2023 MSI DWC Monitoring Review: A Focus on House Creek

Dolores Watersheds Collaborative

08 May 2024

Mountain Studies Institute
SAN JUAN MOUNTAINS COLORADO

DWRF
Dolores Watershed
Resilient Forest
Collaborative

Thank You!

- The DWC Monitoring and DFC/Ponderosa Resilience Metrics Workgroup

- Danny and Nina

- San Juan National Forest – David, Travis, Emma

- MSI's 2023 Forest Monitoring Crew – Brooke, Caeley, Claire, Erin, Halley, Nicholas, and Bender

- Current and Past MSI Staff – Bill Smith, Julia, Alex, Mike Remke, and Laura Hanna

- CFRI – Especially Marin Chambers

- Mike Battaglia, RMRS

Goals for Today

Context
Brief review of the history & context of monitoring and desired conditions conversations

Update
- Update on monitoing progress made in 2023: the where and protocol modifications.
- Update on monitoring frameworks and data shareing systems

Report
Connect pre-treatment condistions for the House Creek IRSC units to DWC resilience metrics

Reflect
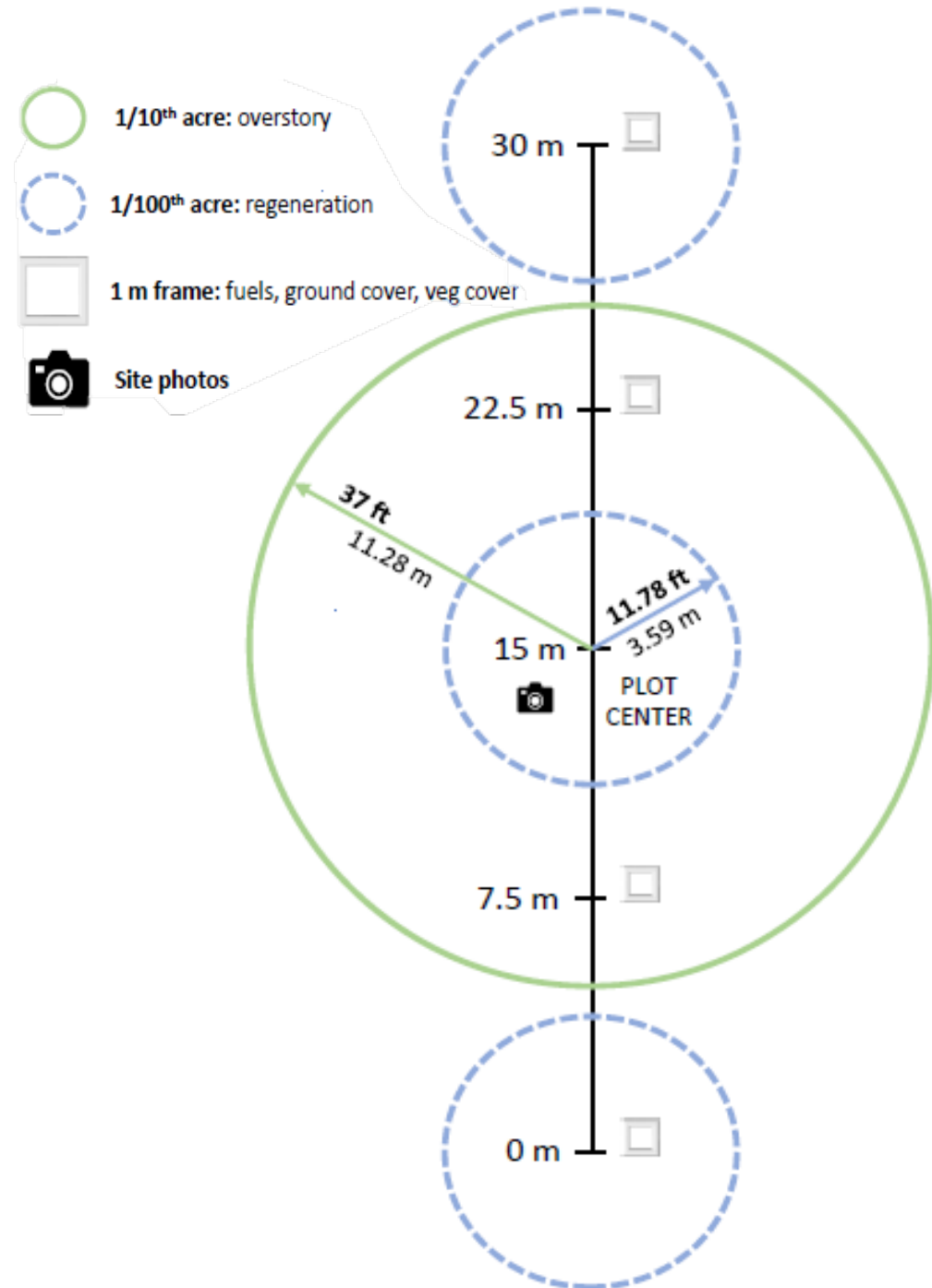Discuss and monitoring efforts/processes (as time allows)

Context & Background

- Ongoing environmental assessment engagement
  - Lone Pine (2020)
    - Tours, presentations/discussions, monitoring,...
    - DWRF as a collaborative partner in the EA
    - Earlier pre-implementation monitoring report-out, Remke Fall 2020
    - 2022 - Need to modify monitoring focus areas to accommodate changes to EA after objection resolutions, Large Tree Retention
    - 2022 – Focus post-treatment monitoring of the BEST units
    - 2023 – Assessment of monitoring to capture information to understand resilience metrics
  - Salter (2022)
    - Pre-scoping, tours, ongoing presentations/discussions, science presentation based on DWRF questions, process review
    - Expectations and commitments document
    - 2023 Modification to protocols to capture information on large tree ages and characteristics
    - 2023 Work with SJNF staff to establish control bocks in Salter landscape
    - 2023 Litigation There have been challenging discussions with these EAs
- Project & monitoring discussions → DWRF desired conditions development
- 3rd party monitoring is ongoing - focus of today

MSI Protocol in Brief

- Site Photos (Overview and Quadrat)
- Overstory
  - 1 1/10 acre fixed radius plot (DBH, height, canopy base height, insect and disease, cone presence, char/scorch height)
  - Cover transect

- Regen/Shrub Cover
  - 3 1/100 acre fixed radius plots (stem counts of all shrub and tree regen)
  - Line intercept transect for shrub cover
- Grass/Forb
  - 4 1 m^2 percent relative cover by functional group quadrats
- Fuels
  - 4 1 m^2 fuel photo load estimates quadrats
- Ground Cover
  - 4 1 m^2 percent cover quadrats
- Invasives
  - Presence/Absence within a 10m belt transect (centered on 30m transect)

1/10th acre: overstory

1/100th acre: regeneration

1 m frame: fuels, ground cover, veg cover

Site photos

30 m

22.5 m

15 m   PLOT CENTER

7.5 m

0 m

37 ft
11.28 m

11.78 ft
3.59 m

2023 Lone Pine Update

- Communications on Sale Timing

- Monitoring Focus Areas

- Use of Plots now outside Implementation

- Integration of Prescribed Fire

- QA/QC Plan

- Data management within the Collaborative Communications Folder

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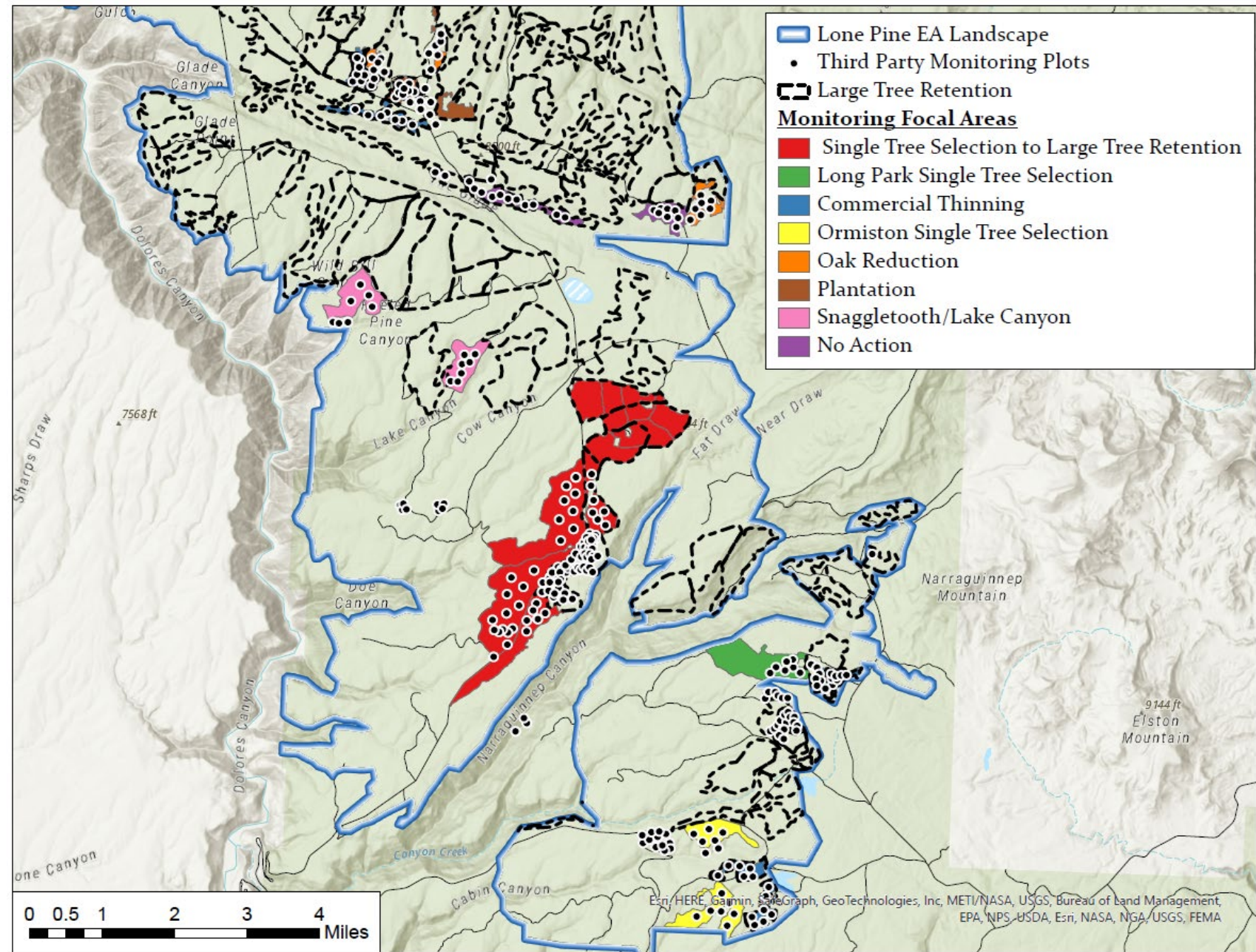
2023 Salter Updates

- Communications on Sale Timing

- Modification of Protocols for tree age and characteristics

- Establishment of controls in the Banquet units, walk trough in May 2023

- House Creek site visit with SJNF staff in May 2023 to determine representative areas outside already marked units, PFA

- QA/QC Plan

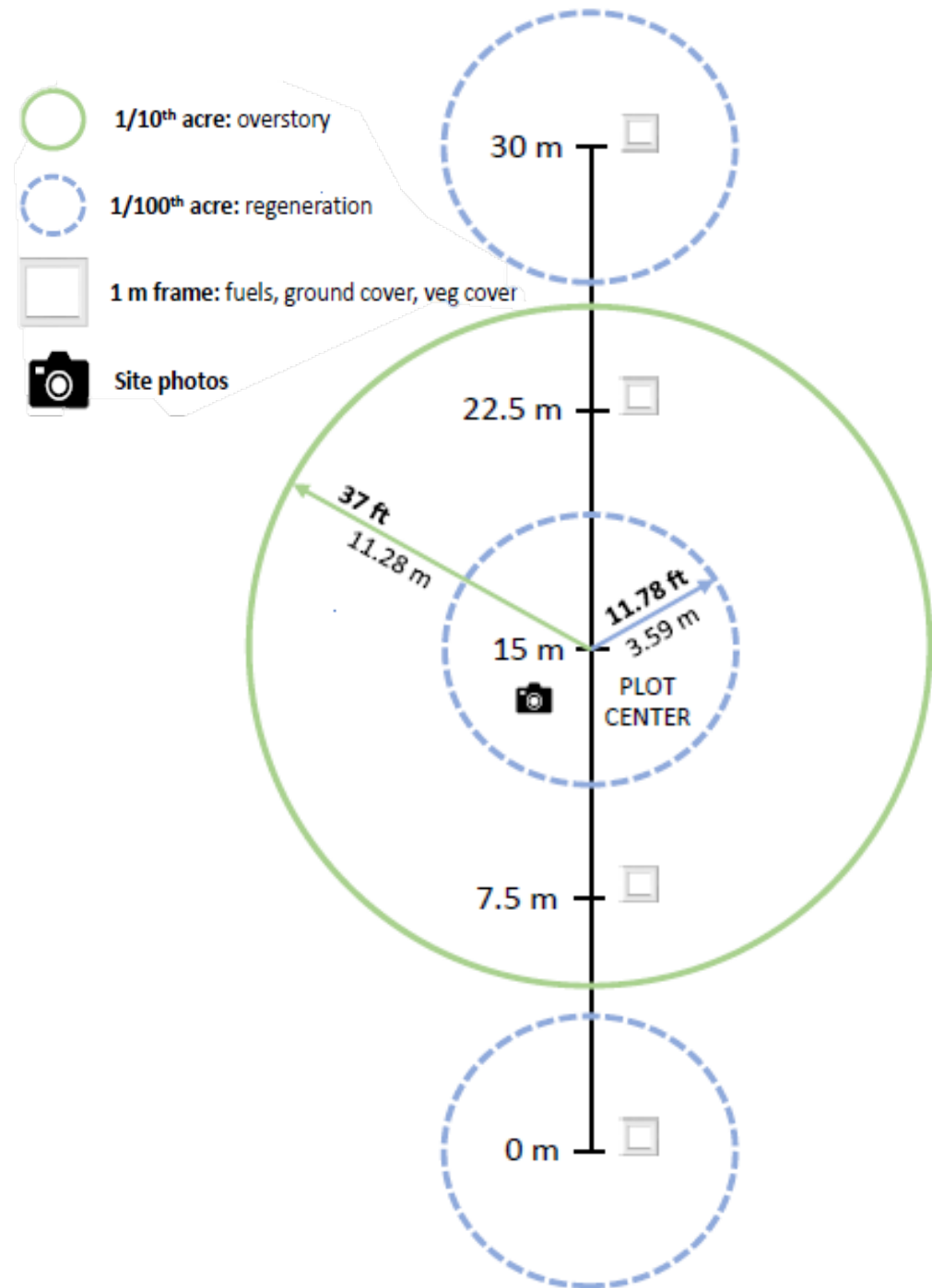- Data management within the Collaborative Communications Folder
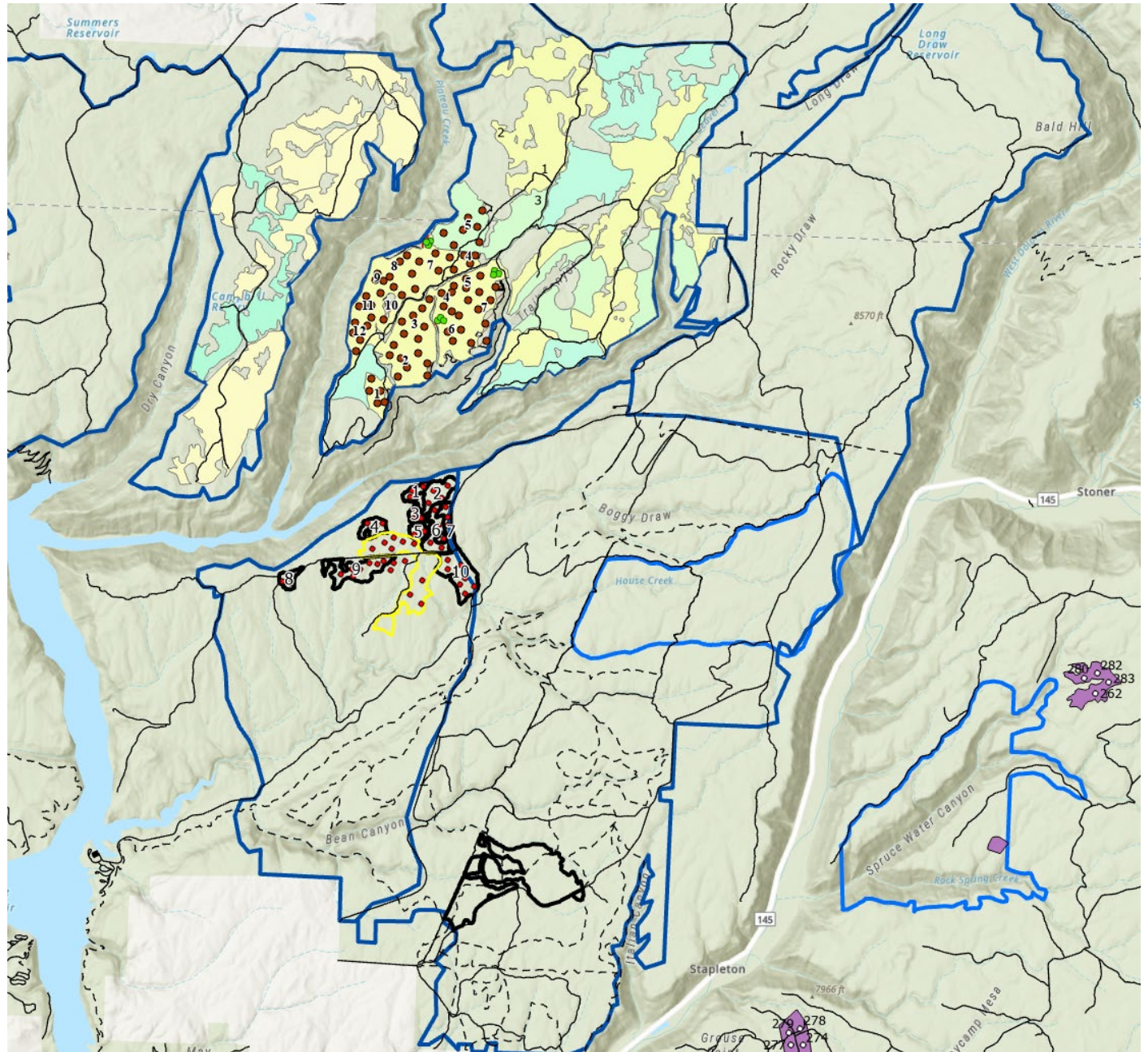
Additions to Salter Protocols

- Tree Cores
  - First tree in 12-16in and 16-20in classes
  - Largest tree on plot >20in
- Large Tree Qualitative Metrics

Huckaby, L.S., et al. 2003. *Field guide to old ponderosa pines in the Colorado Front Range*. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Table 1—Identifying characteristics of ponderosa pine trees at different life stages.

	Crown shape	Live crown ratio	Branches	Trunk shape	Bark	Likely injuries
Old trees (>200 years)	flattened, "bonsai" shape, sparse and open, may be lopsided	small; often fire-pruned	few but large	columnar	smooth, small flakes, pale orange or gray	fire scars, dead tops, broken branches, lightning scars, rot, burls, exposed roots
Transitional trees (150-250 years)	ovoid, flattening on the top, full and rounded	moderate; perhaps half the trunk, beginning to self-prune	fine branches in the interior of the crown dying, longer branches thickening	beginning to lose taper	orange or gray flakes with dark edges, shallow fissures, becoming smoother	relatively few; possibly healed or mostly healed fire scars, lightning scars, mistletoe
Young canopy trees (<150 years)	pointed top, "teardrop" or "Christmas tree" shape, dense foliage	large	many fine branches, dense foliage near the trunk	tapered	large, coarse flakes, deep fissures, dark gray or black with dark orange	very few; possible mistletoe or lightning scars

1/10th acre: overstory

1/100th acre: regeneration

1 m frame: fuels, ground cover, veg cover

Site photos

30 m

22.5 m

37 ft
11.28 m

11.78 ft
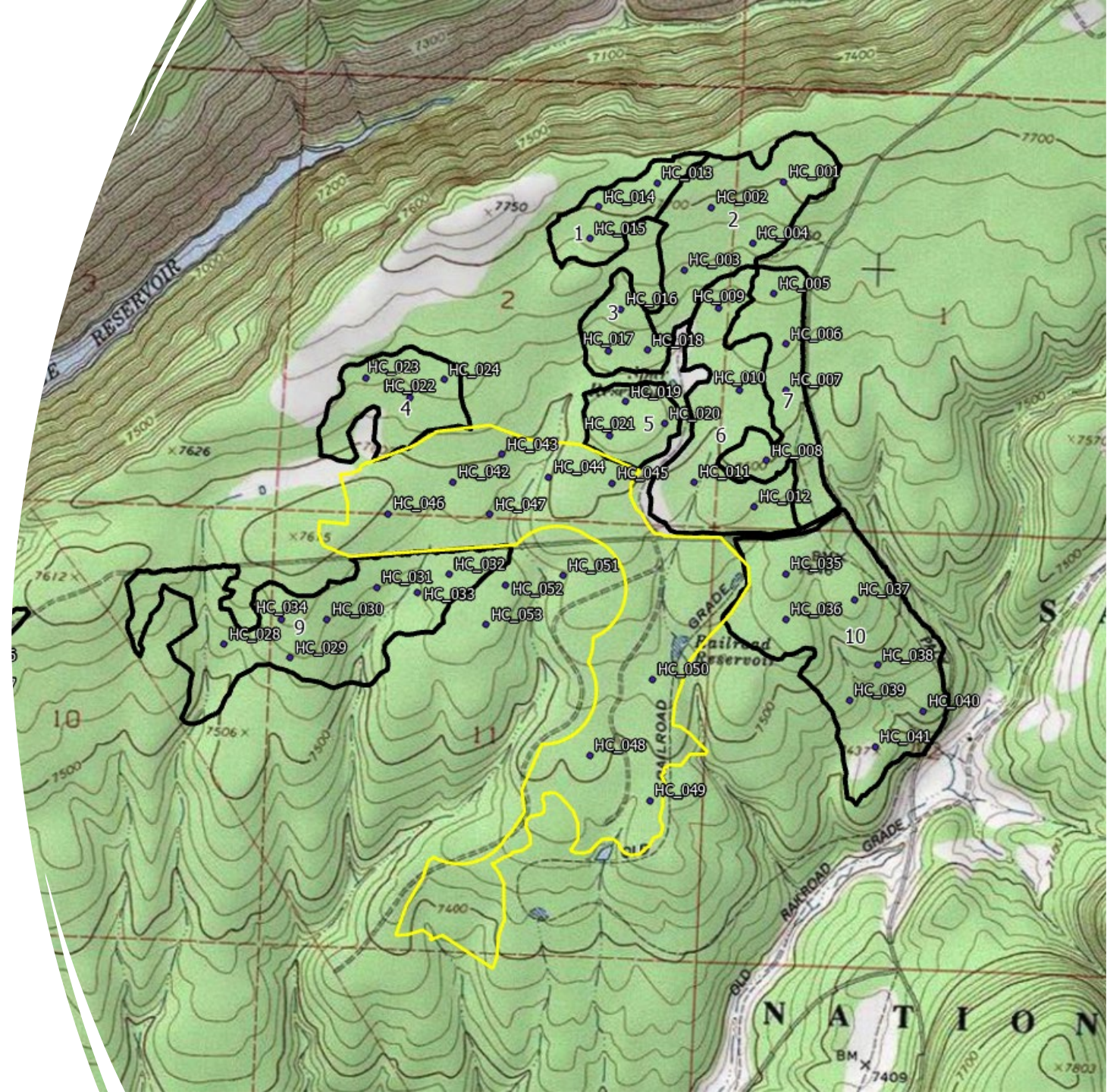3.59 m

15 m

PLOT CENTER

7.5 m

0 m

Banquet Control and Plot Establishment

- Random selection of even area (~100ac) polygons

- Site walk trough, potential control blocks eval for representative nature

- Subset of potential control blocks sent to SJNF staff

- SJNF eval with operations and transportation systems for sale

- MSI sought advice from CFRI and RMRS on control est within small blocks (~25ac)

- Sale boundary marked to exclude control blocks
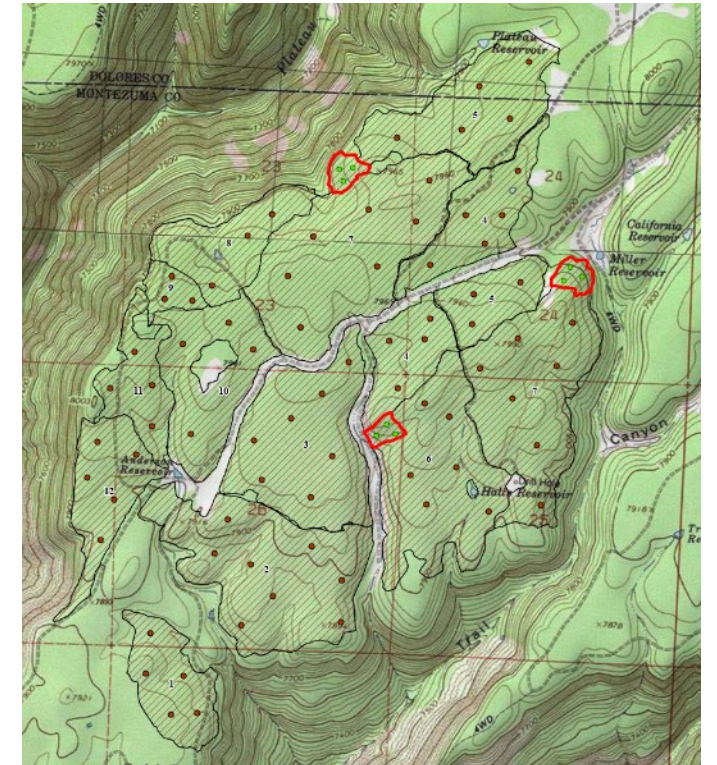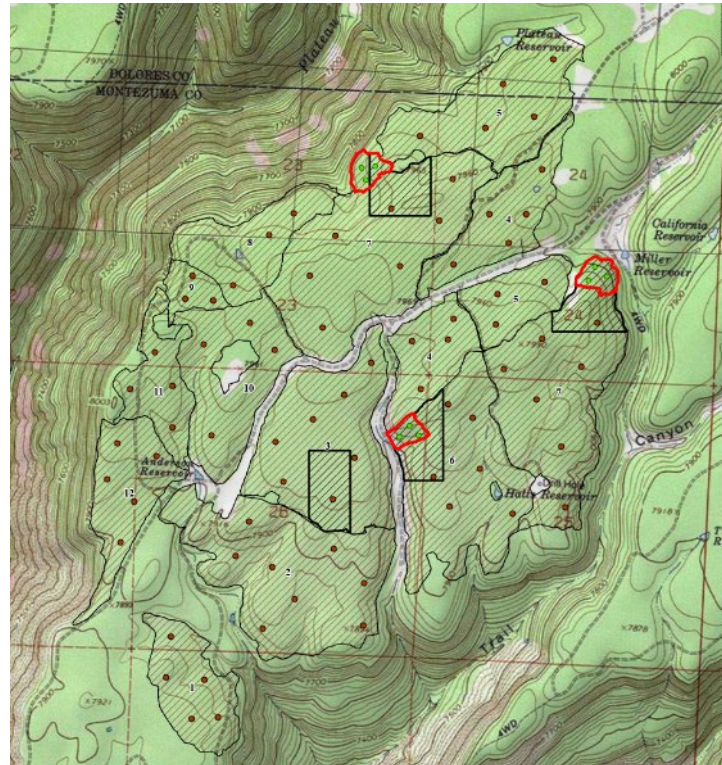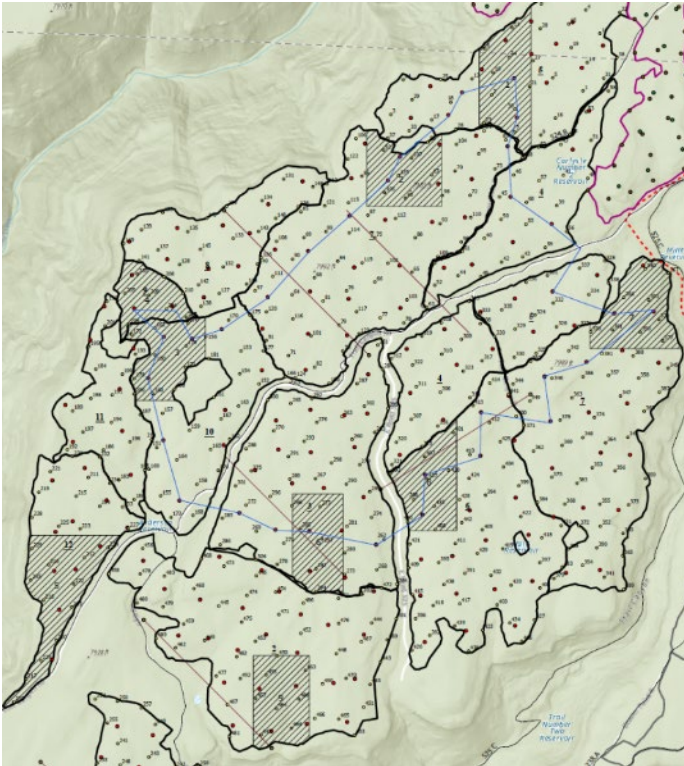
House Creek IRSC Pre-Treatment

- Use of PFA and plots in no cut areas as non-treatment ref

- Field visit in May 2023

- Addition of Large Tree protocols

- Sep/Oct monitoring so limitations w/ shrub data

1	**Tree species composition** that promotes ecological resilience - BASED ON SITE INDEX AND RECENT DISTURBANCE HISTORY
2	Mosaic of forest **understory shrub composition, density, and size** that promotes ecological resilience.
3	Mosaic of forest **understory grass and forb composition, density, and cover** that promotes ecological resilience. - ~5-10 NATIVE GRASS SPECIES; INDICATOR FORB SPECIES?
4	**Reduced noxious or invasive plants**, promoting ecological resilience. - MORE THAN PRESENCE/ABSENCE; IS ABUNDANCE A PRIORITY? A SUBJECTIVE ASSESSMENT?
5	Stand scale - Complex mosaic of **tree density and basal area** that promotes ecological resilience
6	Stand scale - Complex mosaic of **tree sizes** that promotes ecological resilience
7	Stand scale - Complex mosaic of **tree ages and increased old growth** that promotes ecological resilience - OLD GROWTH CHARACTERISTICS; CORE A SITE/REFERENCE TREE
8	Stand scale - Complex mosaic of **snags** and down wood that promotes ecological resilience - DECAY CLASS METRICS (WHICH TO USE?)
9	Stand scale - Complex mosaic of **forest floor conditions** that promotes ecological resilience - SOIL DISTURBANCE, QUALITATIVELY CAPTURE BROAD DISTURBANCES CATEGORIES (TRACKS, RUTTING,...)
10	Stand scale - Complex **within- stand heterogeneity in forest density, size, and age** that promotes ecological resilience
11	Landscape scale - Complex mosaic of forest density, size, and age that promotes ecological resilience - **Landscape patch sizes and structures**
12	Landscape scale - Complex mosaic of forest density, size, and age that promotes ecological resilience - **Stand ages**
13	Landscape scale - Complex mosaic of forest density, size, and age that promotes ecological resilience - **Habitat fragmentation**
14	Insects and disease disturbances - Increase resistance and **resilience to bark beetle outbreaks**.
15	Fire disturbance - Increase **resistance and resilience to fires**

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Desired Condition 4 - Noxious and Invasives

Mosaic of forest understory composition, density, and cover that has reduced noxious or invasive plants, promoting ecological resilience.

Desired Trends

● Decreased occurrence and cover of noxious/invasive plant species as listed on Colorado noxious weed species lists A, B and C

● Post-treatment, maintain the appropriate native plant community to limit potential for establishment of noxious/invasive plant species
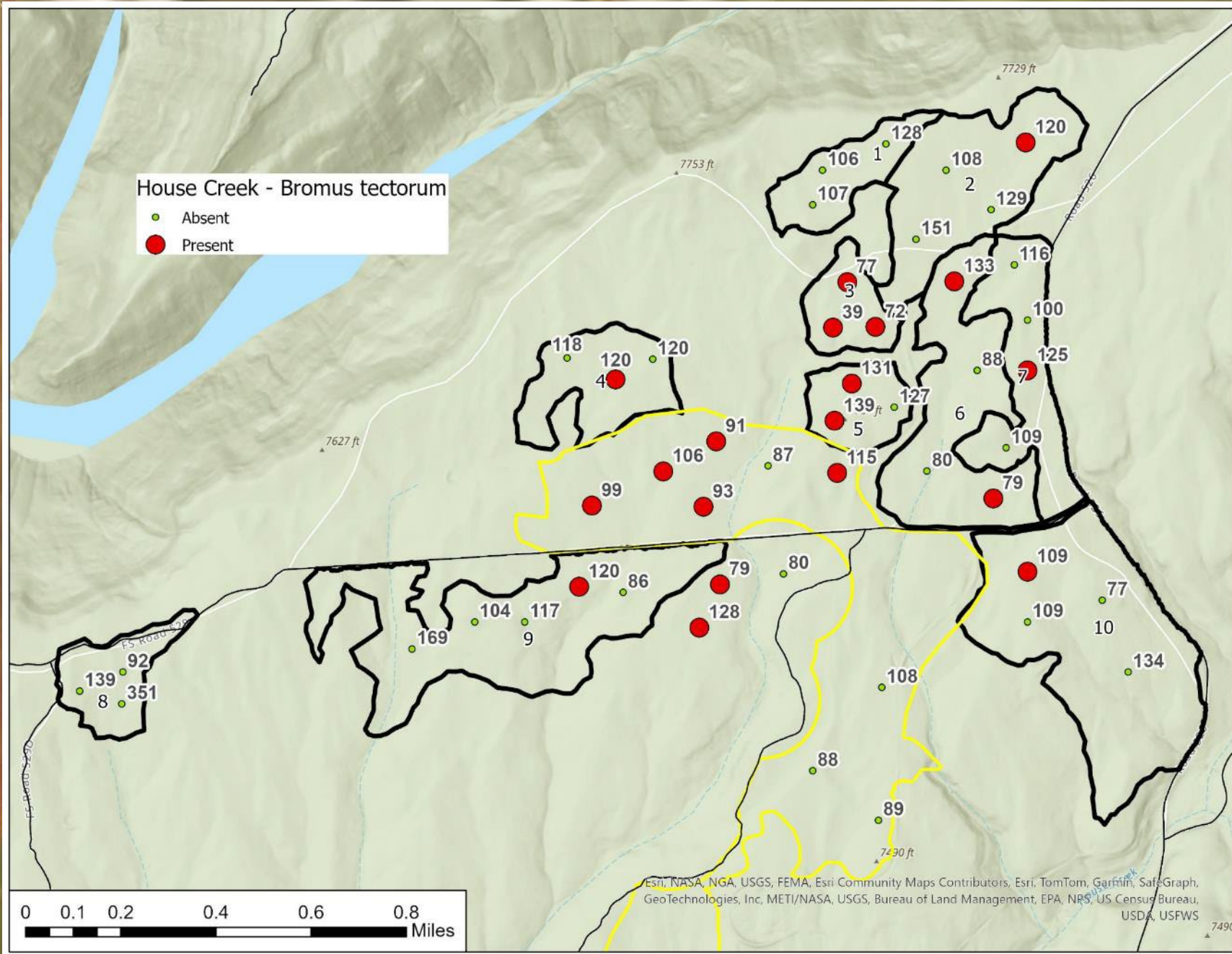
Indicators - currently captured

● **Presence** of invasive species.

Indicators - partially captured or could be in future

● *Cover* of invasive species.

House Creek - Bromus tectorum

- Absent
- Present

Desired Condition 5 - Tree Density and Basal Area

Stand scale - Complex mosaic of tree density and basal area that promotes ecological resilience

Desired Trends

● Restore historically variable tree density and basal area.

● Tree densities and basal areas vary with productivity, soils, and disturbance history

Indicators - Currently Captured

● **Basal area**

● **Tree density**

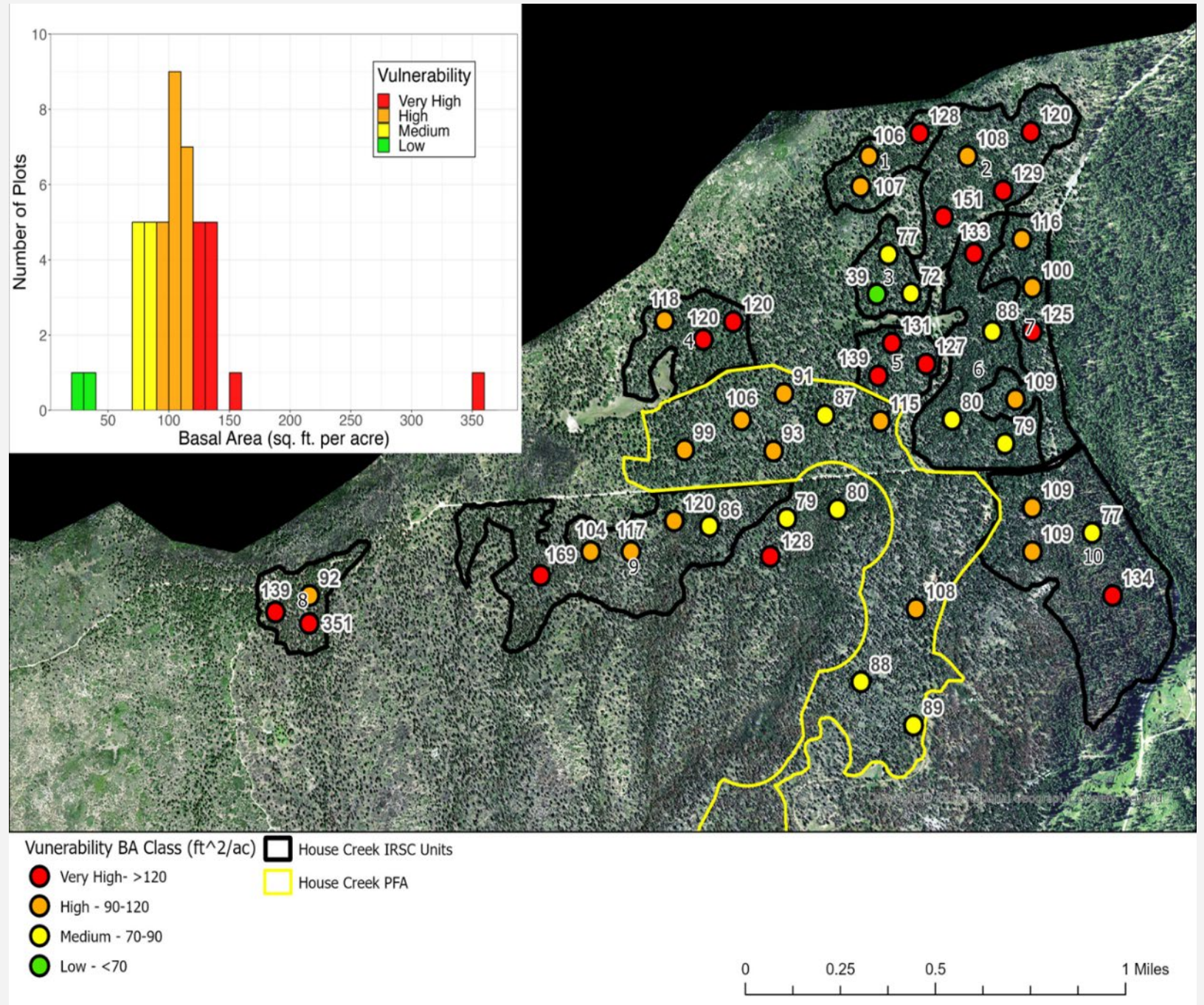● **Canopy cover by species** when available
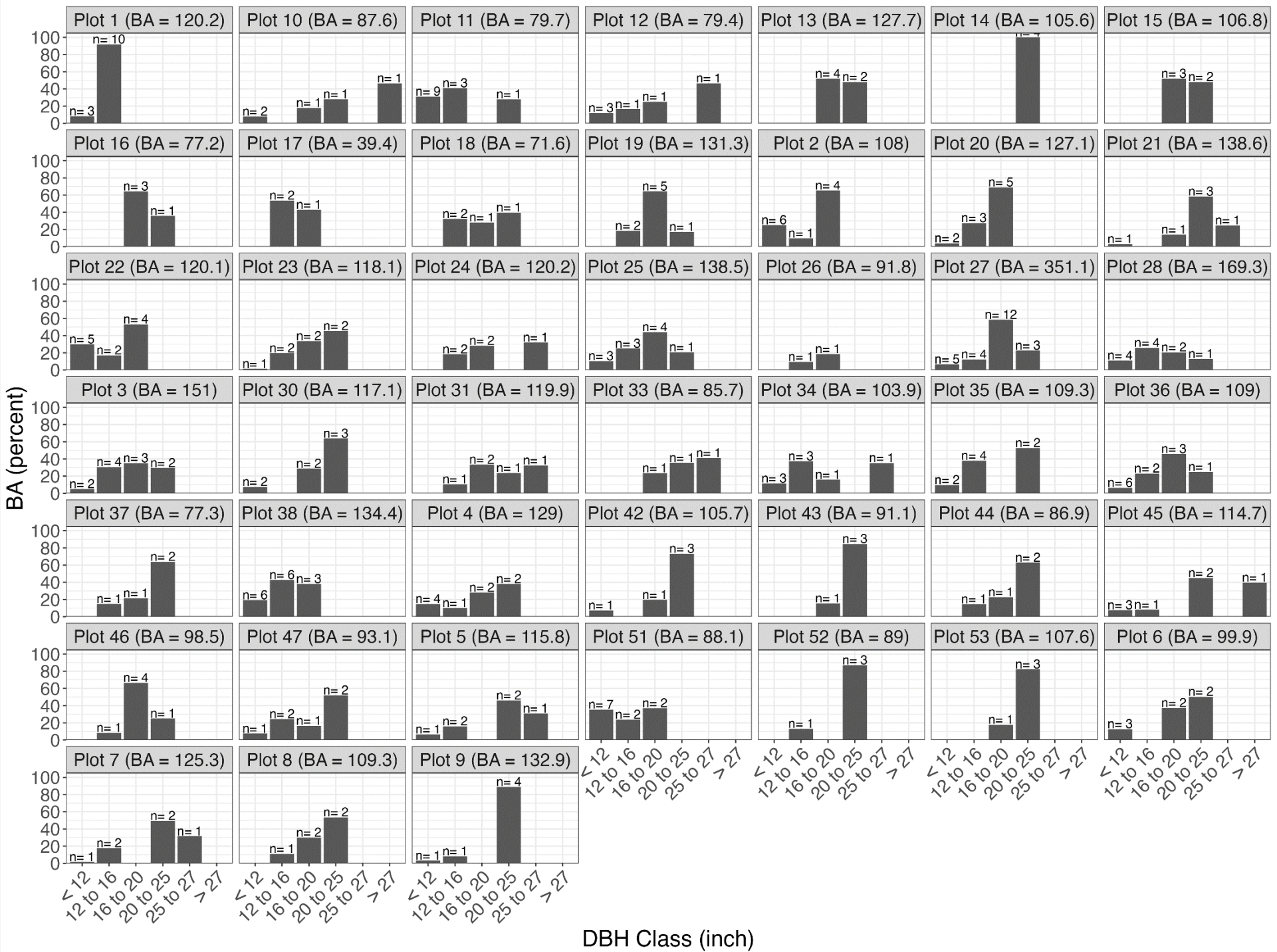
Basal Area
(Overstory)

Observed Trends:

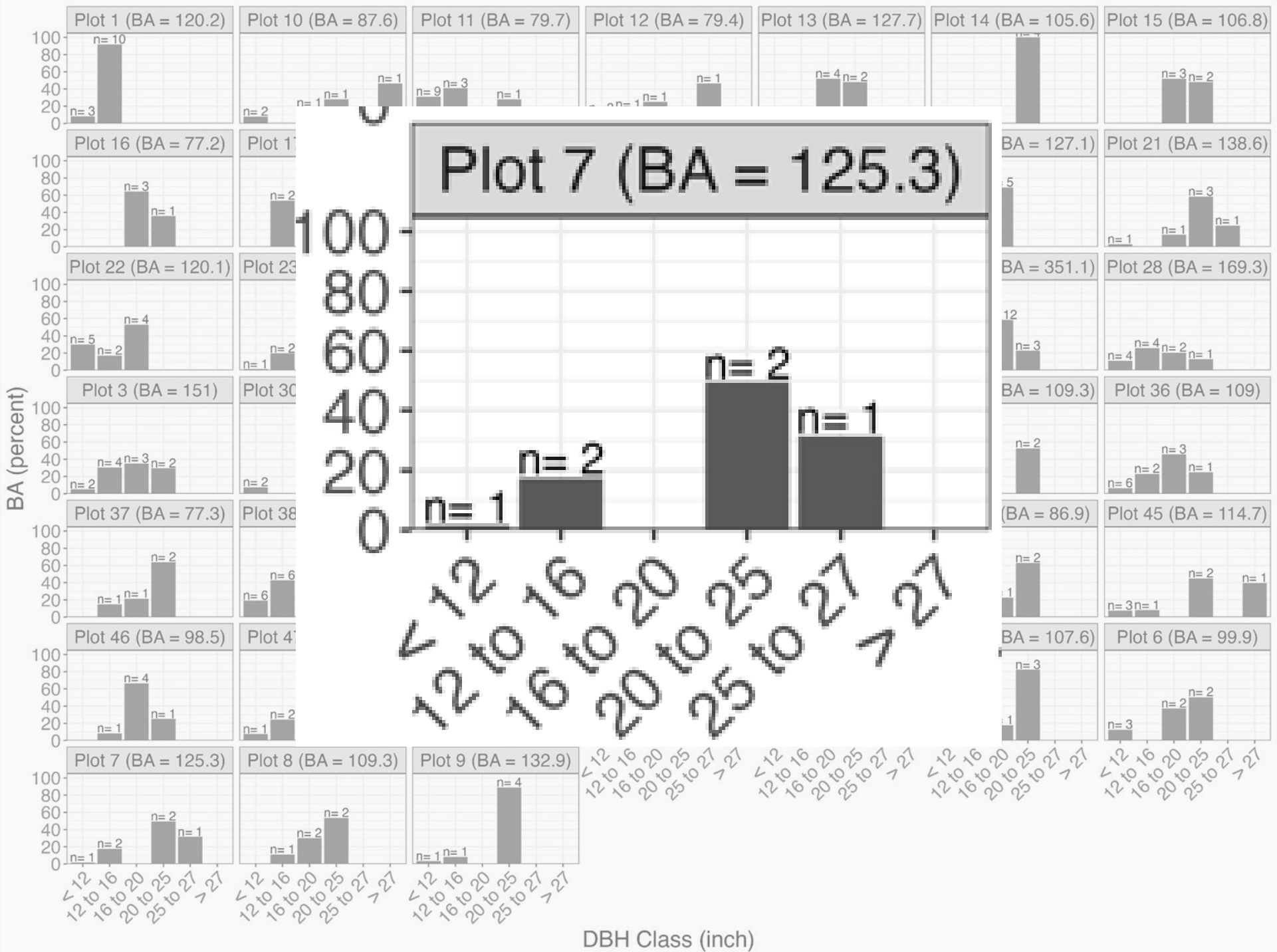- Variable basal area across plots

Potential Future Trends:

- Increase in plot/stand basal area or return to uncharacteristic densities
- Reduction in range of densities (homogeneity)

Vunerability BA Class (ft^2/ac)

- 🔴 Very High- >120
- 🟠 High - 90-120
- 🟡 Medium - 70-90
- 🟢 Low - <70

⬛ House Creek IRSC Units
🟨 House Creek PFA

Plot 1 (BA = 120.2), Plot 10 (BA = 87.6), Plot 11 (BA = 79.7), Plot 12 (BA = 79.4), Plot 13 (BA = 127.7), Plot 14 (BA = 105.6), Plot 15 (BA = 106.8), Plot 16 (BA = 77.2), Plot 17 (BA = 39.4), Plot 18 (BA = 71.6), Plot 19 (BA = 131.3), Plot 2 (BA = 108), Plot 20 (BA = 127.1), Plot 21 (BA = 138.6), Plot 22 (BA = 120.1), Plot 23 (BA = 118.1), Plot 24 (BA = 120.2), Plot 25 (BA = 138.5), Plot 26 (BA = 91.8), Plot 27 (BA = 351.1), Plot 28 (BA = 169.3), Plot 3 (BA = 151), Plot 30 (BA = 117.1), Plot 31 (BA = 119.9), Plot 33 (BA = 85.7), Plot 34 (BA = 103.9), Plot 35 (BA = 109.3), Plot 36 (BA = 109), Plot 37 (BA = 77.3), Plot 38 (BA = 134.4), Plot 4 (BA = 129), Plot 42 (BA = 105.7), Plot 43 (BA = 91.1), Plot 44 (BA = 86.9), Plot 45 (BA = 114.7), Plot 46 (BA = 98.5), Plot 47 (BA = 93.1), Plot 5 (BA = 115.8), Plot 51 (BA = 88.1), Plot 52 (BA = 89), Plot 53 (BA = 107.6), Plot 6 (BA = 99.9), Plot 7 (BA = 125.3), Plot 8 (BA = 109.3), Plot 9 (BA = 132.9)

BA (percent)

DBH Class (inch)

BA (percent)

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Desired Condition 6 - Tree Sizes

Stand scale - Complex mosaic of tree sizes that promotes ecological resilience

Desired Trends

● Restore historical heterogeneity in tree size classes, consistent with uneven-aged stand structures, including but not limited to reverse-J and multi-cohort management

● Generally, increased seedlings and saplings, fewer medium-sized trees, and increased large trees, relative to today.

Indicators

● **Diameters at breast height for trees > 4.5 feet, tree heights,** and **height classes for seedlings**

Diameter Distribution *(Overstory)*

Observed Trends:

- Majority of trees are in the 12-18in size class
- Few large >25in trees documented on plots

Potential Future Trends:

- Retention of large trees
- Increase in small trees
- Decrease in large trees
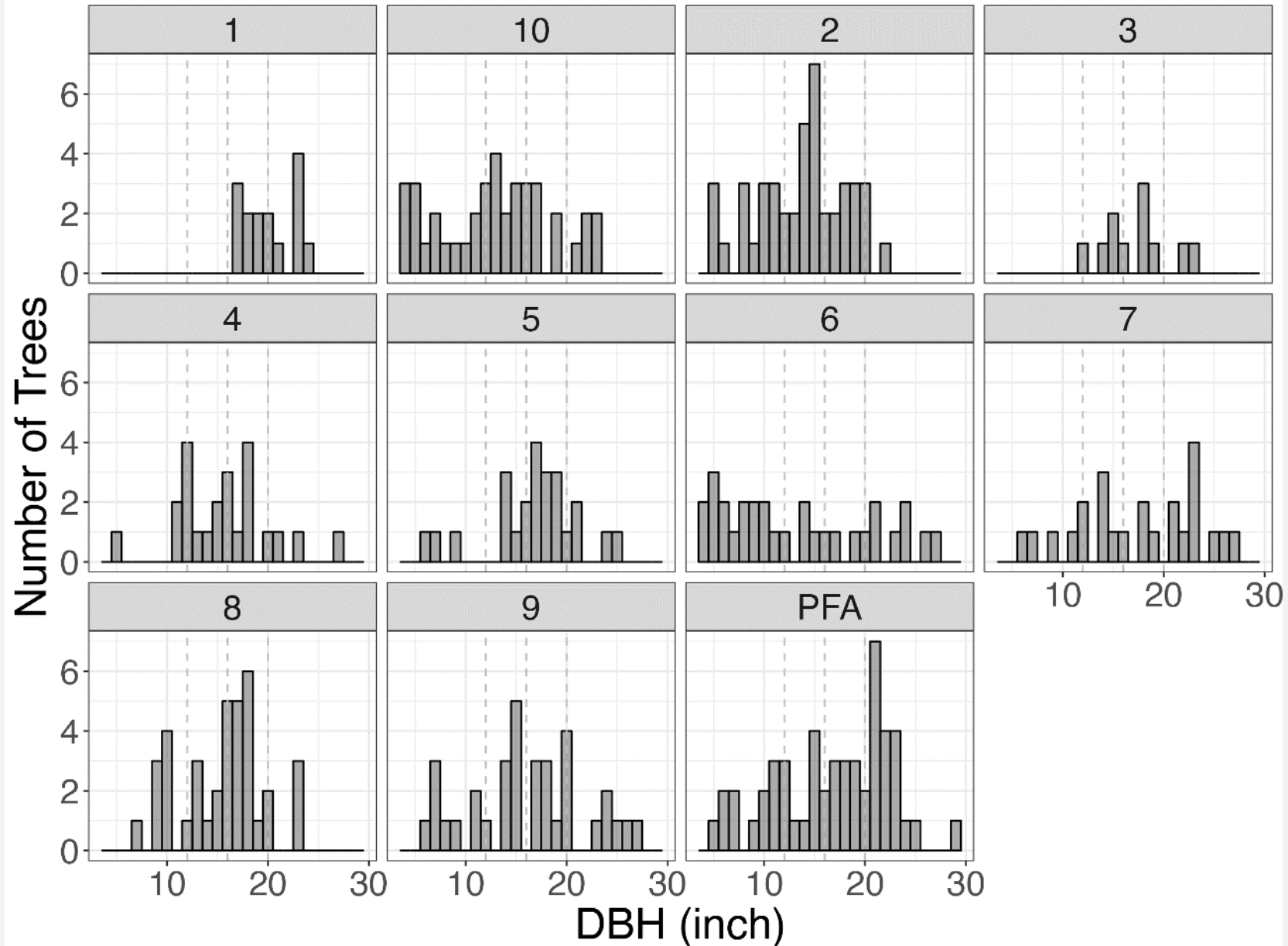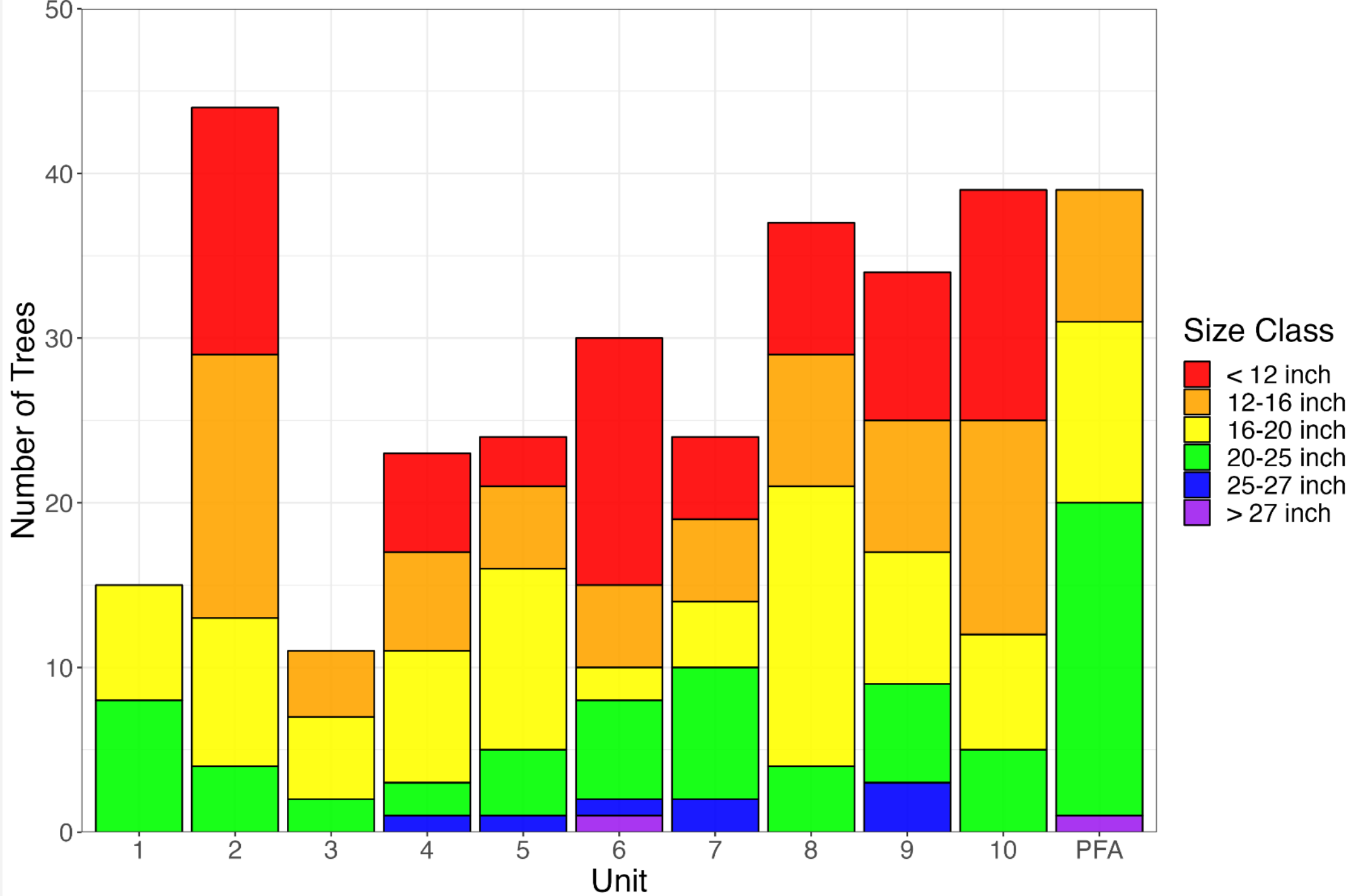
Desired Condition 7 - Tree Ages

Stand scale - Complex mosaic of tree ages and increased old growth that promotes ecological resilience

Desired Trends

● Restore historical age structures

● Restore and enhance rare components of stands that are essential for resilience to fire, particularly large and old trees, by retaining and increasing trees exhibiting old-tree characteristics.

● Increase old growth and move from predominantly single-aged to uneven- aged stands

● Promote younger age classes to advance into older classes.

Indicators

● Diameter distribution charts

Indicators - partially captured or could be in future

● Percentage of landscapes and forest area meeting old- growth criteria
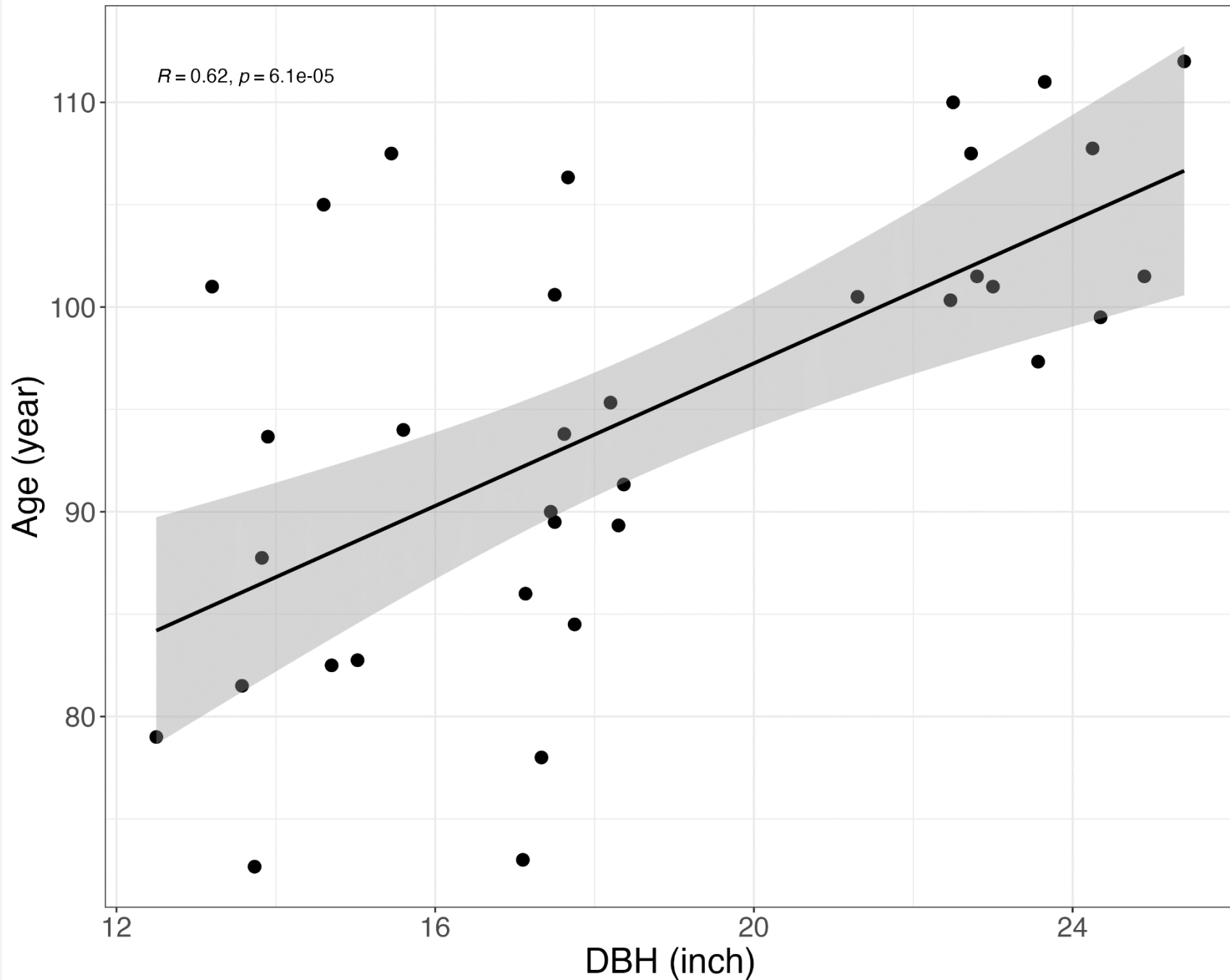
● *Heterogeneity in age-class structure**

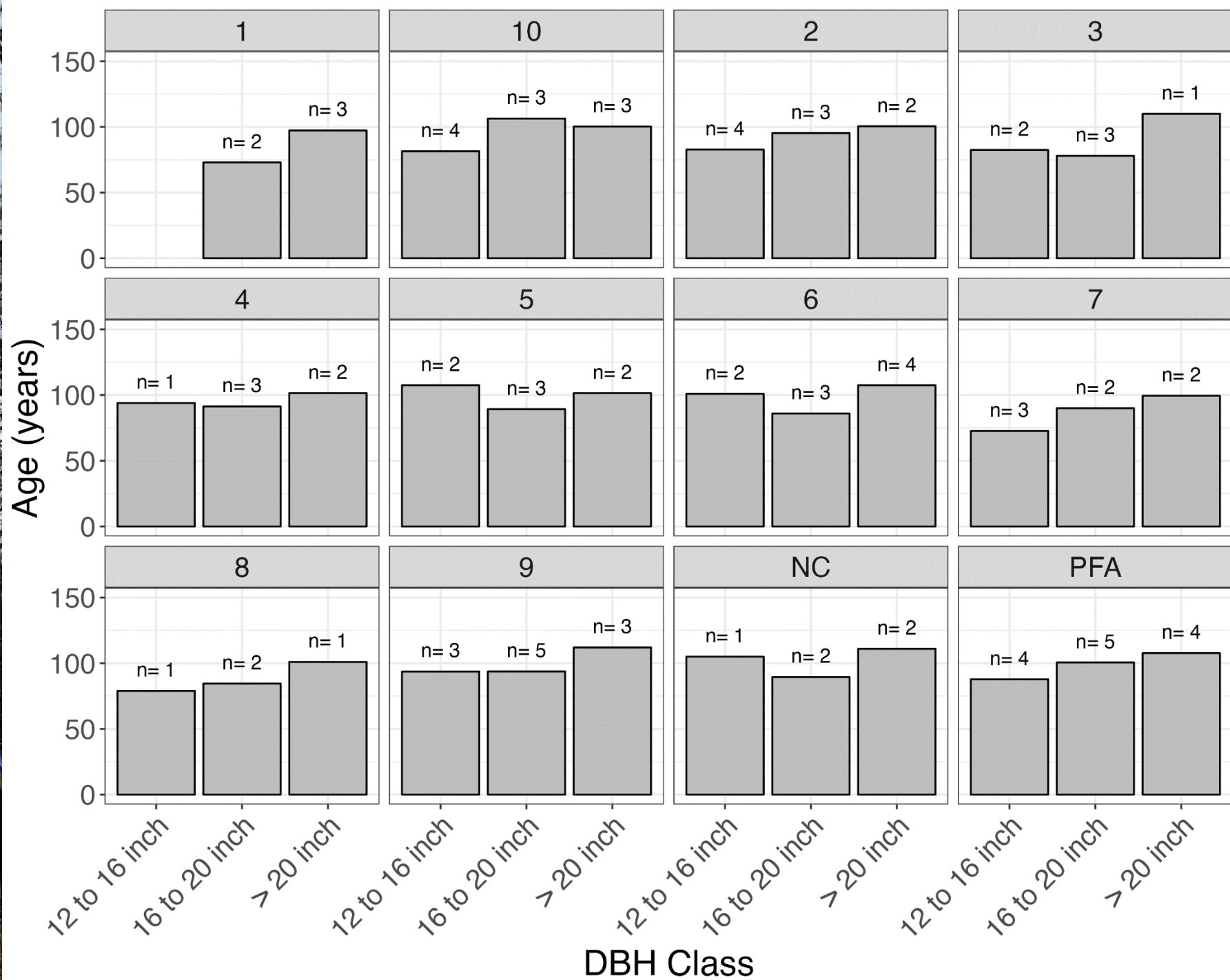# Diameter Distribution *(Overstory)*

Observed Trends:

- Level age range across size classes
- Not visualized are 3 >30in pre-settlement trees documented outside of plots, age range 250-350 years

Potential Future Trends:

- Retention of large trees
- Decrease in large trees

$R = 0.62, p = 6.1\text{e-}05$

Age (year)

DBH (inch)

Desired Condition 8 - Snags

Stand scale - Complex mosaic of snags and down wood that promotes ecological resilience

Desired Trends

● Retain > 1 snag per acre per species of suitable size for cavity nesters and other wildlife use, where appropriate (non-hazardous snags, away from HVRAs, etc.) and increase their representation on the landscape.

● Snag placement that maximizes wildlife benefit (e.g. adjacent to aspen stands, large openings, areas they are missing).

Indicators

● **Snag abundance**

Desired Condition 14 - Insects and Disease

Insects and disease disturbances - Increase resistance and resilience to bark beetle outbreaks.

Desired Trends

● Stand and landscape desired conditions generally match desired conditions for increasing resilience to bark beetle outbreaks

● Overall, lower and more variable tree densities and basal areas to enhance resistance and resilience to bark beetles.

● Maintain and enhance genetic and structural diversity across the landscape by using variable uneven-aged management at the stand scale.

● Enhance tree regeneration and recruitment for long-term resilience

Indicators

● **Beetle-caused tree mortality**

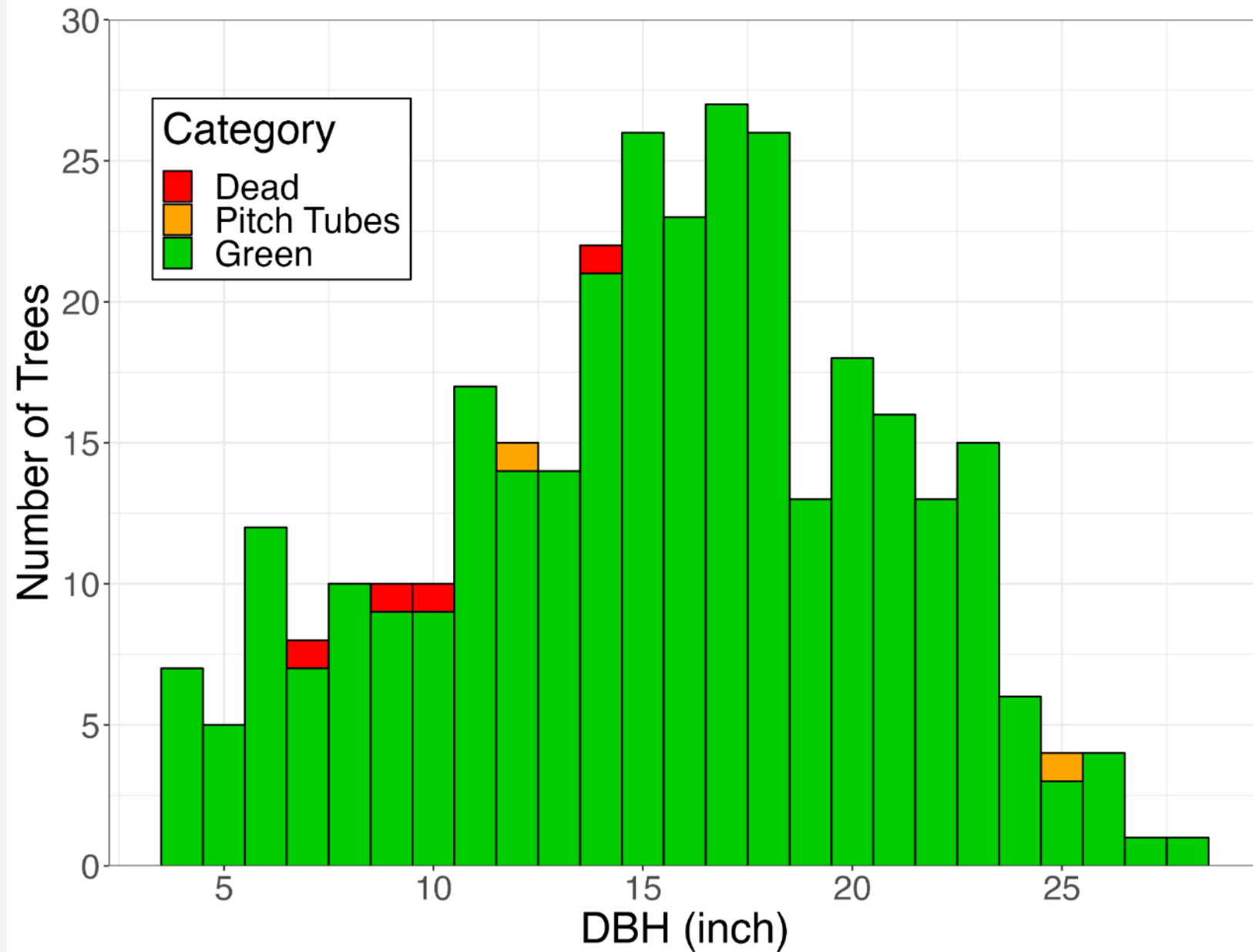● Indicators for desired conditions 7, 10, 12

Snags and Insects

Observed Trends:

- Low prevalence of beetles, 2 trees with pitch tubes

- Relatively few snags present

Potential Future Trends:

- Reduction in beetle evidence
- Increased beetle presence
- Decreased snags

What is the Plan for 2024

- Finalize Salter Monitoring Framework
- Improve the data storage systems in the collaborative exchange folder
- MSI is standardizing our QAQC process across all projects
- We are waiting on agreement to know scale of monitoring
- Priorities will be Banquet, Boggy Draw, Bradfield
- If funds allow, repeat in LP no action areas to track beetles; MA2 areas
- Condensed summary reports for LP and Salter

3D Mapping of snowpack and forest health using Uncrewed Aerial Systems (UASs)

3D Mapping of snowpack dynamics with repeated UAS campaigns.

3D Mapping of forest stress and vulnerability to pests and wildfire.

Desired Condition 1 - Tree Species

Tree species composition that promotes ecological resilience.

<u>Desired Trends</u>

● Generally retain or restore historical species/ecotypes/genetic diversity as well as those associated with likely climate- related trends/movement

● Retain and enhance rare or uncommon species composition when feasible (e.g., aspen and aspen clones)

<u>Captured Indicators</u>

● **Percent composition by species tree density**

● **Tree density by species**

● **<u>Canopy cover by species when available</u>**

● Abundance by species based on **basal area**.

<u>Other Listed Indicators</u>

● Abundance by species based on *site index* and *recent disturbance history*

Desired Condition 2 - Shrub Species

Mosaic of forest understory shrub composition, density, and size that promotes ecological resilience.
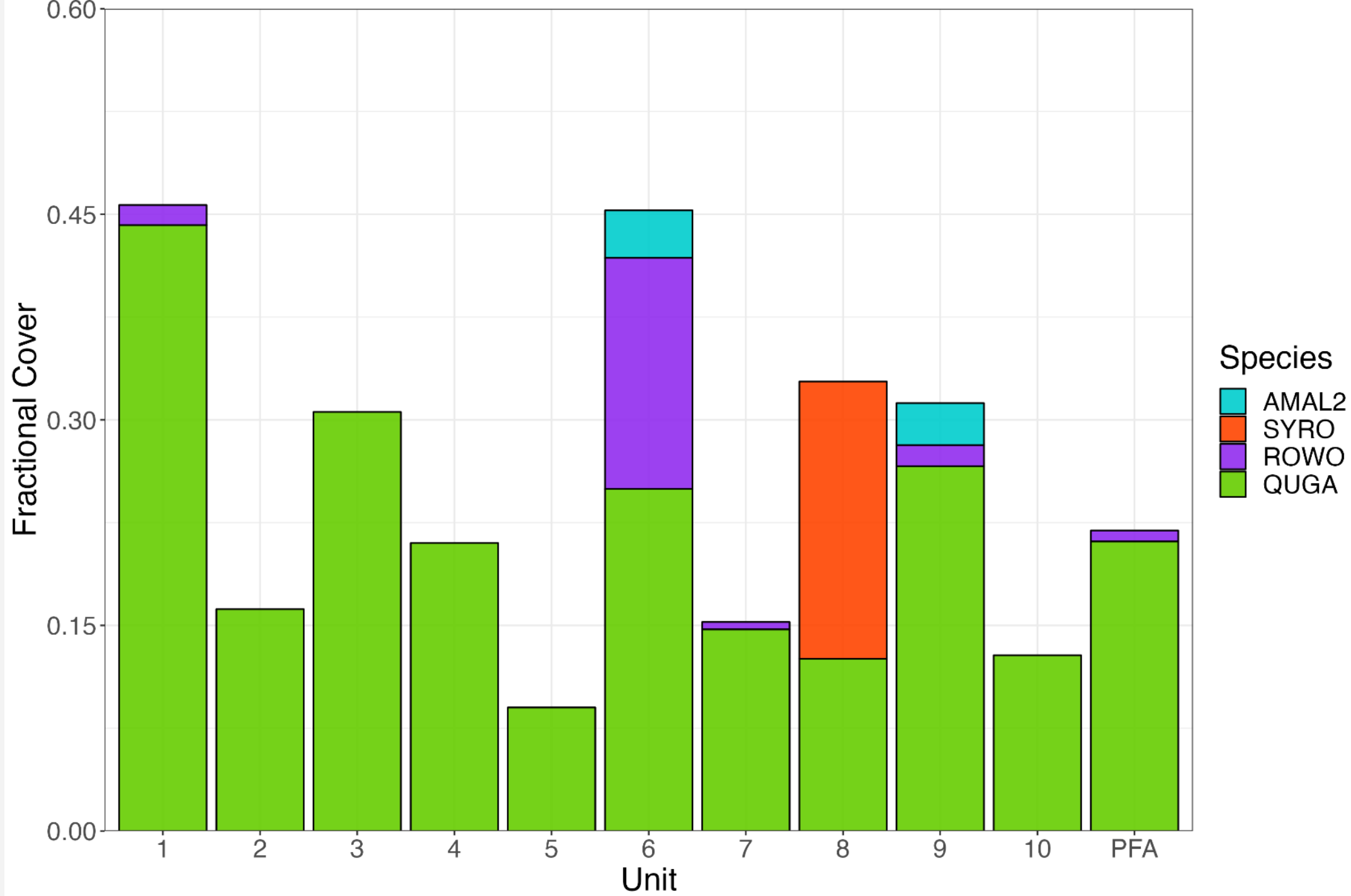
Desired Trends

● Maintain or restore historically variable Gambel oak and other shrub density that also enables variable ponderosa pine regeneration, forb and grass abundance, and meets wildlife habitat needs.

● Maintain or restore historical heterogeneity in size classes of Gambel oak, particularly maintaining larger diameter classes.

● Maintain or restore historical diversity of shrub composition related to environmental setting, and to support wildlife needs.

Captured Indicators

● **Presence, cover, abundance, and diversity of shrubs**

Desired Condition 3 - Grass and Forb Species

Mosaic of forest understory grass and forb composition, density, and cover that promotes ecological resilience.
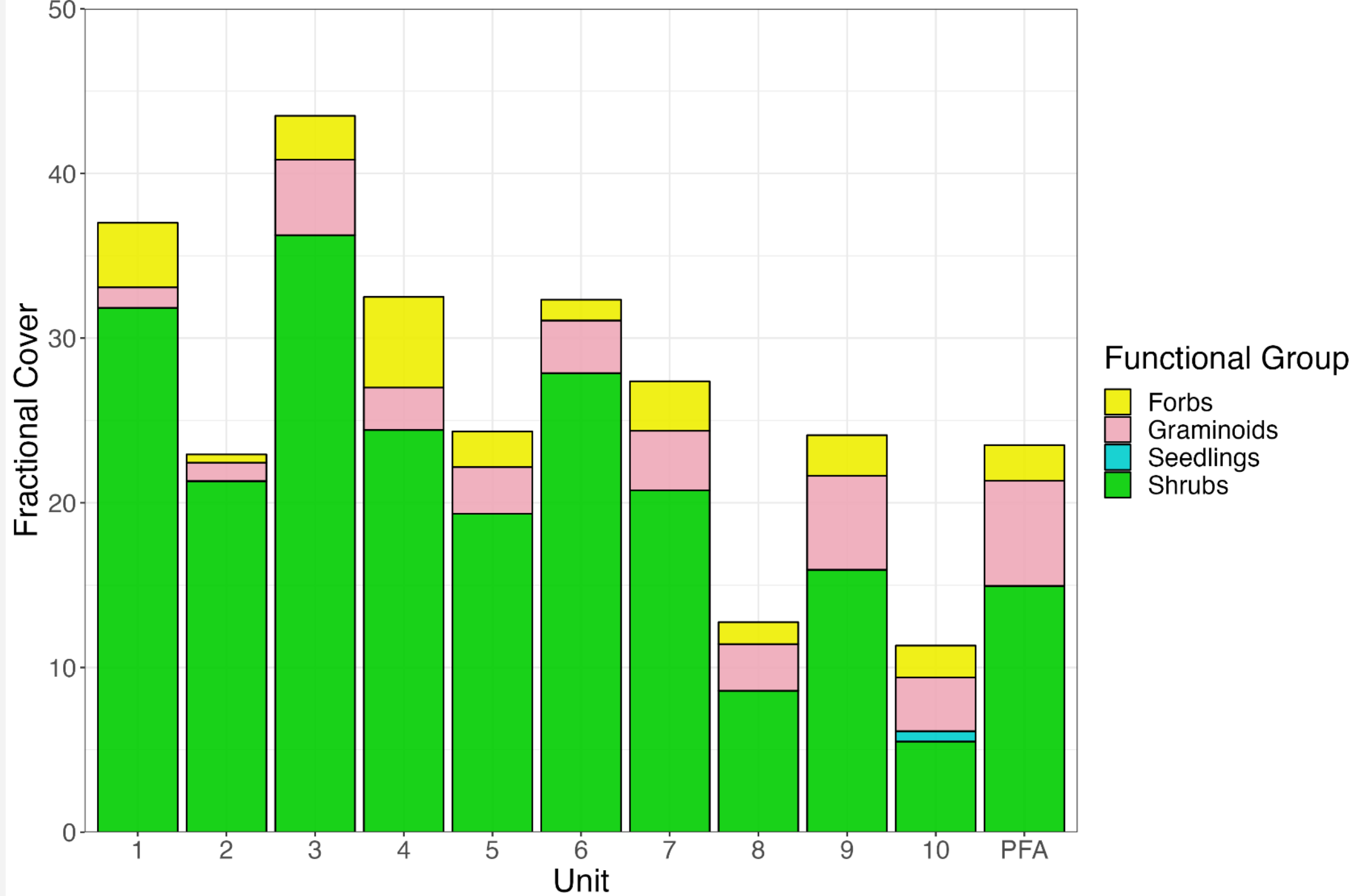
Desired Trends

● Promote and restore historically variable native grass and forb abundance and composition.

Indicators

● **Presence**, **cover**, and *diversity* of native grasses and forbs

Desired Condition 9 - Forest Floor

Stand scale - Complex mosaic of forest floor conditions that promotes ecological resilience

Desired Trends

● Retain or restore historically congruent amounts of coarse woody debris on the forest floor.

● Undesirable condition – too little or too much coarse woody debris.

Indicators

● **Coarse woody debris abundance*** **(plus fuels)**

Cover Type Examples

Not pictured:

Woody Basal

- Area covered by tree/shrub stems

Lichen/Moss

Rock

Gravel

Bare Ground

Coarse Woody Debris

Fine Woody Debris

Litter/Duff