

# SBEADMR annual report: Terror Creek after 12 Years and an update on Spruce studies

Brought to you by RMRS and CFRI

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## Overview

- History of Sudden Aspen Decline Disease
- Introduction to Terror Creek
- Results and Implications
- Update on Spruce salvage and resiliency treatments

# History of Sudden Aspen Decline (SAD)



- Aspen is an important tree to Colorado landscapes due to its ecological importance and fire adaptability.
- SAD started to be of concern in southwestern Colorado after a drought in 1998-2002, as managers started to notice landscape scale rapid dieback and mortality
- Research suggests that drought and water stress are the primary causes of SAD.
- Concern about the lack of aspen regeneration



# Simplified Aspen regeneration primer

- Aspen regenerates either through prolific root suckering or by seed
- Clonal suckering is controlled by plant hormone Auxin
- Presence of auxin helps inhibit sprouting
- Remove auxin (i.e. overstory tree) and roots sprout
- But aspen roots must be alive to sprout



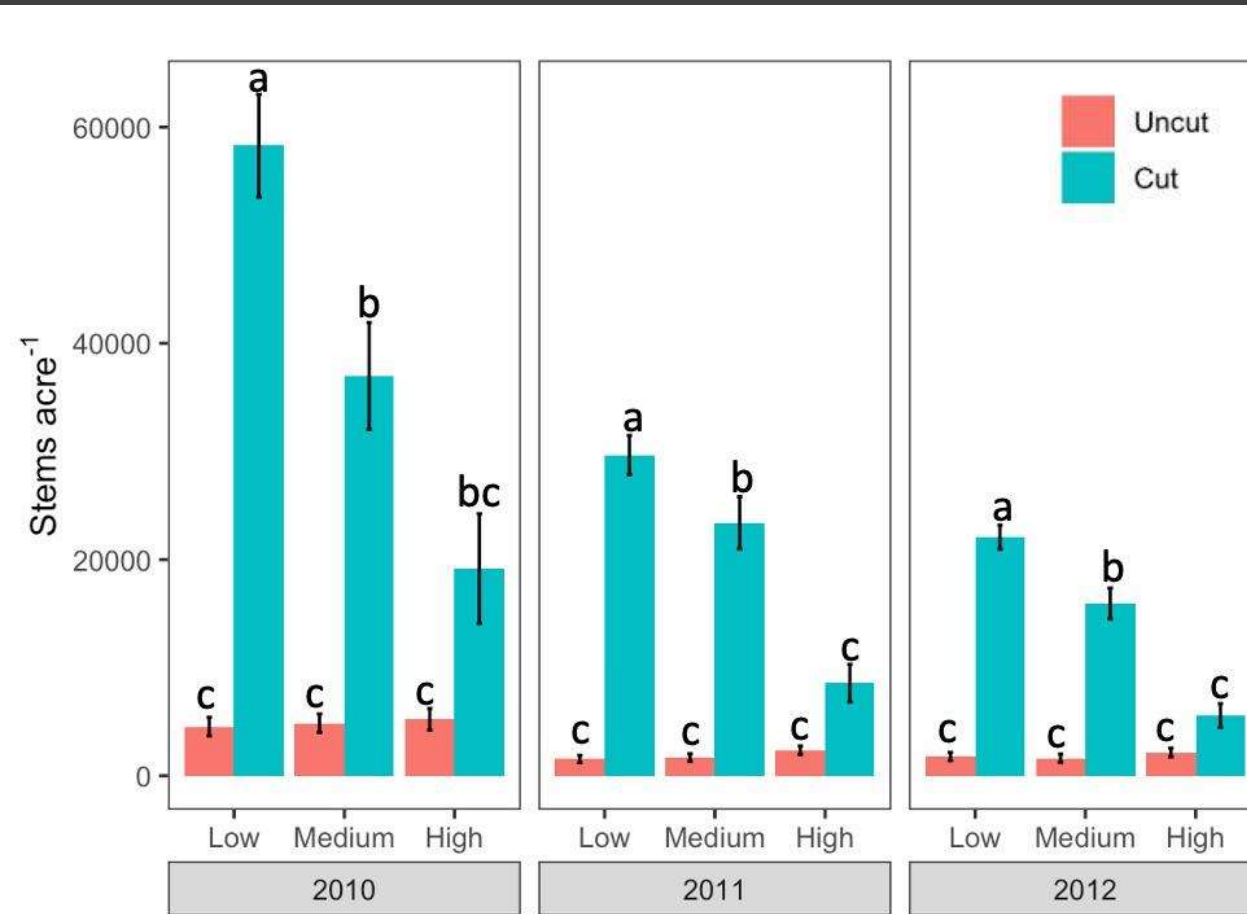
# Introduction to the Terror Creek study

- In 2008, Terror Creek initiated to determine if stands could be stimulated to regenerate before all the overstory stems and capacity of the root system to sprout was lost.
- Identified stands were separated into 3 classes of overstory mortality based on %basal area dead at time of experiment
  - Low = 0 to 20% mortality
  - Medium = 20 to 60% mortality
  - High > 60% mortality
- Stands were split: half treated and half left as control with 3 replicates per mortality level and treatment
- Treatment was clearfell-coppiced and winter logged in 2009/2010

# Sampling Design

- Sampling occurred pretreatment (2009), 1, 2, and 3 years post-treatment
- Resampled in 2022 (12 yrs post-treatment)
- 20 BAF Variable Radius Plots for overstory (>4 inch d.b.h)
- Circular 6.8ft Radius (1/300 ac) Regeneration Plots (<d.b.h to 4 inch d.b.h)
  - Regeneration was tallied based on size class and the tallest live stem was recorded

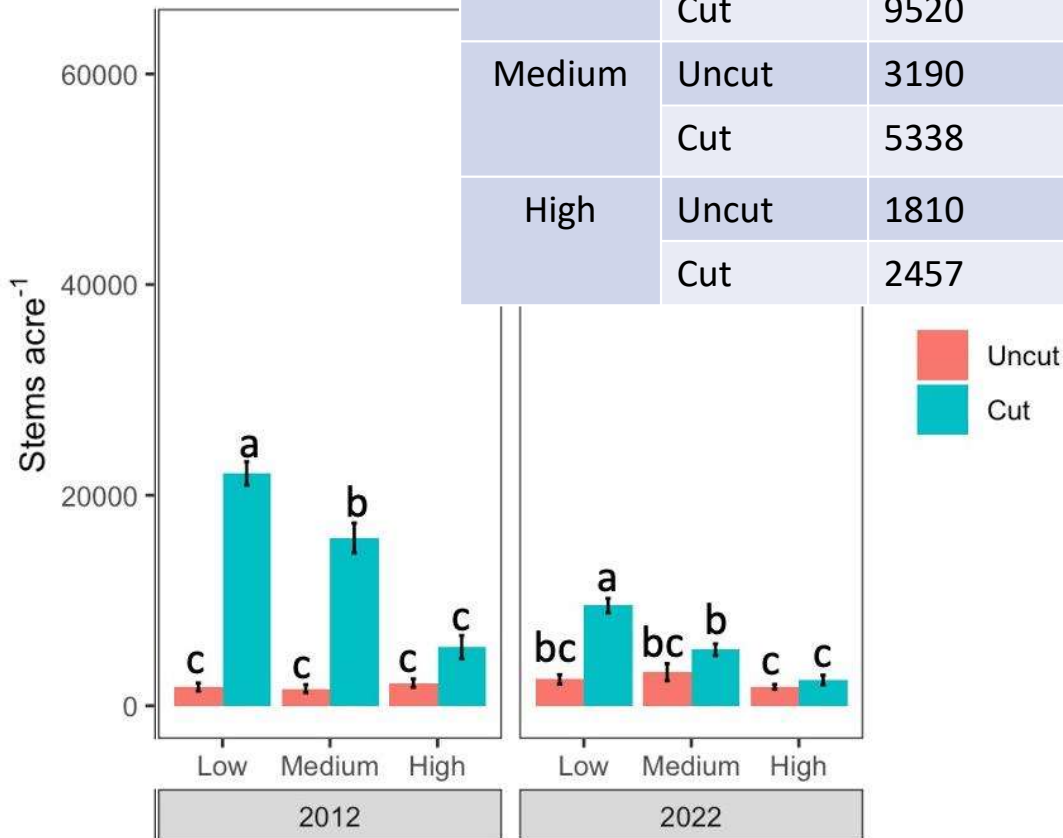
# Average Aspen Regeneration 1<sup>st</sup> 3 years



- Sprouting density declines through time
- By 2012, areas clearfelled in the Low and Medium mortality areas had significantly more sprouts
- Areas in High mortality areas did not have significantly more sprouts in areas clearfelled

# Average Aspen Regeneration 2022

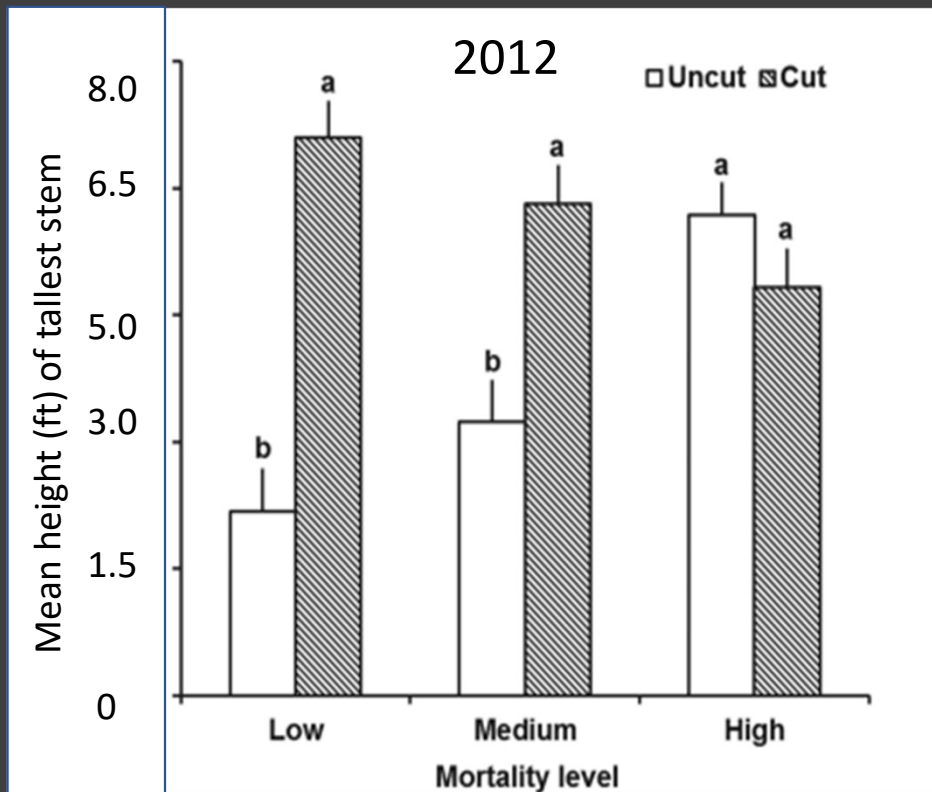
Mortality Level	Treatment	Average Stems/acre in 2022
Low	Uncut	2507
	Cut	9520
Medium	Uncut	3190
	Cut	5338
High	Uncut	1810
	Cut	2457



- As expected, density continues to decrease
- Areas clearfelled with low SAD mortality still had highest regeneration densities
- Areas that were uncut had lowest densities, but 12 years later no significant difference between clearfelled and uncut for areas with Medium or High SAD mortality



## Average Height of the Tallest Stem and Mortality Level: 3 years post-treatment (2012)

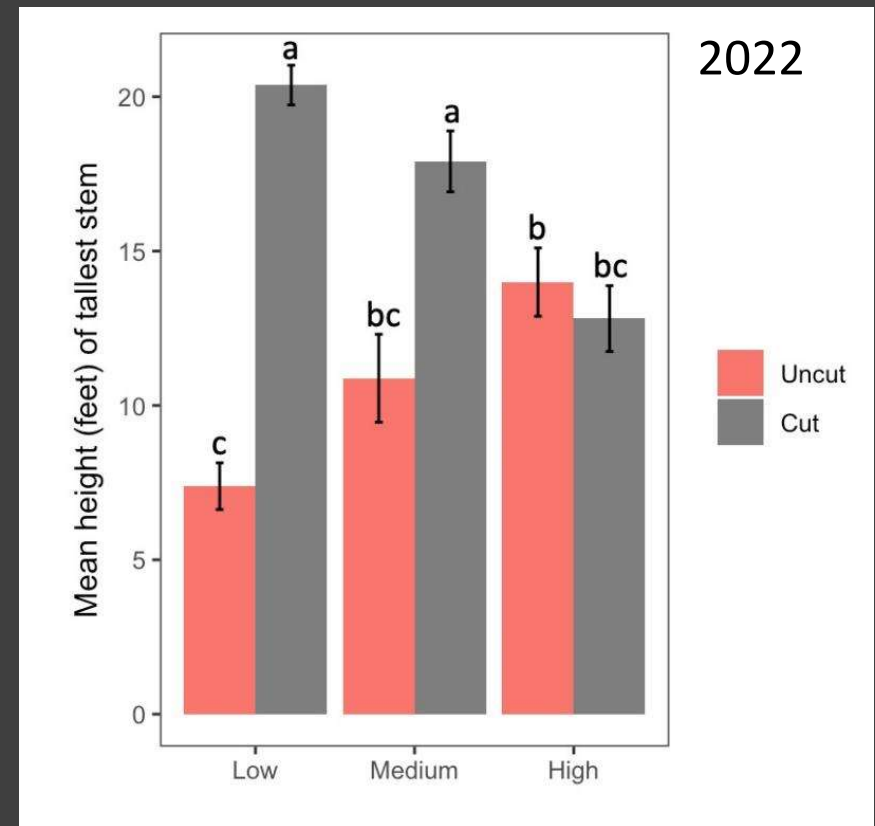


Sheppard et al., 2015

- Areas with low or medium SAD mortality that were clearfelled were significantly taller (6.5 to 7 ft) than those in the uncut areas (2 to 4 ft)
- No difference in height in the High SAD mortality areas
  - Heights about 5 to 6 ft

# Average Height of the Tallest Stem and Mortality Level after 12 years

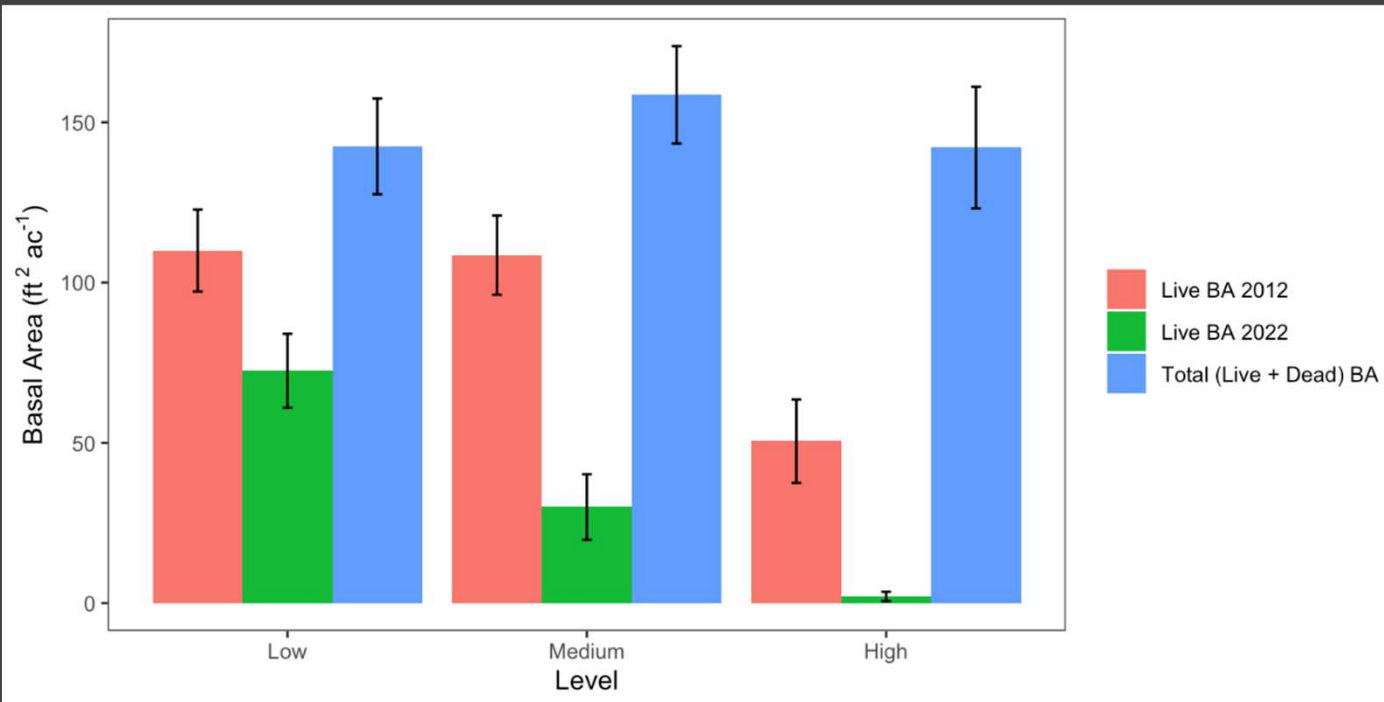
- Areas with Low or Medium SAD mortality that were clearfelled were still significantly taller (15 to 20 ft tall) than those in the uncut areas (7 to 10 ft tall)
- Still no difference in height for the High SAD mortality areas (around 14 ft tall)



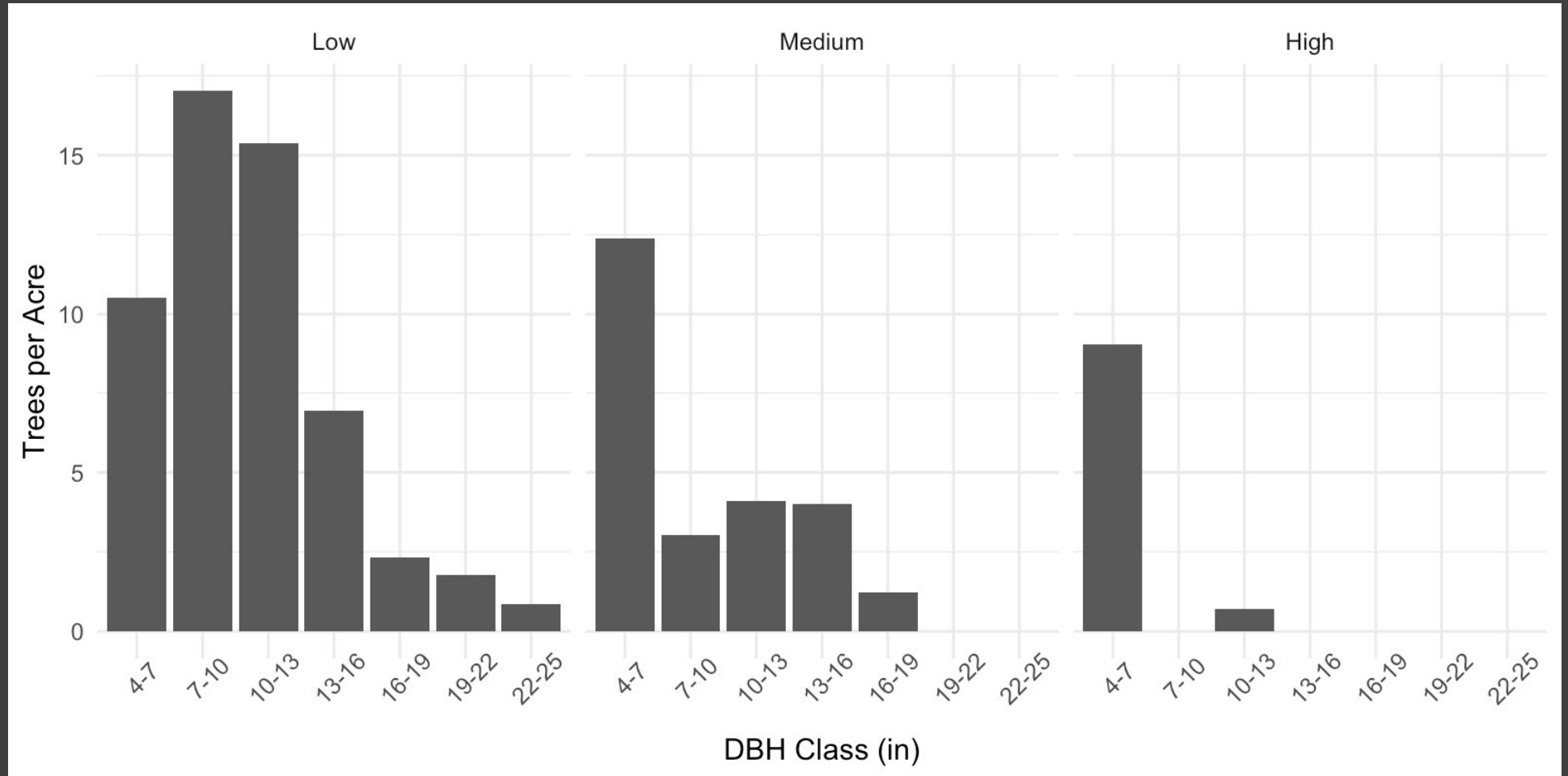
# Overstory Mortality Comparison in Uncut Stands

- All stands, regardless of SAD mortality level showed a decrease in Live Basal Area, with the largest decrease occurring in the High SAD mortality stands
- Substantial amount of Dead Basal Area present in uncut areas

Mortality Level	Year	Live BA (ft <sup>2</sup> /ac)	Dead BA (ft <sup>2</sup> /ac)
Low	2012	110	32
Low	2022	72	70
Medium	2012	109	50
Medium	2022	30	129
High	2012	50	92
High	2022	2.1	140



# Live Overstory diameter distribution in Uncut stands (2022)



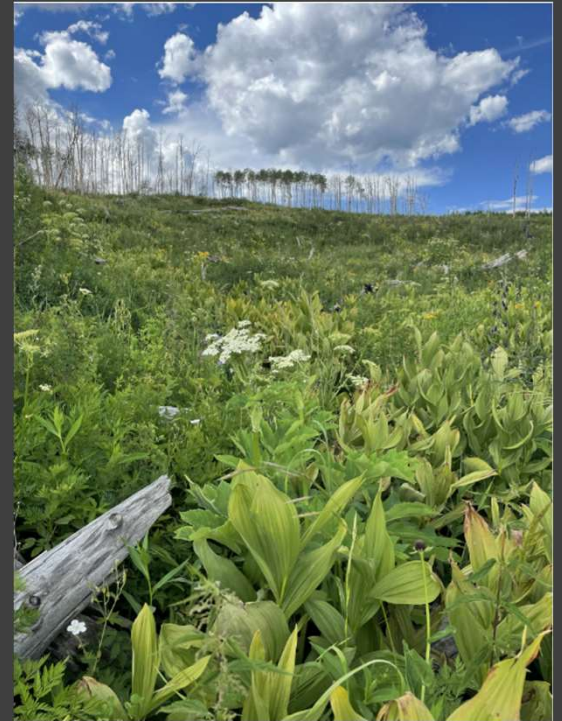
Low Mortality



Medium Mortality



High Mortality

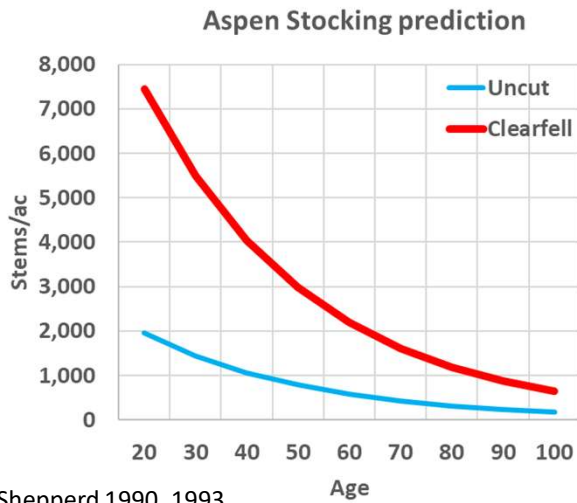


# 2022 Site Photos



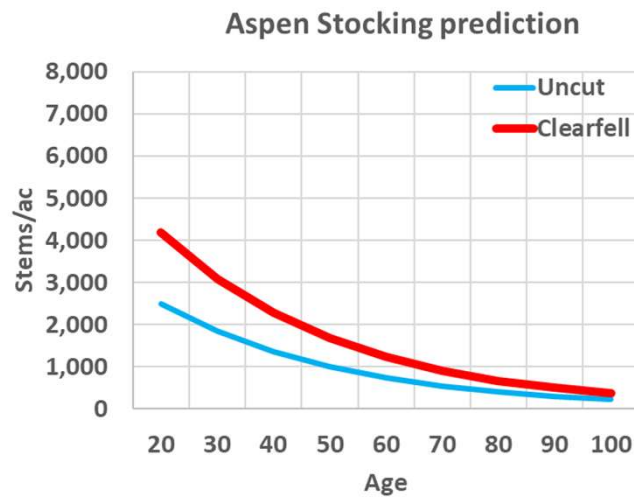
# Aspen stands in 100 years

Low SAD mortality

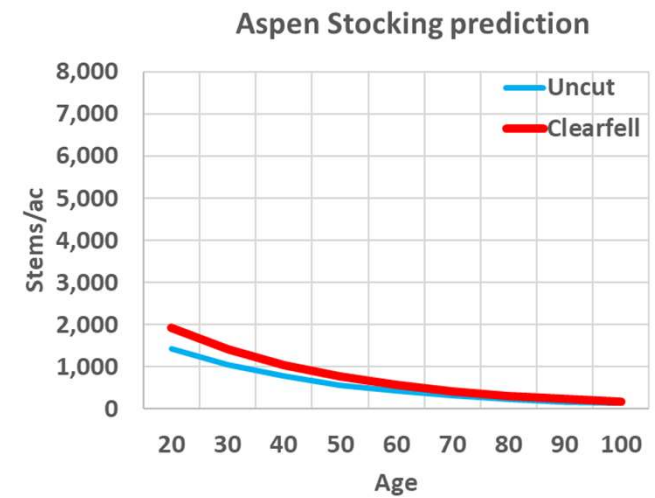


Shepperd 1990, 1993

Medium SAD mortality



High SAD mortality



100 years later	Uncut		Clearfell	
	TPA	Spacing (ft)	TPA	Spacing (ft)
Low SAD	170	16	644	8
Medium SAD	216	14	361	11
High SAD	123	19	166	16

# Take home messages

- Regeneration is happening across all the stands and treatments –
  - Aspen will be a component of the future stands
- Size of trees
  - Uncut areas in the low and medium SAD stands had shorter aspen (<10 feet tall so they are still subject to browsing)
  - Clearfell stands in low and medium SAD stands good height to avoid browsing
  - Uncut areas in the high SAD stands and clearfelled stands also good height to avoid browsing

	Low SAD		Medium SAD		High SAD	
Variable	Uncut	Clearfell	Uncut	Clearfell	Uncut	Clearfell
Density (TPA)	2507	9520	3190	5338	1810	2457
Regeneration Height (ft)	7	20	11	18	14	14
Quadratic mean diameter trees > 4 inch dbh (inches)	12.3	0	7.3	0.5	0.9	0

# Take home messages

- Forest structure
  - Clearfell stands and uncut medium and high SAD are even-aged
  - Uncut Low SAD is two-aged
- Overall, clearfelling when SAD is at low or medium levels will provide enough regeneration response and height growth to promote a fully stocked aspen stand to develop
- Stands that had high SAD mortality still will be aspen, but likely not commercial timber stands

Health status of the living trees? Climate change impacts? Fuel loads? Snags?

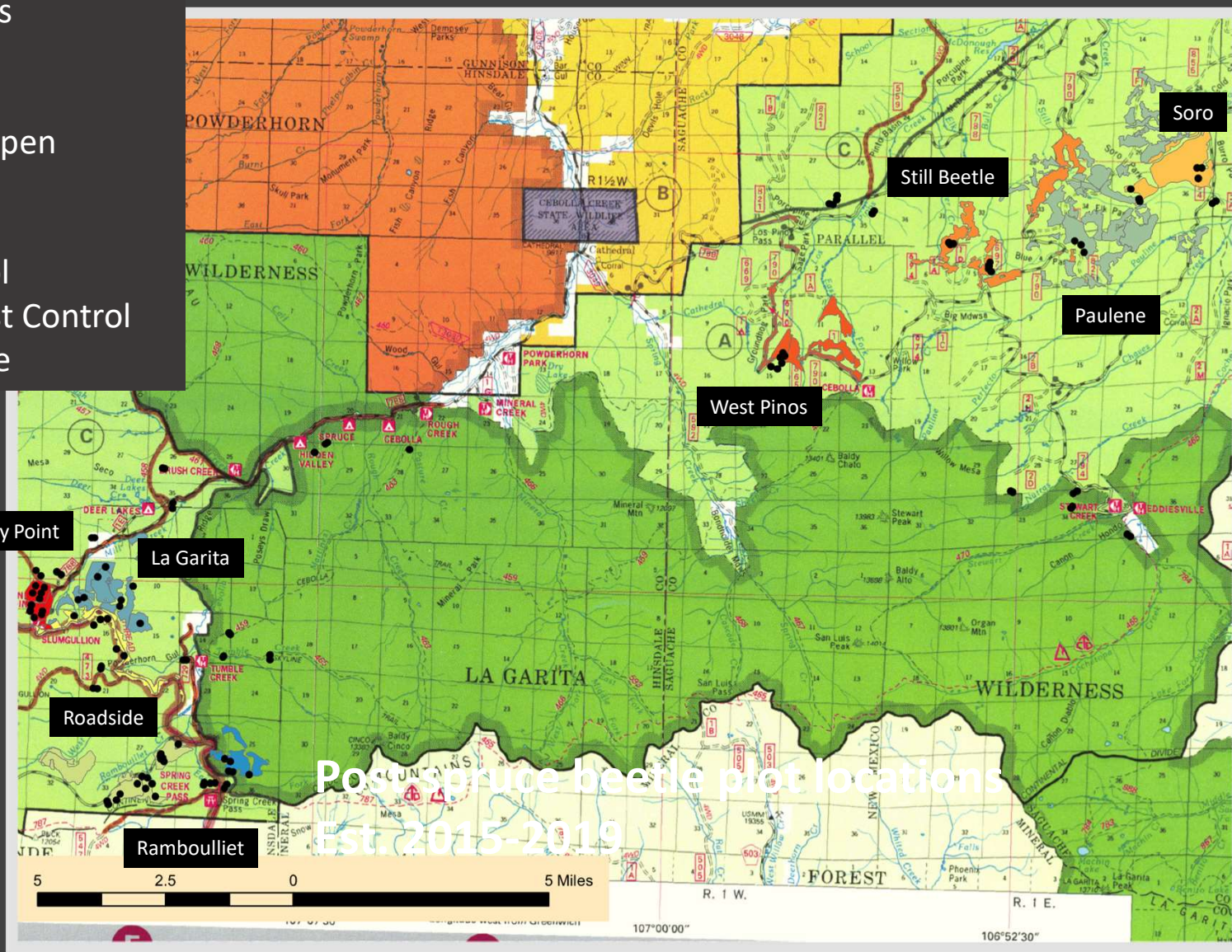
# Summer monitoring plans for 2023 and 2024







- 7 Project Areas
- 3 Forest Types
  - Spruce
  - Spruce Aspen
  - Spruce fir
- 117 Plots
  - 53 Control
  - 35 Harvest Control
  - 29 Salvage



Post-spruce beetle plot locations  
Est. 2015-2019

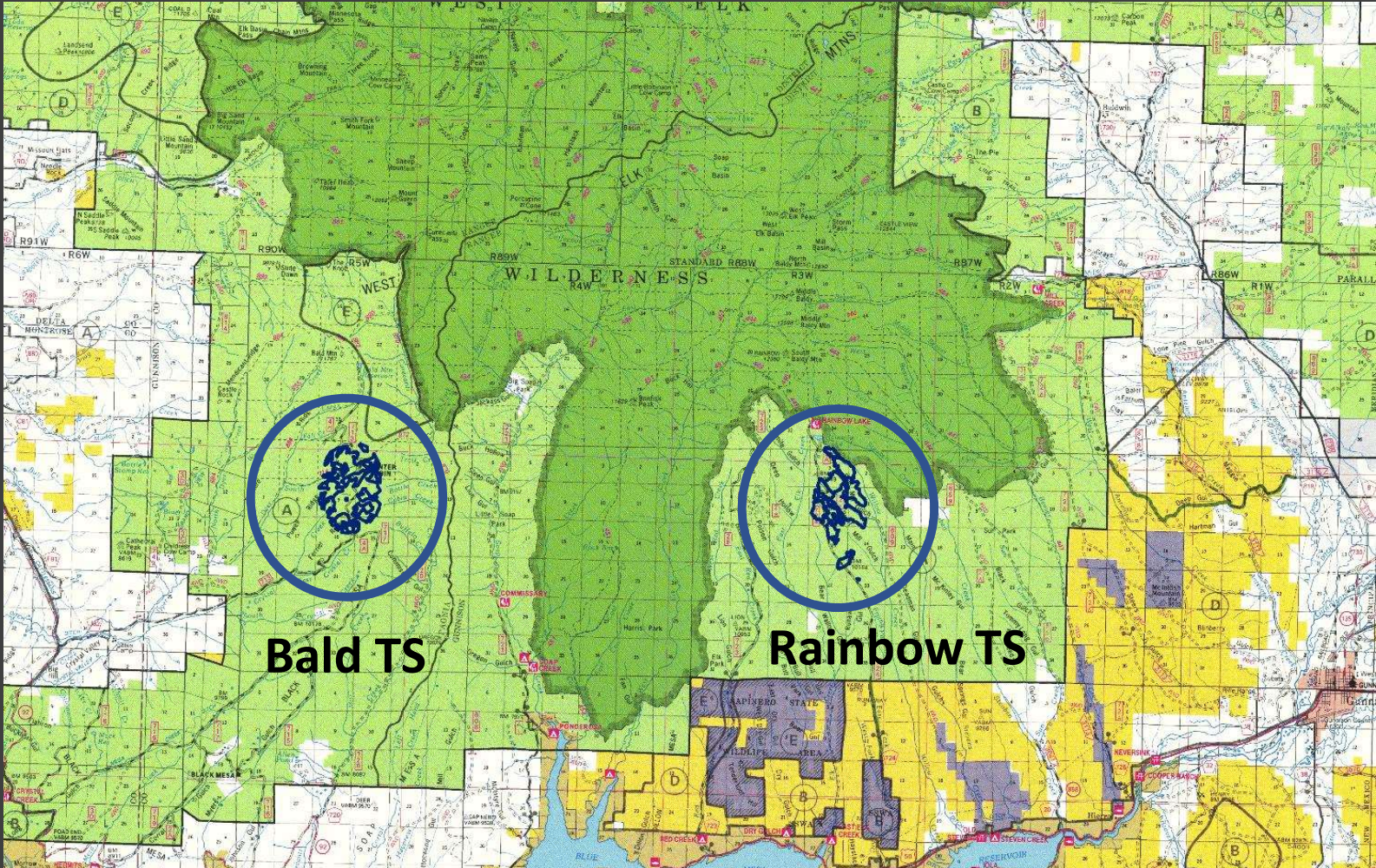


# Seedling regeneration survival and growth in unharvested and salvaged areas





# SBEADMR Resiliency Treatments – Measure in Summer 2024





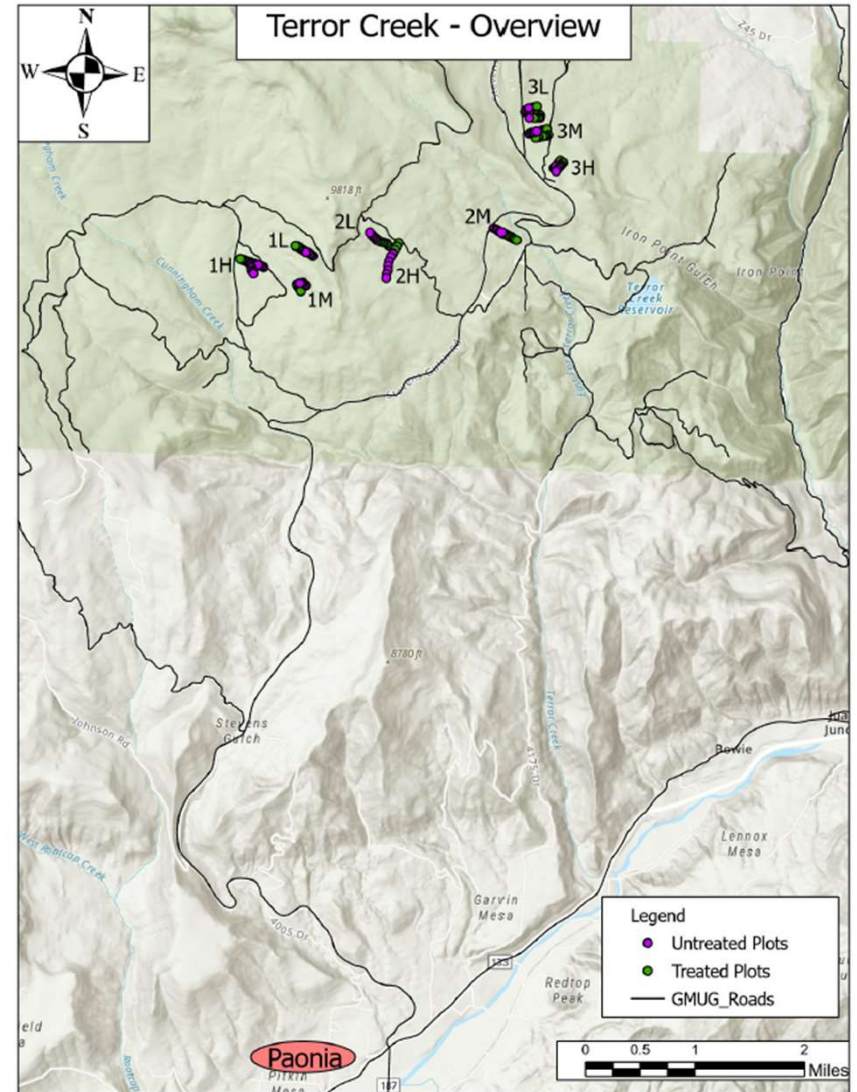
Questions?



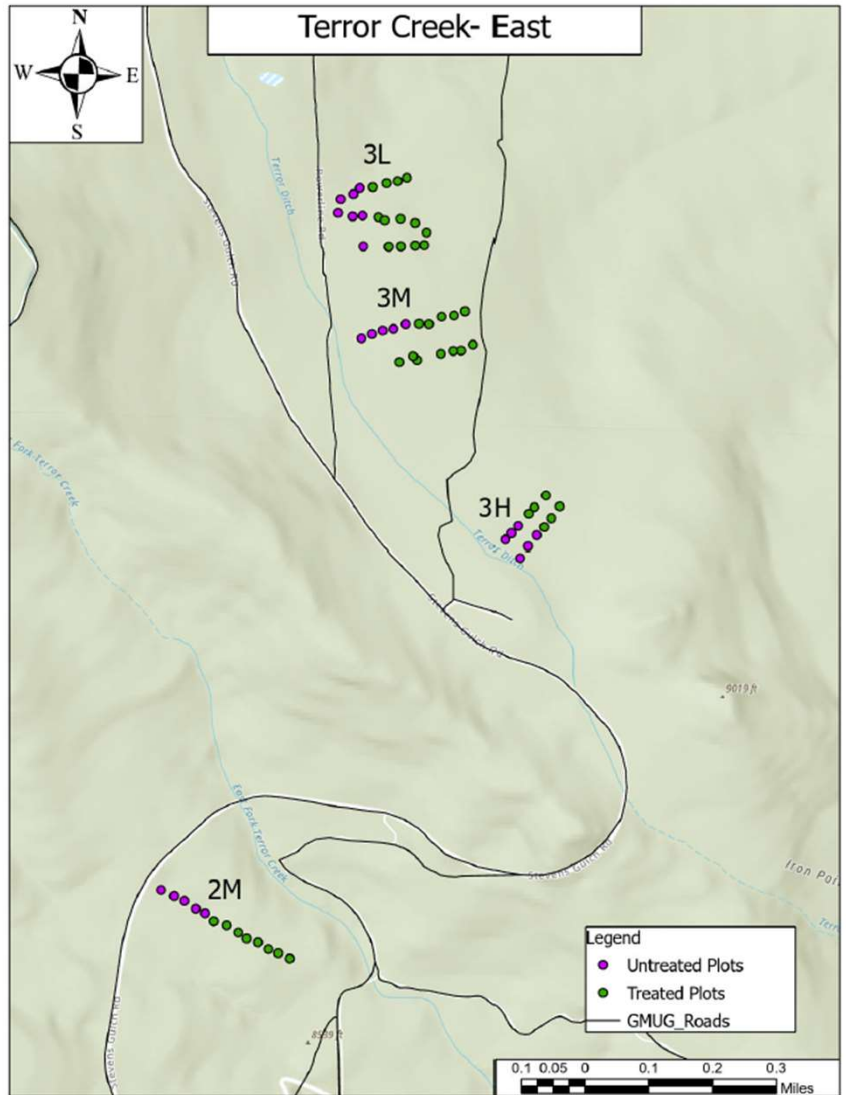


# Terror Creek Monitoring Plot Locations and sample size

Unit and mortality level	Cut plots	Uncut plots
1 Low	6	5
2 Low	7	5
3 Low	13	7
1 Medium	5	5
2 Medium	8	5
3 Medium	12	5
1 High	10	9
2 High	3	7
3 High	6	6







# Plot Close-ups

