Conservation and Habitat Value of Slash Piles for Rare Carnivores

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Funding from **Fish and Wildlife Habitat in Managed Forests research program** and **National Council for Air and Stream Improvement**

Oregon State University College of Forestry

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Pacific marten (*Martes caurina)*

- Coastal Distinct Population Segment Federally Threatened (2020)
- State Endangered in California (2019)

Mark Linnell

Caylen Kelsey

Pacific fisher (*Pekania pennanti)*

- Southern Sierra population State (2019) and Federally (2020) Endangered

Connected, structurally complex forests

Associated with structurally complex forest types

Avoid openings, to varying degrees

Caylen Kelsey

Slash Piles

Used by GPS collared fishers on the Klamath Plateau 2015-2018 (Moriarty et al. 2019)

- 7-12% of rest sites
- 14% of den sites

Collared martens used piles where large trees were sparse in Oregon (Raphael and Jones 1997)

- 45% of rest sites
- 29% of den sites
- 3% of standing structures >50cm DBH

Objectives

1) Document martens and fishers visiting slash piles

2) Generate estimates of small mammal abundance, diversity, and energetic biomass at slash piles and in the surrounding landscape

3) Model effects on surface fire behavior with occurrence of slash piles

Study Area: California

Stands randomly selected across ownership

- <5km of recent marten or fisher detection
- 0-15 years from harvest

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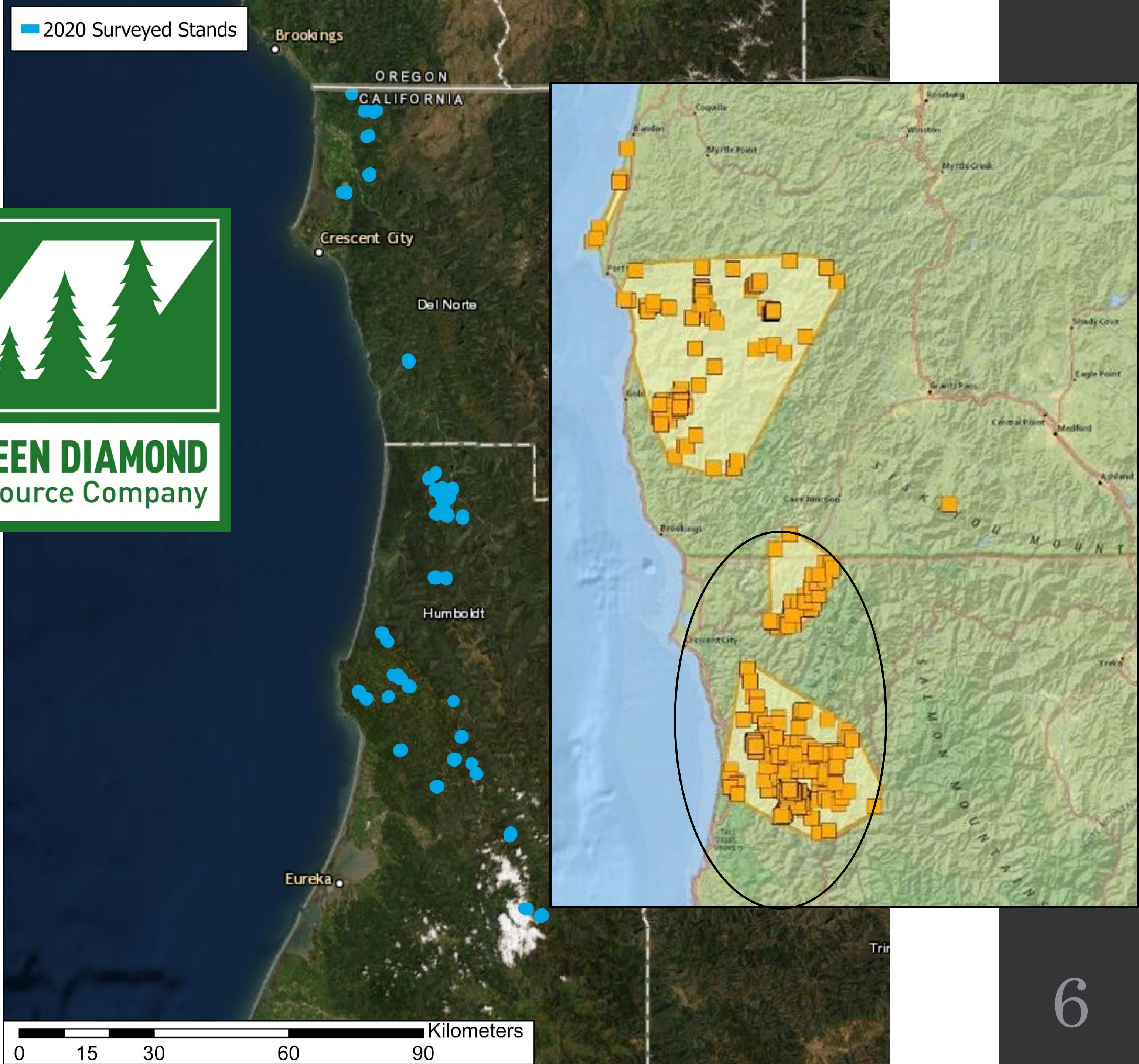


Study Area: Oregon

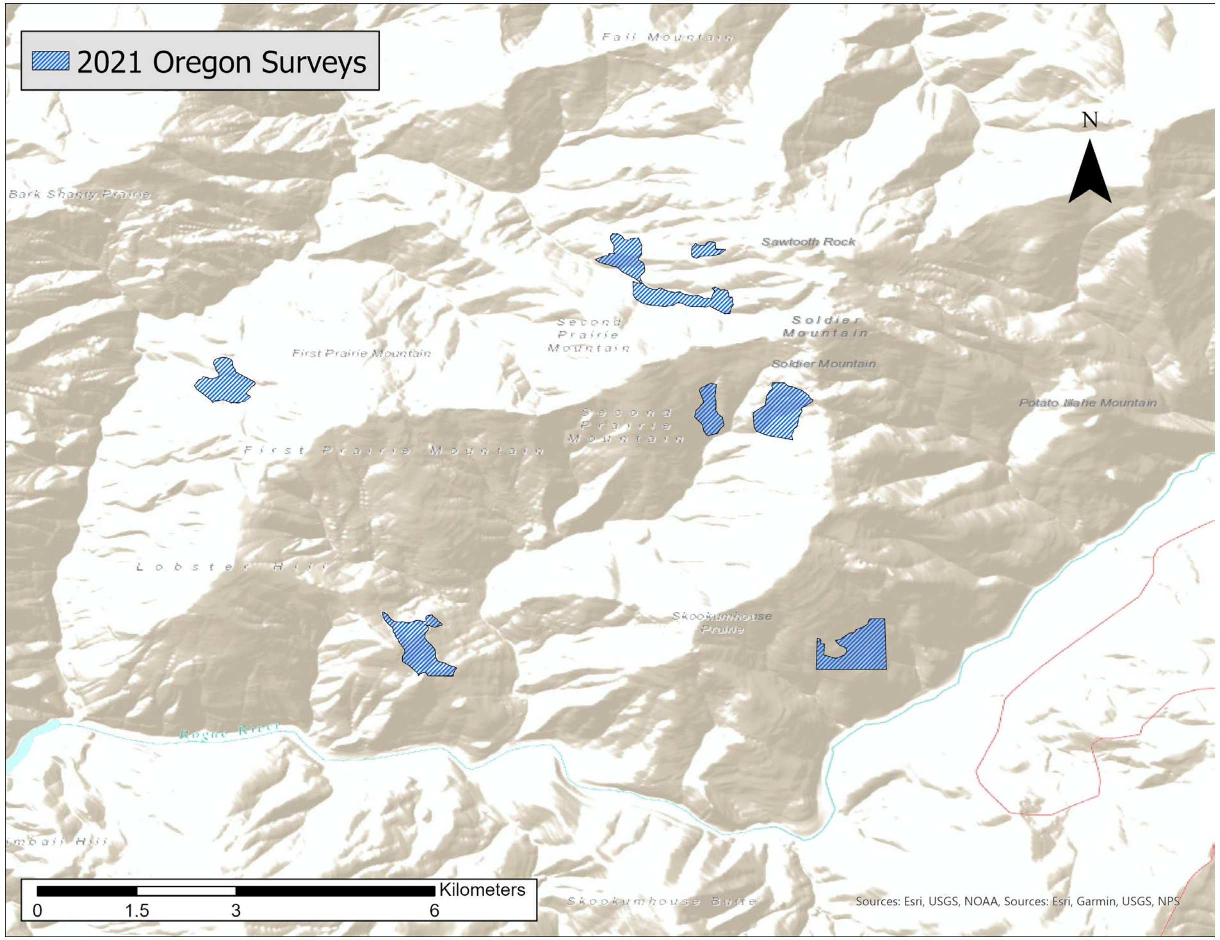
South Coast

- Intensive sampling protocol
- Detection dog surveys

Klamath Plateau

- Revisit fisher rest and den sites

Fisher CCAA funded



Treatments

Regenerating, with slash piles

- <15 years

Adjacent "older" forest

- >20 years

Regenerating, no slash piles

- Small mammal trapping only

Objective 1: Pile Visitation

Document pile visitation by martens and fishers.

Quantify associations between pile visitation and stand characteristics

Quantify associations between pile visitation and pile characteristics

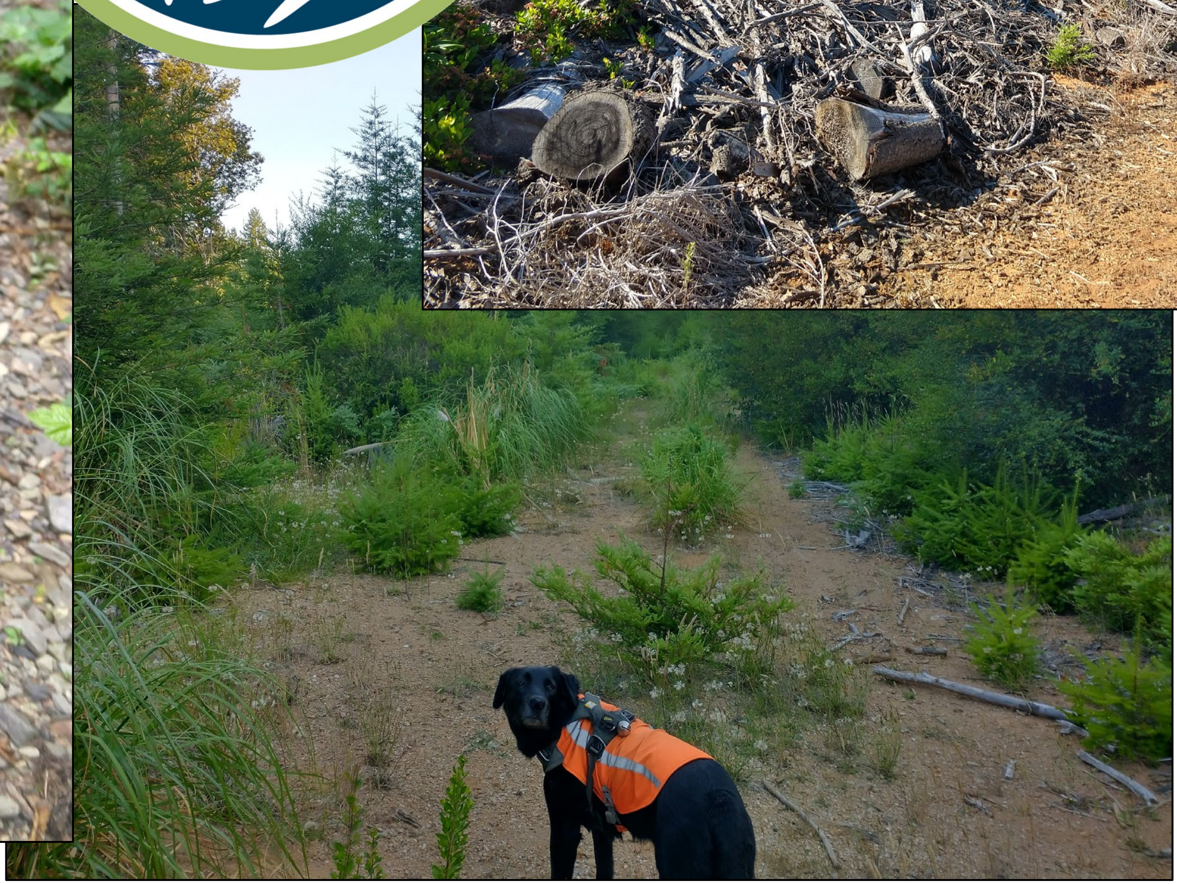
Camera Surveys

One pile surveyed per stand

- **Three** cameras per pile

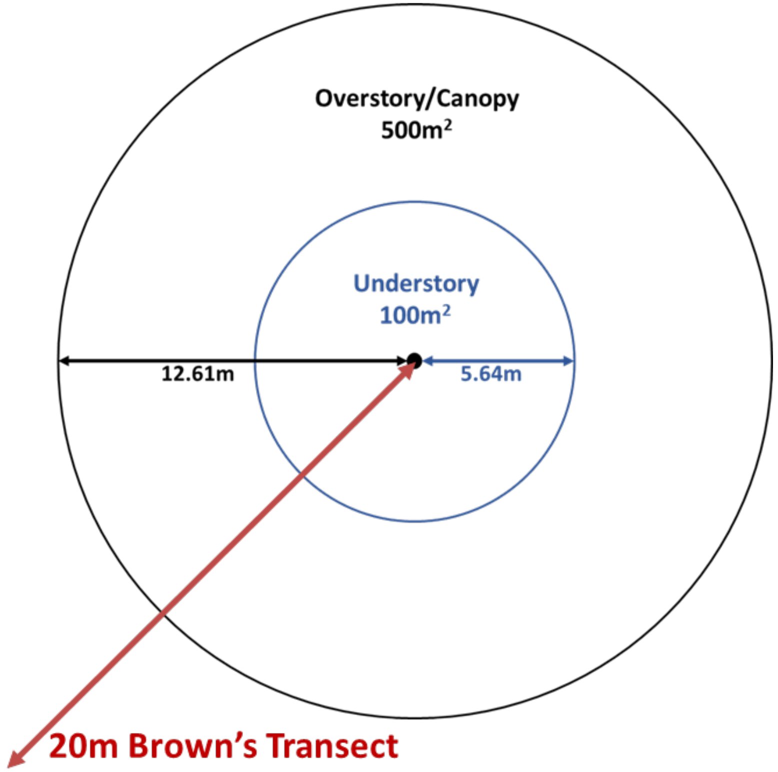
Two baited cameras in adjacent forest

ROGUE DETECTION TEAMS



Vegetation and Woody Debris Sampling

3 plots per stand, 6 per stand pair

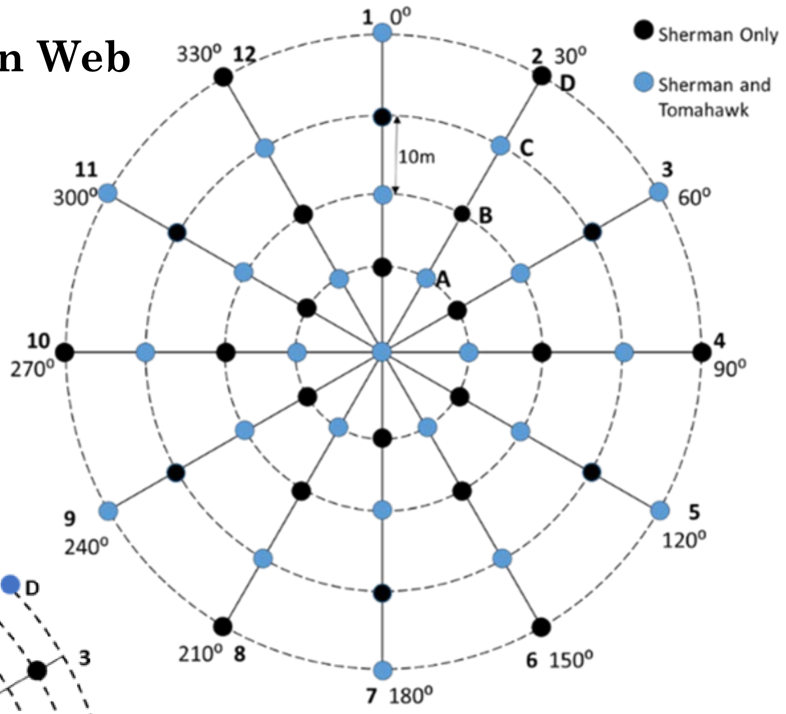


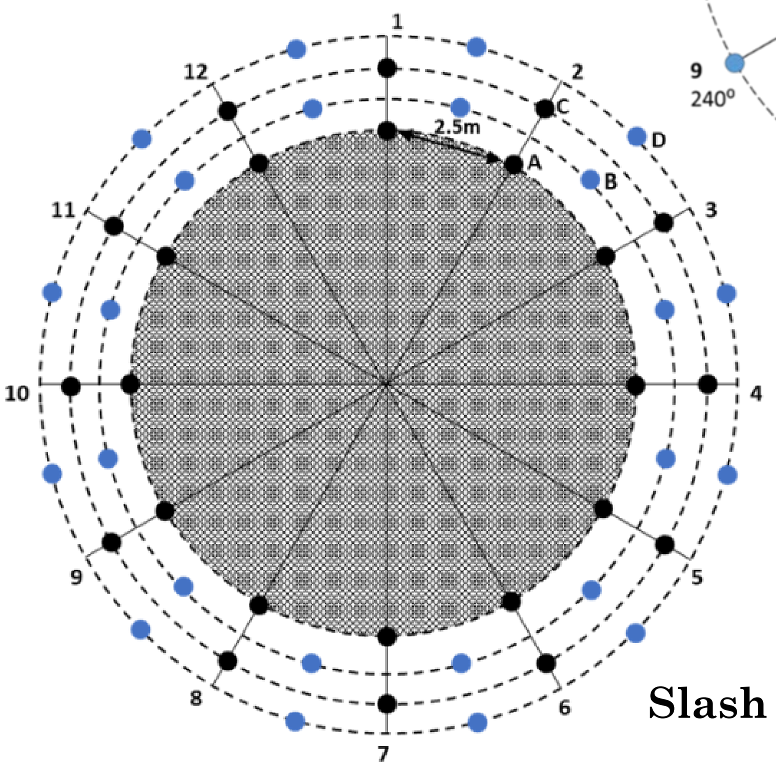
Objective 2: Small mammal communities

Generate estimates of small mammal abundance, diversity, and energetic biomass at slash piles and in the surrounding landscape

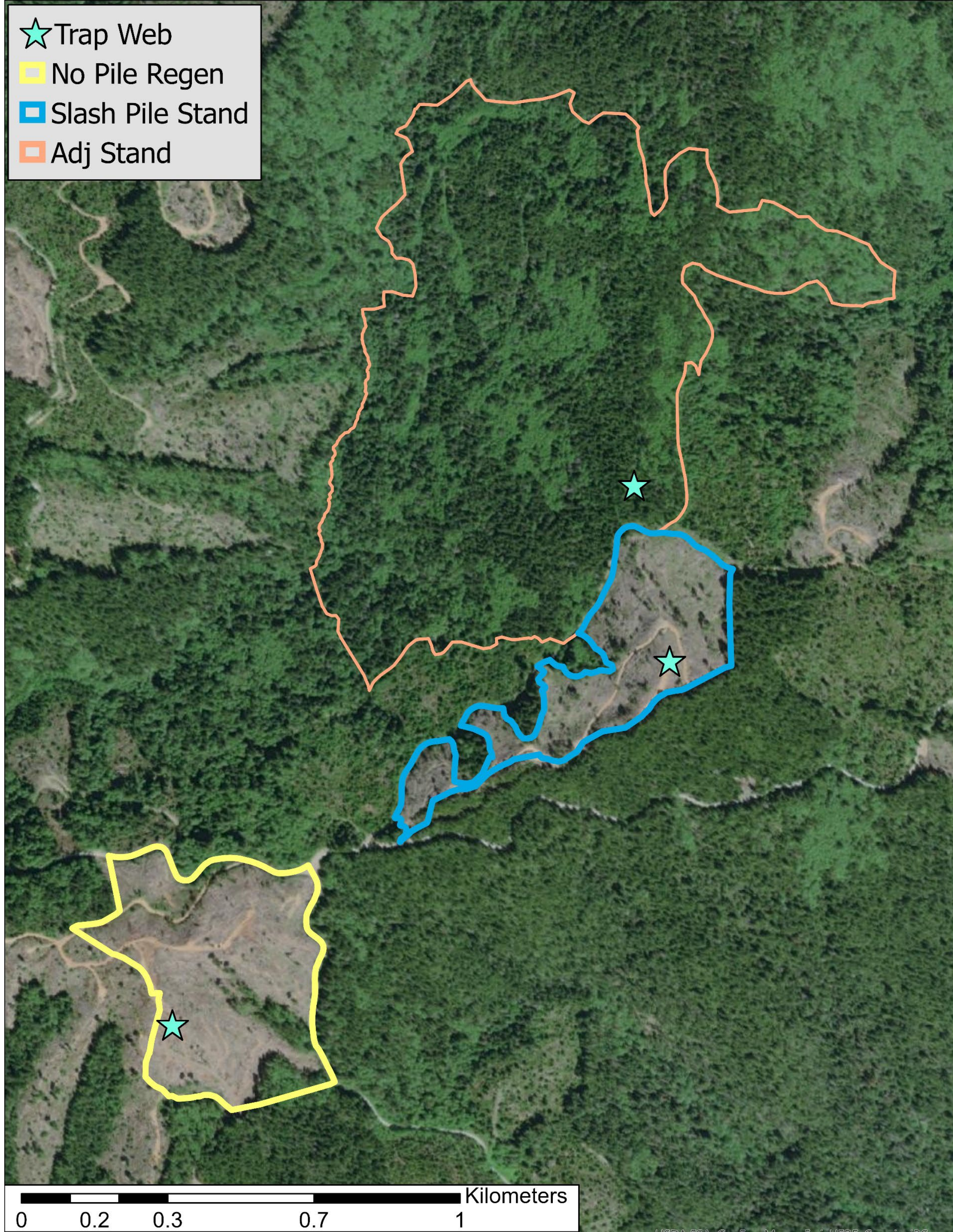
Small Mammal Trapping

Forest /Regen Web





Slash Pile Web



Objective 3: Fire Behavior

Model effects on surface fire behavior with occurrence of slash piles

Intensive Sampling

10 stand subset from California and all Oregon surveys

- Ages 0-7 years
- 6 vegetation and woody debris plots
- Up to 10 piles sampled per stand

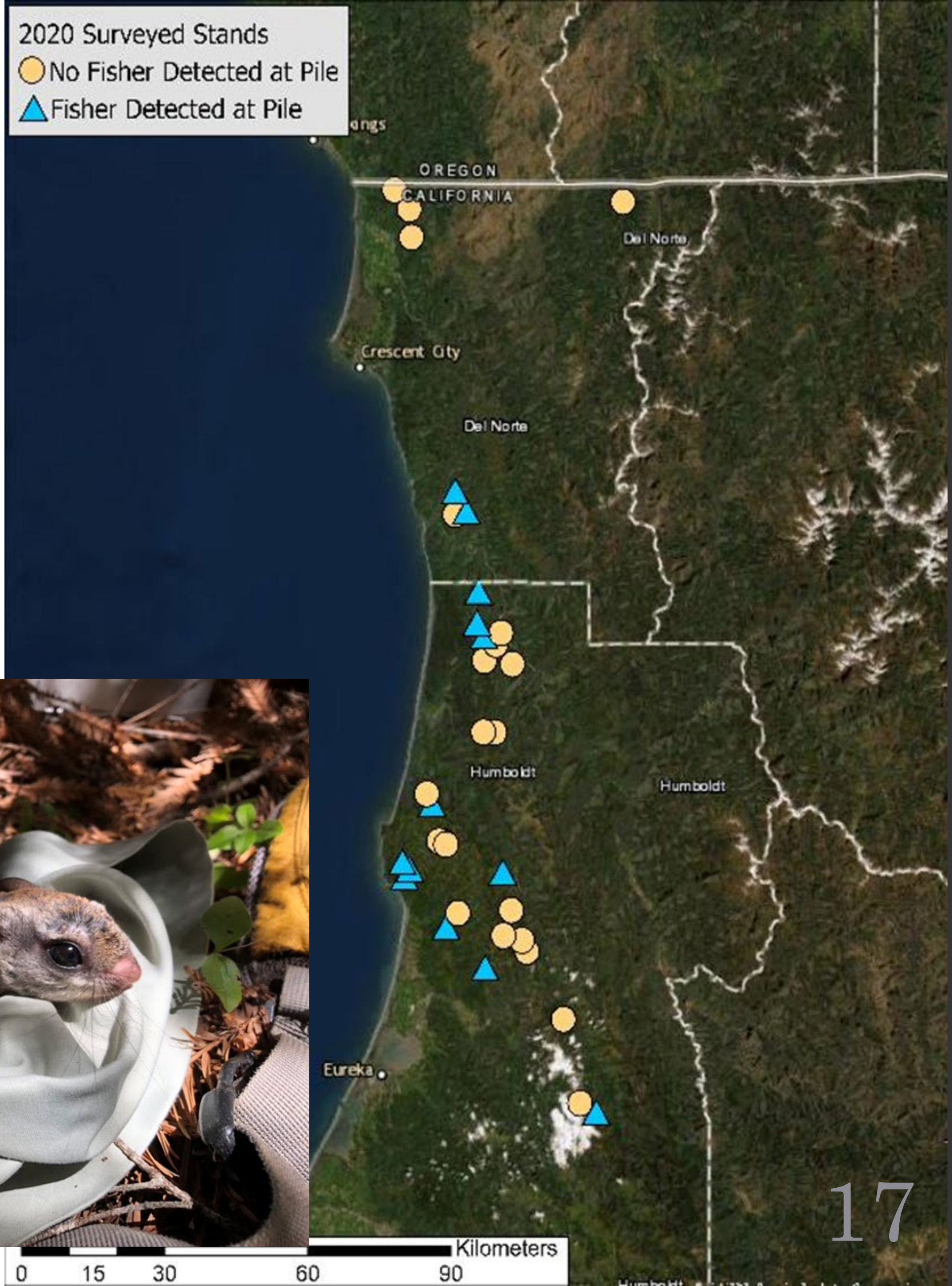
Generate custom fuel models

2020 Summary

35 Stands surveyed

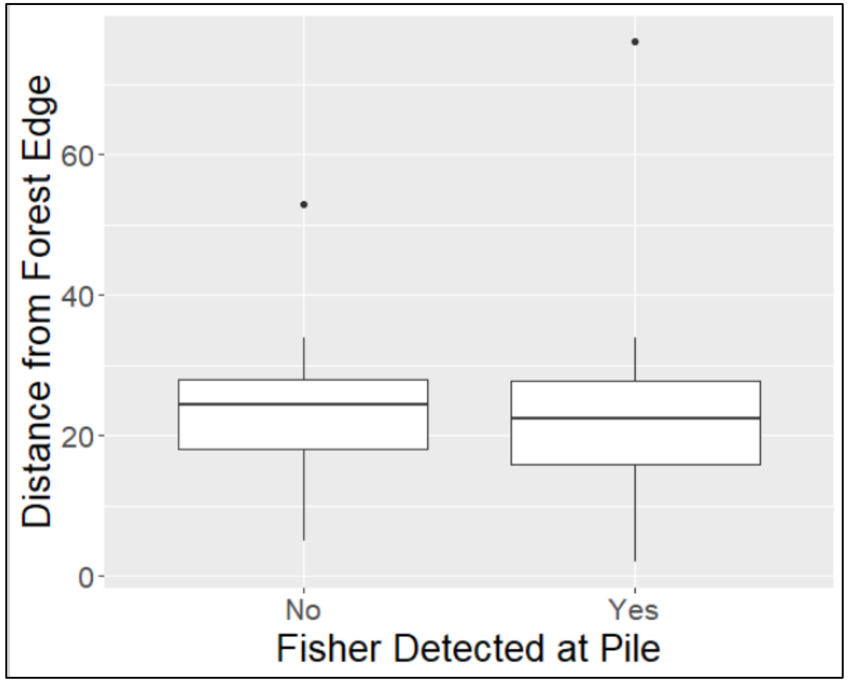
- 5+ cameras per stand
- 185 cameras total
- 1.1 million photos collected
- Fishers detected in 26 stands, 14 at piles

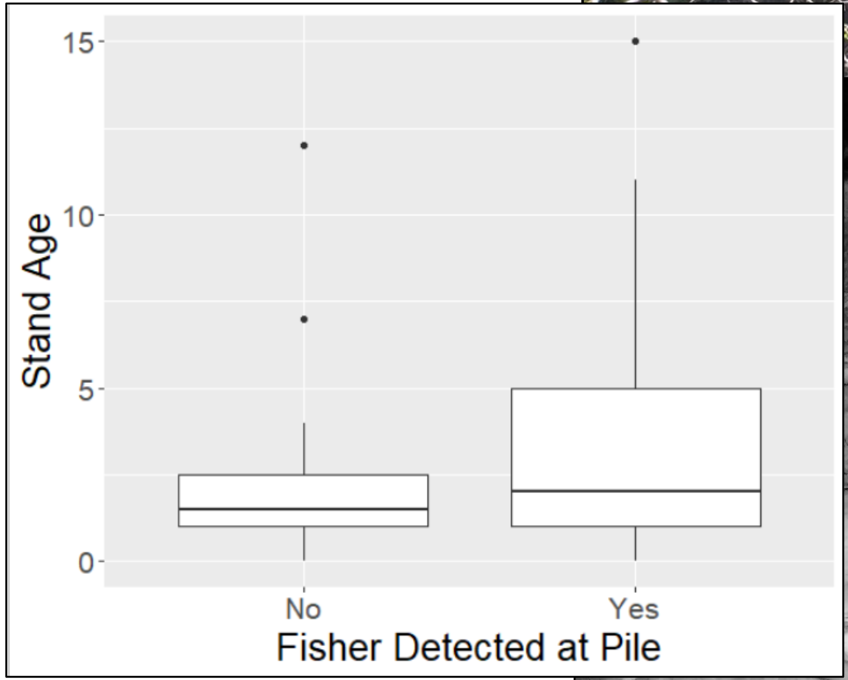
8 completed trap sessions



Take-Aways from 2020: Detections

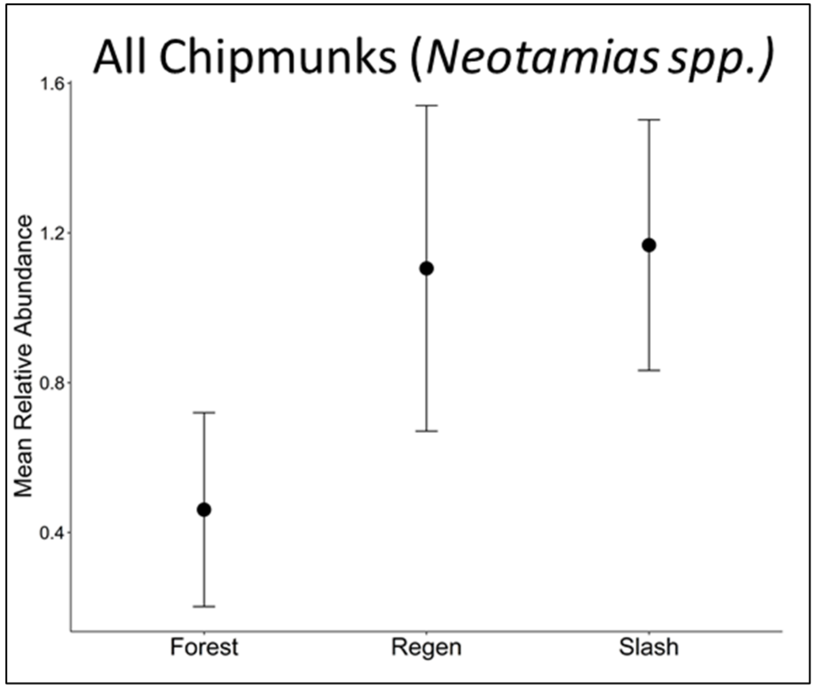
Some willingness by fishers to visit piles

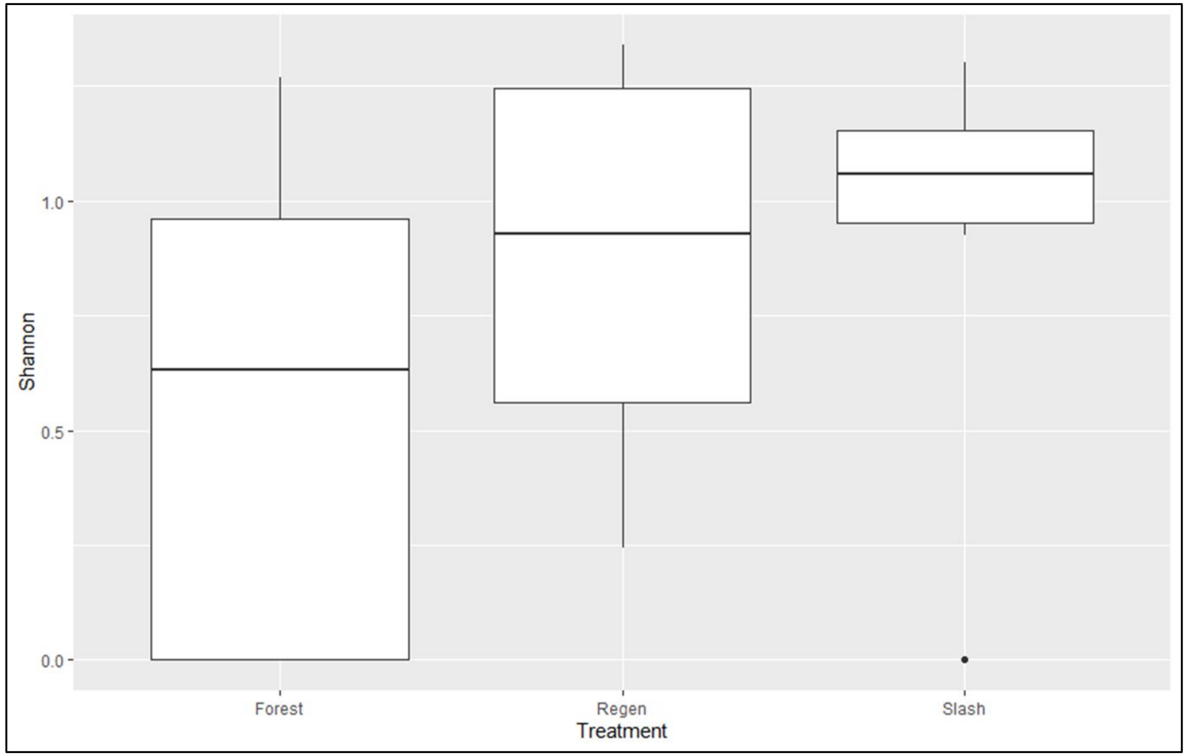


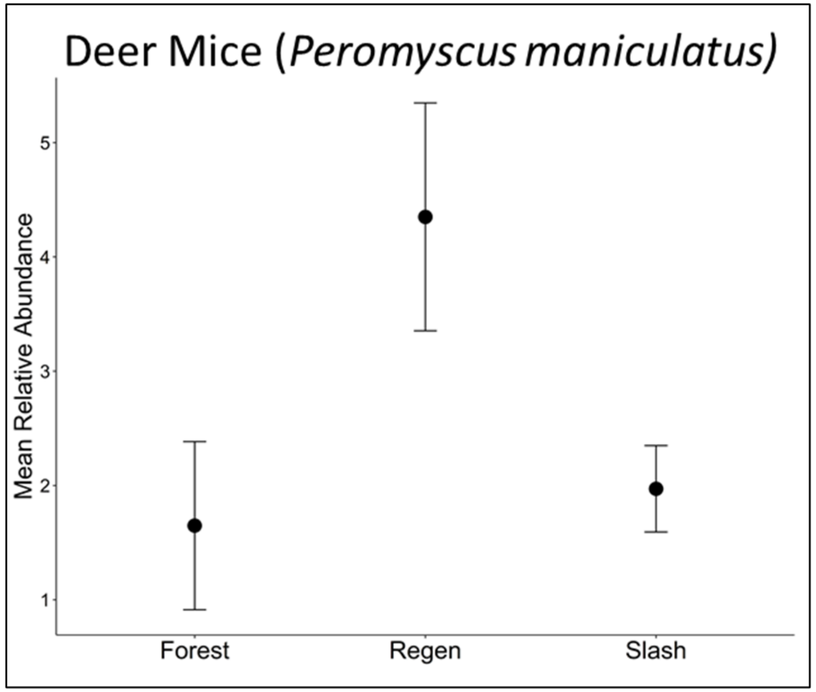


Take-Aways from 2020: Small Mammals

Possible influence on small mammal communities







2021 Summary

California

- 35 stands surveyed
- 10 stands intensively sampled
- 10 small mammal sessions

Oregon

- 8 stands intensively sampled
- No camera surveys
- Lacking piles

Field season ends ~November 21

Next Steps

Anticipated project end date now **Summer 2022**

Additional Oregon stands - TBD

Photo-tagging

- Undergraduate tagging team

Additional Collaborations

Humboldt State University (HSU)

Dr. Micaela Szykman-Gunther

- Scat detection surveys, field personnel, photo tagging

Candidate Conservation Agreements with Assurances (CCAA)

- Funding for data collection in Oregon

Acknowledgements

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Rogue Detection teams: Justin Broderick and Winnie, Will Chrisman and Hooper, Jenn Hartman and Filson

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U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

ROGUE DETECTION TEAMS

Rayonier

Questions?

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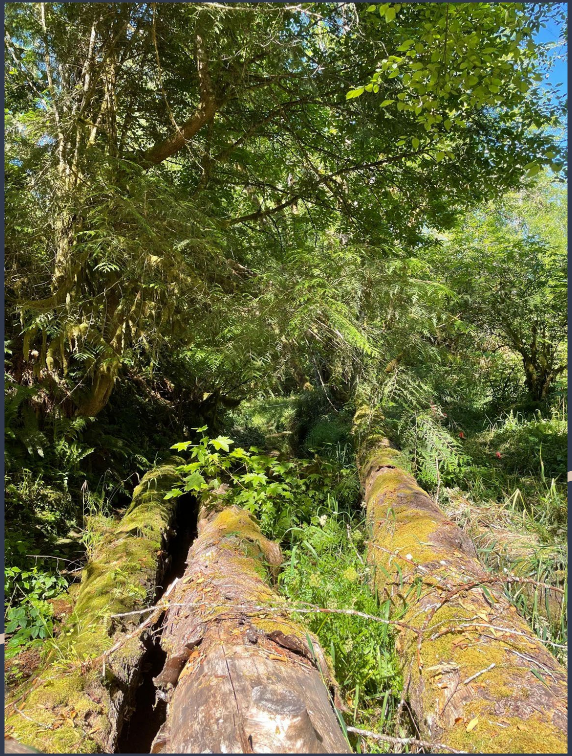
Quantifying Long Term Restoration Success of Large Wood Introductions on Winter Juvenile Coho Salmon Populations

Madelyn Maffia and Catalina Segura

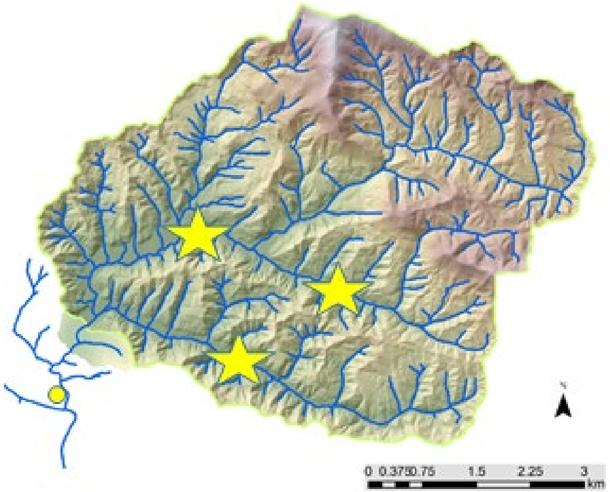
Oregon Fish & Wildlife

Oregon State University

Study Site



- Near Siletz, Oregon
- Weyerhaeuser Harvesting Land
- 3 Sites in the Mill Creek Basin
  - Mill Creek (Site #1)
  - Cerine Creek (Site #2)
  - South Fork (Site #3)



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Why place logs into perennial streams?

- Previous management strategies degraded stream complexity and fish populations
- Logjams have shown to be a useful conservation tool for stream health
  - Pool-rifle morphologies, average flow velocities, sediment retention, local scour
- Few studies on the long term restoration success

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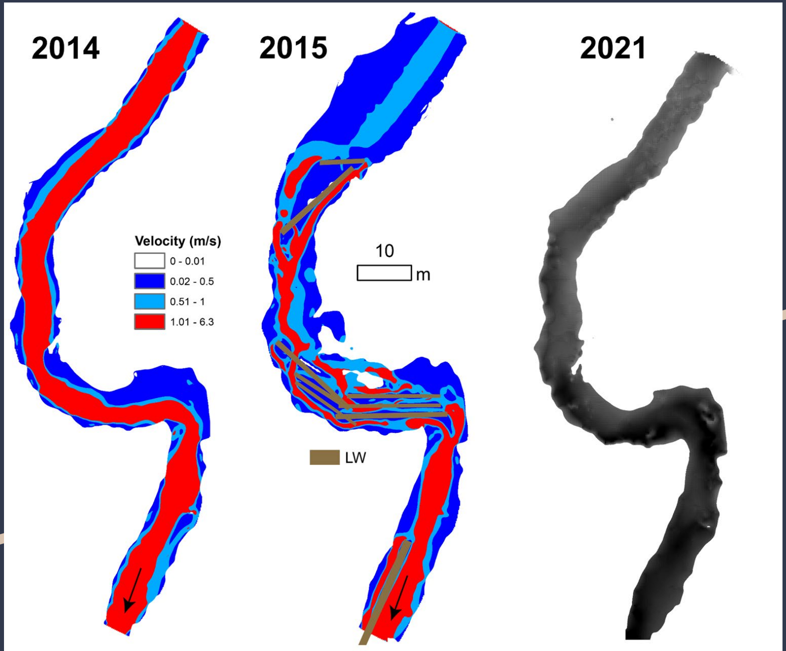
Findings from 2019 study



- 23.2% to 36.4% decrease in average velocities
- Channel bed with stable substrate increased by at least 27 % and at most 94% for portions of all the streams.
- Acceptable habitat for salmon changed for Sites 1, 2, and 3, by +135%, -25%, and +66%

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Objective

Objectives for current research:

1. Assess the changes in available fish habitat
2. Examine long term topographic changes in the stream
3. Investigate the movement and stability of the large wood
4. Investigate the relationship between the basins geomorphology and fish populations

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Expected Findings

- We expect to see the habitat that was created in 2015 to be maintained
  - Increase in acceptable habitat for salmon
    - Decrease in stream velocity
    - Stable stream bed
  - Local scour and sediment deposition
  - Downstream movement of logs
  - Improvement in fish population due to more desirable stream characteristics

Methodology

- **Objective 1.** Assess the changes in available fish habitat
  - Nays2DH hydraulic modeling
    - Topographic surveys
    - Pebble counts
    - WSE observations
- **Objective 2.** Examine long term topographic changes in the stream
  - Topographic surveys

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Methodology

- **Objective 3.** Investigate the movement and stability of the large wood
  - Basin wide wood surveys
- **Objective 4.** Investigate the relationship between the basins geomorphology and fish populations
  - Fish Surveys
    - Conducted by ODFW

What's been done so far?

- Topographic surveys
  - Cross sections
  - Stream bed and bank
  - Large wood
  - 1800 - 2500 survey points per site
- Pebble counts
  - 2000-2800 particles measured per site
- Instrumentation
  - 10 level loggers
  - 20 staff gauges
  - Anchoring

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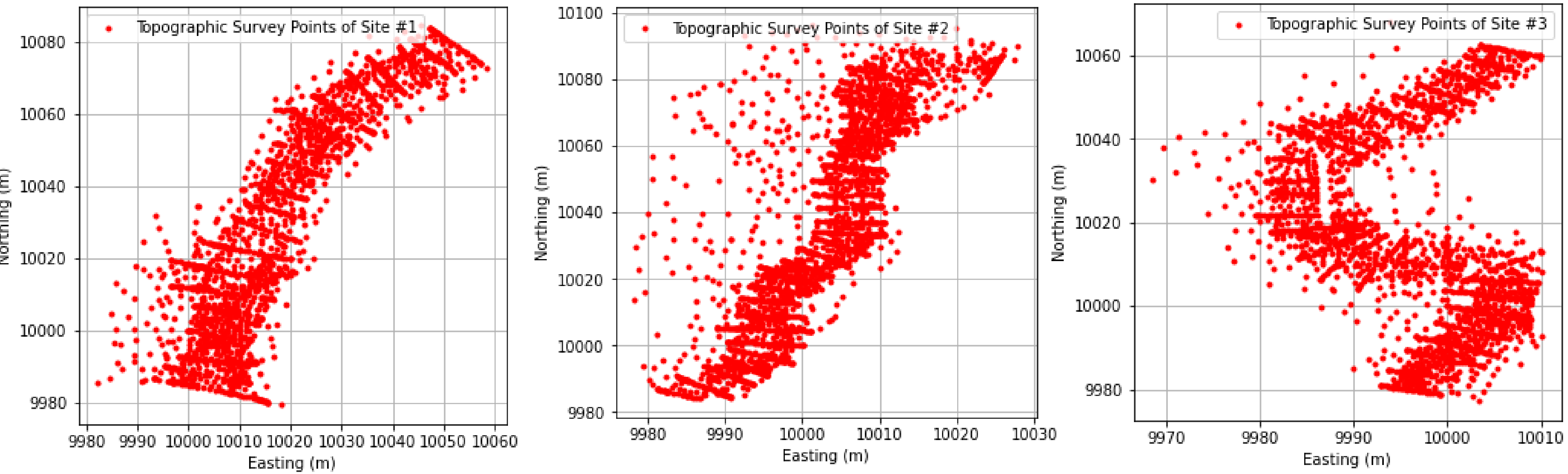
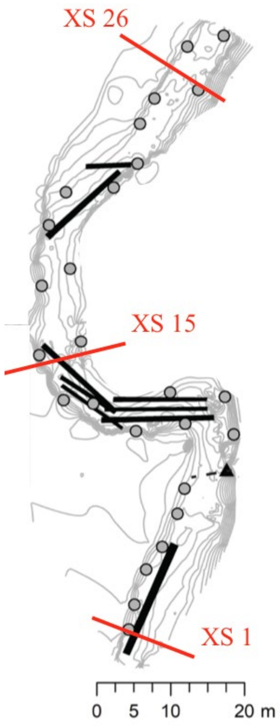
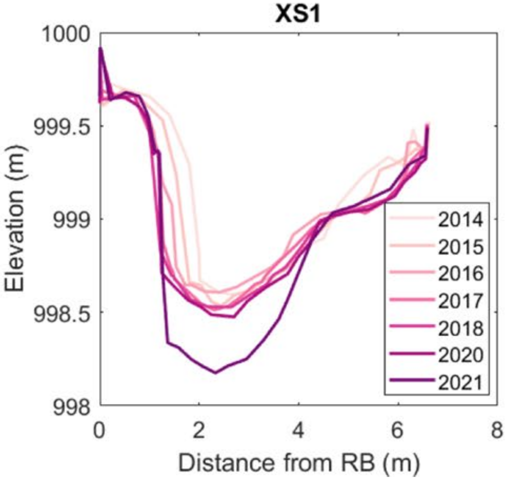
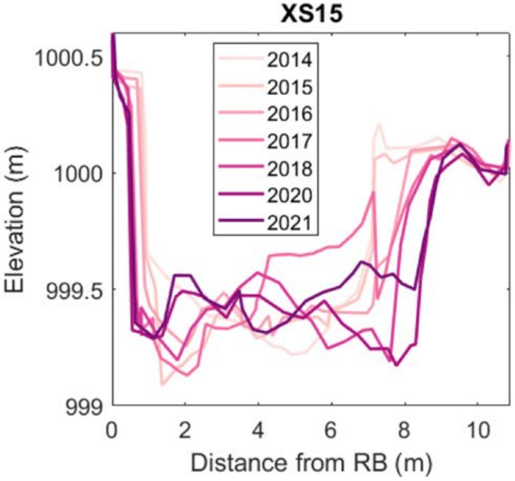
Topographic Survey Points

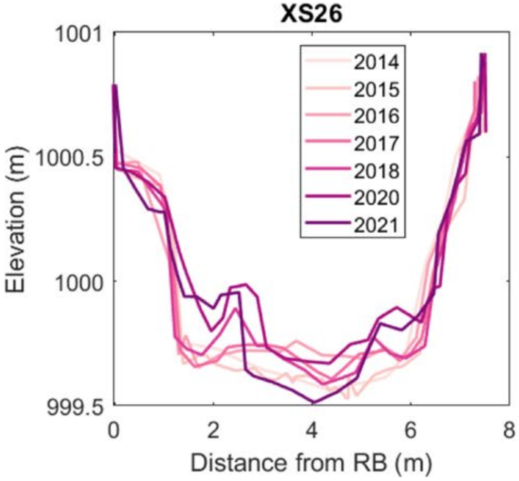


Site 3 Cross Sections









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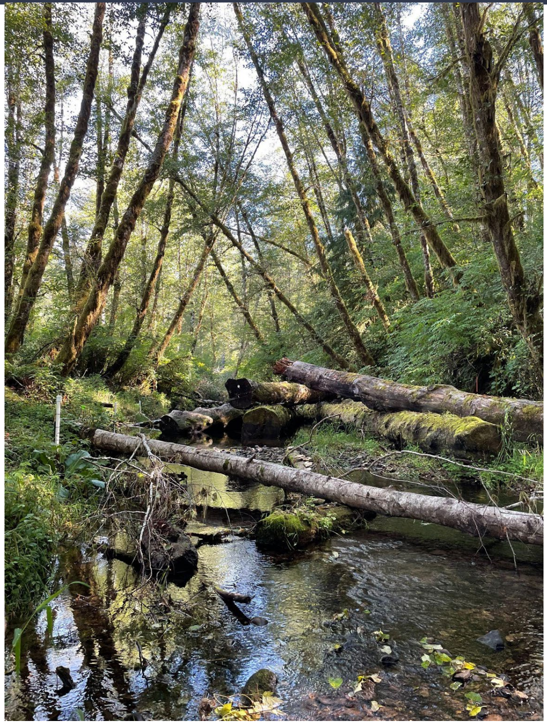
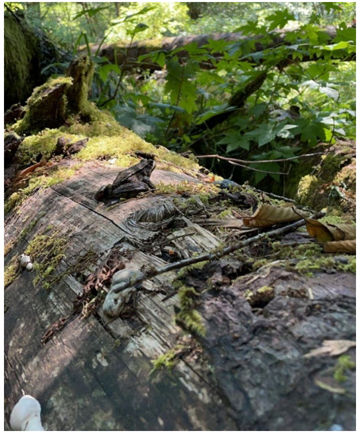
Timeline

Activity	2021						2022												2023				
			Fall			Winter			Spring			Summer			Fall			Winter			Spring		
	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
Topographic Surveys	■	■	■																				
Basin Wide Wood Surveys	■	■	■																				
Instramentation	■	■	■																				
Geospatial Analysis				■	■	■																	
High Flow Field Observations					■	■	■	■															
Hydraulic Modeling								■	■	■	■	■											
Analysis of Results												■	■	■	■	■	■						
Manuscript Writing																■	■	■	■	■	■	■	■

Thank you!





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Development of native bee identification keys for the Pacific Northwest

Jim Rivers
OSU College of Forestry
Linc Best
OSU College of Agriculture

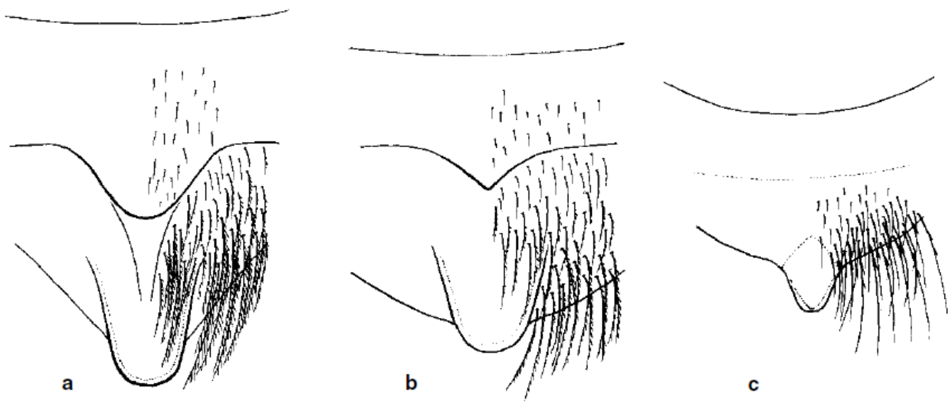

Hannah O'Leary/OSU

Available bee identification keys are challenging to use, even for experts

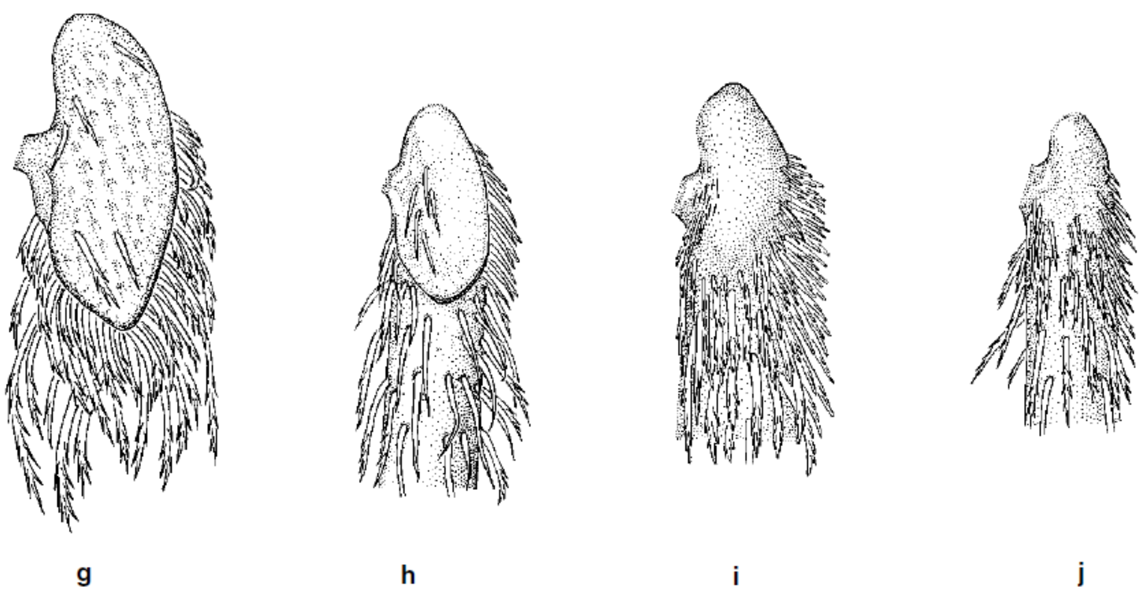
1. Scopa weak (Figs. 8-5a, 8-6) or absent; T5 with longitudinal median zone of fine punctation and short hairs weakly developed or absent; apical labral process without keel (as in Fig. 65-1i) or keel reduced to weak carina 2

—. Scopa present from hind trochanter to tibia (Fig. 8-5b), forming corbicula on underside of femur; T5 with well-developed longitudinal median zone of fine punctation and commonly short, dense hairs, this zone dividing prepygidial fimbria (Fig. 65-1j); apical labral process with strong longitudinal keel on anterior surface (Fig. 65-1a, b, e) 5

Idealized drawings often don’t work well in the real world

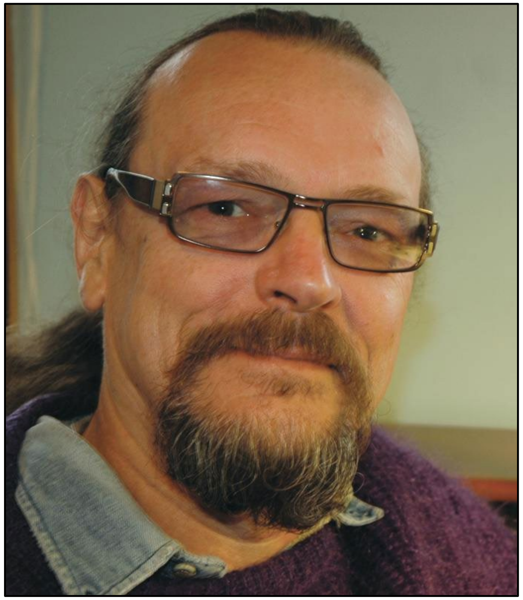


Pygidial plates



Basitibial plates

The problem for most insect identification keys



"Keys are written by those who don't need them, for those who can't use them."

– Dr. Laurence Packer
Bee taxonomist

Key used to teach bee identification in Oregon Bee School

CANPOLIN - Bee Course 2012

Key to Bee Genera in Canada

The sexes in bees can generally be differentiated by counting the number of metasomal terga – 6 in females, 7 in males, or the number of apparent segments of the antenna – 12 in females, 13 in males (excluding *Holcopasites*). The second antennal segment is sometimes largely retracted within the first, particularly in some wasp-like bees.

1. Three submarginal cells (Fig. 1)…2

   One or two submarginal cells (Fig. 2)…33

This project is a partnership with Linc Best, the taxonomic specialist for the Oregon Bee Project

THE OREGON BEE PROJECT

Our project will create three bee identification keys, in both online and print formats

Genus-level key

Species-level keys for ♀ and ♂ *Bombus*

Images courtesy of ODA

Where we are with:

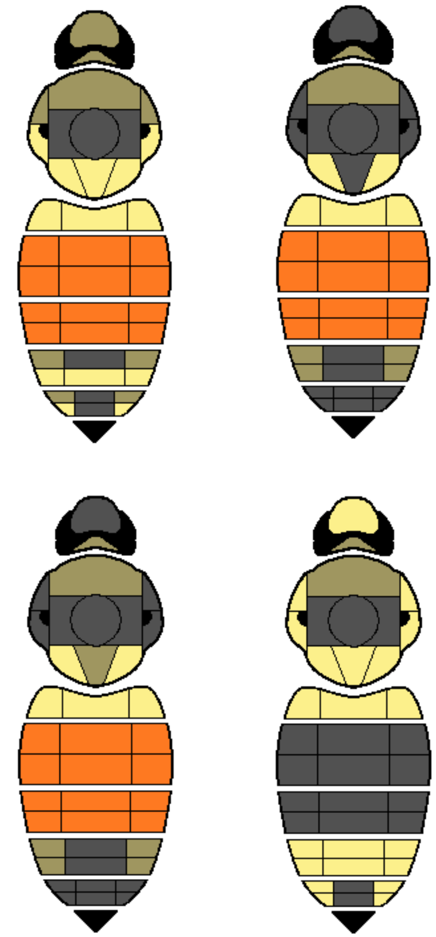
1) Key to female *Bombus* of the PNW

2) Key to male *Bombus* of the PNW

3) Key to the Bee Genera of the PNW

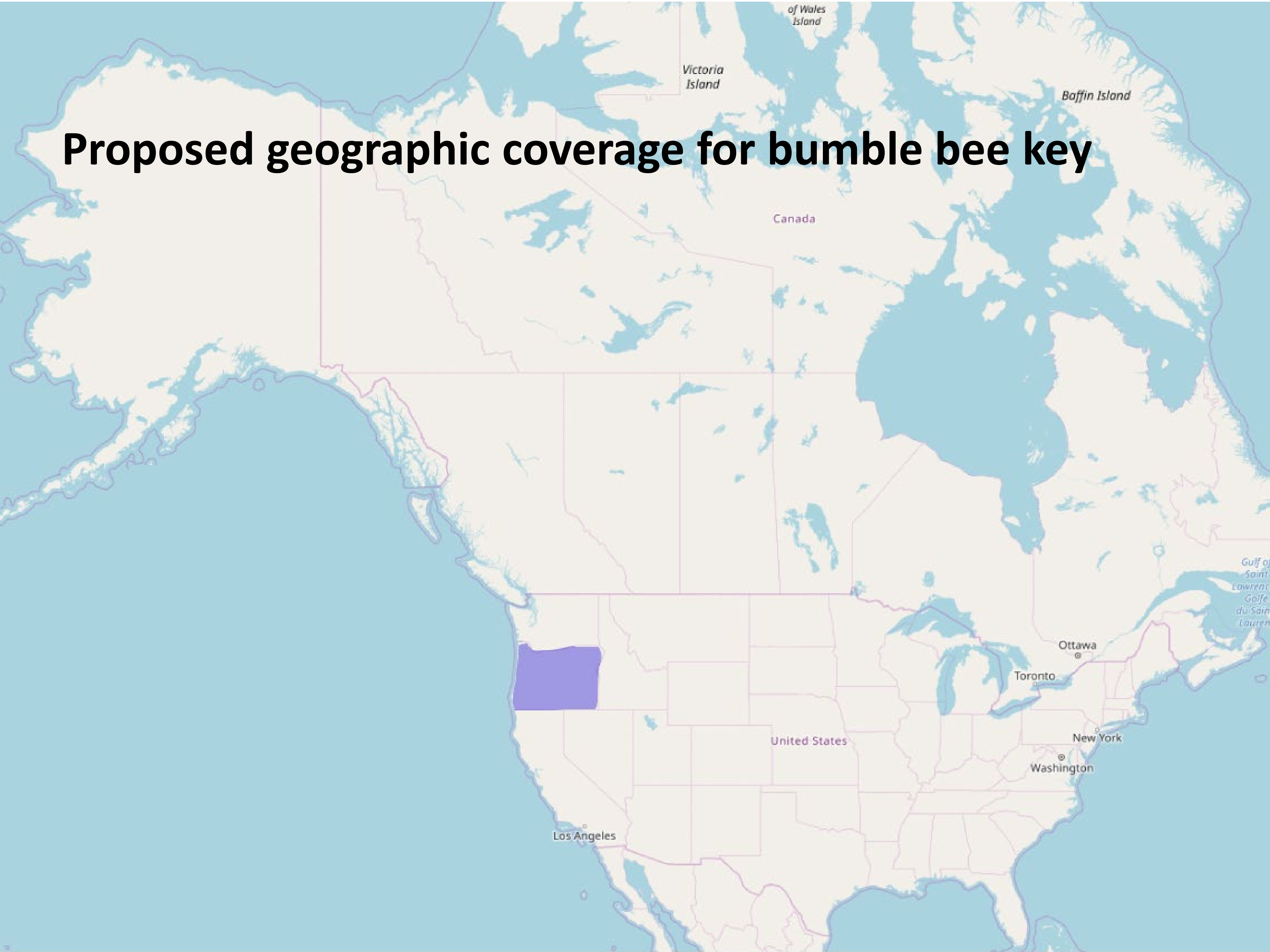
Bumble bee key encompasses 28 species and will leverage 473 existing ID templates from Paul Williams (NHM, London, UK)

Black-tailed Bumble Bee
(Bombus melanopygus)

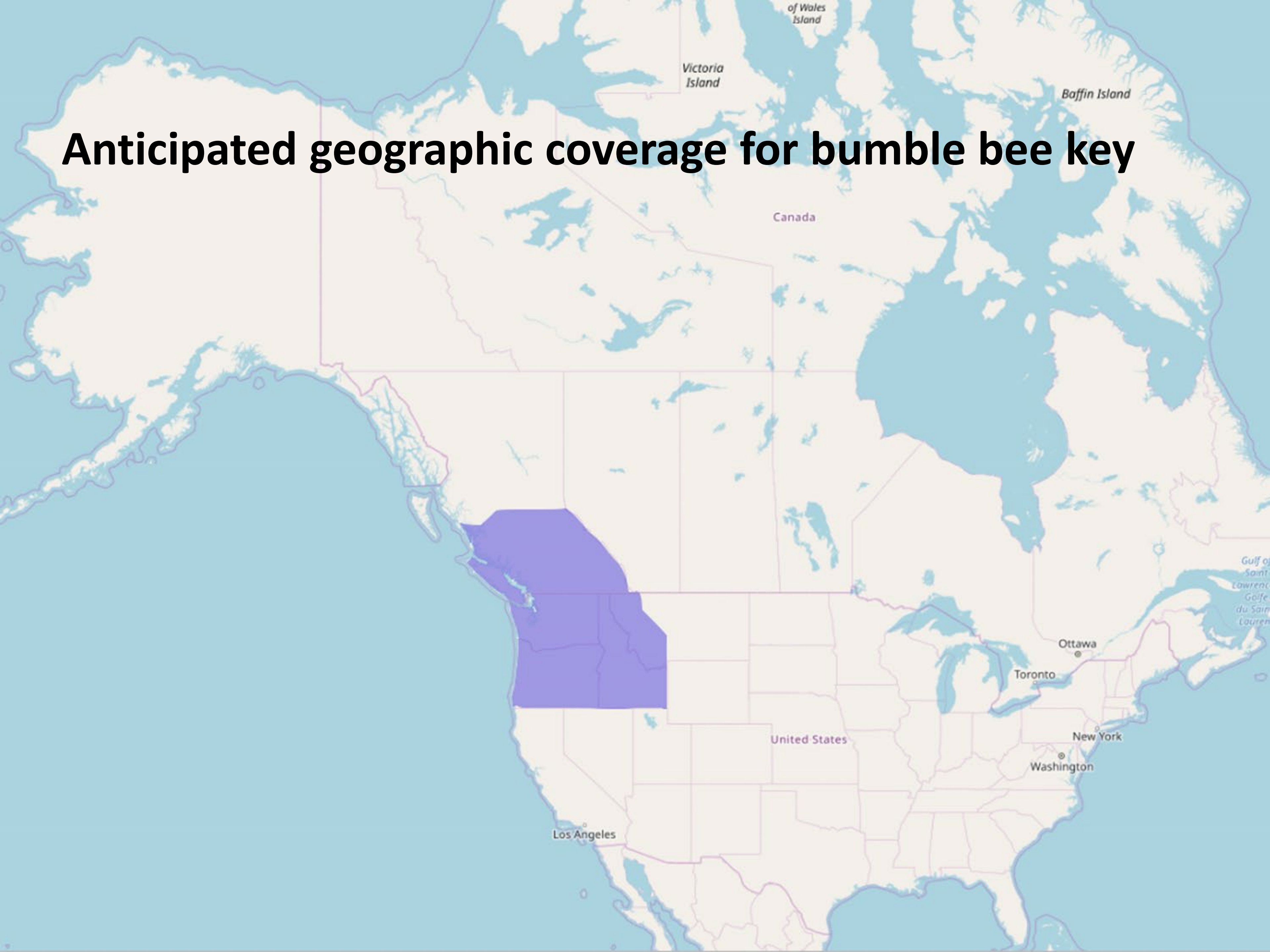


Images courtesy of ODA and Paul Williams

Proposed geographic coverage for bumble bee key



Anticipated geographic coverage for bumble bee key



Modified from Williams et al 2014

Key to Female Bombus species of the PNW

1a Hindleg tibia with a pollen basket (corbicula), the outer surface flat without long hair in the center as well as short anterior and posterior fringes; S6 without lateral keels -> **2** (Pollen collecting species)

1b Hindleg tibia without a pollen basket, the outer surface convex with dense long hair in the center as well as short anterior and posterior fringes; S6 with lateral keels -> **26** (Cuckoo Bumble bee)

2a (1a) Midleg basitarsus distal posterior corner rounded -> **3** (Pyro; S.Str.; Cullu; Alpino)

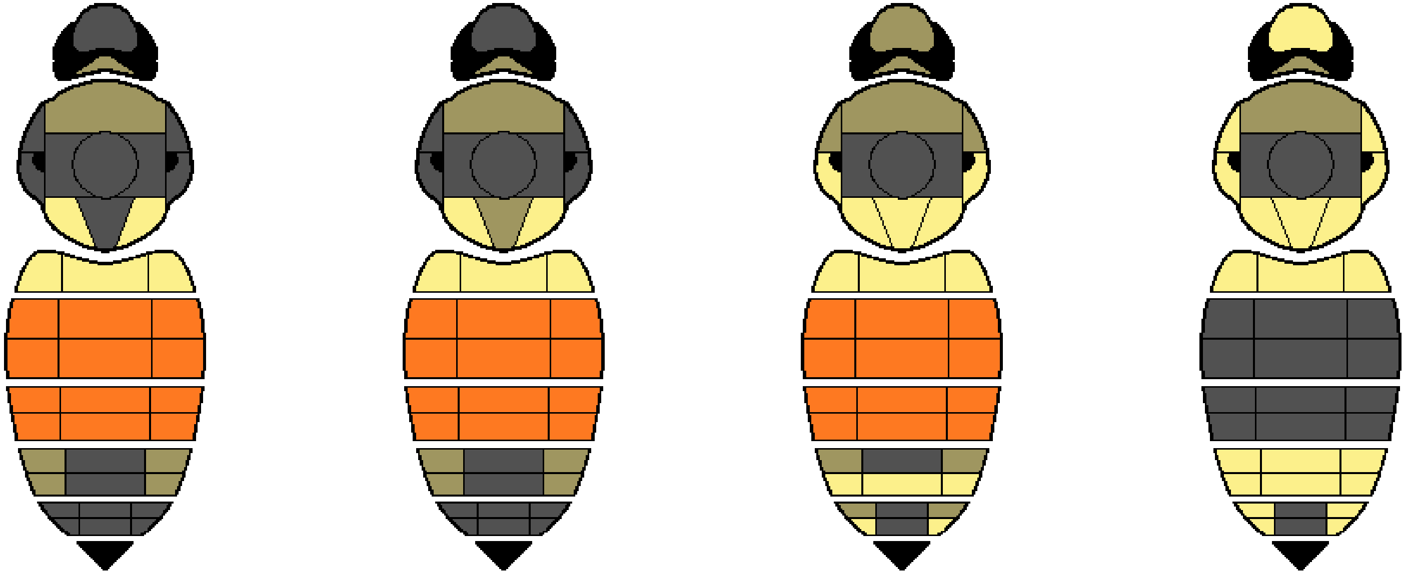
2b Midleg basitarsus distal posterior corner with a sharp spine -> **24** (Bombias; Thoraco; Subterr)

3a (2a) Cheek about as long as broad, or longer than broad, the lateral ocellus always small and its center located posterior to the narrowest line between the eyes -> **4** (Pyro; Alpino)

3b Cheek shorter than broad, the lateral ocellus small *and* its center located posterior to the narrowest line between the eyes, *or if* the cheek is nearly equal in length and breadth *then* the lateral ocellus is large, *and* its center located on the narrowest line between the eyes -> **19** (S.Str.; Cullu)

4a (3a) Cheek approximately square or just longer than broad, mandible with a very shallow notch anterior to the tooth at the posterior distal corner, the depth of the notch less than a third of its width and often scarcely perceptible, inner eye margin opposite the lateral ocellus with a band of large pits or punctures, the punctures spaced by more than their own widths, and the areas between the large punctures flat and shining with very few or no small punctures so that the band appears sparse and

- 27 Couplets
- Differentiates 28 *Bombus* species



Modified from Williams et al 2014

Key to Male Bombus species of the PNW

1a Eye similar size and shape of female eye -> **3**

1b Eye enlarged and bulbous -> **2**

2a (1b) Eyes weakly convergent dorsally; penis valve head dorsoventrally flattened, curved in toward the body midline and sickle-shaped -> **22 (*Cullumanobombus*)**

2b Eyes strongly convergent dorsally, penis valve head laterally flattened, straight and about 5x as long as broad -> ***Bombus nevadensis***

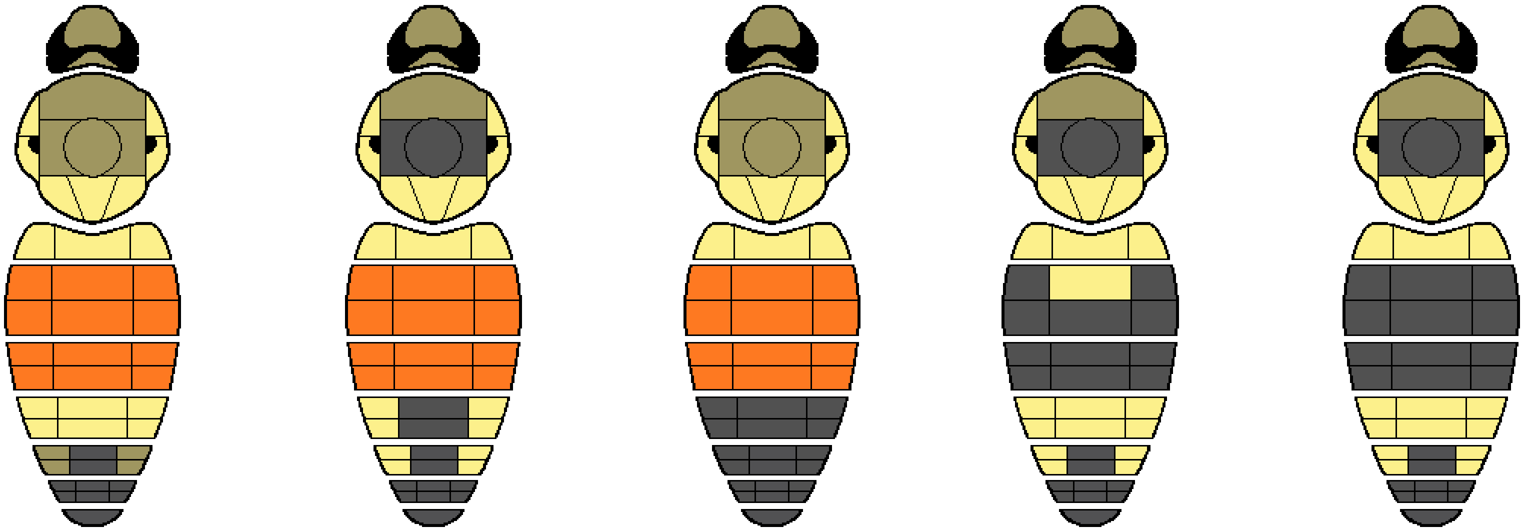
3a (1a) Antenna short, antennal flagellum less than 2.5x the length of the scape; penis valve head greatly broadened dorsoventrally, flared outward and forming a broad funnel shape -> **21 (*Bombus*)**

3b Antenna long or very long, antennal flagellum more than 2.5x the length of the scape; penis valve head either straight, or outcurved from the body midline, or incurved toward the body midline as a sickle shape, or as a short, broad, deep spoon shape -> **4**

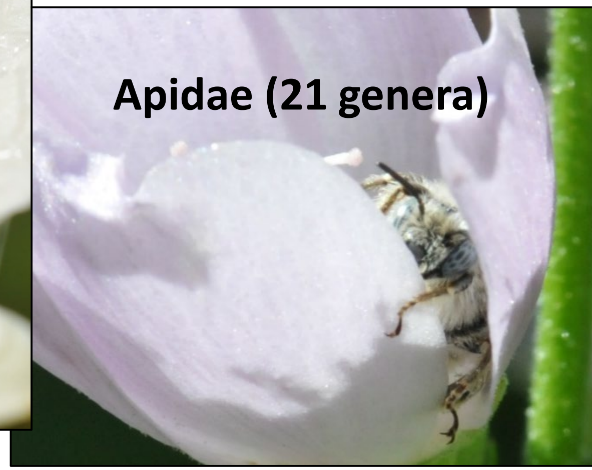
4a (3b) Volsella often yellow without distal hooks on the inner edge, gonostylus inner process with many long-branched hairs -> **24 (*Psithyrus*)**

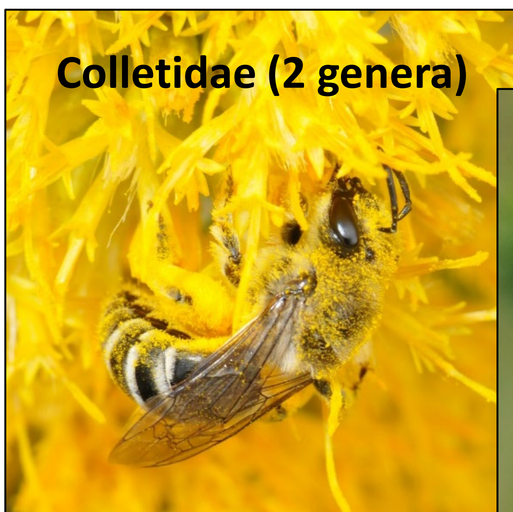
4b Volsella medium to dark brown, with at least one short distal hook on the inner edge, gonostylus inner process without long branched hairs -> **5**

- 25 Couplets
- Differentiates 27 *Bombus* species

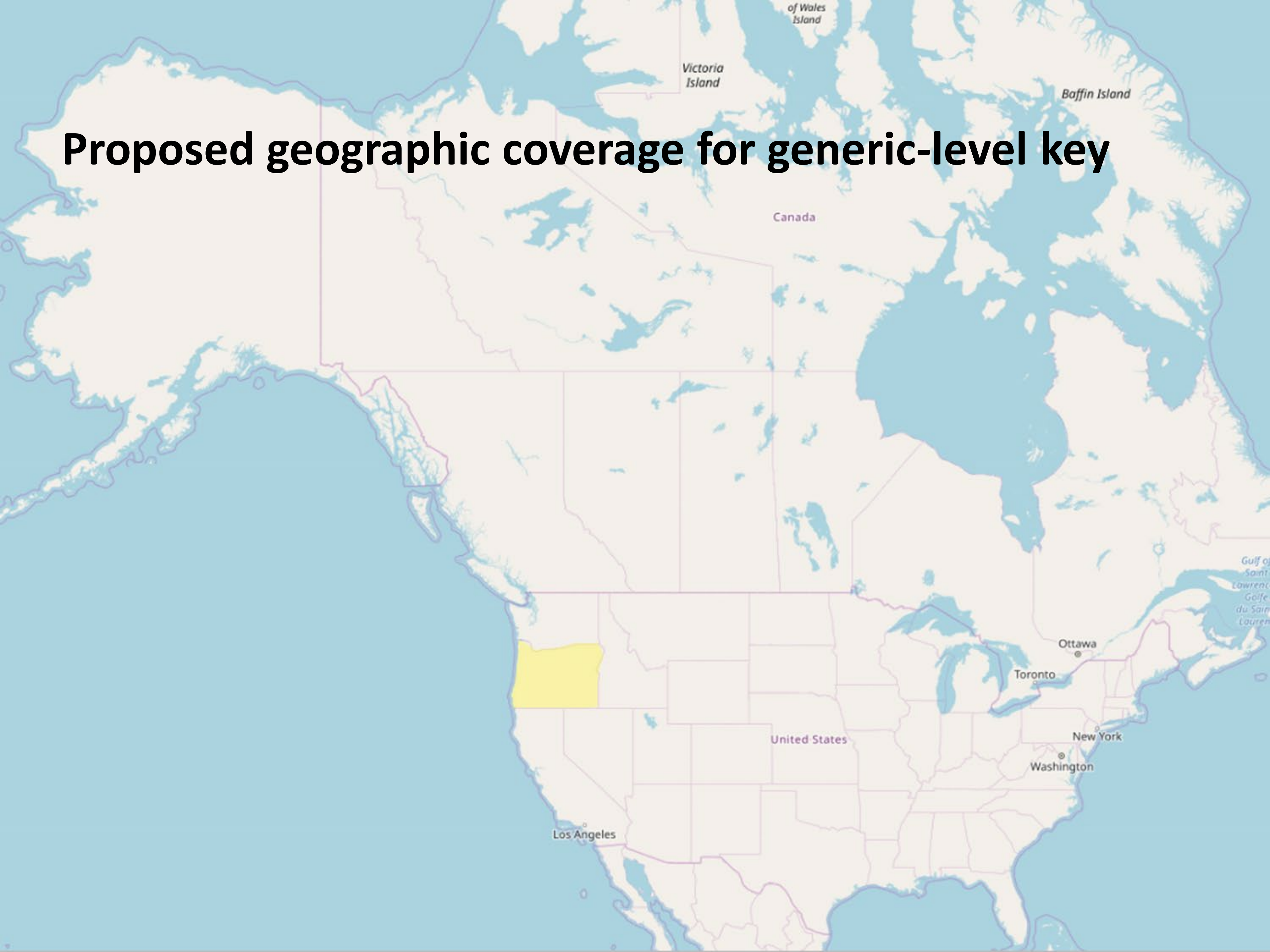


Generic-level bee key encompasses 55 genera in 6 families

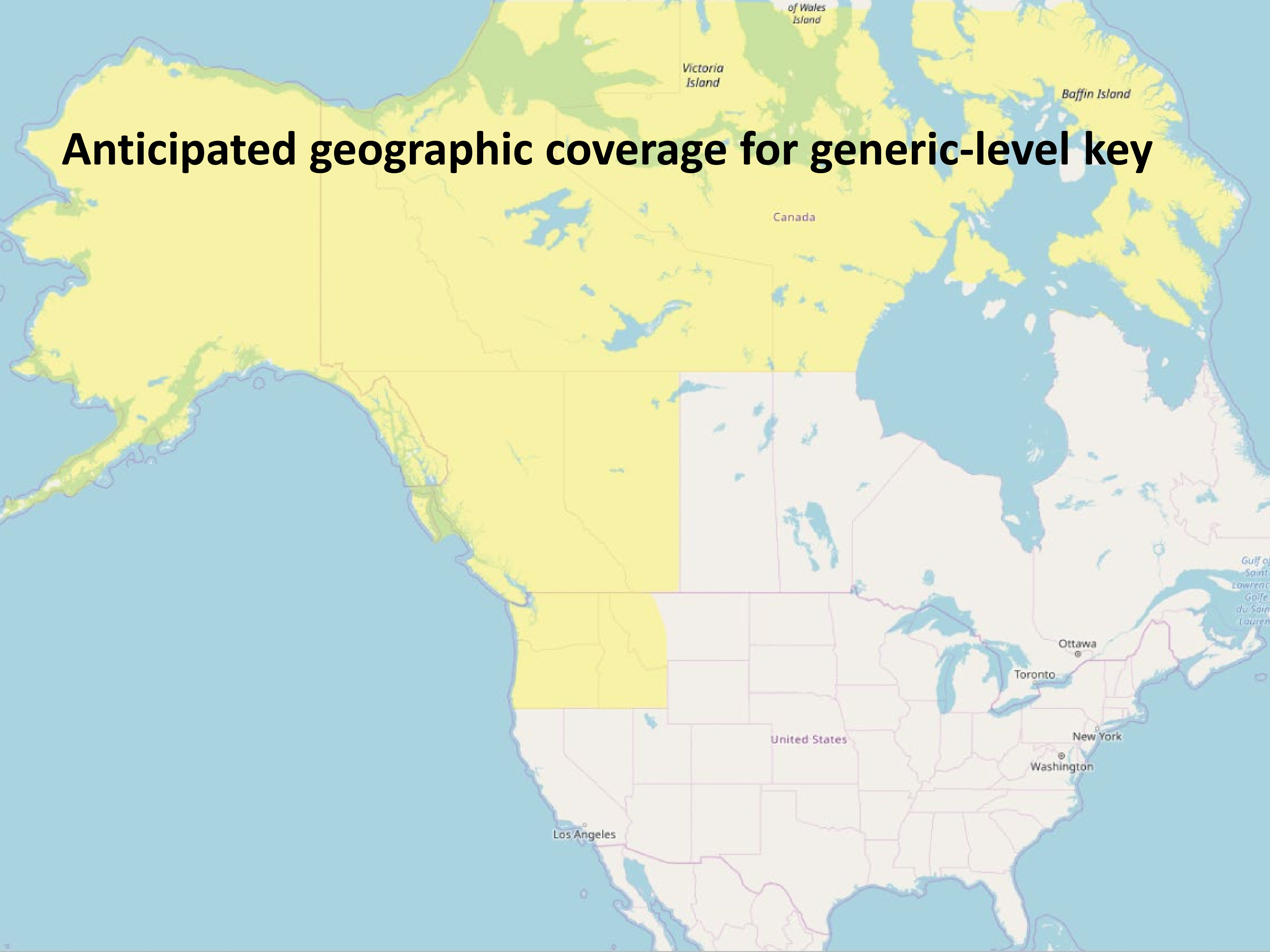




Proposed geographic coverage for generic-level key



Anticipated geographic coverage for generic-level key



Modified from MMD

Key to the bee genera of the PNW

1a With three submarginal cells -> **2**

1b With two submarginal cells; rarely only one -> **40**

2a (1a) Hind tibial spurs absent -> ***Apis mellifera***

2b Hind tibial spurs present -> **3**

3a (2b) Jugal lobe of hind wing absent -> ***Bombus***

3b Jugal lobe of hind wing present -> **4**

4a (3b) Posterior portion of second recurrent vein distinctly arcuate distad -> ***Colletes***

4b Posterior portion of second recurrent vein not arcuate distad -> **5**

5a (4b) Marginal cell pointed, apex on costal margin of wing or, if bent away from margin or truncated, apex less than about three vein widths from costal margin; stigma usually large, usually broader and much longer than prestigma, margin within marginal cell usually convex -> **6**

5b Marginal cell with apex rounded, truncate, or, if pointed, apex bent well away from costal margin, so that it is three or more vein widths from costal margin; stigma commonly small, rarely broader than prestigma, usually little if any longer than prestigma, margin within marginal cell usually straight or concave -> **19**

6a (5a) Jugal lobe of hind wing very small, less than one-third as long as vannal lobe measured from the

- 76 Couplets
- Differentiates 55 genera

Where we are headed:

- 3rd round of drafts, complete by Dec. 15, 2021
- Prepping bee specimens for imaging, first round, complete by Nov. 19, 2021
- Delivering bee specimens to ODA, first round, by December 1, 2021

Many thanks…

Funding and in-kind support:

Oregon Department of Agriculture, Oregon State Arthropod Collection, Oregon Bee Project, Oregon Forest Resources Institute, OSU Extension

Logistical support:

J. Dunlap, J. Labonte, C. Marshall, A. Melathopoulos

Images courtesy of ODA

Black-backed Woodpecker vital rates in unburned and burned forest within a fire-prone landscape

Jim Rivers
OSU College of Forestry
Jake Verschuyl
NCASI

Woodpeckers are ecosystem engineers that enhance biodiversity and promote healthy forests

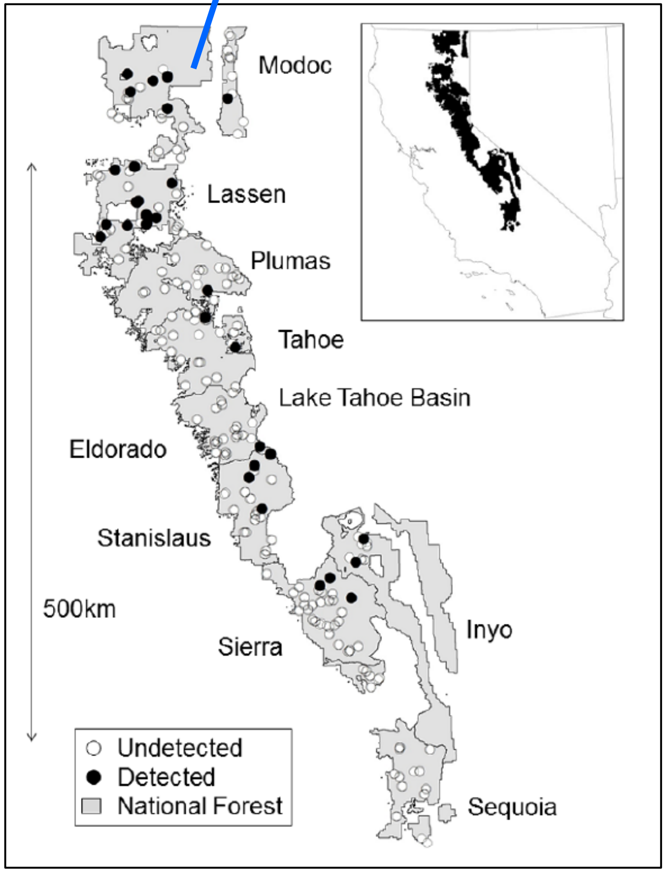
Sap wells are used by >40 species for food

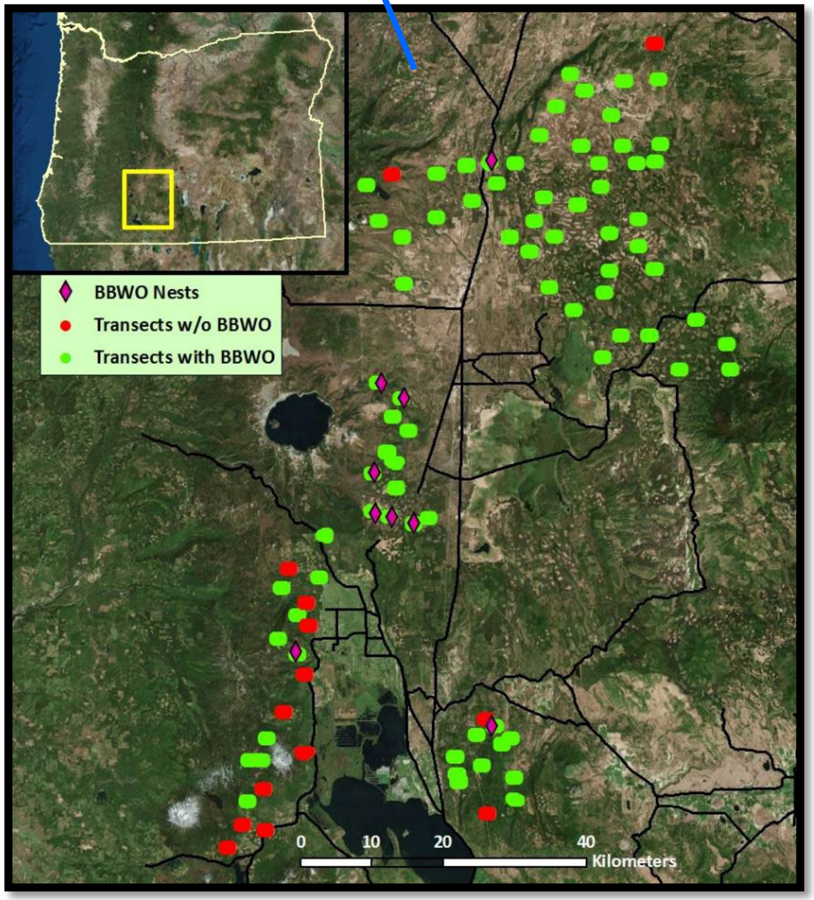
Nest cavities are used by >65 vertebrates in PNW

Black-backed Woodpeckers in OR/CA occupy green forests

Fogg et al. 2014: 21% occupancy in green forest in the Sierra Nevada

Verschuyl et al. 2021: 87% occupancy in green forest within Fremont-Winema NF





Our study focuses on quantifying key vital rates in green and burned forest

Objective #1. Quantify nest survival in green vs. burned forest

- *Nest survival ↑ in burned forest*

Objective #2. Evaluate juvenile survival in green vs. burned forests

- *Juvenile survival ↑ in burned forest*


Fremont-Winema NF


North Pelican Fire (2017)


CH2
2018/06/14 14:08:32
2018/06/11 15:00:58
2018/06/23 09:47:47

Apparent nest survival was relatively high in both green and burned conifer forests

Photos courtesy of Doug Backlund

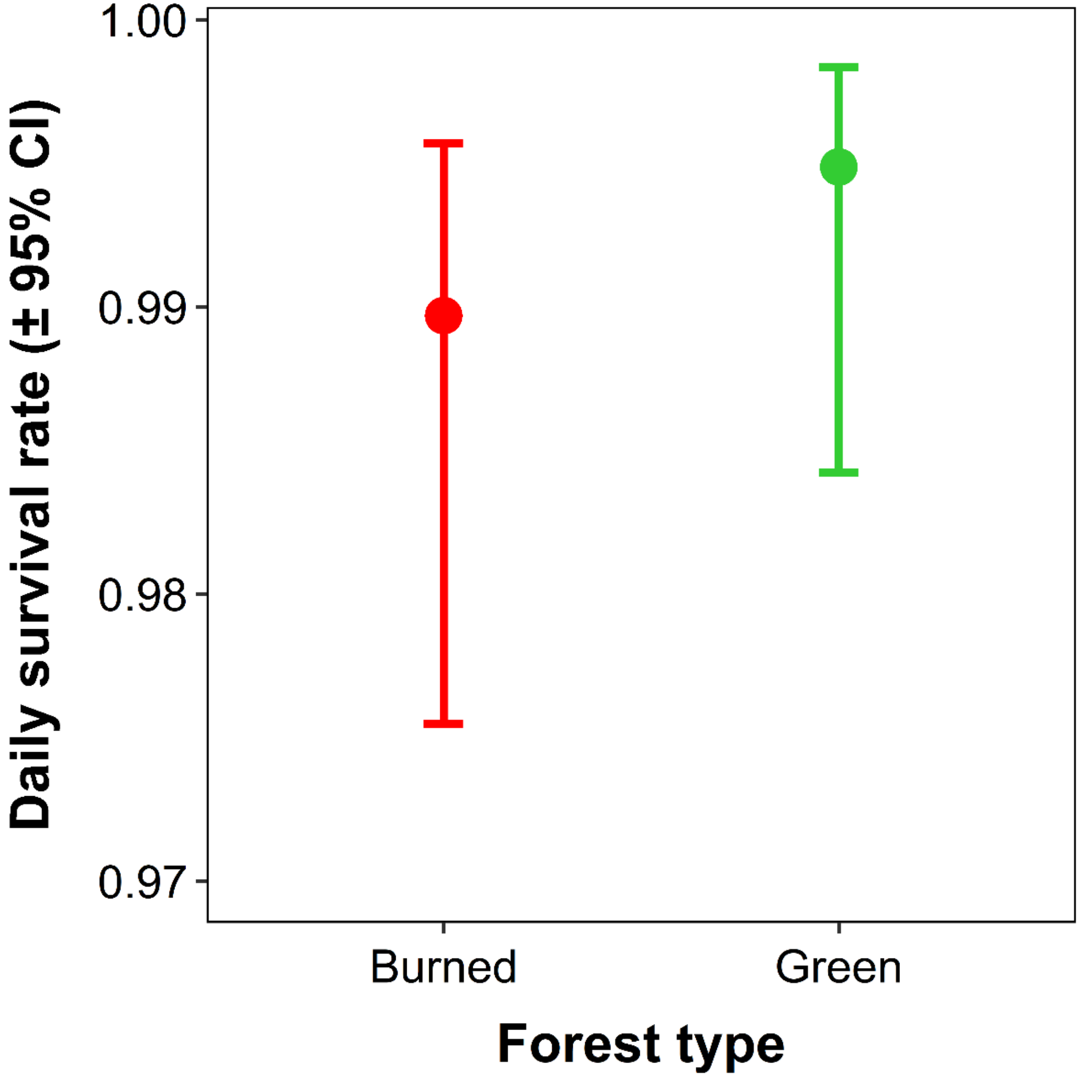
n=94 active BBWO nests located

green forest: 80.5% of n=36 nests successful

burned forest: 83.9% of n=56 nests successful

n=86 nests of 7 other woodpecker species

Nest daily survival rates were similar between green and burned forests in 2018-2019



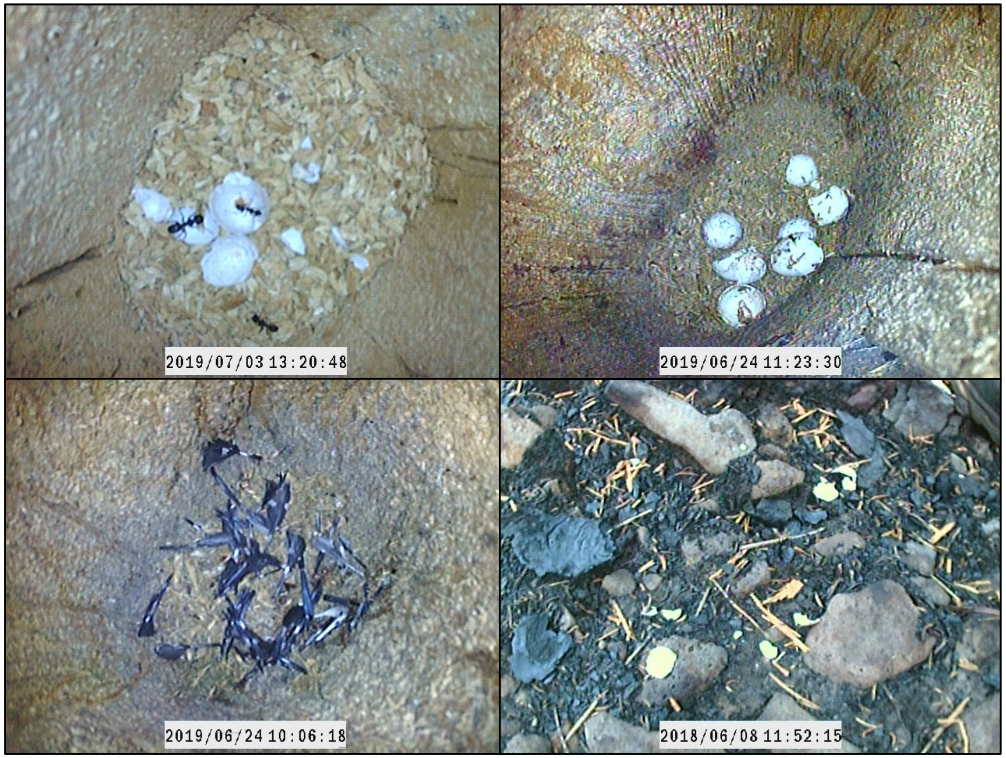
Overall survival (DSR^{40})

green forest: 81.4%

burned forest: 66.1%

Package 'RMark'

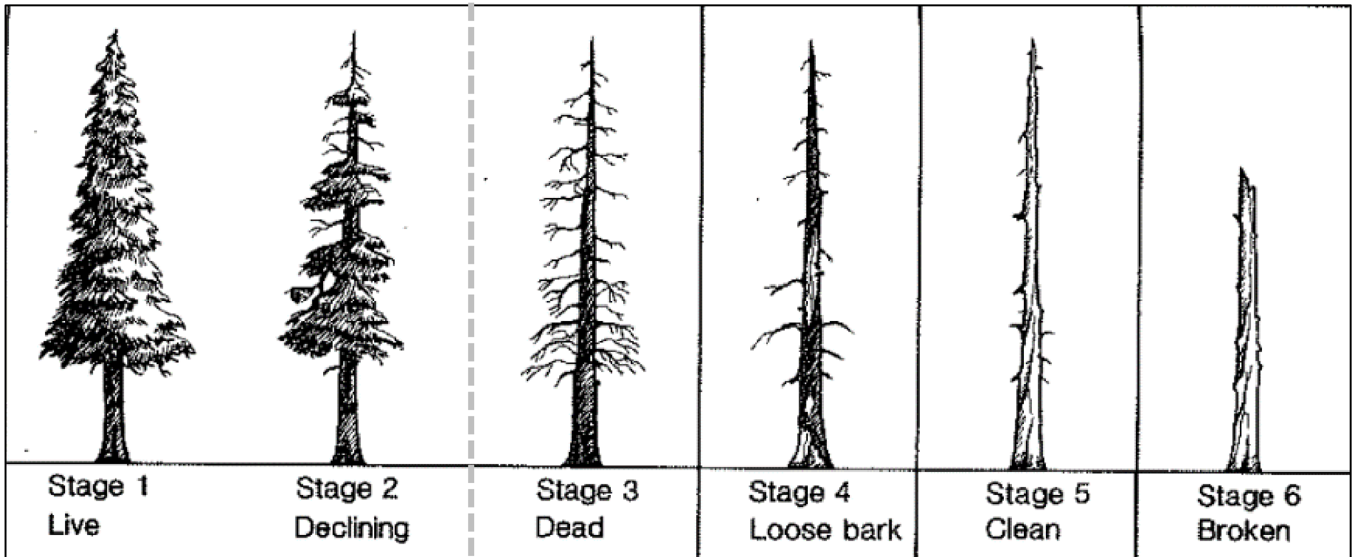
Nests failed due to predation and apparent competition



More than half of nests were placed in lodgepole pine in 2018-2019

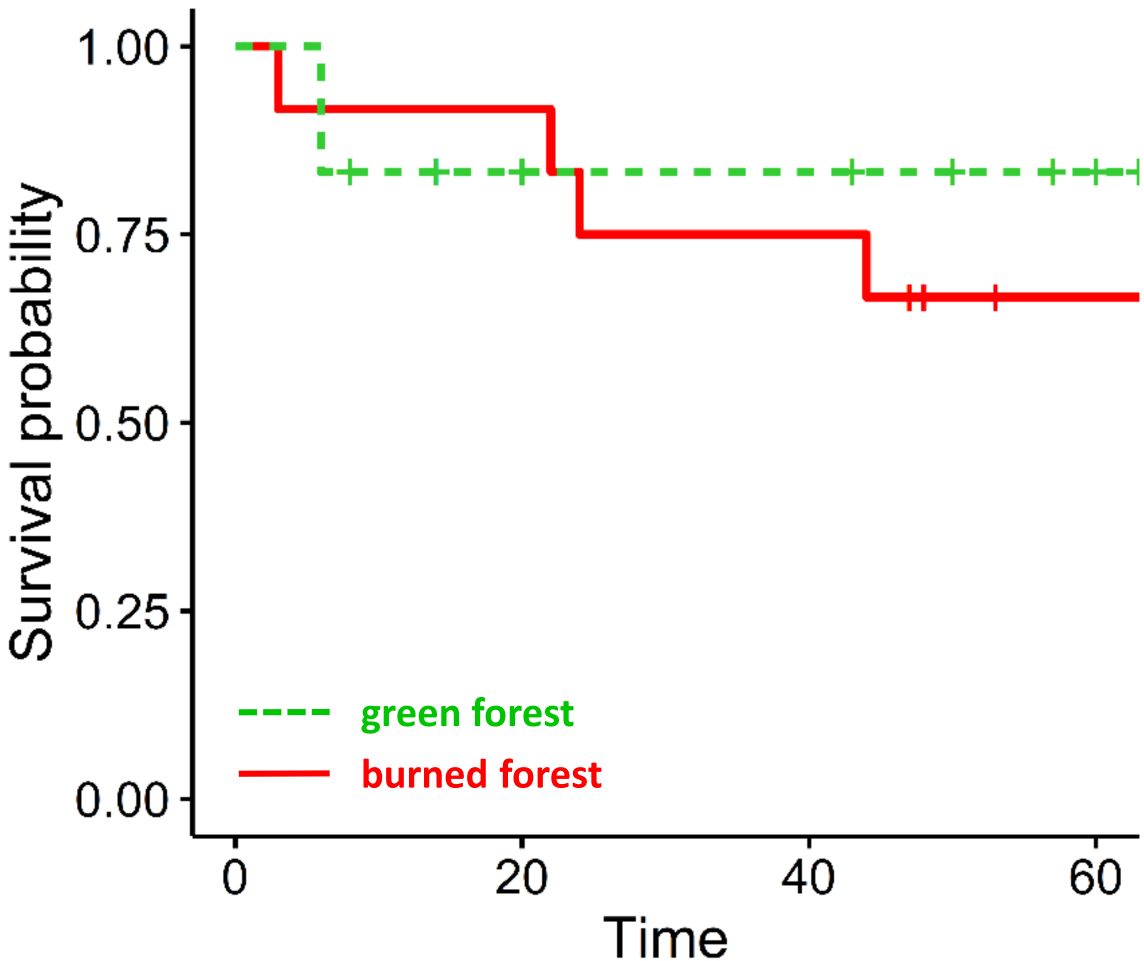
Live trees | **Dead trees**

Thomas 1979



Lodgepole Pine	7	8	3	6	0	2
Abies spp.	0	0	6	5	0	0
Unidentified snag	---	---	3	6	0	0
Ponderosa Pine	1	0	0	2	0	0

Juveniles in green forest tended to have a lower risk of mortality in 2018-2019



<u>Cox PH model</u>

Hazard ratio = 0.60
(95% CI: 0.11, 3.30)

Forest type: *P* = 0.555

Package 'survminer'

Significant expansion beyond original project objectives

Mark Kerstens

Chick provisioning behavior → 155 hours of video in n=58 nests

2^{nd} order habitat selection → n=240 random plots

BBWOs tagged with CTx tags to assess natal dispersal in 2022 → n=36 birds

Many thanks…

Funding and in-kind support:

National Council for Air and Stream Improvement; Oregon Department of Forestry; Fish and Wildlife Habitat in Managed Forests Program, College of Forestry, Oregon State University; Chemult Ranger Station, Fremont-Winema National Forest; LightHawk Conservation Flying

Logistical support:

A. Holland, C. Brock, M. Kuzel, B. Howland, C. Ross, V. Hawk, L. Bee, N. Quatier, J. Ford, T. Lorenz, A. Stillman, N. Palazzotto, C. Weekly, J. Pellissier, M. Gostin, A. Markus, D. Antle, J. Easter, L. Rux, J. Swingle, D. Mainwaring, C. Steele, D. Riffle, M. Johnson, J. Welch, J. Dachenhaus, E. Woodis

Erin Eve

Biodiversity in natural and managed early seral forests of southern Oregon

Progress Report: Fall 2021

MEG KRAWCHUK (OSU, PI)

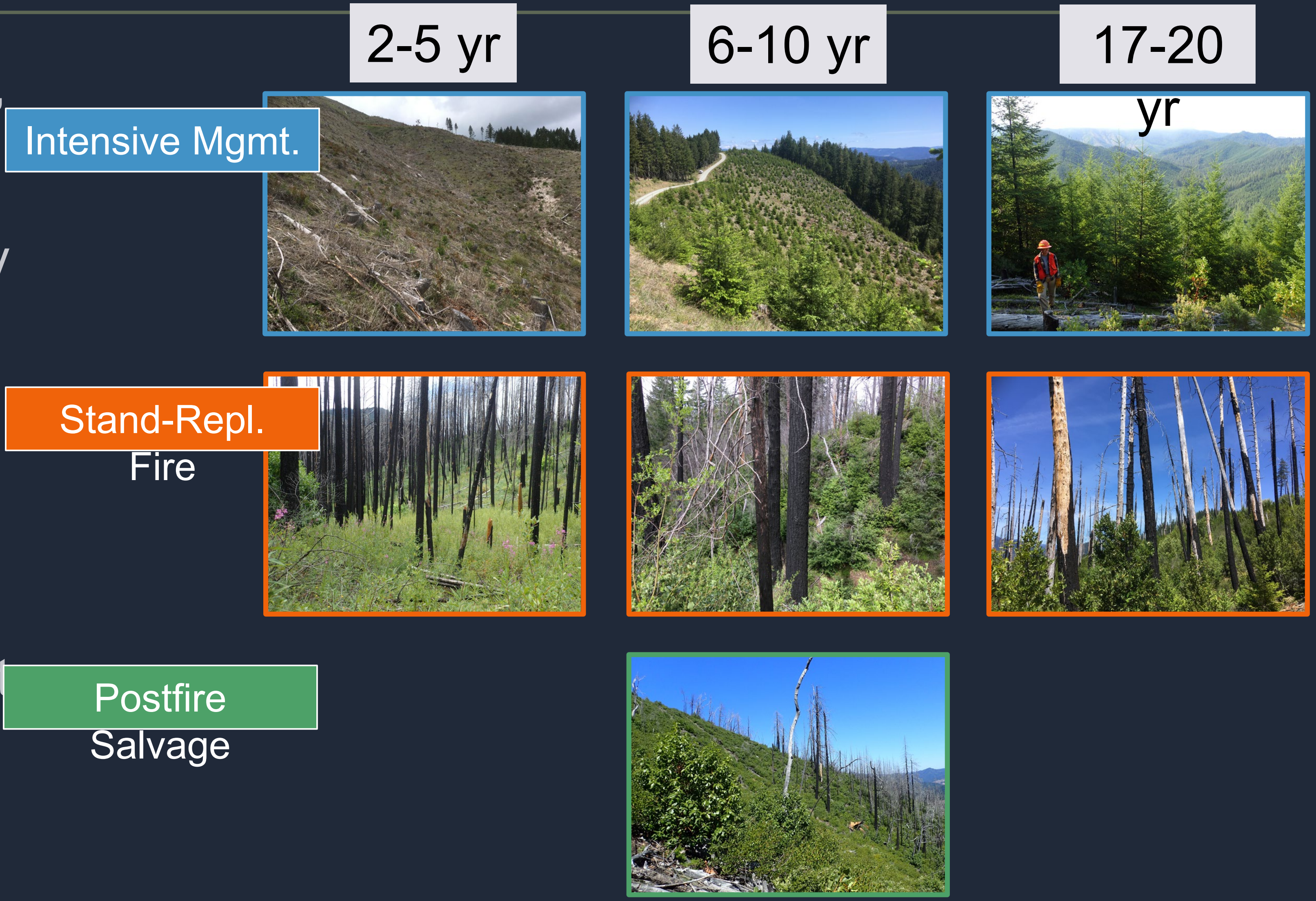
MATT BETTS (OSU), **MARK SWANSON** (WSU), **JIM RIVERS** (OSU),

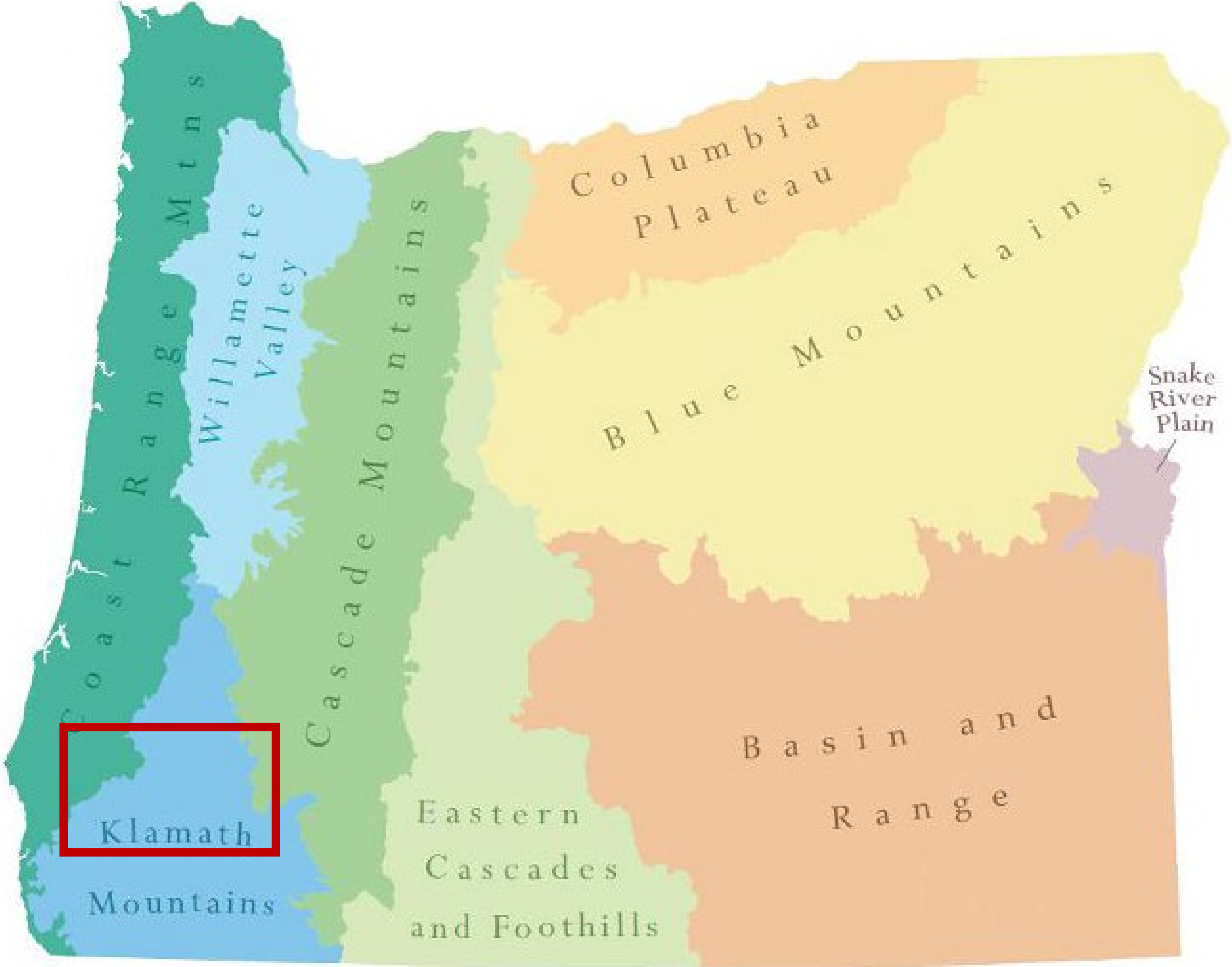
JAKE VERSCHUYL (NCASI), **AJ KROLL** (WEYERHAEUSER)

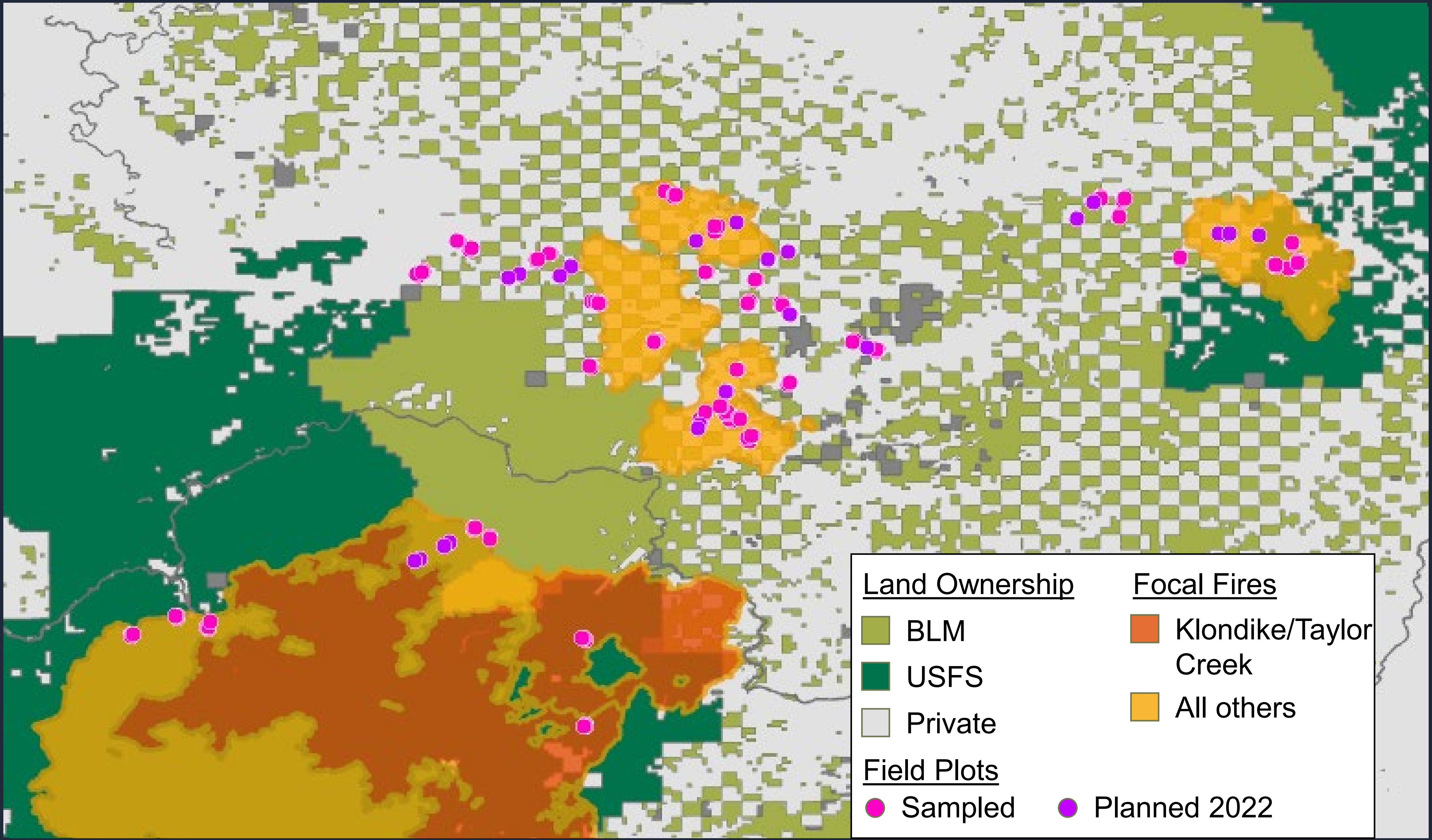
GRAHAM FRANK (OSU, PHD STUDENT)

Young tree plantations aren't parking lots… but how do they compare to their closest natural counterpart?

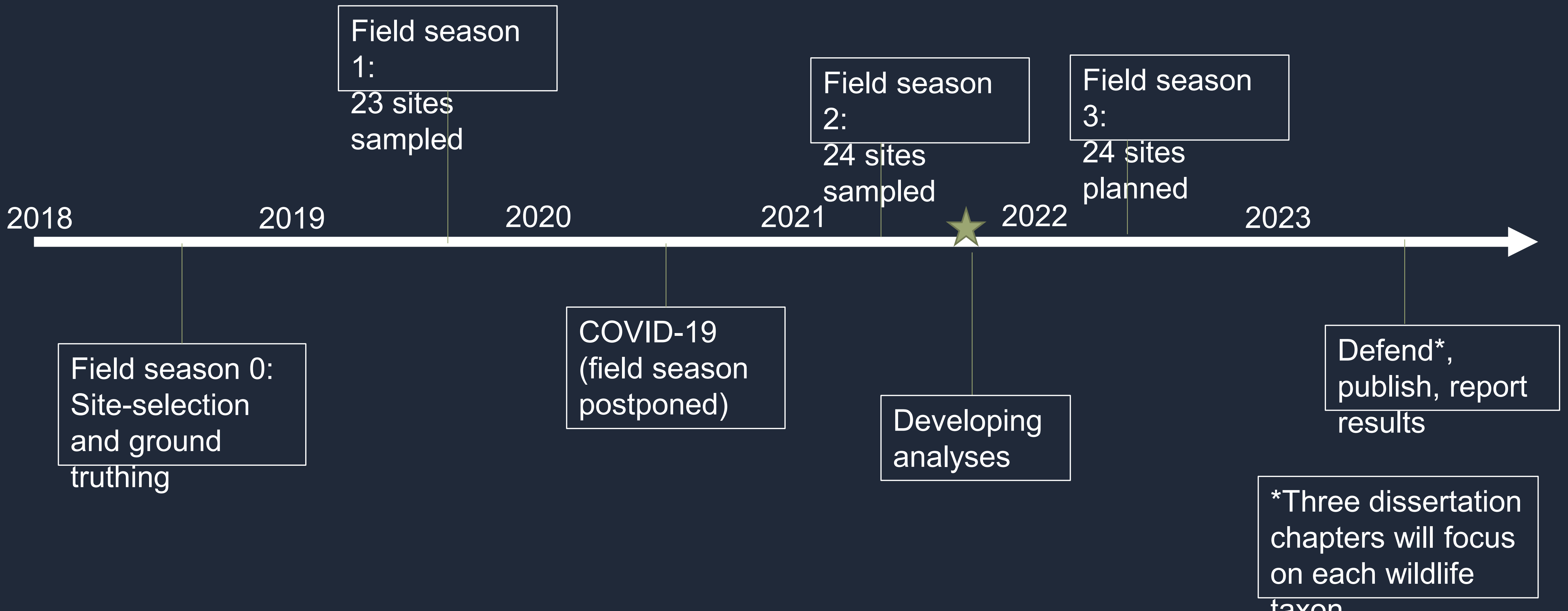
- Four taxa: Birds, bees, ground beetles, plants
- Biodiversity = Diversity and composition
- Comparison among sampling strata
- Associations with environmental gradient




Coast Range Mtns
Willamette Valley
Cascade Mountains
Columbia Plateau
Blue Mountains
Snake River Plain
Klamath Mountains
Eastern Cascades and Foothills
Basin and Range


Land Ownership
BLM
USFS
Private
Focal Fires
Klondike/Taylor Creek
All others
Field Plots
Sampled
Planned 2022

Timeline

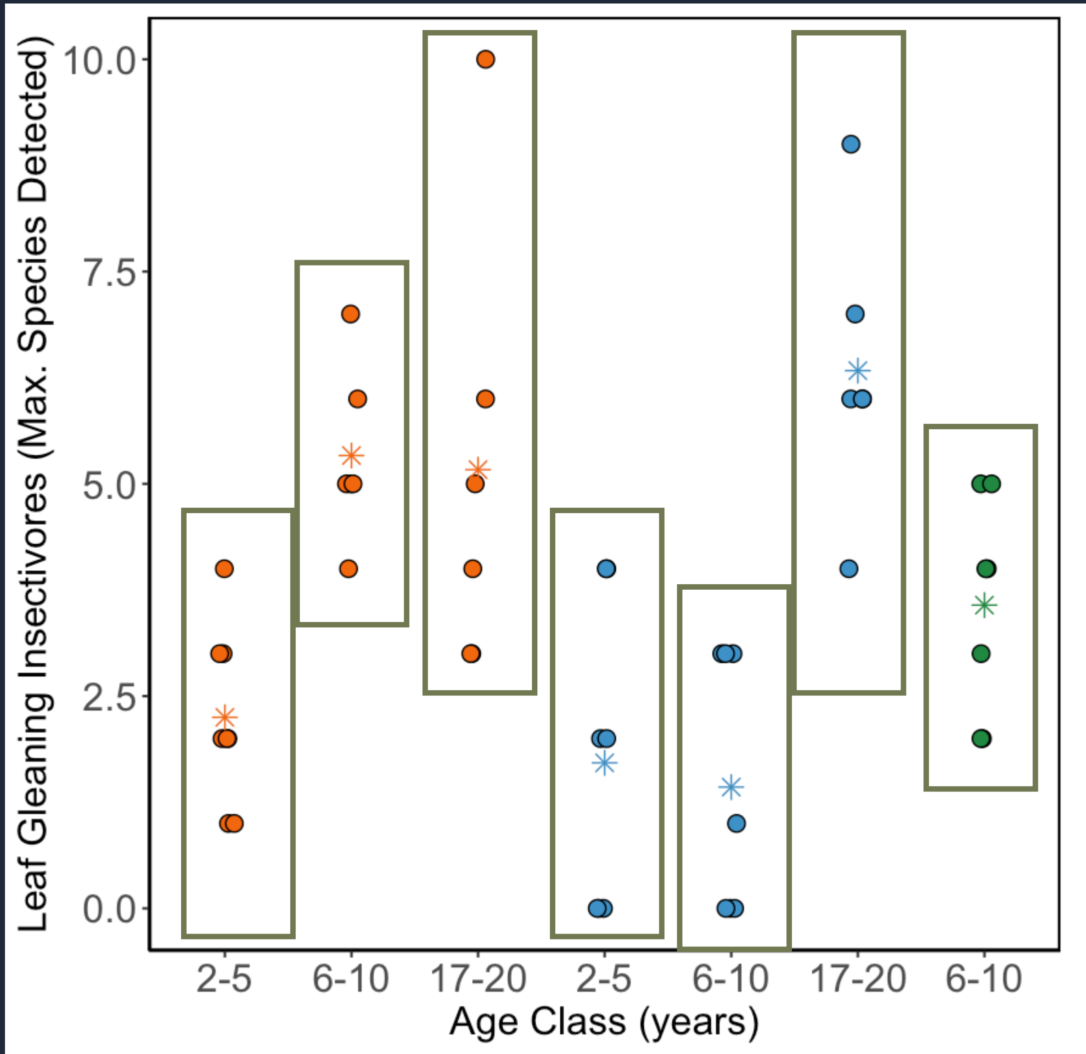


Field season 1:
23 sites sampled
Field season 2:
24 sites sampled
Field season 3:
24 sites planned
2018
2019
2020
2021
2022
2023
Field season 0:
Site-selection and ground truthing
COVID-19 (field season postponed)
Developing analyses
Defend*, publish, report results
*Three dissertation chapters will focus on each wildlife

Raw data suggest front-end truncation for leaf-gleaning birds

- Youngest and oldest stands show ~similar trends for LGI richness

- Differences in intermediate age classes (delayed development of woody vegetation in managed stands)



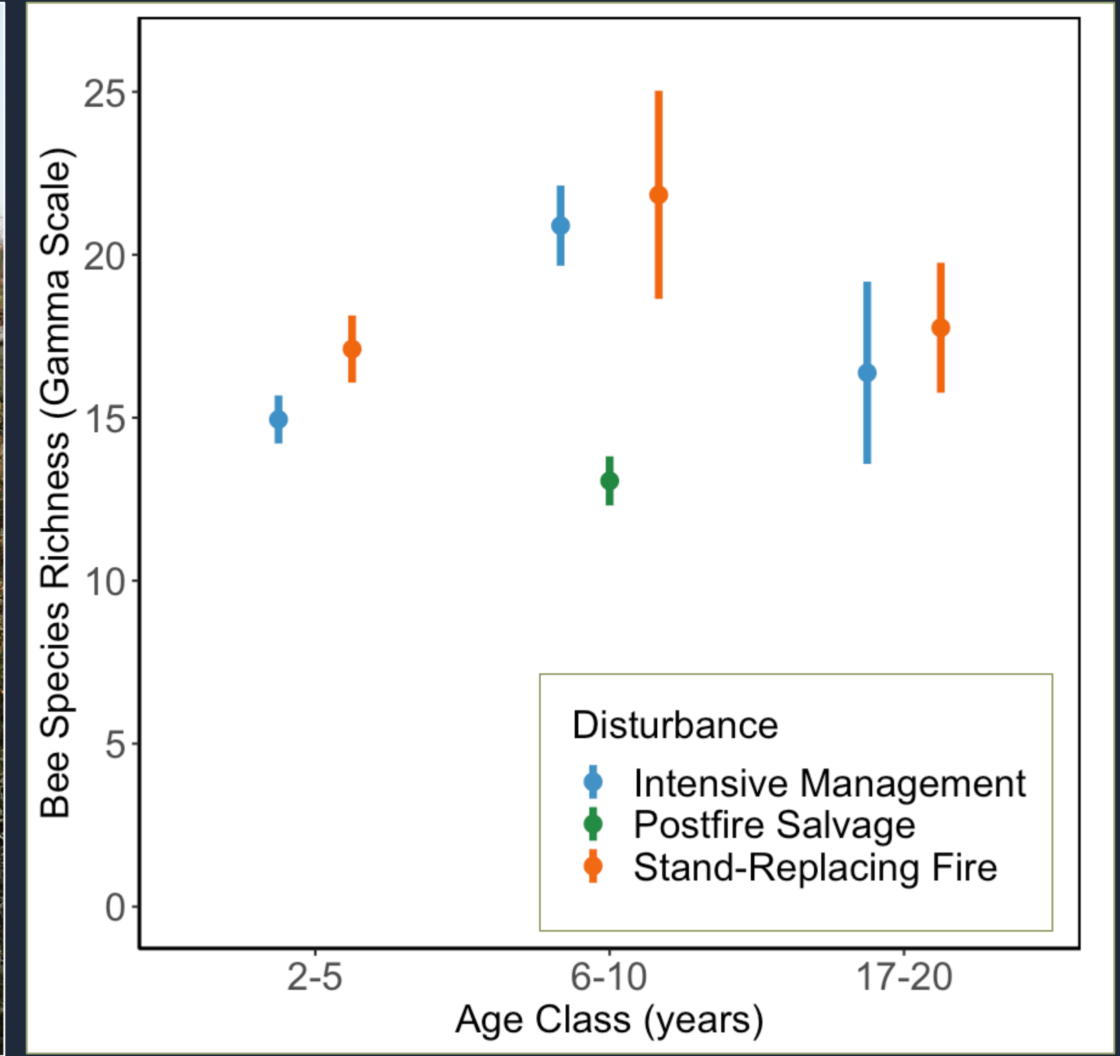
Photos: Joshua Little, Macaulay Library ML331773831; Kristen Cart, Macaulay Library ML382040981

Initial data on bee species gamma-diversity suggests negative effects of salvage logging

- Only first year of bee samples identified so far

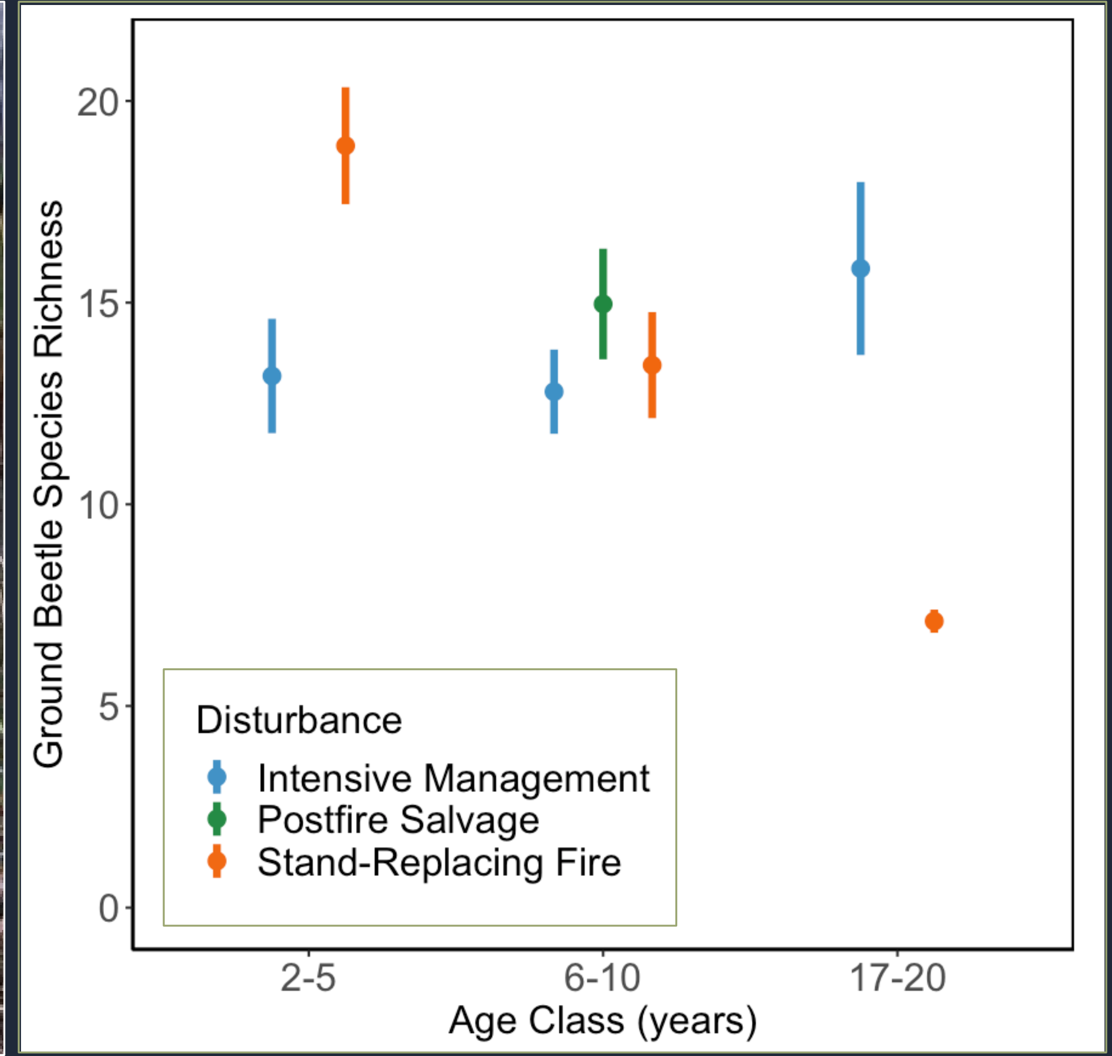
  Fall 2022 -- 2021/22 samples to L. Best

- Consistent with Galbraith et al. 2019 findings

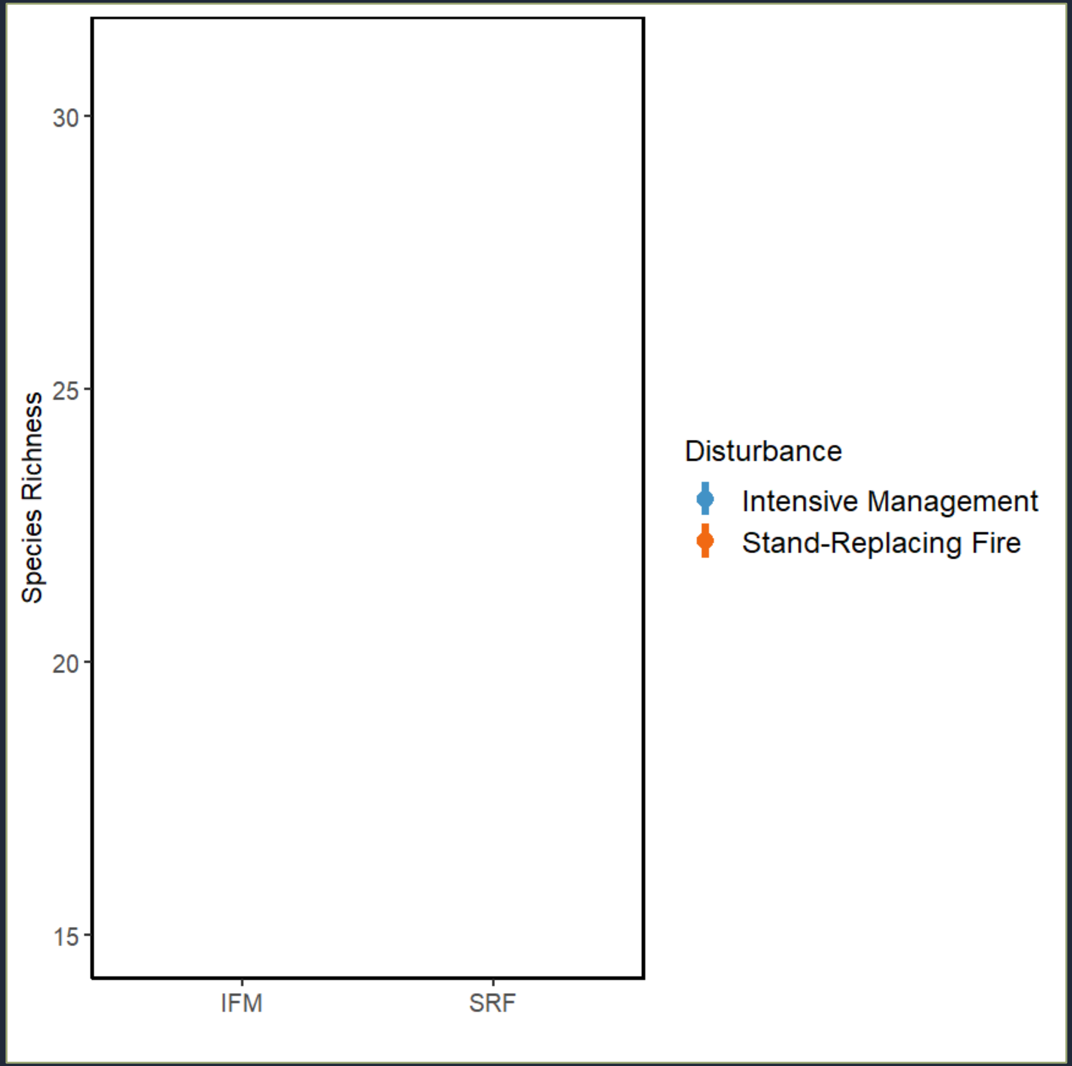


Biodiversity comparisons vary among taxa

- Landscape-scale ground beetle richness declines through time after fire
- Stable through time in managed plantations
- How much do communities change through time?



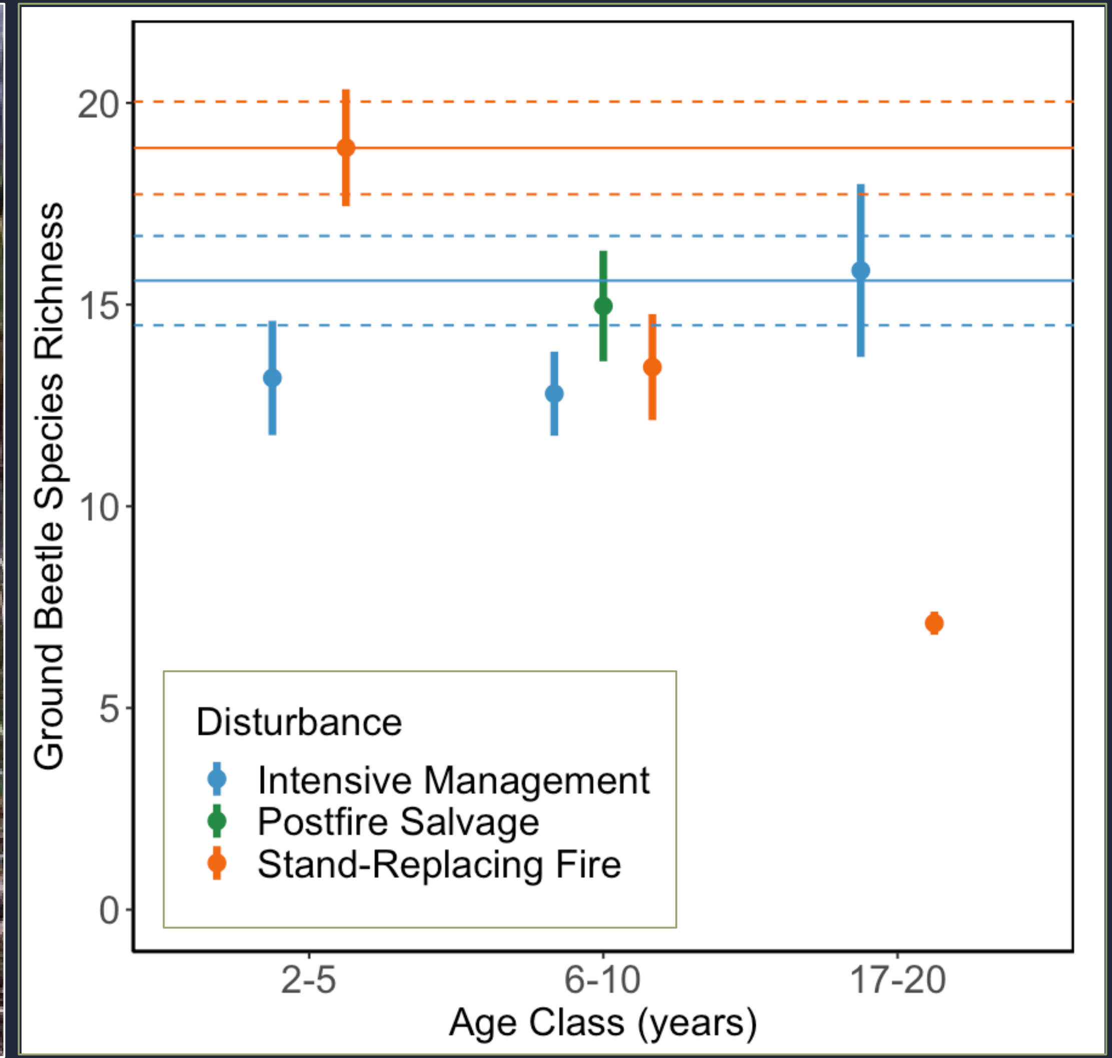
Fire-generated early seral may support more ground beetle species at landscape scale



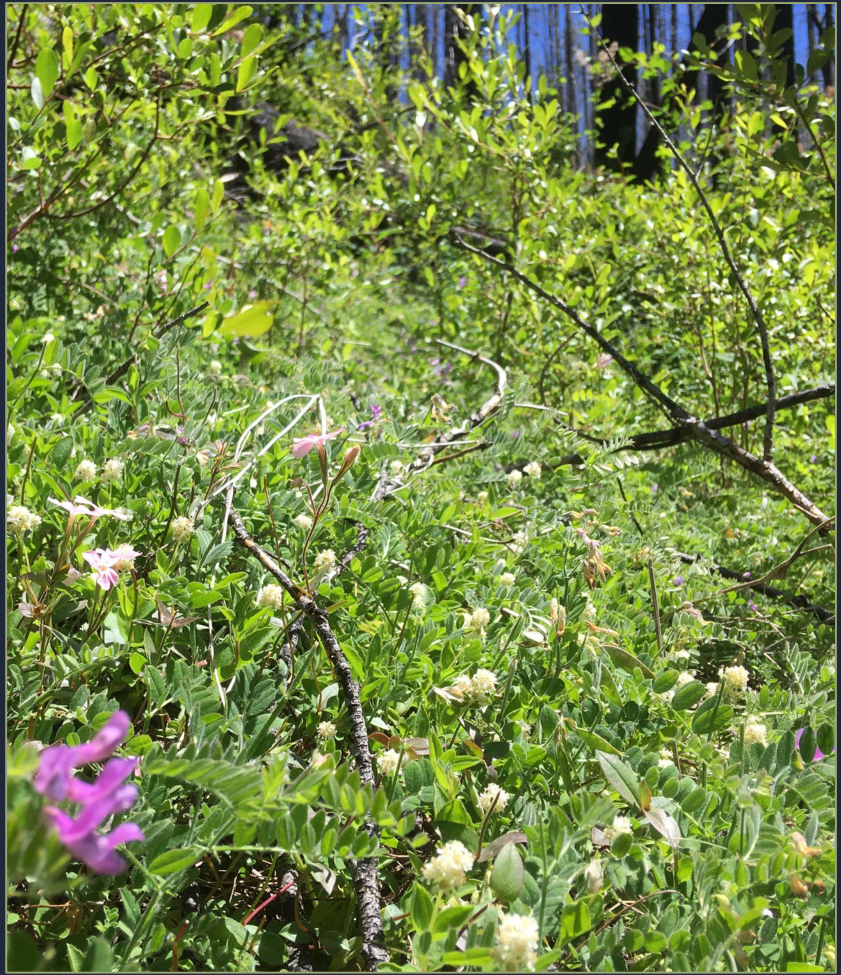
Biodiversity comparisons vary among taxa

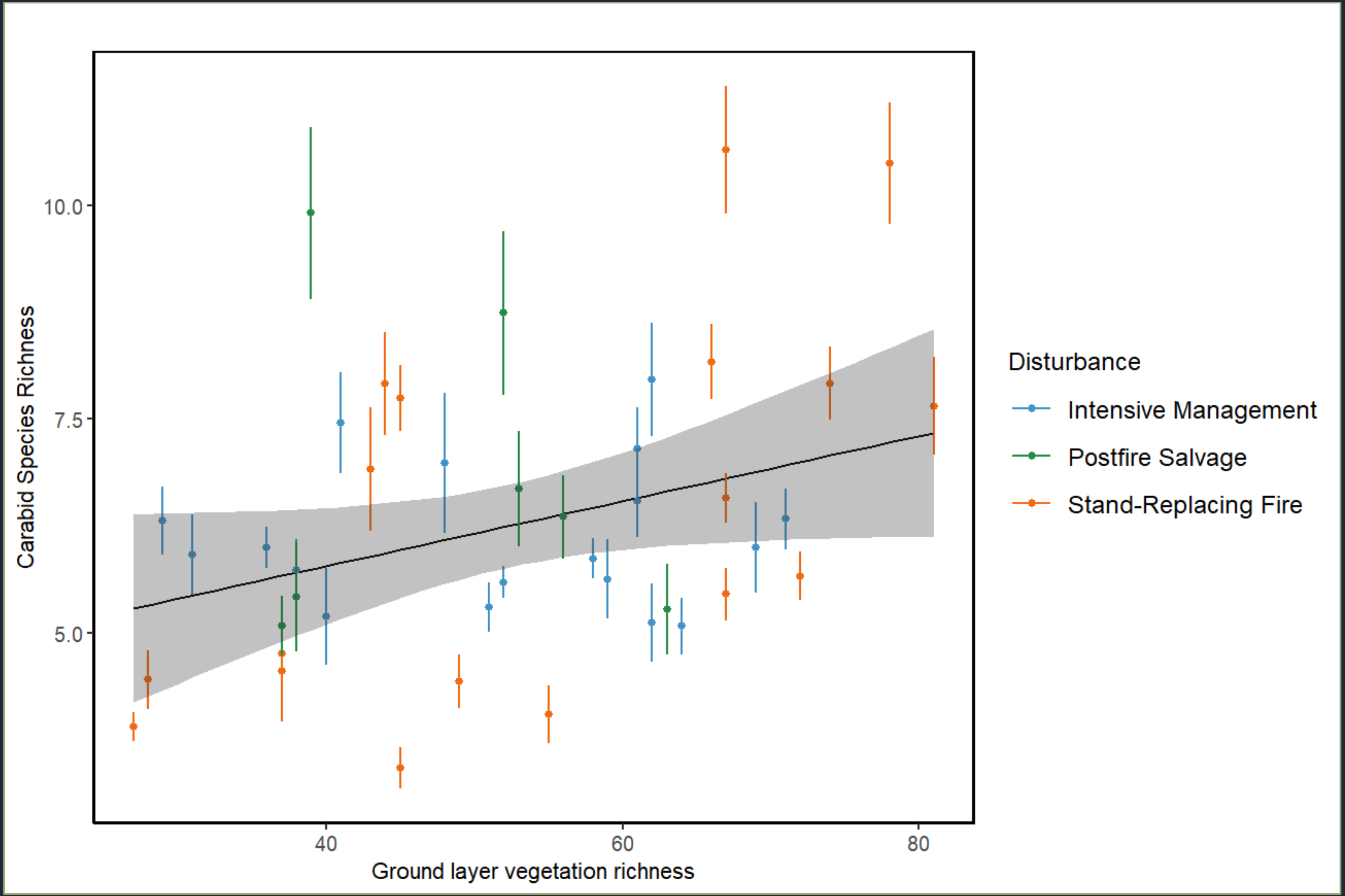
Recent burns contribute disproportionately to diversity supported by SRF at landscape scale

Turnover in species composition through time may be limited



What environmental gradients are associated with ground beetle richness?







Next steps for ground beetles

- Analyses of community composition and traits (Hmsc)
- Morphological traits (CoF Mentored Employment Program)
  - **Mandible ratio**
  - **Locomotion**
  - **Robustness**
  - **Flight ability**

Next Steps

- Finalize modeling approaches – develop code
- PhD candidacy exams – February 2022
- Final field season Spring/Summer 2022
- Undergraduate thesis projects

Exotic plant prevalence – Sarabeth Pearce-Smith (Spring 2022)

Plant species co-occurrence – Lucinda Boyle (Spring 2023)


Questions?

Red tree voles in working forests

Jason Piasecki[1,2], John Bailey PhD[2], Katie Moriarty PhD[1,2]

[1] National Council for Air and Stream Improvement (NCASI)
[2] Oregon State University, College of Forestry

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Oregon State University
College of Forestry

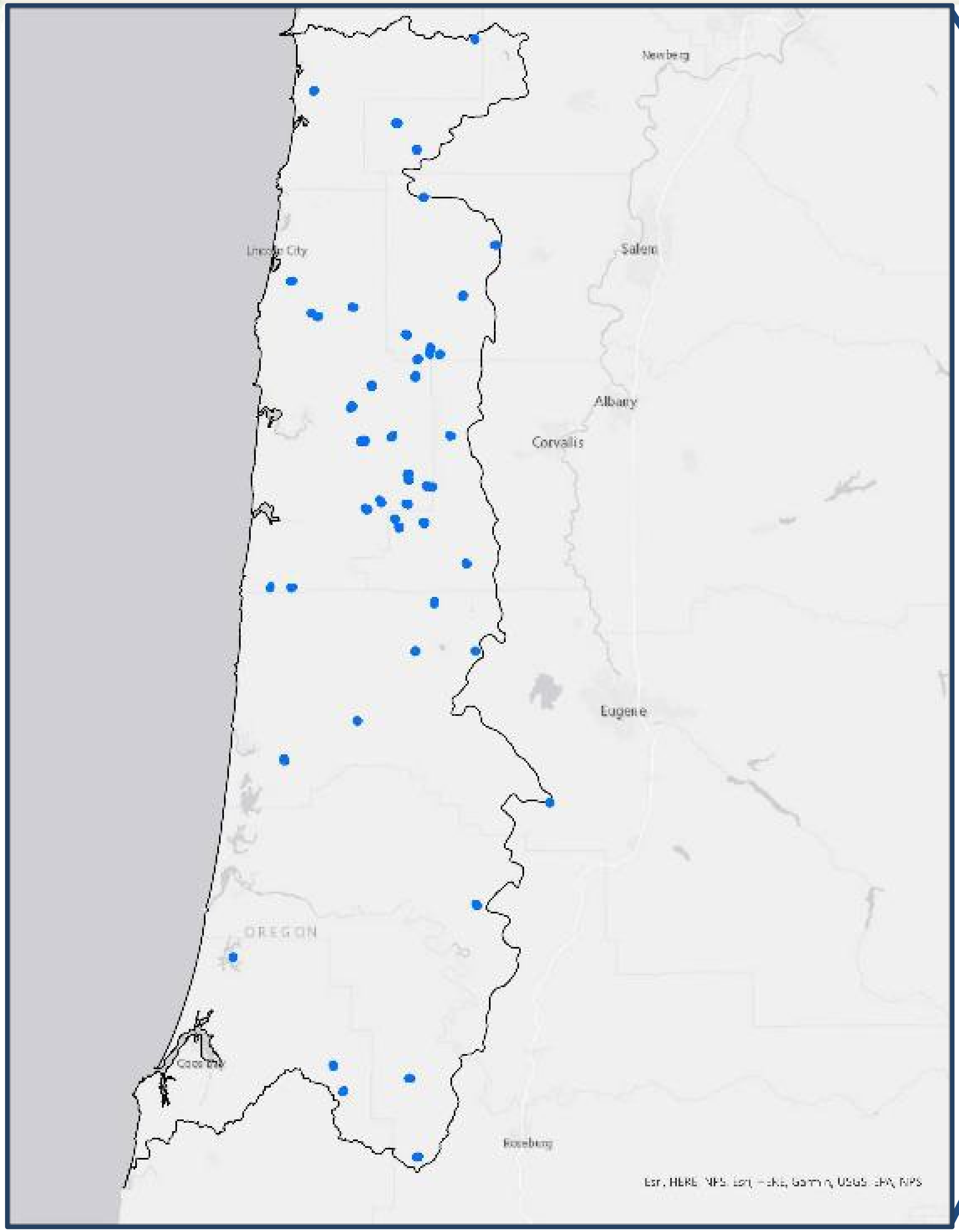
8 November 2021
FWHMF Progress Update

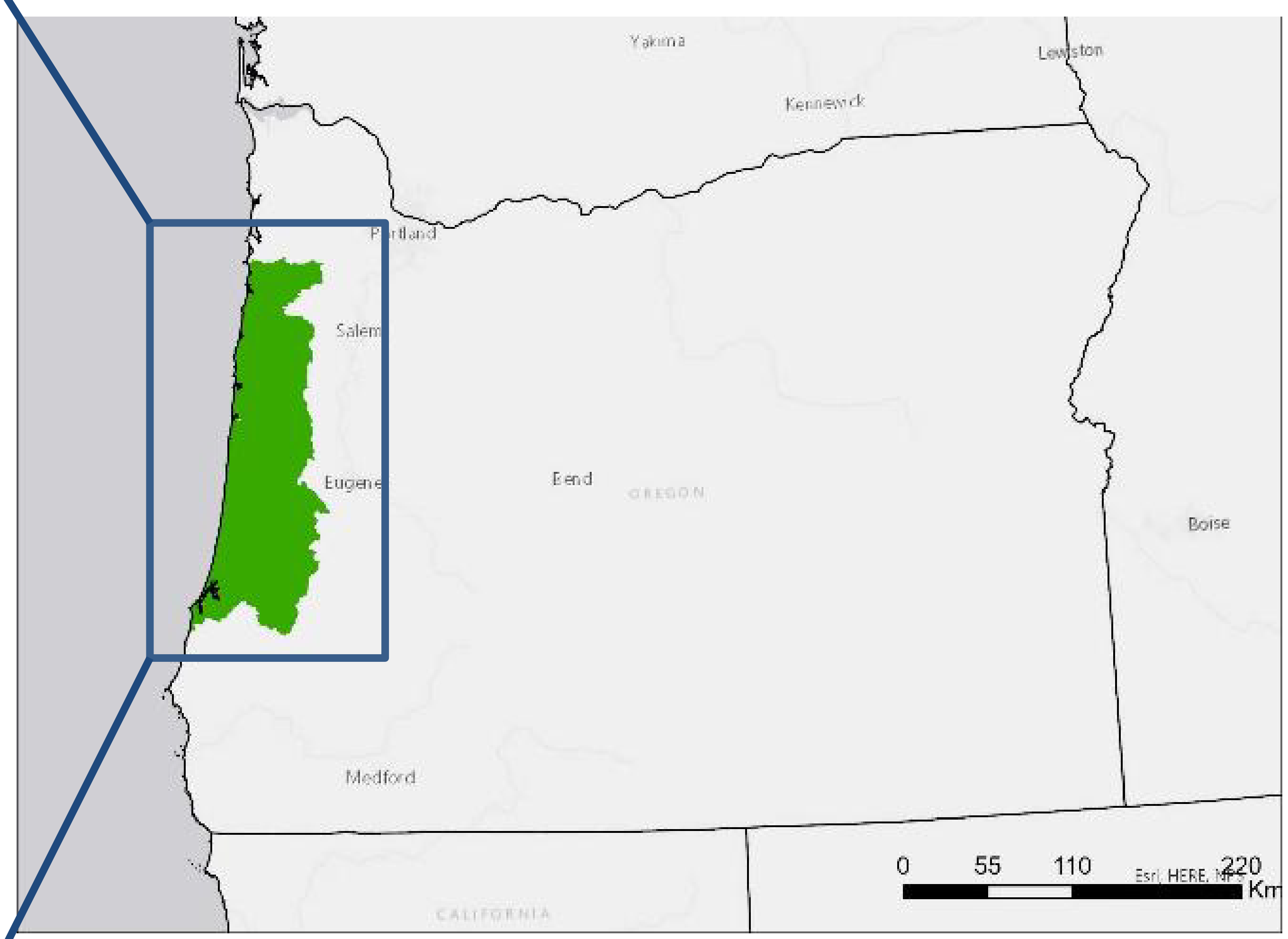
Red tree vole (*Arborimus longicaudus*)

Study Goals

1. Quantify relative abundance of red tree vole nests
2. Estimate nest density
3. Quantify detection rates of red tree vole nests
4. Estimate nest status (e.g., occupied, recently occupied, old) and use by other arboreal mammals
5. Quantify red tree vole colonization and extirpation rates at the nest level
6. Estimate nest survival from 2019-2022

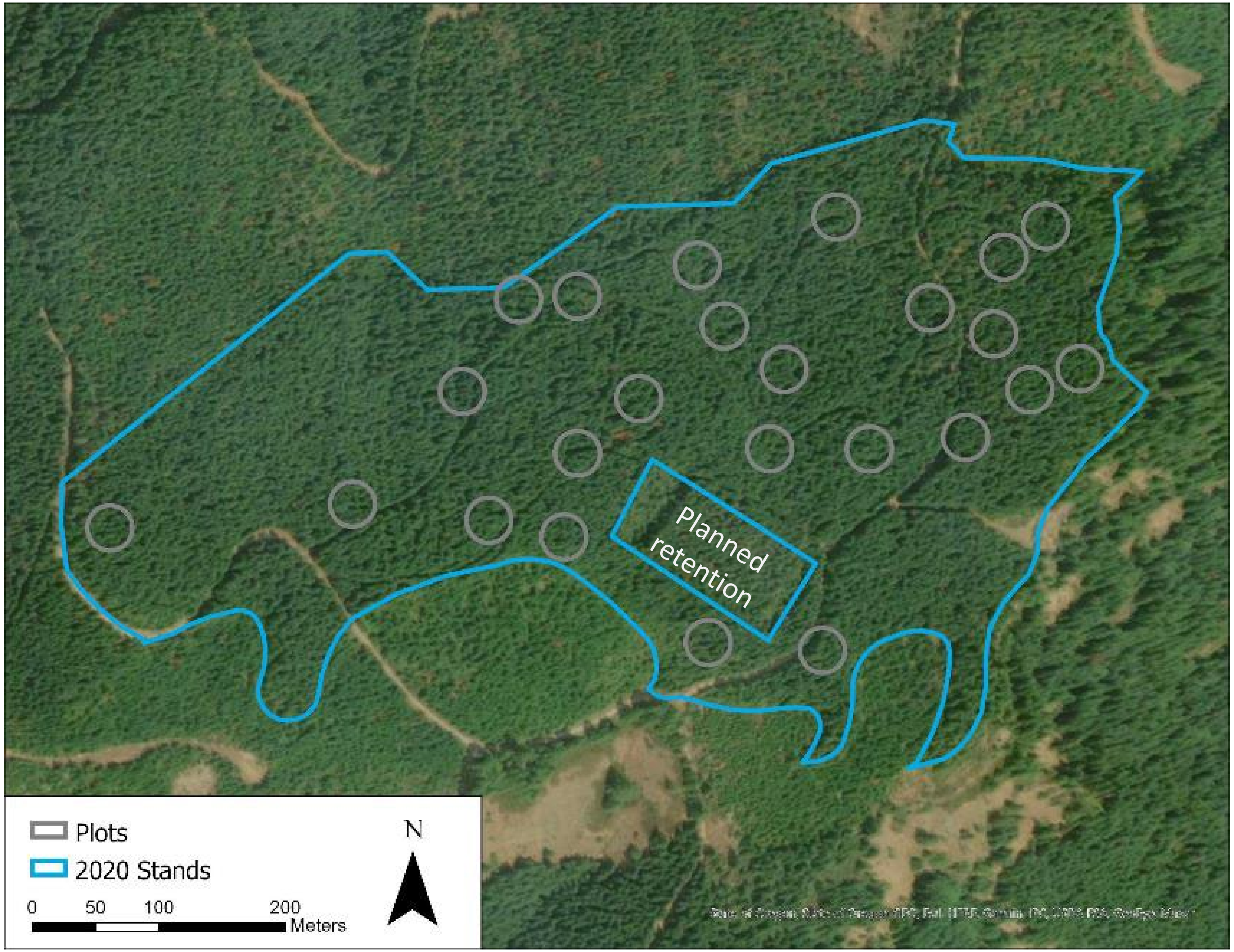
2021 Study Range



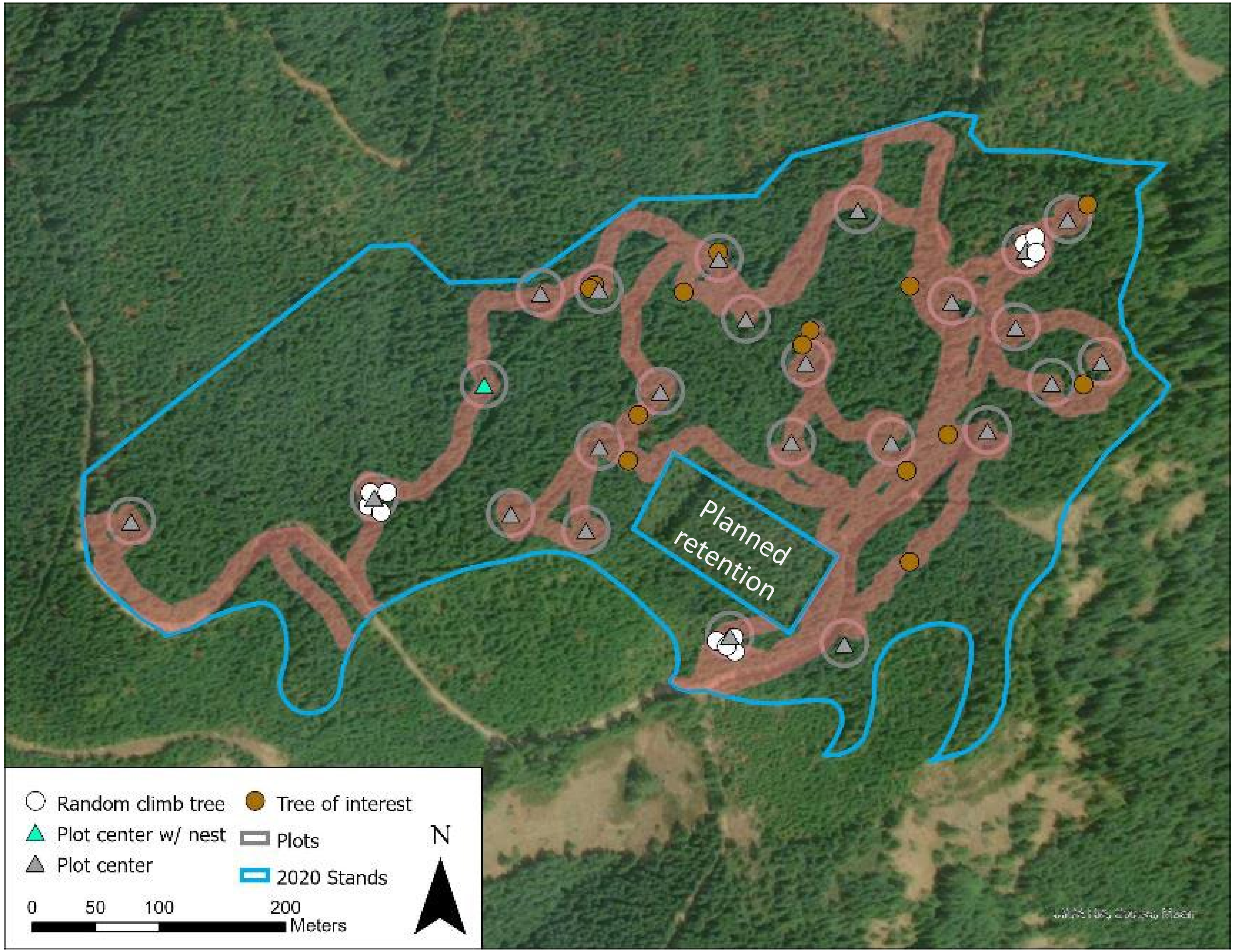



Surveying for red tree voles

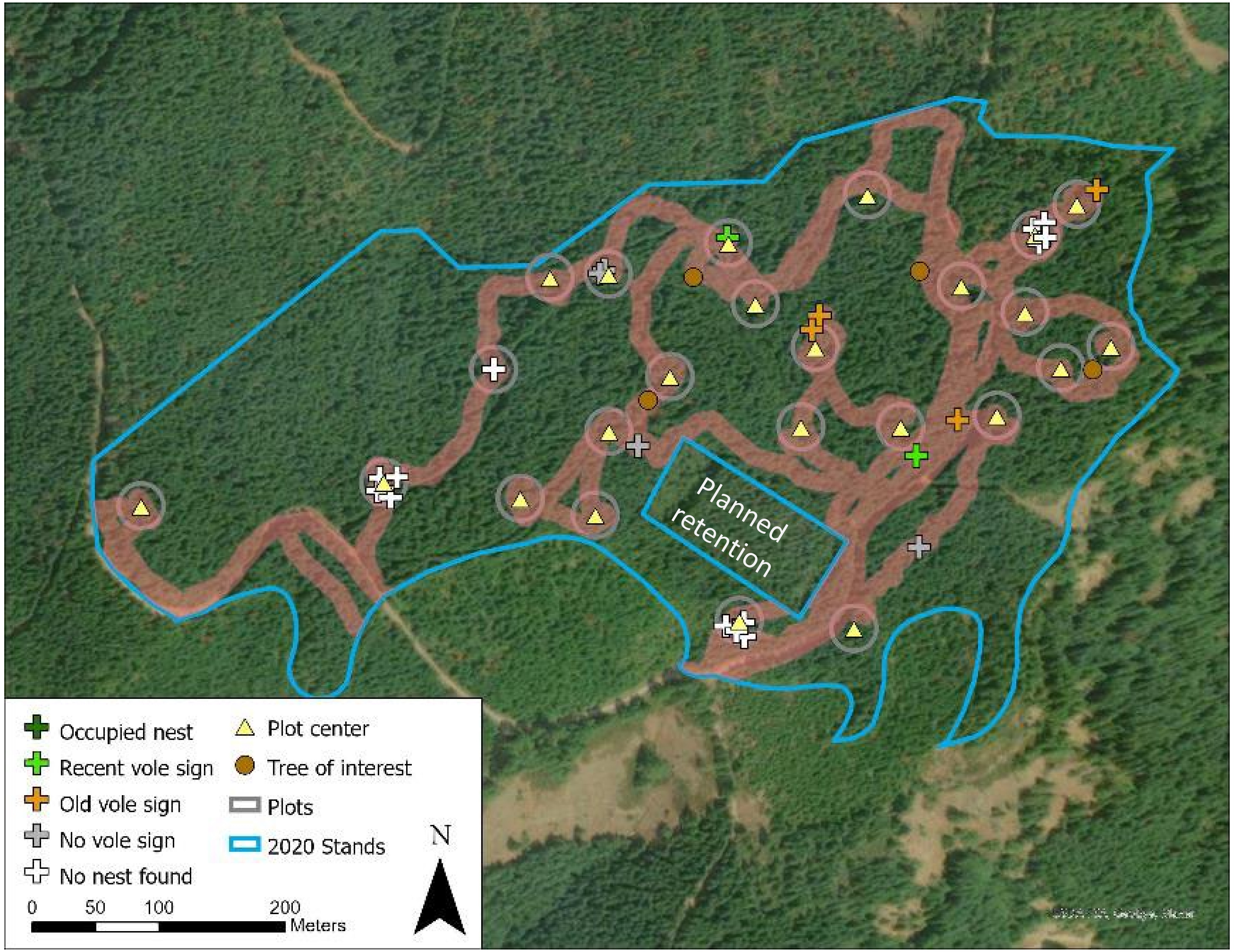
Stand survey layout



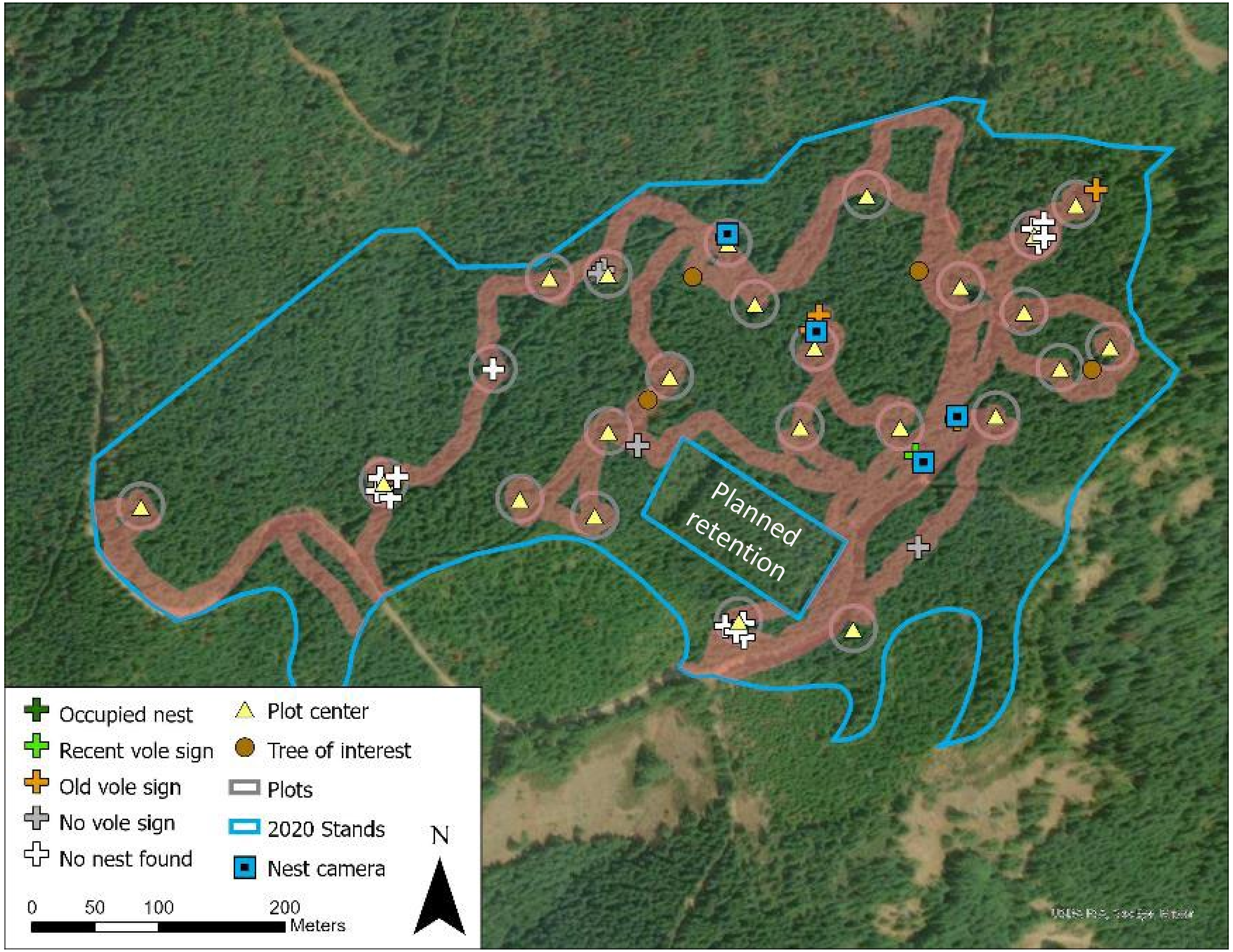
Ground survey for nests



Climbing nests



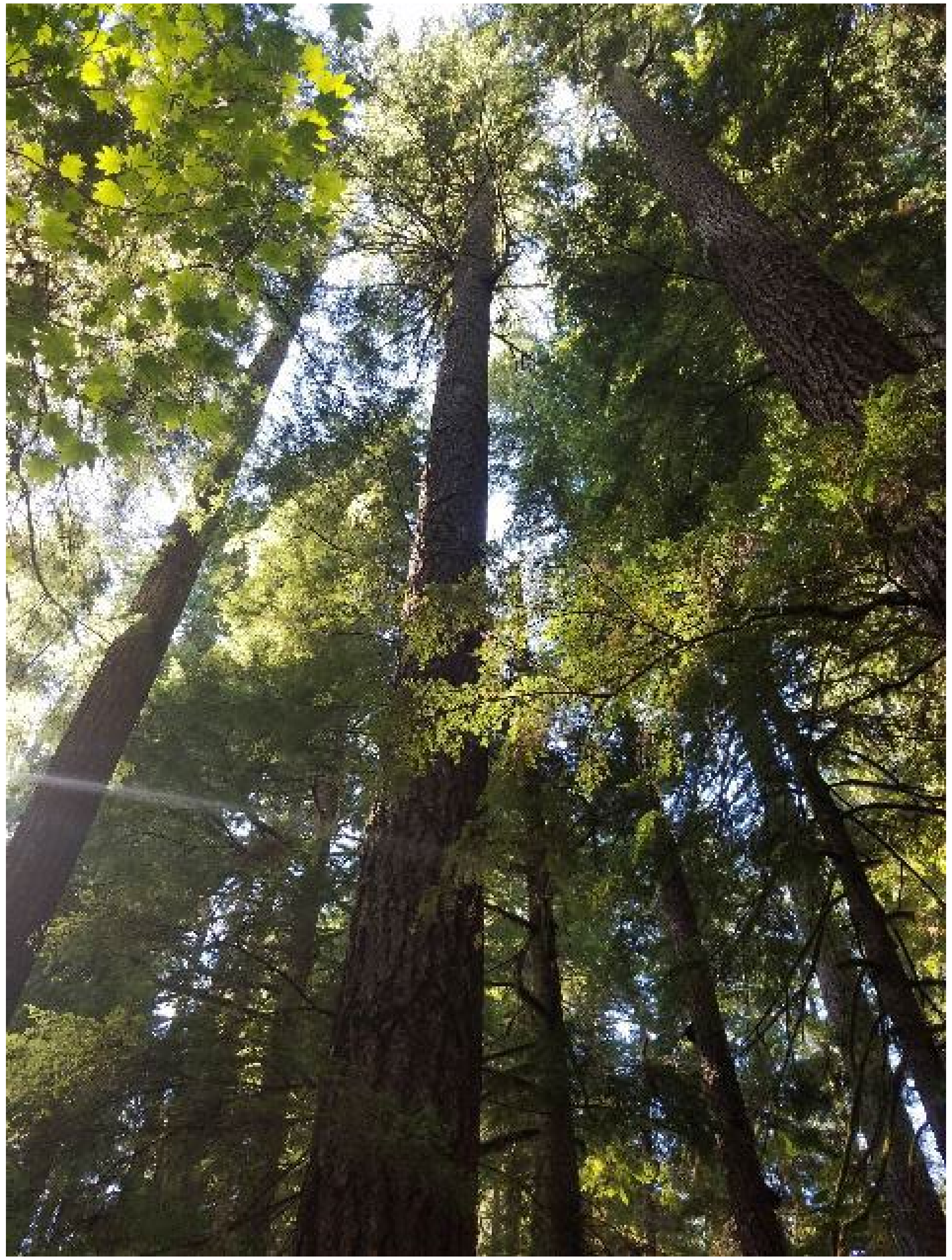
Camera nest monitoring



Double sampling (new in 2021)

Differences in detectability

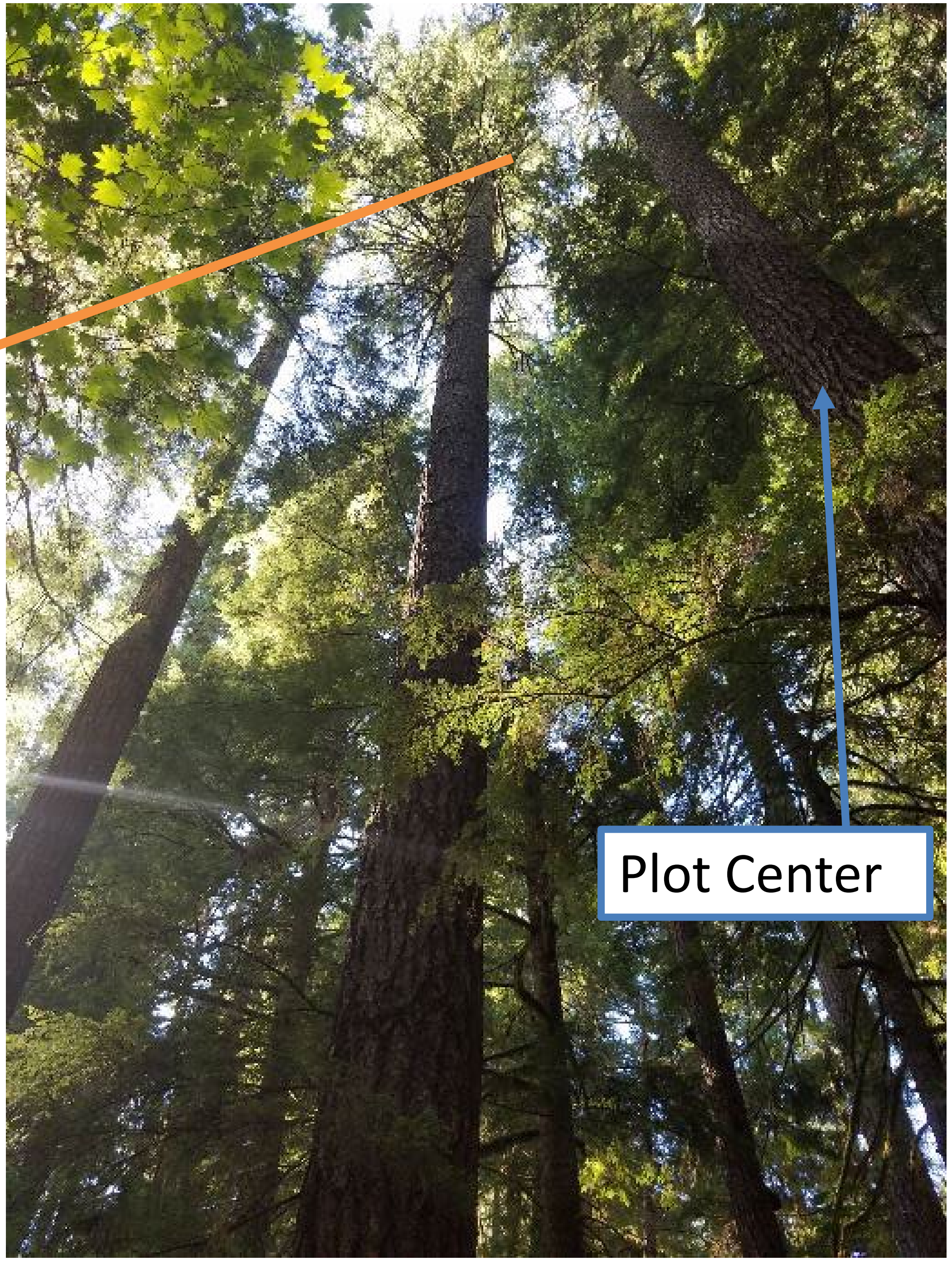
Stand age: 33



Stand age: 320

Optimizing detectability in old stands

Nest height ~40m



Vole Signs: clues to occupancy

Vole Signs: It’s not always obvious

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Vole Nests: all shapes and sizes

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Vole Nests: all shapes and sizes

Vole Nests: all shapes and sizes

Summary: By the numbers

-3 field seasons

-6 Months (Apr-Oct)

-46 stands completed

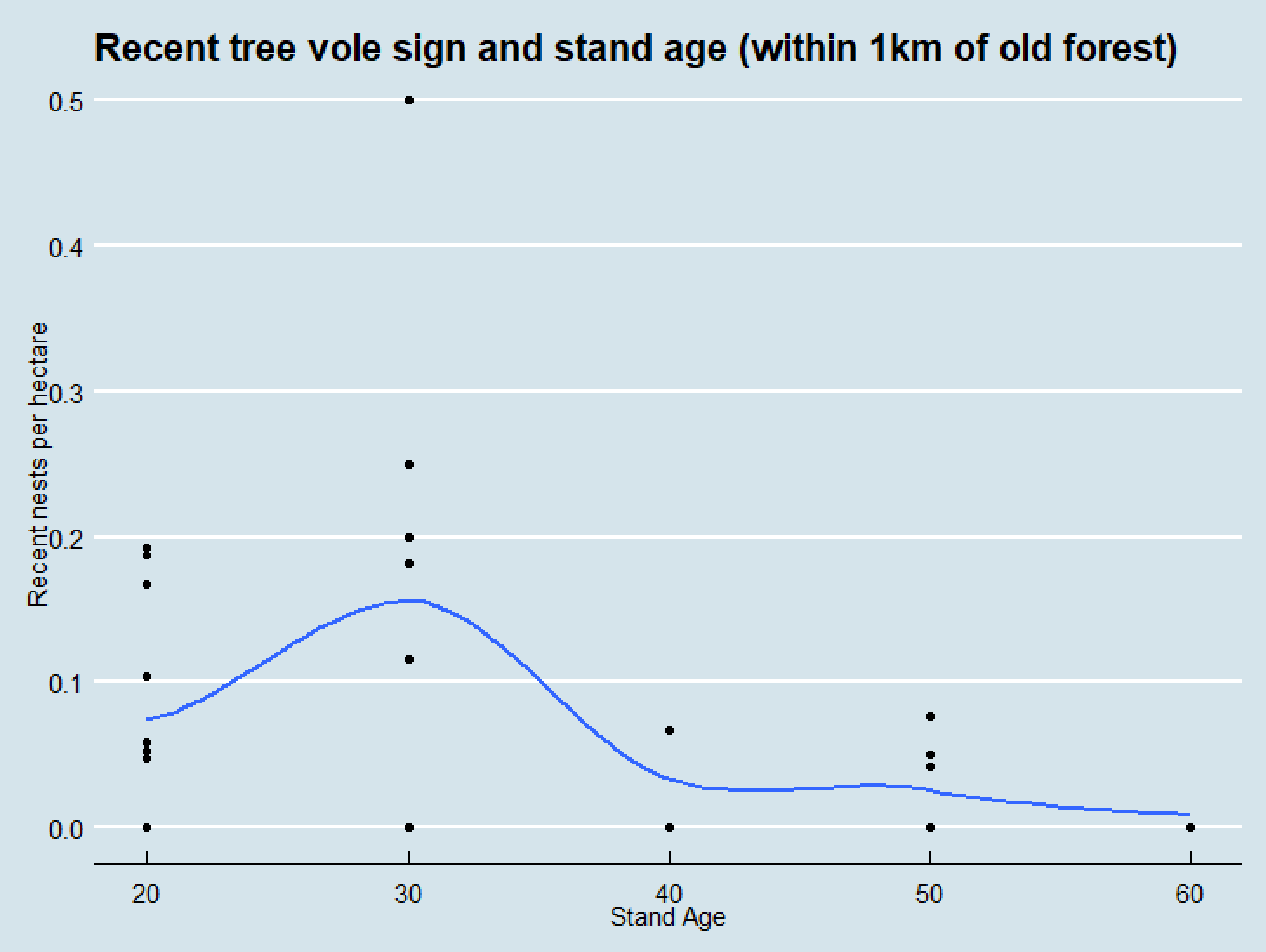
-7000+ trees surveyed

-713 nests climbed

-over 1300 nest photos taken

-111 cameras installed

Summary: Observations



Observations: nest colonization/extirpation

2020

2021

2020

2021

Colonization

Extirpation

Captures

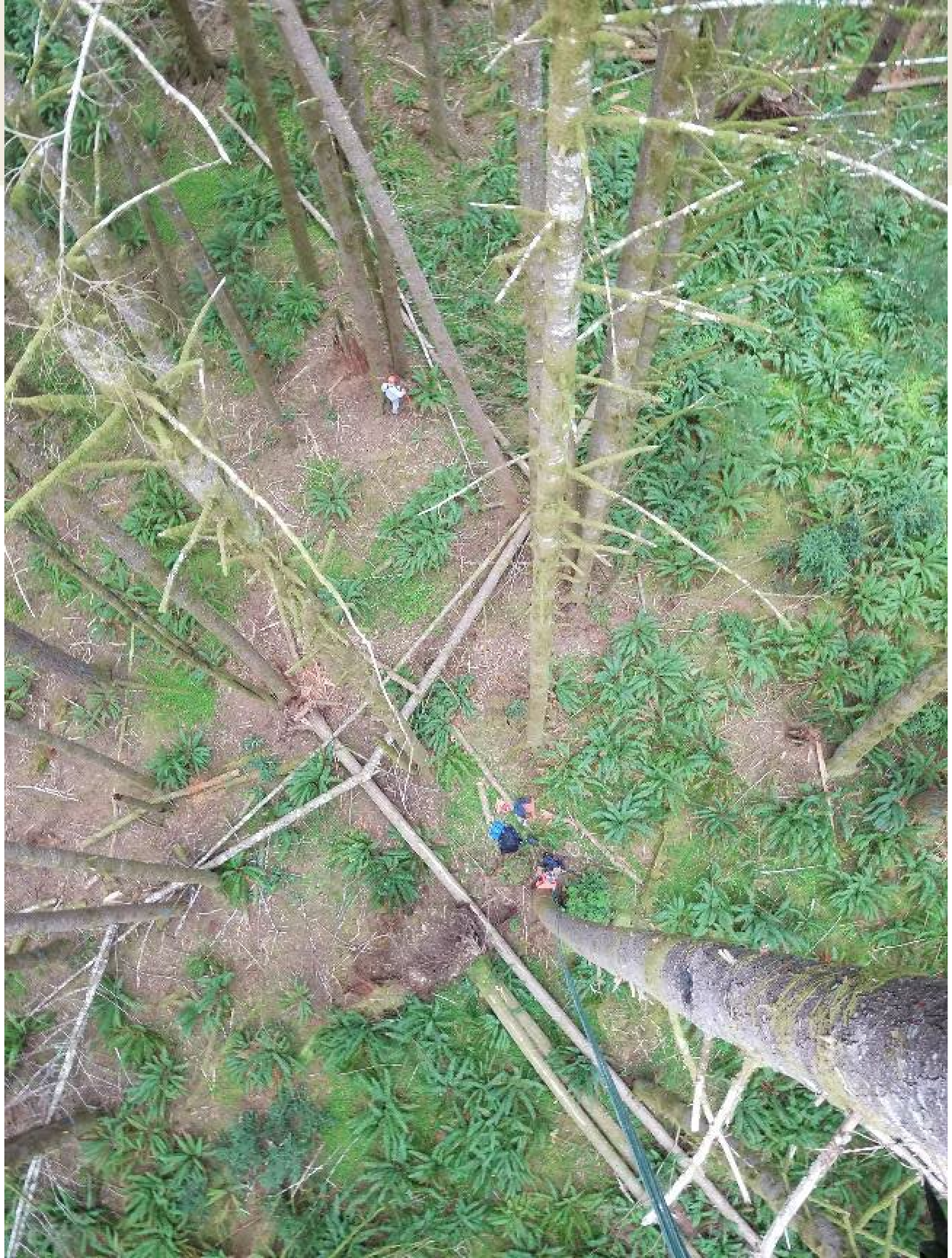
Conclusions

Conclusions
- Successfully implementing two methods to assess tree vole occupancy
- Continue to observe low occupancy surrounding the 50yr-60yr age classes
- Continue to observe both colonization and extirpation across all age classes where voles are found

Limitations
- Detectability in old forest

Future planning 2022

- **Conduct stand selection to address remaining data gaps (60, 80+ age classes)**



Future planning 2022

- Conduct stand selection to address remaining data gaps (60, 80+ age classes)

- **Fully implement capture/mark/re-capture protocol in young forest**

Future planning 2022

- Conduct stand selection to address remaining data gaps (60, 80+ age classes)

- Fully implement capture/mark/re-capture protocol in young forest

- **Conduct nest photo processing and tagging**

Acknowledgements

Field crew – Cody Berthiaume, Mackenzie McCoy, Salix Scoresby, Mark Stevens, Jessie Ritter, Stephanie Loredo

Training and consulting – Eric Forsman, Jim Swingle, Mark Linnell

Tim Lawes - Photos

LONE ROCK RESOURCES

Weyerhaeuser

Hancock Forest Management®

A Manulife Investment Management Company

STARKER FORESTS, INC.

OSU Oregon State University College of Forestry

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT

FOREST SERVICE U S DEPARTMENT OF AGRICULTURE

Cafferata CONSULTING

Questions?

Jason Piasecki

Graduate Research Assistant – OSU College of Forestry

Jason.Piasecki@oregonstate.edu

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Year 3 progress Report

Assessing the response of aquatic biota to alternative riparian management practices

Dana Warren - Oregon State University

Ashley Coble - NCASI

Many project collaborators

Study goal:

Determine how water quality and stream biota respond to alternative riparian management options (standard practice, fixed width, no harvest, buffer gaps, and variable retention).

Study goal:

Determine how water quality and stream biota respond to alternative riparian management options (standard practice, fixed width, no harvest, buffer gaps, and variable retention).

Study Motivations:

1. Determine whether we can build more flexibility into riparian forest management
    - *To do this, we need to have results from research that explores alternatives and their impact on biota and which provide results that can be carried forward to inform policy*

We all recognize the value of riparian buffers, but are there more options than just fixed width?

How did fixed-width buffers become standard practice for protecting freshwaters and their riparian areas from forest harvest practices?

John S. Richardson[1]
Department of Forest Sciences, University of British Columbia, Vancouver, British Columbia, Canada V6T 1Z4

Robert J. Naiman[2]
School of Aquatic and Fishery Sciences, Box 355020, University of Washington, Seattle, Washington 98195 USA

Peter A. Bisson[3]
US Department of Agriculture Forest Service, Pacific Northwest Research Station, Olympia Forestry Sciences Laboratory, Olympia, Washington 98512-9193 USA

We all recognize the value of riparian buffers, but are there more options than just fixed width?

How did fixed-width buffers become standard practice for

Riparian buffers were created in recognition of the need to protect surface waters from harm by forest harvest and have become the norm for protecting freshwater ecosystems. However, requirements for narrow, fixed-width buffers usually originated for administratively simple but scientifically untested reasons. Reliance on fixed-width buffers suffers from a scarcity of actual tests and evaluations of the effectiveness of current guidelines.

US Department of Agriculture Forest Service, Pacific Northwest Research Station, Olympia Forestry Sciences Laboratory, Olympia, Washington 98512-9193 USA

We all recognize the value of riparian buffers, but are there more options than just fixed width?

How did fixed-width buffers become standard practice for

Strategies to maintain ecologically functional aquatic and riparian ecosystems in the face of forest practices will require carefully designed, large-scale field experiments, coupled with long-term monitoring and explicit incorporation of spatial (catchment vs reach) and temporal scales.

School of Aquatic and Fishery Sciences, Box 355020, University of Washington, Seattle, Washington 98195 USA

Peter A. Bisson[3]

US Department of Agriculture Forest Service, Pacific Northwest Research Station, Olympia Forestry Sciences Laboratory, Olympia, Washington 98512-9193 USA

Study goal:

Determine how water quality and stream biota respond to alternative riparian management options (standard practice, fixed width, no harvest, buffer gaps, and variable retention).

Study Motivations:

1. Determine whether we can build more flexibility into riparian forest management
   - *To do this, we need to have results from research that explores alternatives and their impact on biota and which provide results that can be carried forward to inform policy*

2. Understand aquatic-terrestrial linkages

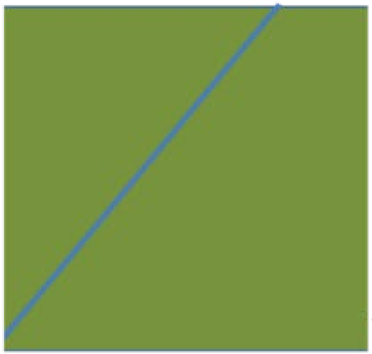
Quick review of the experimental design

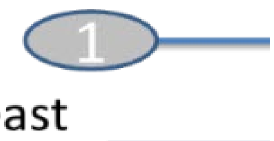
Before-After Control-Impact (BACI) study

- Total of 4 treatments and 1 ”control”
  - Treatments encompass a range of potential light increases
- Two years of pre-treatment data
- Two years of post-treatment data

Quick review of the experimental design

Treatments target a gradient of shading and light availability





Least
Light

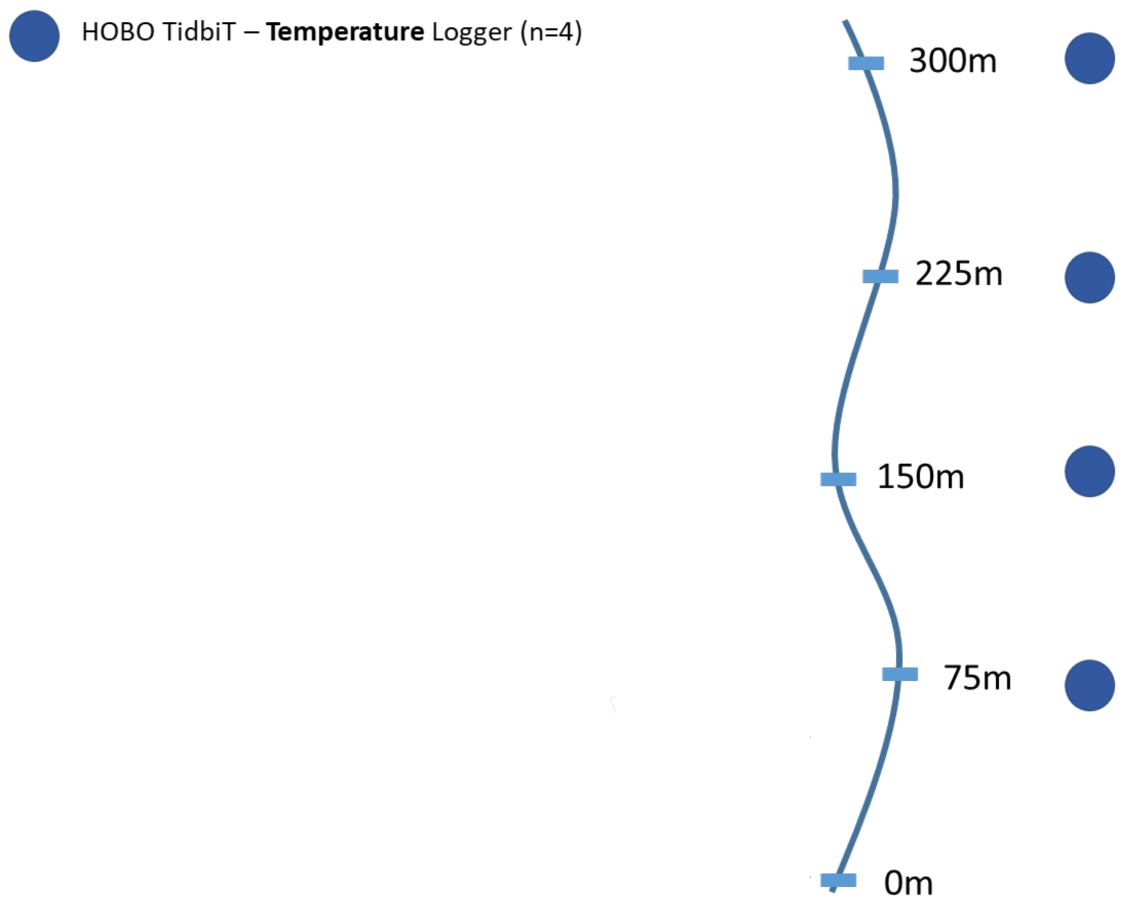
1. Uncut

“control” ?

“control” ?

- width
100 ft max

Stream Sampling Layout



Quick review of the experimental design

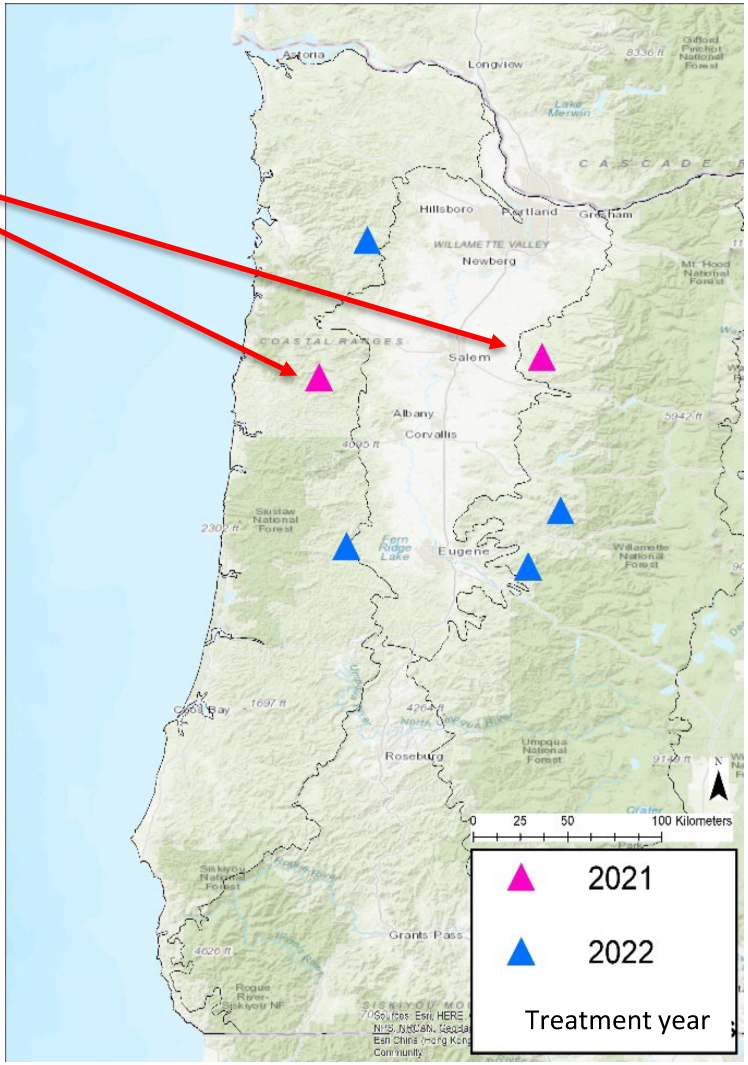
Before-After Control-Impact (BACI) study

- Two years of pre-treatment data
- Two years of post-treatment data
- Total of 4 treatments and 1 ”control”

- Replicate this treatment in 6 blocks across a managed forest landscape in Oregon

Setting out blocks and pre-treatment data collection

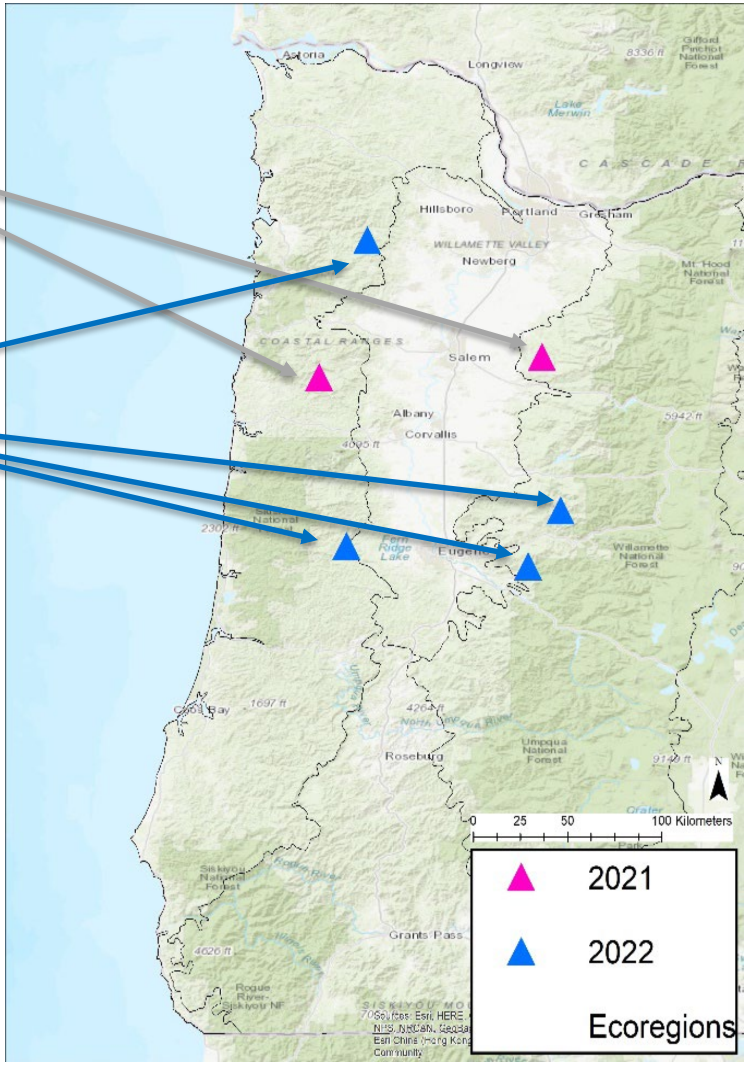
In year 1 (2019), we collected data in **2 blocks**



Setting out blocks and pre-treatment data collection

In year 1 (2019), we collected data in **2 blocks**

In year 2 (2020), we identified four more and planned data collection at a total of **6 blocks**

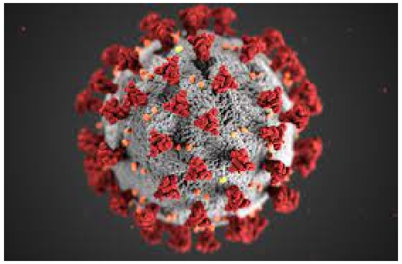


Setting out blocks and pre-treatment data collection

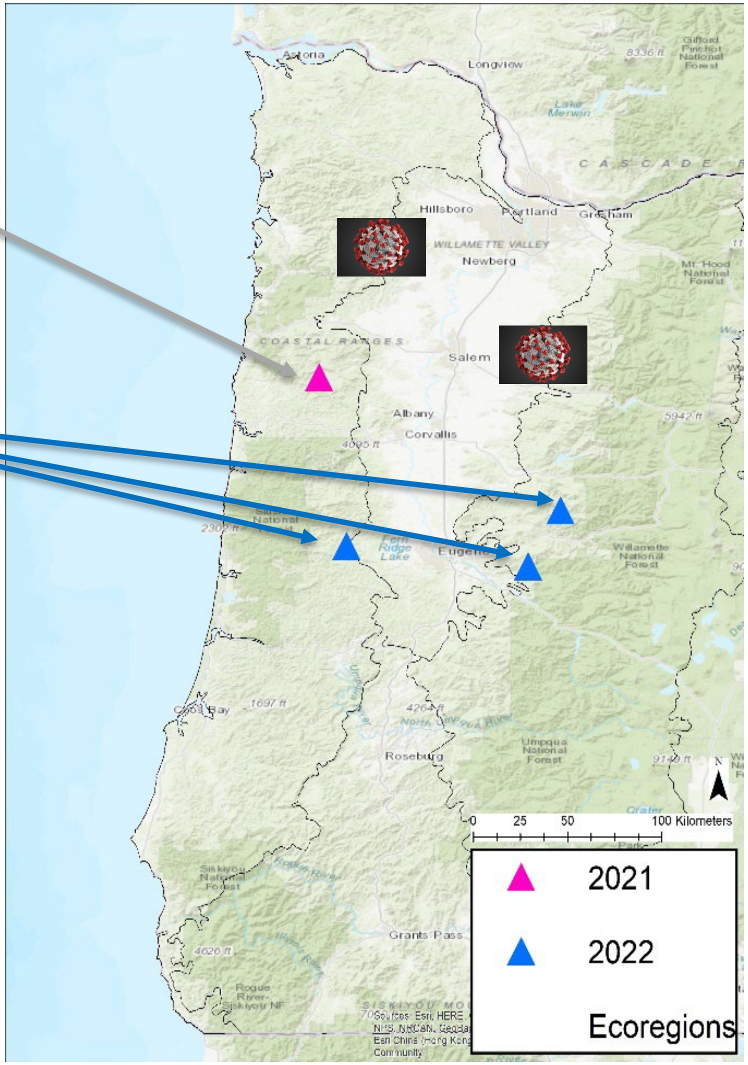
In year 1 (2019), we collected data in **2 blocks**

In year 2 (2020), we identified four more and planned data collection at a total of **6 blocks**

The 2020 field season was impacted by COVID



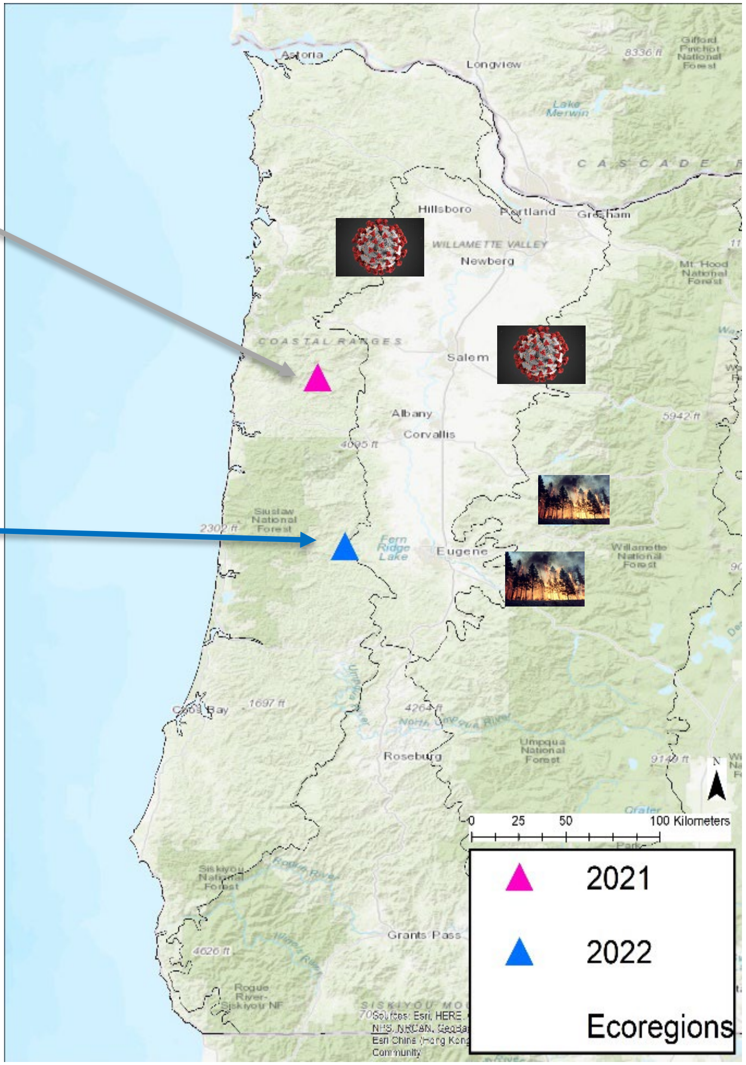
- Collected data from **four** sites in summer 2020



Setting out blocks and pre-treatment data collection

In year 1 (2019), we collected data in **2 blocks**

In year 2 (2020), we added **four** more and planned data collection at a total of **6 blocks**



Two of the 2020 field season sits were impacted by FIRE

- Two sites remained for continued work
- Planned to identify 4 new blocks (20 streams) for 2021 field season

Fall 2020 Revised Timeline and overall project layout

- Study goal is to have 6 blocks (each block is a set of 5 treatment units) in Oregon

- Year 1 – Survey 2 blocks (10 units) pre-treatment on all
- Year 2 – Survey 4 blocks (20 units) pre-treatment on all
  - Sept Y2 - 3 blocks burn
- Year 3 – Survey 6? blocks (30 units) pre-treatment on 5, post-treatment on 1

At the end of the proposed project period, we will have one full block for a BACI analysis

- Year 4 – Survey 6 blocks (30 units) pre-treatment on 4, post-treatment on 2
- Year 5 – Survey 5 blocks (25 units) post-treatment on all
- Year 6 (?) – Survey 4 blocks (20 units) post-treatment on all

- Other Funding sources . . .
  - NCASI
  - Agricultural Research Foundation (ARF) grant in 2020 provided an additional $14k for this project.

Fall 2020 Revised Timeline and overall project layout

- Study goal is to have 6 blocks (each block is a set of 5 treatment units) in Oregon

We did this!

- Year 1 – Survey 2 blocks (10 units) pre-treatment on all
- Year 2 – Survey 4 blocks (20 units) pre-treatment on all
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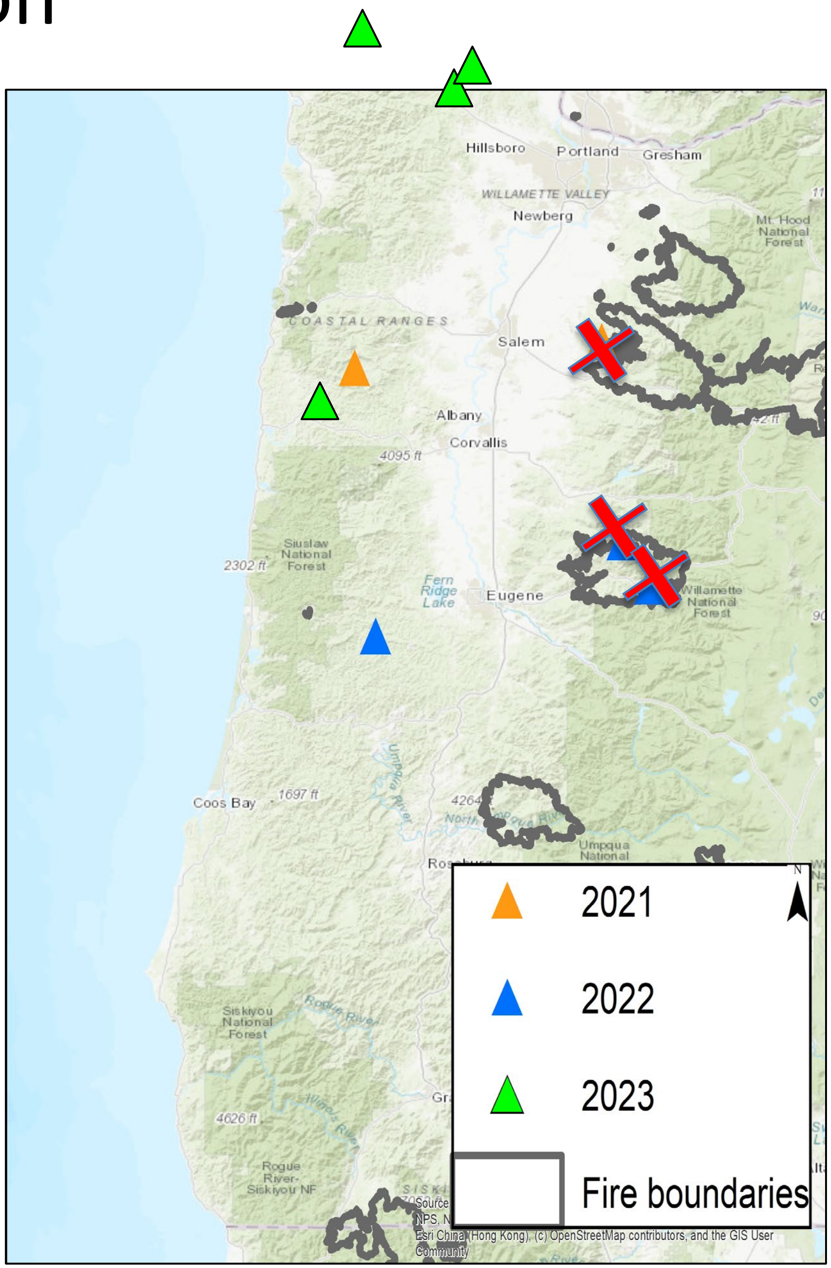
- Year 5 – Survey 5 blocks (25 units) post-treatment on all
- Year 6 (?) – Survey 4 blocks (20 units) post-treatment on all

- Other Funding sources . . .
  - NCASI
  - Agricultural Research Foundation (ARF) grant in 2020 provided an additional $14k for this project.

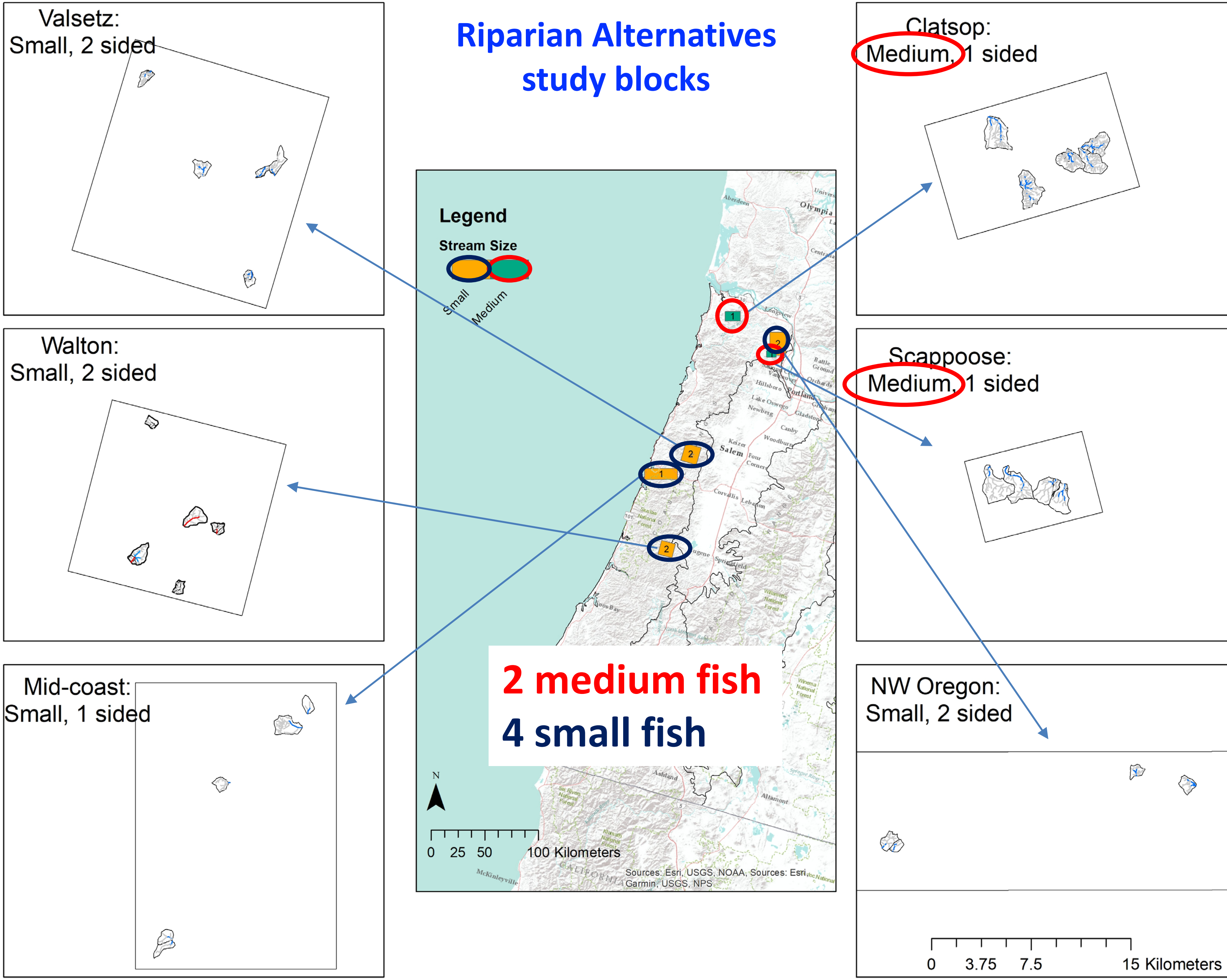
New block configuration

Over winter and spring 2021, four additional blocks were identified in the OR Coast Range

- **Thank you to Ashley Sanders, Ashley Coble, partner companies and collaborators!**



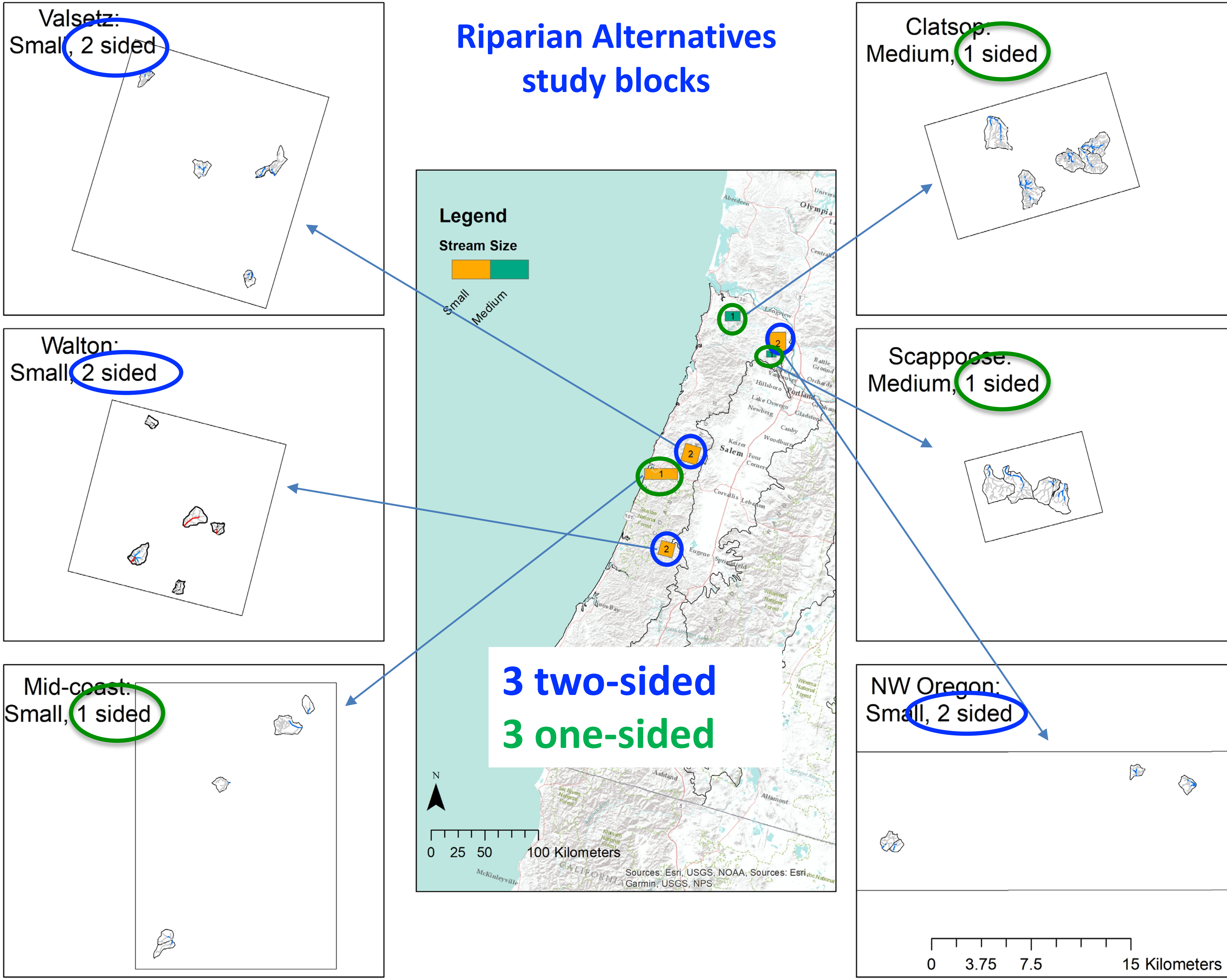
Riparian Alternatives study blocks



2 medium fish

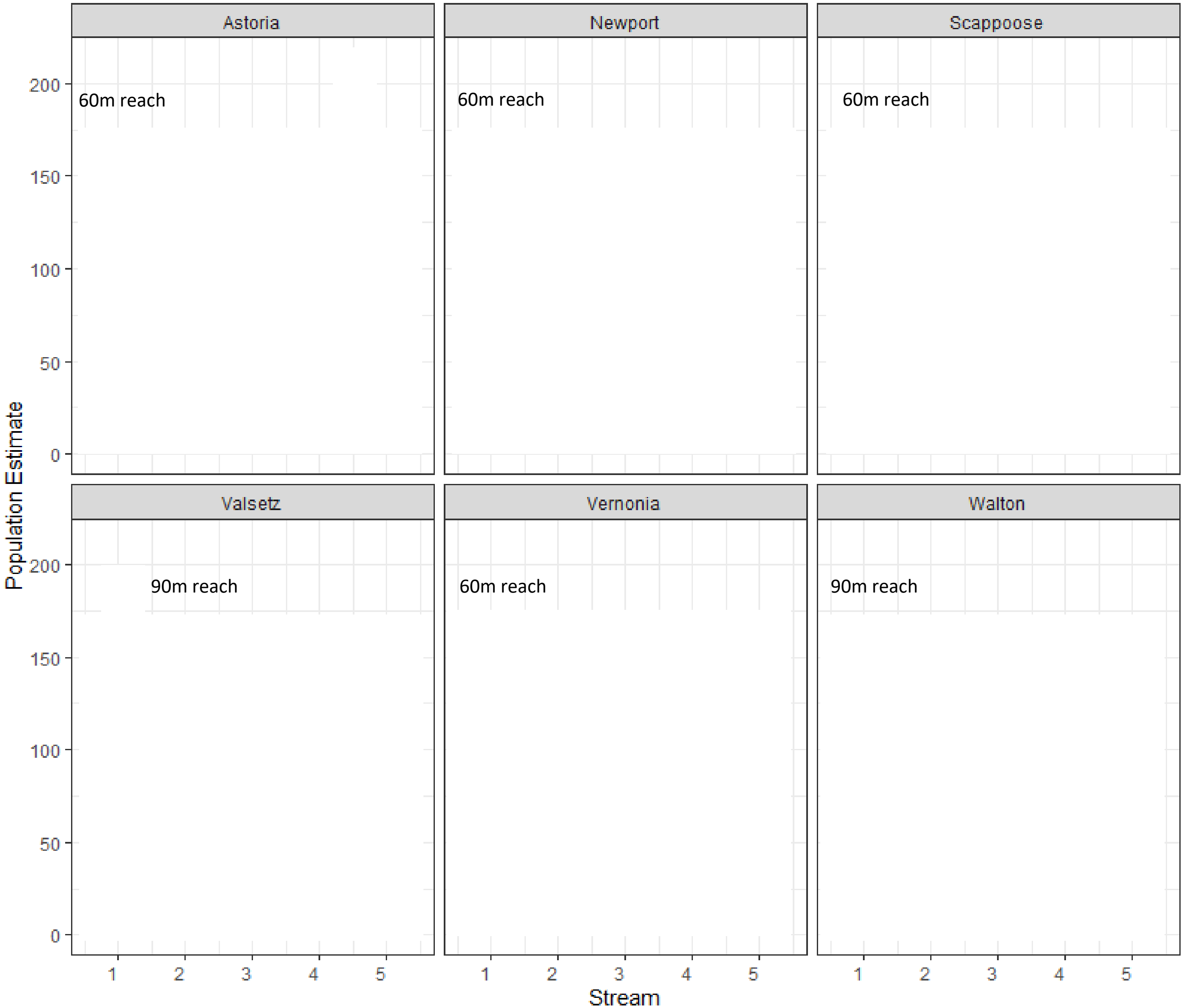
4 small fish

Riparian Alternatives study blocks



Summer 2021 preliminary data:

Fish population estimates for 29 of 30 sites



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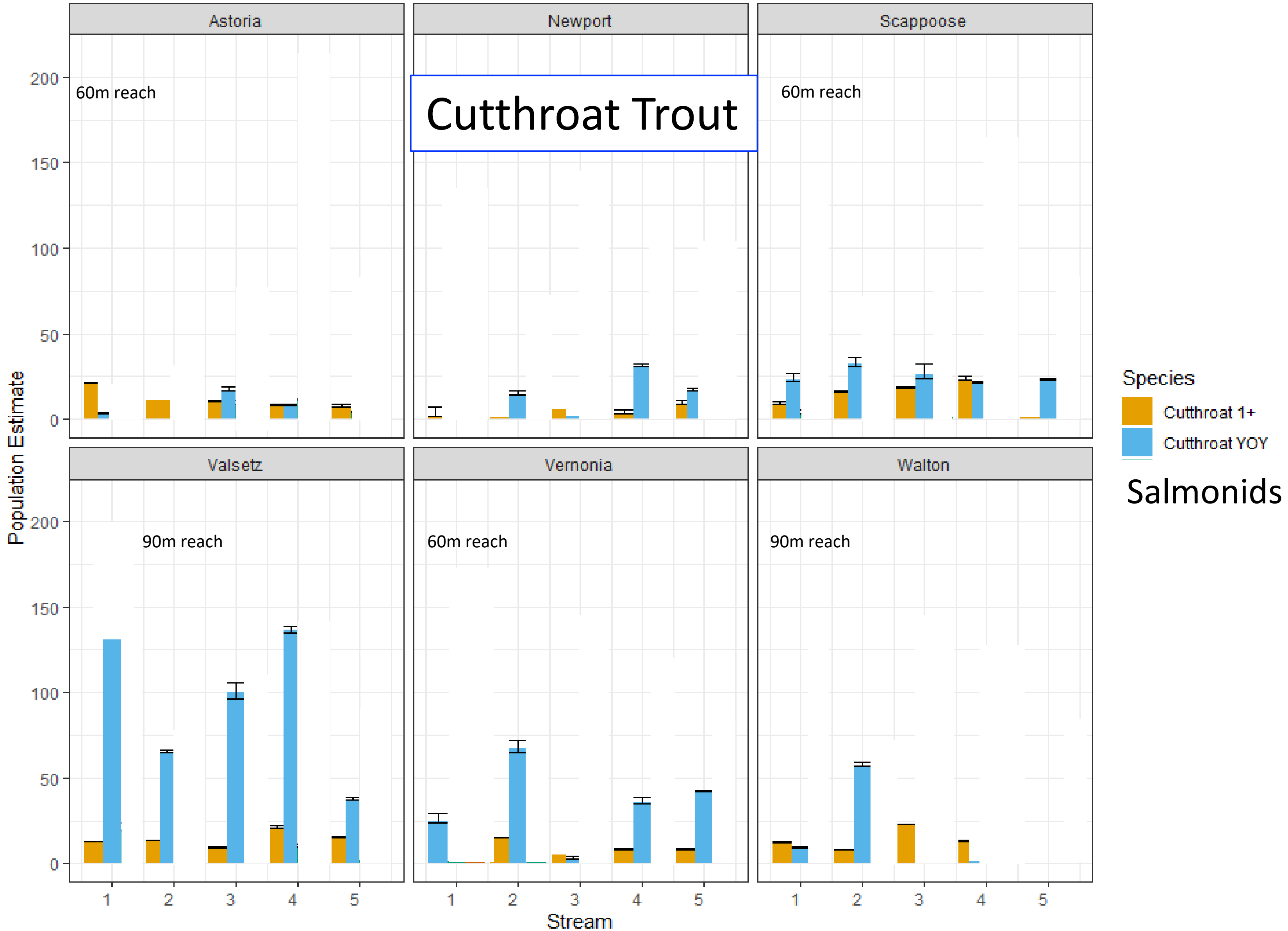

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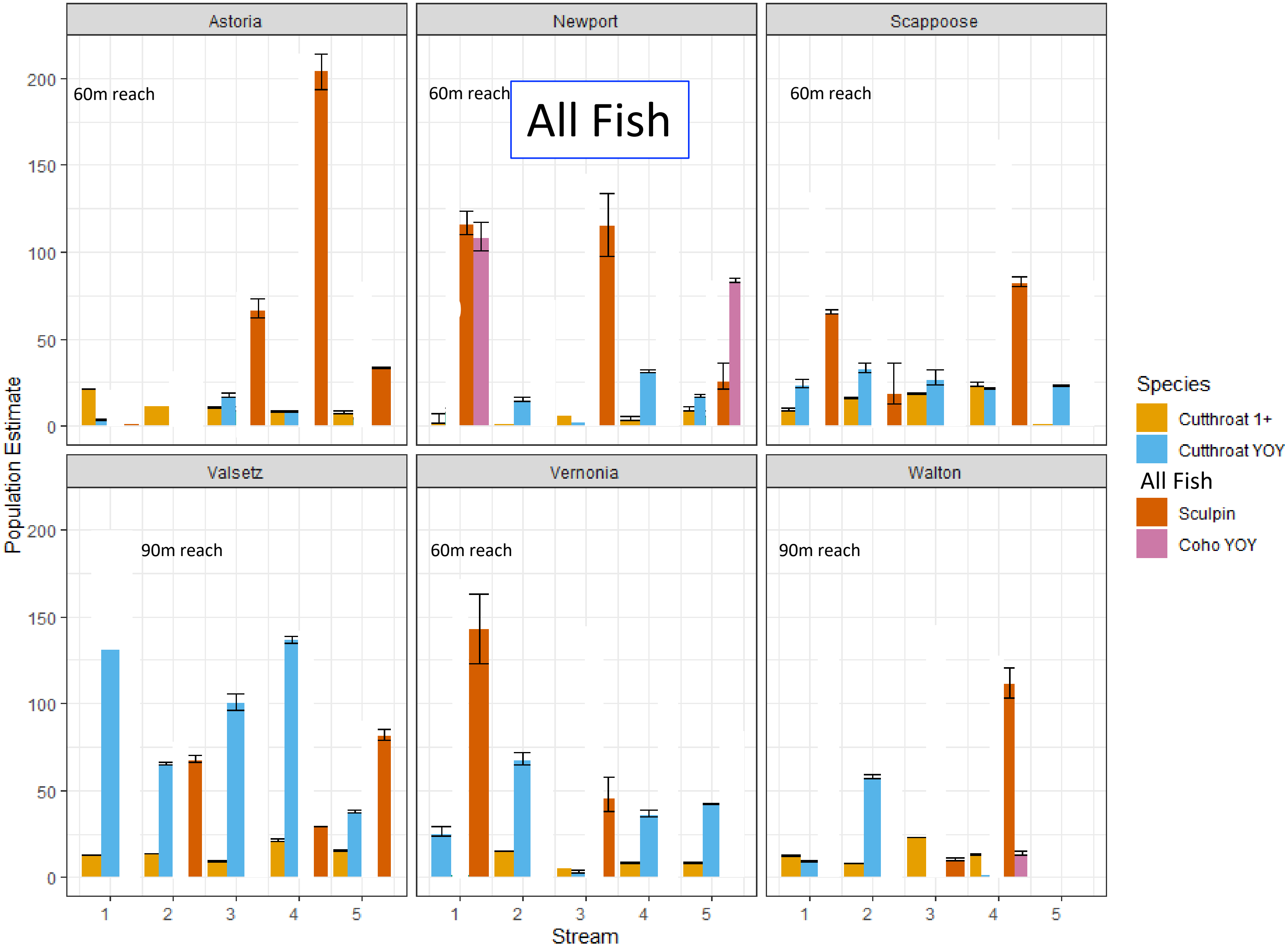

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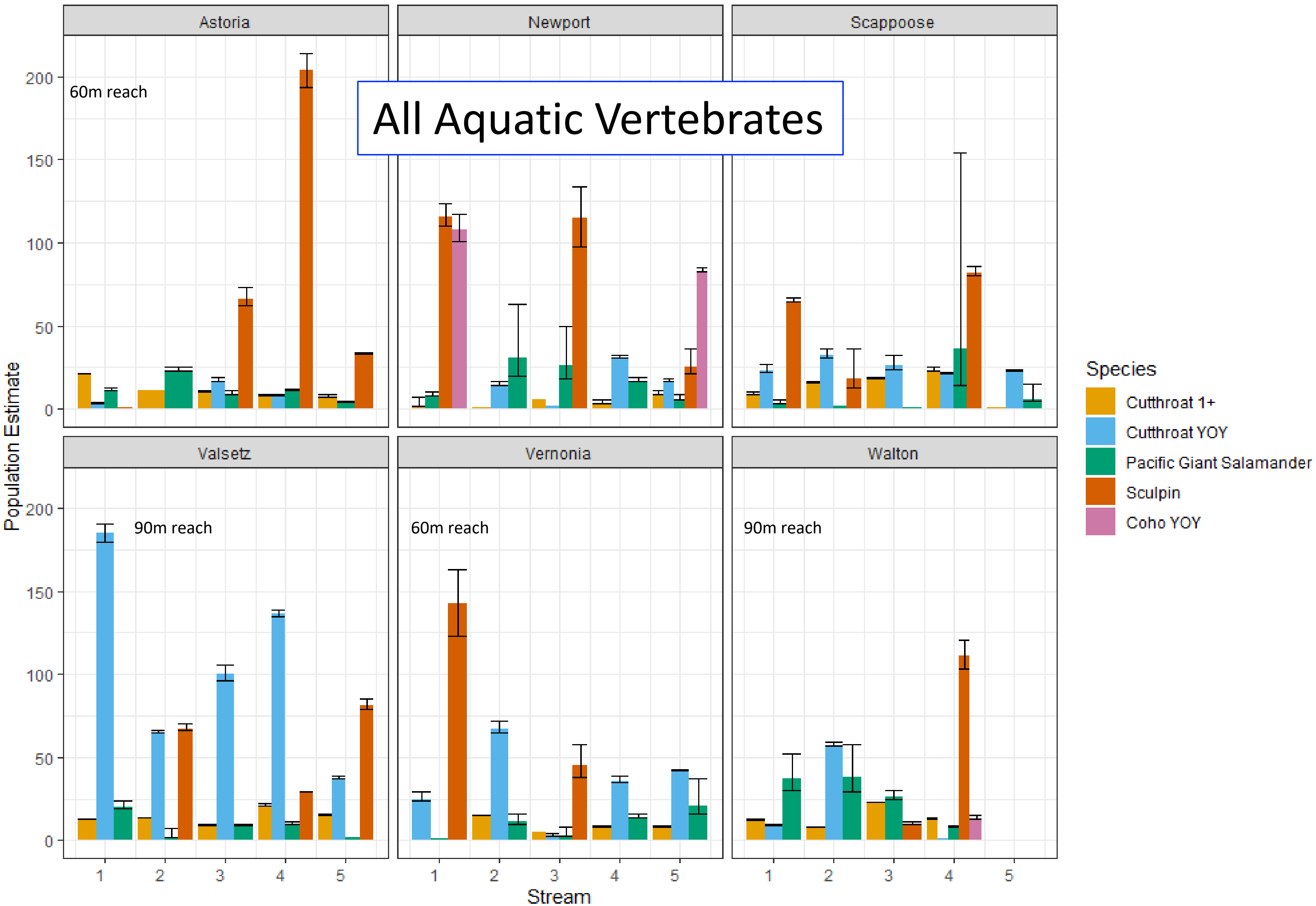
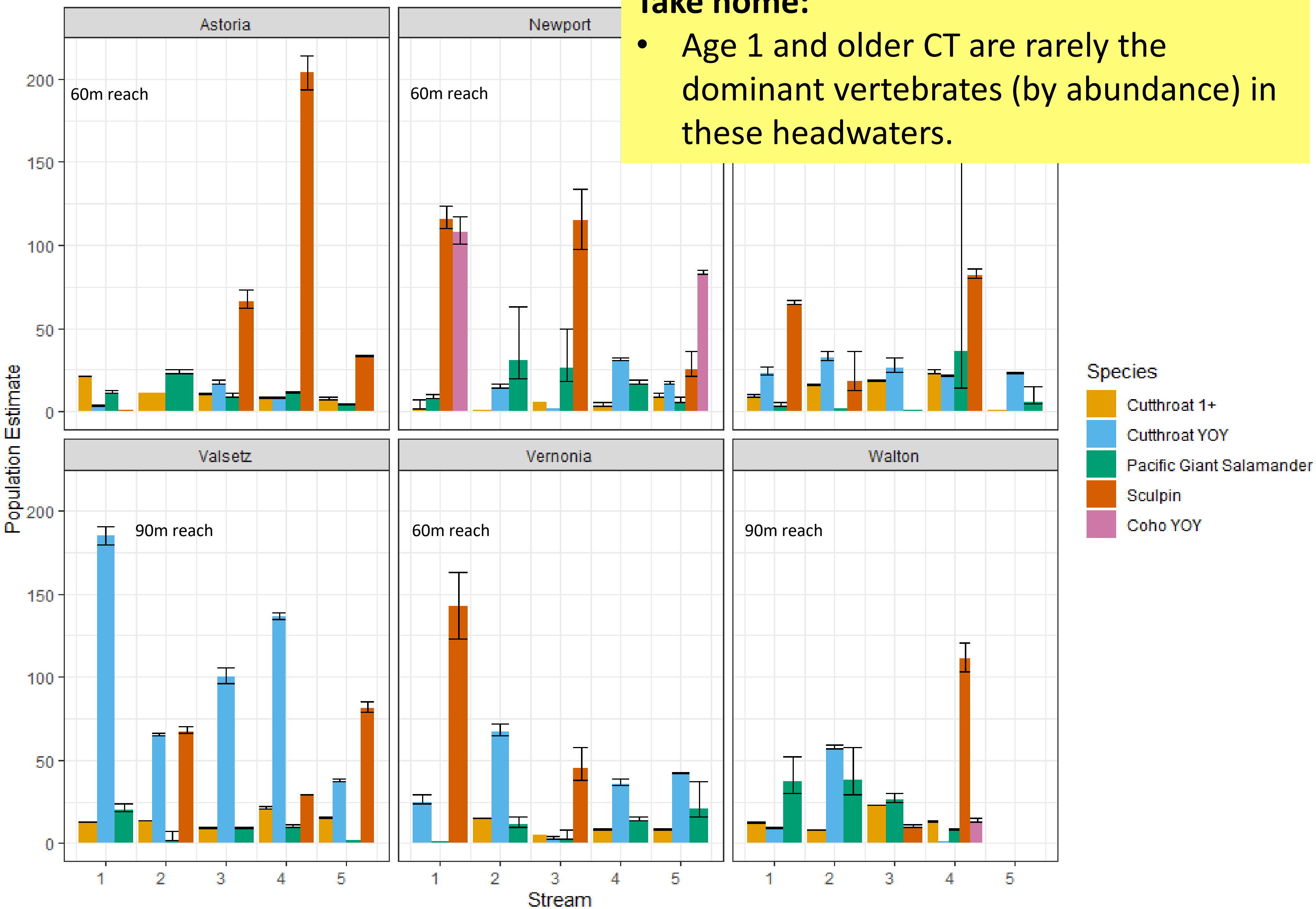


Summer 2021 preliminary data:

Fish population estima



Take home:

- Age 1 and older CT are rarely the dominant vertebrates (by abundance) in these headwaters.

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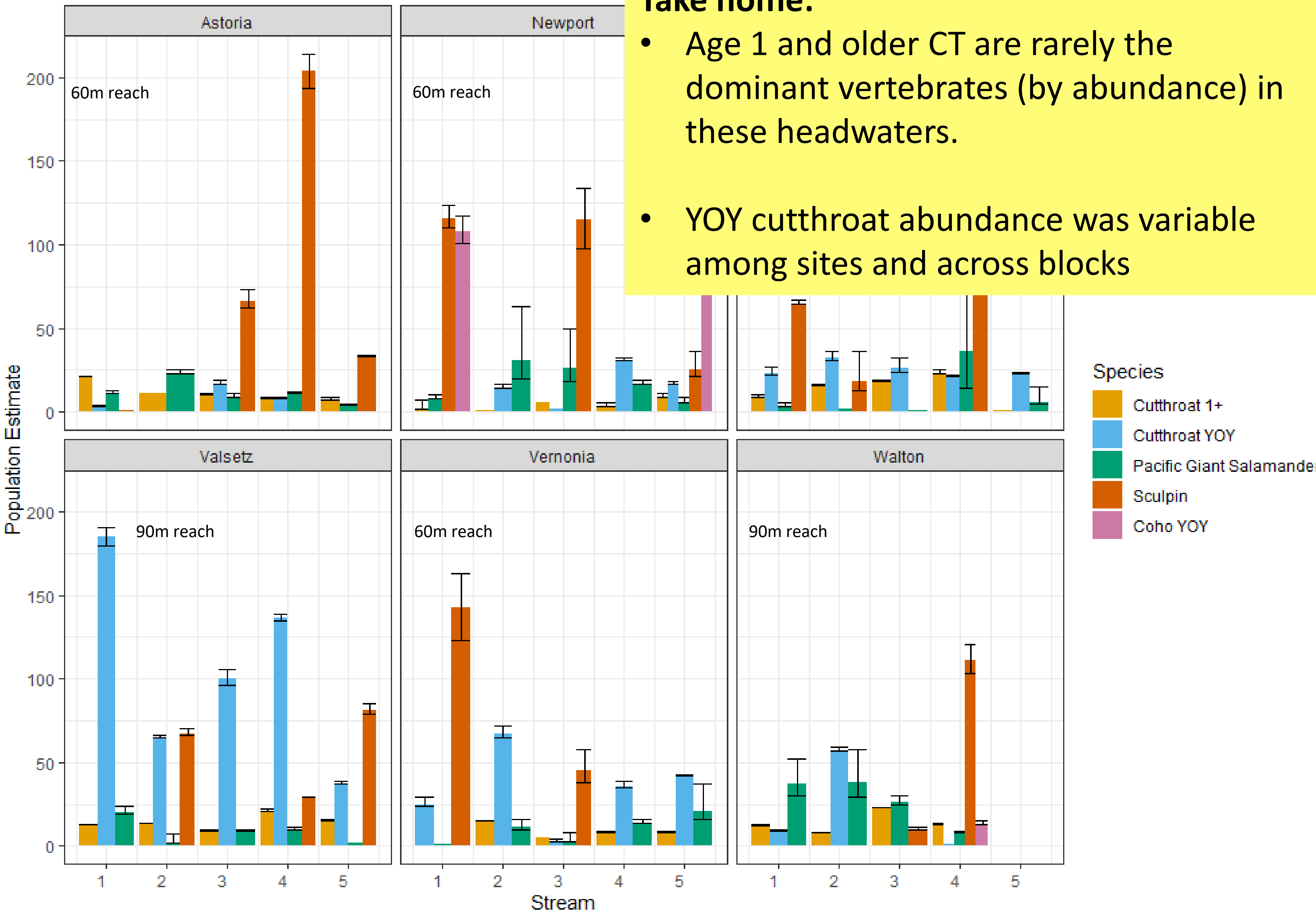
Fish population estim



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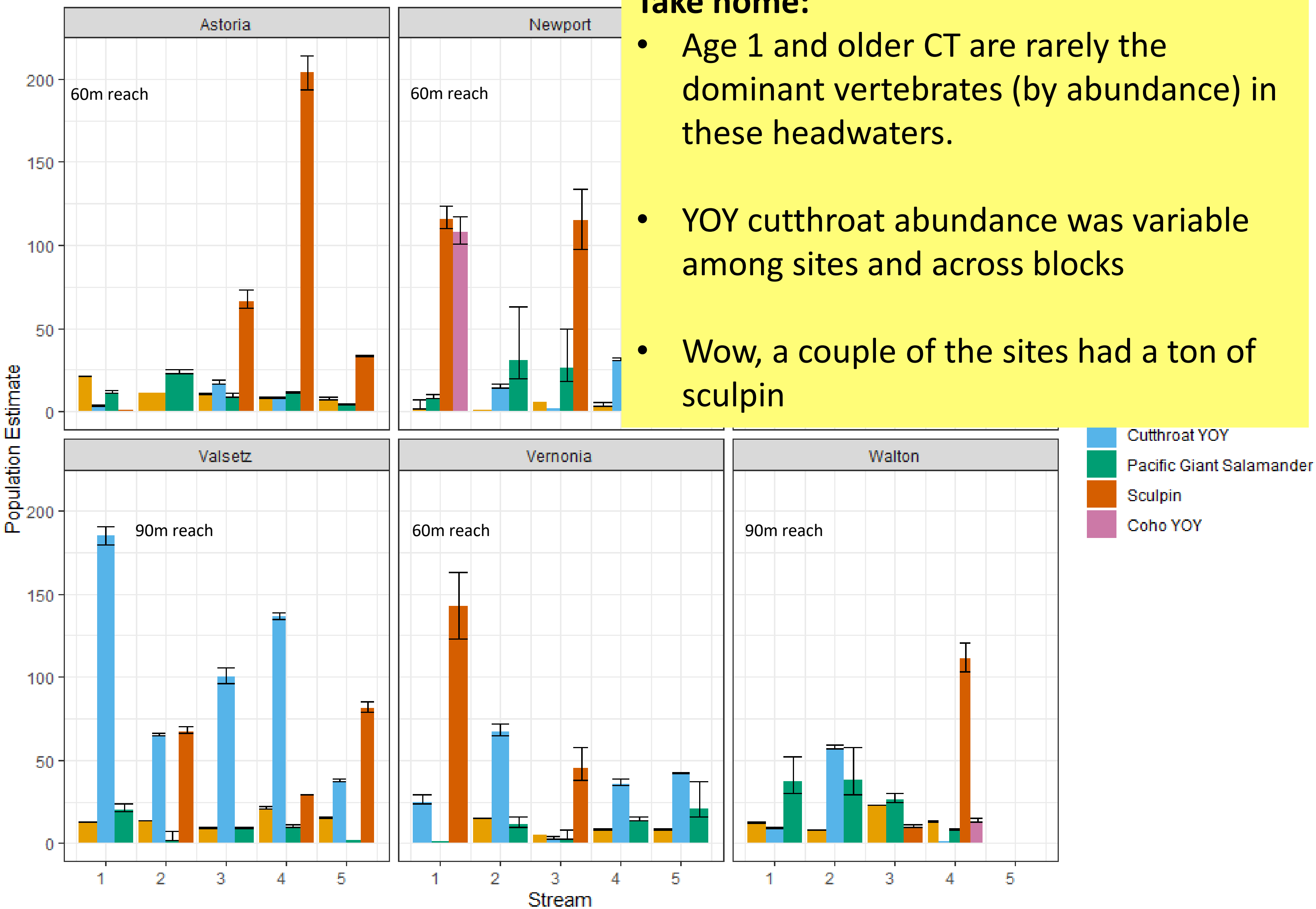

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- Wow, a couple of the sites had a ton of sculpin

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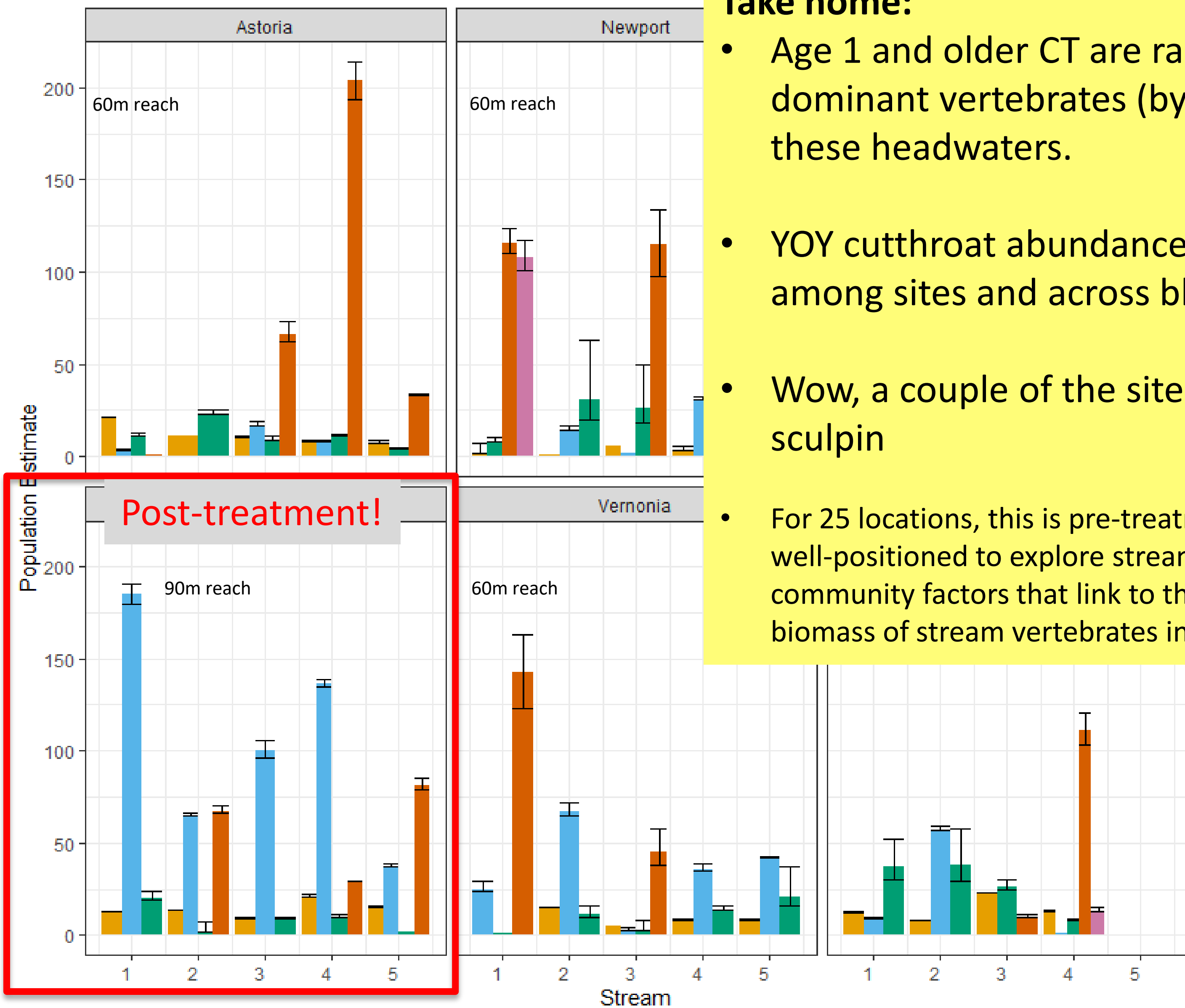
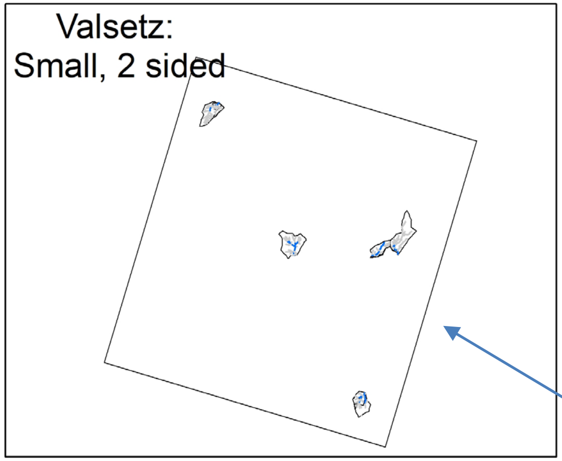
Fish population estim...

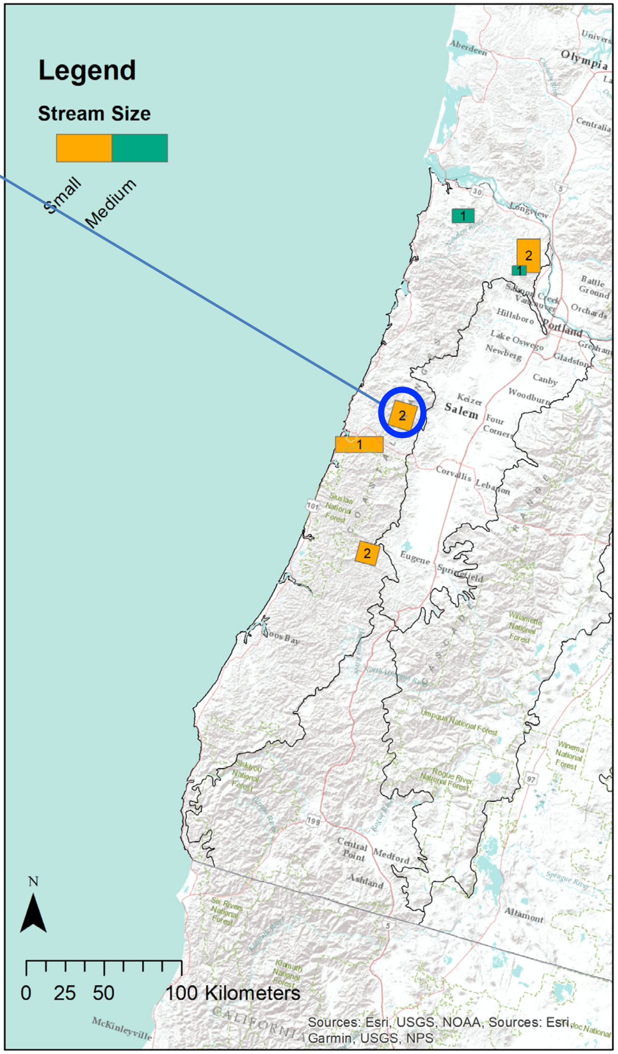


Take home:

- Age 1 and older CT are rarely the dominant vertebrates (by abundance) in these headwaters.
- YOY cutthroat abundance was variable among sites and across blocks
- Wow, a couple of the sites had a ton of sculpin
- For 25 locations, this is pre-treatment data, so we are well-positioned to explore stream, landscape and community factors that link to the abundance and biomass of stream vertebrates in the coast range.

A focus on Valsetz Block

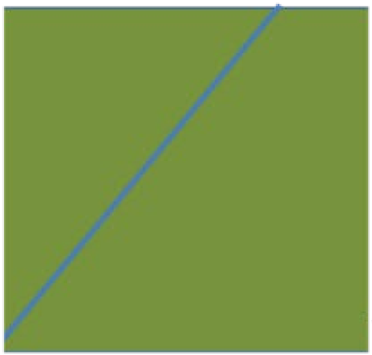




- 2 years pre-treatment
  - Summer 2019
  - Summer 2020
- Experiment Applied
  - Winter/Spring 2021
- 1 year post-treatment
  - Summer 2021

Experimental treatments were applied at Valsetz in winter/spring 2021

Treatments target a gradient of shading and light availability

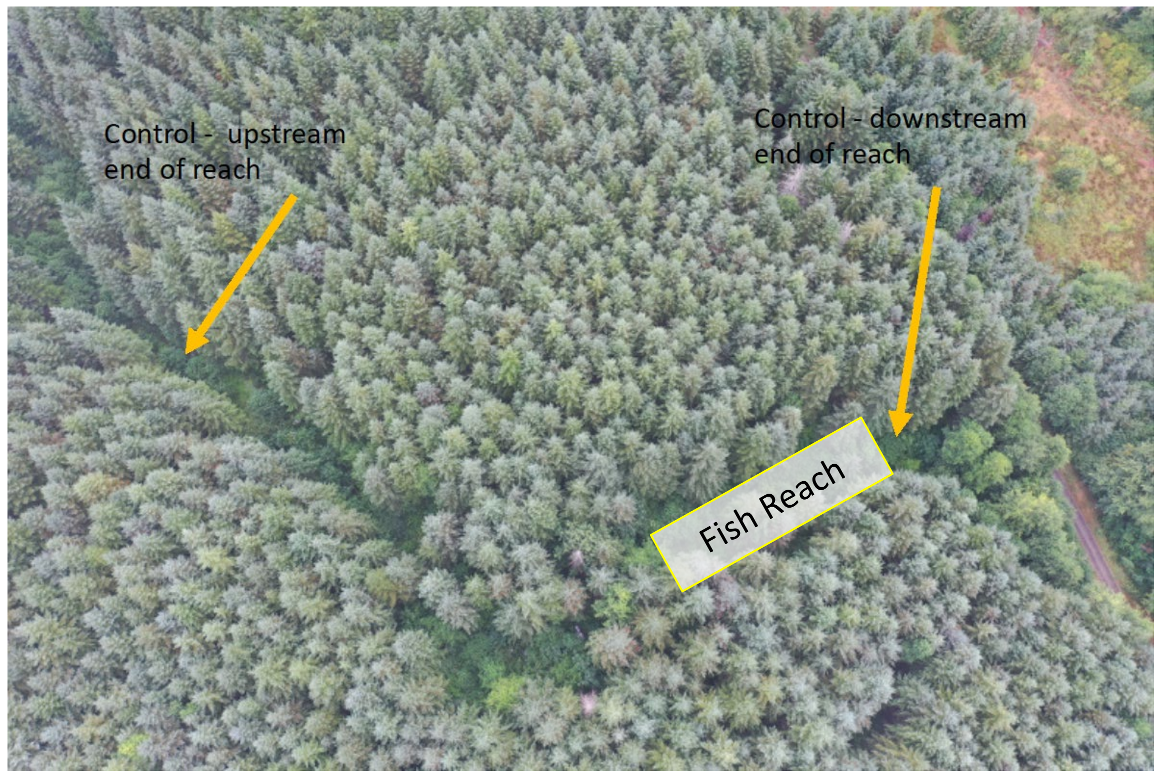


1

Least Light

1. Uncut

Hairball Creek – Control/Reference



Drone Photos Courtesy of Hancock Forest Resources Group

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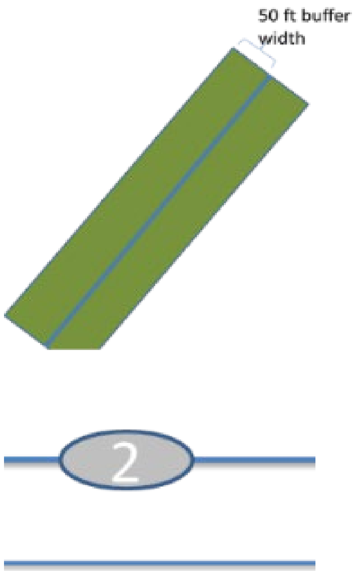
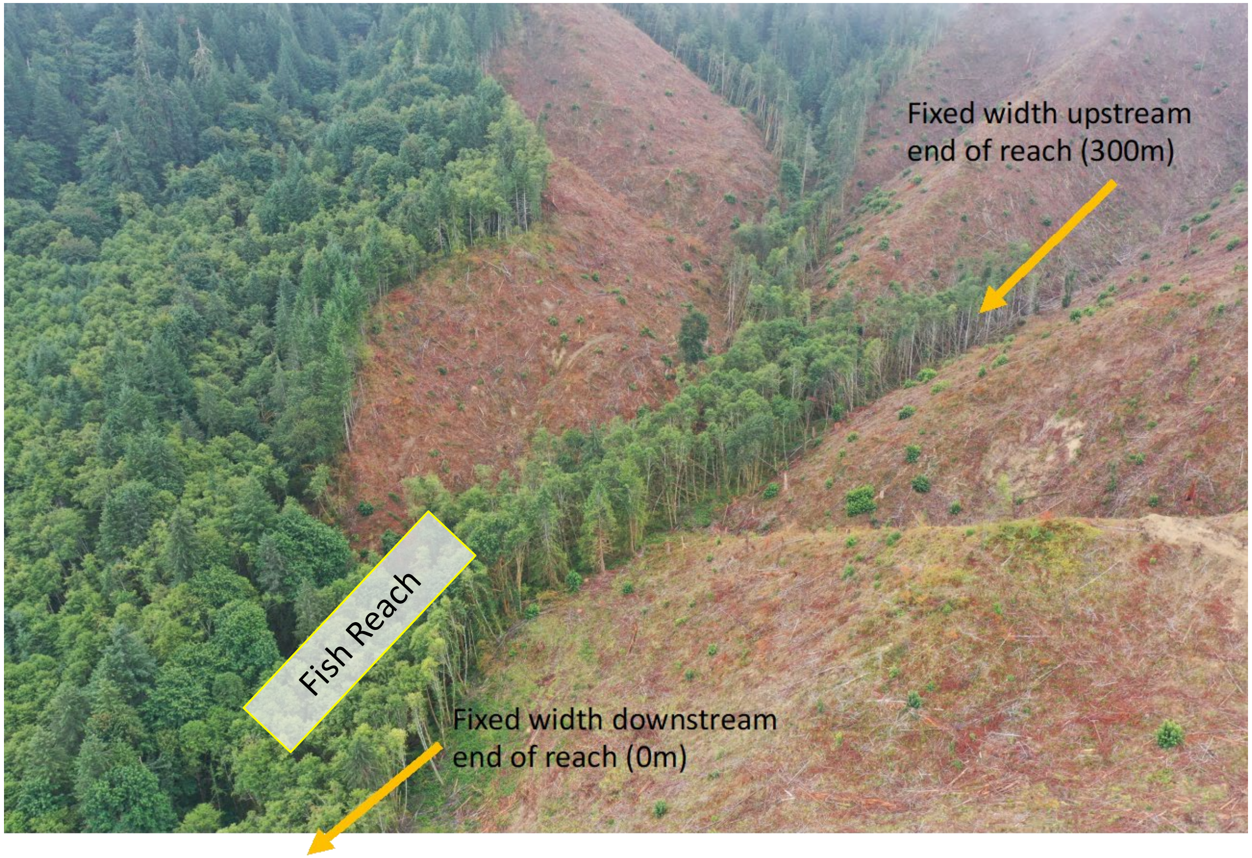


2. Fixed Width

- 50 foot "no touch" buffer

Wabbit Creek – Fixed Width Buffer



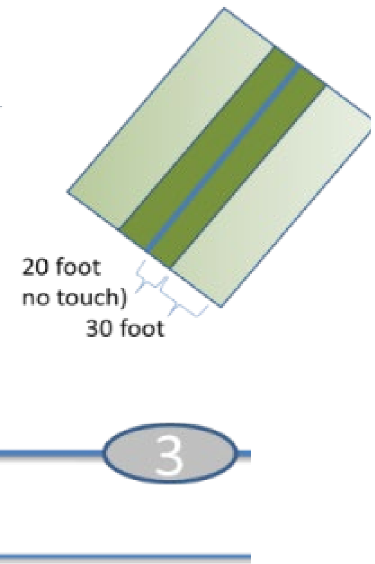
width
- 100 ft max

Drone Photos Courtesy of Hancock Forest Resources Group

reach

Experimental treatments were applied at Valsetz in winter/spring 2021

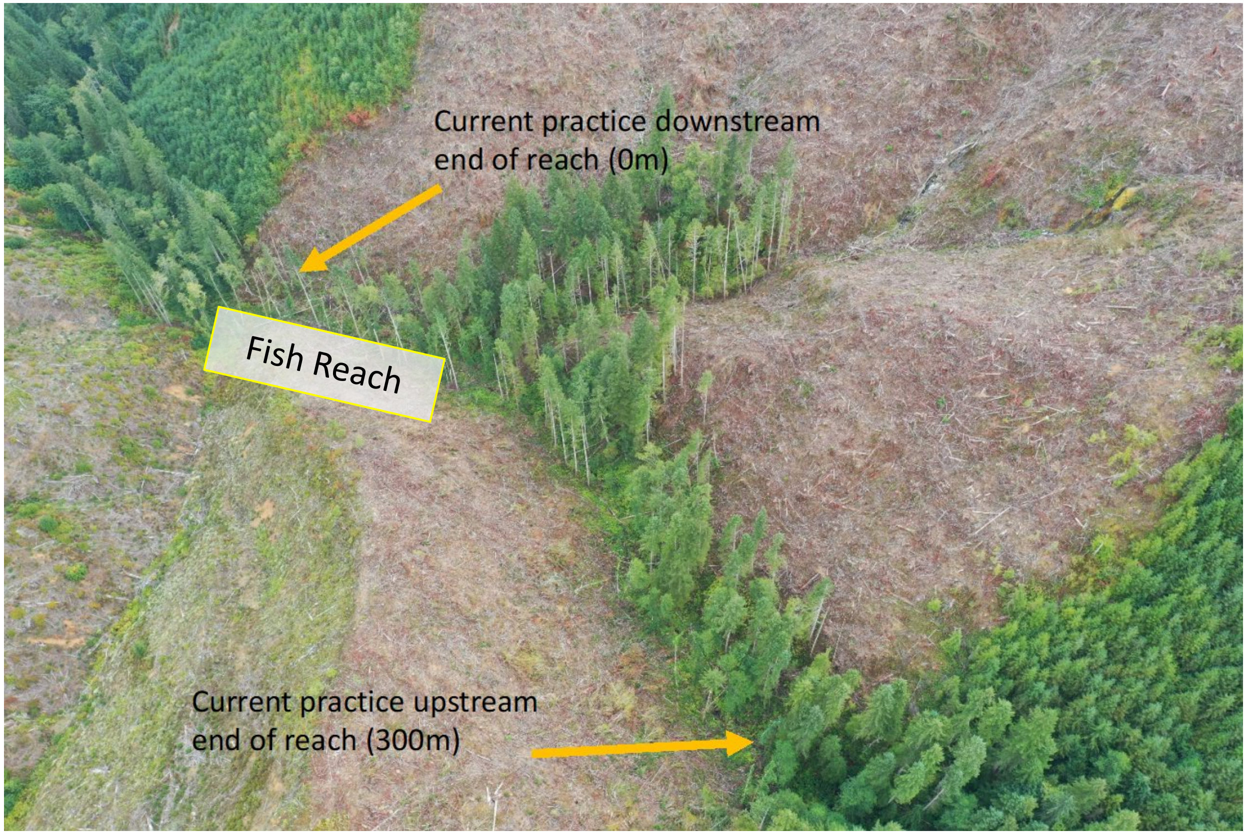
Treatments target a gradient of shading and light availability



3. Current practice

- 50 foot buffer
- 20 foot no touch buffer
- In remainder of buffer, harvest to meet basal a requirements of FPA
  OR: 40 ft² basal area/1000 ft stream

Crossing Creek – Current Practice (using basal area min's etc.)



width
- 100 ft max

reach

Drone Photos Courtesy of Hancock Forest Resources Group

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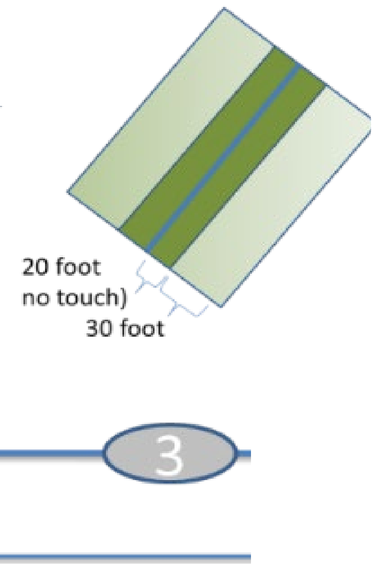

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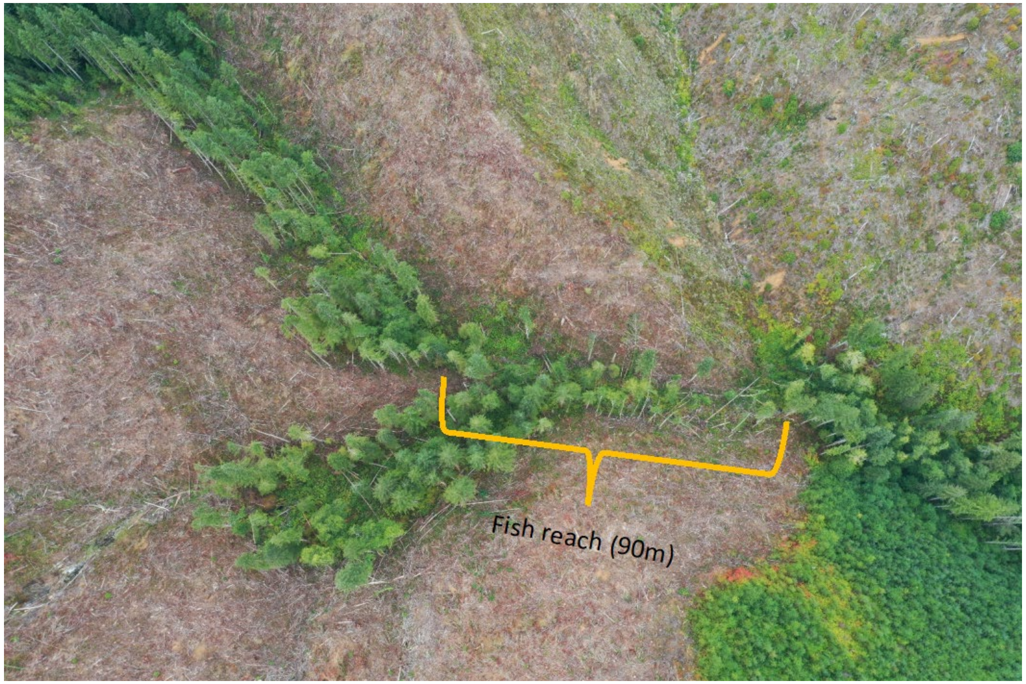

*Considerable blow-down in the fish reach in particular after harvest, which affected **wood loading**, light, and fish capture probabilities.*

width
- 100 ft max

reach

Drone Photos Courtesy of Hancock Forest Resources Group

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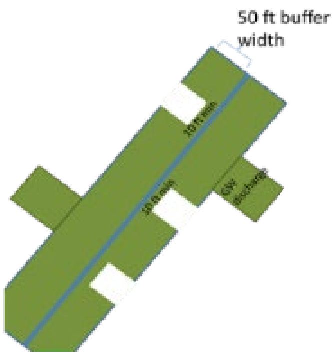
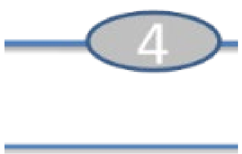
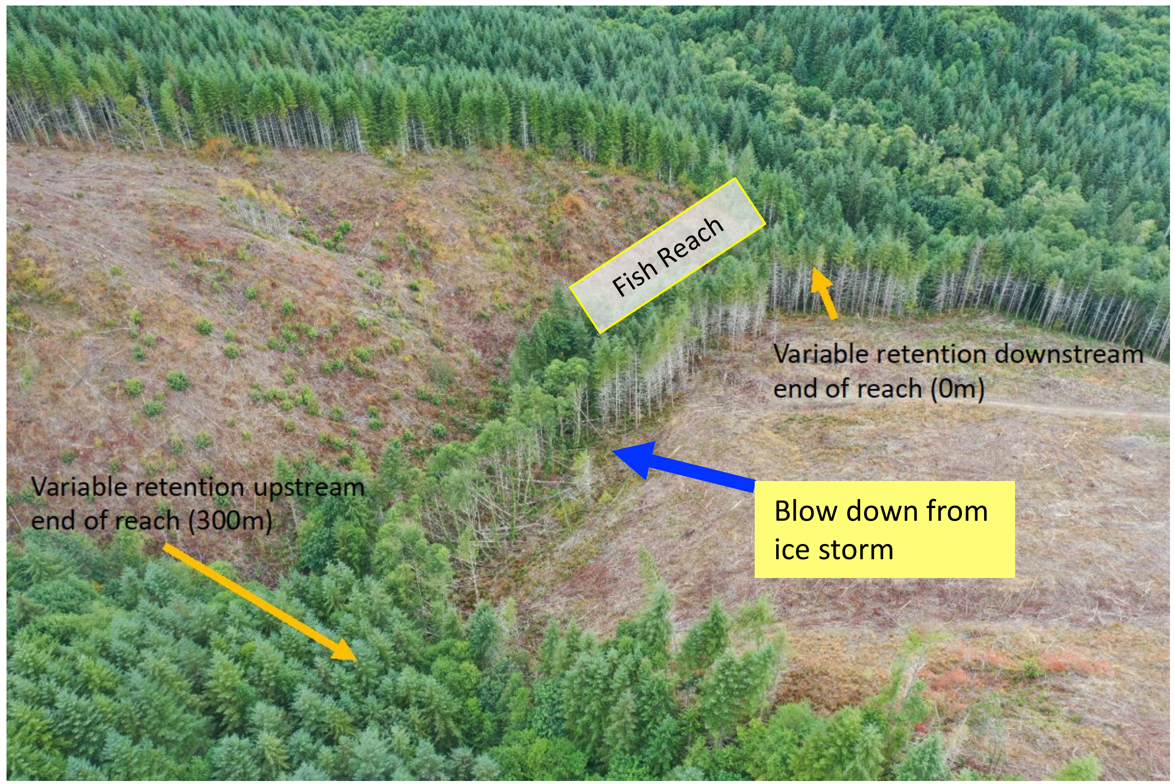




4. Variable Retention

- 50 foot buffer
- Harvest to meet 20 conifer/acre (43560 ft2)
- 10 foot min. width
- 100 ft max

<u>Kirby Creek – Variable Retention Treatment</u>



Drone Photos Courtesy of Hancock Forest Resources Group

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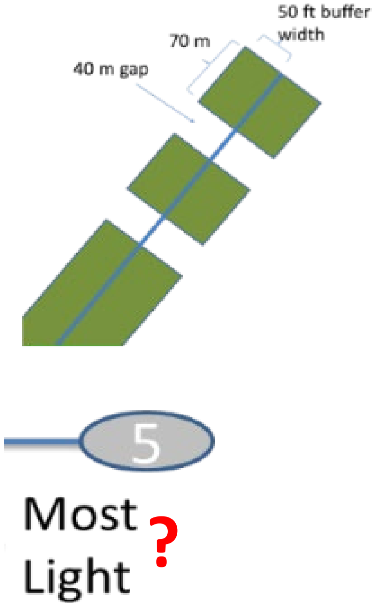
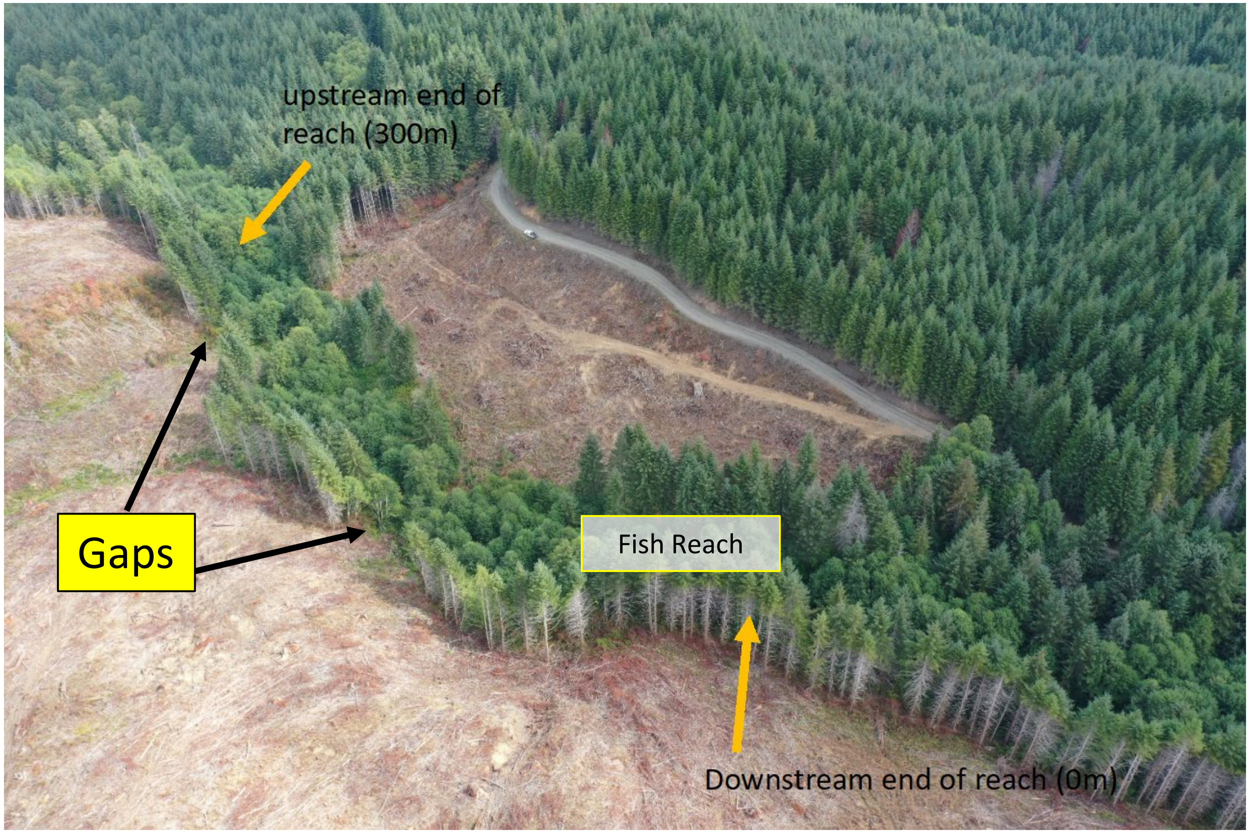


5. Gaps

- 50 foot buffer
- Two 40 m long gaps/ 984 ft (300 m) reach
- Gaps must be at least 164 ft (50 m) above downstream sampling point
- Separate gaps with at least 230 ft (70 m) intervening buffer length along 984 ft (300 m)

Broomstick Creek – Gaps Treatment



Drone Photos Courtesy of Hancock Forest Resources Group

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Treatments target a gradient of shading and light availability

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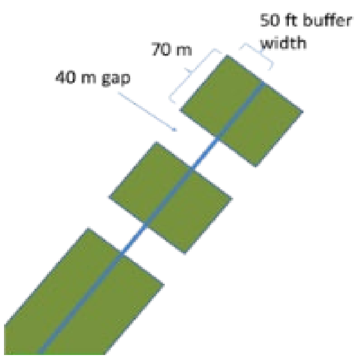

Most
Light ?

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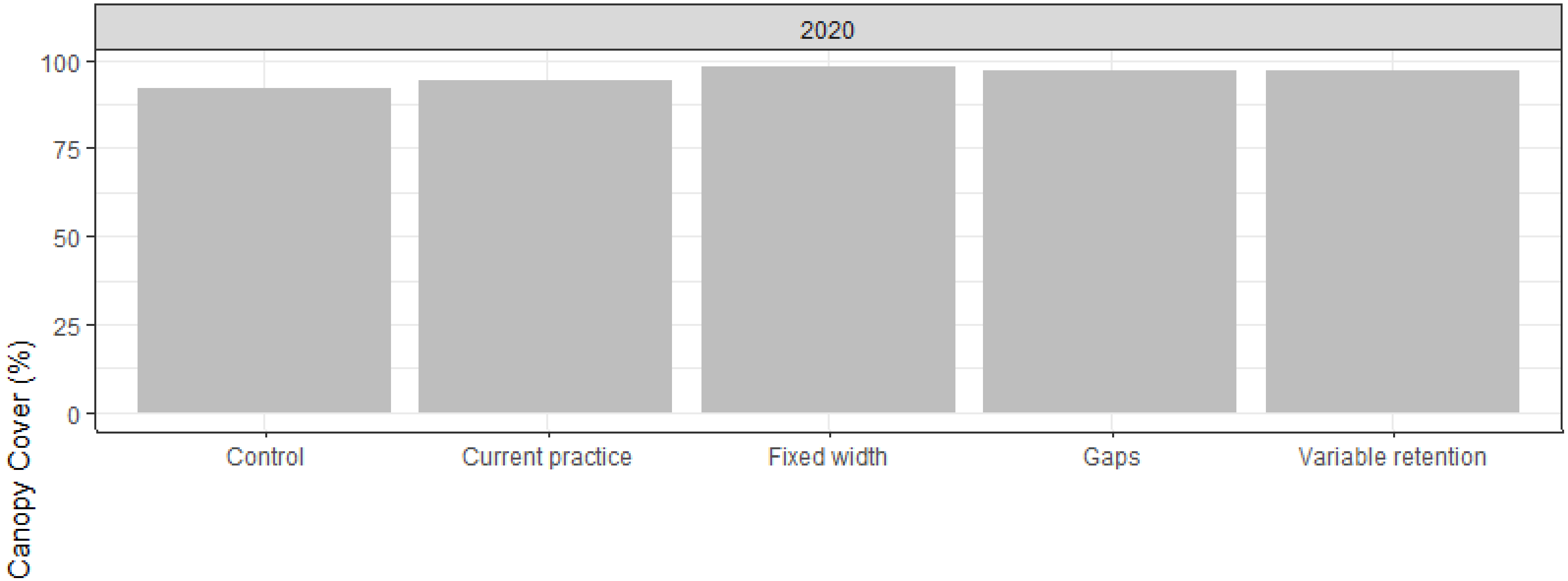
Drone Photos Courtesy of Hancock Forest Resources Group



Pre-treatment

Post-treatment

Blow down event likely a factor here. . .

Blow down event likely a factor here. . .

WB 140m

Before

After

CC 300m

Before

After

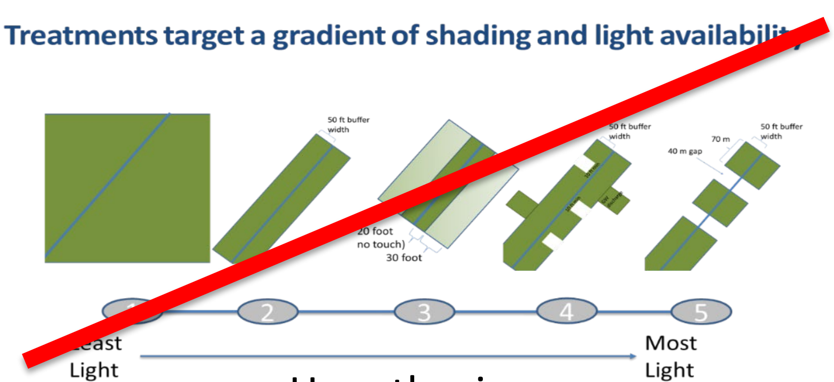
HB 140m

Before

After

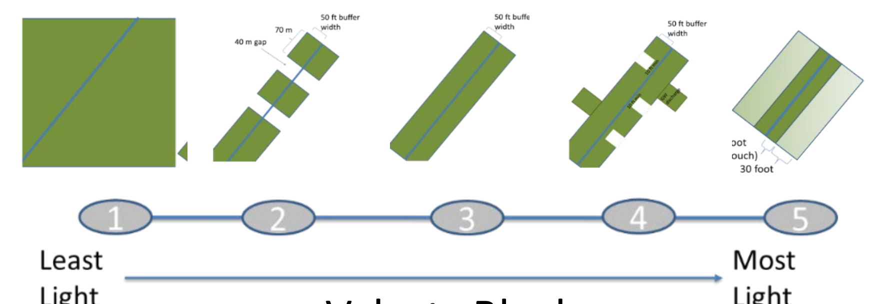
Pre-treatment

Post-treatment



Hypothesis

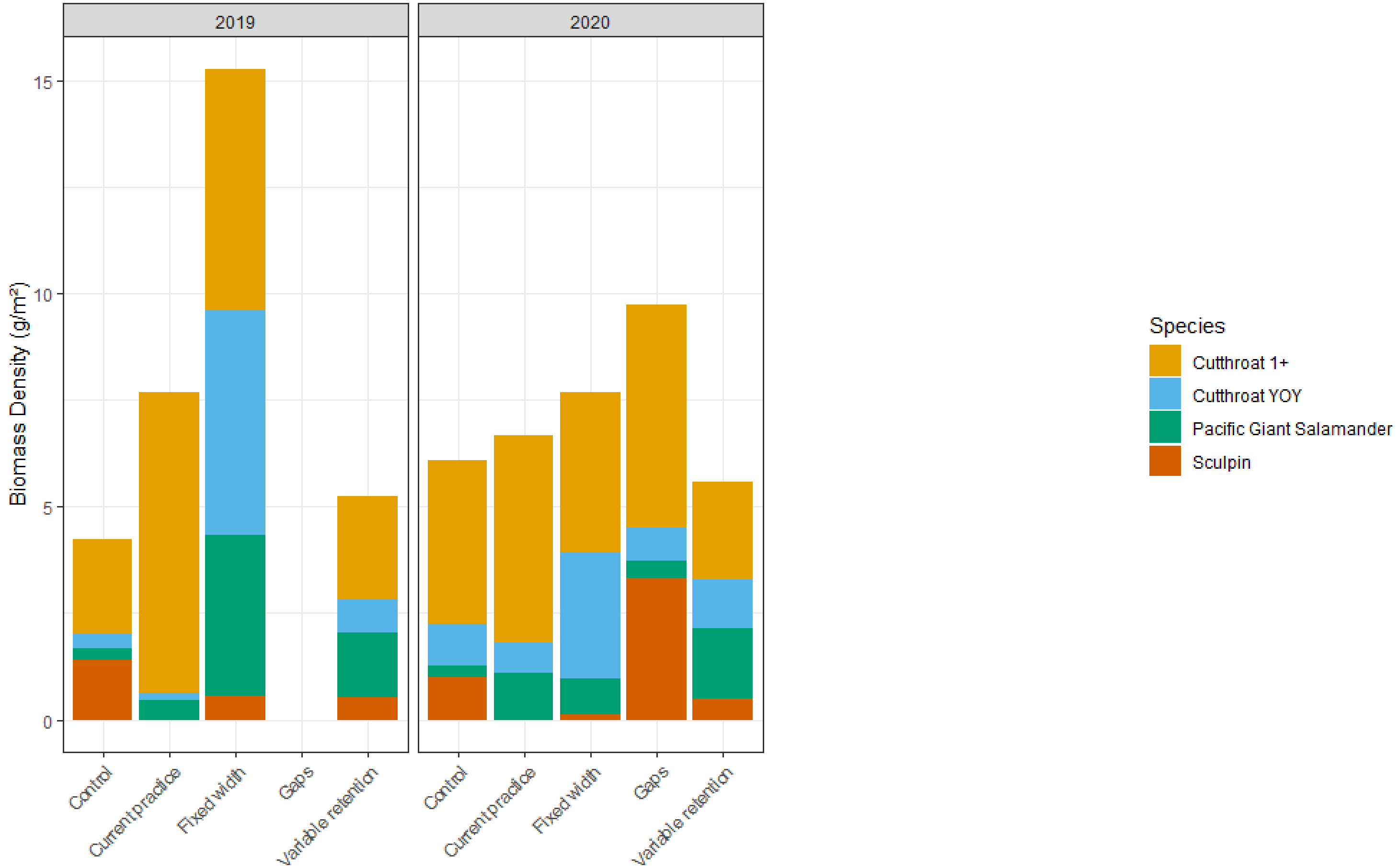
Nonetheless, a clear gradient in cover response
(which will presumably transfer to light)



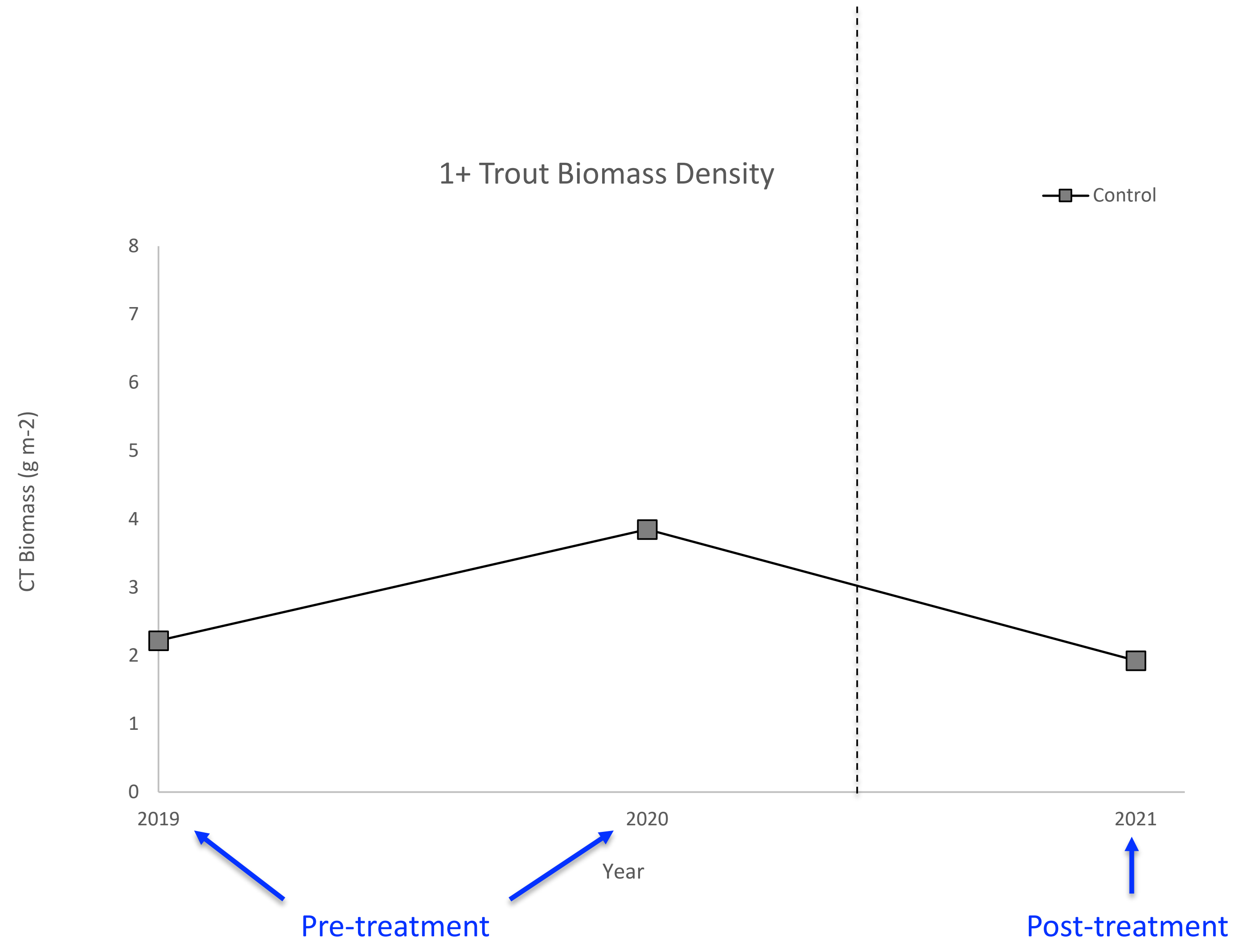
Valsetz Block

Preliminary Results – Biomass density (g m^{-2}) of stream vertebrates

Pre-treatment　　　　Post-treatment



Preliminary Results – Biomass density (g m^{-2}) of cutthroat trout >1+ age



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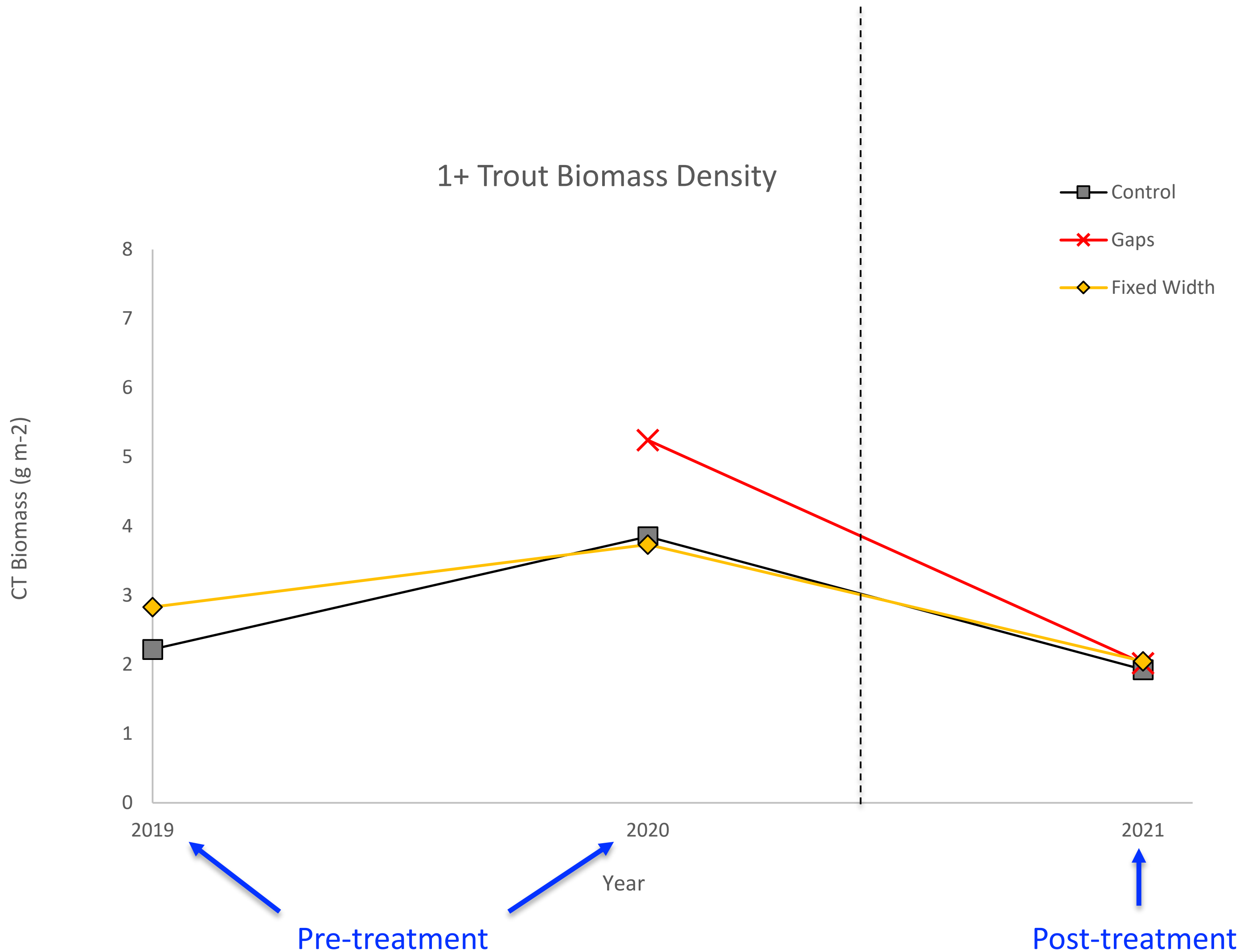

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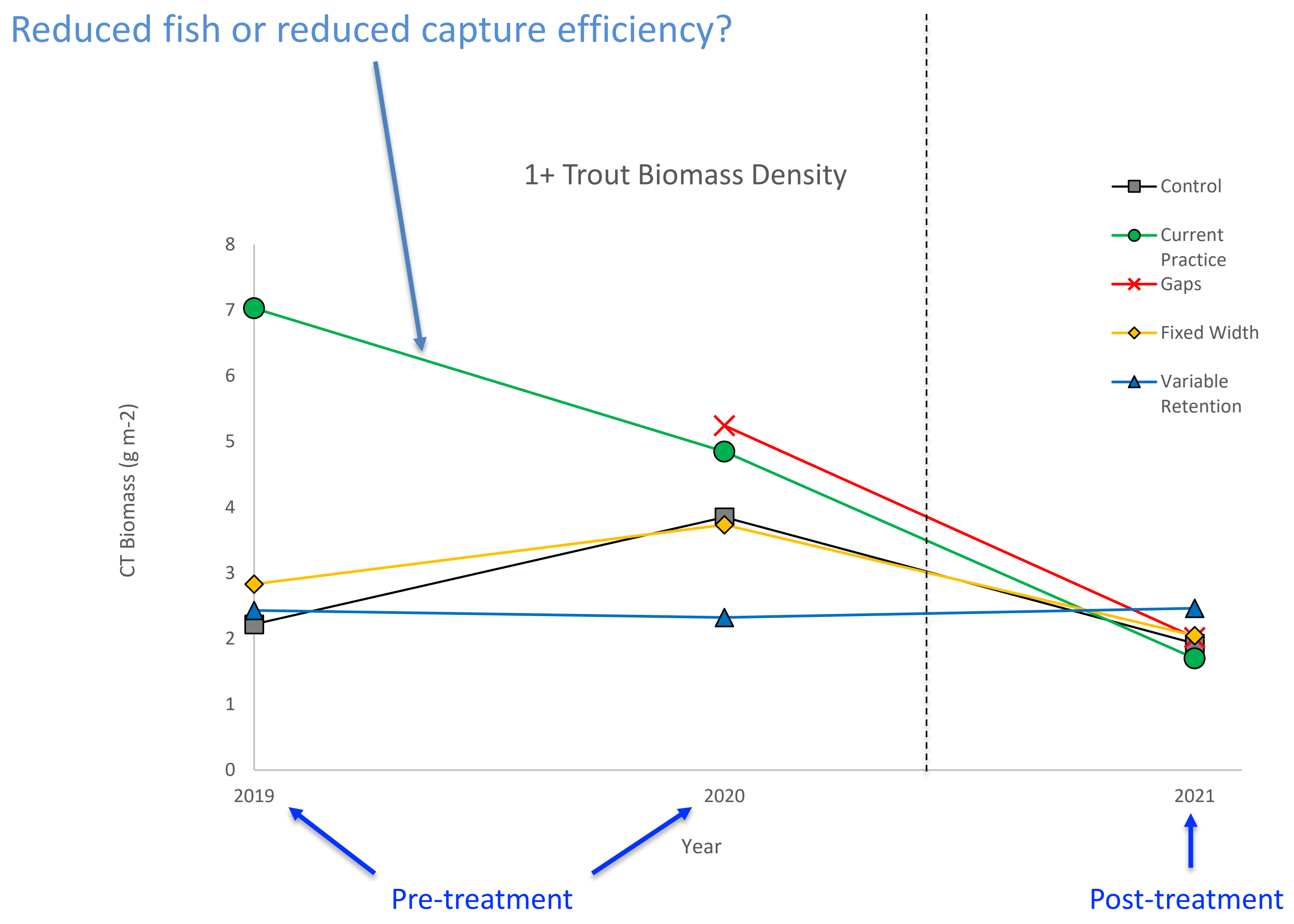
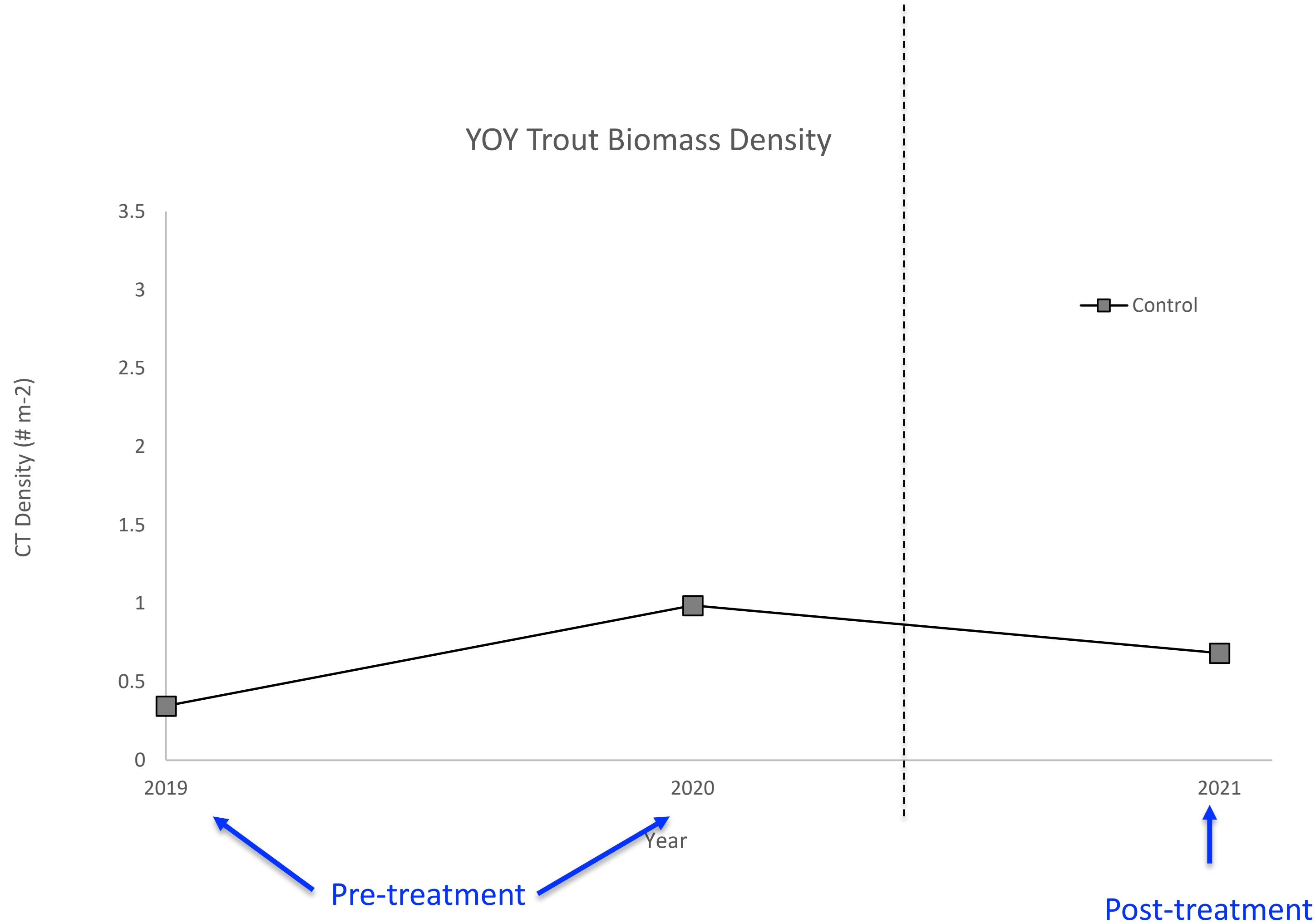


Preliminary Results – Biomass density (g m^{-2}) of 0+ (YOY) cutthroat trout



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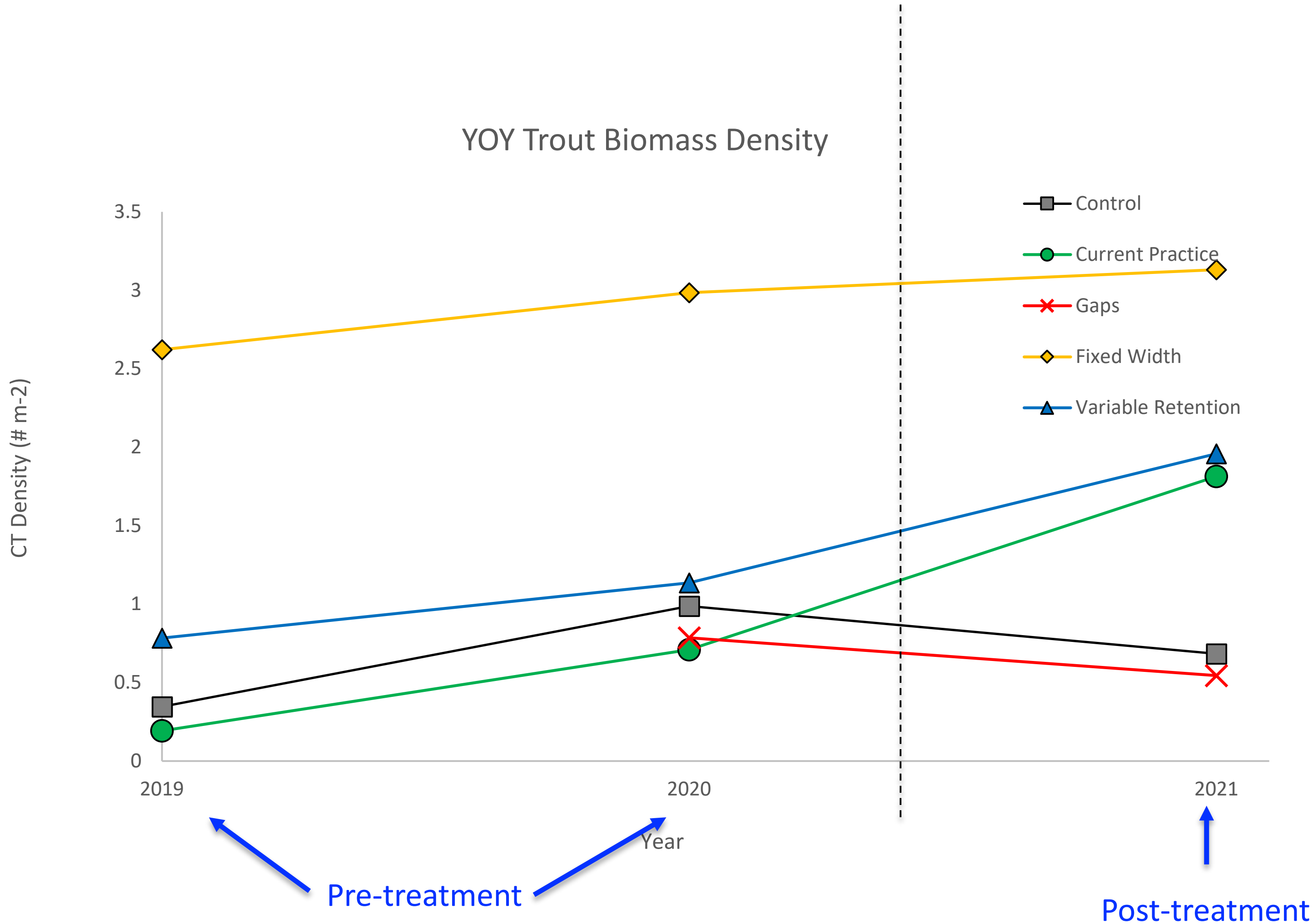

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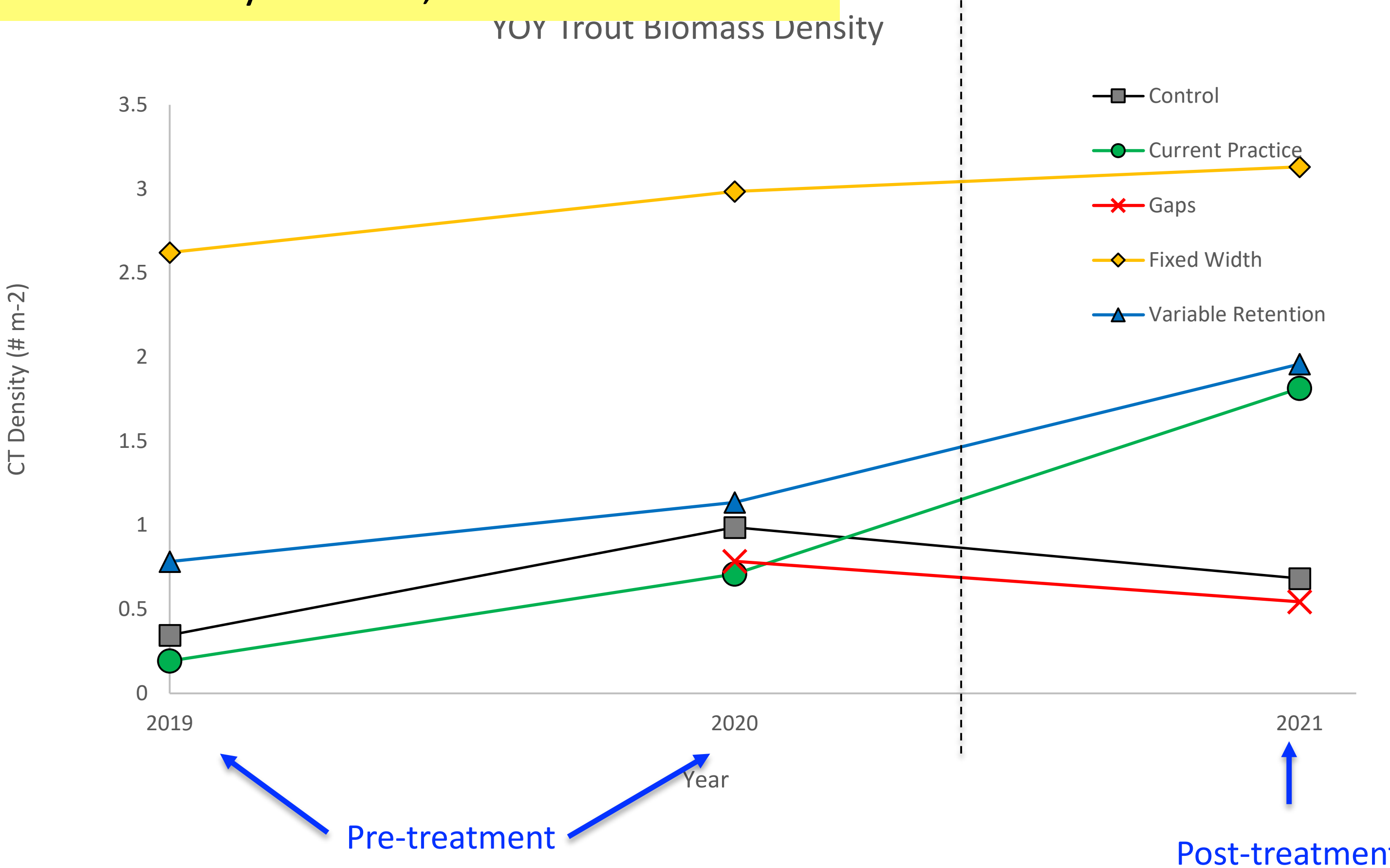
Take Home Messages:

- Reference reach seems okay in capturing aspects of annual variability in some, but not all sites



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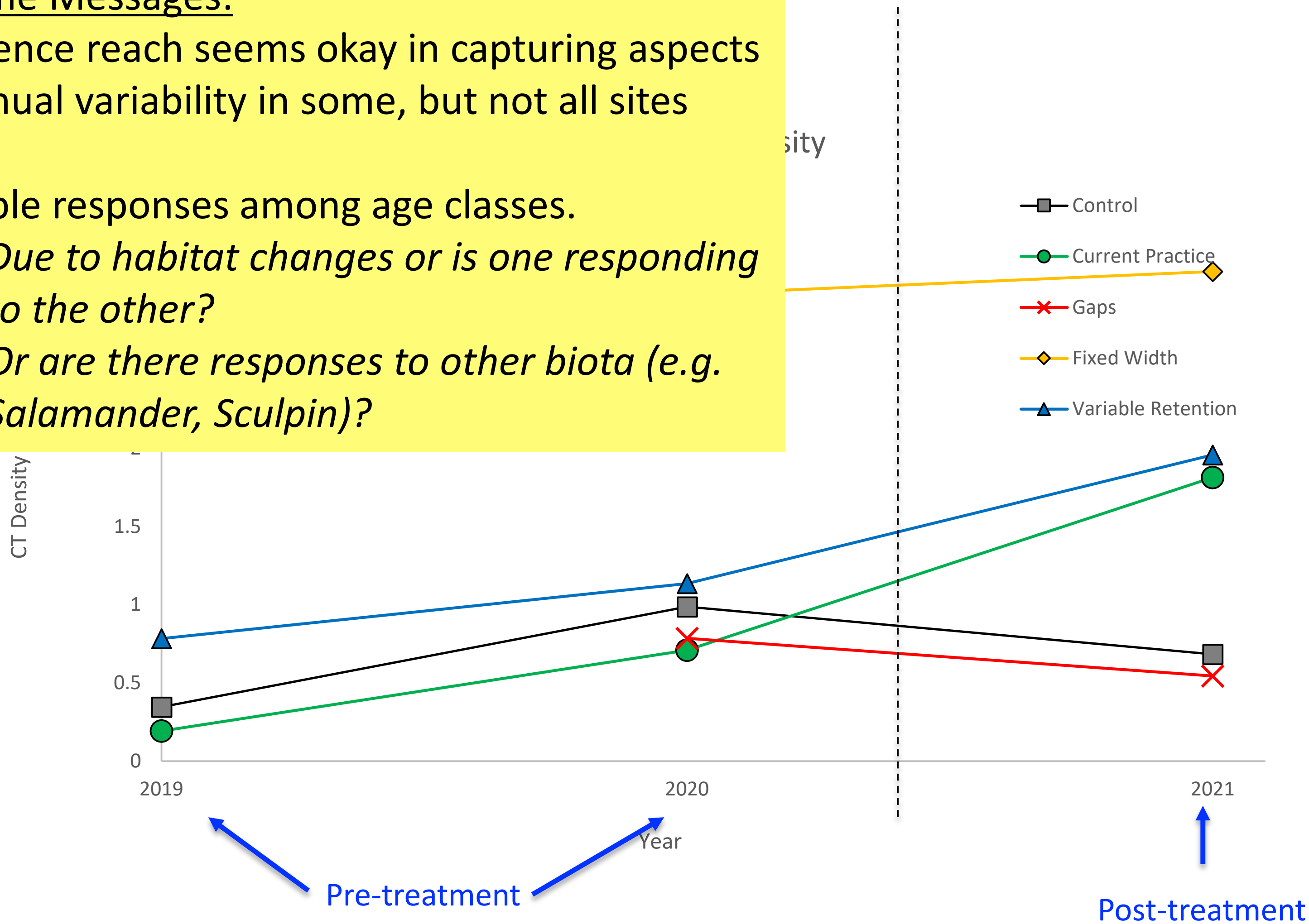

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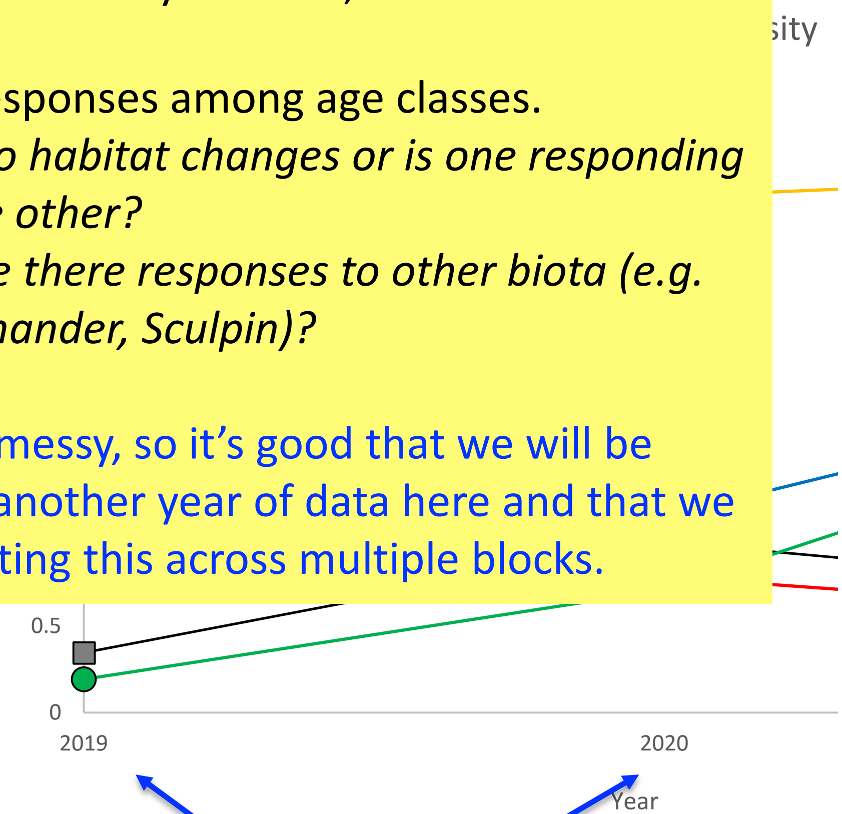
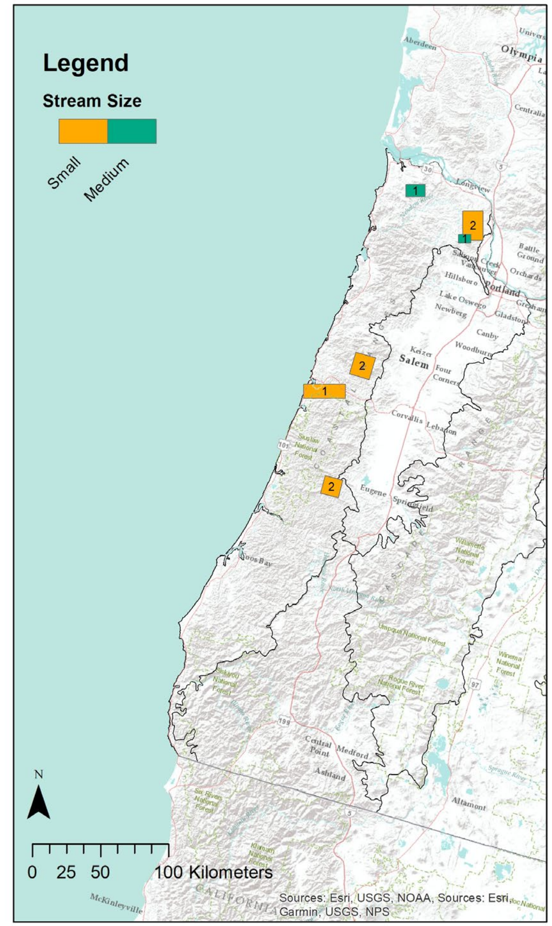
  - *Due to habitat changes or is one responding to the other?*
  - *Or are there responses to other biota (e.g. Salamander, Sculpin)?*
- Ecology is messy, so it's good that we will be collecting another year of data here and that we are replicating this across multiple blocks.



Pre-treatment



Fall 2021 Revised Timeline and overall project layout

Study goal is to have 6 blocks (each block is a set of 5 treatment units) in Oregon

- Year 1 – Survey 2 blocks (10 units) pre-treatment on all
- Year 2 – Survey 2 blocks (20 units) pre-treatment on all
- Year 3 – Survey 6 blocks (30 units) pre-treatment on 5, post-treatment on 1
- Year 4 – Survey 6 blocks (30 units) pre-treatment on 4, post-treatment on 2
- Year 5 – Survey 5 blocks (25 units) post-treatment on all
- Year 6 – Survey 4 blocks (20 units) post-treatment on all

- Other Funding sources . . .
  - NCASI – 2022 request in progress
  - Agricultural Research Foundation (ARF) grant applying for a 2022 new grant

QUESTIONS?

Collaborators:

Hancock Forest Management®
A Manulife Investment Management Company

GreenWood Resources

Weyerhaeuser

NCASI
IMPACT. SCIENCE. SOLUTIONS.

CampbellGlobal
FOREST & NATURAL RESOURCE INVESTMENTS

Roseburg

Giustina Land & Timber Co.

Rayonier

Funding:

- NCASI
- Fish and Wildlife Habitat in Managed Forests Grant Program
- OSU Ag. Research Foundation

Other contributors:

- The many forest engineers, managers, and resource specialists at the collaborating companies

Fieldwork and data collection:

- Ashley Sanders
- Nathan Maisonville
- Rylee Rawson
- Annika Carlson
- Zowie DeLeon