

Columbia Basin PIT Tag Information System (1990-080-00)

2013 Annual Report

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Table of Contents

Table of Contents.....	2
Executive Summary.....	2
Coordination and Data Management for RM&E.....	3
Operate and Maintain the PTAGIS System	3
Install, Operate and Maintain Interrogation System in Field Locations	3
Administration, Management and Coordination.....	4
Introduction.....	5
Background	5
Mark, Recapture and Recovery Data	5
Observation Data	7
Validation Codes and Data Specifications.....	7
Large Scale Interrogation Sites.....	7
Small Scale Interrogation Sites.....	9
Separation by Code	10
Coordination and Data Management for RM&E.....	11
Operate and Maintain the PTAGIS System	11
Install, Operate and Maintain Interrogation System in Field Locations	14
Administration, Management and Coordination.....	17
Results.....	20
Coordination and Data Management for RM&E.....	20
Operate and Maintain the PTAGIS System	20
Install, Operate and Maintain Interrogation System in Field Locations	29
Administration, Management and Coordination.....	36
Synthesis of Findings: Discussion/Conclusions.....	43
Coordination and Data Management for RM&E.....	43
Operate and Maintain the PTAGIS System	43
Install, Operate and Maintain Interrogation System in Field Locations	47
Administration, Management and Coordination.....	49

Executive Summary

The Columbia Basin PIT Tag Information System (PTAGIS) is a coordination and data management project of the Pacific States Marine Fisheries Commission (PSMFC). Data are contributed from regional agencies and are accessible to all

entities. This project is an important, prerequisite component of all PIT Tag research conducted for the Fish and Wildlife Program. 2013 marks the 25th anniversary of this program.

The PTAGIS program's responsibilities include direct operations and maintenance of 25 large scale interrogation sites throughout the Columbia Basin that provide the majority of 160 million observation events available in the database system. PTAGIS also maintains the Separation-by-Code (SbyC) systems at eight of these sites that selectively segregate individual PIT-tagged fish from other tagged and non-tagged fish.

Coordination and Data Management for RM&E

In addition to the on-going work described throughout this report, three significant milestones were delivered in 2013:

- A multi-year effort to upgrade the database and web system infrastructure was completed without any impacts on data collection, delivery or integrity.
- Two new adult detection sites were installed at The Dalles dam using a highly efficient and low cost *thin wall* antenna innovated by PTAGIS.
- Evaluation of new M4 interrogation software deployed at all large scale interrogation sites was deemed a success.

Operate and Maintain the PTAGIS System

2013 data contributions into PTAGIS were similar in terms of quantity and composition as compared to the past few years:

- 2+ million new tagged fish
 - 73% Chinook, 23% Steelhead, 3% Coho, <1% others
 - 71% Hatchery, 27% Wild, <2% Unknown
- 11+ million detections (observations) representing 883,536 unique fish
- 92K fish were reported as recaptured
- 60K recoveries/mortalities reported at year's end

The infrastructure upgrade included the database and web server platforms as well as interrogation software (M4) operating in the field. The only legacy component remaining is the field tagging software (P3). Evaluating the new systems required operating their legacy counterparts in complete redundancy throughout the year to ensure data continuity and integrity. The evaluation was made even more challenging due to an unplanned, in-year budget cut that hastened schedule and increased workload. Adversity among the user community during the upgrade process was mitigated with effective coordination using new tools such as email campaigns, webinars, surveys, forums and online training videos.

The new infrastructure is built upon prevalent, cost-effective and extensible technology that will be further refined and documented as time goes on. The true measure of success will be the system's ability to adapt to the evolving needs of the community it serves. Some of the data and metadata have already been enhanced in the new system. However, effective evolution of the PTAGIS data model will require upgrading the field tagging software (P3) which is the highest of priorities for next year.

Install, Operate and Maintain Interrogation System in Field Locations

The two new adult interrogation sites at The Dalles dam (TD1 and TD1) operated at 99.57% detection efficiency using the new *thin wall* antenna technology innovated by PTAGIS and are now considered permanent installations. There are

on-going discussions this antenna technology will be installed in adult fishways at Lower Monumental, Little Goose and Ice Harbor dams in the next year or two.

Established interrogation sites operated and maintained by PTAGIS had an overall 99.06% detection efficiency. All of the automated reporting tools used by PTAGIS staff for interrogation site operations and maintenance were recreated and validated as part of the infrastructure upgrade. 70 transceivers (readers) at sites with adult fishways were upgraded to the FS2020 model that improved detection efficiency and require less on-site maintenance due to the auto-tuning capabilities.

An evaluation of the new M4 interrogation software was proven a success at all large scale interrogation sites. The legacy software platforms used for the evaluation will be removed from these sites in 2014. The legacy software, MiniMon, will be supported through 2014 until M4 can be refined and documented for use by other agencies at small scale interrogation sites.

Staff coordinated and implemented 17 SbyC projects for various researchers in 2013. This was the first year juvenile lamprey were targeted for separation. M4 interrogation software was used to operate the 17 SbyC diversion gates and had an impressive 98.4% overall efficiency rate.

Administration, Management and Coordination

All funding packages and other contract-related deliverables were provided to BPA on schedule. The regional market for technical positions has become much more competitive in the last few years and is a concern for retaining project staff and the availability of qualified subcontractors. A new inventory management system was procured and deployed this year to manage the project's 1,400 assets at 27 separate locations. Technical support and data contributor coordination activities were enhanced with new features included in the infrastructure upgrade.

Staff have been coordinating and evaluating the development of a new Biomark FS3001 transceiver as a much needed replacement for the first generation 'one-off' transceiver designed almost a decade ago to operate the large antenna at the Bonneville Corner Collector (BCC) interrogation site. The schedule for delivering a stable FS3001 has been pushed into 2014 and PTAGIS will most likely have to rely on the existing transceiver inventory that is prone to failures and requires additional maintenance resources.

Additional data validation has been implemented to identify spurious tags (spontaneously generated in larger antenna fields) as well as to discourage the use of substandard tagging technology within the Basin. As a shared concern among staff and the PTSC, this validation process will be enhanced next year and additional technical coordination will be provided to educate the community.

PTAGIS distributed over 1.6 million tags to various FWP in 2013 using an online request/approval service featured on the new website. Of those tags, 1% were sampled for quality assurance (QA). Staff are making progress on enhancing the automation of the QA process to improve the sample to 3%-5% which would increase the probability of detecting short-run manufacturing defects.

Progress has been made on the redevelopment of a *PIT Tag Forecaster* application that was requested by the BPA this year to help quantify future marking efforts on various populations of fish. PTAGIS is providing the technical resources to deliver this application in early 2014 and the Action Agencies, NPCC and NOAA will provide the necessary technical coordination to ensure that regional entities update the forecasts annually.

Introduction

The Columbia Basin PIT Tag Information System (PTAGIS) has been established for 25 years and is the centralized database for PIT-tagged fish in the Columbia River Basin. PTAGIS provides custom software for contributors to collect tagging and interrogation data, manages the database, and coordinates with fishery agencies and organizations. In addition, PTAGIS collects automated detection data and designs, installs, and maintains the equipment that records those detections. All data contributed to and collected by PTAGIS are freely available through the PTAGIS website (www.ptagis.org).

The PTAGIS project is organized into data systems staff located at PSMFC headquarters in Portland, Oregon and field operations staff with an office in Kennewick, Washington. A PIT Tag Steering Committee (PTSC) provides program oversight, data standardization and technical coordination to the community.

Background

This section provides a broader context for the on-going coordination and data management efforts described subsequently as program objectives and deliverables. The two basic types of datasets contributed to PTAGIS from the region are summarized as:

- Mark Recapture and Recovery (MRR) Data
- Observation Data

To standardize the data contribution process within the region, validation codes and specifications are also described. Large and small scale interrogation sites are defined and a summary of the separation-by-code (SbyC) process is included as additional background.

Mark, Recapture and Recovery Data

The vast majority of PIT tag mark, recapture and recovery (MRR) data are contributed from researchers in the field using custom tagging software developed and supported by PTAGIS called P3.

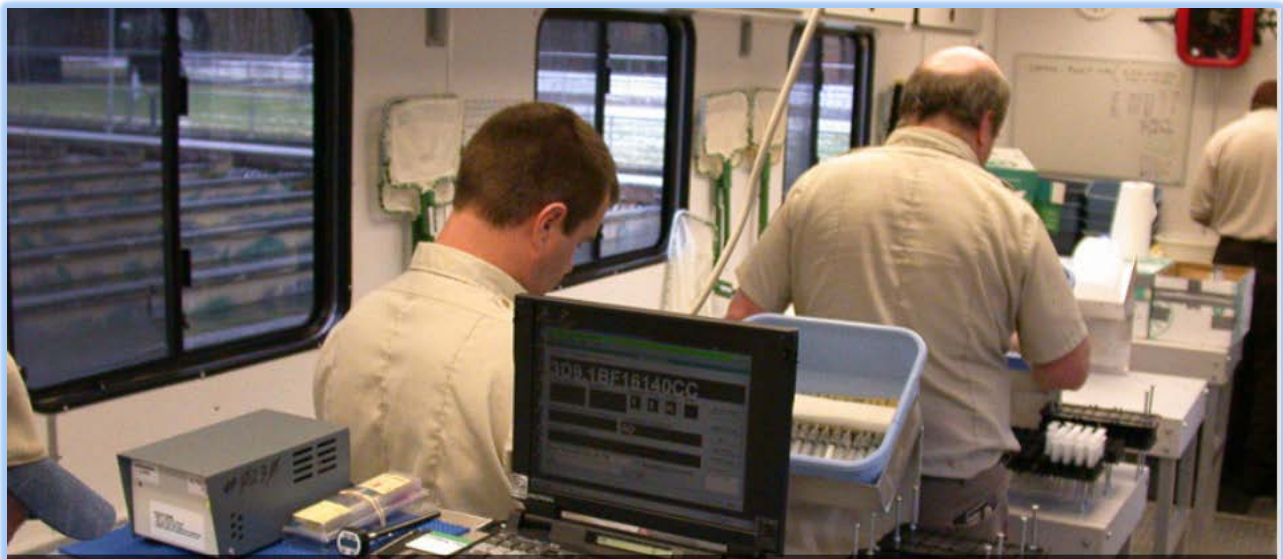


Figure 1. PTAGIS tagging software being used inside a tagging trailer at a hatchery.

The regional-scale MRR dataset uniquely identifies the agency or individual responsible for the contributed data as well as a contact to provide a broader context for project-specific research. A date and a registered MRR site specifying when and where the event occurred is also included.

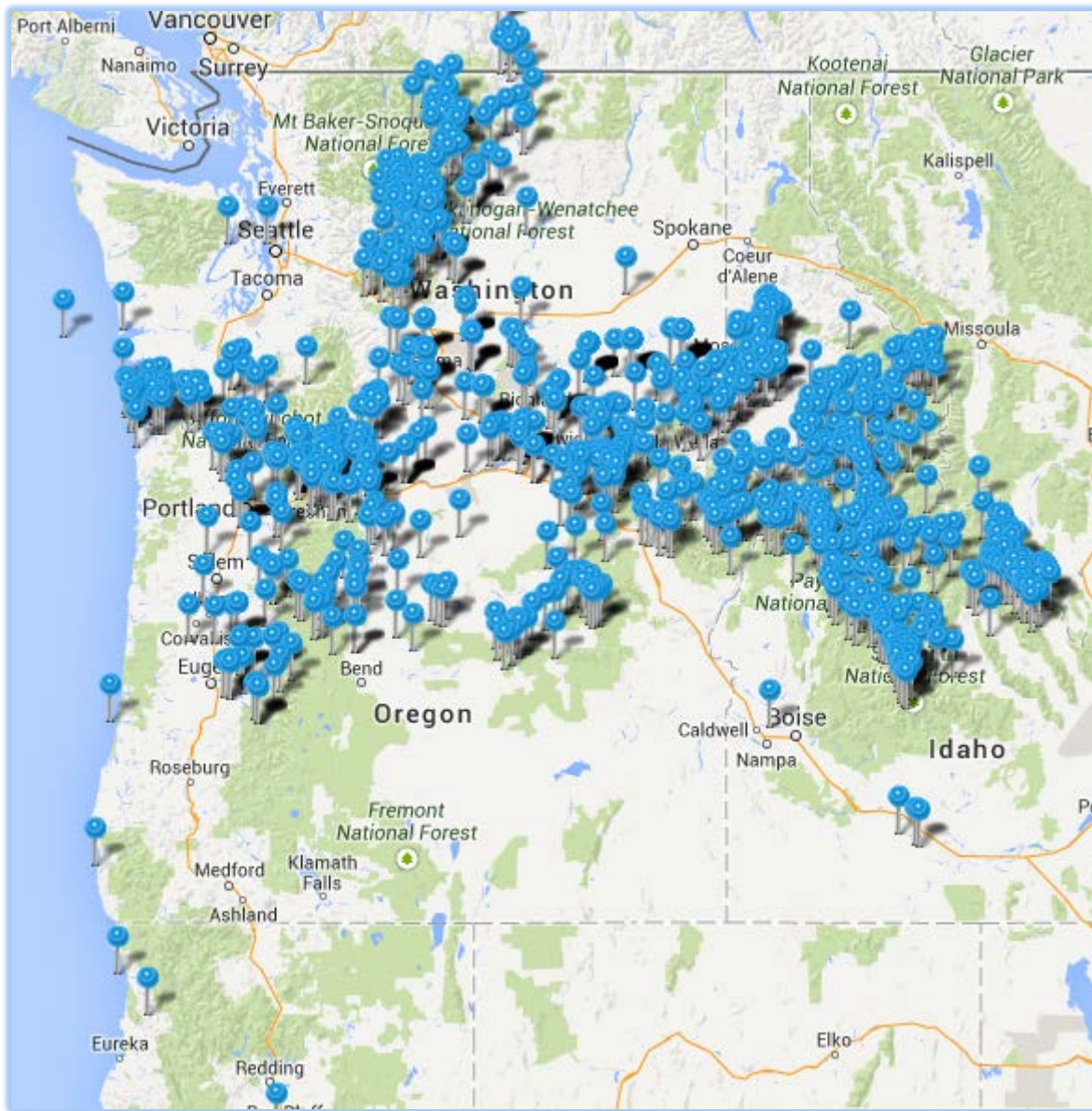


Figure 2: Map of MRR Sites¹ registered in PTAGIS.

The MRR dataset contains individual records for each fish marked or recovered by unique PIT tag code with the species, run, rearing-type designation and other standardized, codified fields to indicate the biological disposition of the animal. Salmon and steelhead represent the vast majority of all records submitted into PTAGIS but other species marked in the region can also be contributed such as lamprey, bull trout and sturgeon.

¹ Interactive map of registered mark/recapture/release sites in PTAGIS: <http://www.ptagis.org/sites/map-of-mrr-sites>

Observation Data

Observation data represent the passive detection of fish marked with a PIT tag at established interrogation sites within the Basin. The unique PIT tag code, location and the date/time is recorded for each passive detection. PTAGIS standardizes the reporting of all dates and time (MRR datasets as well) in Pacific Standard Time (PST).

Numerous detections can occur on a single antenna as a PIT tag passes through its field. An observation record represents the aggregation of all detections that occur within 1 second on a single antenna at a site. These observation records can be further aggregated to the site level, providing one record for each tag detected at a site, summarizing the first and last observation details (antennas and timestamps).

Observation and MRR data are collated in a high-performance reporting system to provide a complete record of fish migration. In rare situations, observation data may be contributed ahead of MRR data and the PTAGIS system temporarily identifies these fish as 'orphan' records.

Validation Codes and Data Specifications

PTAGIS uses the term *validation codes* to represent the standardized agency contacts, registered MRR sites, species, run and other codified data and metadata. A web-enabled workflow² allows researchers to request new validation codes, PTSC to approve the request, and staff to implement them in the database. The current validation codes can be updated in the tagging software with a push of the button and are also published on the website³.

An online data dictionary⁴ provides definitions for each type of validation code and other terms/attributes used throughout the system as well as an accompanying specifications document⁵. The specifications document also provides detail on creating tagging and interrogation data files to facilitate data submission from systems developed outside of PTAGIS.

Large Scale Interrogation Sites

Over 160 million observation records have been contributed to the PTAGIS system and an overwhelming majority of those come from large scale interrogation sites located at Federal Columbia River Power Systems (FCRPS) projects on the Columbia and Snake rivers. The electronic detection systems at these sites are operated and maintained by PTAGIS staff under a *Memorandum of Understanding (MOU)*⁶ between BPA and USACE. The locations of the large scale interrogation sites are displayed in *Figure 3* and the operations and maintenance (O&M) tasks performed by PTAGIS field staff are described subsequently in this report.

² Online service to request and approve new validation codes: <http://www.ptagis.org/services/request-new-validation-code>

³ Current PTAGIS Validation Codes: <http://www.ptagis.org/services/current-validation-codes>

⁴ Online PTAGIS Data Dictionary: <http://www.ptagis.org/data/data-dictionary>

⁵ 2009 PIT Tag Specification Document: <http://www.ptagis.org/docs/default-source/ptagis-program-documents/pit-tag-specification-document-2009.pdf?sfvrsn=12>

⁶ MOU between BPA and USACE defining roles for installing and maintaining PIT tag infrastructure: <http://www.ptagis.org/docs/default-source/ptagis-program-documents/pit-mou.pdf?sfvrsn=6>

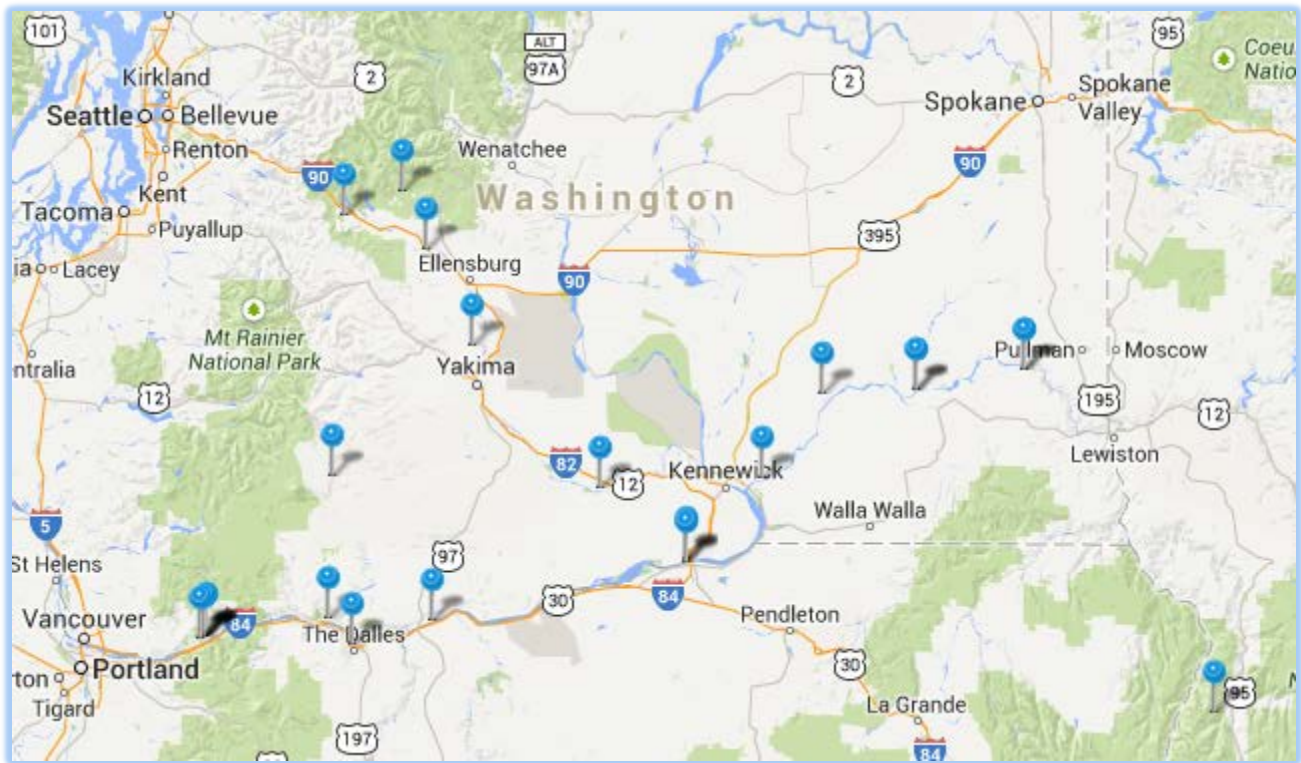


Figure 3. Map of Large Scale Interrogation Sites Maintained by PTAGIS

Juvenile bypass facilities require complex sets of redundant antennas to ensure a high probability of detection in conditions where fish move en mass and at high speeds. These antennas are identified in *Figure 4* as boxes with unique 2-digit identifiers. Sites with adult fishways require larger antennas designed to be retrofitted into ladders, weirs and counting windows.

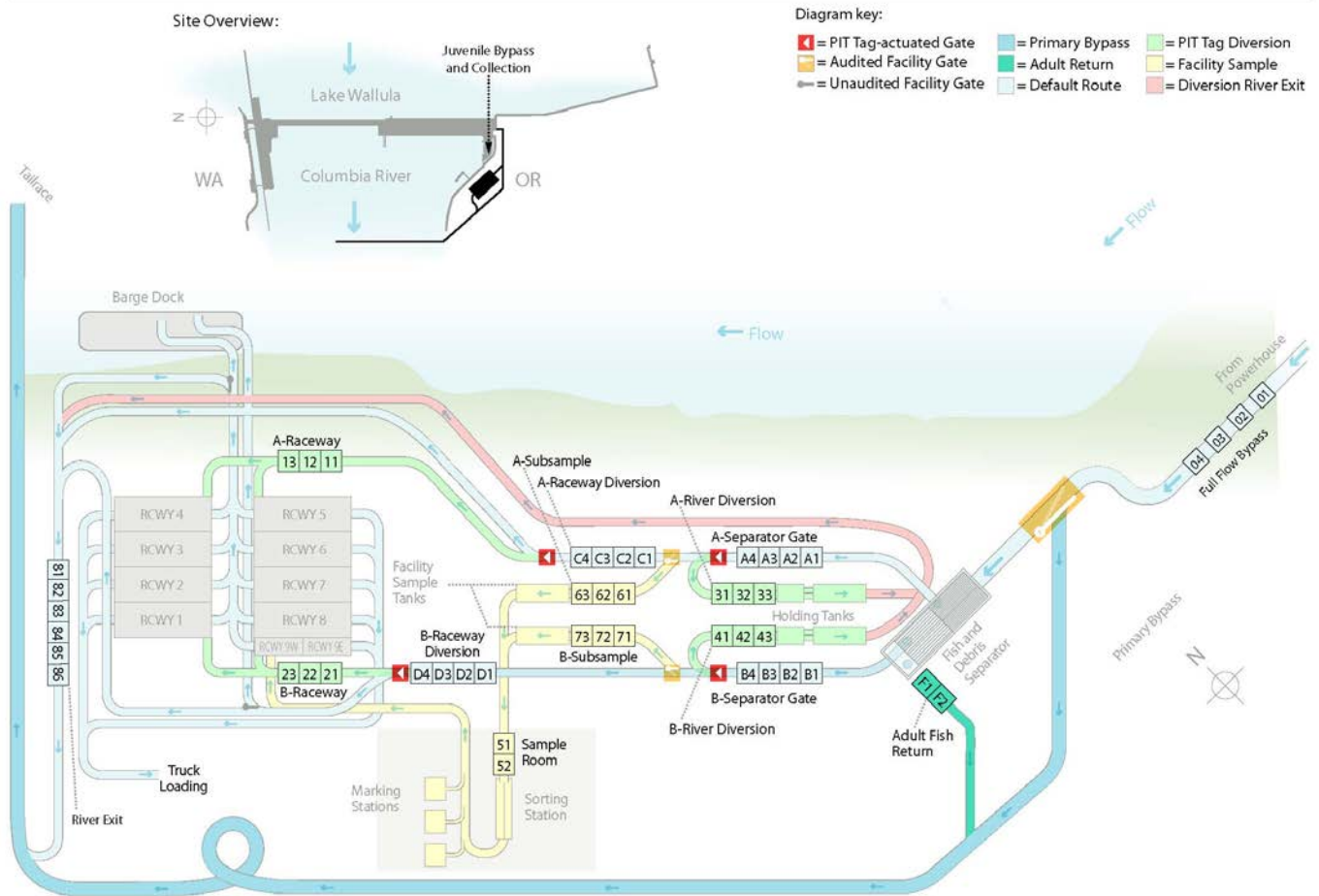


Figure 4. PIT Tag Interrogation Site Configuration for MCJ

Small Scale Interrogation Sites

Small scale interrogation sites are comprised of instream remote detection systems, instream juvenile fish traps, monitored fish releases/returns at hatcheries, and the trawl nets. They have fewer antennas than large scale detection sites and are installed, operated and maintained by various agencies outside of PTAGIS.

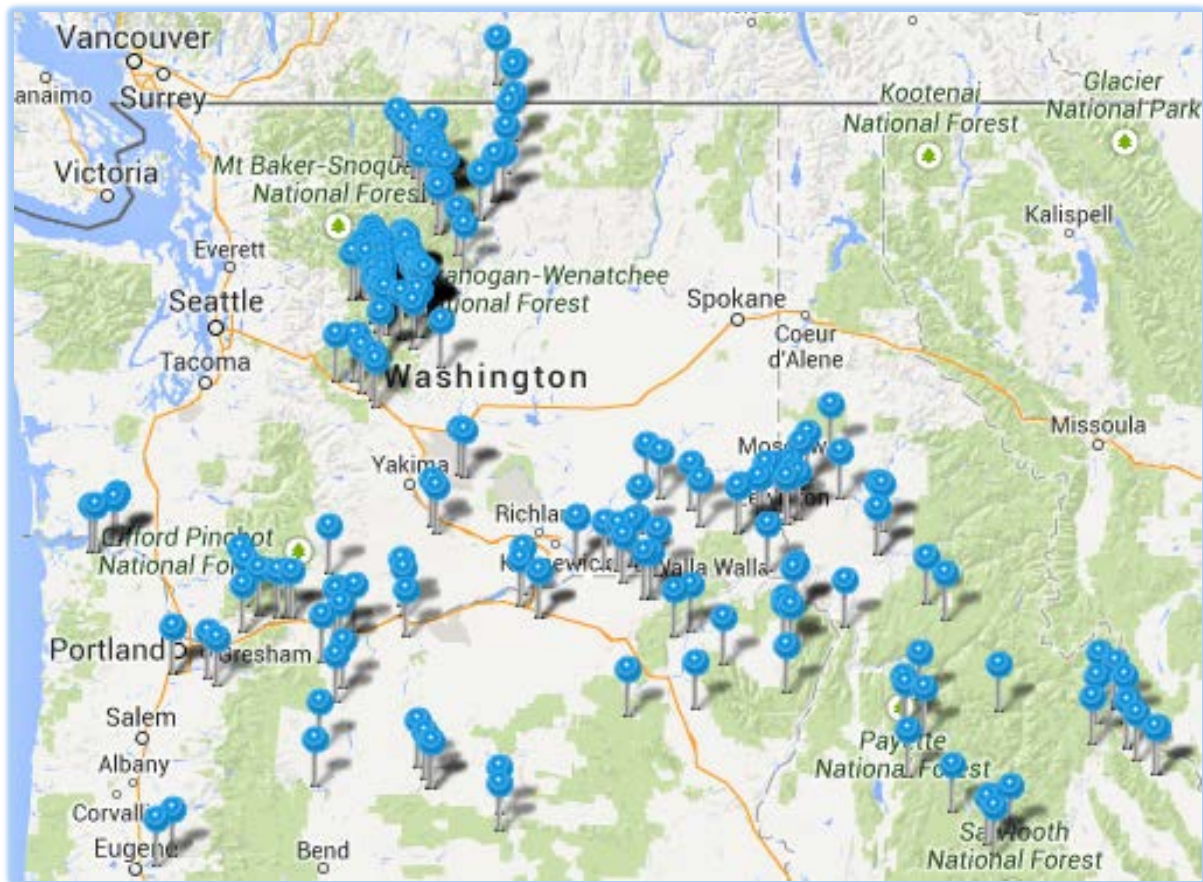


Figure 5. Small Scale Interrogation Sites Contributing Observation Data into PTAGIS

Interrogation site metadata⁷ are stored in the database that includes location, antenna configuration, operational dates, and contact information for the steward of each site. As with large scale sites, each antenna is identified and collated with the observation data in the PTAGIS system. The PTSC provides governance and PTAGIS provides technical coordination with the agencies that support and contribute data from these sites.

Small scale sites vary from their larger counterparts on the mainstem in terms of operating periods, frequency of configuration\location changes, and research purposes.

Separation by Code

The PIT tag Separation by Code (SbyC) process allows researchers to target individual tagged fish and separate them from the general population as they move through juvenile and adult fish passage facilities that are equipped with PIT tag actuated gates. By default, all PIT-tagged fish detected are returned to the river at each of the juvenile fish bypass sites, unless a researcher requests a different disposition for a particular group of fish. Target fish can be collected in a holding tank for hands-on sampling, or the default gate actions can be over-ridden so that they follow the same route as the untagged population of fish. SbyC actions can be applied to an entire population of tagged fish, a proportion of that population, or a predefined number of individuals. Both daily and seasonal collection quotas can be set to limit the number of fish sampled. Each SbyC action can be scheduled for a specified number of hours or days, or a specified

⁷ Interrogation Site Metadata on the PTAGIS website: <http://www.ptagis.org/sites/interrogation-site-metadata>

pattern of days. Multiple populations can be identified and segregated at a given site, with unique SbyC actions assigned to each group at that site.

Through the use of well-designed SbyC instruction logic, frequent on-site inspections of the SbyC equipment components, and the methodical implementation and utilization of equipment diagnostic and alarm systems, PTAGIS has consistently provided effective selection and diversion of targeted PIT-tagged fish with no adverse impacts to non-targeted fish or to regular facility operations.

Coordination and Data Management for RM&E

The PTAGIS program provides a substantial effort to facilitate voluntary contribution of data from disparate agencies within the region including those outside the BPA Fish and Wildlife Program (FWP). These research contributions span across the 4H, Predation, Population, Status and Recovery management question boundaries. Data are processed and collated in near real-time and contributors are immediately informed of any validation errors. Once processed, the data are available to anyone through reporting and data extraction features of the website. A PIT Tag Steering Committee (PTSC) provides governance and additional coordination to ensure regional standardization and uphold the integrity of the data and metadata. A *Data Use Policy*⁸ is published on the PTAGIS website providing guidance to contributors and researchers using the data. PTAGIS is an independent entity and does not analyze or produce biological results from the data. The use of PIT tag data is integral to a large portion of the Fish and Wildlife Program's RM&E projects; PTAGIS FWP project 1990-080-00 is directly associated with *FCRPS 2008 BiOp*⁹ through RPA 50.1, RPA 72.1 and RPA 72.2

Operate and Maintain the PTAGIS System

This section describe portions of the PTAGIS project related to collection, management and web delivery of all PTAGIS data and metadata.

B: 160. Operate, Maintain and Enhance the PTAGIS System

This objective delivers functioning systems for the collection and dissemination of near-real-time PIT tag data. Managed by PTAGIS staff in the Portland, OR office and occasional subcontractors working on-site and remotely, this objective is organized logically into three sections:

- Field Data Collection Systems
- Server Data Management Systems
- Web Data Management Systems

Field Data Collection Systems

PTAGIS develops, maintains and provides technical support for 3 basic types of field data collection systems:

- Tagging Software
- Interrogation Software
- Utility Software

The software systems described in this section are used by many RM&E projects to collect and submit regionally standardized MRR and observation data into the PTAGIS system. The vast amount of PTAGIS data are contributed from these systems that can be downloaded from the PTAGIS website and installed on a researcher's PC.

⁸PTAGIS Data Use Policy: <http://www.ptagis.org/data-use-policy>

⁹ 2008 FCRPS BiOp RPA By Approach, Strategy:
<http://www.cbfish.org/Reports/ReportViewer.aspx?RptName=2008FCRPSBiOp&rs%3AFormat=PDF>

Tagging software captures [MRR datasets](#) by interfacing with tag readers (transceivers) and other devices to provide an ergonomic and highly customizable data entry system. Robust validation alerts users to issues so they can be corrected in real-time while a fish is in-hand. Authorized users can easily submit their datasets to PTAGIS using the software. The datasets are uniquely identified and can be resubmitted to correct data anomalies that cannot be detected with software validation.

Interrogation software combined with communication networks provide unattended operation and continuous recording of [observation data](#) in real-time. The data collected in the field is automatically uploaded to the central database on the hour for processing in 'near real-time'. The sophisticated systems are used at all [large scale interrogation sites](#) combining high-availability technology with standard operating and maintenance procedures described in the [Field Operations and Maintenance](#) section to ensure seamless data collection throughout the year. The software can also *scale downwards* to collect data at [small scale interrogation sites](#).

Utility software is provided by PTAGIS to import, standardize and submit raw observation data collected from the internal storage of a tag reader or from a data logger system operating at a small scale interrogation site. PTAGIS also develops and supports internal software systems to perform data management, QA/QC as well as performance regression testing of the interrogation software systems.

Server Data Management Systems

This portion of the objective addresses the continuous administration and development of a central repository for all PTAGIS data and related metadata. The central repository consists of relational and dimensional database systems that extract, transform, load and collate MRR and observation data submitted through the field data collection systems. The deliverable of this objective is a highly functioning, cost-effective and extensible data management server and related systems.

Key tasks related to this portion of the objective include:

- Maintenance and enhancement of system components that support the automated extraction, transformation and loading (ETL) of field data into the central transactional and dimensional databases in near real-time with data validation and integrity verification.
- Automated alerting system to notify data stewards of anomalous events such as data validation failures or when remote interrogation sites fail to upload on schedule.
- System administration, tuning and capacity planning following industrial best practices.
- Development of new database schema and supporting infrastructure to support the evolving needs of the regional community.

A few of the RM&E projects, such as DART and Fish Passage Center, require a local copy of the entire PTAGIS database on a daily or weekly basis to perform their analysis with additional values. To support this, PTAGIS provides a nightly data extraction process that exports the entire database into a series of files partitioned by day, week and year. The files can be subsequently downloaded and imported into a local database system by project staff as needed. A separate automated system operating on the PTAGIS server also consumes the extracted files and compares the results on a nightly basis for quality assurance.

Web Data Management Systems

The PTAGIS website provides online access to PTAGIS data, metadata, content and services to the public. Most of the online resources can be browsed anonymously, but others needing identification and authorization require the user to

create an account and login to the system. The deliverable for this portion of the objective is a highly functioning, cost-effective and extensible web server and related systems providing public access to PTAGIS data and related resources.

Key tasks related to this portion of the objective include:

- Development and refinement of online functionality such as:
 - Online request/approval workflow services, such as PIT tag distribution for all FWP
 - Content management
 - Community outreach features to support technical coordination
 - Web API interface to allow automated systems to consume PTAGIS data and metadata
- Development and refinement of reports, dashboards and other related infrastructure for public research and internal O&M activities
- System administration, tuning, and capacity planning following industrial best practices.
- Interoperation with server data management systems and field data collection systems

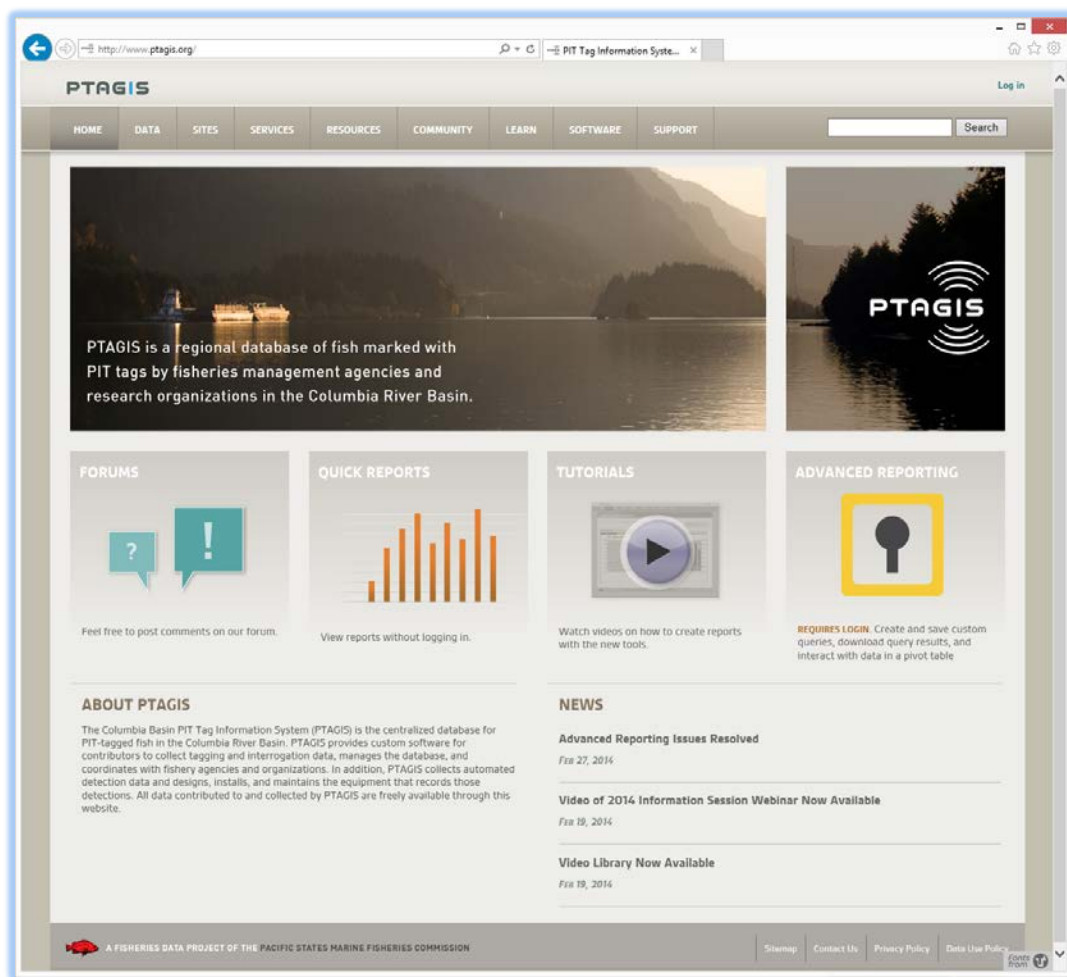


Figure 6. Home page of the PTAGIS website

C: 160. Operate and Maintain the Separation by Code Database

Before a [SbyC](#) project can be implemented by PTAGIS, the researcher must coordinate with all applicable agency contacts. The necessary coordination varies from project to project and facility to facility. If the project involves only

routing PIT-tagged fish toward collection for transportation, minimal coordination is necessary. If the project involves diverting fish into holding tanks, much more coordination is necessary.

PTAGIS is responsible for the coordination and implementation of SbyC requests in the following eight fish passage structures at six mainstem FCRPS:

- Bonneville PH2 Juvenile Bypass (B2J)
- Lower Monumental Juvenile Bypass (LMJ)
- Bonneville Adult Fish Facility (BO3)
- Lower Granite Adult Fish Trap (GRA)
- Little Goose Juvenile Bypass (GOJ)
- Lower Granite Juvenile Bypass (GRJ)
- McNary Juvenile Bypass (MCJ)
- John Day Juvenile Bypass (JDJ)

The agencies and researchers whom request SbyC vary year-to-year. The focal species are salmonids, but recently lamprey were also separated.

The coordination portion of this objective requires various researchers to enter request metadata for each SbyC project into the database using an online service implemented on the PTAGIS website. The requester must notify appropriate contacts at the USACE, NOAA and Smolt Monitoring Program which are referenced on the PTAGIS website. If the planned SbyC projects targets another researcher's PIT-tagged fish, the requester must contact and obtain the permission of that researcher. The online request service provides a check list for these coordination actions with automated workflow so that the Fish Passage Advisory Council (FPAC) can approve each request based upon the metadata provided.

Once approved, PTAGIS staff implements the SbyC request by updating the local database of the interrogation software (described in [Field Data Collection Systems](#)) operating at the target facility, often more than once for each request. This is a time-sensitive process and requests often overlap each other at the same passage structure of an interrogation site. In some cases, the database containing the target fish must be computed and updated by staff in near real-time. Internal O&M reports are used to verify implementation. Additional ad-hoc coordination with researchers and facility staff is necessary to resolve issues and to ensure a successful implementation.

Implemented requests are permanently stored as metadata in the PTAGIS database and can be reviewed from the website. Researchers can use past requests to quickly populate new SbyC requests that are on-going.

Install, Operate and Maintain Interrogation System in Field Locations

A centrally located field operations office designs, installs, and maintains the equipment and software needed for automated PIT tag detection at [large scale interrogation sites](#), including systems for enabling individual fish segregation, examinations and relocation ([SbyC](#)).

This objective is comprised of the following contract work elements:

D: 70. Support Separation by Code Systems

The SbyC system is composed of fishways or flumes, diversion gates of all types (slide gates, rotational gates, side to side gates), air cylinders, solenoids, Programmable Logic Controllers (PLC), serial and Ethernet interfaces to PTAGIS data collection software, server side system diagnostics and more. This work element relates to work that must be done to

operate and maintain the systems and controls necessary to actuate the gates based upon [SbyC database lookup information](#).

During the migration season, PTAGIS field systems personnel inspect and test SbyC pneumatic, electrical, and mechanical components at each facility on a weekly basis. During these site visits, PTAGIS staff coordinate with USACE facility biologists and other researchers at the site. PTAGIS is fully responsible for the operations and maintenance of the SbyC equipment and infrastructure to support this on-going process. The SbyC diversion gates are directly incorporated into complex passage fish structures and a malfunction or failure of the SbyC equipment can result in catastrophic consequences for smolts and adult fish routed through these facilities.



Figure 7. A slide gate diverting a test PIT tag.

Detectors located downstream of the PIT tag diversion gates audit the path taken by tagged fish passing through those gates. The Diversion Gate Efficiency (DGE) system automatically computes the rate at which individual tagged fish are correctly routed through the diversion and facility sub-sample gates at those facilities. The instantaneous and cumulative year-to-date efficiencies are refreshed as new detection data are received into the PTAGIS database. Staff review those efficiencies from a Web-accessible DGE report to verify that, for each gate, the SbyC system issues the correct instructions to divert or ignore PIT-tagged fish, and that the gate operates properly to divert the targeted tags. A reported drop in the instantaneous efficiency is usually indicative of a mechanical problem at that gate. Having been alerted to the problem through the DGE report, PTAGIS staff can respond to and resolve the issue before the gate fails.

E: 70. Install Interrogation Systems in Field Locations

PTAGIS works with a wide range of researchers and agencies that are looking to incorporate PIT tag detection equipment into [large scale interrogation sites](#).

This process for installing a new interrogation system typically has the following stages:

- Field staff evaluate fish passage conditions at the proposed site
- Pre-qualifies the proposed site using radio frequency detection equipment
- Provide design requirements and feedback throughout the process to ensure the success of the project

Once a system is approved by BPA, PTAGIS coordinates with USACE to install the electrical components of this system that include the transceivers, network, PLC, and the data collection computers.

Since 1993, PTAGIS has had an integral role in the NOAA Fisheries project 1983-31-900 (New Marking and Monitoring Techniques for Fish) when PTAGIS assumed from NMFS responsibility for the operation and maintenance of the permanent interrogation systems installed in the juvenile fish bypass facilities at Lower Granite, Little Goose, and

McNary dams. In recent years, PTAGIS has assumed a larger role in the research, development, and evaluation of new PIT tag technologies, such as a new generation of tags and transceivers that provides greater read range, and the construction of arrays of PIT tag antennas in close proximity.

F: 160. Operate and Maintain Interrogation Systems in Field Locations

The PTAGIS field staff utilize daily operational reports which are monitored multiple times each day, 365 days a year. These reports identify the following conditions and allow field staff to respond to situations quickly:

- Data collection gaps
- Low reading efficiency of a detection system
- Transceiver failures and alarms
- Computer, network or other system failures and alarms
- Changes in environmental conditions (such as power, temperature, relative humidity) that may impact a detection system

During the portions of the season with high fish migration, field staff performed weekly, on-site, standard maintenance checks at each facility. In periods with lower migration, these maintenance checks were performed every other week. Site visits include tuning all readers, inspecting and adjusting the timing of diversion gates, data collection computer maintenance and coordination with site operators and biologists.

Juvenile fish bypass facilities on the Snake and Columbia Rivers begin operating around April 1st. Prior to these operations, the field staff perform all the necessary preseason tuning and maintenance to ensure peak performance of the juvenile fish detection and diversion equipment.

General maintenance and anomalous events are recorded by field staff in an event log¹⁰ for each site and are publically available on the PTAGIS website as metadata.

As certified electricians, field staff repair and extensively test PIT tag reading equipment in the Kennewick lab before returning devices to service. PTAGIS inventories a minimal number of spare readers to expedite the replacement of failures and, as a cost savings, repair the equipment in-house.

¹⁰ PTAGIS Event Logs for Interrogation Sites: <http://www.ptagis.org/services/event-logs/view-event-logs>



Figure 8. PTAGIS staff repairing a transceiver device.

Administration, Management and Coordination

This objective is comprised of the multiple contract work elements described in the following subsections. The work elements listed below are either limited in scope or well-defined and do not need further introduction:

- J 132. Submit Annual Progress Reports for 2011
- K 132. Submit Annual Progress Reports for 2012
- L: 185. Produce Pisces Status Reports – Periodic Status Reports for BPA
- M: 165. Produce Environmental Compliance Documentation

A: 119 Routine Administration of the Contract

This work element delivers general administration and on-going management of the contract including:

- Funding package
- Hiring and supervising personnel
- Subcontracting
- Purchasing
- Budget and inventory tracking.

PTAGIS is a fisheries data project of the Pacific States Marine Fisheries Commission. The Commission provides administrative support in the form of:

- Payroll
- Procurement
- Accounting
- Travel arrangements
- Contract monitoring

G: 122 Technical Support and Training Assistance to Field Users

This work element delivers online, email, and phone technical support/training to entities engaged in PIT tag research activities in the Columbia Basin. This support is primarily focused on the publically accessible PTAGIS [Field Data Collection](#) and [Web Data Management](#) systems.

H: 122. Additional Support Actions

PTAGIS staff is often tasked to share their unique expertise with the regional community in solving complex PIT tag detection and operational issues. This “catch-all” deliverable describes these types of ad-hoc requests that are within the program’s scope of work and can range from:

- Additional regional coordination
- Transceiver, antenna and PIT tag conformance testing
- Electronics, process and control engineering
- Electrical design
- Radio frequency identification (RFID) design
- Computer-aided design (CAD) detail

I: 189 Coordination- Columbia Basinwide

This objective covers standard regional coordination activities such as:

- Participating and the hosting of PIT Tag Steering Committee meetings
- Participating in and providing ad-hoc data requests to policy and technical forums
- Conducting email campaigns and surveys
- Publishing and distributing a semi-annual PTAGIS newsletter

Specific coordination activities are introduced in the following subsections.

Data Contributor Coordination

All MRR data and a good portion of observation data are contributed to PTAGIS by a diverse array of fisheries management and research organizations working in the Columbia Basin. Basinwide coordination is necessary to ensure the contribution of these data are valid, timely and have adequate metadata. *New Tag Data Projects* and interrogation sites must be coordinated and approved through the PTSC before they can submit data into PTAGIS. Once approved, staff add the site metadata and implement automation features in the [Server Data Management System](#). Ongoing coordination among active data contributors involves the following activities:

- Manage Tag Data Project coordinator information
- Manage Interrogation Site steward information
- Manage validation codes, MRR sites and interrogation sites
- Provide start-up information for new data contributors
- Notifications about data anomalies
- Year-end reminders about data QA/QC and metadata requirements
- Special mailings as needed to disseminate information about process changes

PIT Tag Distribution and Quality Assurance

PTAGIS inventories and distributes all PIT tags to FWP projects funded by BPA. A web-enabled workflow is provided by PTAGIS to simplify the coordination effort and make it transparent. Aspects of this workflow process are:

- Forecasting annual PIT tag needs from FWP project leads
- Inventory management coordination between BPA and the PTAGIS Kennewick office
- BPA approval of tag requests for each project
- PTAGIS staff ship tags for each approved request
- Coordinate distribution with vendors for tags that are preloaded into needles
- Distribution and tag information is archived and made available online

In addition to inventory and distribution, PTAGIS performs quality assurance (QA) on a sample of the PIT tags. This QA process uses advanced automation technology (*Figure 9*) to verify PIT tags are manufactured according to specifications of the contract between BPA and the vendor, such as:

- Turn-on voltage
- Modulation percentage
- Resonant frequency
- Bandwidth/"Q"
- Size and weight

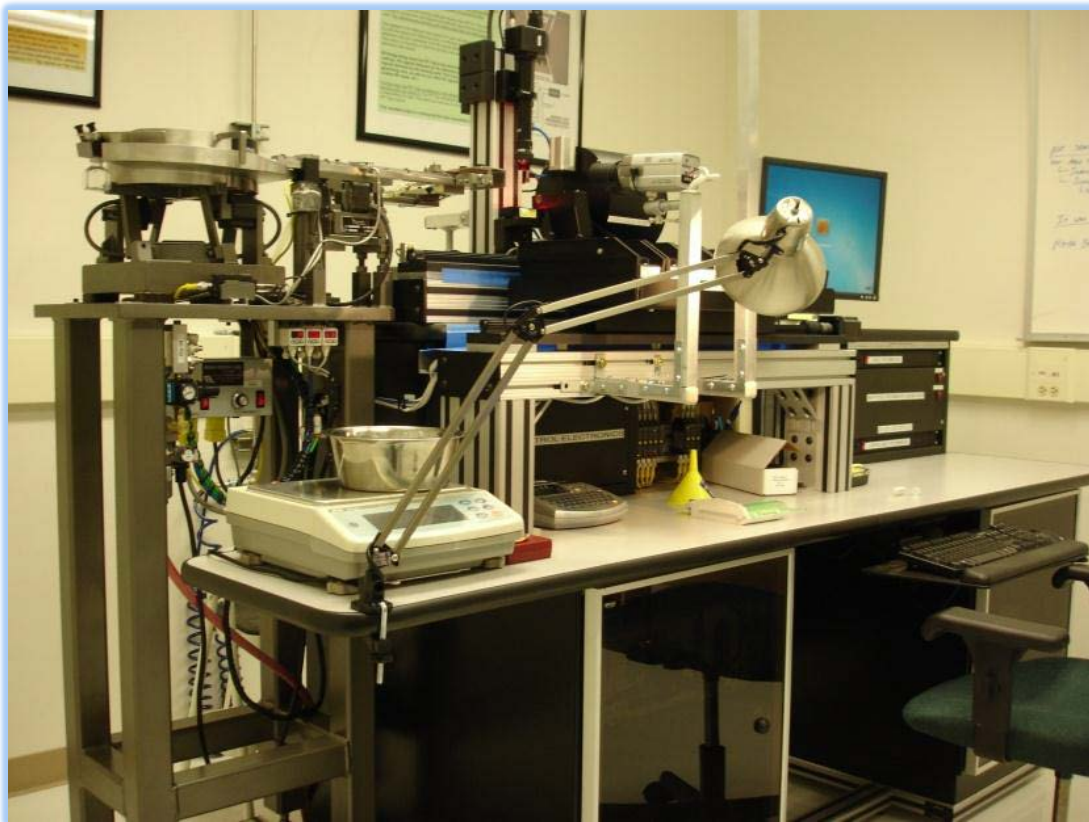


Figure 9. Automated PIT Tag Test System (APTTs) located in the PTAGIS Kennewick laboratory

PIT Tag Forecasting

In response to elements contained in the 2008 BiOp, the Action Agencies (AA), NOAA and the NPCC determined that a means to forecast future PIT-tagging effort would be instructive and should be established. Ideally, the forecast should extend several years into the future. A sub-group was formed that specified attributes to be included in a database that would inventory and forecast future tagging efforts. In December 2009 a template for a new PIT tag forecast-inventory was constructed and distributed to all agencies to populate. Until recently the database was resident at Columbia Basin Research in UW.

The agencies felt it would be advantageous to integrate the Forecaster into PTAGIS and make it more user friendly. BPA approached PTAGIS to take on this additional scope of work in the summer of 2013. PTAGIS has been coordinating the development of this application as part of the [Web Data Management System](#). The AA, NOAA and NPCC agreed to coordinate the participation of FWP, AFEP, HCP and BOR funded projects.

For populations, the ESU or MPG is the target unit. Spatially, an established PTAGIS release site and/or HUC4 scale is the focal point. The forecaster focuses on anadromous salmonids and other species may be added such as lamprey, bull trout and sturgeon.

PIT Tag Recovery Rewards Program

This incentive program was established in 2006 to encourage people to report PIT tags recovered in commercial or sport fisheries. The program rewards fishers who find and turn in PIT tags with a pocket fish scale (with measuring tape) to encourage the recipient to give us weight and length measurements from recovered PIT tags, a PTAGIS test-tag key chain with an active PIT tag imbedded in it, and a reward letter with detailed information and history on the host fish from which the PIT tag was recovered.

Results

Coordination and Data Management for RM&E

As an independent entity, PTAGIS does not analyze or produce biological results from data collected and managed by this project. As a measure of annual performance for this contract, the results summarized in this section are for on-going technical activities and accomplishments structured by scope of work elements introduced in the previous section.

Operate and Maintain the PTAGIS System

Over 2 million fish marked with a PIT tag were contributed into the PTAGIS database in 2013 (*Figure 10*). The proportions of salmon and steelhead tagging in 2013 were similar to those species tagged in 2012 and 2011 (*Figure 11*). In 2013, 883,533 unique tagged fish were detected at one or more locations (*Figure 12*). One fish can generate many interrogation records as it passes through multiple PIT tag antennas at one or more detection sites. In 2013, there were 11,210,753 detections reported to PTAGIS with a total of over 161 million cumulative detections since 1987 (*Figure 13*).

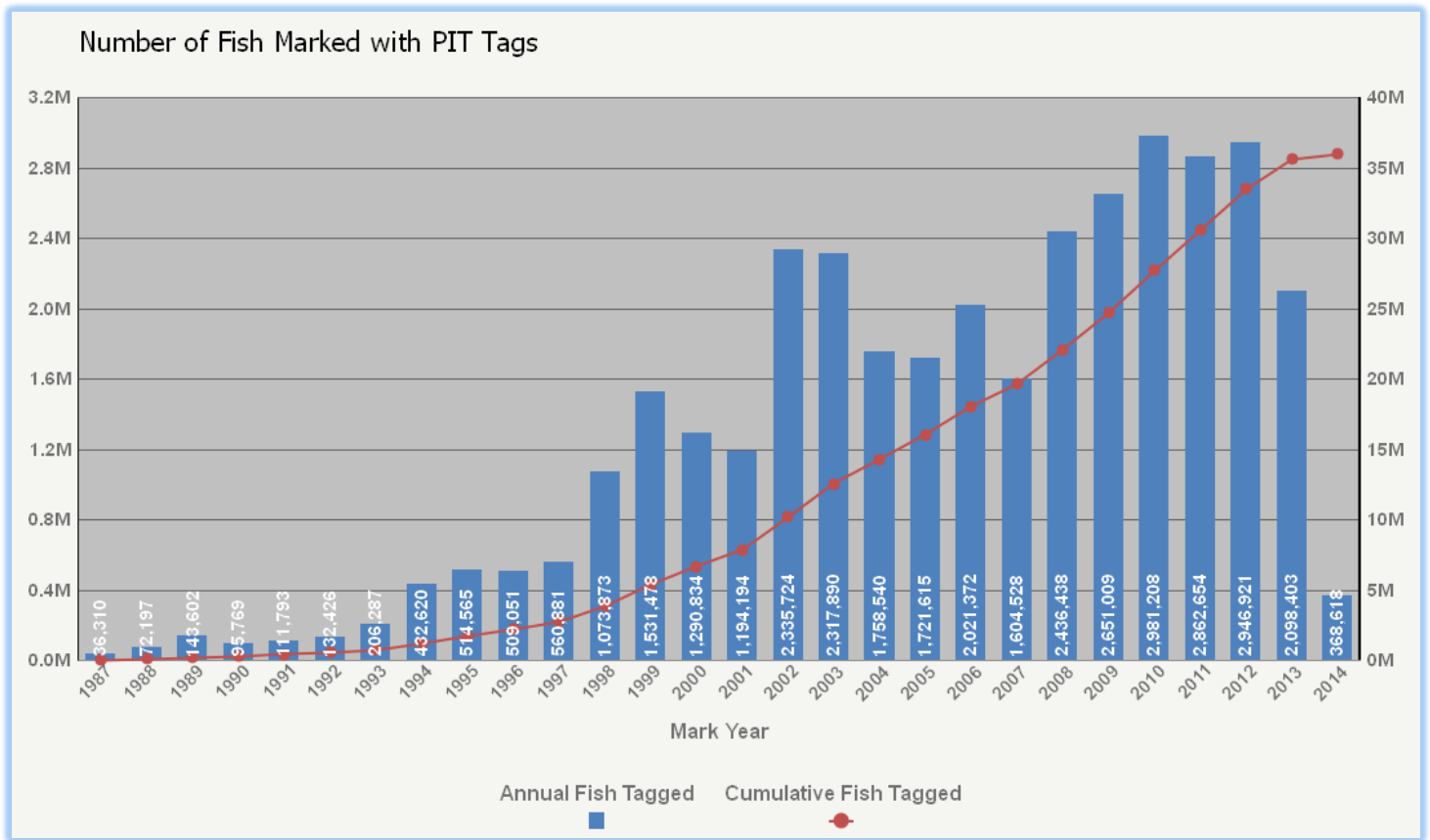


Figure 10. Annual and Cumulative Number of Fish Marked with PIT Tags

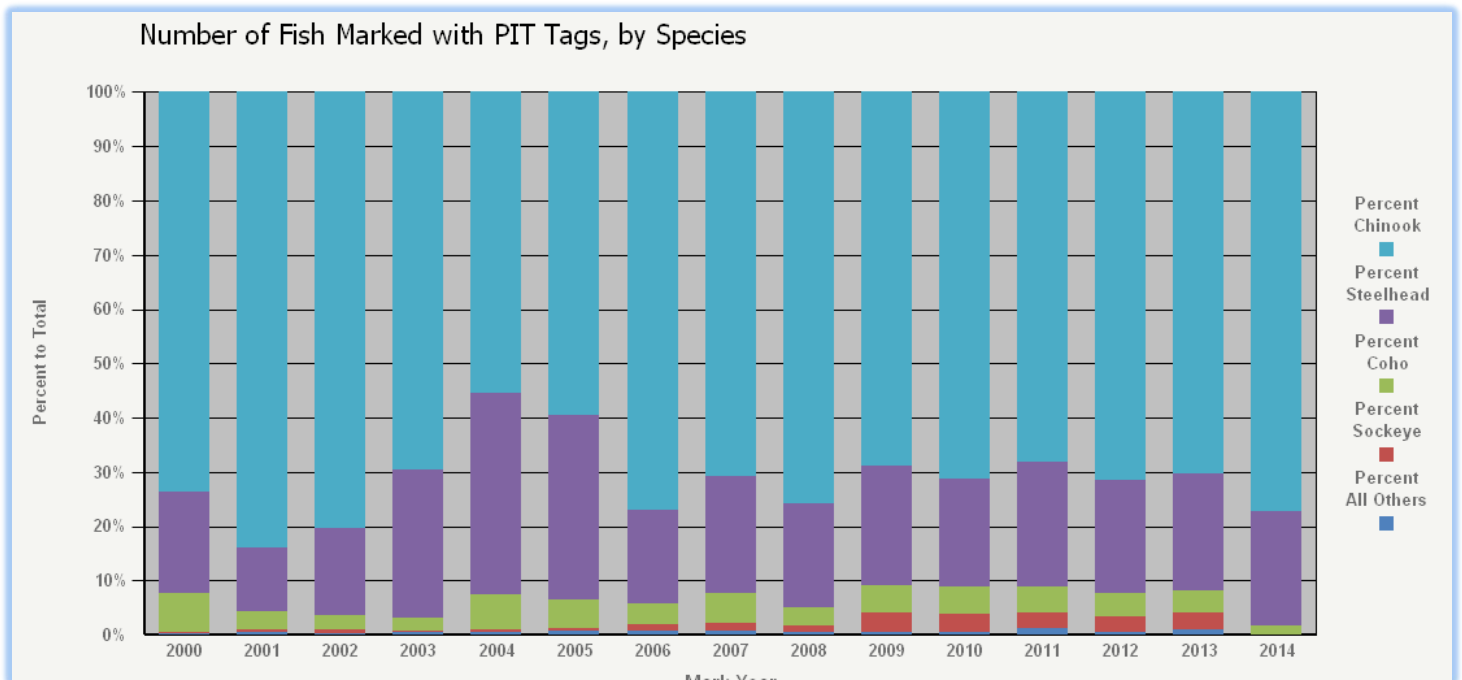


Figure 11. Number of Fish Marked with PIT Tags, by Species

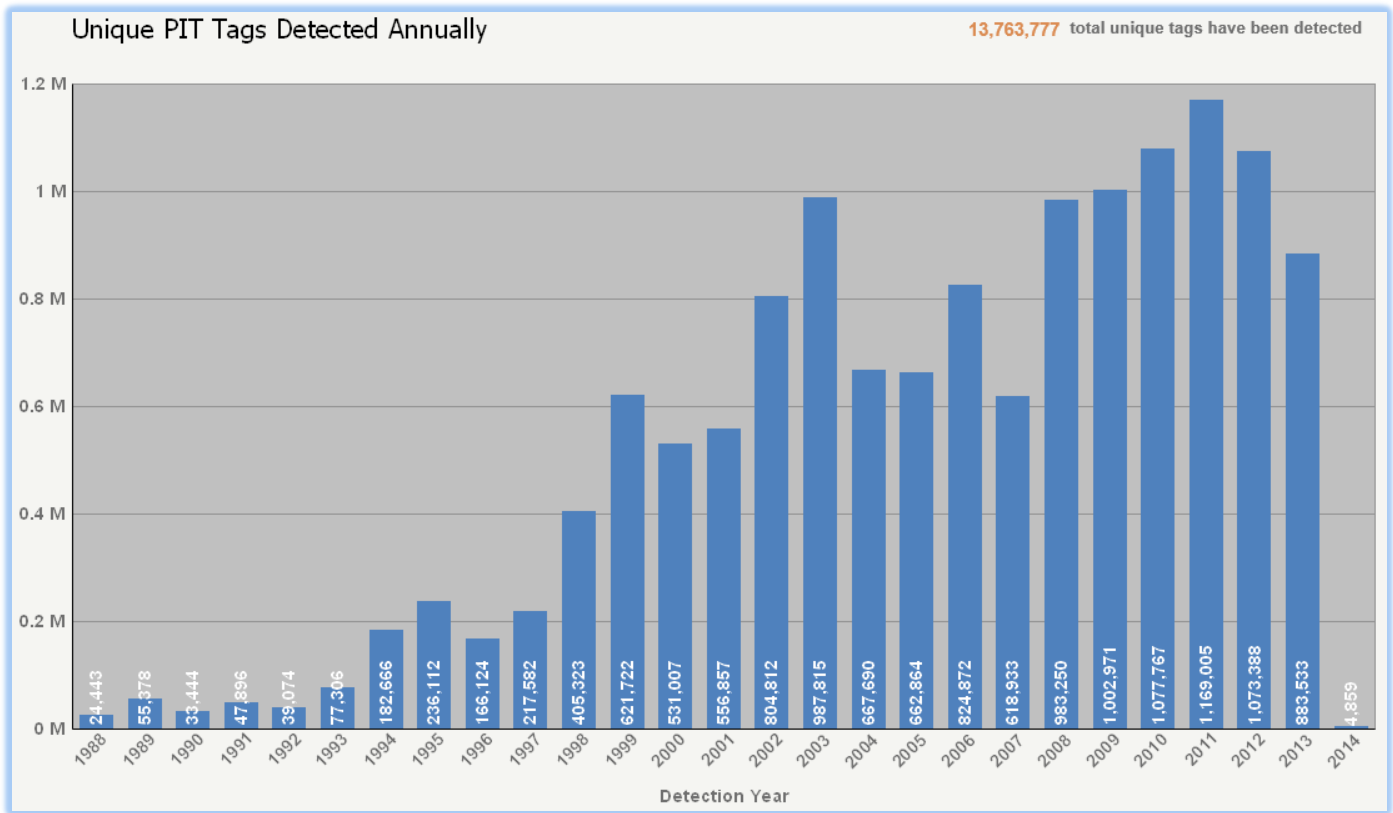


Figure 12. Unique PIT Tags Detected Annually

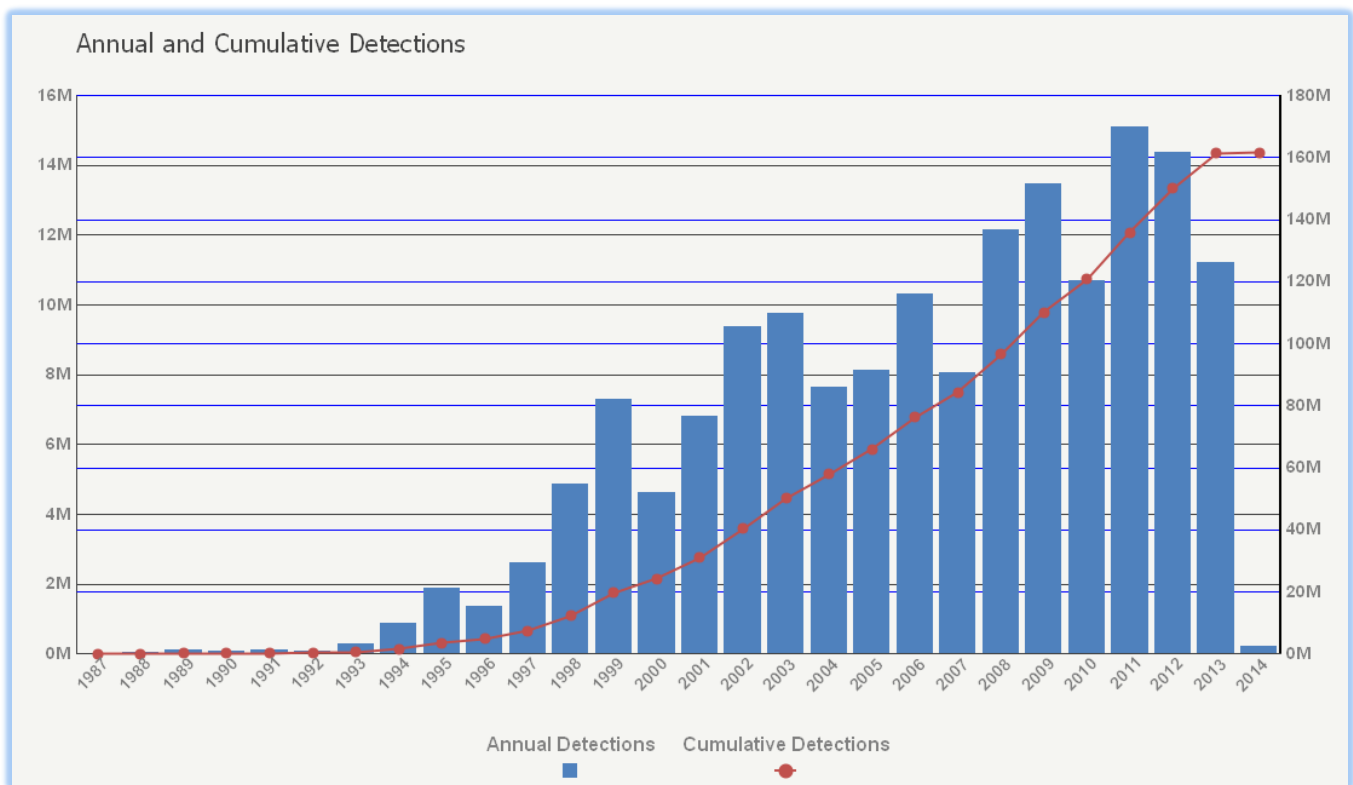


Figure 13. Annual and Cumulative Detections

B: 160. Operate, Maintain and Enhance the PTAGIS System

The results in this section are focused on software, database, and system engineering/administration efforts to support the PTAGIS system in 2013. Some of these efforts directly support other work elements and are described in those sections for context.

One of the most significant milestones in the 25 year history of this program occurred this year as a system-wide upgrade was completed. This was a multi-year effort with implementation starting in 2010. This upgrade included the database, web server and interrogation field software leaving the tagging software as the only remaining legacy component.

The previous (legacy) system was retired in October 2013 before a deadline to renew the license for the Ingres database and related server/web infrastructure. Adding to the effort, the legacy system remained operational and processed data in parallel with replacement system over a period of time to evaluate data integrity. The legacy and new systems were internally identified as PTAGIS3 and PTAGIS4 respectively.

A timeline for the upgrade of the entire PTAGIS system is as follows:

- Website and Reporting
 - Beta 1 released to focus group in April of 2012
 - Beta 2 was released on October 24, 2012
 - Website and reporting moved to production status on April 30, 2013
- Observation data collection and loading
 - M4 installed at PTAGIS-maintained sites in May 2012 to run in parallel with legacy data collection platforms (Minimon/Multimon)
 - M4 data becomes primary source for PTAGIS-maintained interrogation dataset on March 1, 2013
 - Minimon data loading moved from legacy database server to PTAGIS4 database server on March 1, 2013
- Tag distribution
 - New Tag Distribution and Inventory system released on September 10, 2013
- MRR data loading
 - P3 tag file loading moved from PTAGIS3 to PTAGIS4 on September 27, 2013
 - Validation and notification processes for P3 tag files and Minimon interrogation files implemented on PTAGIS4 system

The new systems were developed using *agile software development methodology*¹¹ on top of a Microsoft technology stack. To save cost and consolidate administration, some systems are running in a virtual server environment provided by PSMFC.

Field Data Collection Systems

PTAGIS tagging software, called P3, is the remaining system component that has not been upgraded and continues to be widely used throughout the region to submit MRR data into PTAGIS. This software is stable and was declared end-of-life years ago. There were two new releases¹² of this software in 2013 to further support the Biomark HPR portable reader and to correct a bug.

¹¹ Agile software development background: http://en.wikipedia.org/wiki/Agile_software_development

¹² Change log for P3 tagging software: <http://www.ptagis.org/docs/default-source/ptagis-software/p3-readme.txt?sfvrsn=7>

PTAGIS interrogation software, called M4, was deployed at all [large scale interrogation sites](#) at the end of 2012 and operated in parallel with legacy systems for evaluation and contingency purposes during all of 2013 (shown in *Figure 14*). There were no issues with the software at any of the data collection sites and M4 efficiently provided the 2013 dataset for all [observation data](#) in the PTAGIS database since March 1, 2013.

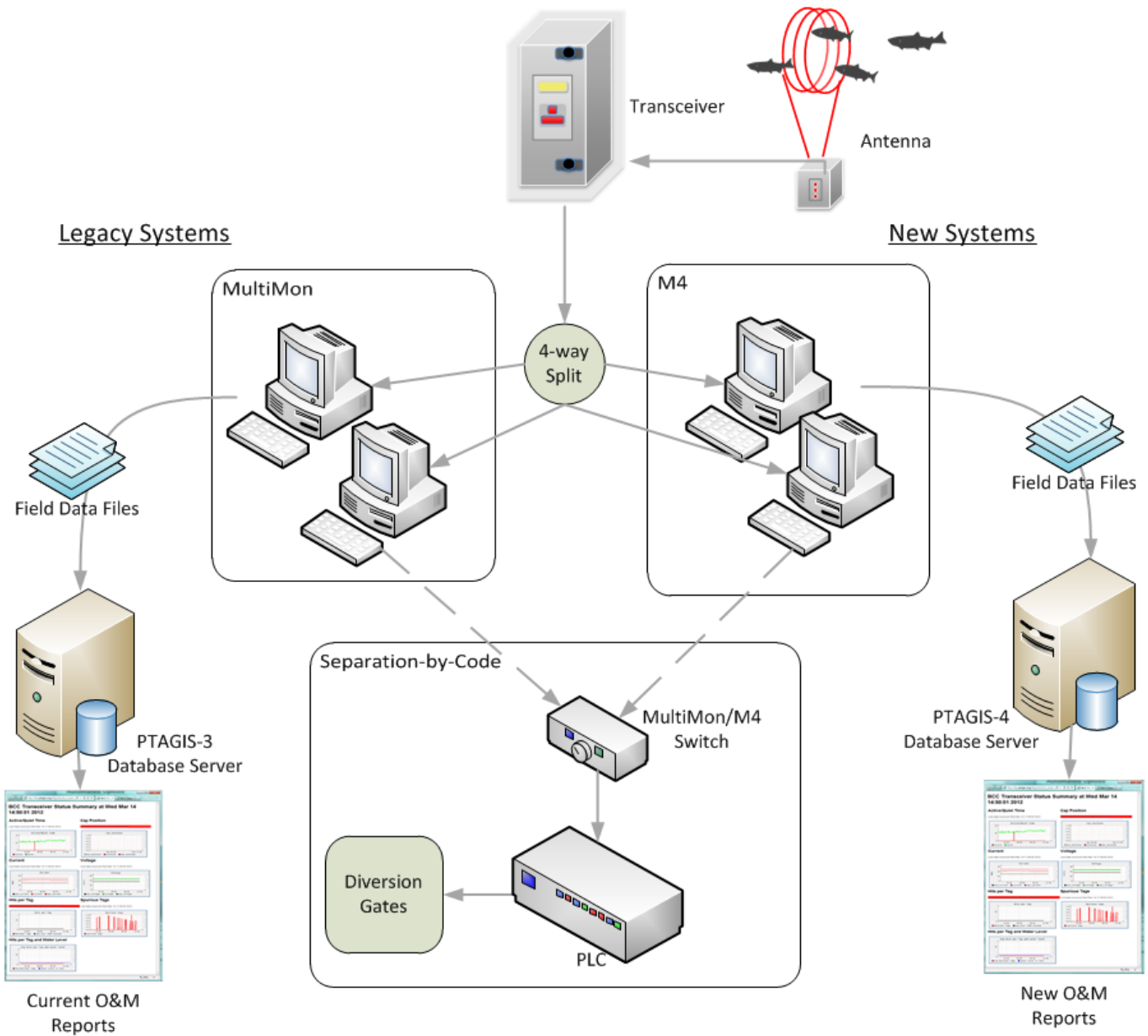


Figure 13. M4 parallel deployment with legacy systems for 2013 evaluation

A new version of the PIFF utility software was released to support data originating from the new Biomark IS1001 reader and to support a firmware change to the CR1001 data logger version 1.7.

Server Data Management Systems

The usage results of the PTAGIS server reporting system can be summarized as:

- **433** users ran at least one report
- **82,000** reports were executed
- **3.3 billion** rows returned

As noted, the upgrade of PTAGIS database and related server infrastructure was finalized in 2013 and the following deliverables summarize this effort:

- Efficient and extendable ETL processing of MRR and observation datasets (legacy and M4) in near real-time
- Continued support for data submissions via email
- Customizable notification system for stewards/staff for data contribution/validation
- Internal operational reports used by Kennewick field staff were developed and evaluated against legacy counterparts for production use. Those reports include:
 - Diversion Gate Efficiency (DGE)
 - Cumulative Efficiency Analysis (CEA)
 - Timer Tag Report
 - Transceiver Annunciator Service (TASS)
- Provisioned new file server and migrated 1.5 million raw data files from legacy system
- Refined relational and dimensional database for added efficiency
- Upgraded Microstrategy reporting server and verified implementation via vendor system audit
- Refined data extraction system for large data consumers and added automated QA
- Created new QA/QC data reports for internal/external data management
 - Duplicate Tag Summary
 - Release Date Earlier than Mark Date
 - Release Date out of Range
 - Release Info Missing
 - Interrogation File Load Overview
 - Interrogation File Load Status
- Developed additional data management software (Patch Manager) to patch observation data gaps from redundant systems

Web Data Management Systems

A new PTAGIS website went into production on April 30th, 2013. Web analytic features were enabled in May of 2013 to capture metadata on visitor demographics, how they navigate the system, and what features are most popular:

- Total Visits: **27,887**
- Unique Visitors: **6,599**
- Page Views: **98,695**
- Pages/Visit: **3.54**
- Avg. Visit Duration: **5:46**
- % New Visits: **21%**
- Top Three Cities by Total Visits:
 - Portland: **3,974**
 - Boise: **2,754**
 - Salem: **2,165**

Numerous features and content were delivered to this site that includes:

- *Interrogation Site Metadata (Figure 15)* is maintained for interrogation sites such as: description, location, photos, configuration history, operational dates, event logs, and contacts
- *Interrogation Data Load Setting* feature allow stewards to manage automated notifications

- *Tag Data Project Management* page that allows Tag Data Coordinators to authorize individuals to submit data under the Tag Data Project they coordinate
- *Raw Data File Browser* feature allows researcher to locate and view raw data files used to contribute data into the system
- *Clip File Download* feature allows researchers to download metadata on vials and the tag codes distributed by PTAGIS
- *Event Log* features allow for the contribution and reading/filtering of events for all interrogation sites
- Additional *Quick Reports* were added or refined, such as
 - Adult Ladder Detections
 - Small-scale Interrogation Site Detections
 - Complete Tag History
- *Separation by Code Summary* reports provide metadata on implemented SbyC projects by year

Other web-enabled features added or refined in 2013 are discussed in subsequent sections as they relate to specific objectives.

PTAGIS Log in

HOME DATA SITES SERVICES RESOURCES COMMUNITY LEARN SOFTWARE SUPPORT

Home / Sites / Interrogation Site Metadata

INTERROGATION SITE METADATA

Map of MRR Sites | Map of Interrogation Sites | Interrogation Site Metadata

SITE TYPE: All Sites Active Sites

SITE NAME: BO1 - Bonneville Bradford Is. Ladder

BO1 - BONNEVILLE BRADFORD IS. LADDER

Bradford Island Adult Fishway at Bonneville Dam

OPERATED BY: PSMPC

FIRST YEAR: 2002

LAST YEAR: 2014

RKM: 234

SITE CONTACTS

Steward: Nicole Tancetti
ntancet@psmpc.org
(503) 595-2141

POC: Don Wierf
dwierf@psmpc.org
(503) 735-2773 x1

MAP

Map showing the location of Bradford Island and the Bonneville Dam area. Labels include North Bonneville, Bonneville, and various roads like I-5 and SR-101.

PHOTO GALLERY

BO1 - Bradford Island Fish Ladder Download Image

OPERATIONAL DATES

Year	Start Date	End Date	Notes
2002	3/27/2002	1/1/2003	This was the first year of operation. Temporary configuration of BO1 (3/27/02 - 4/26/02): Bradford Island Left Branch A Viter 4B (cols 05, 06) & Viter 4B (cols 03, 04) Bradford Island, Right Branch B Viter 4E (cols 1B, 1C) & Viter 4E (cols 1A, 1A). These cols began interrogation at noon on 3/27/02. Data were submitted manually on Monday, Wednesday and Friday until permanent installation was completed. NOTE: The date/time stamps associated with fish records collected during this temporary configuration are times that data were collected, and not times that fish transited the ladder.
2003	1/1/2003	1/1/2004	The Bradford Island Fish Ladder was dewatered from 2/3/03 08:00 until 2/27/03 17:00 for annual inspection and maintenance.
2004	1/1/2004	1/1/2005	Facility was dewatered on 1/16/04 in response to an oil spill at TCA, two days before a scheduled dewatering for annual maintenance. Facility returned to operation at 1600h on Feb. 12, 2004.
2005	1/1/2005	12/5/2005	The Bradford Island ladder was dewatered on December 5, 2005 to prepare for the construction and installation of the new PIT tag antennas in the vertical slots upstream of the Oregon Shore Visitors Center.

CURRENT AND HISTORIC SITE CONFIGURATIONS

Select Configuration Number: 100

Figure 14. Interrogation Site Metadata available on PTAGIS website

A first version of a RESTful API¹³ was published in 2013 to share PTAGIS data and metadata between systems via web services. The web API provides a platform independent interface (HTTP) and outputs standard XML and JSON data formats. The following table describes the API methods and types of data that can be accessed from this system. Figure 16 shows a sample XML output in a browser call to the API tag data method for a given tag code.

¹³ Wikipedia definition for REST: http://en.wikipedia.org/wiki/Representational_State_Transfer

Data Type	API	Description
MRR Site Metadata	GET mrrsites	Gets metadata for all MRR sites
	GET mrrsites/{code}	Gets metadata for a MRR site given a code
Validation Codes	GET validationcodes	Gets all validation codes identified by domain
	GET validationcodes/capturemethods	Gets capture method validation codes
	GET validationcodes/conditionalcomments	Gets conditional comment validation codes
	GET validationcodes/hatcheries	Gets hatchery validation codes
	GET validationcodes/organizations	Gets organization validation codes
	GET validationcodes/rearingtypes	Gets rearing type validation codes
	GET validationcodes/runtypes	Gets run type validation codes
	GET validationcodes/species	Gets species validation codes
	GET validationcodes/combinedspeciesrunrear	Gets verbose species, run and rearing type validation codes
	GET validationcodes/tagcoordinators	Gets tag data coordinator validation codes
	GET validationcodes/tagmethods	Gets tag method validation codes
Tagging Event	GET tagdata/{tag}	Gets tagging data event for a given tag code
Interrogation Site Metadata	GET interrogationsites	Gets metadata for all interrogation sites
	GET interrogationsites/active	Gets metadata for active interrogation sites
	GET interrogationsites/{code}	Gets metadata for an interrogation site given a site code
	GET interrogationsites/configurations	Gets historical configuration metadata for all interrogation sites
	GET interrogationsites/{code}/configurations	Gets historical configuration metadata for an interrogation site given a site code
	GET interrogationsites/configurations/current	Gets current site configuration metadata for all interrogation sites
	GET interrogationsites/{code}configurations/current	Gets current site configuration metadata for an interrogation site given a site code

Figure 15. Web API methods made available from PTAGIS in 2013

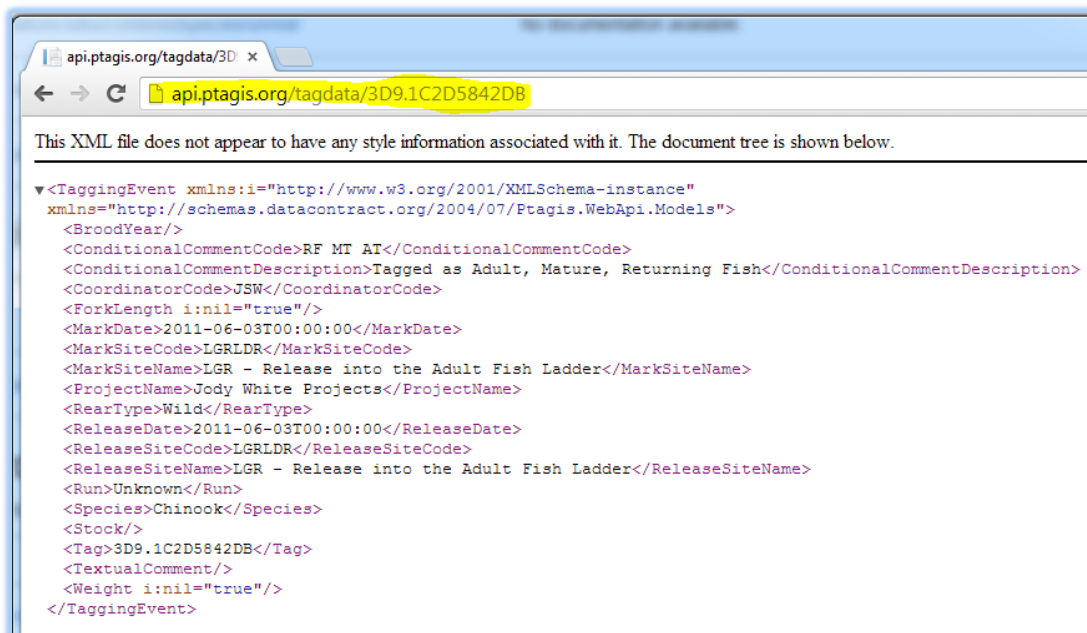


Figure 16. Sample XML output shown in a browser from a 'Tag Data by Code' API request

C: 160. Operate and Maintain the Separation by Code Database

In 2013, 17 SbyC projects were implemented and coordinated by PTAGIS staff as shown in the table below. These projects requested a total of 4,683,401 tag codes to be separated. This was the first year juvenile lamprey were targeted for SbyC.

Organization	SbyC Project	Number of Tags
Biomark, Inc.	LGR Juvenile Fish Collection Channel Prototype Overflow Weir and Enlarged Orifice Biological Evaluation	17,925
Fish Passage Center	Comparative Survival Study	411,996
Idaho Department of Fish and Game	Monitoring and evaluation of PIT tagged Chinook salmon smolts released from Idaho hatcheries	95,645
Idaho Department of Fish and Game	Measure returning Dworshak Hatchery steelhead	117
Idaho Department of Fish and Game	Radio tagging adult spring Chinook at Lower Granite Dam	50,654
Idaho Department of Fish and Game	Known repeat spawning adult steelhead scale collections	16,930
National Marine Fisheries Service	Evaluation of fish condition and gateway residence in modified gateway at BON PH2	9,000
National Marine Fisheries Service	Migration timing and parr-to-smolt survival for wild Snake River Chinook	30,977
National Marine Fisheries Service	Transportation and survival research	3,792,668
Nez Perce Tribe	B-Run Steelhead Evaluations	84,973
Nez Perce Tribe	Nez Perce Tribe 2013 Separation by Code Request	26,220
Oregon Dept. of Fish and Wildlife	Wallowa and Imnaha Stock Steelhead	29,957
Washington Department of Fish and Wildlife	Asotin Creek Project	21,607
Washington Department of Fish and Wildlife	Kooskia National Fish Hatchery Spring Chinook Hatchery Evaluation	13,180
Washington Department of Fish and Wildlife	Snake River Fall Chinook Salmon Fidelity and Fallback Study	52
Washington Department of Fish and Wildlife	WDFW estimate SARs and Straying for Summer Steelhead from Lyons Ferry Hatchery	31,500
Washington Department of Fish and Wildlife	Yearling and sub-yearling fall Chinook released from Lyons Ferry Hatchery	50,000

Figure 17. SbyC Projects Implemented in 2013

Two new SbyC systems were implemented in 2013 – web-based coordination workflow and SbyC software platform. This necessitated development of new processes and procedures to put in place next to the legacy processes and systems. An SOP was developed for maintaining and updating SbyC software platforms at the sites.

Install, Operate and Maintain Interrogation System in Field Locations

As in previous years, the juvenile fish bypass facilities on the Snake and Columbia Rivers began operating around April 1st. Prior to these operations, the PTAGIS Kennewick staff performed all the necessary pre-season tuning and maintenance to ensure peak performance of the juvenile fish detection and diversion equipment. Detection and diversion efficiency rates for 2013 were good as or better than previous years. No data losses or diversion gate failures occurred in 2013.

D: 70. Support Separation by Code Systems

SbyC interrogation sites were operated with the new M4 interrogation software. The older Multimon data collection platforms were retained at all sites for a one season to evaluate the performance of M4.

The efficiency of operating the SbyC diversion gates was an overall 98.4%. A DGE report (*Figure 18*) breaks down the efficiency for each of the 17 diversion gates operated by PTAGIS in 2013.

Diversion Gate Efficiency Summary									
({Divert Time} (Value) Between 1/1/2013 4:53:05 PM and 1/1/2014 4:53:05 PM)									
B2J - Bonneville PH2 Juvenile									
Site Code	Diversion Gate Antenna Group	Total Fish	Success Count	Failure Count	Percent	YTD Total Fish	YTD Success Count	YTD Failure Count	YTD Percent
B2J	SBYC SEPARATOR GATE	31,827	31,686	131	99.6%	31,827	31,686	131	99.6%
GOJ - Little Goose Dam Juvenile									
Site Code	Diversion Gate Antenna Group	Total Fish	Success Count	Failure Count	Percent	YTD Total Fish	YTD Success Count	YTD Failure Count	YTD Percent
GOJ	A-SEPARATOR GATE	43,450	42,174	1,209	97.2%	43,450	42,174	1,209	97.2%
	B-SEPARATOR GATE	47,267	46,113	1,074	97.7%	47,267	46,113	1,074	97.7%
	DIVERSION SBYC GATE	49,199	49,096	1	100.0%	49,199	49,096	1	100.0%
GRJ - Lower Granite Dam Juvenile									
Site Code	Diversion Gate Antenna Group	Total Fish	Success Count	Failure Count	Percent	YTD Total Fish	YTD Success Count	YTD Failure Count	YTD Percent
GRJ	A-SEPARATOR GATE	81,732	79,559	1,896	97.7%	81,732	79,559	1,896	97.7%
	B-SEPARATOR GATE	47,897	46,766	941	98.0%	47,897	46,766	941	98.0%
	DIVERSION / SBYC GATE	73,616	71,351	2,068	97.2%	73,616	71,351	2,068	97.2%
	RCWY-10 GATE	33,702	32,359	1,278	96.2%	33,702	32,359	1,278	96.2%
	SBYC GATE	15,470	0	0	0.0%	15,470	0	0	0.0%
JDJ - John Day Dam Juvenile									
Site Code	Diversion Gate Antenna Group	Total Fish	Success Count	Failure Count	Percent	YTD Total Fish	YTD Success Count	YTD Failure Count	YTD Percent
JDJ	SBYC GATE	15	15	0	100.0%	15	15	0	100.0%
	SBYC SEPARATOR GATE	67,858	67,682	157	99.8%	67,858	67,682	157	99.8%
LMJ - Lower Monumental Dam Juvenile									
Site Code	Diversion Gate Antenna Group	Total Fish	Success Count	Failure Count	Percent	YTD Total Fish	YTD Success Count	YTD Failure Count	YTD Percent
LMJ	A-SEPARATOR GATE	20,400	19,957	430	97.9%	20,400	19,957	430	97.9%
	B-SEPARATOR GATE	21,458	20,772	675	96.9%	21,458	20,772	675	96.9%
MCJ - McNary Dam Juvenile									
Site Code	Diversion Gate Antenna Group	Total Fish	Success Count	Failure Count	Percent	YTD Total Fish	YTD Success Count	YTD Failure Count	YTD Percent
MCJ	SBYC A-RACEWAY RIVER GATE	28,635	28,616	0	100.0%	28,635	28,616	0	100.0%
	SBYC A-SEPARATOR GATE	28,871	28,840	3	100.0%	28,871	28,840	3	100.0%
	SBYC B-RACEWAY RIVER GATE	32,134	32,111	0	100.0%	32,134	32,111	0	100.0%
	SBYC B-SEPARATOR GATE	32,403	32,384	1	100.0%	32,403	32,384	1	100.0%

Figure 18. DGE report for 2013

Note: the diversion efficiency cannot be computed for the gate labeled *SBYC GATE* at GRJ because it does not have a downstream detection point.

E: 70. Install Interrogation Systems in Field Locations

The Dalles adult ladders are now equipped with thin body ferrite tile PIT tag antennas. The goal of these antennas is a detection rate of near 100% and an uptime of near 100%. The first detections at the dam have resulted in each antenna

reading each tag 10+ times, which is an indication of a very robust detection system. The antenna systems were operational prior to water up at each ladder with the east ladder watering up on 2/12/2013 and the north ladder watering up on 3/11/2013.

The prototype 5" deep thin wall antenna was developed in Kennewick. The production units have a 15" footprint in the counting window slot. Near the debris guide, only a 12" footprint is used at the upstream end of the counting window slot.

5" thin wall PIT tag antenna, a 5" ramp/guide and a 2" debris guide/antenna mount give a total footprint of 12" for the light box side of the upstream antenna.

5" thin wall PIT tag antennas and two 5" ramp/guides give a total footprint of 15". This view shows the two-inch "speed bumps" on the side walls of the counting window channel. (3plcs)

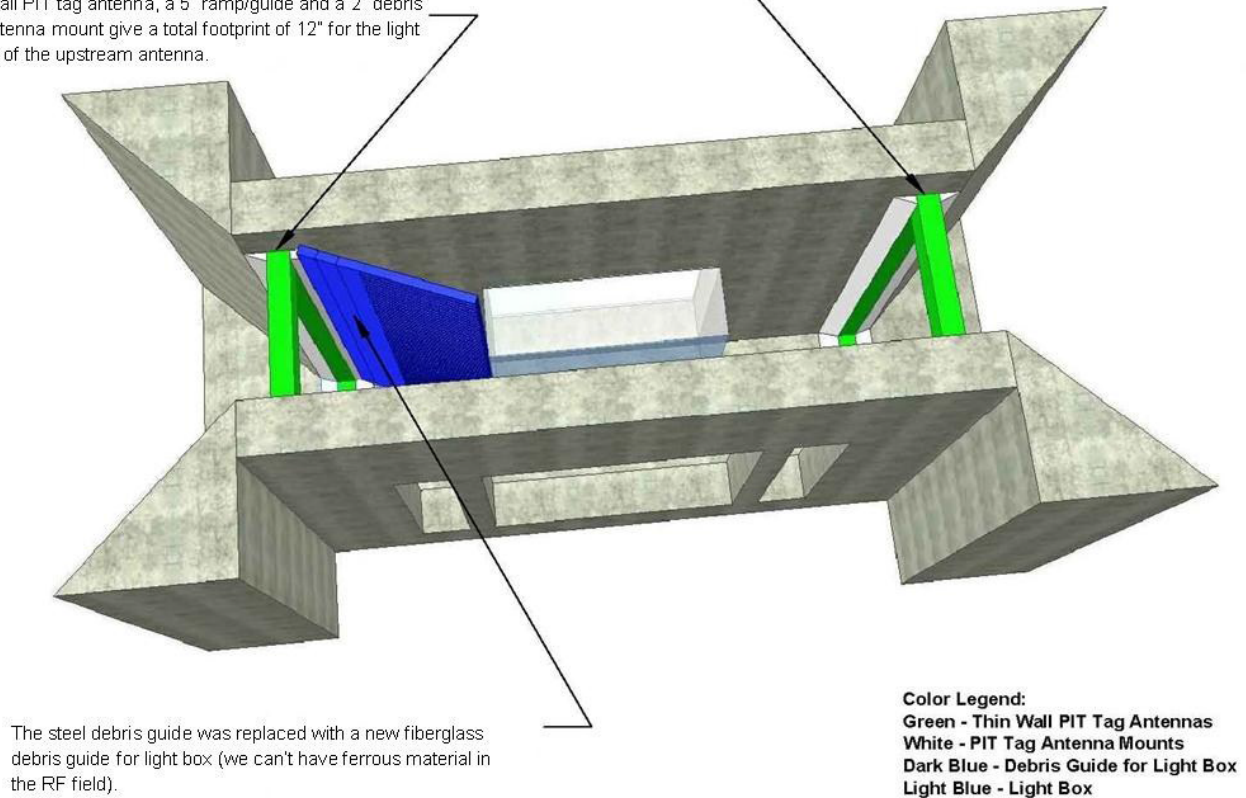


Figure 19. Prototype CAD designed by PTAGIS of 5" deep thin wall antenna



Figure 20. TD1 downstream thin body antenna



Figure 21. TD2 downstream thin body antenna



Figure 22. PIT tag stationary readers at TD2

Both of the PIT tag systems at The Dalles (TD1 and TD2 in the database) include fully redundant data collection computer platforms (*Figure 23*) with hourly uploads to the PTAGIS database. BPA provided the computers, readers and related electronics. PTAGIS installed these systems and continue to operate and maintain them.



Figure 23. PIT tag system data collection computer platform at TD2

PTAGIS has performed weekly YTD detection efficiency reports for adult detection at both The Dalles counting windows. Total combined efficiency for the site, as of 10/7/13 is 99.57%, which meets or exceeds the efficiency of all other main stem ladders. A graph (Figure 24) of how this efficiency was calculated is shown below and does not consider the unlikely possibility of missed detections at multiple dams.

PIT Tag Detection Efficiency at The Dalles Dam				
99.57%		The Dalles Dam has detected 20,082 of the 20,169 PIT tags detected at both Bonneville and McNary Dams.		
Data Detail				
PIT Tag Detections in the Fish Ladders since February 4, 2013 (February 4, 2013 was the last day fish could get through either of The Dalles Dam fish ladders prior to the installation of PIT tag detection equipment). This data was last updated October 7, 2013				
ROW 1	Individual Dam Numbers	Bonneville Ladders (BO1, BO2, BO3 & BO4) Unique PIT Tags Detected: 35,847	The Dalles Ladders (TD1 & TD2) Unique PIT Tags Detected: 26,953	McNary Ladders (MC1 & MC2) Unique PIT Tags Detected: 20,541
ROW 2	Two Dam Comparisons	Unique PIT Tags detected at both Bonneville & The Dalles Dams: 26,645		Unique PIT Tags detected at both The Dalles & McNary Dams: 20,203
		Unique PIT Tags detected at both Bonneville & McNary Dams: 20,169		
ROW 3	Three Dam Comparison	Unique PIT Tags detected at all three dams: Bonneville, The Dalles & McNary 20,082		

Figure 24. 2013 PIT Tag Detection Efficiency at The Dalles Dam

The .43% loss in detection efficiency is explained by either side by side tagged fish movement through the counting windows, canceling each other out, or fish traveling through the navigation lock which is always possible at all other PTAGIS operated main stem adult sites.

F: 160. Operate and Maintain Interrogation Systems in Field Locations

All non-SbyC sites were upgraded to the M4 data collection platform and performed without issue in 2013. PTAGIS continued to deploy FS2020 transceivers at sites and as of 2013, there are 70 of these adult readers operating at the following locations:

- All main stem juvenile full flow bypass antennas
- All slots and orifices at the Granite Adult ladder
- Both ladders at the McNary counting windows
- Both ladders at The Dalles Dam counting windows
- All three counting windows at Prosser Dam
- The adult ladder antennas at Roza Dam
- The juvenile bypass flat plate antennas

The following reports (Figure 25) provide examples of cumulative efficiency analysis (CEA) for each antenna at different three types of sites managed by PTAGIS.

JCJ - Jack Creek Acc. Pond

Subsite	Antenna Group	a	Tags	Tags	Detected by	Missed	Tags	Missed per	Tags
JCJ	NORTH RIVER EXIT	A1	11,687	5,686	5,650	36	99.37%		
		A2	11,687	5,686	5,662	24	99.58%		
	SOUTH RIVER EXIT	B1	11,687	6,001	5,975	26	99.57%		
		B2	11,687	6,001	5,981	20	99.67%		

B2J - Bonneville PH2 Juvenile

Subsite	Antenna Group	a	Tags	Tags	Detected by	Missed	Tags	Missed per	Tags
B2J-FF	FULL FLOW BYPASS	01	34,845	34,845	34,564	281	99.19%		
		02	34,845	34,845	34,628	217	99.38%		
		03	34,845	34,845	33,814	1,031	97.04%		
		04	34,845	34,845	34,628	217	99.38%		
B2J-JFF	SBYC SEPARATOR GATE	A1	33,720	33,718	33,604	114	99.66%		
		A2	33,720	33,718	33,646	72	99.79%		
		A3	33,720	33,718	33,649	69	99.80%		
		A4	33,720	33,718	33,651	67	99.80%		
	RIVER EXIT	81	33,720	29,526	29,444	82	99.72%		
		82	33,720	29,526	29,482	44	99.85%		
	SAMPLE ROOM	51	33,720	624	622	2	99.68%		
		52	33,720	624	623	1	99.84%		
	SBYC EAST TANK	E1	33,720	3,467	3,461	6	99.83%		
		E2	33,720	3,467	3,457	10	99.71%		
	SBYC WEST TANK	F1	33,720	95	95	0	100.00%		
		F2	33,720	95	94	1	98.95%		
	SAMPLE / SBYC EXIT	91	33,720	3,481	3,207	274	92.13%		
		92	33,720	3,481	3,230	251	92.79%		
		93	33,720	3,481	3,238	243	93.02%		

GRA - Lower Granite Dam Adult

Subsite	Antenna Group	a	Tags	Tags	Detected by	Missed	Tags	Missed per	Tags
GRA-LDR	WEIR 733	01	19,180	19,160	3,052			20	99.90%
		02	19,180	19,160	17,397			20	99.90%
	WEIR 732	03	19,180	19,131	4,037			49	99.74%
		04	19,180	19,131	16,245			49	99.74%
	WEIR 731	05	19,180	19,127	5,906			53	99.72%
		06	19,180	19,127	14,440			53	99.72%
	WEIR 730	07	19,180	19,112	6,170			68	99.65%
		08	19,180	19,112	14,157			68	99.65%
GRA-TRP	ISO WEST	12	8,527	7,916	7,897	19	99.76%		
		14	8,527	7,916	7,864	52	99.34%		
		16	8,527	7,916	7,852	64	99.19%		
		18	8,527	7,916	7,900	16	99.80%		
	ISO EAST	22	8,527	715	715	0	100.00%		
		24	8,527	715	715	0	100.00%		
		26	8,527	715	715	0	100.00%		
		28	8,527	715	711	4	99.44%		

Figure 25. Example CEA Reports for Acclimation Pond, Juvenile and Adult Interrogation Sites

In 2013, the overall CEA for the 410 detectors maintained by PTAGIS was 99.06%. Sites such as BO2 utilize overflow weirs and fish have the opportunity to travel over PIT tag detectors reducing the site efficiency. Due this and other

unique factors, BO2 and BCC were not used to determine the overall 2013 cumulative efficiency analysis shown for each site managed by PTAGIS in *Figure 26*.

Site Code	Cumulative Efficiency Analysis
B2J	99.48
BCC	N/A
BO1	98.70
BO2	87.55
BO3	99.81
BO4	98.77
CFF	100.00
CFJ	98.47
ESJ	99.53
GOJ	98.86
GRA	99.72
GRJ	99.29
ICH	99.21
JCJ	99.54
JDJ	99.30
LFF	97.54
LMJ	99.11
MC1	98.90
MC2	98.83
MCJ	99.27
PRO	98.62
ROZ	98.90
RPJ	97.13
TD1	99.64
TD2	99.65
Overall Average	99.06

Figure 26. CEA Analysis for PTAGIS Interrogation Sites in 2013

Administration, Management and Coordination

A: 119 Routine Administration of the Contract

The objectives and deliverables described in this report were performed under a 2 year contract submitted as a funding package in 2012. An unplanned budget cut to the program in 2013 required a careful revision of the project SOW and budgeting plans already underway. All contract-related deliverables such as annual and periodic status reports were completed on schedule. The new funding package for FY14 was developed, reviewed and submitted in 2013.

Without staff turnover this year supervision was routine and performance reviews were completed and submitted on schedule per PSMFC guidelines. Rent was lowered due to the budget cut as lab space in the Portland office containing transceivers and other electronic equipment used for software development was forfeited in June and the inventory was moved to the Kennewick lab or to offsite storage.

An inventory software management system was procured and deployed in July of 2013. A three week evaluation of 5 products was conducted and Wasp Inventory Control Management system was selected based upon cost and

functionality. The system allows staff to manage inventory for over 1,400 assets at 25 separate locations and log maintenance records for tag readers and other uniquely-identified electronic equipment. Staff performed an annual inventory audit and the product was loaded into Pisces for the FY14 funding package.

In 2013, subcontracts were extended from FY12 or were created for follow-on work with the same entities as described in *Figure 27*.

PSMFC Subcontract	Subcontractor	Description of Work
12-98	Field Trip, Inc.	Graphic design for new website, update of media for online <i>Tour</i>
13-89	ManageForce	Consulting and development of Microstrategy reporting server
14-49	Microstrategy	Consulting and system audit of Microstrategy reporting server
12-95	Synergetics Inc.	Consulting and on-going maintenance of legacy server system (PTAGIS3)
8672, 9182	Falafel Inc.	Consulting and development of new website

Figure 27. Summary of subcontracts used by PTAGIS related to technical activities

G: 122 Technical Support and Training Assistance to Field Users

Users of all PTAGIS field software, web and reporting systems were supported with technical support and training assistance. Staff are responsive to ad-hoc support requests that can range from simple to complex coordination requirements. Complex requests are routed to the expertise within the staff. In combination of traditional methods such as phone and email, staff also incorporated online webinar, video tutorials and forum (*Figure 28*) technology.

FORUMS / REPORTING QUESTIONS AND FEEDBACK				Show threads that are:
THREAD	POSTS	VIEWS	LAST POST	
Relative queries by get2will , 25 Feb	2	7	by NTancreto@psmfc.org 26 Feb	Recently Replied Newest Most Viewed Answered
Detection at two different mainstem sites by cookamy , 08 Nov 2013	2	33	by NTancreto@psmfc.org 12 Nov 2013	
Query Design by cookamy , 08 Nov 2013	2	29	by cookamy 08 Nov 2013	
Editing Reports by dvenditti , 26 Sep 2013	2	22	by NTancreto@psmfc.org 27 Sep 2013	
Excel and "Complete Tag History" by dvenditti , 15 May 2013	2	39	by dvenditti 15 May 2013	
Small Scale Site Interrogation Quick Reports by Dave.Marvin , 06 May 2013	1	29	by Dave.Marvin 06 May 2013	

Figure 28. Online Technical Forums now available on PTAGIS website

H: 122. Additional Support Actions

The following actions occurred in 2013 related to support on-going PIT tag detection activities Basinwide:

- Continued coordination and evaluation of the Biomark FS3001 transceiver development project as replacement for first-generation transceivers at the Bonneville corner collector interrogation site (BCC)
- Participate in COE design team for installing thin-body antennas at counting windows at Lower Monumental, Little Goose and the adult fish trap at Ice Harbor
- Evaluation with COE personnel to determine if hydrofoil antenna prototype at BCC will impact existing antenna as well as those at the BO4 slots

I: 189 Coordination- Columbia Basinwide

Staff coordinated and participated in the *Annual PIT Tag Steering Committee* meeting in January 2013. The meeting notes for this and past meetings are available online¹⁴. Ad-hoc teleconference meetings and email coordination also occurred throughout the year in 2013 and was primarily concerned with the rollout of new technology.

PTAGIS Portland staff continued to provide technical review and data for the NPCC Fish Tagging Forum¹⁵. Kennewick staff participated in FPOM, FFDRWG, AFEP, and AFS meetings.

Two newsletters were published in 2013 providing insight and technical coordination to 1,300 subscribers in region. All newsletters are available online¹⁶. Staff used a new email campaign to distribute the newsletters electronically this year. The public can easily subscribe to receive the newsletter from a new service¹⁷ on the PTAGIS website. Anyone receiving the newsletter electronically can unsubscribe by clicking a link embedded in the distribution email.

The new PTAGIS website contains a *News and Announcement* feature (Figure 29) on the home page and 16 items were published throughout 2013. Past news items are accessible through the *Resources*¹⁸ section of the website.

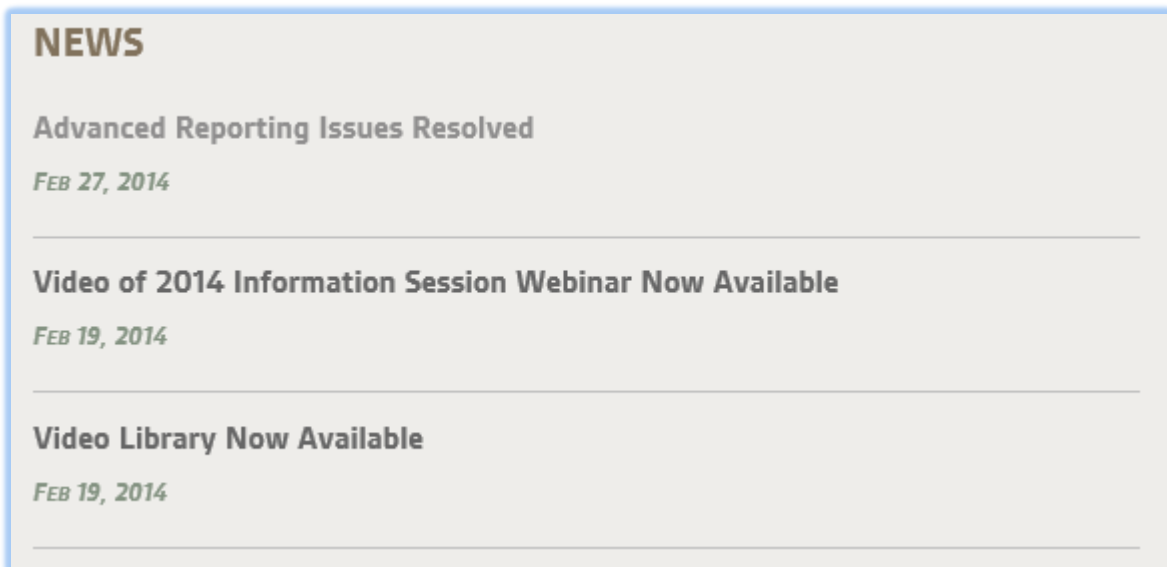


Figure 29. News and Announcement feature of PTAGIS website

¹⁴ Annual PTSC meeting notes: <http://www.ptagis.org/resources/document-library/meeting-notes>

¹⁵ NPCC Fish Tagging Forum on the web: <http://www.nwcouncil.org/fw/tag/home/>

¹⁶ PTAGIS newsletter archive: <http://www.ptagis.org/resources/document-library/ptagis-newsletter-archive>

¹⁷ Subscription service for newsletter: <http://www.ptagis.org/resources/subscribe>

¹⁸ News and announcement archive: <http://www.ptagis.org/resources/news-and-announcements>

Staff coordinated two online surveys targeted at the entire PTAGIS user community. The first was a *Tagging Software Survey*¹⁹ to establish usage of the P3 tagging software and current/future needs from people contributing MRR data to PTAGIS. There were 103 participants in this survey distributed across regional organizations. The second survey, *Information Session Survey*²⁰, was designed to help PTAGIS staff scope coordination meetings planned in 2014 at various cities in the region. 61 individuals participated in this survey. The email campaign feature of the new PTAGIS website was used to distribute the surveys electronically.

Data Contributor Coordination

Over 30 organizations contributed MRR and/or observation data to PTAGIS in 2013.

Data Contributor Coordination Summary	Tag Data Projects	MRR Sites	Small-scale Interrogation Sites
Total Registered in PTAGIS	266	1025	266
Submitted Data in 2013	119	397	196
Updated/Added in 2013	34	31	46

Figure 30. Summary of Data Contributor Coordination in 2013

PIT Tag Distribution and Quality Assurance

Staff coordinated the distribution of 1,612,300 PIT tags to 71 unique FWP's in 2013. The following table shows how many of each type of tag were distributed in this year.

Tag Type	Total Shipped
12mm	1,254,000
12PL	318,900
9mm	26,200
9PL	13,200
Total:	1,612,300

Figure 31. Summary of PIT Tag Distribution by Tag Type n 2013

Researchers provided forecasting for PIT tags and requested distributions using a new workflow developed in the PTAGIS website called Tag Distribution and Inventory (TDI) shown in *Figure 31*. This workflow also provides features to allow BPA staff to approve distribution requests for shipment and manage FWP authorization.

¹⁹ PTAGIS Tagging Software Survey Results:
https://www.surveymonkey.com/sr.aspx?sm=Vl4adTzgKQyW5fsi4ogtH6lNsaSRVll2HGE9oV23C14_3d

²⁰ PTAGIS Information Session Survey Results:
https://www.surveymonkey.com/sr.aspx?sm=ThPhG6C4GP6_2b_2fNebzp8h36Esk5lmlDwZ8A7TaYS_2fhNs_3d

Filter requests
Request dashboard

Approved
Selected request id: +3187

[<< If you do not need tags, go here >>](#)

+ Add new request
Refresh

RequestId	Submit	Fish/Wildlife Project Number	Fiscal Year	Do Not Ship Before	Do Not Ship After (Required)	Status	Name	Delete	
3187		1987-127-00-5	2014		4/1/2014	Approved	Brandon Chockley	delete request	Edit
3207		2003-017-00	2014	4/1/2014	4/15/2014	Approved	Chris Jordan	delete request	Edit
3209		2003-017-00	2014	4/1/2014	4/15/2014	Approved	Chris Jordan	delete request	Edit
3213		2003-017-00	2014	4/1/2014	4/15/2014	Approved	Chris Jordan	delete request	Edit
3215		1988-064-00	2014	10/11/2013	4/30/2014	Approved	Shawn Young	delete request	Edit
3198		2008-518-00	2014		5/1/2014	Approved	Jeff Fryer	delete request	Edit

Request Details

Name/Organization

Address

City

State

Zip

Country

Add Details Of Your Shipment

+ Select Tag Type and Quantity
Refresh

Tag Type	Quantity	
12mm	16,200	Edit

Nice to see you back John. You role is: TagAdmin
Today is: Tue 11 Mar

Do not ship after: Tue 1 Apr 2014
Fiscal year: 2014

Tracking number:

This is your request dashboard. From here you can change ship to address, edit request details or add/remove/change tag details. Your order can be edited until it is shipped.

For more information please contact PTAGIS admin or PIT Tag coordinator

Figure 32. Tag Distribution and Inventory Service on PTAGIS Website

An internal software utility called Tag Inventory Manager (TIM) was developed/used to manage inventory and distribute PIT tags based upon the online requests managed by the TDI system.

The screenshot shows the PTAGIS Tag Inventory Manager 1.3.0.6 x86 application window. The interface includes a toolbar at the top, a header area with a drag-and-drop instruction, and a main data table. The table has columns for Box Number, Date In, Full, Tag Type, Tag Mod..., Total Vials, Available Vials, Purchase..., Release..., and QA Status. The first row is highlighted in orange and shows box CBB3866 with 1 total vial. Subsequent rows list individual tag IDs (R000020 to R000045) with their respective dates, full status, tag types, and quantities. A status bar at the bottom right indicates the data source is Production.

Box Number	Date In	Full	Tag Type	Tag Mod...	Total Vials	Available Vials	Purchase...	Release...	QA Status
Total Boxes = 207					Total Vials = 10,328				
CBB3866	6/14/2011	<input type="checkbox"/>	9pl	TX149011...	1	0	00034945	000201 (re...	Ready
R000020	11/1/2013	<input type="checkbox"/>	12mm	TX1400SST	100	0	54893	17	Ready
R000023	11/1/2013	<input type="checkbox"/>	12mm	TX1400SST	100	0	54893	17	Ready
R000024	11/1/2013	<input type="checkbox"/>	12mm	TX1400SST	100	0	54893	17	Ready
R000025	11/1/2013	<input type="checkbox"/>	12mm	TX1400SST	100	0	54893	17	Ready
R000026	11/1/2013	<input type="checkbox"/>	12mm	TX1400SST	100	0	54893	17	Ready
R000027	11/1/2013	<input type="checkbox"/>	12mm	TX1400SST	100	0	54893	17	Ready
R000028	11/1/2013	<input type="checkbox"/>	12mm	TX1400SST	100	0	54893	17	Ready
R000029	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000030	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000032	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000033	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000034	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000035	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000036	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000037	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000038	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000039	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000040	11/1/2013	<input checked="" type="checkbox"/>	12pl	TX1400SS...	100	100	54893	17	Ready
R000041	1/24/2014	<input type="checkbox"/>	12mm	TX1400SST	100	0	54893	18	Ready
R000042	1/24/2014	<input type="checkbox"/>	12mm	TX1400SST	100	0	54893	18	Ready
R000043	1/24/2014	<input type="checkbox"/>	12mm	TX1400SST	100	0	54893	18	Ready
R000044	1/24/2014	<input type="checkbox"/>	12mm	TX1400SST	100	74	54893	18	Ready
R000045	1/24/2014	<input checked="" type="checkbox"/>	12mm	TX1400SST	100	100	54893	18	Ready

Figure 33. Tag Inventory Manager internal software application

A 1% sample of all tags inventoried by PTAGIS underwent a rigorous quality assurance (QA) process using automation housed in the Kennewick laboratory. No significant manufacturing defects were detected in 2013. Progress continued on the development of additional advanced automation and software to increase the sample size to 3-5%. The new automation project is called the PIT Tag Sorter (Figure 34) and will also make PIT tag testing more efficient as many tags from multiple vials can be processed and sorted back into their original packaging.



Figure 34. New PIT Tag Sorter automation (left) and the Automated PIT Tag Testing System (APTTS) automation (right).

PIT Tag Forecasting

Staff made progress on the development of a new, online *PIT Tag Forecaster* tool (*Figure 35*). Data analysis from the past implementation of this project resulted in a concise data model, user interface and workflow. Staff coordinated meetings with proponents from AA and subcontractors to refine the application, data model and reporting. At the end of 2013 the application was on schedule to be released for beta testing in early 2014.

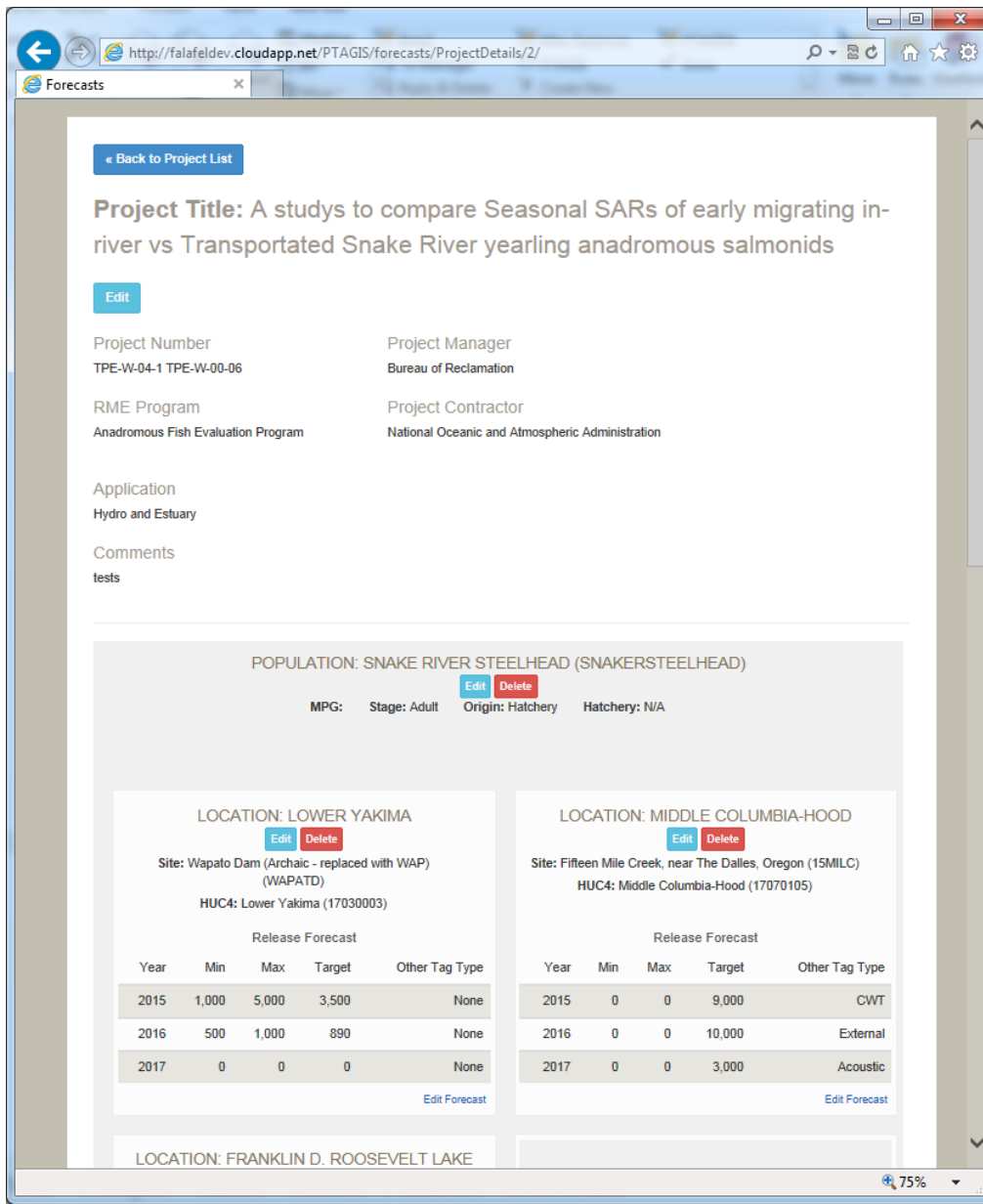


Figure 35. New PIT Tag Forecaster web application.

PIT Tag Recovery Rewards Program

In 2013, PIT Tag recovery reward letters were distributed to 29 individuals who returned their recovered PIT tags to PTAGIS or other fishery management agencies. Tag data coordinators who submitted the initial mark records for these tags were also notified.

Synthesis of Findings: Discussion/Conclusions

Coordination and Data Management for RM&E

Operate and Maintain the PTAGIS System

As the foundation of the new PTAGIS reporting system, the dimensional database has an added side-effect that promotes data anomalies to the top level. These anomalies were not as easily identified in the legacy system and

represent a tiny fraction of the millions of PTAGIS data records. They are to be expected from a 25-year dataset, especially when data was collected early in the program's history without advanced validation processes in place. For example, a few records reference invalid dates or undefined validation codes. With the upgrade completed, staff will have time to focus on correcting these issues. Some anomalies will require coordination with PTSC where the responsible contributor can no longer be contacted and intent cannot be determined.

To preserve MRR data continuity and project relationships into the future, PTAGIS is transitioning from an individual *Tag Coordinator* to *Tag Data Project Coordinator* that is more agency-specific. Similarly, the new metadata designed for small scale interrogation sites allows data steward contacts to be retired and promoted. Project metadata will be enhanced for both MRR and observation datasets as the new system evolves going forward. Additional automated QA/QC processes will be added in the near future to ensure data integrity and capacity as the overall number of contributors and researchers using the new system grow and their needs become more complex.

B: 160. Operate, Maintain and Enhance the PTAGIS System

Infrastructure inertia is a difficult fact for any project to face and most likely will not have a consensus especially from those with the most invested in the status quo. The prevalence, or lack thereof, of a technology such as a database is one of the best indicators of inertia and the cost of operation and maintenance will rise steeply as the technology and expertise becomes more exotic. Another indicator is the inability of a system to align with the evolving needs of the diverse community that uses it. Often what happens is the community adapts by recreating smaller, disparate workaround systems. It is even a greater challenge to recognize inertia when the existing infrastructure has enjoyed great success in the past. It took steady leadership, astute technologists, and rational voices within the community to convince stakeholders to see that benefits outweighed risks in undertaking a complete upgrade of PTAGIS technology.

Operating and maintaining both legacy and new systems concurrently as part of a planned evaluation process was a challenge for staff and resource intensive. Some of the rigidity of the legacy system had to be reproduced in the new system to provide a complete side-by-side analysis. This effort seemed warranted due to intense scrutiny this upgrade received from some of the past project stakeholders when it was first conceived in 2008-2009. Adding complexity it pushed the overall schedule of the upgrade probably by a factor of 6-12 months. One advantage of maintaining two systems was a fallback contingency if the upgrade failed. The end result of the evaluation process was an unequivocal decision by staff and stakeholders to retire the legacy system and discontinue the resources required to operate and maintain it.

The ability to recreate a system that evolved over 20+ years in just 2-3 years can be credited to the proficiency and resolve of staff using an agile development methodology (compared to the outdated waterfall methodology of past) and the prevailing and cost-effective technology stack the project was founded upon. Much of the 'heavy lifting' of technology is complete but the refinement and documentation to reduce operation and maintenance overhead are still to come and will most likely take the same period of time. The ultimate measure of success of this upgrade will be the ability to finally evolve the PTAGIS data model and systems with the current and future needs of the community. It will take a coordinated effort by staff and PTSC to determine and effectively address those needs – technology, however, is no longer an obstacle.

Field Data Collection Systems

It is clearly evident the P3 tagging software needs to be upgraded and should be the highest of priorities next year. Plans are already underway to start this process and the existing codebase from M4/server development as well as the Web API will be leveraged to reduce schedule. The plan also includes additional coordination with the PTSC to concurrently evolve the PTAGIS data model.

The complex M4 interrogation software exceeded expectations in terms of performance and continuity of data collection. There were two issues related separation-by-code mentioned in another section, however, these issues were addressed immediately. No upgrade of this software was necessary for [large scale interrogation](#) sites next season. Biomark has requested an update to support new firmware for the FS2020 but it was determined the update would not benefit BPA-funded projects. Because the software is complex and lacks documentation, PTAGIS will continue to support the legacy MiniMon software operating at [small scale interrogation sites](#) throughout 2014.

The next major release of M4 will focus on making features more user-friendly and well-documented. Once completed the MiniMon software will be retired and small scale interrogation sites will transition to M4. A revision to the M4 application architecture will take the complex data parsing dependent upon frequent changes to transceiver firmware and migrate it to the ETL processing on the central server. This will promote application stability and decrease the need to update software in the field.

Server Data Management Systems

The database and related ETL systems have been performing well and are stable. Operating on oversized hardware should provide stable performance and capacity for the next 3-5 years. Tag mask and additional validation processing will be added to the system next year and the database licensing allows for a fully fault-tolerant failover and recovery deployment that will be investigated in the near future.

The data extraction process supporting large data consumers has been stable and two revisions were provided immediately last year when issues were discovered. With automated quality assurance enabled at the end of 2013 stability and integrity should be assured going forward. Because of staff workload and competing priorities, this system may prove to be too costly to support and require alternative solutions such as duplicating the PTAGIS database in the cloud. However, it should be pointed out that only consumers with in-house database expertise should be given access to raw tables of PTAGIS data to avoid misuse and invalid research.

The Microstrategy (MSTR) reporting system was also very stable and handled increasing loads of concurrent users even with a license limiting processing to a single CPU core. The total number of accounts created on this system approached the 500 limit set by the software license. A substantial number of these accounts are used infrequently throughout the year and disabling those accounts frees additional licenses but any associated report objects remain persisted in the system. Staff and a subcontractor modified the system to transparently enable any disabled accounts the next time the user logs in providing a significant return on investment. A subsequent process would run to disable infrequently used accounts as necessary to preserve the 500 user limit.

Staff have been concerned with the unresponsiveness of MSTR regarding complex bug reports. Browser compatibility issues were also a concern as well as the ability to upgrade the system without introducing unintended side effects. Staff negotiated with the vendor to fully license a separate staging server environment at a low cost so new releases of MSTR can be fully tested before going into production.

MSTR is a feature-rich system and is currently being underutilized. As staff and user expertise ramps up over time more features will be introduced to the community to enhance and expedite research, especially in terms of GIS reporting capabilities. As a leading provider of business intelligence and analytics²¹ MSTR has a limited presence on the West Coast

²¹ Gartner 20 February 2014 'Magic Quadrant for Business Intelligence and Analytics Platforms': <http://ptagisbi.psmfc.org/Gartner.pdf>

and the latest of several sales managers has moved on in late 2013. Staff will look at attending regional and nationwide user conferences to reestablish a better working relationship with MSTR and related technology partners.

Web Data Management Systems

The PTAGIS website was stable and effective since it was deployed this year. As additional features were added, it became apparent the difficulty of releasing new versions of the website due to interdependencies between components and a rigid system architecture based upon *ASP.NET Web Forms*²² and the Sitefinity²³ content management system. Now that staff have more expertise with this platform a more efficient ASP.NET MVC²⁴ architecture can be investigated with the grouping of logical feature sets into separate libraries. This modularity should facilitate maintenance and expedite new rollouts.

The ASP.NET Web API²⁵ system will be fully utilized with advancements to PTAGIS field software. Currently a project with IDFG and another with Sitka are using the API to support their web service needs. The system will be refined and promoted to others as staff workload allows.

C: 160. Operate and Maintain the Separation by Code Database

Operation of SbyC in 2013 was more complex than in previous years due to the following factors:

- Implementation of web-based coordination between researchers, PTAGIS, and FPAC
- Implementation of new SbyC software system
- Operation of legacy and new SbyC software systems in parallel

Once the initial hurdles of implementation of the web-based coordination system were overcome, feedback from both researchers and FPAC members was positive. It has provided a standard method to researchers for coordinating SbyC projects, and standard metadata to FPAC for evaluating the SbyC requests. Automated notifications also keep all parties up to date on where in the process the request is located, from submittal to implementation.

The new SbyC software platform (M4) required development of new configurations for SbyC actions at each location and a new SOP for managing the projects, actions, and PIT tag codes on each platform. Developing and maintaining the new processes in parallel with the legacy configurations and processes required twice the work every time an update to a SbyC project was received.

These complexities led to a couple of problems during 2013 SbyC season causing the missed diversion of some fish for two different projects. One of these was caused by a bug in the SbyC software platform, which was caught and fixed within a week of its appearance. The second was caused by a configuration issue and was corrected by improving the SOP. Plans for SbyC in 2014 include better integration of web-based SbyC request workflow with SbyC database and software platform. This will lead to more automation, better QA checks and more efficient updates to SbyC projects in the field.

²² Microsoft ASP.NET Web Forms: <http://www.asp.net/web-forms>

²³ Sitefinity website: <http://www.sitefinity.com/>

²⁴ Microsoft ASP.NET MVC: <http://www.asp.net/mvc>

²⁵ Microsoft Web API: <http://www.asp.net/web-api>

Install, Operate and Maintain Interrogation System in Field Locations

D: 70. Support Separation by Code Systems

The M4 platform performed all tasks with a high degree of detection/diversion efficiency and no data losses. The decision to retire the Multimon SbyC platforms in 2013 was a clear choice. Developed by the PTAGIS Portland group, M4 raises the O&M capabilities of the Kennewick group to a whole new level with up to the minute reader statuses and instant email alerts to problems within the fish facilities.

The legacy platforms will be removed and staff will continue to fully deploy the M4 platforms that include solid state hard drives and industrial grade power supplies to promote high availability. These platforms will also include uninterruptible power supplies (UPS) that self-diagnose and have email capabilities. New high speed network interface panels will consolidate the networking features. The enhanced platform will be robust and continue operation through frequent power-related issues where the legacy platforms did not. The M4 equipment layouts were standardized across all the SbyC PIT tag rooms for ease of use and maintenance and were configured to allow future expansion without the need for additional wall mounted enclosures.

The M4 platforms communicate with programmable logic controllers (PLCs) to activate SbyC gates, control sample gates, collect site operational statuses, and gather environmental data. These PLCs are aging, but still perform well. The PLC programs, including associated human machine interfaces (HMIs) are all programmed in house by PTAGIS Kennewick engineers. Upgrading the PLCs and HMIs to newer technology may become necessary within the next 5 to 7 years.

During 2013 the GRJ RCW-10 SbyC gate was lower in efficiency than other gates due to the flume design and site operational procedures. PTAGIS will be working with the site operators to improve these conditions in 2014.

A new DGE program/report was created in 2013 by the Portland staff that reports all SbyC gate diversion efficiencies. This report has performed exceptionally well and is used daily by the Kennewick staff to quickly identify problems. Faster repairs or adjustments to the gates are now possible.

E: 70. Install Interrogation Systems in Field Locations

A technological jump in PIT tag antenna design was accomplished by R&D efforts at the PTAGIS Kennewick lab in 2012 and 2013.

Since the beginning of the Basin-wide adult ladder PIT tag detection project, one of the most costly components of these projects was mining enough concrete to install the standard body antennas in the existing ladders. With costs in mind, the Kennewick staff embarked on an effort to reduce the thickness of the antenna bodies. The first target was both ladders at The Dalles. After prototyping these in 2012, the first production antennas were installed at The Dalles in 2013. At only two inches thick, the TD1 and TD1 antennas were able to be surface mounted into the counting window slots. Hydraulic disruption within the slots is minimized by constructing the antennas into a "speed bump" design. The thin body antenna was installed at much lower cost compared to installing standard body antennas that require extensive concrete remodeling and removal of metallic structure.

Ferrite tile is what makes the thin body antennas possible. This technology was first pioneered by Destron Fearing (now Biomark) engineers for use in trench style antennas. The trench style antennas are targeted for embedding in spillways. The PTAGIS Kennewick staff has taken this technology and applied it to flat plate and thin body pass through antennas. The ferrite tile that makes the thin body antennas possible also allows for them to be installed on metal surfaces, something not possible with the older standard body antennas.

The future for thin body antennas is bright. Upcoming U.S. Army Corps of Engineers (USACE) projects include antennas for the Little Goose adult ladder, both adult ladders at Lower Monumental and a single antenna at the Ice Harbor adult fish trap. The single antenna at Ice Harbor will be implemented as a new SbyC system to target specific fish for trapping and transport. Other possible projects being discussed are both adult ladders at John Day.

The results of the Kennewick staff efforts will provide regional fisheries researchers with valuable, low cost, reliable and efficient PIT tag monitoring sites for years to come.

F: 160. Operate and Maintain Interrogation Systems in Field Locations

The already high antenna group efficiencies were edged slightly higher for 2013 partly due to the deployment of FS2020 transceivers. This upward trend in detection efficiency will continue with the additional deployment of the FS2020 transceivers planned for the next few years at critical detection locations. The FS2020 has a huge advantage over older transceivers due to its auto-tuning capability. The planned deployment of FS2020s and those already in service are listed in Figure 36.

Site	Monitor	Number 2020s Deployed	Number 2020s Needed	Total for Site
GRA	Ladder	8	0	8
GRJ	Full Flow	0	3	3
GOJ	Full Flow	4	0	4
GOA	Goose Counting Window	0	2	2
LMJ	Full Flow	4	0	4
LMA	LM Adult Slots and Orifices	0	4	4
ICH	Ladders and Full Flow	4	16	20
ICT	Ice Harbor Adult Trap	0	1	1
MC1	Counting Window	2	0	2
MC2	Counting Window	3	0	3
MCI	Full Flow	4	0	4
JO1	John Day South Ladder	0	4	4
JO2	John Day North Ladder	0	6	6
JDJ	Full Flow	4	0	4
TD1	Counting Window	2	0	2
TD2	Counting Window	2	0	2
BO1	Slots	0	4	4
BO2	N/A	0	0	0
BO3	N/A	0	0	0
BO4	Slots	0	4	4
BCC	N/A	0	0	0
B2J	Full Flow	4	0	4
CFF	Bypass Channel	3	0	3
LFF	Channel and Wet Lab	15	0	15
PRO	Ladders	6	0	6
ROZ	Ladder and Flat Plates	5	0	5
JCI	N/A	0	0	0
ESJ	N/A	0	0	0
CRJ	N/A	0	0	0
RPJ	N/A	0	0	0
Spares / Lab	N/A	0	14	14
TOTALS:		70	58	128
Note: Future and proposed main stem sites are in blue.		In PSMFC Stock as of 8/14/13:	13	
		To Be Ordered by PSMFC 2014:	12	
		To Be Ordered by NMFS 2014:	15	
		Total Needed to be Ordered In 2015 / 2016 to Complete Upgrade:	18	

Figure 36. FS2020 Deployment for Outgoing Years

The aging FS1001, FS1001A and FS1001B transceivers are repaired in house and are projected to last, at a minimum, another 5 to 7 years. The yearly failure rate for these transceivers has not risen since they were initially installed.

Administration, Management and Coordination

A: 119 Routine Administration of the Contract

The unplanned budget cut in FY13 was disruptive and added workload to an already overburdened staff. Overall staff performance was exceptional, professional and team-oriented. Some staff are still filling two or more positions and expertise has yet to be disseminated due to high workloads and limited training. Employee turnover due to competitive market for highly skilled positions remains a concern.

Giving up the lab space in Portland HQ to save costs on rent introduced additional overhead for field software development and maintenance. The hardware that was local now resides in the Kennewick lab and must be accessed over a wide area network which introduces latency and complexity. Staff have developed software to emulate real-world conditions at large and small scale interrogation sites, but there is still a need to interface with actual field devices such as transceivers and PLC devices. A contingency plan is to ship the equipment back-and-forth and stage them in office space as needed throughout the year.

Subcontracting for technical consultants proved to be difficult due to a competitive local market and a perceived reluctance to bid on technical RFPs. Sole source justification was cited for the majority of the technical subcontracts to continue on-going work during the schedule-driven upgrade and post-upgrade processes. At least one subcontract was terminated during this contract period due to poor performance.

G: 122 Technical Support and Training Assistance to Field Users

This year was more challenging than in the past due new systems coming online much faster than planned while concurrently operating the legacy systems. Based upon feedback, PTAGIS staff successfully launched the new systems with minimal impact on the user community. This was largely due to ramped up support and training using online webinars, video tutorials and forums combined with traditional email and telephone support.

Users will be encouraged to use the web forums to submit all technical support requests as it will eventually provide a searchable knowledgebase to quickly answer common questions.

H: 122. Additional Support Actions

Destron / Biomark engineers in Minnesota are developing a new transceiver (FS3001) for the single, 17' x 17' Bonneville Corner Collector PIT tag antenna. Ongoing testing by PTAGIS field engineers at this site has produced promising results. Stability and auto tuning still needs to be refined; however, we are optimistic that the system will be ready for the 2014 out migration. If the transceiver auto tuning stability problem is not solved, the contingency plan is to reinstall the original transceivers built in 2006. The obsolete transceivers have each been repaired and rebuilt multiple times and have become unreliable, so this is not a desirable contingency and comes at a cost in terms of overall maintenance. The old transceivers do not have a reliable auto-tune circuit and manual tuning is required often throughout the season, draining labor resources. If the new transceiver is accepted by PTAGIS as production, it will be a prime candidate for powering embedded ogee antennas in spillways and other applications.

The Kennewick PTAGIS staff has been invited to be part of a new team targeting spillway PIT tag detection at USACE dams on the Snake and Columbia. Since hydrofoil and embedded trench antennas both have significant design hurdles, a new effort is being discussed to use the flat plate antennas used at Roza Dam on the Yakima River that were designed by PTAGIS Kennewick staff.

I: 189 Coordination- Columbia Basinwide

Coordination between staff, PTSC and the regional community was very good this year given a large workload. The new tools now available to the project (email campaign, news, newsletters, surveys and online forums) should enhance on-going regional coordination. Members of the community and PTSC have consistently commented on how they appreciate the dedication, responsiveness and professionalism of the entire PTAGIS staff. Live seminars are planned in various cities within the region early next year to educate the community on the new PTAGIS systems and future direction. A 2015 PIT Tag Workshop is also planned.

As PIT tag technology and vendors evolve and become more prevalent, staff and PTSC share a concern that researchers outside of the FWP will choose substandard tags (such as pet-grade tags) based upon cost. Choosing untested tags that are too powerful is also a concern because in high abundance they can impact the reading of established tags. Because it is improbable for the PTSC to police the river in terms of what PIT tagging technology is acceptable or compatible, this concern has been readdressed as a data validation issue with a workable solution: a published list of known tag masks (first significant digits of a tag code assigned by ICAR and identify a batch of tags to a vendor) will be added to the validation of all MRR and observation data. Any tag that has an unknown tag mask will be processed but identified and reported as "invalid". "Invalid" tags will be filtered from any of the reports generated by PTAGIS. Researchers can request a new tag mask be added to the list of approved validation codes governed by PTSC and any related "invalid" tags will be reprocessed as "valid".

Another concern related to regional coordination was a report from a fisherman that had bitten and broken a glass PIT tag while eating a cleaned and prepared salmon. PTAGIS was able to identify the code from the broken tag and trace it back to a fish tagged as an adult in the dorsal sinus area by a project outside the Basin. The PTSC is in the process of updating the *Marking Procedures Manual* and will explicitly state fish should not be tagged in this manner. Biomark stated there are too many impediments in developing a food-grade PIT tag.

PIT Tag Distribution and Quality Assurance

Staff continued to inventory and distribute PIT tags efficiently this year even with the added challenge of upgrading the software systems that manage this process. Excellent coordination between BPA and PTAGIS staff allowed the new systems to be designed and deployed in time before the initial forecast in September 2013. There were no delays in distribution or gaps in the resulting metadata.

As the last of many components in the overall PTAGIS system upgrade, and to expedite schedule, the TDI system did not receive as much design consideration as it should and users of the service had a few difficulties entering their requests during the 2013 year. PTAGIS will review and improve the user interface and should be able to deploy an upgraded solution before the next forecast in September 2014. There may be an opportunity to integrate some of the features with the PIT Tag Forecasting application. The internal TIM software performed well and only minor upgrades to further interface with new Tag Sorter QA system should be required.

Schedule on the Tag Sorter project was pushed due to expanded workloads related to the budget cut. Staff will continue to develop the Tag Sorter system to increase the sample size for QA. As with most manufacturing, quality issues happen in short runs which a 1% sample probably would not detect. The Tag Sorter automation should increase the overall sample size to 3-5% which would catch short-run manufacturing issues.

PIT Tag Forecasting

As an unfunded request by BPA within the contract year, this project has been absorbed and is progressing as planned given an ambitious schedule. The coordination, database/functional design, and review has been performed principally by program staff and a BPA subcontractor. Much of the actual software development has been performed by a

subcontractor (Falafel) coordinated by PTAGIS. The project will be integrated into the production website and beta tested with selected users in early 2014.

The development of a simplified relational data model combined with a well-designed web interface should be enough to ensure the quality of forecast data contributed by regional users, some of which are outside the FWP. Of great concern, however, is how the regional users will be coordinated, or compelled, to contribute this data – a task that was given to the AA requesting this application be redeveloped. Program staff have been consistent in stating they would be responsible for implementing a compelling data entry and reporting system but do not have the ability or resources to mandate its use.

[Data Contributor Coordination](#)

The number of data contributors continues to expand each year, necessitating improvements to efficiency and transparency. Implementation of a web-based workflow for the addition of new Tag Data Projects increased the efficiency for researchers, the PTSC and PTAGIS staff. A planned expansion of this web-form to include all of the PTAGIS validation codes in 2014 will only increase efficiency.

[PIT Tag Recovery Rewards Program](#)

This program relies on word of mouth and curious fishermen trying to discover the origin of the little glass tube they discovered in their fish. These opportunistic recoveries complete the life history of a very small number of PIT-tagged fish, yet provide valuable information. More recoveries could potentially be generated with some promotion and a well-defined process for submitting recovered PIT tags for a reward.