new indicators and their supporting metrics and metadata, and CA data are loaded and QA'd in a conforming database. A node on the EPA network is created and an indicator database for the same data exists on StreamNet and is linked effectively to that node.

CTCR	CTCR staff participated in the DES development meetings.
FWS	FWS participation has begun now that CA has begun more actively addressing hatcheries.
IDFG	IDFG StreamNet staff participated in the DES development meetings, and implemented changes and additions of the DES to the HiLI database and application.
ODFW	ODFW staff contributed significant input to CA DES discussions, various forums and email correspondences throughout the year, and updated internal data systems as needed based on adopted DES changes.
PSMFC	C.A. database created based on DES, and accepting data began.

PSMFC Two new versions of the C.A. DES were created during the calendar year, resulting in new data types as well as refinements of existing data types. The most significant changes in version 20140418 from April 18 include: fields to identify specific fish populations and individual data records; standardizations of species/run designations; indicators of whether a record is based on the TRT method; the ability to capture more than one estimate for a population in a year; and a set of metadata fields for every table to identify the record source agency, the reference number, data entry information, the record number in the source database, and whether a record is ready to be freely shared with all.

In version 20140725 from July 25 we indicated required fields, conditionally required fields, and key fields. In both versions we standardized table and field names to avoid programming difficulties when the exchange network was created, as well as making various corrections and improving descriptions.

In addition to those 2 official versions, we made progress on the next version by indicating more required/conditionally required fields, further improving some descriptions and fixing additional errors, and updating ESA-listed salmon and steelhead population names to match NFMS's on-going refinements.

We also nearly completed work on new DES tables for indicators based on number of natural origin juvenile fish outmigrants and on natural origin juvenile (fry-parr) abundance in the wild (i.e., standing stock).

WDFW The Data Manager met with Bio's and Research Scientists in the Lower Columbia to discuss current data format and structure. Internal databases were reviewed to ensure that they contain or could contain the raw data needed to produce the desired outputs to populate the CA database.

The Access version of the CA database was placed on the agency server to test exchanging NOSA and SAR data. Routines and front end portals are being created to populate the tables in the CA database.

An updated script to build a SQL Server CA database with the three adopted tables in DES version 20140418 was received this quarter. Processes to populate these tables and create a DFD for internal purposes was worked on and testing next quarter of this process will take place.

E CA data - compile data

CA data - compile data 159. Transfer/Consolidate Regionally Standardized Data

Deliverable: All available CA indicators and metrics are obtained, updated, converted to the DES format, and exchanged with the CA database.

CTCR Available CA indicators and metrics have been obtained and the process of converting to DES format and exchange has begun.

FWS FWS data related to all known indicators were exchanged with StreamNet.

IDFG Links to data sources were updated, and the queries ran to extract, transform, and load the 1957-2006 sp-su chinook RperS data into the IDFG HiLI database.

ODFW Compiled and submitted 23 NOSA, 3 adult RperS, 1 juvenile RperS, and 1 SAR population estimate using the automated transfer process and the StreamNet API, and provided access to metadata and data analysis flow diagrams. In a second submission, we successfully updated 3 populations and appended new data for 1 population. Development of data analysis flow diagrams throughout the basin, and detailed documentation of field collection and analytical methods used to calculate abundance and productivity indicators and metrics for Snake River and Middle Columbia populations continued.

PSMFC Measurable goals developed thru the Executive Committee, reviewed with the StreamNet partners, and incorporated into the Phase VII work plan.

WDFW The Lower Columbia Data Steward continued working on with the Region 5 data management team the new design of the Traps weirs and Surveys (TWS) database.

Lower Columbia Data Steward is also working with the Region 5 data management team to develop a TWS tablet version to be used this fall for testing data collection at weir/trap and hatchery sites.

The Upper Columbia Data Steward participated in development and design of the revised schema for Region 5 TWS (Traps, Weirs, Survey] restructure. Participated in review of StreamNet CA DES and in internal data flow process to ensure delivery of upper Columbia CA data. Participated in design and development of pilot mobile application TWS for Weirs.

Internal review to identifying data sources for Coordinated Assessments in the upper Columbia Basin. Pilot data was identified and loaded into a draft DES.

F CA data - automated data exchange

CA data - automated data exchange 160. Create/Manage/Maintain Database

Deliverable: Automated feeds of CA data to the CA database are implemented and evaluated for effectiveness, and automated data feeds to NOAAF are initiated.

CTCR CTCR initially used Streamnet's Access Database/API to transfer and update Natural Origin Spawner Abundance data. Beginning in late 2014, CTCR collaborated with Sitka Technology Group to replicate the data transfer so that it occurred from their servers, which is where the CTCR data system of record now resides.

IDFG IDFG StreamNet staff collaborated with PSMFC staff to create and test web services which exchanged data between IDFG and StreamNet HiLI databases.Â Automated exchange of data is planned to begin in 2015.

ODFW Staff created internal databases and applications to extract, transform, and transfer data as necessary and completed the ODFW CA automated data exchange system via the StreamNet API. The process to transfer CA DES data from ODFW internal systems to the StreamNet API was documented. System enhancements were made to increase robustness, validation of the data transfer, and ease of future modification.

PSMFC SQL Server and Access tables were created for CA Populations, Natural Origin Spawner Abundance, Recruits per Spawner and Smolt to Adult Ratios based on approved Data Exchange Standards. Scripts to build these SQL Server tables and an Access database were posted on the StreamNet Coordinated Assessments and PNAMP web sites.

WDFW Work began on automated data feeds to StreamNet CA using the StreamNet API. Internal Agency data systems in are in the process of being modified to contain CA indicator data.

G CA data - dissemination

CA data - dissemination 161. Disseminate Raw/Summary Data and Results

Deliverable: The CA indicators, metrics and metadata are available, consistent with a Data Sharing Agreement on either the StreamNet website or EPA node.

PSMFC Work on data sharing agreement has been ongoing. Offered shared data to NOAA-Fisheries for use in current 5 year status review, but they determined that existing methodology was best for the current process. Automated sharing with multiple organizations and tested data flow. Current focus in on acquisition of NOSA indicators as prioritized by the Exec Comm. Initiating testing and configuration of the EPA node, which should go live in 2015.

H Compile traditional StreamNet data and explore CA-like process for other fish metrics

Compile traditional StreamNet data and explore CA-like process for other fish metrics

159. Transfer/Consolidate Regionally Standardized Data

Deliverable: Data sets are updated as time and staffing allow. State hydrography layers, including streams and lakes, are maintained and updated as necessary. Compile fish data on adult abundance, spawner counts, and estimates of spawning populations, hatchery returns, age composition, habitat, barriers, distribution, juvenile abundance, resident fish, hydrography, and related metrics. As regional priorities for resident fish and other fish metric data are established via a CA-like process, and as time and resources allow, survey fish managers to determine the availability of resident fish and other fish metric data, by priority, to detail the availability, type, and location of data.

CTCR	CTCR's "traditional StreamNet data" included juvenile snorkel densities, redd counts, and video counts. However, the Coordinated Assessments project now captures adult steelhead spawner estimates which the redd counts were a part of. Redd count data and snorkel densities are still available on CTCR's website, and video counts are submitted to and available on the DART website.
CTCR	Resident fish data within the CTCR are managed with separate funding by the Resident Fish Department. The Resident Fish Department maintains and continues to develop their own data systems on resident fish in water bodies on or near the Reservation of the CTCR.
FWS	Data for the most recent Return year was exchanged with regional StreamNet, and minor QA/QC issues with a small amount of older data were resolved.
IDFG	Idaho compiled and delivered fish data to StreamNet as time and staffing allowed.
IDFG	The major sources of resident fish data were updated for 2014. The data are accessible and backed up on the IDFG network.
MFWP	MFWP compiled traditional StreamNet data throughout the year and exchanged the following data: EscData—50 records; Barriers—2 records; Fish Barriers—2 Records; Trend—31 Records; Fish Distribution—231 records; References—5 Records
MFWP	MFWP managed and maintained hydrography data throughout the year. Much QC was done on waterbodies coinciding with the development and refinement of centralized database systems. Relevant hydrography data was exchanged with StreamNet according to contract guidelines.
MFWP	MFWP StreamNet staff reviewed the availability of existing resident fish data and evaluated the possibility of exchanging resident fish data populations(?) using standard StreamNet DES. The decision was not to use the existing DES because Montana's data is structured by community not by species.
ODFW	ODFW submitted 281 updated and 72 new trends containing 5,027 escapement records along with 283 age data records to the StreamNet online query system. Additionally, were submitted. Trend updates originated from the BPA funded projects, the BPA Inventory Data Capture effort, and Recovery Populations within the Columbia Basin. Updates included juvenile spring Chinook and summer steelhead abundance trends for BPA funded projects and recovery populations in the Interior Columbia domain of Oregon. Submitted 6 Barrier table additions, 33 Barrier table deletions, 72 Barrier table record replacements, 24,053 Barrier table records for location update, 2,594 Dam table records for location update, 12 Fish Barrier table additions, 2 Fish Barrier table deletions, 21,872 Fish Distribution table replacement records, 45,373 LocMaster table replacement records. Staff completed the effort to align trend locations and measures to the latest National Hydrologic Dataset and submitted 12,068 updated SuperCodeStreams records.

ODFW Staff created a new version of the NHD-derived statewide whole stream route dataset including a schema to improve alignment with the regional StreamNet Mixed Scale Hydrography dataset. After final review and refinement, staff packaged and submitted 47,845 features to StreamNet.
Metadata for the NHD-geometry derived whole stream route dataset was updated and published to the ODFW Data Clearinghouse.

ODFW Staff developed a resident abundance data acquisition plan to guide the process and inventoried resident fish availability within ODFW and its partners. Results were updated as additional information came to light.

PSMFC

Category	Specie	Max_Data_Year	New_Observations
Adult Return-Est of Spawning Pop	Chinook salmon	2013	466
Adult Return-Est of Spawning Pop	Coho salmon	2010	22
Adult Return-Est of Spawning Pop	Smallmouth bass	2012	12
Adult Return-Est of Spawning Pop	Steelhead	2012	13
Adult Return-Redd Counts	Bull trout	2013	65
Adult Return-Redd Counts	Chinook salmon	2013	440
Adult Return-Redd Counts	Coho salmon	2012	183
Adult Return-Redd Counts	Mixed anad salmonids	2012	9
Adult Return-Redd Counts	Steelhead	2013	337
Adult Return-Spawner Counts	Chinook salmon	2013	1136
Adult Return-Spawner Counts	Coastal cutthroat trout	2012	18
Adult Return-Spawner Counts	Coho salmon	2012	47
Adult Return-Spawner Counts	Steelhead	2013	1184
Dam/Weir Counts (Ad. or Juv.)	Bull trout	2013	3
Dam/Weir Counts (Ad. or Juv.)	Chinook salmon	2013	198
Dam/Weir Counts (Ad. or Juv.)	Coho salmon	2013	102
Dam/Weir Counts (Ad. or Juv.)	Rainbow trout	2013	3
Dam/Weir Counts (Ad. or Juv.)	Sockeye salmon	2013	7
Dam/Weir Counts (Ad. or Juv.)	Steelhead	2013	204
Est of juvenile populations	Chinook salmon	2012	27
Est of juvenile populations	Steelhead	2012	19
Fish Counts	Bull trout	2012	6
Fish Counts	Chinook salmon	2012	86
Fish Counts	Pacific lamprey	2012	7
Fish Counts	Smallmouth bass	2012	12
Fish Counts	Steelhead	2012	78
Fish Counts	Westslope cutthroat trout'12		2
Harvest - Freshwater/Estuary	Chinook salmon	2012	125
Harvest - Freshwater/Estuary	Coho salmon	2010	22
Harvest - Freshwater/Estuary	Steelhead	2010	22
Harvest - Freshwater/Estuary	White sturgeon	2012	18
Hatchery - Returns	Chinook salmon	2013	48
Hatchery - Returns	Coho salmon	2013	2
Hatchery - Returns	Steelhead	2013	21
Age Data associated with data above			380
Dams			108
Barriers			236
Barriers effects on particular species			100
Fish Distribution			35
New Trend series			57

PSMFC Resident fish data discussions were held with all StreamNet partners and with contractors working for NPCC and tasked with populating Council HLIs and dashboards with data. Ongoing assistance will be provided for this effort, which is expected to take several years.

WDFW	Reviewed BPA project metrics, and conducted an internal survey of WDFW data stewards to determine most appropriate WDFW databases for each metric. Final adoption of WDFW's draft new stream layer has repeatedly been delayed. When it is adopted, the StreamNet Location Manager will fully scope the layer & draft a proposal to integrate MSH with the new line work. Partners continue working to improve the linework, have different business needs for the level of accuracy and different methods to generate the best linework.
WDFW	WDFW posted new stream (GeoLib.DBO.LLID_Routes) and fish distribution (GeoLib.DBO.SWIFD) on their corporate server. Both are based on a snapshot of NHD lines. Notably WDFW's older corporate layer (str24) was not removed yet and likely will remain until WDFW has fully adopted the new hydrography layer by moving all pre-existing data to georeference LLID_Routes. Final adoption of WDFW's draft new stream layer has repeatedly been delayed. When it is adopted, the StreamNet Location Manager will fully scope the layer & draft a proposal to integrate MSH with the new line work.
WDFW	No specific work was done during this period due to other competing priorities

I Data exchange standards and database for resident fish and other metrics

Data exchange standards and database for resident fish and other metrics 160. Create/Manage/Maintain Database

Deliverable: Discussions are held with states, tribes, NPCC staff, and others concerning development of DES for resident fish and other fish metrics. Timelines and priorities are established for developing regional DESs. The existing StreamNet DES and database for fish abundance, resident fish presence, and other fish metrics are maintained and data are loaded into the StreamNet database and quality assured as they are received.

CTCR	CTCR participated in the SNTC meetings held in 2014.
FWS	Q-2 Input: ODFW prepared for and participated in the StreamNet Technical Meeting held in March. Staff agreed to minor changes and additions to codes and conventions in the DES.
IDFG	IDFG StreamNet staff participated in SNTC meetings to maintain and develop Tier 2 DES like the Escape table.
MFWP	MFWP StreamNet staff have determined that no existing DES will work for exchanging resident fish population information. However, no significant progress was made this calendar year on developing a DES due to competing priorities
MFWP	As part of determining the availability of resident fish data and metrics the existing DES for resident fish were reviewed. It was determined that the number of revisions needed to existing DES' to accommodate existing data warrants the creation of new DES.
ODFW	ODFW regularly participated in CA planning and technical meetings as well as StreamNet Technical Committee meetings. Staff contributed to escapement table, Steering Committee proposals, and other DES discussions. Juvenile DES discussions focused on CA related data. No significant progress was made this calendar year on developing a resident fish DES.
PSMFC	Discussions held with NPCC staff and contractors about coordinating with the resident fish data efforts associated with the Council initiative on dashboards and HLIs. StreamNet staff will support this effort.
PSMFC	Relatively minor changes were identified and agreed to during 2014. A new version of the StreamNet DES will be promulgated in calendar year 2015.
WDFW	WDFW continued regular participation in CA planning and technical meetings as well as StreamNet Tech Com meetings.

J Regional Coordination

Regional Coordination 189. Coordination-Columbia Basinwide

Deliverable: StreamNet participants coordinate with regional entities to manage and improve data sharing at the Columbia Basin scale. Coordinated Assessment-like efforts are initiated to determine specific target data needs and then collaboratively develop standards and methods that simplify, standardize, and automate data flow to meet regional priorities.

All	Communication with NFHs is ongoing.
All	StreamNet partners presented information on the project at multiple forums, including the NPCC, AFS, and related organizations.
CTCR	CTCR anadromous division coordinated with other separately funded CTCR programs such as the Chief Joseph Hatchery and the Resident Fish Department to keep them informed of the efforts and data structure CTCR was using for the Coordinated Assessments project.
FWS	Routine data collection was accomplished with the majority of National Fish Hatcheries. Additional effort was required for one hatchery.
IDFG	IDFG StreamNet staff continued to assist and encourage non-FWP project sponsors to manage data their data within secure and accessible data repositories like the Standard Stream Survey (SSS) and Lake and Reservoir Survey (LRS) databases. IDFG StreamNet staff coordinated data collection, compilation, management, and access with federal, state, and tribal collaborators. IDFG StreamNet staff coordinated data needs and priorities for the FWP and potential data sources within FWP projects.
MFWP	Staff participated in Western Governors Association (WGA) efforts which relate directly to the use of StreamNet data. No other support was identified or requested.
MFWP	StreamNet staff attended annual meeting in Bozeman for Yellowstone Cutthroat Trout Geographic Management Unit (GMU) personnel. Staff coordinated data update meetings. Updating YCT Assessment database with 2014 data and observations is in progress and will finish in early 2015
ODFW	Oregon StreamNet contributed to BPA's effort to identify data collection repositories by identifying and prioritizing appropriate repositories and URLs for Metric subcategories for project sponsors within ODFW. Staff also reviewed and provided comment on several draft Regional Data Sharing Agreements. Coordination with federal, state, and tribal partners for enhancing the collection and management of data related to the StreamNet project mission and efficient flow of data to the StreamNet database beyond the CA process was limited in CY-2014.
PSMFC	Prioritized coordination efforts through the formation of the Executive Committee, CA project, improved website, presentations to NPCC, and other activities.
PSMFC	Held a data integration forum in September, 2014. Direct improvements were made as a result of the forum, including development of a common facilities GIS dataset to improve quality and function in StreamNet, RMIS, and PTAGIS.
PSMFC	Worked with PNAMP to foster documentation and encourage improvement and participation in mm.org. Prioritizing documentation of analytical protocols used to calculate NOSA indicators.
PSMFC	Integrated Data Management Objectives into the current SOW, the CA project, and the general priorities of the StreamNet project.
WDFW	WDFW provided support to the program, including leadership of the CA project through the EPA grant process.

K Disseminate Data

Disseminate Data 161. Disseminate Raw/Summary Data and Results

Deliverable: Website provides functional, attractive, and relevant access to key data, including CA indicators. Requests for information or assistance are responded to within one business day at PSMFC. If within StreamNet capabilities, requested help or information is provided as rapidly as reasonably possible within existing resources.
All data that are submitted by the source agencies are available for review and download through the StreamNet online query systems and as web services.

CTCR	CTCR responded to 12 data requests this year which were either met by directing users to appropriate data sources, or by running specific queries in the OBMEP database to fulfill the request.
FWS	No StreamNet specific requests were noted during the report year.
IDFG	IDFG StreamNet staff responded to at least 32 data requests. The number of data requests continues to decrease as the number of IFWIS users increases, and people find data for themselves.
MFWP	MFWP staff responded to 55 requests in 2014. 48 requests were fully satisfied, 7 were partially satisfied with requestors referred to appropriate data sources.
ODFW	Oregon StreamNet responded to 62 requests this year; 56 of which were completely satisfied.
PSMFC	Made significant improvements to the website and the Data Store in 2014. The StreamNet web site was redesigned and the new version made public in December.

PSMFC Direct requests for information have become less frequent over the years, as our web site has been more stable and our services more robust. Only 14 direct requests were received in 2014. These requests break out as follows:

AGENCY TYPE

College / university = 1
General public / other = 1
Government, county / local = 1
Government, federal = 4
Government, state = 1
Government, tribal / tribal organization = 1
Industrial / commercial = 1
Nonprofit organization = 2
Private consultant = 1
Unknown = 1

REQUEST TYPE

Data request = 2
GIS data / map = 3
Help finding information = 2
Help with data interpretation / analysis = 1
Library / documents = 3
Report error or problem = 1
Other = 2

OUTCOME

Could only refer user to other info source(s) = 2
Request fully satisfied = 7
Request partially satisfied = 5

WDFW WDFW StreamNet staff responded to 10 data requests this year pertaining to spatial data and data sharing with ODFW as well as escapement data for Columbia and non Columbia tributaries.

L Enhance data efficiency - system development

Enhance data efficiency - system development 160. Create/Manage/Maintain Database

Deliverable: Agency database systems and procedures are enhanced over time to improve data flow efficiency. Web services are established, and automated flow of data to StreamNet is tested.

CTCR Beginning in late 2014, CTCR collaborated with Sitka Technology Group to establish direct connections between StreamNet's and Sitka's servers, which is where the CTCR data system of record now resides.

IDFG	IDFG StreamNet staff completed, corrected, and standardized data source workbooks for natural origin HiLI data. This will reduce data entry errors, and speed the data flow to the StreamNet HiLI database.
MFWP	StreamNet staff have implemented internal scripting to allow for a more streamlined process for submitting data to StreamNet. StreamNet staff and MFWP application developers did not have time or resources to investigate or implement web services for MFWP data.
ODFW	Staff added 24 new Data Clearinghouse records, and updated 81 existing records, increasing overall data availability and our ability to flow data using automated approaches. Staff developed and adopted a file naming standard specifically for VSP data files to improve overall data flow. This standard will be evaluated for applicability across other datasets. Oregon StreamNet published, configured, and field tested a pilot web map for supporting mobile data access, update and creation of fish passage barrier data, and explored the potential to test this out more broadly across the basin.
PSMFC	Automated data flow has been initiated for several partners.
PSMFC	Continued to provide financial support to partners for database development and maintenance.

M Coordinate testing of field data capture devices & software

Coordinate testing of field data capture devices & software 189. Coordination-Columbia Basinwide

Deliverable: Conduct a comprehensive survey (to include a wide variety of devices and users) on the durability and utility of these devices in various field settings. Results are posted on the StreamNet website, and shared at professional meetings and in publications. Results are reported at a workshop held during the FY, and used to guide additional work in the future.

CTCR	CTCR was not involved in the field trials of data capture devices, but was able to provide information on their experience with electronic field devices that they already use and have developed custom applications for. CTCR participated in the Emerging Technologies in Mobile Data Collection Workshop in the fall of 2014.
IDFG	IDFG staff participated in the EFDC Workshop. They presented their findings, and participated in several follow up meetings for further development of the snorkel app, and again shared their findings.
MFWP	MFWP did not have the opportunity to assist in field trials during the contract period as the pilot projects focused on Coordinated Assessment data or data types MFWP does not collect.
ODFW	Working with Regional StreamNet staff, two ODFW field projects participated in device trials for creel and spawning ground survey data collection. ODFW and StreamNet staff participated in the Emerging Technologies in Mobile Data Collection Workshop. Information was summarized and distributed to inform device acquisition decisions.
PSMFC	PSMFC co-sponsored a workshop on device usage with Sitka Technologies and PNAMP in 2014. Over 100 people attended. Also held follow-up discussions on development of snorkel survey applications with several sponsors. Planning a second workshop in 2015.
PSMFC	PSMFC deployed a limited number of devices in 2014, followed up and serviced projects using the devices and the Fulcrum software application, as needed. Developed revised plans during the calendar year which involved partnering with Sitka Technologies and PNAMP on a coordinated effort to improve the use of mobile technology in field data collection, resulting in the November 2014 workshop. Data entry of the full results of the handheld devices trials was not yet completed in 2014; data entry will be completed and a final report of the 2014 tests will be completed in 2015.

WDFW WDFW representatives attended and participated all workshops sponsored by PSMFC relating to Mobil and CA development this year

N Metadata exchange through Monitoring Explorer pilot project

Metadata exchange through Monitoring Explorer pilot project 161. Disseminate Raw/Summary Data and Results

Deliverable: Metadata for the pilot explorer are provided to Sitka via web services in conformity with the project metadata exchange standards.

PSMFC Continued participation in this work element.

O Data sharing agreements

Data sharing agreements 161. Disseminate Raw/Summary Data and Results

Deliverable: Data Sharing Agreements are implemented effectively for CA and the Data Store.

PSMFC Data sharing agreements were written, reviewed, modified, and adopted for both the CA project and the Data Store.

P Infrastructure and base operations

Infrastructure and base operations 160. Create/Manage/Maintain Database

Deliverable: Project infrastructure and databases are maintained and updated as needed to acquire, manage and disseminate referenced data.
Specific actions may include:
1. Computer system administration, including maintenance and upgrades to hardware and software, backup and recovery, and system security, as necessary
2. Application of appropriate data management and QA/QC procedures in loading and managing data and creation of metadata
3. Creation and maintenance of interfaces and applications to enhance data flow efficiency
4. Participation in routine management and improvement of the StreamNet Data Exchange Standard working through the Steering Committee.
5. Obtain reference documents for all data developed under WE 159 and submit them for inclusion in the collection and catalog, and,
6. Encourage and support the flow of agency reports and publications related to Columbia Basin fish and wildlife resources to the library.
7. Maintain and further develop integrated search capabilities based on the Fish Species geo-spatial datasets.

CTCR CTCR collaborated with Sitka Technology Group to host and manage CTCR's OBMEP database. Sitka maintains database infrastructure and runs routine and redundant backups of CTCR data. They also maintain existing custom applications and are developing new tools for collecting, editing, finalizing, and distributing fisheries data.

FWS FWS IT continues to support the infrastructure and software required to perform StreamNet activity.

IDFG	IDFG StreamNet staff did regular system and database administration, backup and recovery. We also updated applications and web services for StreamNet data and Coordinated Assessments. The IDFG spatial fishery databases were updated with new data. Existing applications and databases were enhanced per user feedback, and new applications and databases were supported by technical staff.
MFWP	MFWP is actively maintaining, designing and developing the database and infrastructure of the Fisheries Information System.: MFWP added stream and fish barriers, as well as hatchery stocking and six year stocking plan data into web data entry application for MFWP biologists. MFWP Data Services staff developed Python tools for updating spatial hydrography layers and automating uploads of standalone database information into Montana Fisheries Information System. MFWP Data Services staff also migrated all mapping services to ArcServer 10.1 and expanded types of feature datasets to Montana FWPMapper, our online mapping services and continue to update References database for documents of refereed and gray literature. StreamNet and MFWP staff attended StreamNet technical working group net meeting (16 Dec 2014)
ODFW	Routine system management and maintenance was performed throughout the year. The data structure and user interface for Oregon's Trend database were updated and enhanced. QA/QC was opportunistically conducted during data updates. Data management protocols and manuals were updated to accommodate CA and DES modifications and describe data flow, as needed. Computers were migrated to Windows 7 as needed due to end-of-life support for Windows XP. Server and application migration to Windows Server 2012 and SQL Server 2012 was initiated. Processes to mitigate against catastrophic failures were updated. Migration to ArcGIS Server 10.3 was also started. ODFW updated and added new references to the StreamNet Library in support of BPA funded projects and Coordinated Assessments, submitting 17 updated reference records, and 30 new documents to the Library.
PSMFC	Maintained operations of the database(s), improved functionality of the Data Store, and improved website design and function. Maintained DES through periodic review and discussion with partners. Met with library staff to resolve issues related to updating links to documents. Implemented improvements to the facilities mapper across multiple PSMFC databases and programs.
WDFW	WDFW continued to develop and maintain regional and corporate systems which hold and report SN and CA data sets

Q Manage project activities

Manage project activities 119. Manage and Administer Projects

Deliverable: Regional data management priorities are addressed and project staff and budgets are effectively managed. Work detailed in this SOW is accomplished. Required SOW and budget documents are prepared and submitted on schedule.

All	Regular meetings of both groups were held in 2014. The Executive Committee started to provide guidance to the CA project in 2014.
All	Completed as required in CY 2014.
All	Completed as required in CY 2014.
All	Completed as required in CY 2014.
All	Completed as required in CY 2014.
CTCR	CTCR staff participated StreamNet Steering Committee meeting.

FWS	Pastor participated in Steering Committee activities and assured that activities were occurring as planned. Assured that activities were occurring as planned.
IDFG	IDFG StreamNet staff participated in project management and the StreamNet Steering Committee meetings. IDFG StreamNet staff and budget were effectively managed. Participated in limited discussions of the SOW. IDFG StreamNet staff provided input for the FY 2015 Statement of Work and Budget. IDFG StreamNet staff were effectively supervised.
MFWP	A StreamNet data technician, Jane Horton, was brought on board in October after the previous incumbent accepted another position at MFWP. MFWP StreamNet staff participated in project management, StreamNet Technical and Steering committee meetings. Budgets were effectively tracked and managed. Staff participated in all relevant budget and Statement of Work discussions and provided input for FY2015 SOW and budget.
ODFW	ODFW StreamNet staff participated in project management, StreamNet Technical and Steering committee meetings. ODFW StreamNet staff were effectively supervised and budget were managed throughout the year. ODFW StreamNet staff provided input to the FY-2015 Statement of Work and Budget, and submitted updated inventory and cost share reports to Regional StreamNet. Our vacant Application Developer/Database Manager position was filled early in the year.
PSMFC	Established Exec Committee. Held regular meetings with that group, the Steering Committee, BPA, NPCC, and others to ensure program alignment with regional fish and wildlife managers. Substantially simplified and streamlined the SOW from FY 14 to FY 15. Reduced PSMFC staff dependence on BPA budget and made funds available to other partners.
PSMFC	Completed as required in CY 2014.
PSMFC	Completed as required in CY 2014.
PSMFC	Completed as required in CY 2014.
PSMFC	Completed as required in CY 2014.
PSMFC	Completed as required in CY 2014.
PSMFC	Completed as required in CY 2014.
PSMFC	Completed as required in CY 2014.
WDFW	WDFW StreamNet staff actively participated in Steering Committee and Executive meetings, conference calls, Coordinated Assessment Planning Committee, and others throughout the year.

R Annual Report 1/1/2014 - 12/31/2014

Annual Report 1/1/2014 - 12/31/2014 132. Produce (Annual) Progress Report

Deliverable: Finalize and submit 2015 Annual Report to BPA for upload into Pisces and cbfish

CTCR	CTCR provided input for the Annual Report
FWS	Input was provided for the Annual Report.
IDFG	IDFG StreamNet staff provided their input for the Annual Report.

MFWP	MFWP StreamNet staff provided input for the annual report.
ODFW	Oregon StreamNet provided input to the CY 2013 Annual Report.
PSMFC	Completed as required in CY 2014.
WDFW	Completed as required in CY 2014.

S Periodic Status Reports for BPA

Periodic Status Reports for BPA — 185. Produce Pisces Status Report

Deliverable: Status Report submitted on quarterly schedule.

All	Completed as required in CY 2014.
All	Completed as required in CY 2014.
All	Completed as required in CY 2014.
All	Completed as required in CY 2014.

T Produce Calendar Year 2014 BiOp Report

Produce Calendar Year 2014 BiOp Report — 202. Produce BiOp RPA Report

Deliverable: Finalize and submit Calendar Year 2014 BiOp Report to BPA for upload into Pisces and cbfish.

PSMFC	Completed as required in CY 2014.
PSMFC	Completed as required in CY 2014.
PSMFC	Completed as required in CY 2014.

V Other accomplishments

Other accomplishments — 986. Catch-all for FY-14 SOW items or anything else in Calendar Year 2014

Deliverable: Catch-all for elements from the FY-14 SOW or anything else you'd like to report

CTCR	CTCR did not conduct any work beyond the SOW.
FWS	Nothing else to report.

IDFG	IDFG StreamNet staff did not do any work outside of the SOW.
MFWP	MFWP StreamNet staff did not conduct any work outside of the SOW
ODFW	Culminating efforts started in CY-2013, Oregon StreamNet staff were instrumental in the ODFW Director disseminating a memo to staff supporting simple metadata development across the agency and spelling out the near term objectives.
PSMFC	Work has been reported elsewhere.
WDFW	WDFW StreamNet staff did not do any work outside of the SOW.