Evaluation of the 106 Reforestation Pilot Project

Larissa Yocom, Ph.D.

Justin DeRose, Ph.D.

Department of Wildland Resources, Utah State University

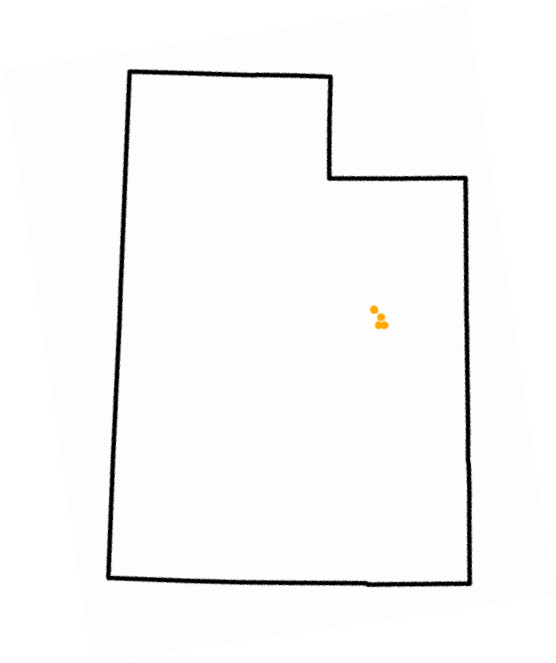
USU's role

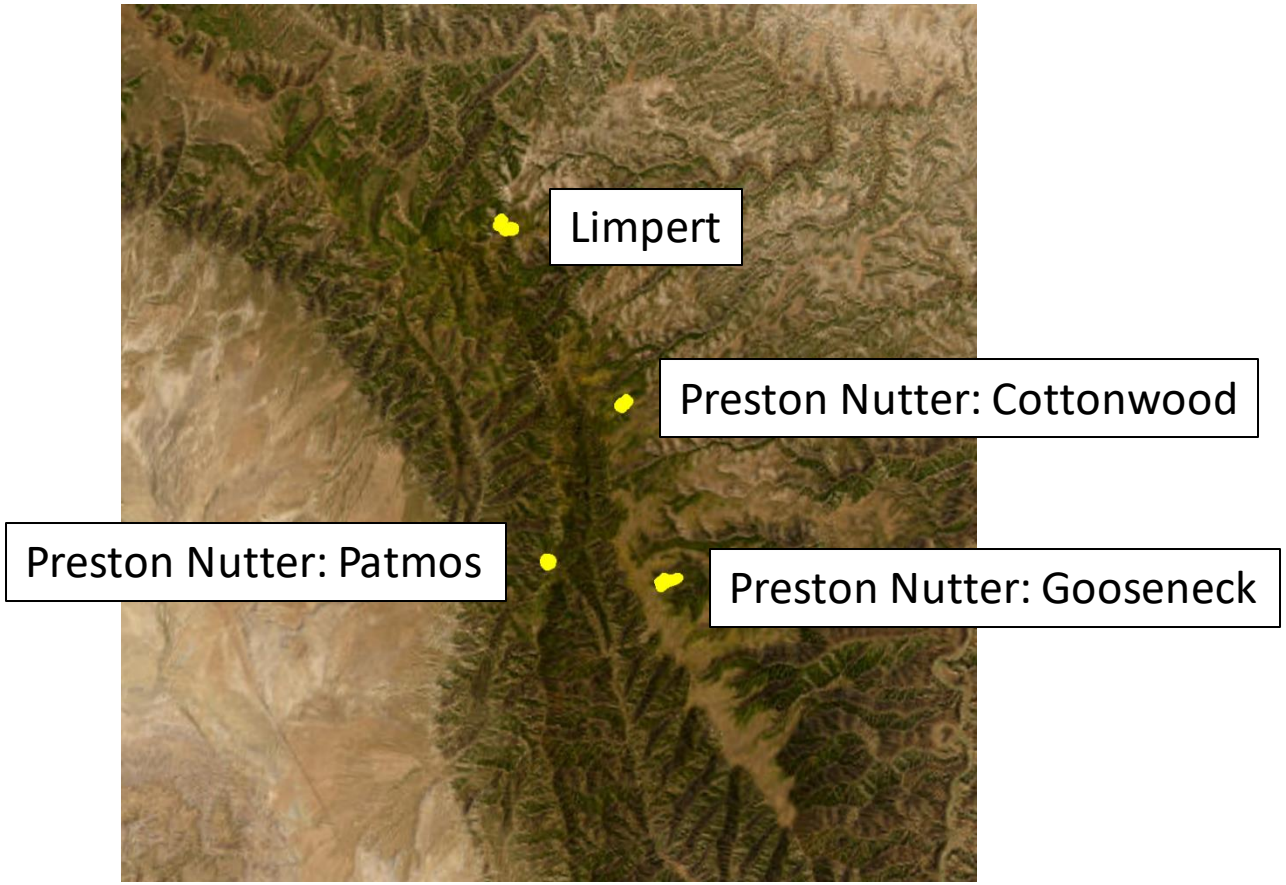
Develop and implement a research study to evaluate the effectiveness and efficiency of mechanical treatment methods developed by 106 Reforestation toward achieving two key public purposes identified by the State Legislature:

a. Create fire mitigation blocks

b. Promote aspen growth

Tavaputs study area





Important study design note

- In conjunction with 106 Reforestation and FFSL, the decision was made to not directly compare 106 methods with other techniques to mitigate fire or promote aspen, such as logging machinery
- Decision was made to put all funds toward 106 Reforestation methods

Approach: Start with defining terms

- Fire mitigation:
  - Reduce fire occurrence, or in the case of fire, reduce behavior or severity
- Promote aspen growth:
  - In the short term, promote aspen regeneration
- Effectiveness:
  - Meet fire mitigation or aspen growth objectives
    - This means objectives must be defined
- Efficiency:
  - $ per acre

Fire mitigation: risk, behavior, severity

Low risk of fire ignition
Risky fire behavior
High fire severity

Clearly in the short term, the 106 Reforestation treatments reduce fire risk and potential fire behavior and severity, at least in cleared areas

Low fire risk
Low-risk fire behavior
Low fire severity

Fire mitigation: risk, behavior, severity

Low risk of fire ignition
Risky fire behavior
High fire severity

Over a longer time scale, what should managers be aiming for?

- Species composition
- Patch size
- Tree age/forest structure
- Understory plants

Low fire risk
Low-risk fire behavior
Low fire severity

Aspen and fire: a complicated relationship

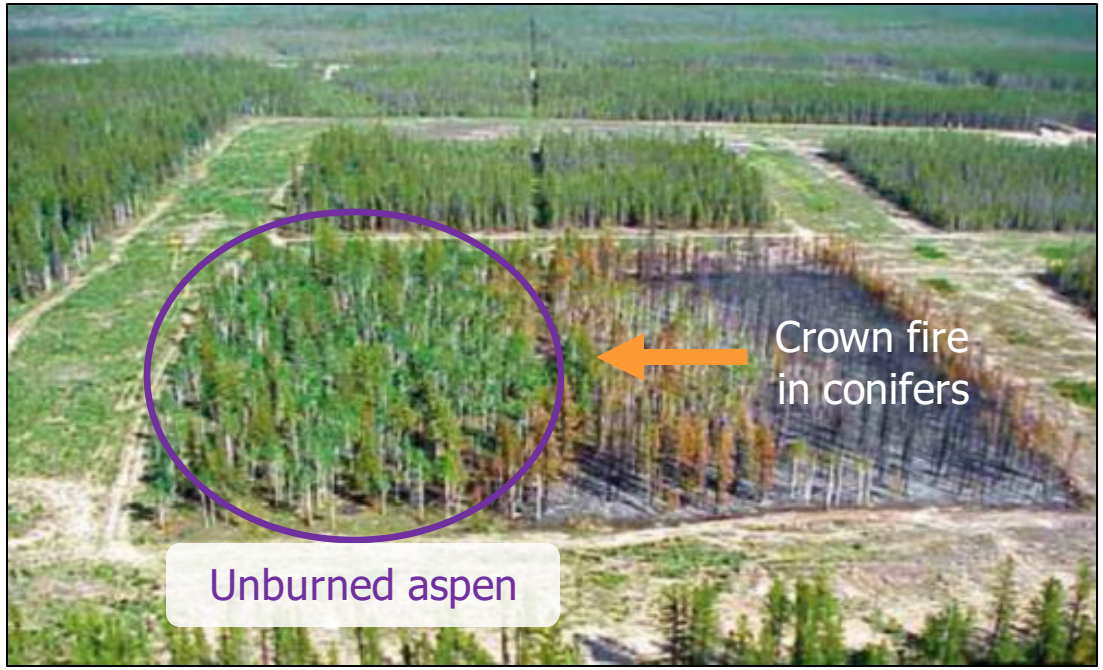
Assumption:

“Asbestos” forest

BUT…

Aspen can burn

and thrives after fire



Back to USU's mandate

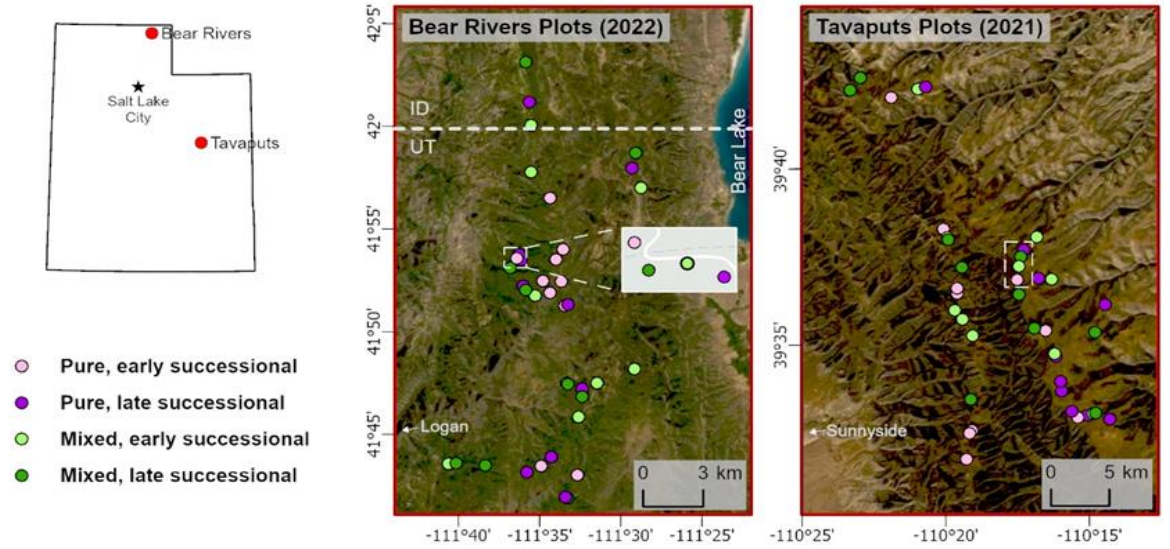
- Evaluate effectiveness of 106 Reforestation method in creating fire mitigation blocks

- 106 Reforestation method relies on assumption (common knowledge) that aspen carries less risk than conifer

- Where and when is this assumption true?
  - (Set objectives, or baseline to compare with treatment outcomes)

What makes aspen an effective fire mitigation block?

- Searched literature
- Surveyed firefighters and land managers
- Measured fuels and fuel moisture in aspen & conifer stands



- Reviewed 84 published papers
- Surveyed 137 managers
- Looked for factors that affect fire occurrence, behavior, and severity in aspen stands
- Searched for quantitative values for patch size, species composition, understory, age/structure, etc. to guide evaluation of fire mitigation effectiveness

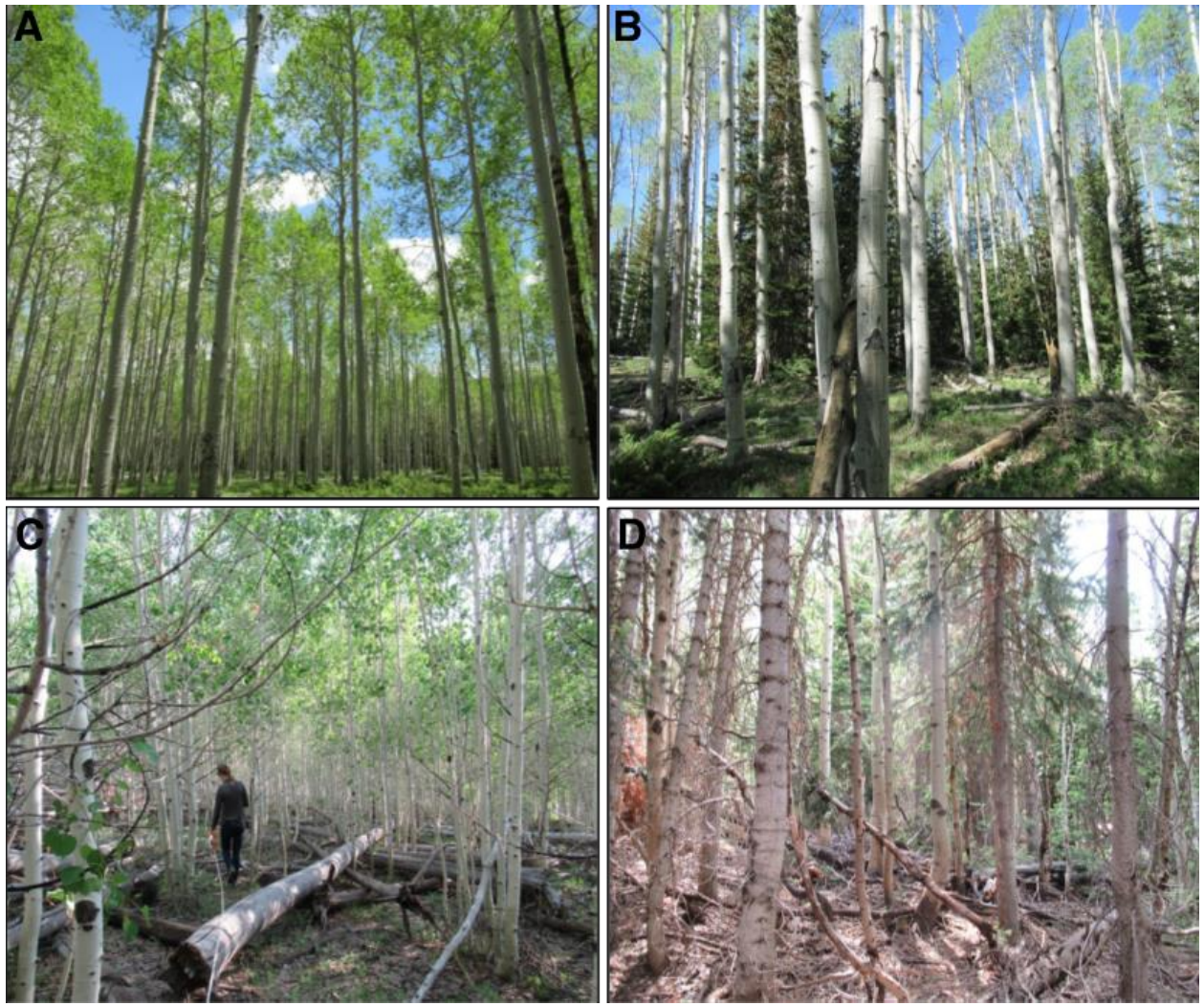
- Established 80 plots
- Measured fuel loads and fuel moisture across gradient of aspen-conifer dominance and across forest development stage
- Sought to define threshold of aspen dominance where fuel load or fuel moisture would likely result in less fire risk

Results from literature review and survey

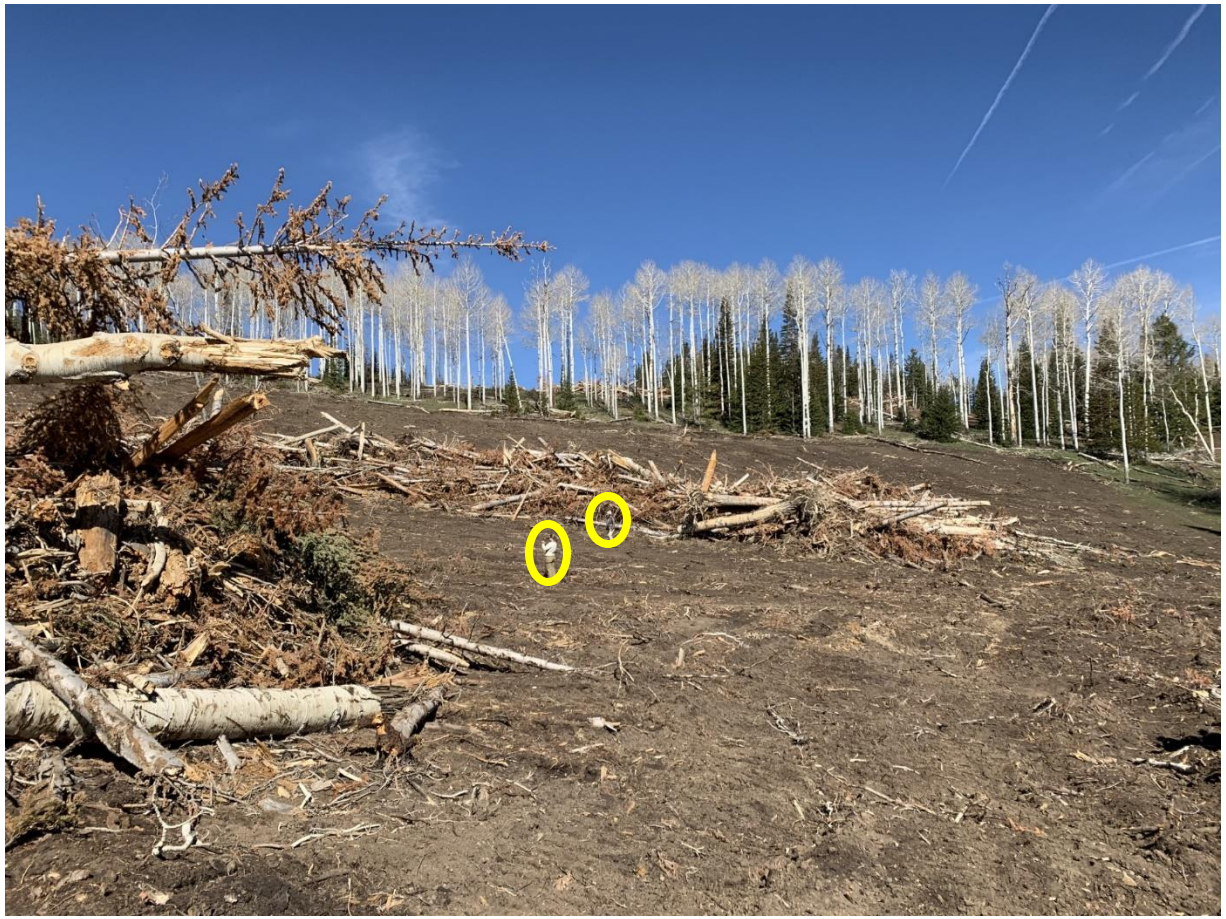
- Pure aspen with low fuel loads: likely to reduce fire occurrence, behavior, & severity
- Higher ratio of live understory fuels to dead understory fuels more effective in reducing fire risk

- Where the 106 Reforestation methods end up resulting in pure aspen with low understory and surface fuel loads, fire mitigation achieved

- Where significant fuel loads remain, fire danger is likely higher



High risk where slash piles remain



1st published paper

Forest Ecology and Management 531 (2023) 120752

Contents lists available at ScienceDirect

Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

Check for updates

Tamm review: Quaking aspen's influence on fire occurrence, behavior, and severity

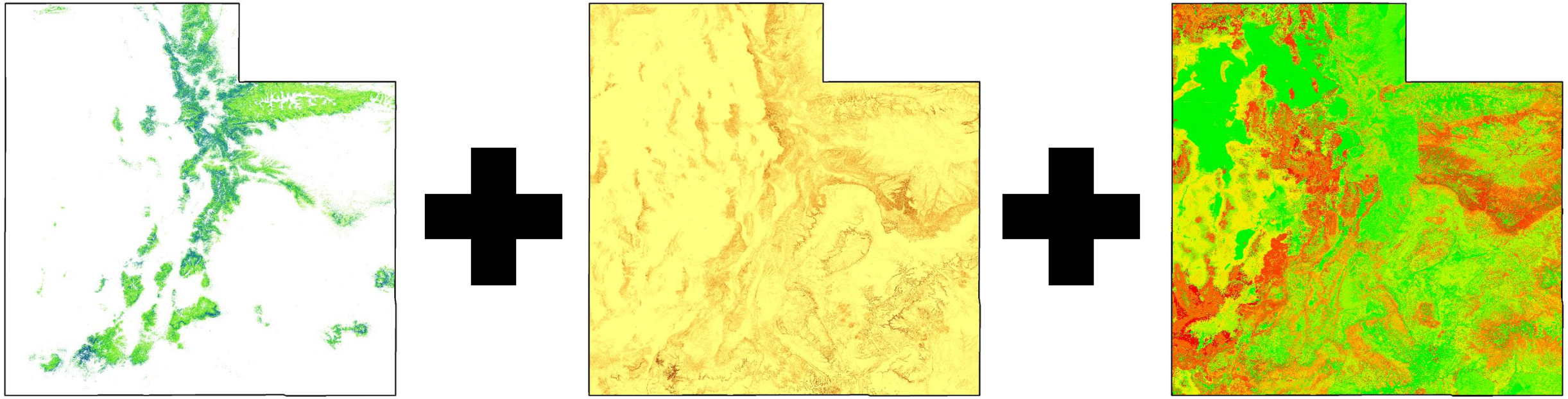
Kristin A. Nesbit [a,*], Larissa L. Yocom [a], Allison M. Trudgeon [a], R. Justin DeRose [a], Paul C. Rogers [b]

[a] Department of Wildland Resources and the Ecology Center, Utah State University, 5230 Old Main Hill, Logan, UT 84322, USA
[b] Western Aspen Alliance, Department of Environment & Society, and the Ecology Center, Utah State University, 5215 Old Main Hill, Logan, UT 84322, USA

Comparison to other methods for creating fire mitigation blocks

- Timber harvest:
  - Removes fuel rather than rearranges fuel
- Thinning conifers and piling and burning:
  - Smaller piles logistically more likely to be burned
- Prescribed fire
  - Weather windows difficult to find; but fuel reduced

Considerations for using this method in UT



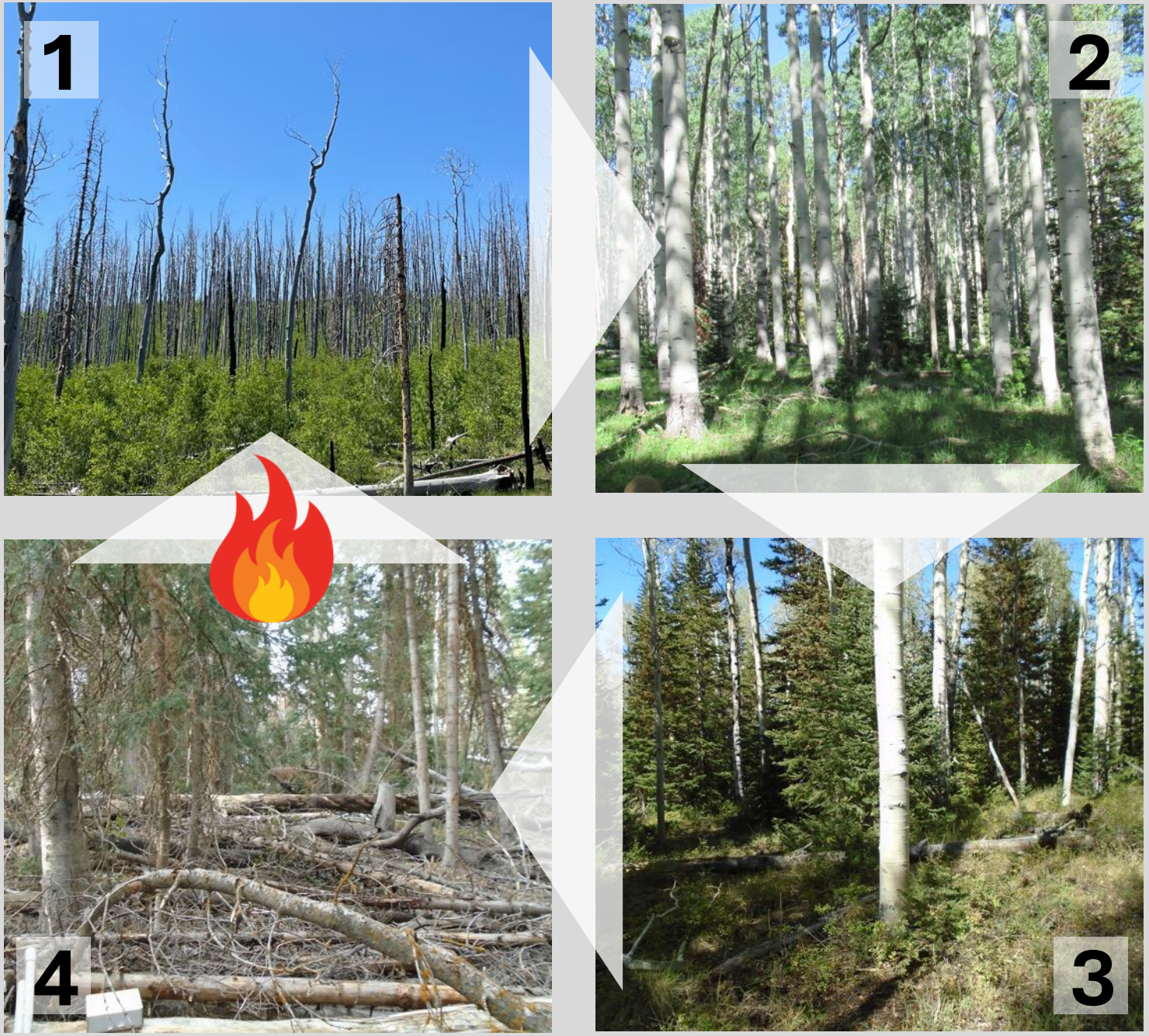
Aspen cover > 0, < pure

Slope < 30%

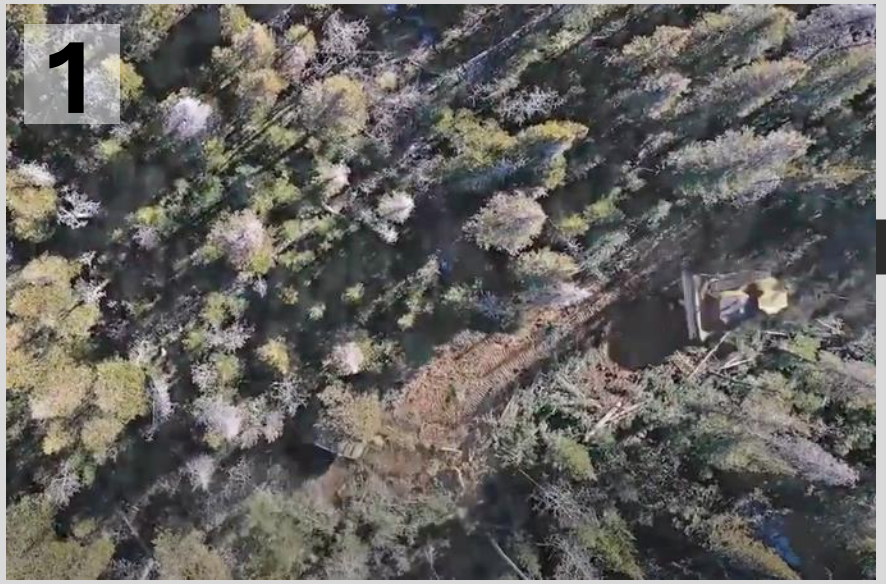
High fire risk

NATURAL SUCCESSION OF **QUAKING ASPEN**

- Naturally fire-driven
- Aging stands
- High fire risk



106 MECHANICAL ROLLER-FELLING



All photos - 106 Reforestation

STUDY DESIGN

Site 1 — 18 HA — 2020

Site 2 — 18 HA — 2021

Unit 1 | Unit 2 | Unit 3 | Unit 4 | Unit 5 | Unit 6

FULL

PARTIAL

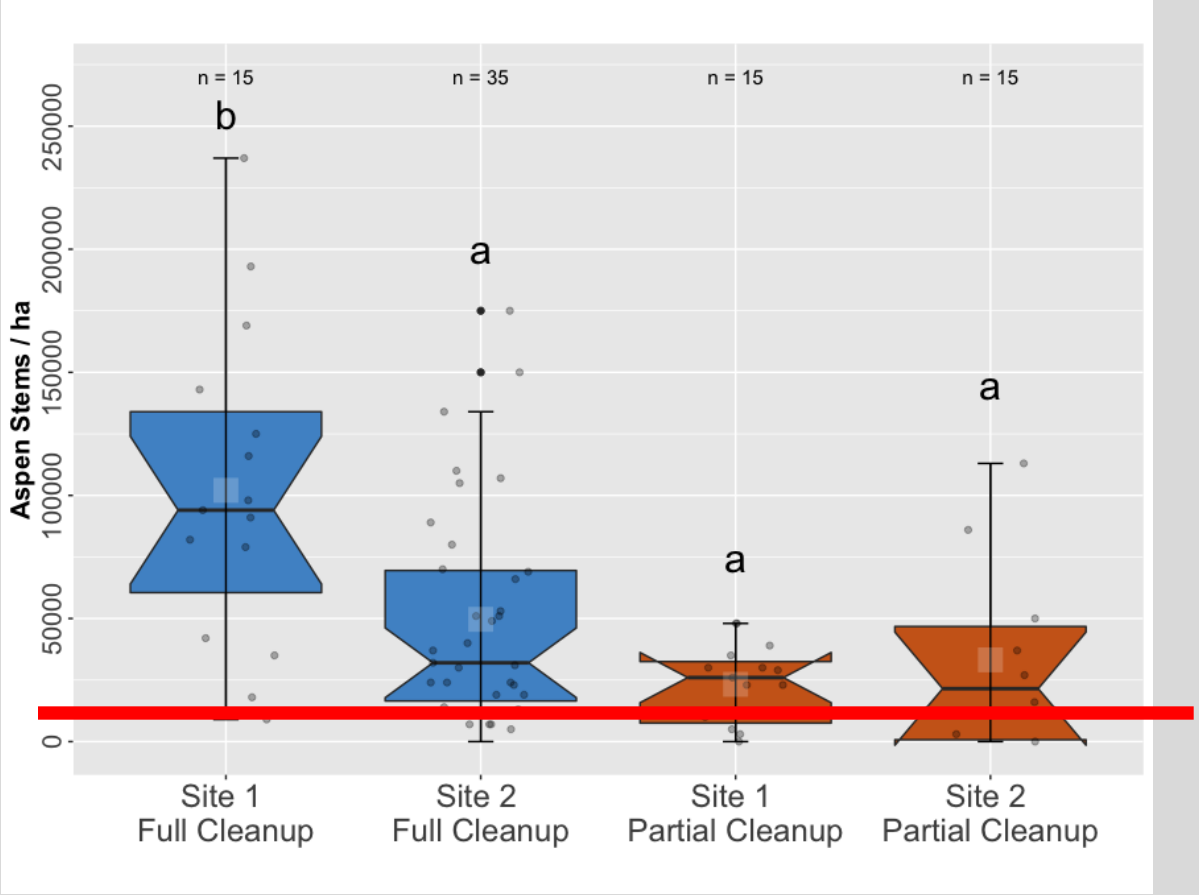
BULLDOZER CUTLINE

UNTREATED CONTROL

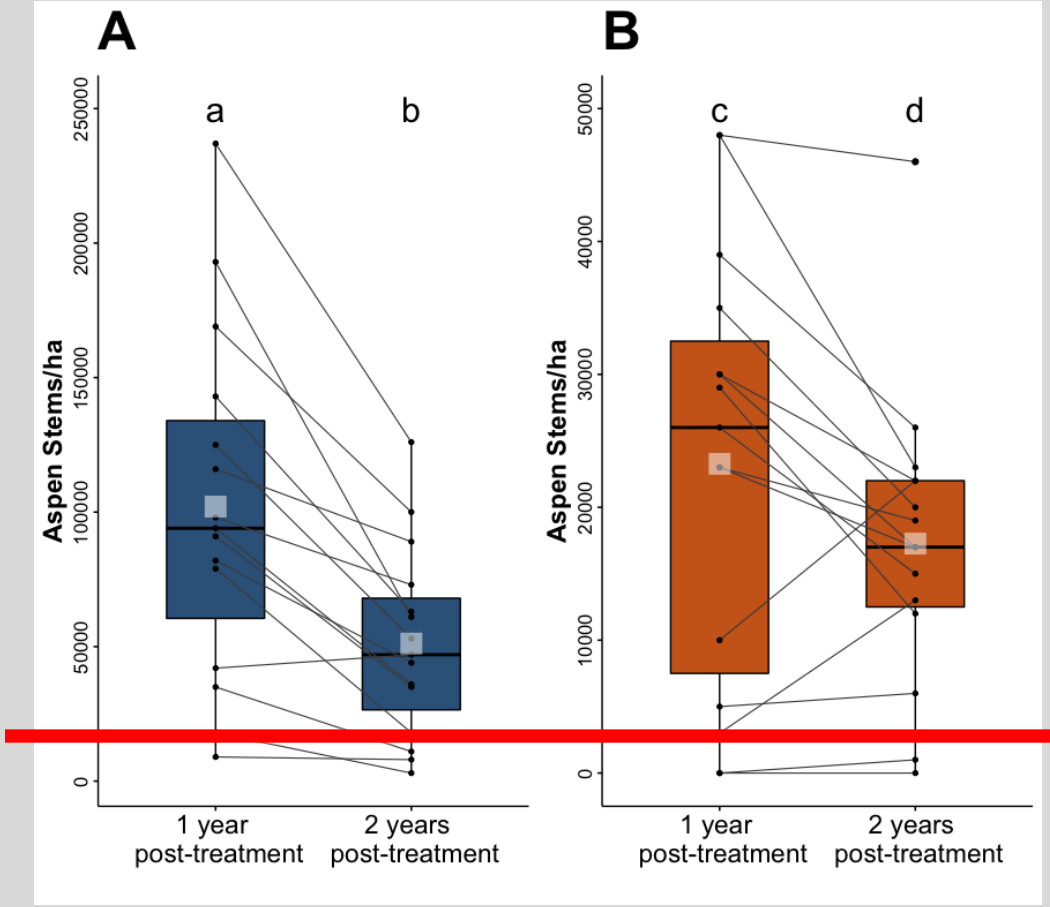
5 plots / block
Pre + post treatment

3 exclosures / block
Constructed post treatment

Effectiveness: Aspen Regeneration



Aspen Regeneration: Year 2



106 Mechanical Treatment Breakdown

106 Mechanical Treatment	Costs Per Acre
Roller-felling	$504 - $512
Perimeter cutting	$208 - $254
Fuel consolidation	$115 - $125
Mobilization	$60 - $120
Total costs	$1006 - $1244

Overall Cost Comparison

	106 Mechanical	Cold Springs	Tabby Mountain
Acres	**825**	138	130
Total Cost	**$1,027,080**	$129.874	$136,500
Per Acre	**$1006 - 1244**	$942	$1050

Conclusions

Effective in create fire mitigation blocks?	Partially.
Effective in promoting aspen growth?	Yes.
Efficient?	Similar to other methods.

Limitations

- Did not directly compare method to other methods; comparisons are apples and oranges to some degree, including efficiency comparisons
- Large piles unburned
- 1-2 year window; very short-term
- Soil compaction and erosion not addressed
- Didn’t evaluate when and where most effective (highest-risk areas)
- Didn’t evaluate implications for water yield

Study Outputs

1. Nesbit, K.A., Yocom, L.L., Trudgeon, A.M., DeRose, R.J., Rogers, P.C., 2023. Tamm review: Quaking aspen's influence on fire occurrence, behavior, and severity. Forest Ecology and Management 531, 120752.

2. Nesbit, K.A. 2023. MS Thesis: Evaluating quaking aspen's influence on fire behavior. USU, Logan, UT.

3. Trudgeon, A.M. MS Thesis: Regeneration of quaking aspen and understory vegetation change after fire risk reduction treatment. USU, Logan, UT.

4. Trudgeon, A.M. MS Defense (on youtube)

5. Nesbit, K.A. et al. (in prep) Stand composition and development stage affect flammability of quaking aspen forests in Utah, USA.

6. Trudgeon, A.M. (in prep) Regeneration of quaking aspen after mechanical roller felling.

Contact

- Larissa Yocom Larissa.Yocom@usu.edu
- Justin DeRose Justin.DeRose@usu.edu