



The effects of environmental variables on bull trout movement ecology and habitat selection

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Introduction

- In Canada the Nelson-Saskatchewan River designatable unit for bull trout is listed as threatened¹.
- Knowledge gaps for bull trout distribution and critical habitat use within a watershed, and life history use of seasonal habitats exist².
- Bull trout have three known life histories in Alberta
 - fluvial, adfluvial and resident¹
- Most movement research has been done on adfluvial populations and fluvial populations in regulated rivers (below dams).



Fig 1: Released bull trout

Study Area: Highwood River

- 160 km of mainstem with no natural or anthropogenic impassable barriers.
- ~2400 km² catchment area with intact headwaters and low levels of disturbance.
- Land use includes: recreation, logging, grazing, industrial, and urban development.
- Both resident and fluvial life histories present.

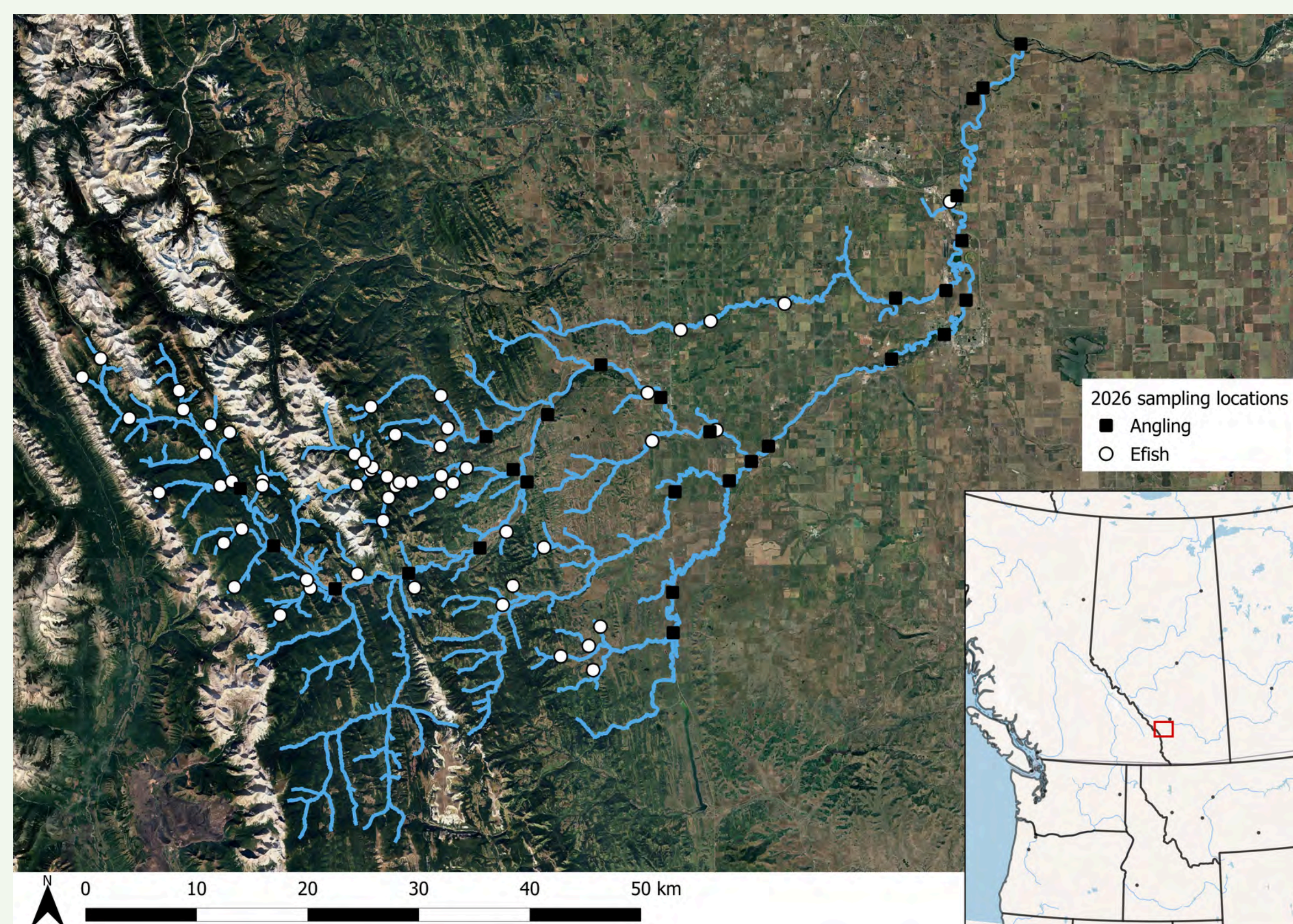


Fig 2: location of Highwood River watershed and sampling locations

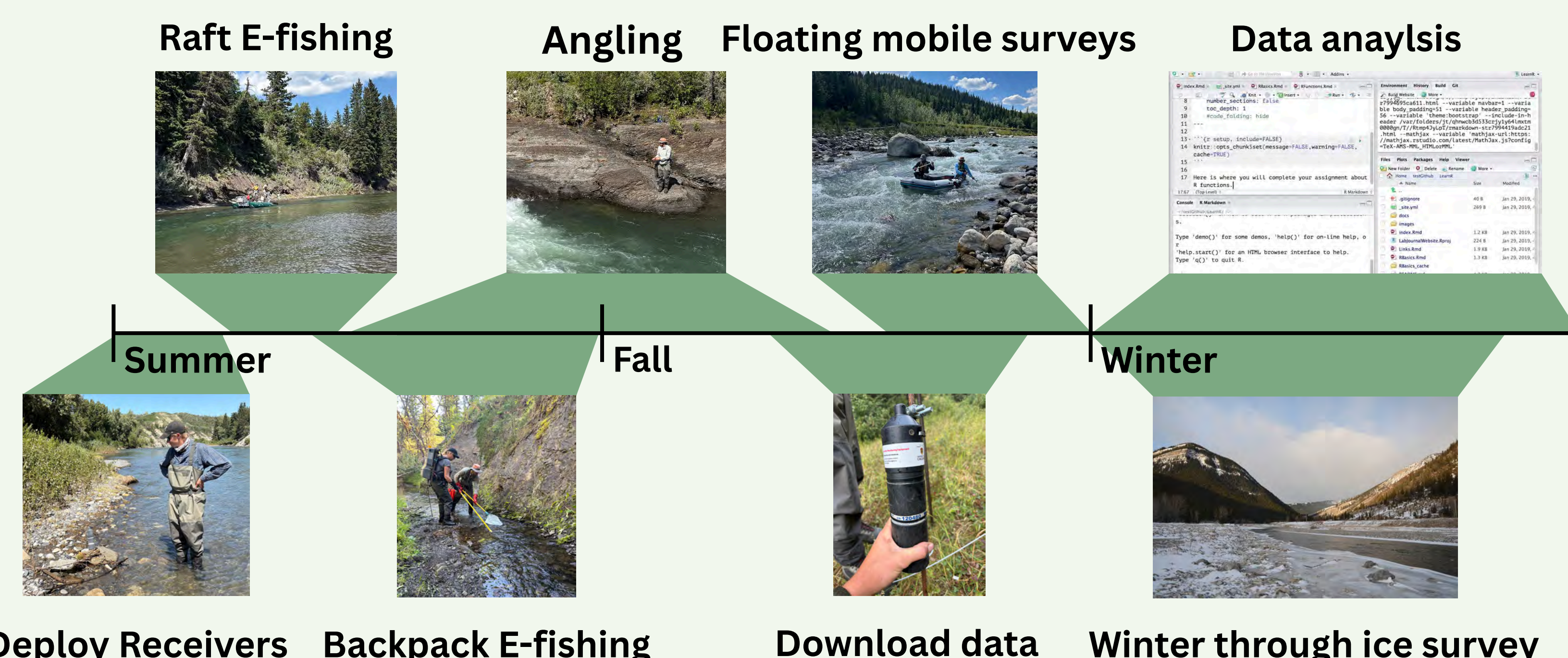
Objectives

- Determine what environmental factors influence the annual movement patterns and habitat use of at-risk bull trout.
- Describe bull trout migration phenology,
- Describe key characteristics of overwintering habitats.

Methods

Telemetry

- 67 receiver arrays deployed (37 vr2w, 30 Nextrack).
- Receivers were cabled to shore and attached either to a concrete anchor or rebar in the stream bed.
- Bull trout were captured via angling (1 km surveys), backpack electrofishing (300 m surveys) and raft electrofishing (2 km surveys) (Fig 2).
- Acoustic tags (V9-2x) were surgically implanted in the body cavity in Bull trout > 225 g (tag burden < 2%) while under clove oil anesthesia (Fig 4)³.
- Acoustic tags have a lifespan of ~18 months.
- Fork length, weight (bull trout > 200 mm), and fin clips were collected.
- Conduct active tracking with VR100 in late fall/early winter to identify wintering habitat.
- Conduct through-ice surveys of identified pools throughout winter to confirm winter use.



Deploy Receivers Backpack E-fishing
Fig 3: seasonal timeline for telemetry work

Environmental variables

- Surface water temperature
 - Internal temperature loggers in Nextrack receivers and hobo loggers paired with vr2w receivers
- Water level and discharge
 - 7 government flow stations in lower reaches
 - 4 staff gauges logged hourly with trail camera in headwater streams
 - Depth-to-flow curve created for staff gauges created with swoffer velocity measures
- Air temperature and precipitation
 - 8 weather stations
- Land cover and use
 - Alberta Biodiversity Monitoring Institute land use dataset

Work to date

- 62 actively deployed receivers (Fig 5).
- 30 angling (12 revisits), 11 raft electrofishing and 56 backpack electrofishing surveys completed (Fig 2).
- 57 bull trout tagged, 35 in mainstem and 22 in tributaries (Fig 5).
- 24 bull trout > 400 mm tagged (272 mm-672 mm).



Fig 4: tagging bull trout

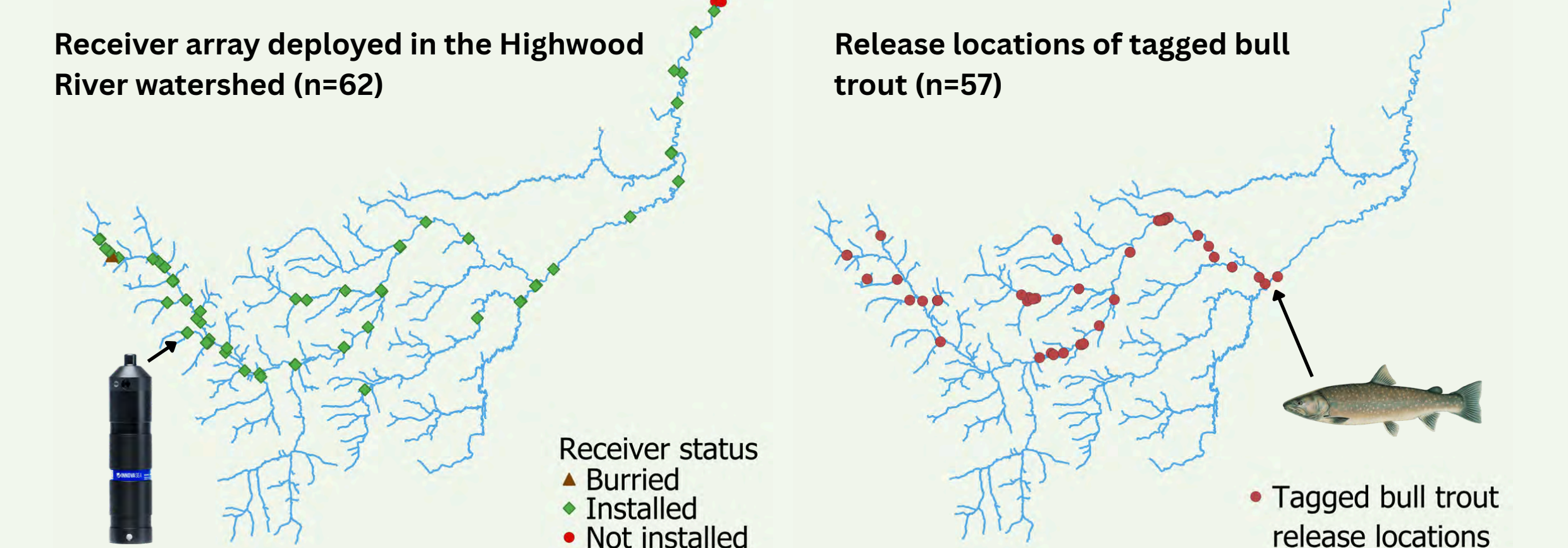


Fig 5: locations of receiver array and tagged fish release sites

Significance

- Provides empirical evidence linking seasonal movement and habitat selection to environmental factors.
- Answers the call for knowledge on critical habitat.
- Provides a baseline for future recovery work in fragmented watersheds.
- Will provide evidence to support stronger protections for where and when bull trout are vulnerable.

Acknowledgement

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