PIT Tag Information System
Columbia Basin

Newsletter

April 2018
Volume 16
Issue 1

The PTAGIS Newsletter is published periodically by Pacific States Marine Fisheries Commission.

We welcome input from the PTAGIS community, so email us at ptagis_newsletter@ptagis.org with your story ideas.

If you have questions regarding the contents of this publication, or about the PTAGIS program, please contact PTAGIS Staff.

Contributors for this issue include:

SCOTT LIVINGSTON
slivingston@psmfc.org

JENNIFER LUNDY
jlundy@psmfc.org

NICOLE TANCRETO
ntancreto@psmfc.org

JOHN TENNEY
jtenney@psmfc.org

DON WARF
dlwarf@psmfc.org

DANIEL WILSON
dwilson@psmfc.org

BEN WARREN
Benjamin.Warren@dfw.wa.gov

A Fisheries Data Project of the Pacific States Marine Fisheries Commission

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Dual Mode Detection Enabled at Lower Columbia and Yakima River Adult Fish Ladder Interrogation Sites

DON WARF (PTAGIS Kennewick Office)

PTAGIS O&M staff have enabled dual mode detection capabilities at adult fish ladders on the lower Columbia River and Yakima River. Dual mode allows the reading of both full duplex (FDX) and half duplex (HDX) tags without impacting detection efficiency of either tag. These actions were approved by the PIT Tag Steering Committee (PTSC) to assist lamprey researchers and encourage the continued use of HDX tags in lamprey. This will help to alleviate the possibility of lamprey tagged with FDX tags attaching to antennas and blocking all other detections of FDX tags (see the first article in the September 2017 newsletter for more information on potential impacts to salmon research from the use of FDX tags in lamprey).

Site Codes	Date Enabled	Notes
BO1, BO4	03/30/2018	Slot antennas only. Orifice antennas are FDX only.
TD1, TD2	08/29/2017	Counting windows enabled for evaluation.
JD1, JD2	Projected 2019	FDX only for establishing baseline efficiency in 2018. Enabling dual mode projected for 2019.
MC1, MC2	04/02/2018	Counting windows only. Orifice antennas are FDX only.
PRO, ROZ	04/05/2018	Counting windows at PRO. Weir wall antennas at ROZ.

Table 1. Summary of dual mode operations at interrogation sites on the lower Columbia and Yakima rivers.

Before dual mode was enabled at any of these sites, PTAGIS staff conducted lab tests which indicated that dual mode should not diminish detection efficiency of either FDX or HDX tags. This conclusion was further investigated with a field test conducted at The Dalles fish ladders during the fall of 2017. Detection efficiency was monitored during the field test by both a NOAA statistician and PTAGIS staff using O&M reports developed to monitor detection efficiency at fish ladder interrogation sites. The O&M reports and statistical analysis agreed that detection efficiency does not appear to be impacted by dual mode operations.

The Dalles adult ladders continue to operate in dual mode. The new John Day ladder system will be run in FDX only mode to determine a baseline detection efficiency in 2018. Should no drop in detection efficiencies occur at any of the currently enabled dual mode sites, PTAGIS will send a proposal to the PTSC requesting to enable dual mode at all PTAGIS adult sites permanently. Tentatively this would take place prior to the 2019 season.

PTAGIS main stem sites currently have two models of transceivers which are capable of operating in dual mode, the FS2020 and IS1001 models. Older transceivers still in use at PTAGIS sites (models FS1001 and FS1001A) do not have dual mode and are only capable of detecting FDX tags; because of this, dual mode isn't available in all circumstances. The FS1001 transceivers are primarily used at juvenile bypass facilities and acclimation ponds. The FS1001A transceivers are used in the first-generation orifice antennas in the fish ladders at Bonneville and McNary. The full flow bypasses at COE juvenile fish facilities are instrumented with FS2020 transceivers, but testing would be needed to determine if dual mode is possible at those locations.

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End of Life for Tagging Software P3

NICOLE TANCRETO (PTAGIS Portland Office)

When P4 was first released, one of the frequently asked questions was how long PTAGIS would continue to support P3. We didn't want to force anyone to migrate to P4 before they were ready and had planned on supporting P3 for at least a year. P4 has been in production release since September 2016, and over the past year, the PTAGIS community has been using it instead of P3 in higher and higher numbers (Figure 1).

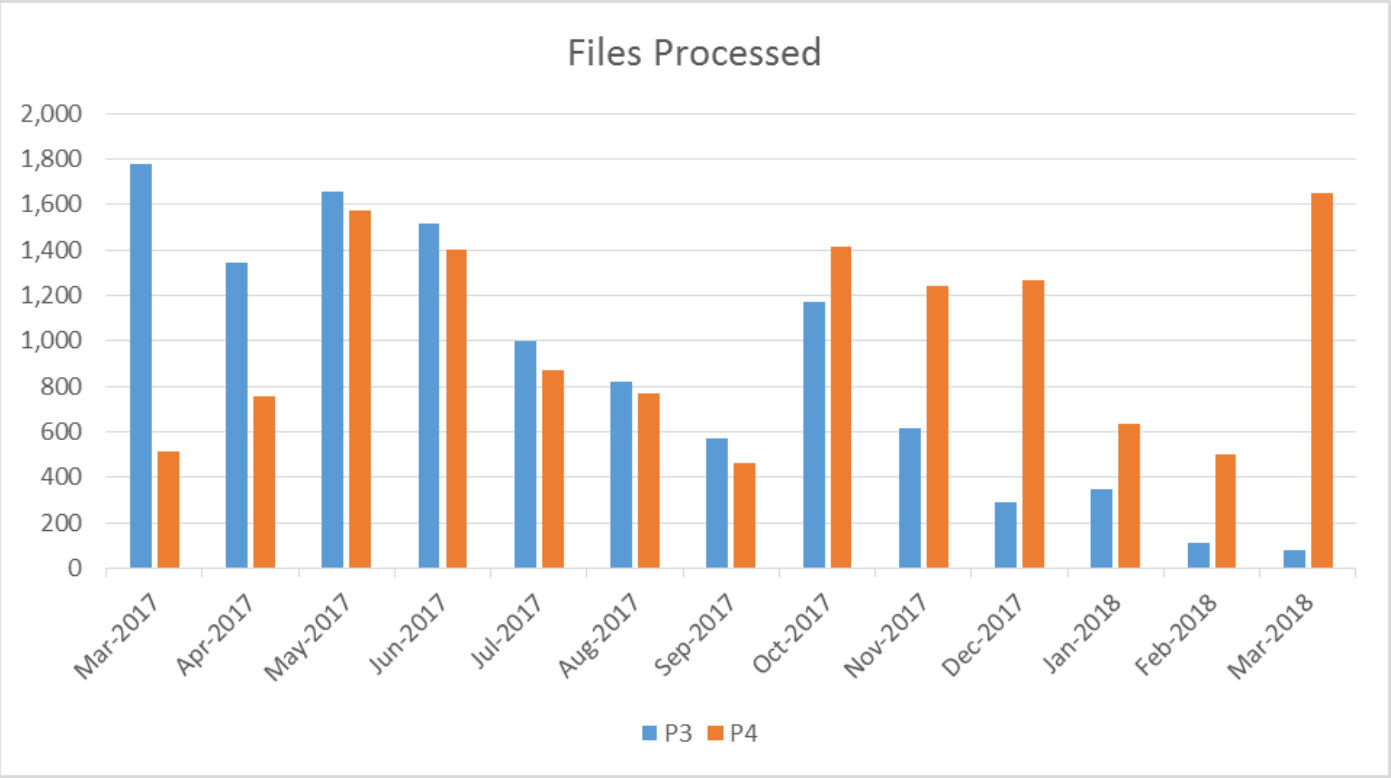

Figure 1. Number of P3 and P4 files processed per month from March 2017 – March 2018.

We have released ten updates to P4 in the year and a half since its first production release, adding requested features and squashing bugs with each release. The data model and customization features of P4 are much better aligned with common field data collection scenarios. Maintenance of legacy processing systems and two streams of tagging data are a burden and extra cost to the program.

For all these reasons, PTAGIS proposes that P3 be retired beginning January 1, 2019. This proposal was discussed at the annual PIT Tag Steering Committee meeting in February and agreed upon.

What this means for users, beginning January 1, 2019:

- PTAGIS will no longer accept tagging files in the P3 format
- PTAGIS will no longer accept tagging files via email submission
- Users may continue to use P3 but will need to import resulting files into P4 for submission to PTAGIS
- PTAGIS will no longer provide technical support for P3

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End of Life for Tagging Software P3

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If you are new to P4, here are some resources to get you started:

- PTAGIS Newsletter October 2016 Volume 14 describes the major differences between P3 and the first release of P4
- Watch the P4 Training Webinar video for a deep dive into P4
- This short video demonstrates new features in P4 1.15 added after the training webinar
- The P4 help file can be downloaded and printed but it is also integrated into the program and can be accessed for each feature by pressing the help button

If you have any concerns about the retiring of P3, please contact us at ptagisadmin@ptagis.org.

P4 Tagging Software Update

DANIEL WILSON (PTAGIS Portland Office)

As the adoption of P4 continues to grow, PTAGIS has released version 1.20 with additional features, enhancements and bug fixes. In order to ensure you have the most stable and efficient experience with P4, please update to the latest version as soon as possible when new versions are released. New version announcements can be found in several places: the PTAGIS Home and News pages, the PTAGIS newsletter, and the Notifications area in P4 (accessed using the toolbar located in the upper-right corner of the application).

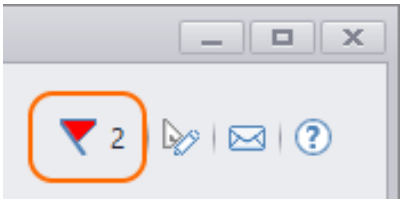

Figure 2. Notifications button

Updates since 1.18:

- Implemented a method to import Clip Files from PTAGIS directly into a Tag List (Internet connection required)

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P4 Tagging Software Update

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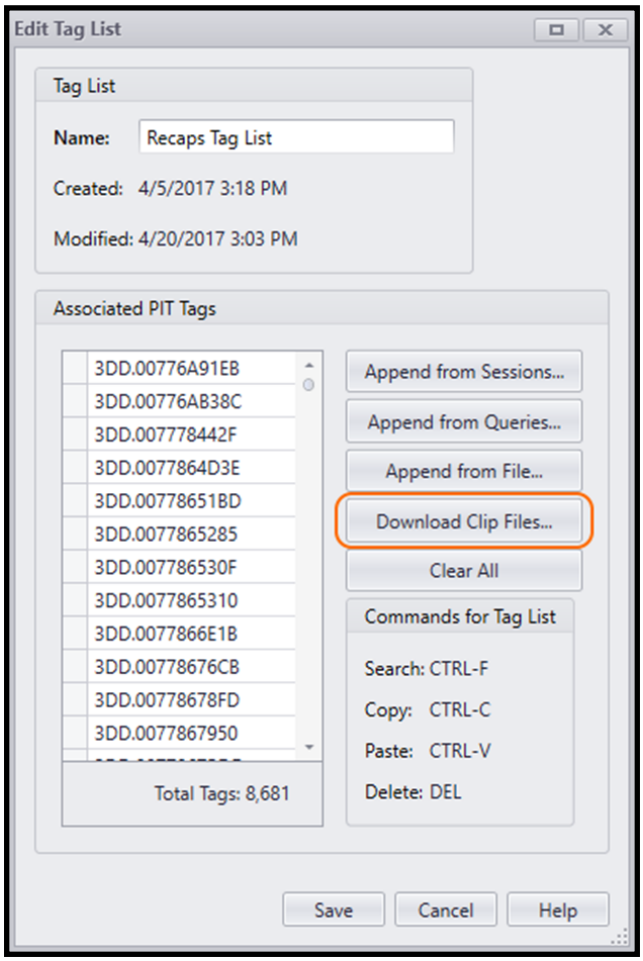

Figure 3. Download clip files directly into a Tag list.

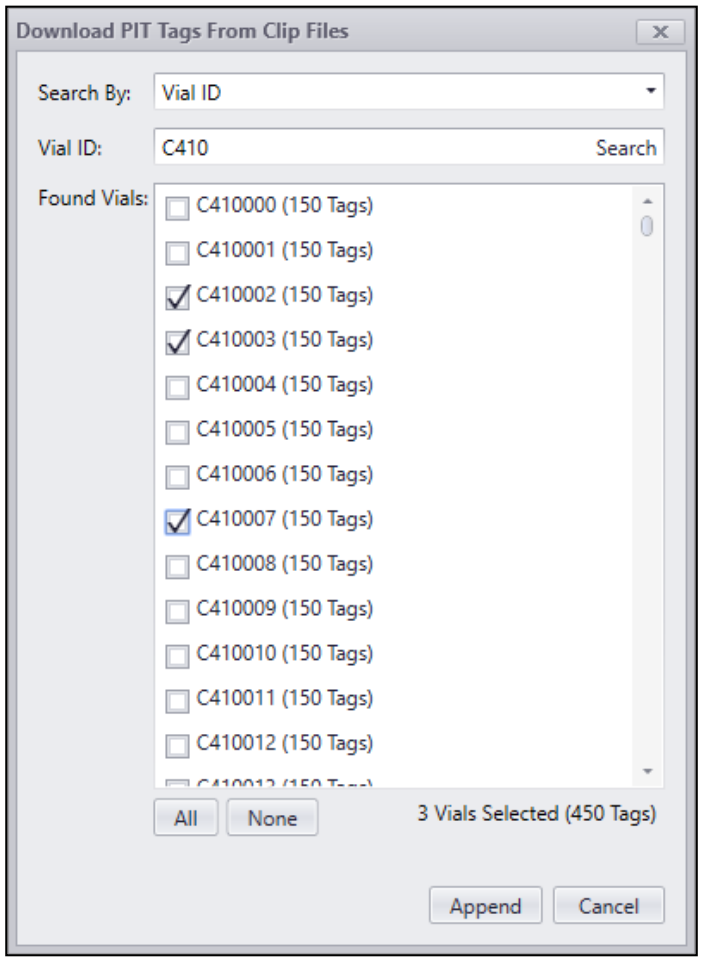

Figure 4. Search by partial vial code or request ID.

- Clip Files can be imported into a Tag List using a full or partial Distribution Request ID or Vial ID.
- Implemented a new Column Chooser feature in Record and Query Management that allows searching for column names and includes checkboxes to add/remove the columns displayed in a grid
- Enhanced command set available to the Generic peripheral device
- Improved validation checks in Data Entry when values are entered from a Digitizer or a Generic device
- The range of acceptable temperatures has been expanded to allow values from -2 to 25 degrees Celsius
- Existing feature enhancements and bug fixes throughout the application

For the full list of changes, please visit http://www.ptagis.org/software/p4-release-notes.

P4 runs on the latest Windows PCs and can be downloaded from the PTAGIS website at https://www.ptagis.org/software/p4.

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PTAGIS Interrogation File Formatter

DANIEL WILSON (PTAGIS PORTLAND OFFICE)

Now on its third update since being released, version 2.5 of the PTAGIS Interrogation File Formatter (PIFF) utility can be used to export Observation data from one or more device data files into an M4 Interrogation File, as well as submit M4 Interrogation Files to PTAGIS.

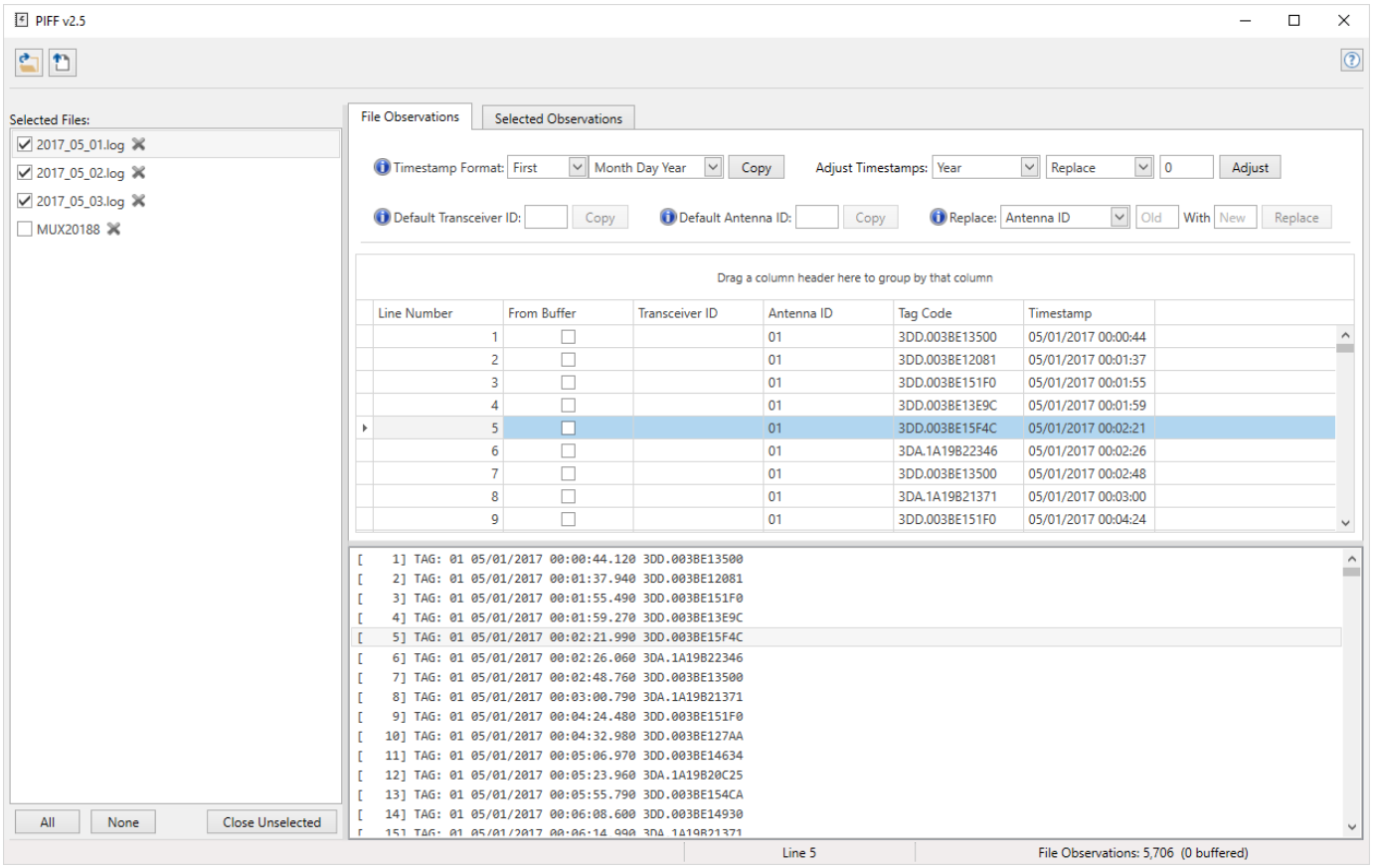

Figure 5. Observation data is displayed in tabular views and can be sorted and filtered using any of the available columns.

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PTAGIS Interrogation File Formatter

DANIEL WILSON (PTAGIS PORTLAND OFFICE)

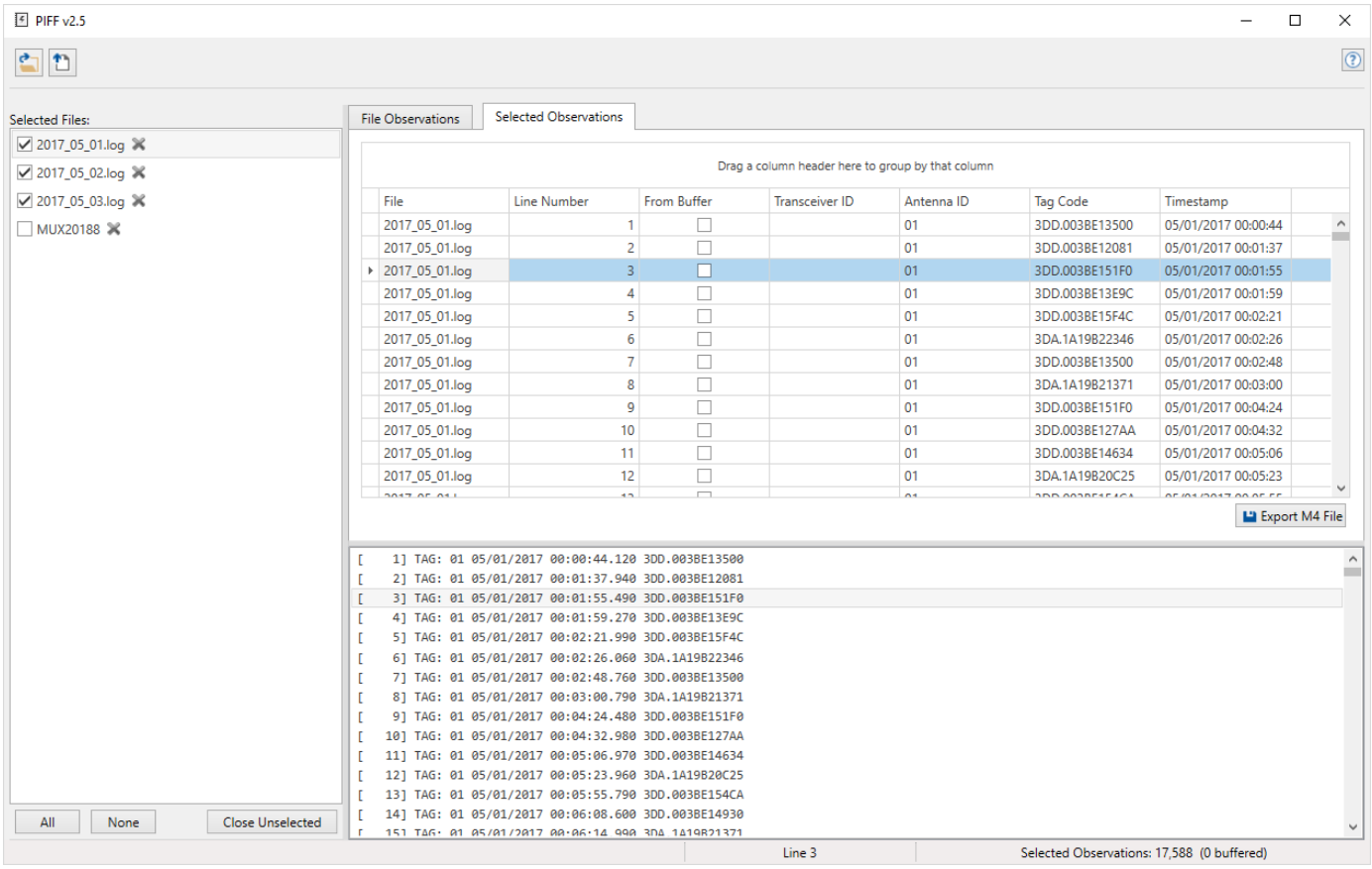

Figure 6. Multiple raw data files can be opened, filtered and selected for export.

Updates in v2.5:

- Added a feature to easily replace parsed Antenna ID & Transceiver ID values
- Added support for data files with multiple timestamps per line
- Existing feature enhancements and bug fixes

New features in v2.2:

- A streamlined user interface
    - The contents of raw data files are displayed along with the parsed Observation records
    - Selecting an Observation record will highlight where the data was found in the file
    - Observation records can be filtered per file, and files can be opened, closed and selected for export
    - No longer need to select the device type before opening files

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PTAGIS Interrogation File Formatter

DANIEL WILSON (PTAGIS PORTLAND OFFICE)

- Easily adjust timestamps in a file and modify file parsing options
- Submit M4 Interrogation files to PTAGIS
- Automatic software updates

PIFF runs on the latest Windows PCs and can be downloaded from the PTAGIS website: https://www.ptagis.org/software/piff-2

Annual PIT Tag Steering Committee Meeting

NICOLE TANCRETO (PTAGIS Portland Office)

The annual PIT Tag Steering Committee (PTSC) Meeting was held February 8, 2018, at the PSMFC office in Kennewick, WA, home of the PTAGIS field operations crew. PTSC members were given a tour of the electronics lab, PIT tag testing facilities, and antenna/transceiver testing lab.

Topics covered during the meeting include:

- Summary of PTAGIS accomplishments in 2017 and plans for 2018
- An update on the spillway detection system (aka the ogee project) to be installed at Lower Granite Dam
- Summary of results from the half-duplex/full-duplex dual mode test
- A discussion with biologists about coordinating research that involves tagging lamprey with full duplex tags and mitigating potential issues.
- Discussion of PTAGIS plans to enhance interrogation site metadata and improve support for small (instream) sites. See newsletter article for more information.
- Results of the most recent BPA PIT tag RFO

A complete set of notes from this (and previous) meetings can be downloaded from the Document Library on the PTAGIS website.

John Day Adult Ladder and Lower Granite Juvenile Bypass Updates

NICOLE TANCRETO (PTAGIS PORTLAND OFFICE) AND SCOTT LIVINGSTON (PTAGIS KENNEWICK OFFICE)

The PIT tag interrogation systems at the John Day adult fish ladders (site codes JO1 and JO2) are fully operational as of February 14, 2018. As previously noted in the June 2017 newsletter, the transceivers were installed and operational before the communication and synchronization lines were installed. As a result these sites have been collecting detections on one of the two installed weir walls and storing those detections to the transceiver buffers. The buffered detections were downloaded approximately weekly and submitted to PTAGIS as passive recapture records at MRR sites JDALD1 and JDALD2. The communication and synchronization lines were installed this winter, and the internet service for all sites at John Day Dam (JO1, JO2 and JDJ) was upgraded to a more reliable and faster connection. Now that the adult ladder sites are fully operational detections are being submitted automatically as regular interrogation records.

Figure 8. John Day Dam adult ladder orifice and overflow antennas.

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John Day Adult Ladder and Lower Granite Juvenile Bypass Updates

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Construction on the Lower Granite full flow juvenile bypass is coming to a conclusion and the site is scheduled to water up during the first week of April. Three new antennas have been installed to monitor passage through the full flow pipe; they are fully operational and ready to record PIT tag detections as soon as the system waters up for the season. A new site diagram has been published to the GRJ metadata page, which shows the locations of these new antennas (01, 02, and 03).

Figure 9. Installation of the three antennas and shields on the new full flow bypass at Lower Granite Dam.

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Enhancements to Interrogation Site Metadata and Software

NICOLE TANCRETO AND JOHN TENNEY PTAGIS PORTLAND OFFICE)

PTAGIS is working on multiple enhancements to interrogation site metadata and software for collecting and reporting interrogation data.

Slowly changing metadata includes the information about interrogation sites which changes infrequently and is manually updated – information such as location, antenna configuration, operational periods, and site steward contact information. PTAGIS plans to work with site stewards and data users to update the metadata standards so that all sites are well documented. We have two primary goals for enhancing the slowly changing metadata:

1. Improve information about small-scale sites for data users
2. Develop a portal for site stewards to maintain the slowly changing metadata for their sites, rather than having to go through PTAGIS staff to make changes

PTAGIS is also planning to accept and make available to data users automated metadata about small-scale sites. Automated metadata includes information about detection equipment or environmental conditions which is reported automatically by equipment at the site and changes continuously – information such as equipment diagnostics, virtual test tags, and environmental data. This information can help data users determine if a site was operating and/or functioning properly during a specific time period. Our primary goals for automated metadata include:

1. Develop a path for submission and loading of diagnostic and environmental metadata along with interrogation data
2. Develop reports for site stewards and data users to view those data

Finally, PTAGIS is planning to develop interrogation software to replace M4 (in use at mainstem sites) and Minimon (in use at instream sites). The M4 replacement will target high-performance computers running Windows to support separation by code features required at the mainstem sites. The Minimon replacement will target low-powered platforms such as the Raspberry PI and other headless Windows 10 IoT computers, which may provide a low-cost alternative to data loggers.

PTAGIS was originally exploring the possibility of taking data directly from low-powered instream interrogation sites that currently operate with data loggers instead of computers via satellite and cellular modems. This was discussed at the annual PIT Tag Steering Committee meeting (along with the other enhancements in this article), but the PTSC felt that PTAGIS should not postpone development of replacement software for M4. Our primary goals for replacement interrogation software include:

1. Centralize parsing and processing of transceiver, PLC and sensor messages on the server
2. Target low-cost and low-power Windows 10 IoT platforms
3. Incorporate water temperature probes and other sensor input
4. Support current transceivers models including Biomark IS1001

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Enhancements to Interrogation Site Metadata and Software

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The ultimate goals of these enhancements to interrogation metadata and software systems are to provide greater transparency to the operational fidelity of instream interrogation sites and to make O&M efforts for mainstem sites even more efficient to keep pace with the expansion of new sites without adding additional overhead to the program. Even when these enhancements are in place, the integrity of data and metadata contributed from instream interrogation sites will continue to rely upon the efforts of stewards and agencies that directly support those sites.

HPS1: Bluetooth Connectivity for the Biomark R601 Reader

BEN WARREN (WASHINGTON DEPARTMENT OF FISH AND WILDLIFE, BIOLOGICAL DATA SYSTEMS| SOUTHWEST REGION)

"Traditional limitations of hardware design and manufacture are disappearing."

Build it! Developing a Custom PIT tag sampling tool

What if you didn't have to throw it away? We've all been there: the annual (or more likely decadal) workspace cleaning, where you dig back through the layers and layers of old hardware, excavating the dusty detritus of field sampling days past. As an application and hardware specialist for the Washington Department of Fish and Wildlife (WDFW), I have surplused my share of flip-phones and PDAs, yet this tragic exercise always seemed overtly wasteful.

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HPS1: Bluetooth Connectivity for the Biomark R601 Reader

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In a world where micro-processors and Bluetooth radios are as ubiquitous as a watch or a wallet (perhaps more so), we're all slaves to Moore's law; a rule that says computing power – or more broadly, hardware potential – doubles every two years. To me, this often seems like a zero sum game: we develop sampling applications and research hardware, usually at a significant investment of time and money, only to find that our system is approaching obsolescence the moment it hits the field.

This is especially frustrating for those tasked with facilitating PIT tag sampling in fisheries management. Commercially available PIT tag readers for fisheries work is a very limited market. Fish and wildlife agencies pay a premium price for a small catalog of specialized RFID readers; and if your task is to facilitate connecting these PIT tag readers to tablet devices in a secure and wireless manner, options become even more limited. As a state agency, WDFW is bound by very specific sampling, security, connectivity and budgetary requirements, and two years ago, nothing available commercially could meet those requirements.

So what do you do when nothing exists that will meet your needs? You build it! We decided that we would try to build our own custom device to resurrect our existing (and still operable) fleet of PIT tag readers. We thought that if we could extend the life of that investment, we could save taxpayer money and modernize our ability to collect PIT tags at the same time.

Our first step in this process was to assess the feasibility of this core concept: could we develop a device that gave our old PIT tag readers wireless connectivity while still being cost effective? Of course, anything is possible with enough money, but when you work for a state agency, you not only need to determine if what you want to develop is feasible, you need to ensure that it is cost effective as well.

We decided fairly quickly that we wanted our device to utilize Bluetooth Low Energy (BLE) technology. Not only was it the only wireless system that met our agency's current security standards, but it also presented us with the best way to maximize battery efficiency and still maintain a waterproof device.

Since most modern smartphones on the planet have a BLE module, options were both abundant and relatively inexpensive. We ended up using the uBlox OLS425 module (now superseded by the NINA-B1 series), a chip that was compatible with all major mobile operating platforms, and cost about $13 retail.

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HPS1: Bluetooth Connectivity for the Biomark R601 Reader

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Once we had a system selected for data transfer, we needed to think about what shape (literally) our device would take. There were a few design options that we considered. We could physically retrofit each of our 601 readers directly, essentially an upgrade kit approach. This design had some benefits, one example being that there was no need to manufacture a separate waterproof housing for the Bluetooth module, as it was small enough to fit alongside the existing RFID reader motherboard. However, this would require an electrical engineer to retrofit each existing PIT tag reader (and any future 601 readers) making it expensive, time consuming and unlikely to be attractive to other projects that needed a solution that worked right out of the box.

Another idea was to manufacture a stand-alone, stripped down PIT tag reader. In this concept, the sole function of the reader would be to interrogate for a PIT tag and transfer that data along a Bluetooth pipe. With no storage and no display, there would fewer parts to break or leak. However, while this idea was attractive, it did nothing to leverage our existing PIT tag readers, and required 100% reliance on Bluetooth communication protocols that were still in development at WDFW in 2015.

After much deliberation, we decided on an endcap concept. This would be an independently housed BLE device that would fit on our existing PIT tag readers – the tried and true plug-and-play model. We would maintain the onboard data storage and interrogation capabilities of the 601 reader that we liked, and would have the added benefit of improving on the stock waterproofing and ruggedness of the reader. Plus, our ideal unit would be field ready, right out of the box.

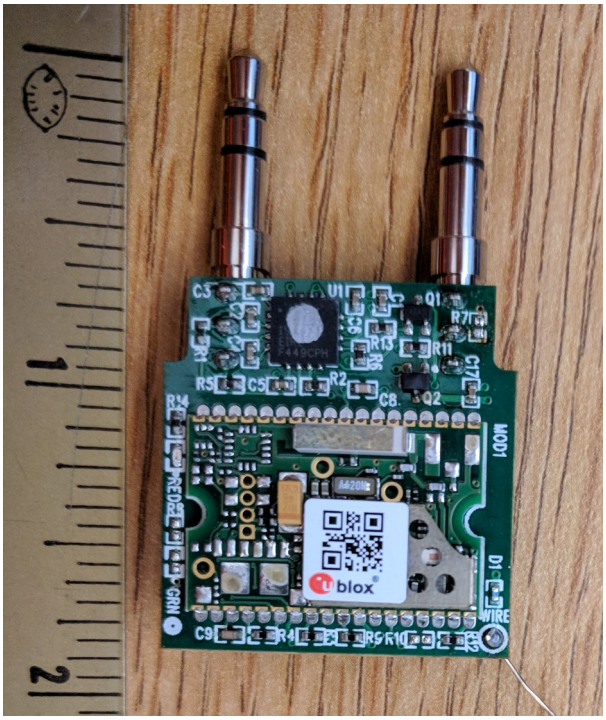

Figure 10: Ublox OLS425 module installed on a HPS1 production model PCB.

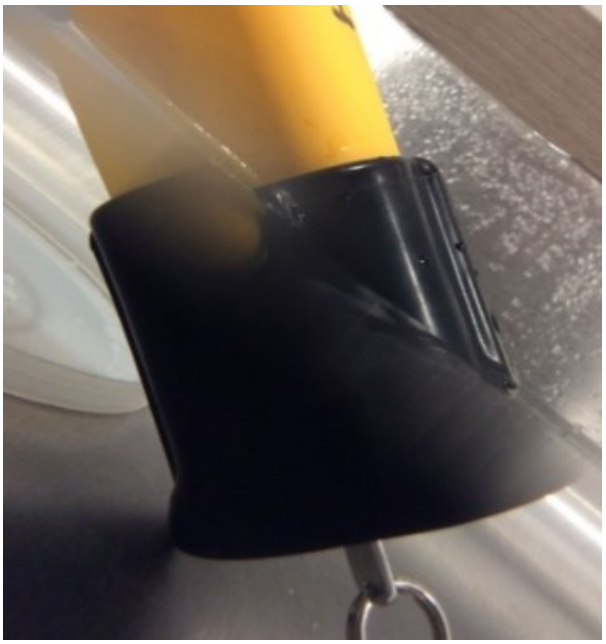

Figure 11: HPS1 production endcap installed on a Biomark R601 reader partially submerged in water.

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HPS1: Bluetooth Connectivity for the Biomark R601 Reader

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Now that we had a specific design in mind, it was time to turn to the professionals to build us a prototype. Our team reached out to High Point Sensing, a design firm headed by Chris Doughty, to help us create our endcap device. Our goal was a durable, waterproof, low-cost BLE communication prototype capable of transferring PIT tag data to Apple and Windows environments.

Now at this point in the process, using an established means of prototyping to build our endcap may have cost tens of thousands of dollars to manufacture, with no guarantee of success. But in the 21st century, traditional limitations of hardware design and manufacture are disappearing.

With the power of 3D printing, High Point Sensing was able to go from an endcap concept to an alpha-run prototype in a matter of months. The use of rapid and relatively inexpensive 3D printing facilitated our ability to evaluate sequential endcap models and implement design changes to beta prototypes without major costs, saving taxpayers thousands of dollars. This flexible design process resulted in a more effective final product, and would not have been possible in our timeframe and budget without the power of 3D printing.

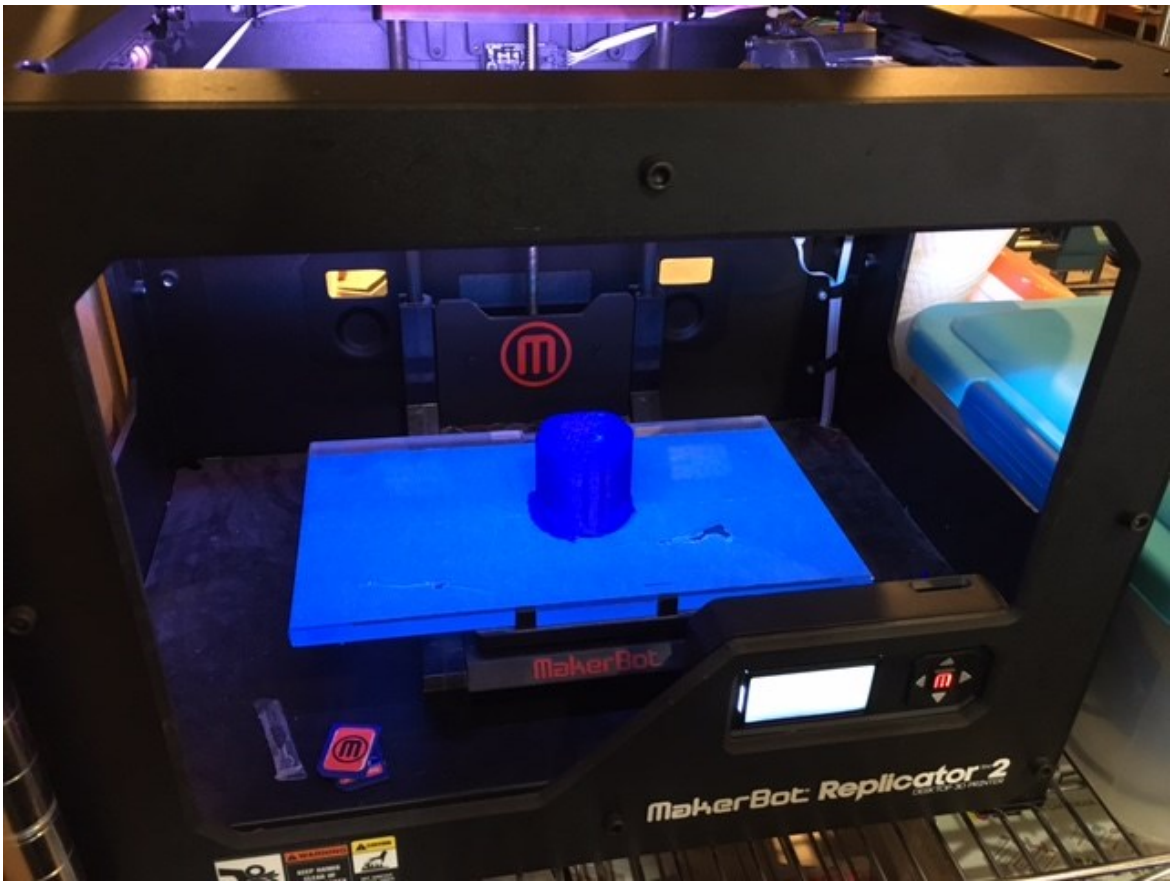

Figure 12: HPS1 Beta prototype housing being 3D printed by High Point Sensing.

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HPS1: Bluetooth Connectivity for the Biomark R601 Reader

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Our final product was the HPS1; a compression-molded, rubber and steel endcap device that weighed in at a little over four ounces. Now, for the cost of $220 we can connect an existing Biomark 601 PIT tag reader wirelessly to a variety of sampling systems, fulfilling our goal to modernize our capabilities to collect PIT tags.

Initial field trials show that design features like the wrap-around rubber housing have substantially improved our ability to sample PIT tags in adverse field conditions. To date, the HPS1 has been used to sample many hundreds of fish, and it has substantially increased data reliability and availability as a result of all-digital data collection.

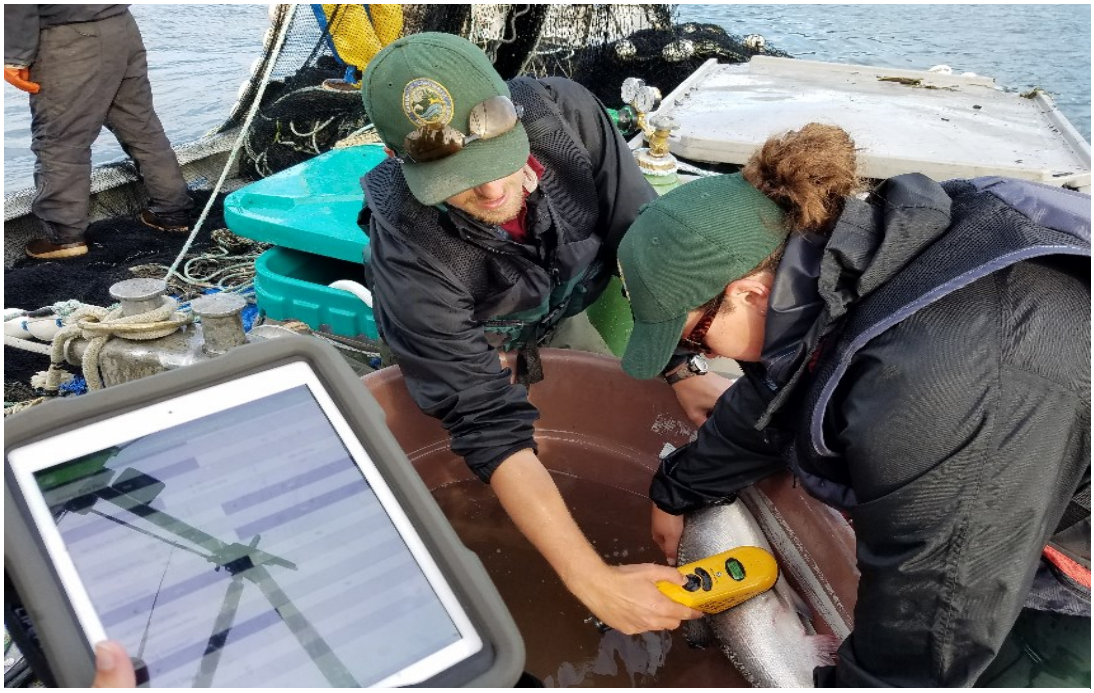

Figure 11: WDFW Staff using a HPS1 enabled 601 PIT tag reader and an iPad Air while sampling adult salmonids on the Columbia River during the 2017 Seine Mortality Holding Study.

The HPS1 also represents technology that is flexible in terms of interfacing with existing PIT tag sampling systems. Through the use of two lightweight wedge applications that come with the HPS1, users can connect their PIT tag readers to a virtual serial port on their Windows PC or through the native Bluetooth service on their iOS device. This allows a wide range of sampling programs to take advantage of the HPS1, and facilitates access to wireless PIT tag data capture in real time. To date, the HPS1 has been tested successfully on a variety of common PIT tag sampling/telnet programs, most notably: P4, PuTTy, BioTerm, iFormBuilder and MS Access.

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HPS1: Bluetooth Connectivity for the Biomark R601 Reader

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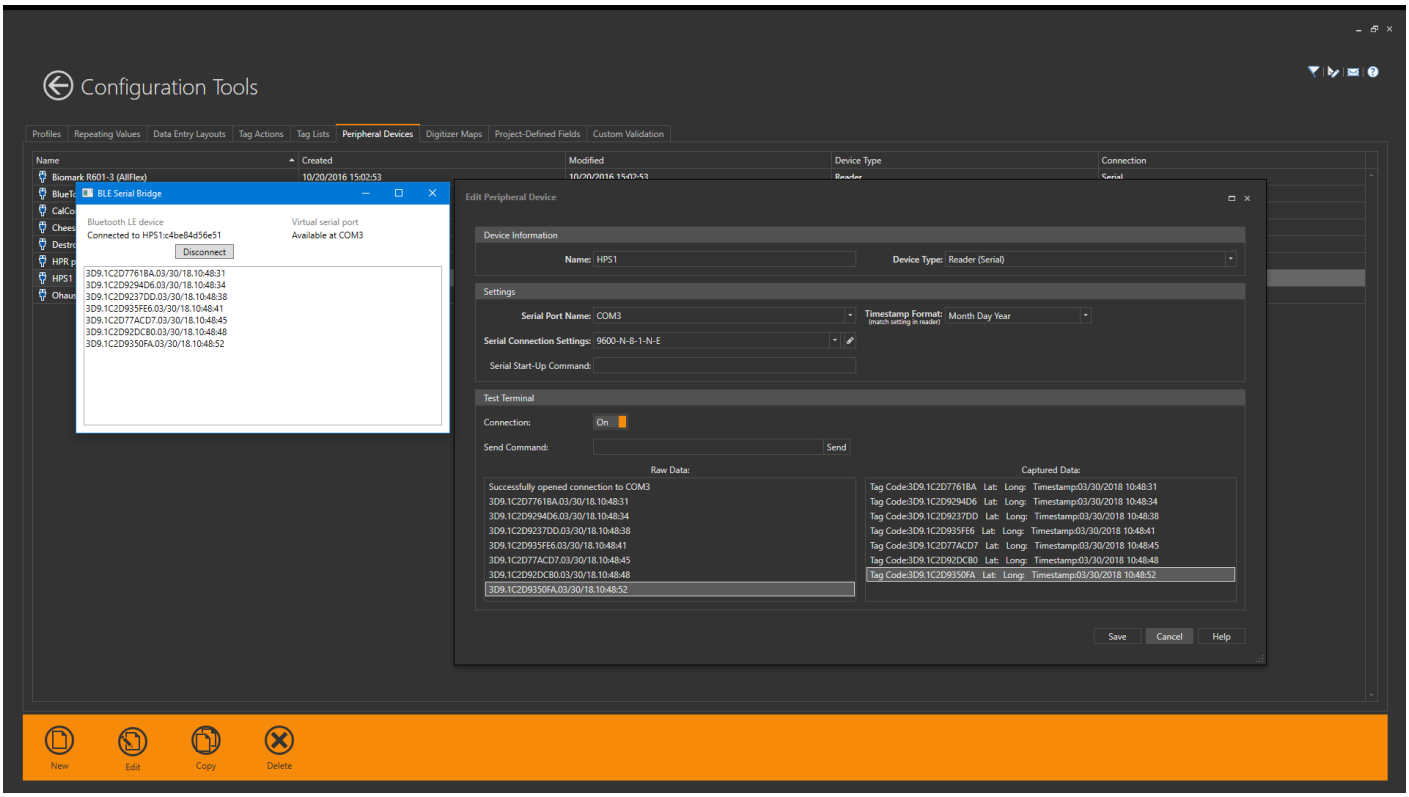

Figure 13: Demonstration of the HPS1 Windows wedge application in use with the PTAGIS P4 application.

In the end, this two-year process demonstrated that tools currently exist that can facilitate the custom development of hardware and software solutions to our sampling problems that are both innovative and cost effective. Tools like Bluetooth Low Energy for wireless communication and 3D printing for effective and dynamic prototyping. So, if you are looking for a solution to a sampling problem, maybe it's time to forgo the annual hardware surplus. Maybe it's time to go out and build it.

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