Field and Analytical Models of Critical Habitat of At-Risk Stream Fishes for Recovery Strategies

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Background



- Habitat degradation and loss is a primary driver of species extinction worldwide, and strong habitat protection is required for species recovery[1,2].
- Bull trout (*Salvelinus confluentus*) are federally listed as threatened in Southern Alberta.



- Multiple life histories including Fluvial, Adfluvial, Resident, and Anadromous.
- Fall spawning and require specific spawning and rearing habitat to persist.
- Juveniles (<150mm) rear in natal streams near spawning sites.



- Spawning and rearing habitat is vital for the success of bull trout populations[4].
- Spawning and rearing habitat is typically much more restricted than the entire distribution (i.e., ~1–10 vs. 1000 of river km).
- Finescale bull trout critical habitat use is unknown within current recovery strategies[5].

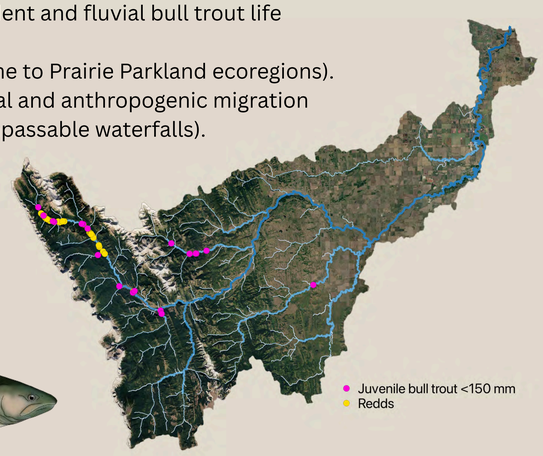
Fig 1. Bull trout critical habitat[5].

Objective 1. To describe, define, and predict the current, bull trout spawning and rearing habitat within the Highwood River.
Objective 2. Confirm identified spawning areas through the use acoustic telemetry.

Study Site: Highwood River

- Large (~2,400 km^2), with many potential spawning tributaries.
- Presence of both resident and fluvial bull trout life histories.
- Spatially diverse (Alpine to Prairie Parkland ecoregions).
- Lacks mainstem natural and anthropogenic migration barriers (e.g., dams, impassable waterfalls).
- Bull trout complete entire lifecycle within the watershed.
- One documented spawning tributary.





Methods: Objective 1



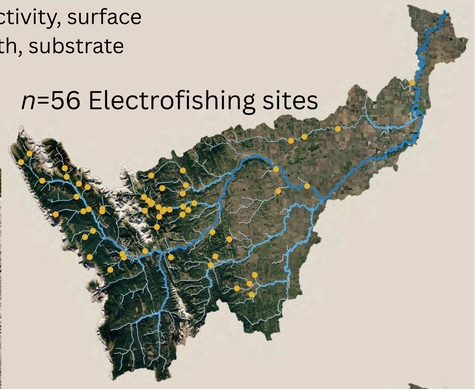
- Record the presence/absence of juvenile bull trout (<150mm).



- Collect habitat variables (conductivity, surface stream temperature, stream width, substrate characteristics).



n=56 Electrofishing sites



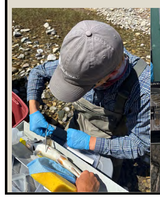


n=30 Angling sites

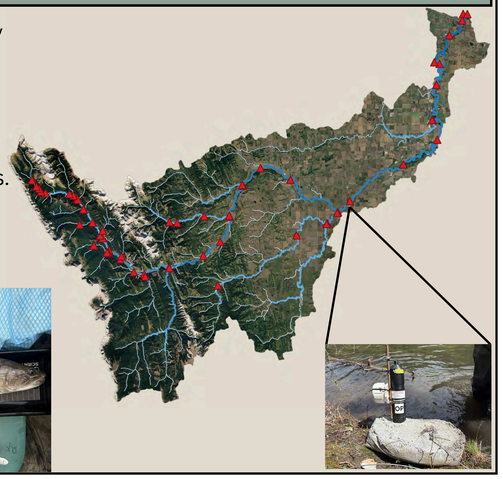


Methods: Objective 2

- Acoustic telemetry to identify spawning tributaries.
- Receiver array of 62 acoustic receivers.
- Placed above and below potential spawning tributaries.
- Adult bull trout (>225g) surgically fitted with acoustic transponders.







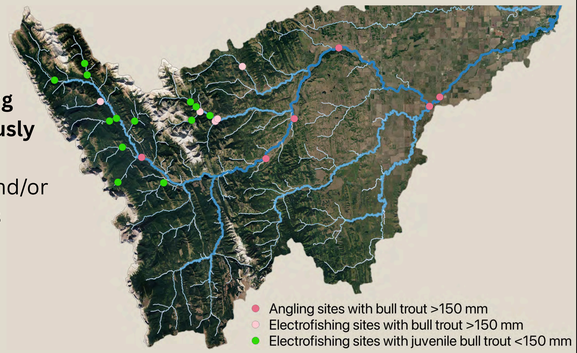
Preliminary Results

Highwood watershed assessed

- Bull trout present at 32% of electrofishing sites (n=18).
- Juvenile bull trout (<150mm) present at 23% of electrofishing sites (n=13).
- 56 bull trout tagged.

More extensive spawning habitat use than previously assumed

- Juvenile bull trout and/or spawning individuals observed in eight 5th order streams in the upper half of the watershed.



Significance

- Improve recovery strategies and population status assessments of bull trout by identifying the scale and locations of biologically important habitat.
- Aid targeted conservation actions to protect important habitat.
- Provide a framework for future habitat assessments of at-risk species.



Next Steps

- Continue adult capture and tagging, as well as download acoustic telemetry data.
- Build spawning and rearing habitat model using machine learning.
- Ground truth spawning and rearing habitat prediction with electrofishing, Redd surveys, and acoustic telemetry.



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