NOSA Steelhead Methods Review Workshop
February 22, 2018, Portland, OR
Workshop Notes

Background
As part of PNAMP's Methods Review Workshop Series, this event is intended to facilitate information sharing and discussion of implementation of monitoring methods, including field procedures and analytical methods.

Workshop Objectives
The primary goal was to provide a venue for steelhead monitoring practitioners and managers to share their current approaches for estimating Natural Origin Spawner Abundance (NOSA) for steelhead populations. Presentation of experts' latest work and subsequent discussion will lead to advancements across the community of practice.

Workshop Overview
- All workshop documents are posted on the event page located here, https://www.pnamp.org/event/5998.
- Over 50 participants representing 18 organizations attended the workshop
- Subject matter experts from Idaho Fish & Game, Oregon Fish & Wildlife, Nez Perce Tribe, and Washington Fish & Wildlife presented their latest work; presentation links can be found below

Notes

Weir'd Science: Using Weirs to Estimate Adult Steelhead Abundance in Smaller Streams
Ethan Crawford (WDFW)
Link: https://www.pnamp.org/document/6049

Discussion
- You said that you have a requirement for observing 2 holding habitats - above and below - what metric are you looking for?
    - This is for NOAA take reporting. Every day they fill out a form with number of fish above and below. We want to make sure fish are moving and not just holding.
- There isn't a single way to build a weir; you need to adapt it to your specific situation.
- In low water years you can leave a substrate rail in the water, but it usually best to remove it.

Estimating summer steelhead NOSA in Eastern Oregon: Redd surveys and probabilistic survey design
Jim Ruzycki (ODFW)
Link: https://www.pnamp.org/document/6050

Discussion
- How do you define your sampling domain? You mentioned using barriers to restrict the upstream domain. How else do you define the total sampling frame?
    - It was initially based on professional opinion from district biologists, sometimes enhanced by observations. In the John Day, for example, it was based on observations of O. mykiss distribution in the system which is a conservative approach that likely includes habitat that steelhead might not inhabit. The downstream extent is limited by our ability to do the surveys. We assume that they do spawn in some areas below, but we just aren't efficient at seeing redds in those locations.
- In Deer Creek, are fish per redd values highly correlated or variable across streams?

    - In the Umatilla River we are having problem correlating redd estimates with spawner estimates at 3 Mile Dam, so there is concern there. At Joseph Creek can't remember details off hand, but not tight correlations between weir counts and redd counts. ODFW doesn't know exactly why, probably a number of factors influencing the relationship.
    - Dan Rawding added that on west side of WA, Deer Creek is a small stream, high gradient - 0.8 females per redd on average - so each female was digging more than one red. This had to do with gradient and characteristics of the steam. WDFW usually sees one female per redd.
- If you want to apply the one fish per redd assumption across landscape, how well will that hold?
    - ODFW would like to be able to do that, but there are insecurities. For example, depending on where you have a weir it is typically not possible to survey all the fish and habitat above the weir. You don't have to know you're looking at a viable redd or a structure built by a fish, you just need to have a relationship between the structures you do identify and the number of fish that are available to build those structures. A fish per redd fish might be more appropriately called a fish per structure estimate, in Deer Creek for example.

Estimating Steelhead Escapement in the Upper Columbia DPS
Andrew Murdoch (WDFW)
Link: https://www.pnamp.org/document/6048
Additional documents: Estimating observer error and steelhead redd abundance using a modified Gaussian area-under-the-curve framework - Andrew R. Murdoch, Chad J. Herring, Charles H. Frady, Kevin See, and Christopher E. Jordan

Discussion
- On the tributary estimates are you assuming there is negligible overwinter mortality in the tributaries?
    - We don't have fish overwintering in the tributaries. The RT study was used to get at that.
- Did any of the spring run fish die before they spawned?
    - No, not if they made it through the winter.
- So when talking about your error rates, the omission and commission, what was the standard used to compare it to?
    - The census surveys - based on steelhead surveys conducted by highly experienced surveyors that were out there every three days - were considered to be the "truth". This is the one criticism. Susceptible to freshets that can interrupt the surveys, but typically they're getting 30 surveys in each reach, you get to know the reach really well. Because the fish are PIT tagged, we know when we start surveying that there aren't fish in the system and document things that could be confused with redds, then when redds are observed we can confirm they're redds.
- Looking at overwintering mortalities estimates with RT data - how do you tease apart spit tags and morality due to tag?
    - All RT fish were also PIT tagged. We knew where all the fish were just by looking at PTAGIS. When a fish passed a dam we radio track them, and sometimes we'd find the radio tag was left behind in the previous pool. Most of that happens right after tagging within a few days, avg spit rate was 2.5%. Once above Rock Island Dam, if we detected a PIT tag we also detected a RT tag.
    - Not sure we can differentiate fall mortality from tagging effect vs natural causes. Not sure how to get at that.
    - One interesting thing from the study - mortality was higher in the Columbia than the tributaries, and wild fish had better survival than hatchery.

PIT-tag Based Abundance Estimation for Snake River Basin Steelhead Populations
Ryan Kinzer (NPT)
Link: https://www.pnamp.org/document/6051

Discussion

- Will PITcleaner work with MARK?
    - No, it won't work for MARK capture history files, but it wouldn't take much to tweak it so that it would generate capture history files.
- Of the populations you're looking at, are they run escapement or spawner estimates, or a combination of both?
    - Most of them are moving in to the tributary in spring, for the spring migrants there is very little mortality, so they are likely escapement and spawner abundance.
    - With tagged fish you can see where they're going, for example in late summer many are headed to the Upper Salmon River; you can start to tease that out from this data.
- For unbiased abundance estimates you're trying to tag proportionally at the trap, but when you have large number of tagged juveniles coming back as adults, is there a way to leverage those tagged fish for something, maybe getting at transition probabilities or detection probabilities?
    - One of the assumptions we're making is that we representatively tag fish within a weekly period, we are meeting that well, but not for the entire migration season. We are using previously tagged fish for escapement estimates at Lower Granite Dam, but not upstream. They could be used for detection probabilities, but we haven't gone there yet.
- I can understand estimation above instream array sites, but how do you account for locations within the populations' distribution where you don't have coverage?
    - Goes back to what Andrew Murdoch's presentation covered - the black box. If we don't see them, they are in the mainstem and didn't convert all the way to the upper sites - could be mortality or mainstem spawning - or they went into a tributary without an array.

Estimating Steelhead Abundance at a Very Large Scale and Relation to Smaller Scales
Tim Copeland (IDFG)
Link: https://www.pnamp.org/document/6052
Additional documents: IDFG Chinook Salmon and Steelhead Genotyping for Genetic Stock Identification at Lower Granite Dam ANNUAL PROGRESS REPORT January 1, 2016-December 31, 2016; IDFG Snake River Basin Steelhead 2014/2015 Run Reconstruction; IDFG Wild Adult Steelhead and Chinook Salmon Abundance and Composition at Lower Granite Dam, SPAWN YEARS 2009-2016 CUMULATIVE PROGRESS REPORT

Discussion

- You alluded to the different genetic groups - in the past there was an issue from John Day or the Deschutes up to the Grande Ronde - have they been able to tease out the differences?
    - If they make it to Lower Granite Dam then they are Snake River fish - maybe some Walla Walla - if we were at Ice Harbor Dam we'd have a bigger problem.
    - The CRITFC lab completed a large sequencing study and have been able to partition one large reporting group into 5 groups with good accuracy - will be available in their report to BPA
- Will you be able to assign fish at Lower Granite to those groups in the future?
    - Yes
- Is the Tucannon one of those groups?
    - There is a lot of interest in separating Tucannon fish from Asotin fish (above and below Lower Granite Dam) - even in doing an intensive search for outlying loci to differentiate these populations, we weren't able to do that. There is too much effective straying between the systems; they are not acting as

independent populations. Fish that ascend and fall back are Lower Snake genetic group - too much real time gene flow - upstream stocks don't do that.

- How often do you see a PIT detection that disagrees with the genetic assessment, and how does that affect escapement vs NOSA at Lower Granite?
    - Depends on genetic reporting group - some with high concordance between pit tag and final genetic assignment.
    - As Andrew Murdoch's presentation showed, some fish show up somewhere but don't stay there.
- You say you can tell if the fish are hatchery fish based on their genetics, but they were bred from wild fish, so how do you know?
    - We sample all the parents, so you can assign a hatchery fish back to its two parents with certainty, and therefore to a specific hatchery.

General Discussion

- **Additional information of interest:**
    - **GitHub website**
        - **Kevin See's repositories**
            - **STADEM – Estimate escapement across dam**
            - **DABOM – Dam Adult Branch Occupancy Model**
            - **PITcleanr – Clean up PIT tag capture histories for use by DABOM**
    - **PTAGIS website**
        - **GIS Data**
        - **Map of Interrogation Sites**
    - **PSMFC Facilities Mapper**
- One common theme we are seeing is how messy steelhead behavior is. Having limited experience developing queries that get useful information out of the messiness is a common area for everyone. One opportunity for improved cooperation/coordination is getting large data queries summarized into useful model input. Today focused on adults, when you get to life cycle models it gets ugly – in the future we should think about standardization of queries used for multiple life stages.
    - PITcleanr was originally developed for DEBOM model, but it can be modified easily to be used in different ways. Focus on migration behavior to pick up kelts; want to estimate detection probabilities at individual arrays.
- Brady Allen, mballen@bpa.gov, is the new BPA representative on the PTAGIS Steering Committee. He hasn't been to a meeting yet, but he does have a background in small streams - worked with Pat Connelly (USGS). Maybe need a pre-meeting with steelhead managers to get all the comments together and organized then present to PTAGIS Steering Committee.
- There are things that could be improved with respect to connection to PTAGIS:
    - There are sites in PTAGIS that have incorrect river km, so you can't count on that, we've had to hard code where those sites are. Let's make getting these errors fixed a priority so you don't have to hard code around them. Send list of errors/corrections to Dan Rawding or Andrew Murdoch so they can take them to the PTAGIS Steering Committee.
    - Would be helpful if PTAGIS would treat small stream PIT interrogators as valuable. This is a watershed moment - we are using these things for everything - PTAGIS could really help standardize everything.
    - Reach out to your PTAGIS representative and let them know new directions that are being taken.
    - Improve coordination at a larger scale among people installing and using PIT arrays. E.g. make sure propane gets replaced on time, how to account for when service does go down.
    - Last PTAGIS Workshop was in 2015. Perhaps a PIT tag workshop in 2019? Pre-work to set that in motion would be good.

    - Possibly a learning opportunity, a session on non-mainstem uses or a presentation about the system deficiencies with respect to non-mainstem users.
- PTAGIS Location errors
    - Location errors need to be fixed by whoever installed the array.
    - Maybe steelhead managers need to implement a location validation check once a year.
    - If sites move they need to be a new code, maybe create a new distance code.
    - Many are based on river/reach names, how do you not lose historic connectivity?
        - WDFW tried to section the Columbia up and the PTAGIS SC was unwilling to break that up because of concerns about legacy data. It wasn't set up that way and it would compromise the legacy data.
        - Idaho has been dealing with it. If you don't know how names change you won't know what to query.
- Some ideas that a steelhead monitoring working group could address:
    - Create standard methods for documentation of instream and mobile PIT arrays - and making sure people are registering that information consistently.
    - Advances in genetic techniques were presented today, others can start to apply. Help practitioners to understand if there are strays in Upper Columbia, whether they are the wild fish you have from the Snake River system.
    - Continue to discuss standard methods and tools for steelhead.
    - Want to have a larger discussion/workshop/meeting for PIT tag O&M and remote array O&M
    - Would be good to be able to convey exactly what percent of arrays and tags that are associated with purposes beyond the mainstem. Maybe this is just part of the O&M discussion.
    - How to develop better queries. BPA has a contract with DART, a working group could document what the needs are and Russell Scranton will help advance some of this needed work
        - Address how to effectively analyze stray rates without really good queries, to think across the life history of steelhead and develop queries that serve multiple purposes or build off of current queries to serve other purposes.
    - PNAMP can help support a working group, if desired by practitioners
- Genetics work? Is there a need for more communication?
    - Close coordination is already happening. Such a specialized skill, you need a lab, and those involved are very connected.
    - CRITFC Snake River Lab and WDFW are the 2 big players.
- Are people still interested in a MonitoringResources.org documentation workshop for steelhead protocols and methods?
    - If you are struggling with your documentation do not hesitate to contact PNAMP staff. We know that it is not always easy to document complex analyses and we are looking for feedback to help you.
    - BPA felt that one of the reasons we should have this workshop, was due to reviewing the CA data submissions, there is one method that has been applied by many, but it has changed and is out of date, would be good to update and even better if practitioners would use and reference MonitoringResources.org for methodologies.
    - Dan Rawding feels that one of his big challenges with MonitoringResources.org is that creating analyses protocols gets ugly quickly especially with model selection or model averaging, it is not straightforward how to do that. Apriori must specify models he hasn't thought of yet and then he can talk about best model or model averaging - that's challenging to forecast what model he's going to consider for AIC weights.

- Russ Scranton responded that with complex modeling say generally what the approach is (AIC, DABOM, area under the curve), and then in the annual report you'd document your implementation notes on what equations you actually used. A good topic for us to have further discussion about.

NOSA Steelhead Methods Review Workshop Attendees, February 22, 2018

First	Last	Affiliation
Brady	Allen	BPA
Jamie	Anthony	ODFW
Leslie	Bach	NPCC
Cyndi	Baker	CTWS
Mike	Banach	PSMFC
Jennifer	Bayer	PNAMP
Kasey	Bliesner	ODFW
Graham	Boostrom	CTWS
Evan	Brown	IDFG
Carlos	Camacho	IDFG
Matt	Campbell	IDFG
Jake	Chambers	ODFW
Tom	Cooney	NOAA
Tim	Copeland	IDFG
Nadine	Craft	ODFW
Tom	Desgroseillier	USFWS
Meg	Dethloff	PNAMP
Scott	Donahue	BPA
Keith	Dublanica	GSRO
Jonathan	Ebel	Shoshone-Bannock Tribes
Alex	Farrand	ODFW
Tom	Friesen	ODFW
Emma	Garner	ODFW
Karen	Hans	ODFW
Jay	Hesse	NPT
Todd	Hillson	WDFW
Michael	Humling	USFWS
Tom	Iverson	Nat Res Consulting
Maureen	Kavanagh	BPA
Elise	Kelley	ODFW
Denise	Kelsey	CRITFC
Ryan	Kinzer	NPT
Nancy	Leonard	NPCC
Mark	Lewis	ODFW
Steve	Martin	GSRO
Collin	McCandless	Calapooia Watershed Council

First	Last	Affiliation
Todd	Miller	WDFW
Andrew	Murdoch	WDFW
John	Powell	IDFG/StreamNet
Amy	Puls	PNAMP
Dan	Rawding	WDFW
Shannon	Richardson	ODFW
Jim	Ruzycki	ODFW
Cris	Salazar	Calapooia Watershed Council
Russel	Scranton	BPA
Kevin	See	Quantitative Consultants, Inc.
Philip	Simpson	ODFW
Adam	Storch	ODFW
Matt	Weeber	ODFW
Chris	Wheaton	PSMFC
Luke	Whitman	ODFW
Mari	Williams	NOAA
Joe	Zendt	YN