

Assessing spatial and temporal distribution of spawning adult summer steelhead with PIT tag interrogation data.

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The goal of the Asotin Creek Project (ACP) is to assess the status and trends of the Asotin Creek Wild Steelhead Population as part of the Lower Snake Major Population Group. As an RM&E project, ACP provides estimates of abundance, productivity, survival rates, and distribution for ESA-listed summer steelhead *Oncorhynchus mykiss*. Since 2008, Asotin Creek has been an Intensively Monitored Watershed (IMW). As part of the design of the IMW, PIT tag interrogation sites were installed at the tributary mouths of Asotin Creek and in the mainstem to help assess juvenile emigration and survival. The arrays above the weir were online starting in 2009, and starting in spring of 2010, all wild adult steelhead captured at the Asotin weir received a PIT tag if not previously tagged. With all the adults handled at the weir having or receiving a new PIT tag and being released into a closed system (Figure 1), we began to look at the movement of escaped adults.

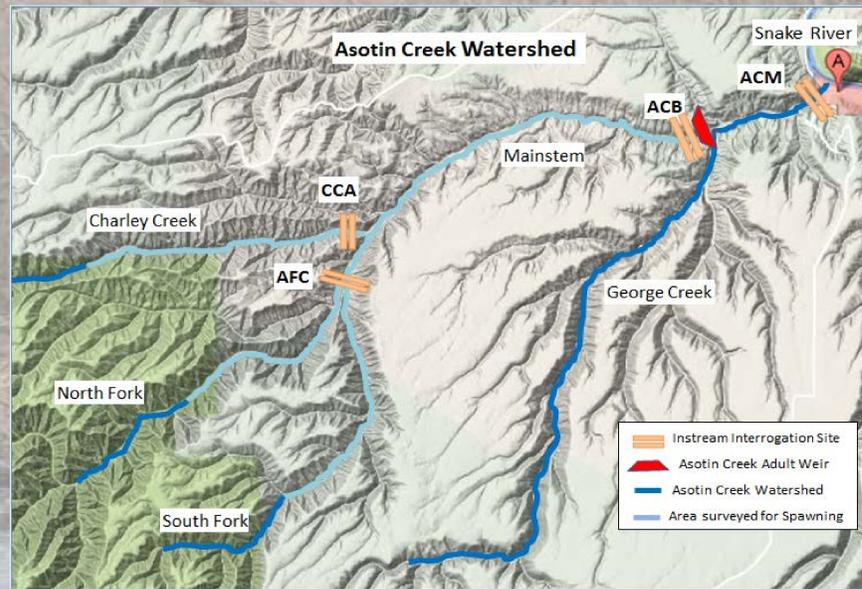


Figure 1. Asotin Creek Watershed with weir and PIT array locations.

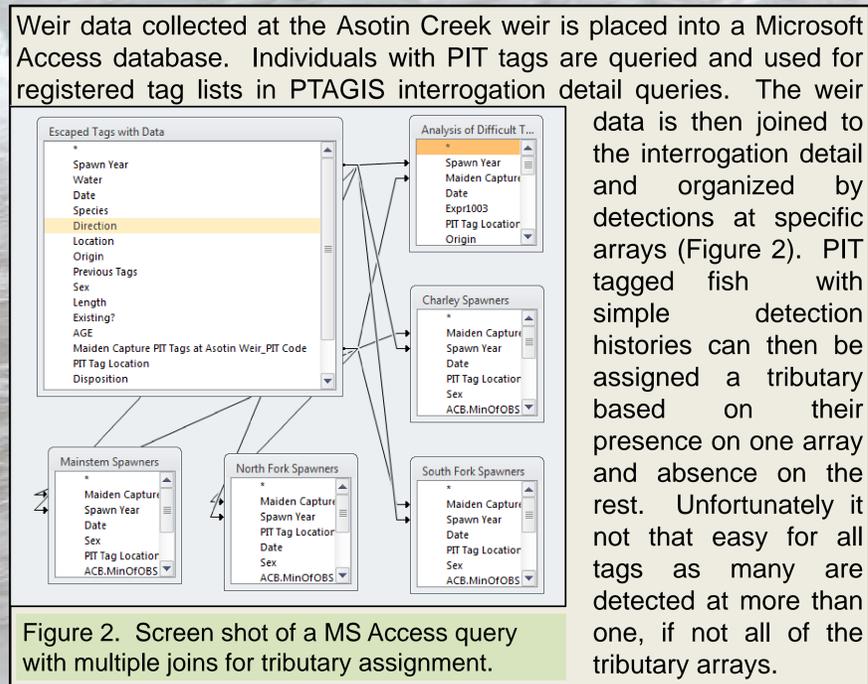


Figure 2. Screen shot of a MS Access query with multiple joins for tributary assignment.

Weir data collected at the Asotin Creek weir is placed into a Microsoft Access database. Individuals with PIT tags are queried and used for registered tag lists in PTAGIS interrogation detail queries. The weir data is then joined to the interrogation detail and organized by detections at specific arrays (Figure 2). PIT tagged fish with simple detection histories can then be assigned a tributary based on their presence on one array and absence on the rest. Unfortunately it is not that easy for all tags as many are detected at more than one, if not all of the tributary arrays.

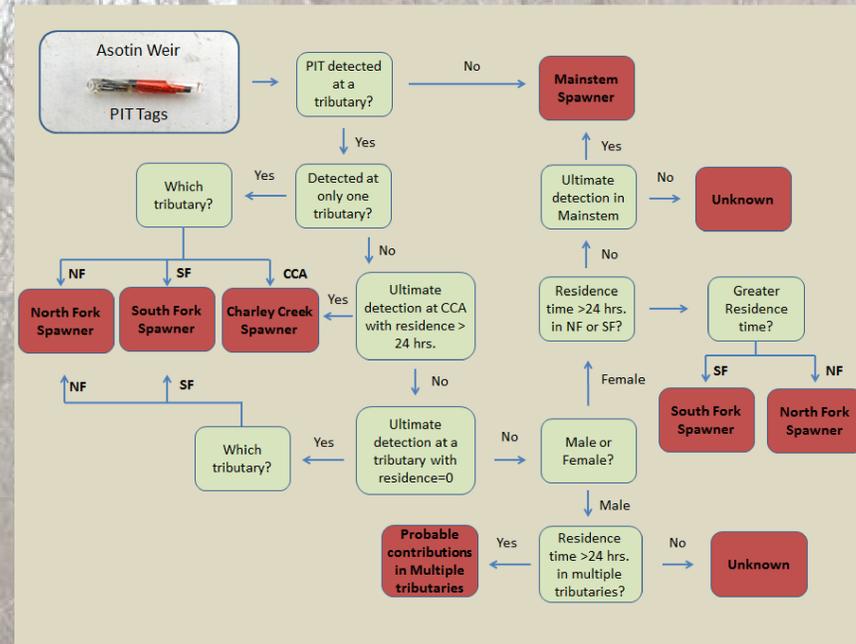


Figure 3. Flow chart showing conditional arguments used to assign PIT tags to a tributary.

Several assumptions are made when assigning PIT tagged fish to tributaries:

- Tagged fish escaping above the weir will be spawning that year in Asotin Creek.
- Tagged fish undetected at any of the tributary arrays are presumed to be mainstem Asotin spawners.
- Tagged fish detected in a tributary haven't spawned completely in the mainstem.

Tributary assignments begin with tags detected in one tributary (Charley Creek, North or South Fork) but not any of the others.

Tags that do not meet that condition are then further evaluated with a series of conditional arguments (Figure 3). The conditional statements compare initial detection timing, ultimate detection timing, residence time, and sex to assign tags that meet the conditions to a specific tributary (Figure 4). Fish meeting none of the criteria are assigned an "Unknown" designation.

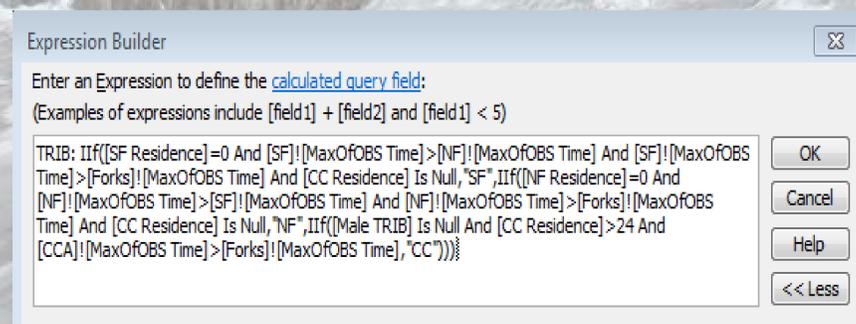
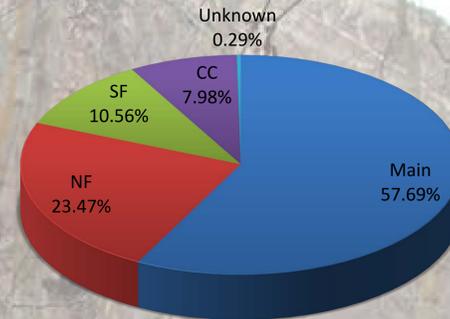


Figure 4. Screen shot of a conditional argument in MS Access expression builder

Mean Percentage of PIT tagged females by Tributary using Array Data



Mean Percentage of Redds per Tributary using SGS Data

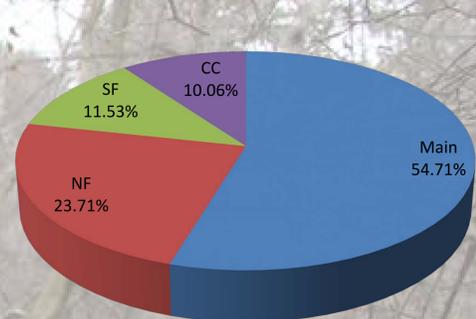


Figure 5. Annual mean proportions for PIT tagged Females and Redds per tributary for years 2010-2014.

This methodology works well for assigning PIT tagged females to tributaries. Most females do not have complex detection histories and seem to have higher stream fidelity. This is not the case for PIT tagged males, as most tags detected at one tributary are detected at the others as well. Multiple detections, in addition to long residence times in multiple tributaries make assigning a single tributary difficult.

Using either the interrogation data or spawning ground data, we arrive at similar proportions of female fish utilizing the tributaries for spawning (Figure 5.). One of the limitations for spawning grounds surveys (SGS) for summer steelhead is highly variable stream flow and turbidity conditions during the spring spawning season. Arrays continue to work in conditions that are unsuitable for SGS and can be used to help assess spawning distribution at a finer scale. In addition to supplementing the SGS data, weir data can also be applied to the tributary designations in order to look at population demographics at the tributary level (Figure 6).

We believe these methods could be useful in any small drainage where lack of staff, time, or environmental conditions affect the ability to conduct spawning ground surveys.

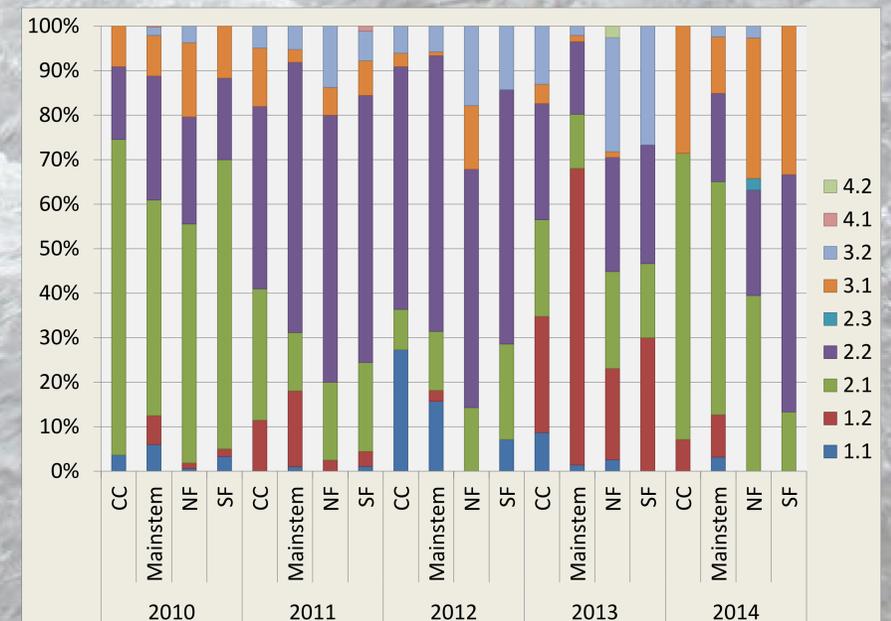


Figure 6. Age breakdown by year and tributary in Asotin Creek.