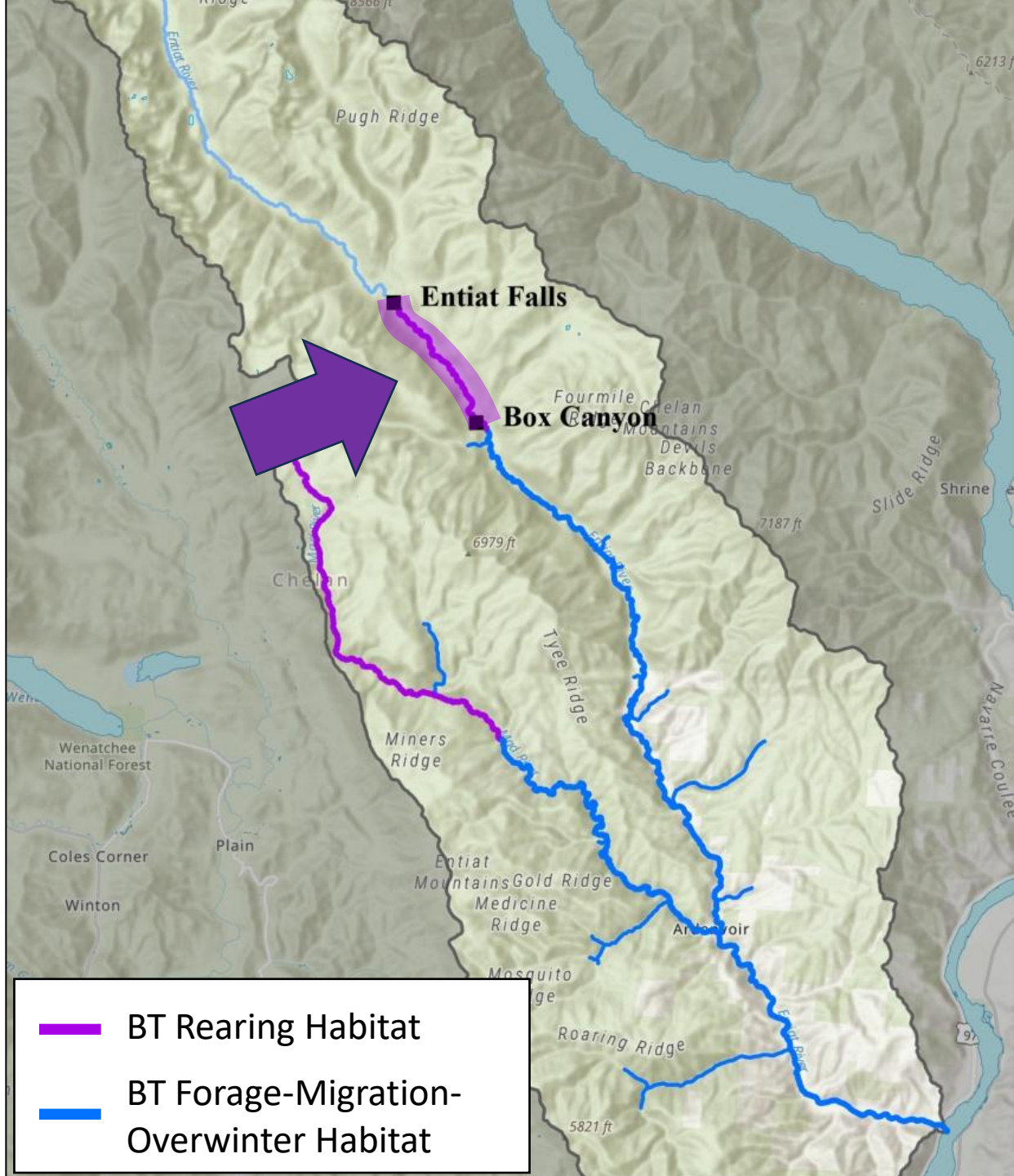
Brook Trout Redd Observations in Entiat River Bull Trout Spawning Reaches

Presented by Jose Vazquez

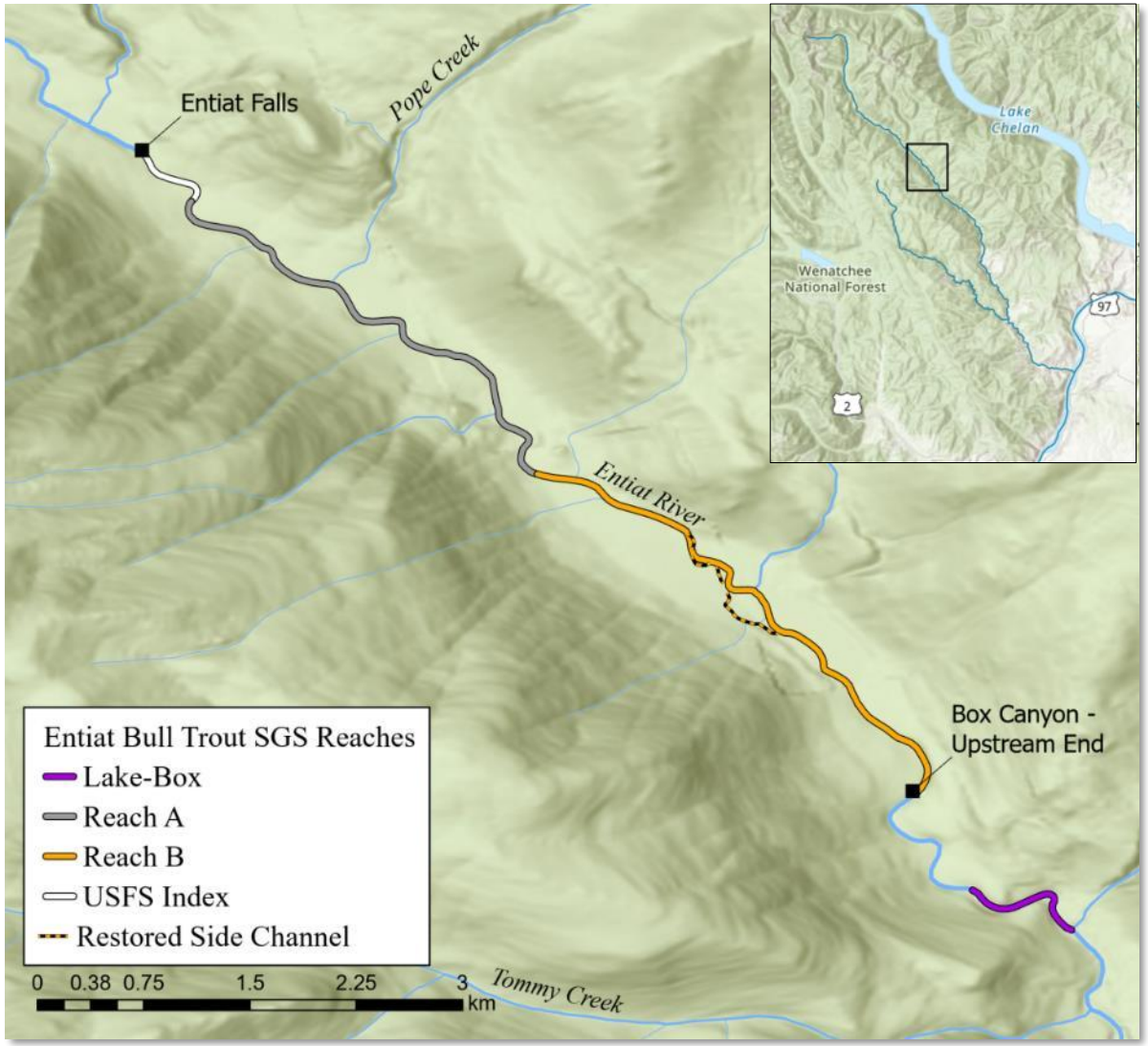
Entiat Basin Bull Trout

- One of two Entiat Basin Bull Trout populations
- Highly migratory population that spawns in the Entiat River between Box Canyon and Entiat Falls
- Small and susceptible to extirpation
  - Average of 20 redds per year
    - 7 redds in 2025



USFWS Entiat River Bull Trout Spawning Ground Surveys

- Redd Surveys performed in all accessible Bull Trout habitat by USFWS since 2004
- **Objectives:**
  - **Primary:** Monitor Entiat River Bull Trout spawning activity
  - **Secondary objective:** Document local spawning by all other salmonid species during BT spawning season

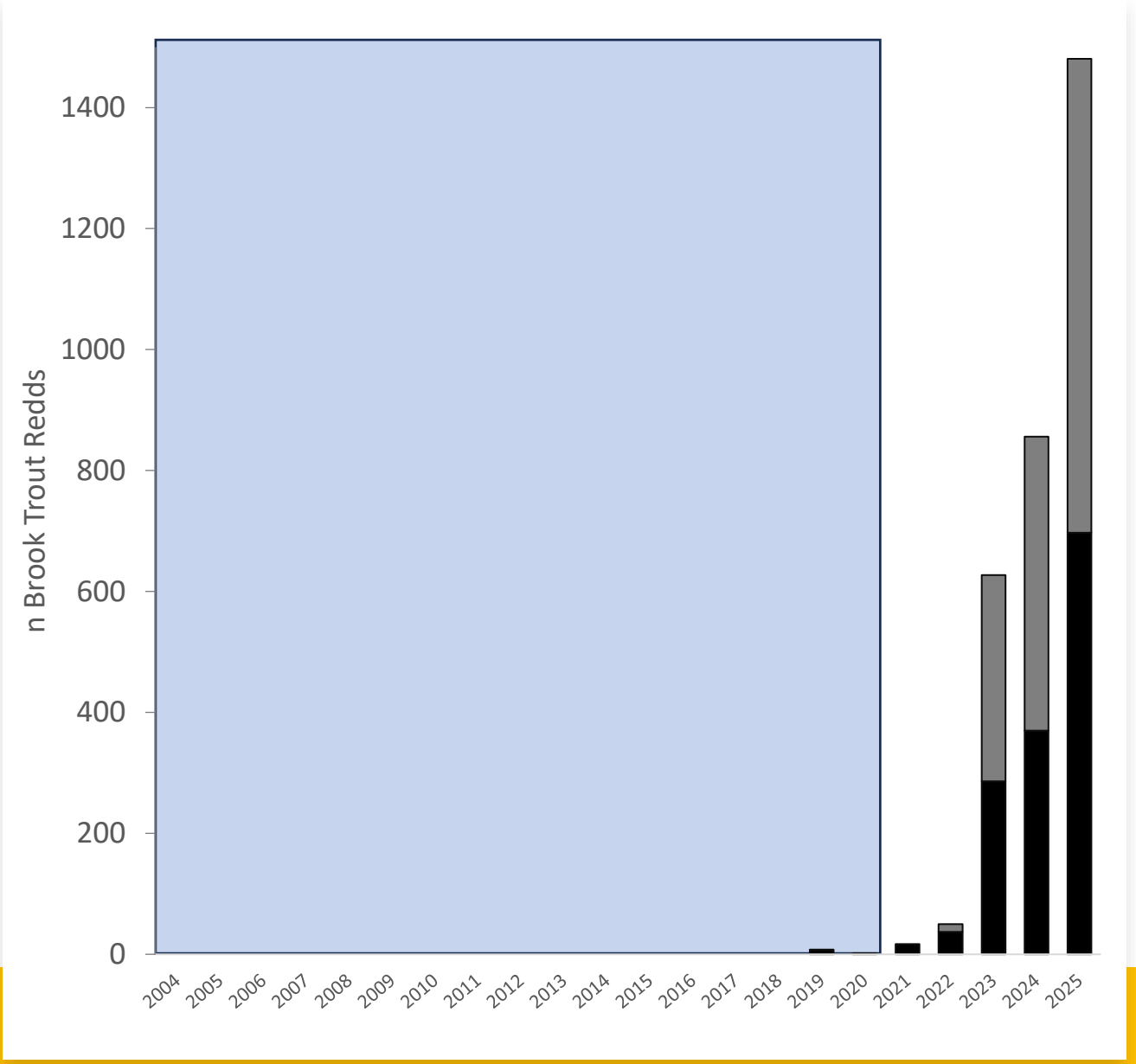


Brook Trout observations during Bull Trout spawning ground surveys

- All observations made weekly by “expert” observers
- Brook Trout redds are difficult to identify and quantify
  - Small redd size
  - Many test redds
  - Multiple redds per female
  - Short redd life
  - Very high superimposition levels
- At superimposition sites, Surveyors estimate maximum and minimum number of redds
- Weekly surveys result in approximation of spawning activity

2004-2024 Results:
Brook Trout Redds

- 0-8 redds observed annually before 2021
  - Undercounting of low densities likely



2004-2024 Results:
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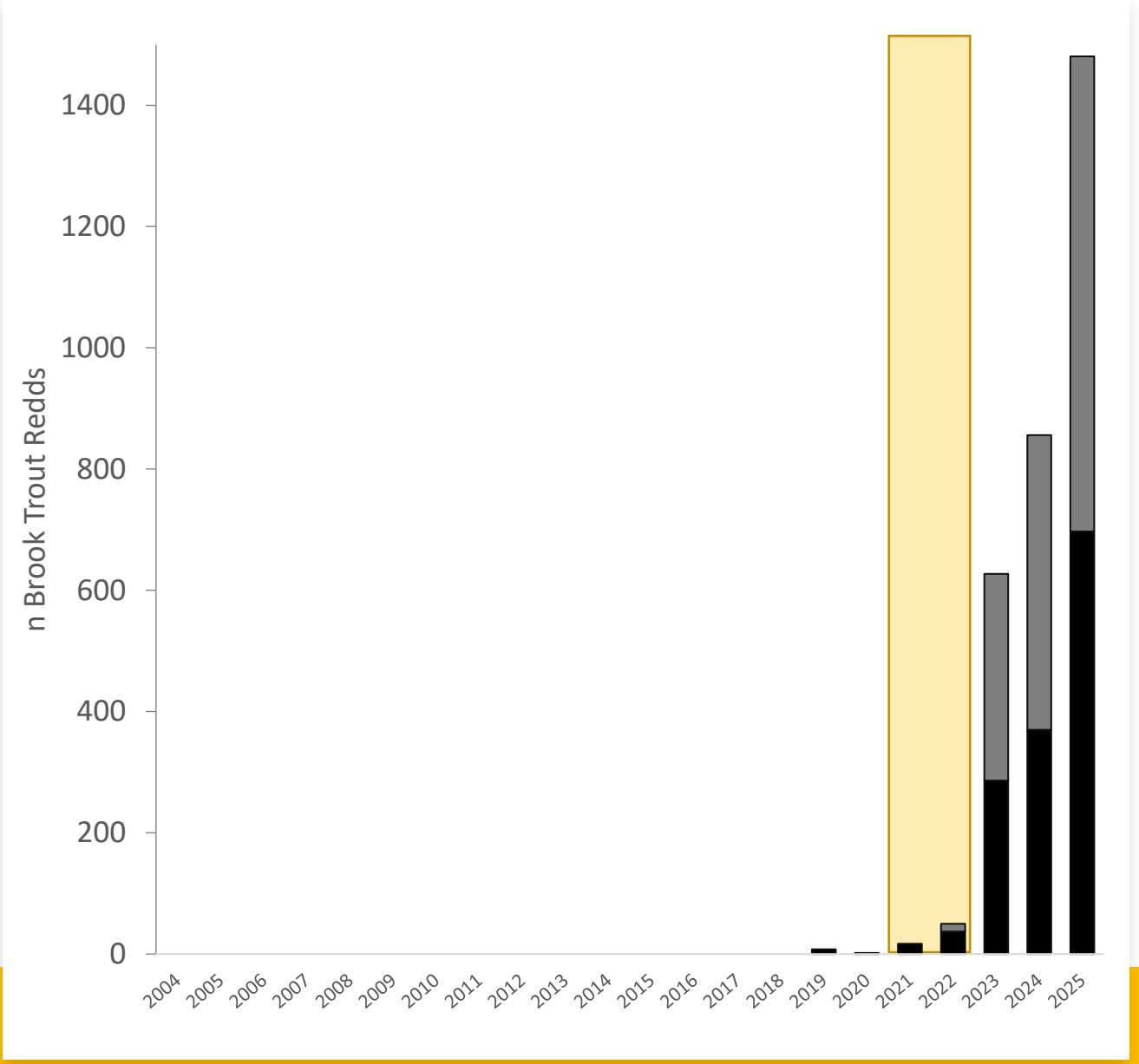
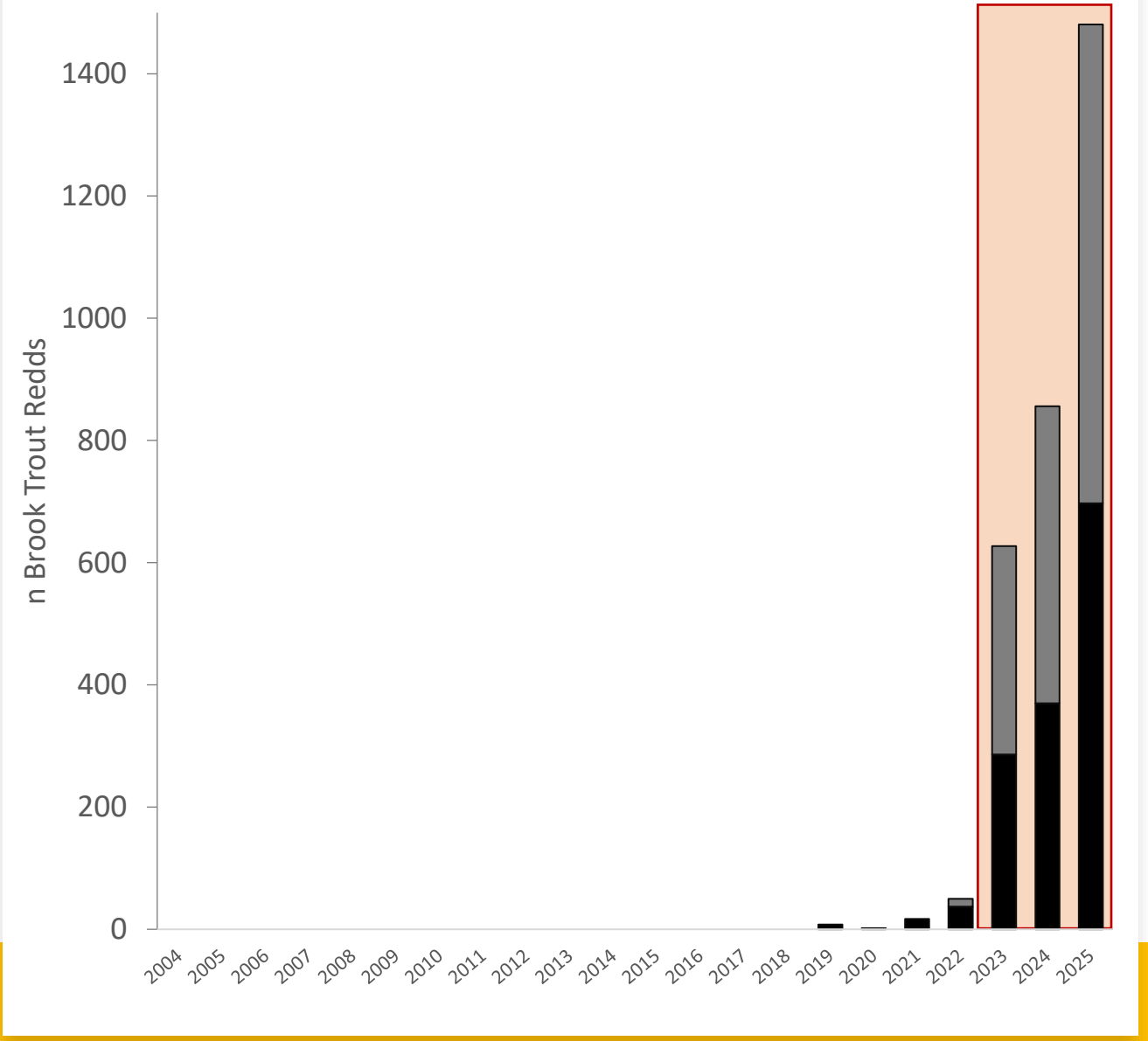
- 18-50 observed in 2021-2022



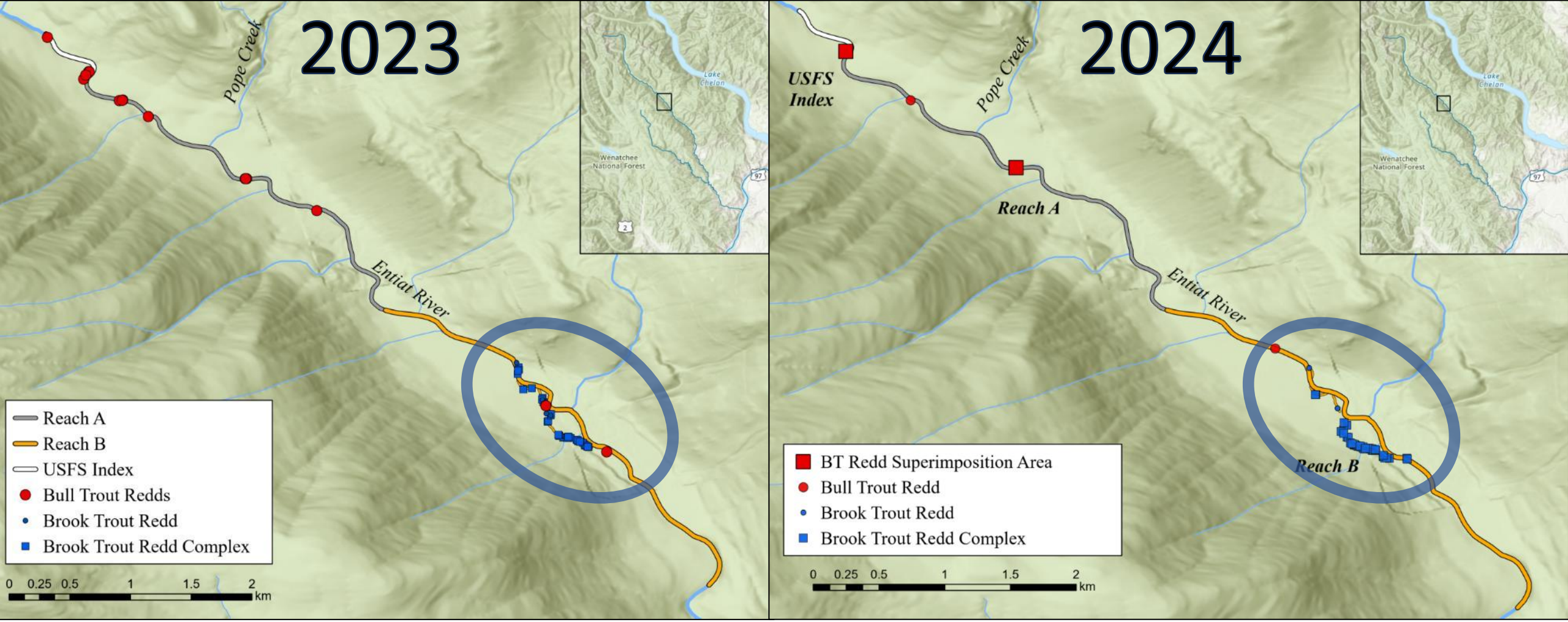
2004-2024 Results: Brook Trout Redds

- 0-8 redds observed annually before 2021
  - Undercounting of low densities likely
- 18-50 observed in 2021-2022
- 286-627 and 370-826 observed in 2023 and 2024.
  - 692 to 1,474 in 2025
  - Potentially highest *recorded* Brook Trout redd densities, but evidence this may not be unusual

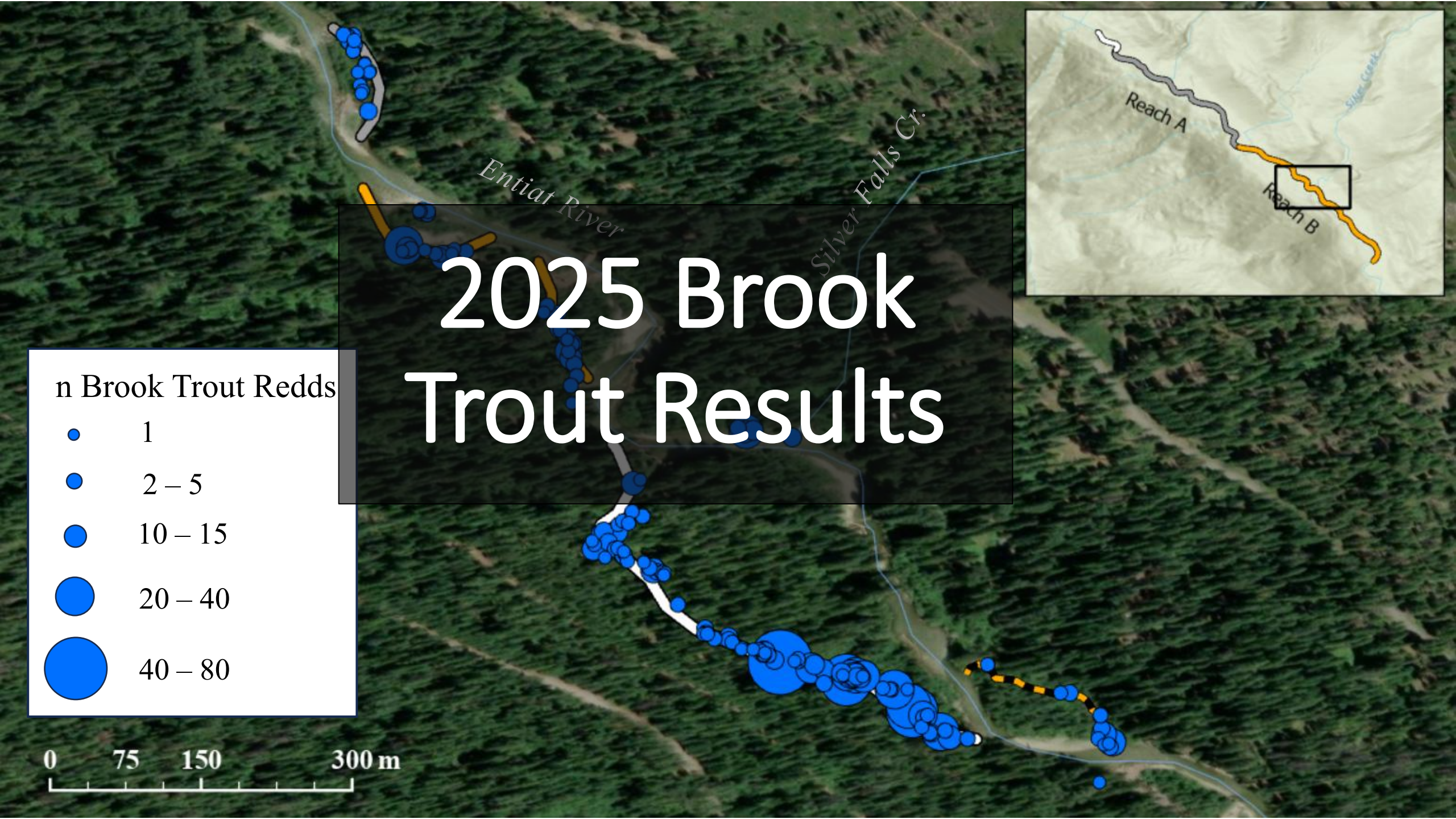


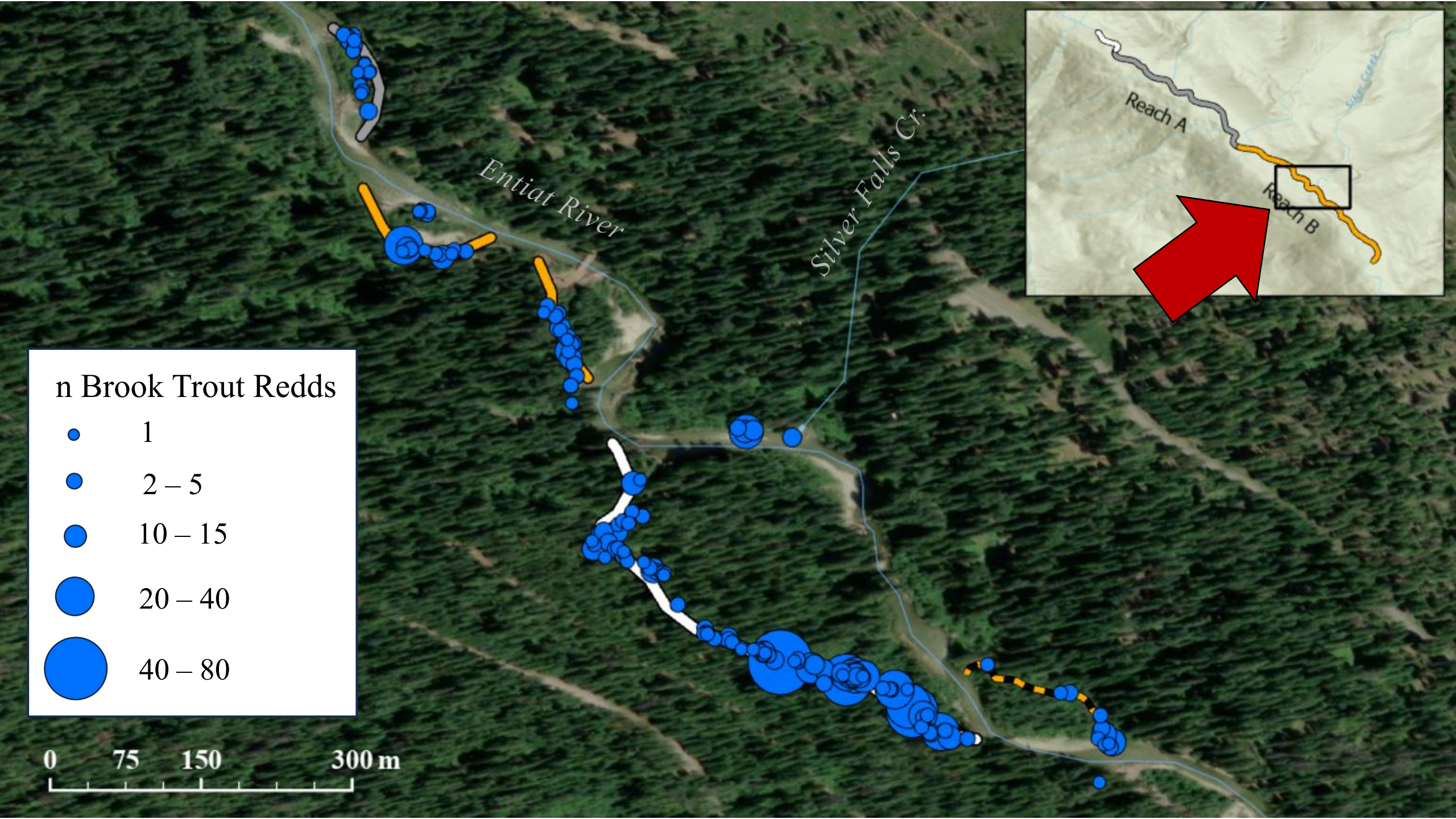
**Grey and black bars reflect superimposition related uncertainty*

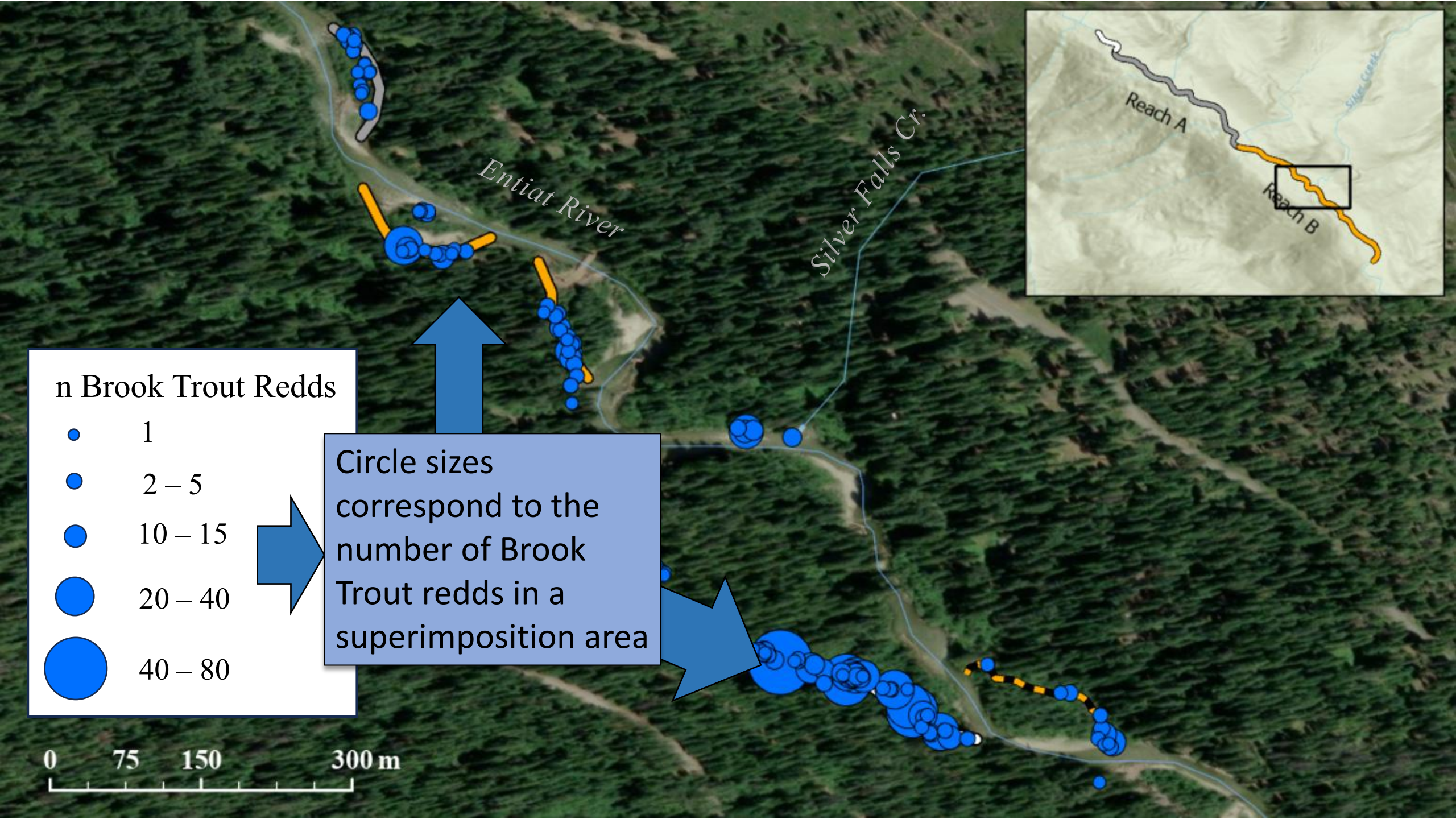
Where & Why?

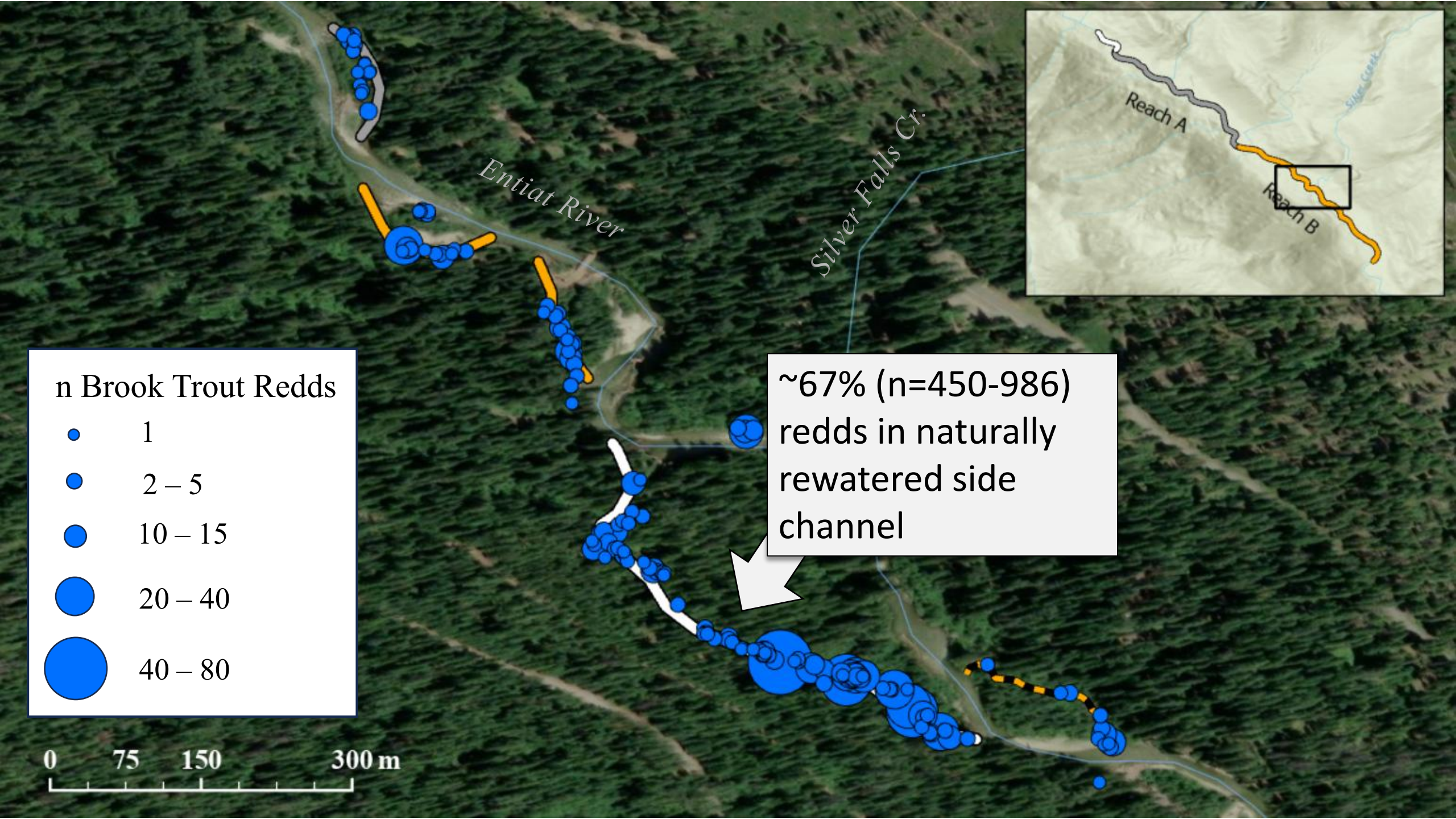


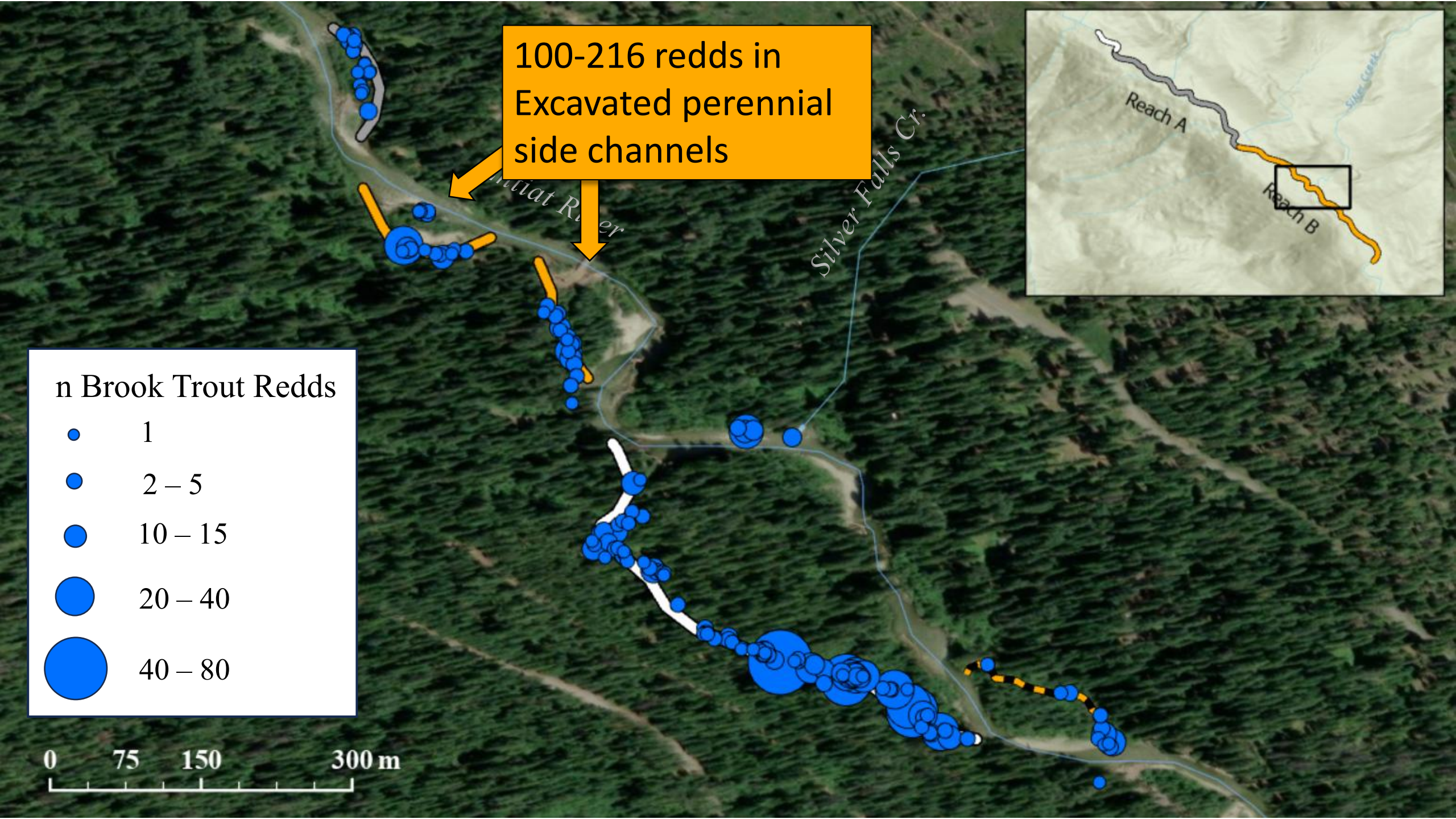
- Most Brook Trout redds were found in a series of side channels near the Silver Falls Creek confluence
  - These are a mix of natural and restored channels
    - Several channels were reconnected by high flows in 2022 or during the 2023 Silver Falls Enhancement Project

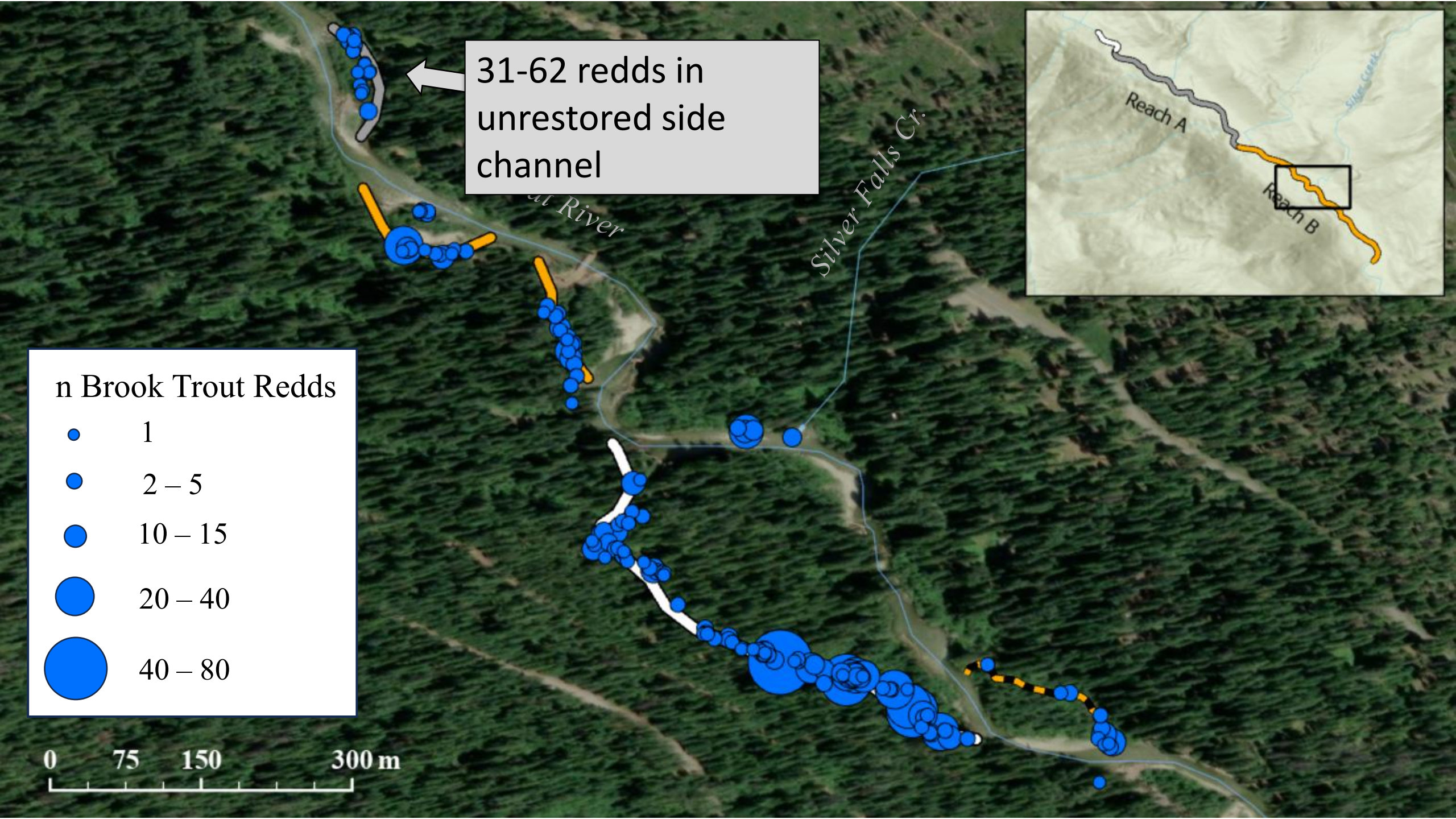

Entiat River
Silver Falls Cr.
Reach A
Reach B
2025 Brook Trout Results
n Brook Trout Redds
1
2 – 5
10 – 15
20 – 40
40 – 80
0
75
150
300 m

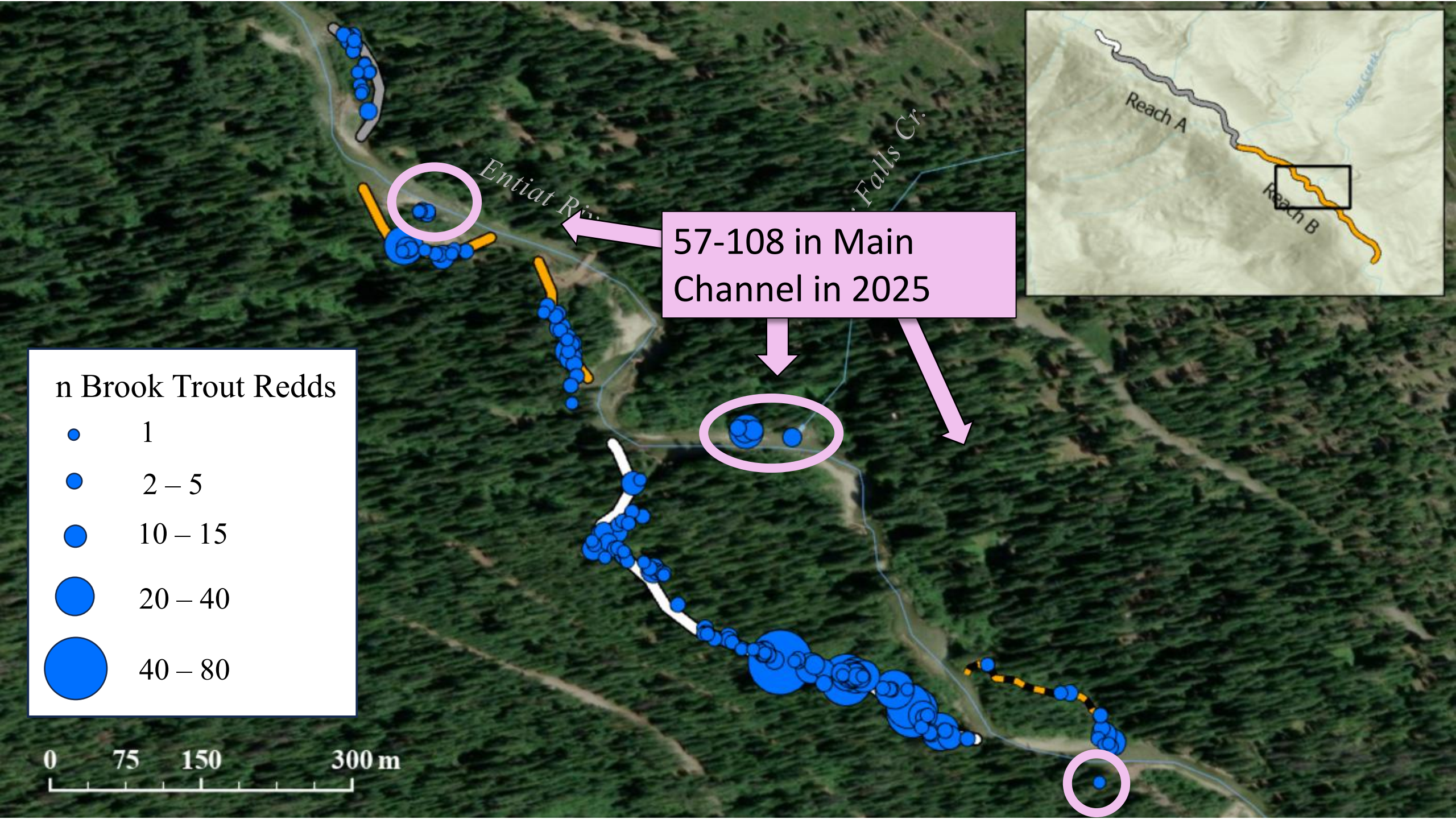

Entiat River
Silver Falls Cr.
Reach A
Reach B
n Brook Trout Redds
1
2 – 5
10 – 15
20 – 40
40 – 80
0
75
150
300 m


Entiat River
Silver Falls Cr.
Reach A
Reach B
n Brook Trout Redds
1
2 – 5
10 – 15
20 – 40
40 – 80
Circle sizes correspond to the number of Brook Trout redds in a superimposition area
0
75
150
300 m


Entiat River
Silver Falls Cr.
Reach A
Reach B
n Brook Trout Redds
1
2 – 5
10 – 15
20 – 40
40 – 80
~67% (n=450-986) redds in naturally rewatered side channel
0
75
150
300 m


100-216 redds in Excavated perennial side channels
Silver Falls Cr.
Reach A
Reach B
n Brook Trout Redds
1
2 – 5
10 – 15
20 – 40
40 – 80
0
75
150
300 m


31-62 redds in unrestored side channel
Silver Falls Cr.
Reach A
Reach B
n Brook Trout Redds
1
2 – 5
10 – 15
20 – 40
40 – 80
0
75
150
300 m


Entiat Ri
Falls Cr.
57-108 in Main Channel in 2025
Reach A
Reach B
n Brook Trout Redds
1
2 – 5
10 – 15
20 – 40
40 – 80
0
75
150
300 m

Why are these counts suddenly so high??

- Brook Trout thrive in 12-16°C low gradient, low velocity, complex, narrow, habitat with small substrate sizes
- Increasing stream temperatures (+1-2 °C) and reconnection are causing areas such as the Silver Falls side channels to meet this criteria
    - Spawning also occurred in areas upstream of Silver Falls during historic 2025 flows and temperatures

Why are Brook Trout a concern?

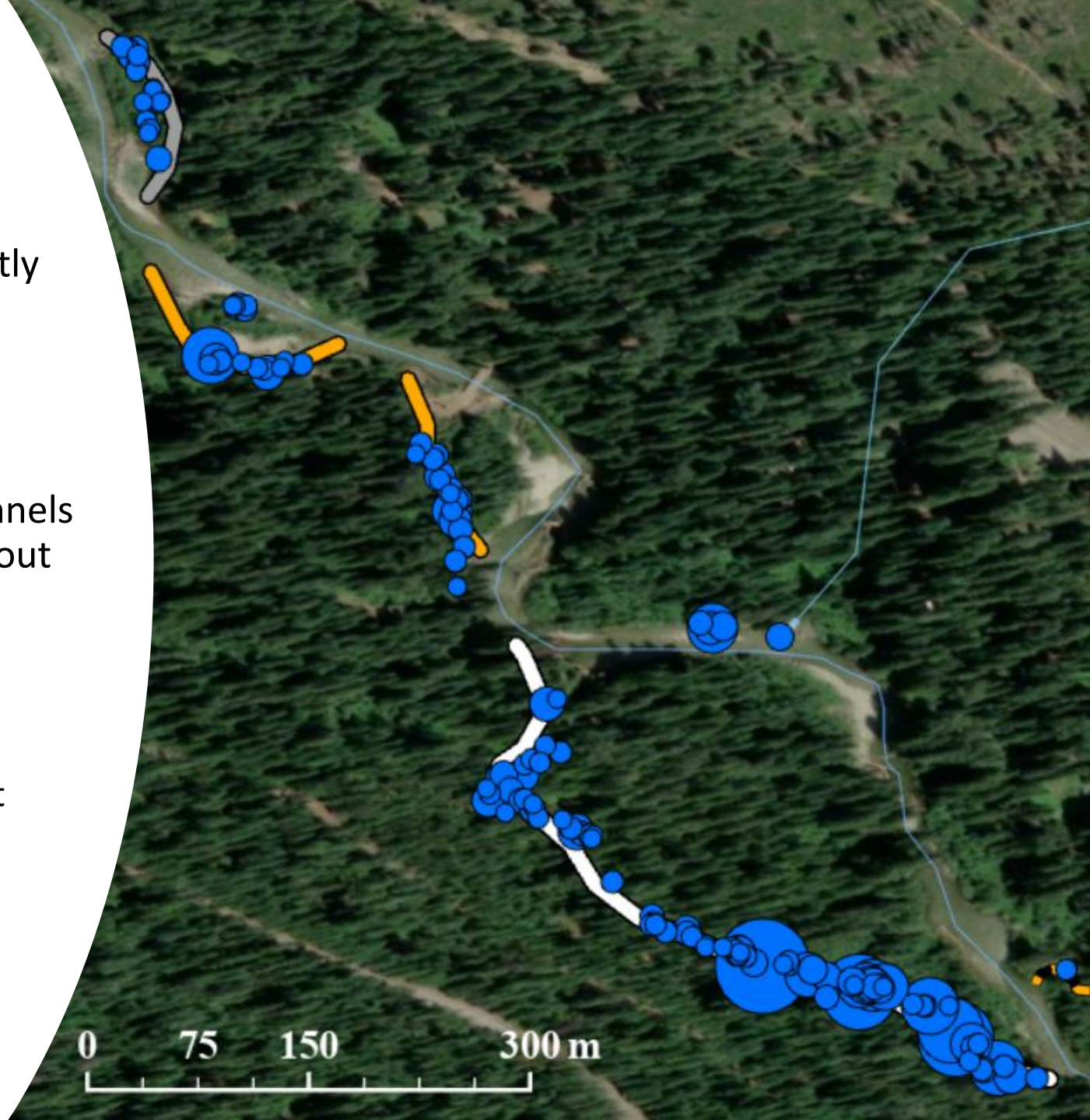
- Brook Trout can outcompete juvenile Bull Trout and hybridize with spawning adults
  - Densities as low as 2-7 Brook Trout per 100m reach can lead to extirpation of some Bull Trout life histories
  - Competition increases exponentially when temperatures >12C
- Threat to other native salmonids
  - Cutthroat: many, *many* studies
  - Chinook: Levin et al. 2002 – reduced survival and growth when Brook Trout present
  - O. mykiss: Little published data, lots of unpublished assemblage data

Conclusions:

What conclusions can be drawn from this?

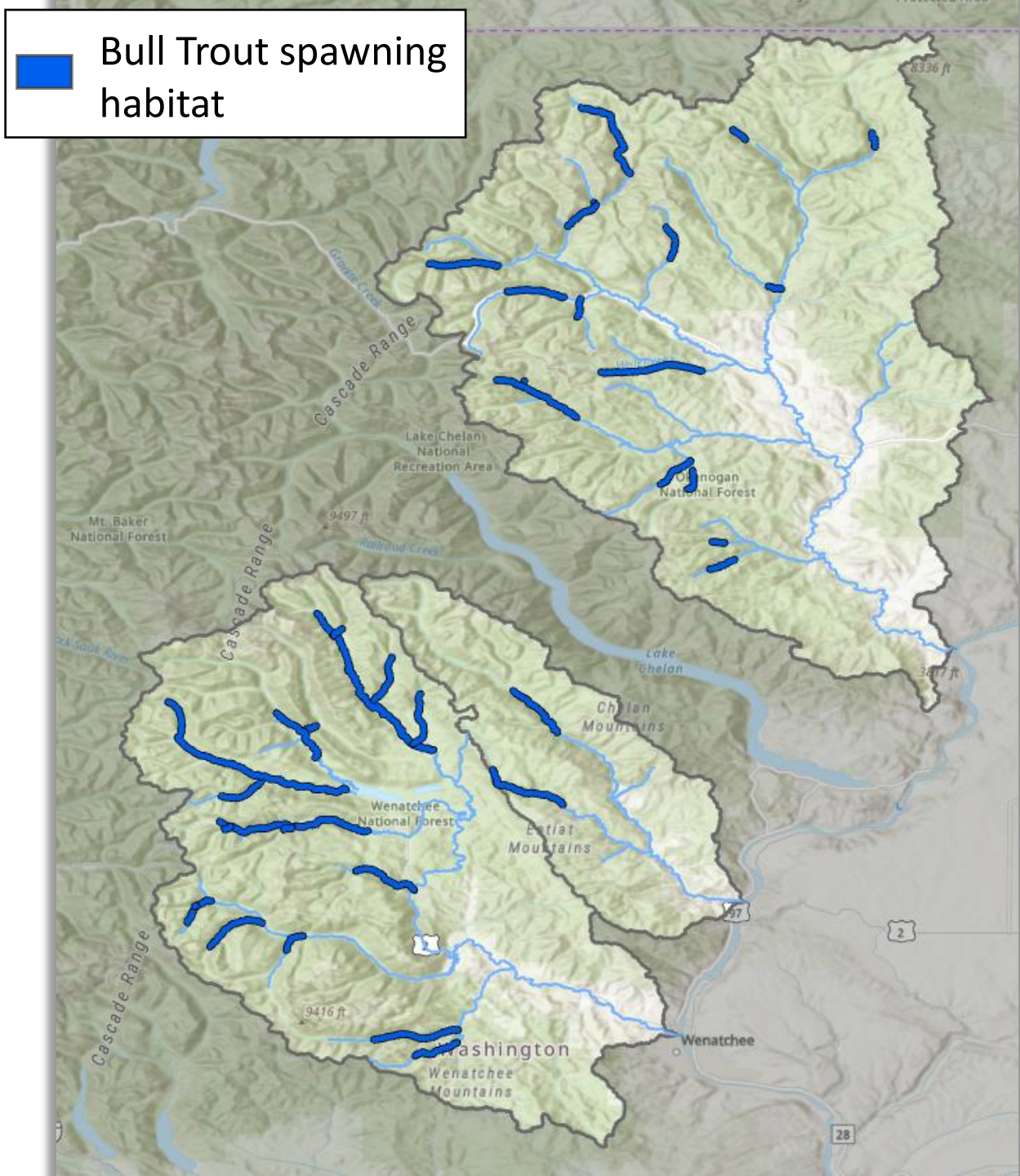
What the data **does NOT** indicate:

- Does not indicate that habitat restoration is directly responsible for all increased local Brook Trout spawning in the Upper Entiat River
  - >80% of Brook Trout redds observed in naturally reconnected and/or unaltered habitat
- Does not indicate that all reconstructed side channels in the Mid Columbia can or will increase Brook Trout populations
  - This is monitoring data from one location
  - Conditions will vary between locations and side channels (e.g. temperature, flow, etc.)
  - Source populations of Brook Trout are not present everywhere

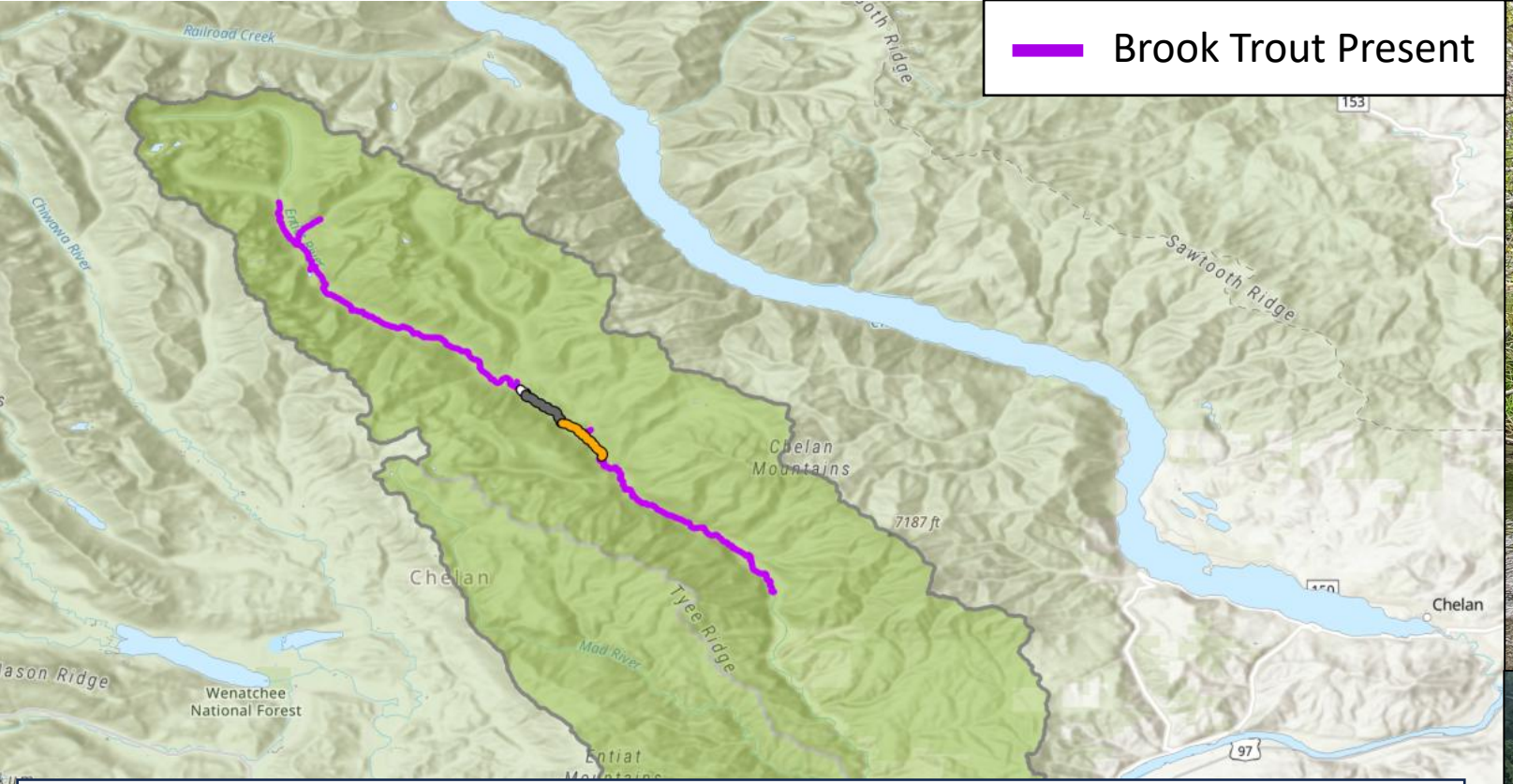


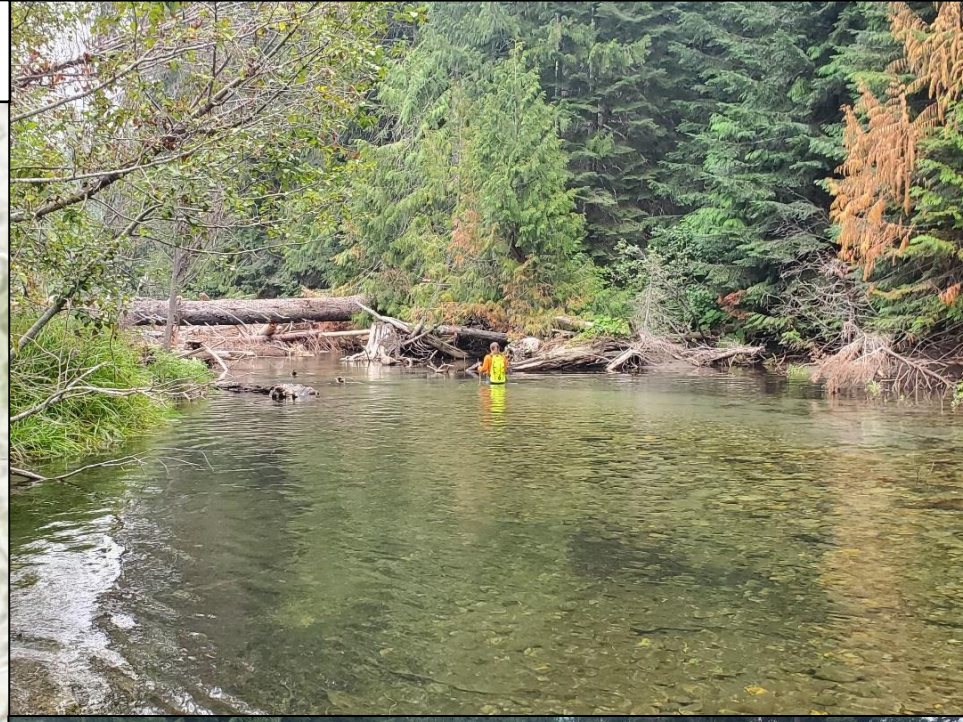
What the data **does** indicate:

- Brook Trout are spawning at very high densities within side channel habitat in Entiat River Bull Trout spawning & rearing reaches
- Perennial side channels ***CAN*** support large levels of Brook Trout spawning and potentially rearing under conditions present in Mid-Columbia Bull Trout rearing habitat
  - This is a concern where Brook Trout are present and side channels offer perennial habitat that is relatively small, low gradient, cool (12-16C), and complex with fine substrate
    - Brook Trout can outcompete most native species in these conditions



Brook Trout removal & suppression options (*If time)*





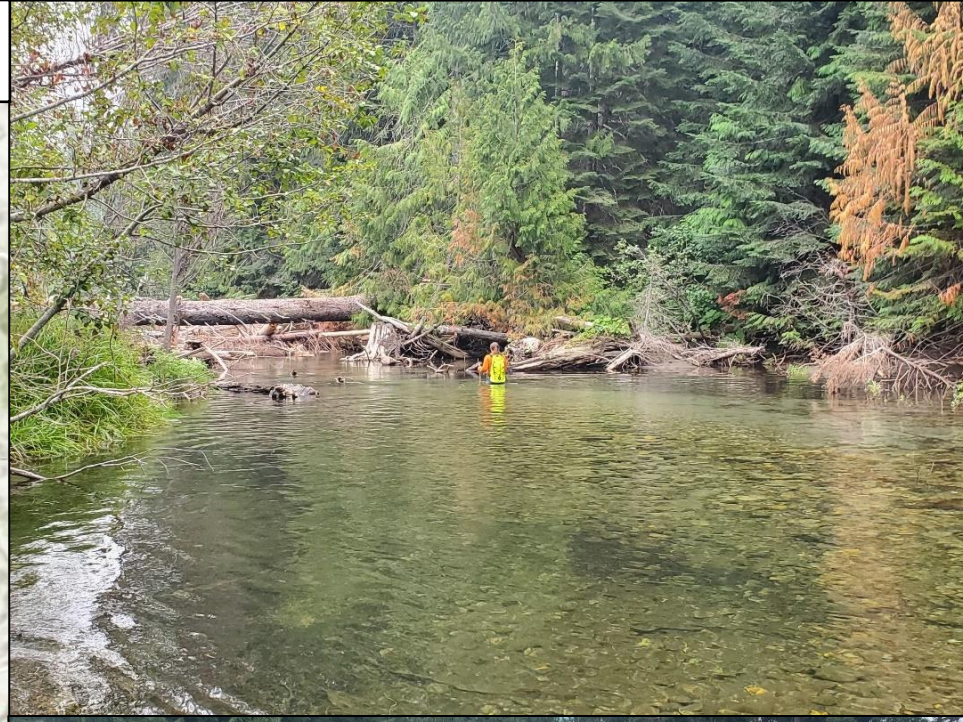
Can Brook Trout be removed from the Entiat River?

Brook Trout removal is likely not currently possible in the upper Entiat watershed and similar river systems

- Too large and complex for most removal methods to be feasible
- Presence of listed species makes rotenone and YY introductions extremely difficult
- Large Brook Trout source populations present

Brook Trout Present

Bull Trout Spawning Reaches



Railroad Creek
Chiwawa River
Sawtooth Ridge
Chelan Mountains
7187 ft
Chelan
Tyee Ridge
Mad River
Entiat Mountains
Wenatchee National Forest
Chiwaukum Creek
Eagle Creek
Icicle Ridge
Icicle Creek
Leavenworth
Swakane Creek
Cashmere
8625 ft
Stuart Range
Ingalls Creek
Wenatchee River
Badger Mountain
Wenatchee
Washington
153
209
97

Is suppression an alternative?

- Suppression is possible, but effectiveness, feasibility, and long-term sustainability is debatable
  - Potential issues: recolonization, sustained funding, complex habitat, listed species impacts, etc.
- **Bottom line:** Prevention is critical in sensitive habitat
  - Avoid introducing or augmenting Brook Trout populations where possible