Caples Ecological Restoration Rx/Wildfire
2019

The Legacy of Fire Suppression

Caples Creek Watershed 1899
Historic (Desired) Conditions

Caples Creek Watershed 2014
Heavy Understory and Dense Timber

Caples Ecological Restoration Project
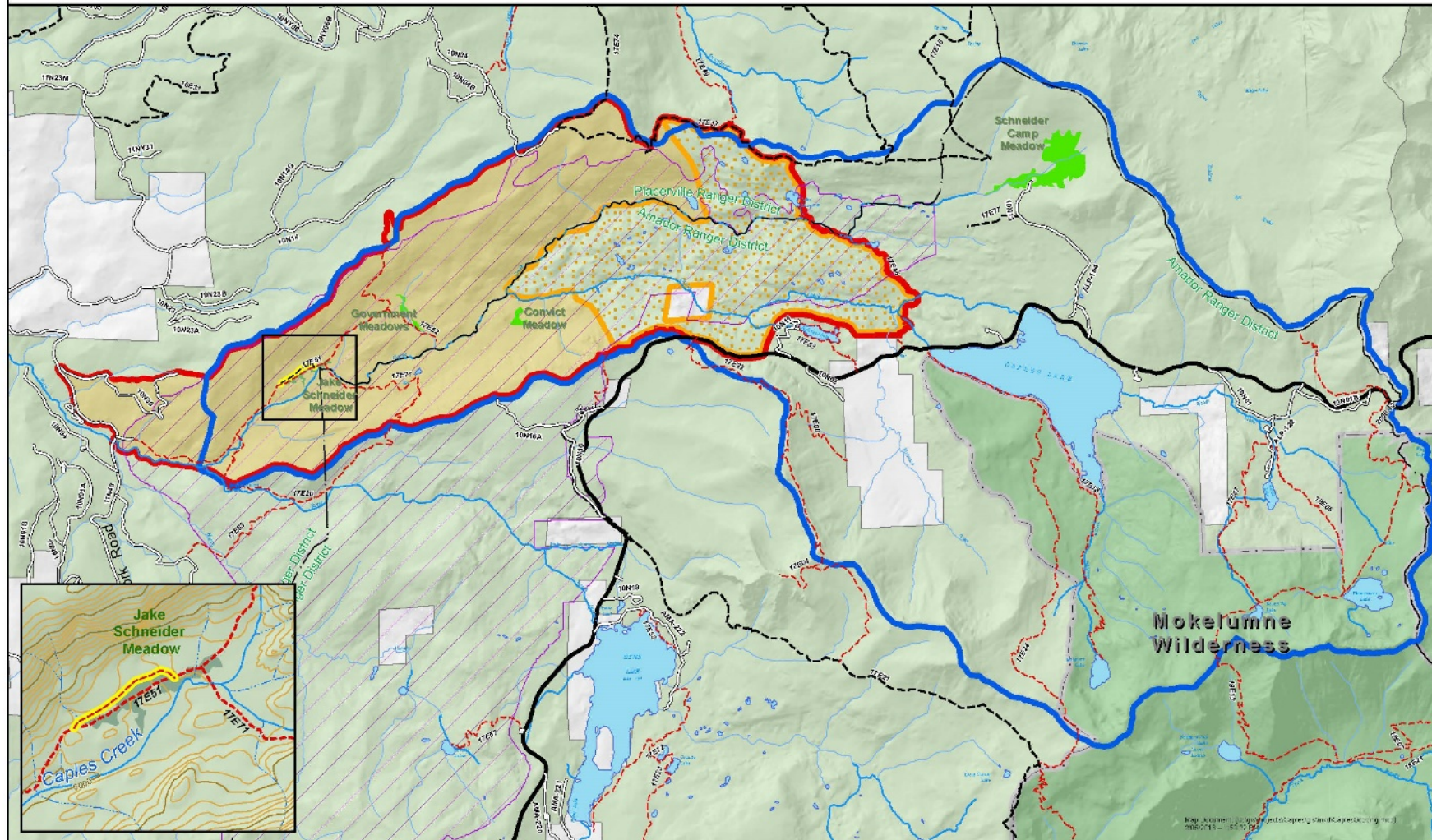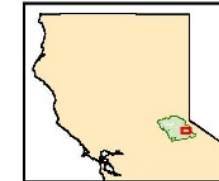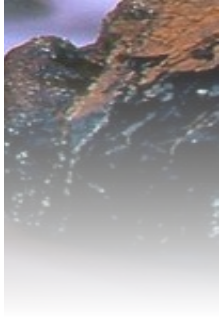*Amador and Placerville Ranger Districts*
Eldorado National Forest

Legend:
- Roads
- Motorized Trail
- Non-Motorized Trail
- Trail 17E51 ReRoute
- Ranger District Boundary
- Caples Creek Watershed
- Caples Creek Recommended Wilderness
- Prescribed Burn Area
- Vegetation Island Ignition
- Understory Burn
- USDA Forest Service
- NON-Forest Service

1:76,000

0   0.5   1   2   3   Miles

3

Caples Proposed Understory Burn Units

- Vegetation Island Ignition
- Caples Unit A
- Caples Unit B
- Caples Unit C
- Caples Unit D
- Caples Unit E
- Caples Unit F
- Caples Unit G

National Forest Land
OWNERCLASSIFICATION

- USDA FOREST SERVICE
- NON-FS

Abundant dead and downed fuels, small trees and ladder fuels.

LEGACY TREES

400 -700 year old with > 40" dbh

Post Fire Conditions

Post Fire Condition
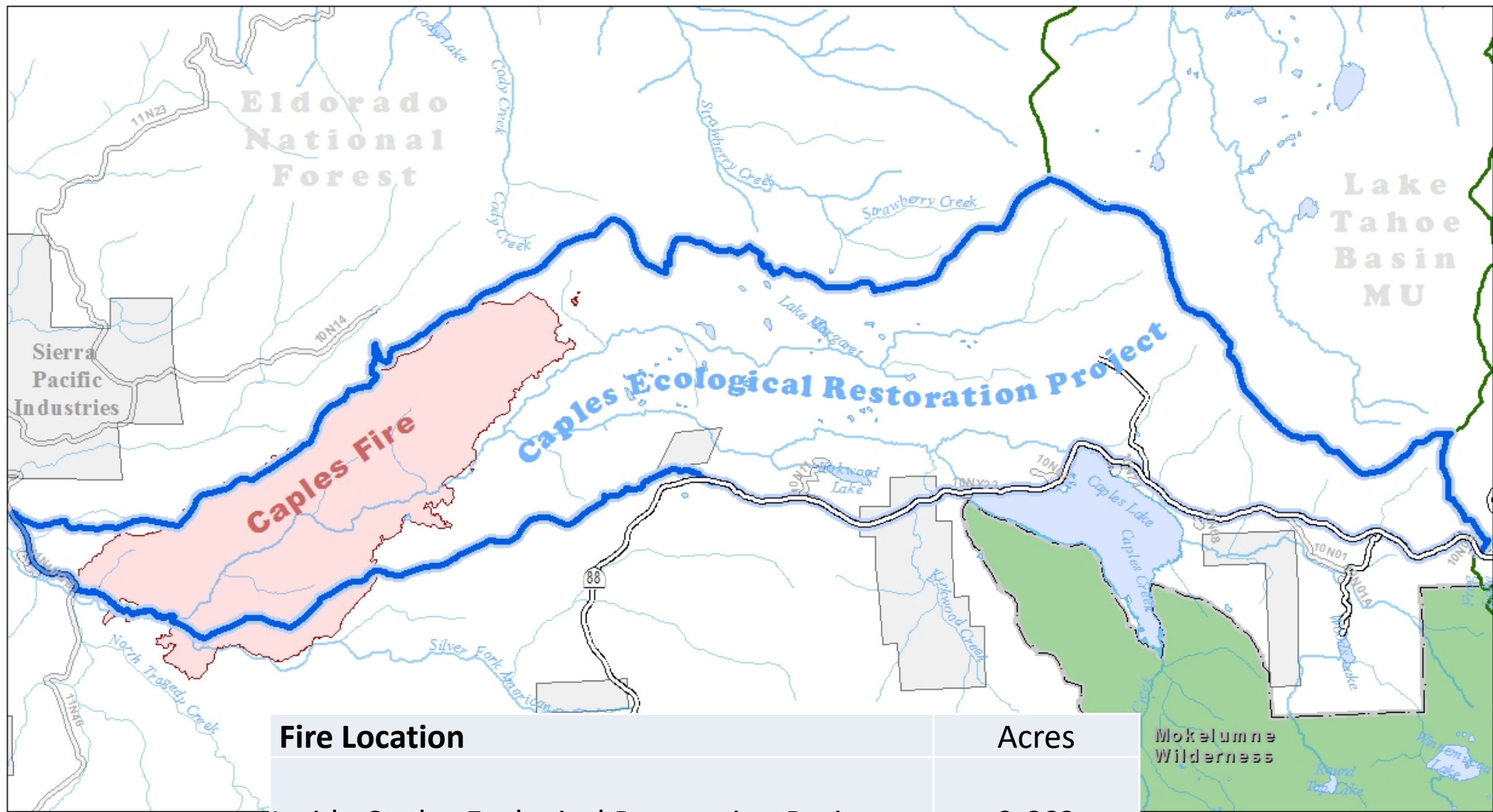## Area Thinned Before Burning

Legacy Trees Post Fire

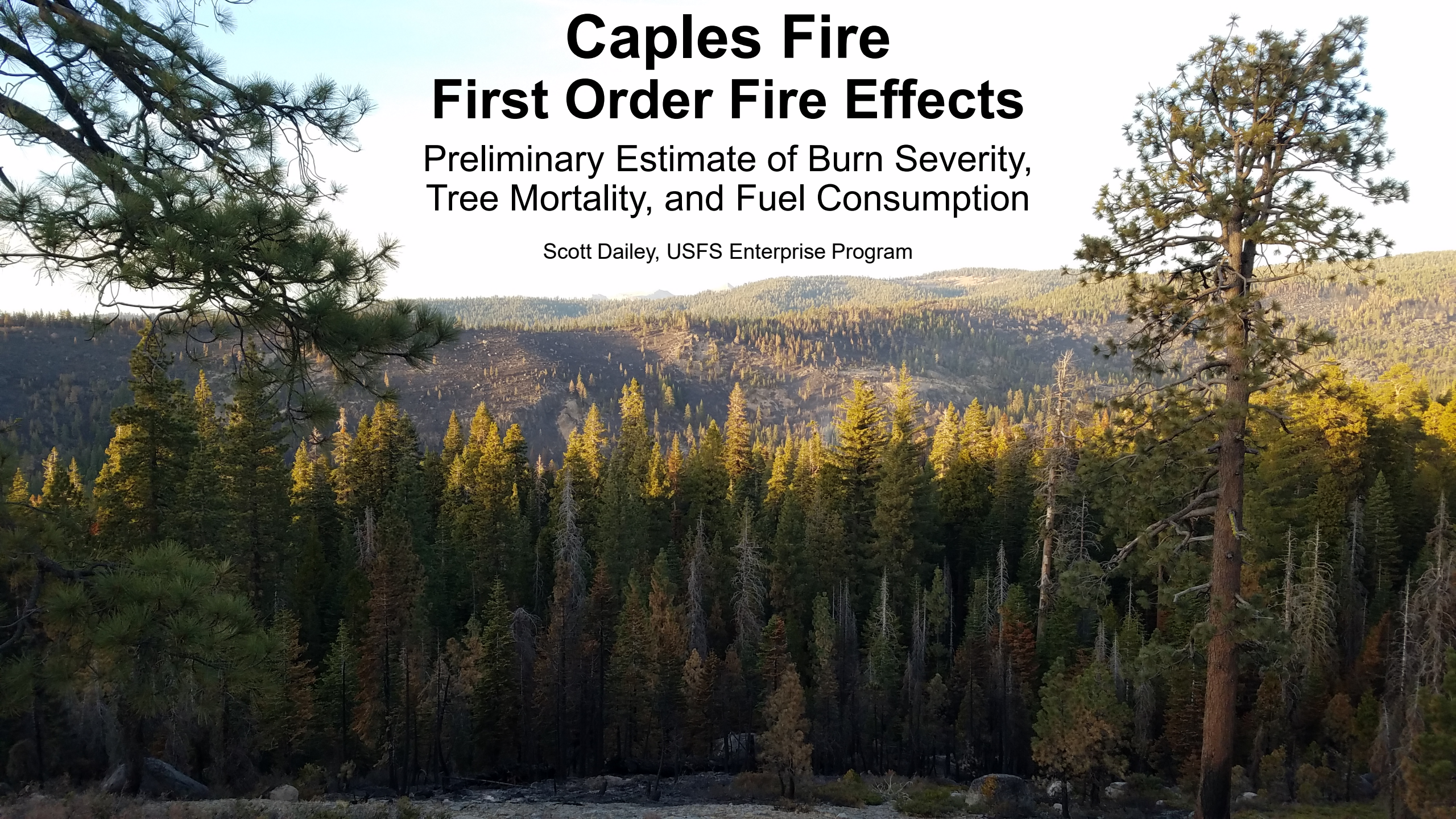| Fire Location	Acres
Inside Caples Ecological Restoration Project	2,663
Outside Caples Ecological Restoration Project	320
Grand Total	2,983

QUESTIONS?

Caples Fire
First Order Fire Effects

Preliminary Estimate of Burn Severity, Tree Mortality, and Fuel Consumption

Scott Dailey, USFS Enterprise Program

Introduction

- Scott Dailey, Fire Ecologist with US Forest Service Enterprise Program

- Fire Behavior Assessment Team (FBAT)
  - Been in operation since 2003
  - Multi-agency group
  - Fire/fuels managers, and fire scientists
  - Collect fire behavior and fire effects data
  - Collect data for various objectives, various agencies

Background

- FBAT was requested in late October by the Eldorado NF to collect first order fire effects data on the Caples Fire

- **Main Objective:** Provide a quick/preliminary estimate on fire effects of the Caples Fire. Were key restoration objectives met?

FBAT Objectives

- Metrics to Evaluate:
  - Changes in tree density / Tree mortality
  - Burn severity (soils, understory veg, shrubs, trees)
  - Fuels consumption
- Provide info to support land managers working to complete the Caples Creek Restoration Project
- Provide info to support ongoing monitoring and research

- Provide info to help track tree raking effectiveness
- Support Fuel Treatment Effectiveness Monitoring

Approach

- Quick planning (1 week)

- Collaborated with USFS R5 Ecology Program staff and Eldorado NF Fire staff to develop data collection plan

- Data collection plan based on pre-existing R5 Ecology Program monitoring protocol (additional measures for fire effects)

- Data collected in 1/10 acre plots

- Fieldwork occurred first 2 weeks of November, with field crew of 6

46 plots total: 38 forest plots, 8 chaparral plots
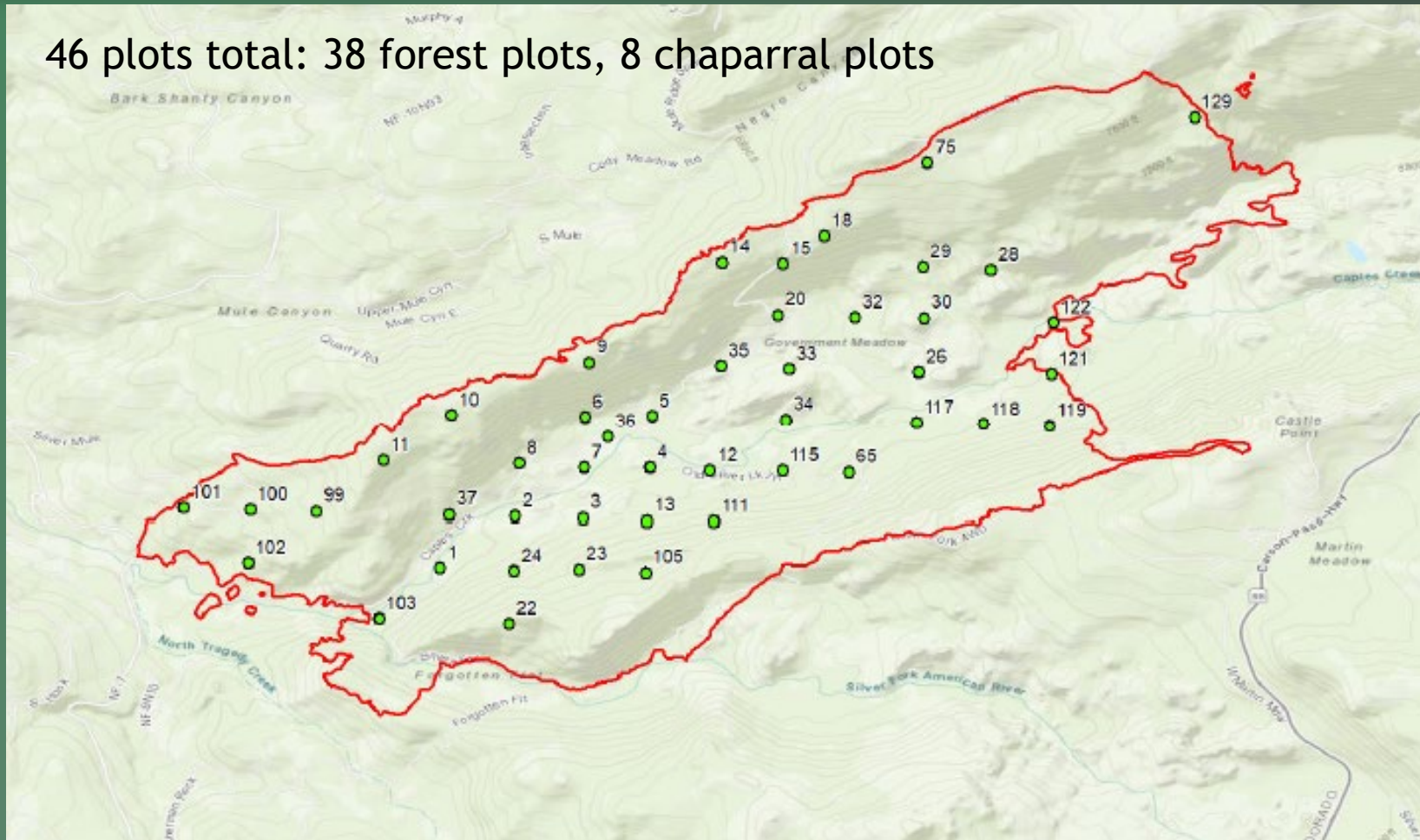
Pre/Post Photos

Data collected

Pre/Post Photos

Data collected

Pre/Post Photos

Data collected

Pre/Post Photos

Pre/Post Photos

Pre/Post Photos

Data collected

Burn Severity

Qualitative ratings of burn severity were assigned on each plot for:

- Substrate (soils, litter, duff)
- Understory Vegetation (Live vegetation pre-fire, all grass, herbs/forbs, shrubs, and trees < 3" diameter)

Quantitative measures taken to rate burn severity for Trees

Data collected

Burn Severity: **Substrate Ratings**

(Soil, litter, duff)

- 0 = Inorganic
- 1 = Unburned
- 2 = Litter partially blackened. Duff nearly unchanged. Wood/leaf structures unchanged
- 3 = Litter charred to partially consumed. Duff upper layer charred but not altered for entire depth. Wood debris partially burned. Logs blackened, not charred.
- 4 = Litter mostly to entirely consumed, leaving course light colored ash. Duff deeply charred, but underlying mineral soil not visibly altered. Logs deeply charred. Burned out stump holes common.
- 5 = Litter and duff completely consumed, leaving fine white ash. Mineral soil visibly altered, often reddish. Sound logs deeply charred. Rotten logs completely consumed.

Data collected

Burn Severity: **Understory Vegetation Ratings**

(Grass, herbs/forbs, shrubs, trees <3in)

- 0 = None present pre-burn
- 1 = Unburned
- 2 = Foliage scorched and attached to supporting twigs
- 3 = Foliage and smaller twigs partially to completely consumed, branches/stems intact
- 4 = Foliage, twigs, and small stems consumed, some branches/stems present
- 5 = All plant parts consumed, leaving some or no major stems

Trees *(all trees > 3 inches DBH)*
- Every tree within 1/10th acre plot (11.3m radius)
- Tag#
- Status (live/dead) *no green foliage*
- Height to live crown
- Burn severity measures
    - Bole Char Height
    - Canopy Scorch Height (toasted foliage)
    - Canopy Torch Height (consumed foliage)

- ~~DBH~~
- ~~Total tree height~~

Data collected

Forest Fuels

Litter and Duff depths
- Depths measured for each litter and duff at 3 locations along each of the 4 transects (N,E,S,W) at each plot

Fine Woody Debris
- Tallies of dead and downed woody material (twigs and sticks) <3" diam

Course Woody Debris
- Measurements on all large dead and downed woody material (logs) >3" diam

Data collected

Raked Trees (Large trees >31 inches)

- GPS coordinates taken
- Photos of each tree (2 of base, 2 of canopy)
- Photos of each tree's surroundings (4)
- Basic tree metrics: species, status, diameter
- Fire effects tree: char, scorch, torch heights
- Burn severity rating for surroundings
- Raking method (bermed vs scattered)
- Litter and duff depth estimate (pre-fire)

Results

Percent of Burn Severity Categories within Plots

	Forested		Shrub	
	Substrate	Understory Veg	Substrate	Understory Veg
■ Very High	5	7	1	20
■ High	36	6	18	26
■ Mod	14	6	19	7
■ Low	9	9	8	6
■ Unburned	15	11	5	5
■ Non-burnable	21	61	50	37

Substrate Burn Severity, Forest plots vs. Shrub Plots

	Substrate Forest	Substrate Shrub
Low	37%	25%
Mod	24%	50%
High	39%	25%
V. High	0%	0%

Understory Vegetation Burn Severity, Forest vs Shrub Plots

	Understory Veg Forest	Understory Veg Shrub
■ Low	38%	13%
■ Mod	32%	38%
■ High	16%	38%
■ V. High	14%	13%

Results

Burn Severity for Intermediate and Large Sized Trees, as Percent of Total Plots Sampled

	Intermediate Trees	Large Trees
Low	59%	72%
Mod	36%	23%
High	5%	5%
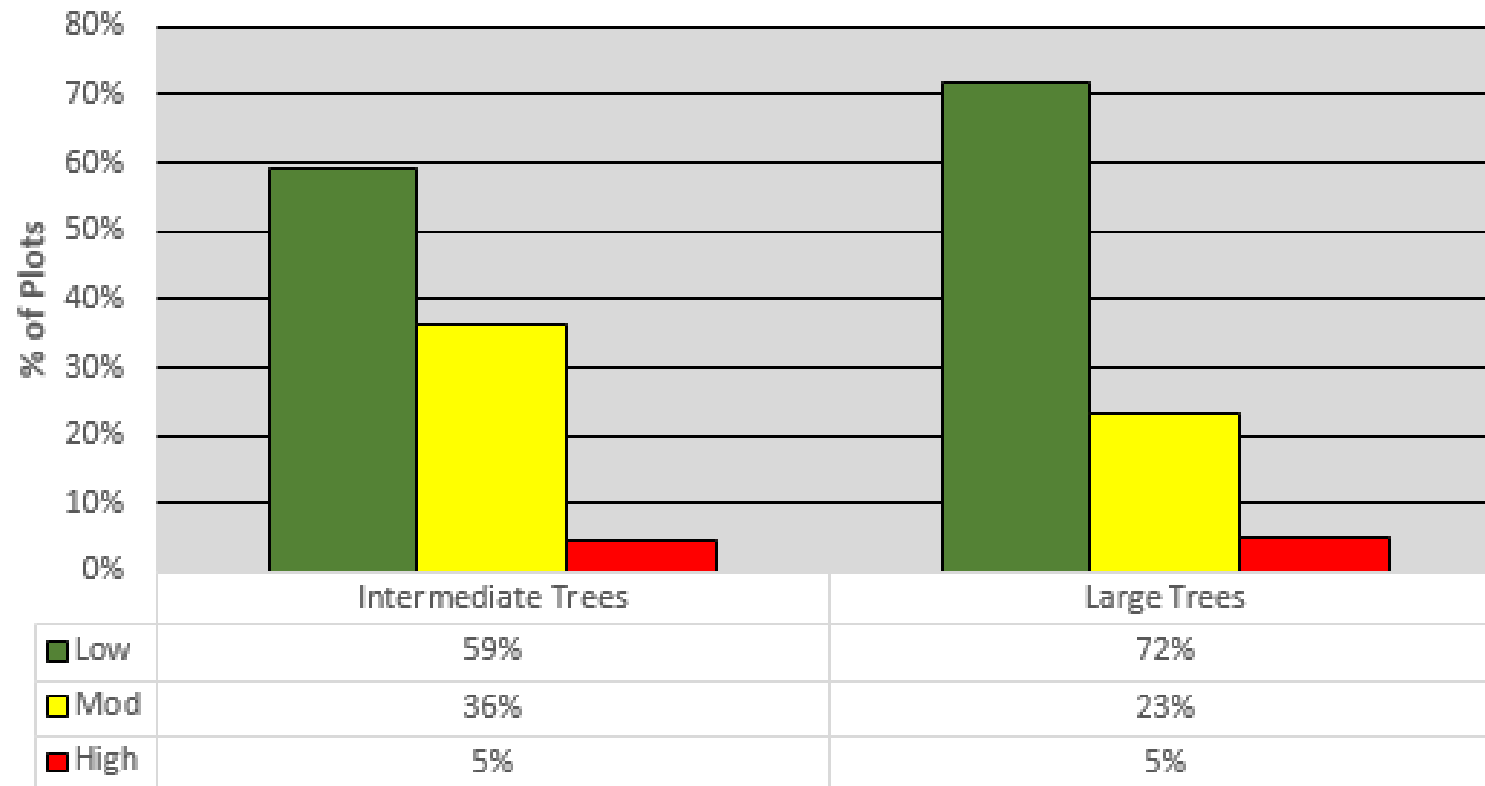
Overall Burn Severity: (Substrate + Understory Vegetation + Trees)

Overall Burn Severity as Percent of Total Plots Sampled
Forest vs. Shrub vs. All Veg Types

	Forest	Shrub	All Veg (F+S)
Low	45%	38%	43%
Mod	47%	25%	43%
High	8%	38%	13%
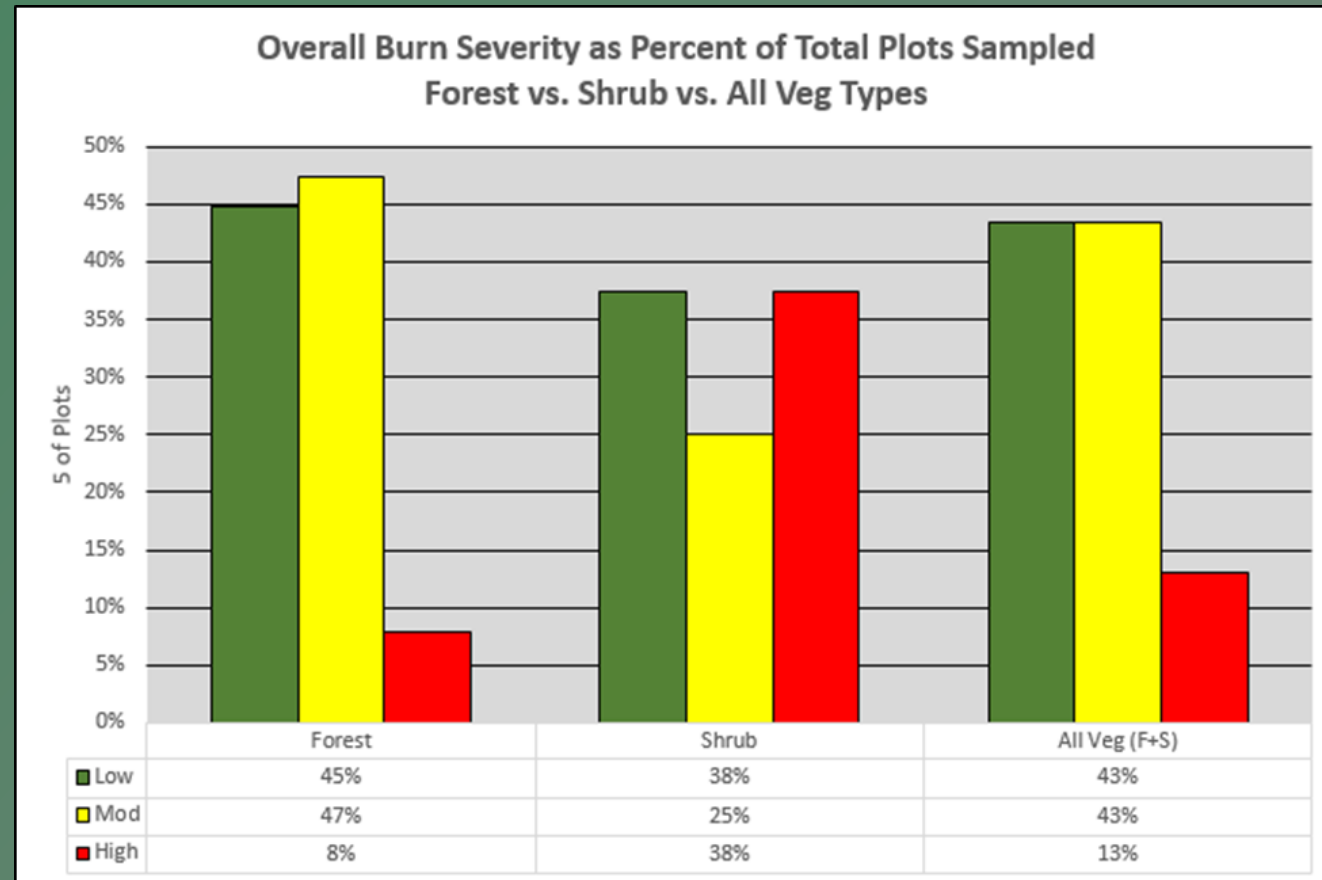
Burn Severity: Prescribed burn vs. Wildfire

Results

**Overall Burn Severity in Forest Plots,
Prescribed burn (Sept30-Oct9) vs Wildfire (Oct 10 -Oct25)**

	RxBurn	Wildfire
■ Low	60%	43%
■ Mod	30%	50%
■ High	10%	7%
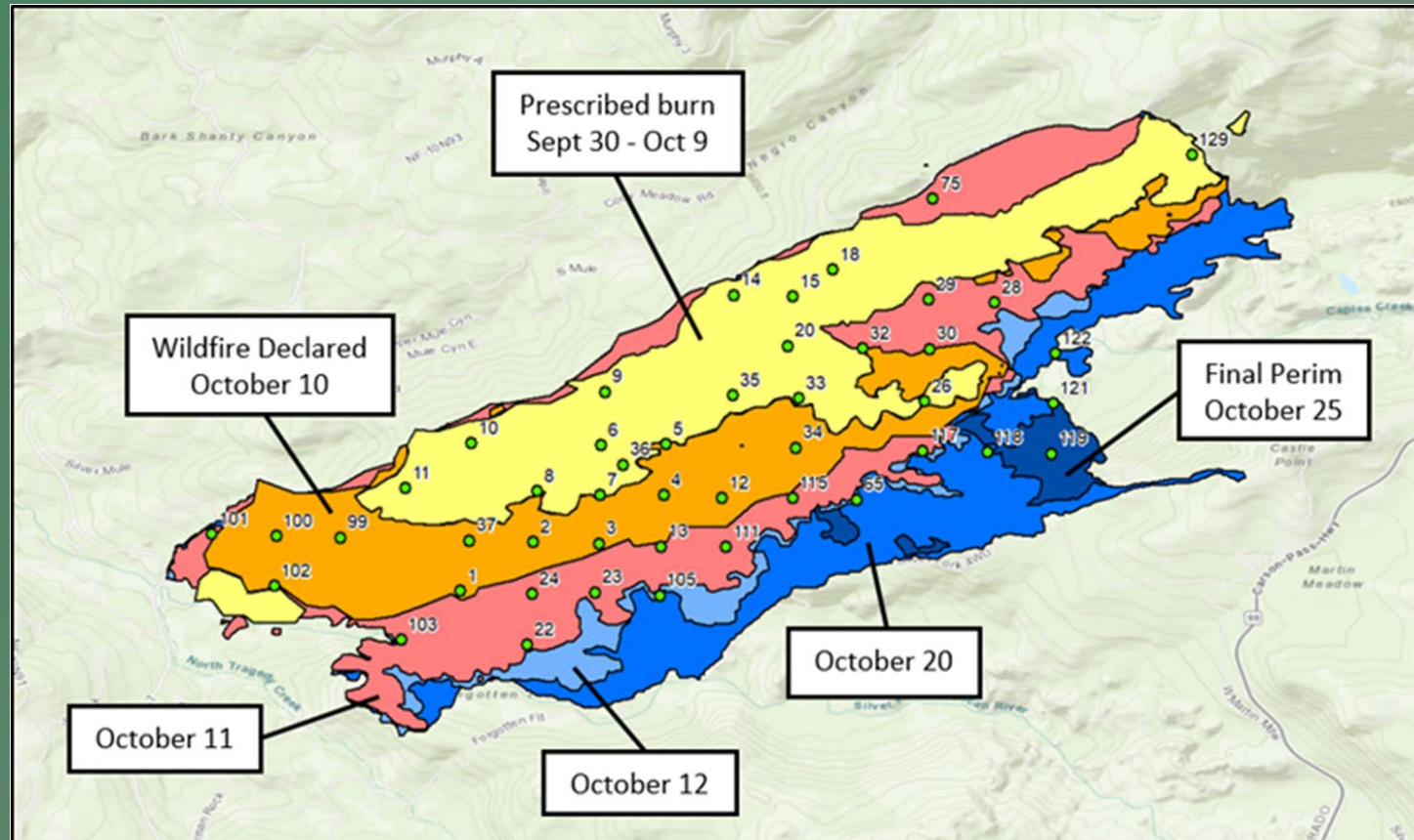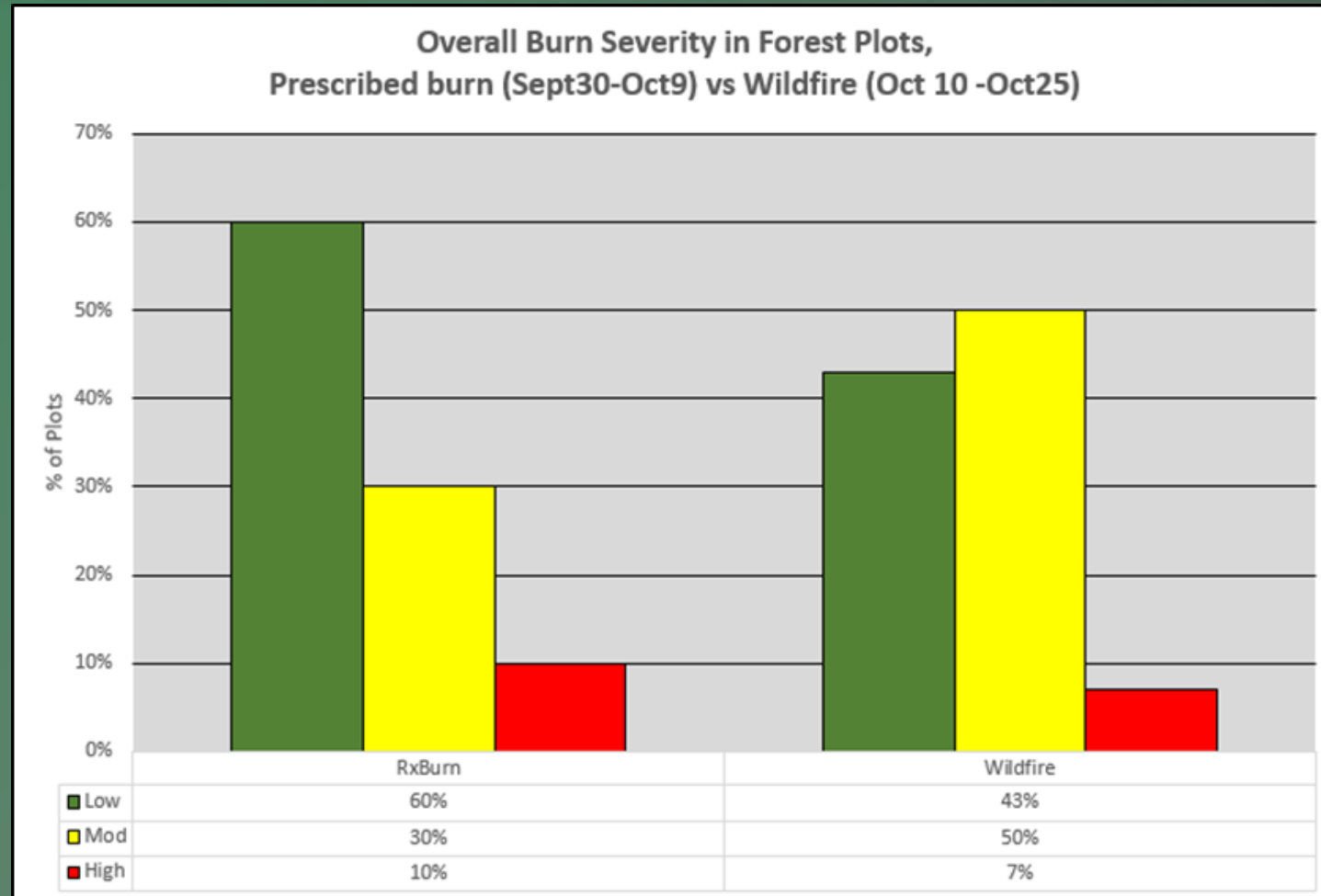
Results

Natural Range of Variability (NRV)

- Yardstick for assessing ecological integrity
- NRV describes variation in ecosystem characteristics under historic (pre-European) disturbance regimes
- Reference conditions can be interpreted by various means: tree ring studies, historic photos, and others
- One approach: Look at conditions of 'Resource Benefit' fires
- Studies have determined that these Resource Benefit fires fit the NRV (Meyer, 2015)
- We compared burn severity in prescribed burn portion of Caples Fire to Resource Benefit fires in the Sierra Nevada to gauge if it was near the NRV, and therefore improved ecological condition.

Results

Overall Burn Severity: Caples Fire vs the Natural Range of Variation

Comparison of Burn Severity Fraction, Caples Prescribed Fire & Resource Benefit Fires, VS Caples Wildfire & Other Sierra Wildfire, including 2014 King Fire (ENF)

	Caples RxBurn v. Resource Benefit Fires				Caples Wildfire v. Other CA Wildfires					
	CAPLES - RXBURN	YNP-RB	YNP/KCNP-RB	S.SierraNev-RB	CAPLES - WILDFIRE	Red Fir - Wildfire	YNP-Wildfire	NorthSierra - Wildfire	Mixed Con - Wildfire	King Fire - ENF 2014
Low	60	54	56	57	43	60	37	46	36	28
Mod	30	37	33	32	50	23	45	28	30	18
High	10	9	11	10	7	17	18	26	34	53

Results

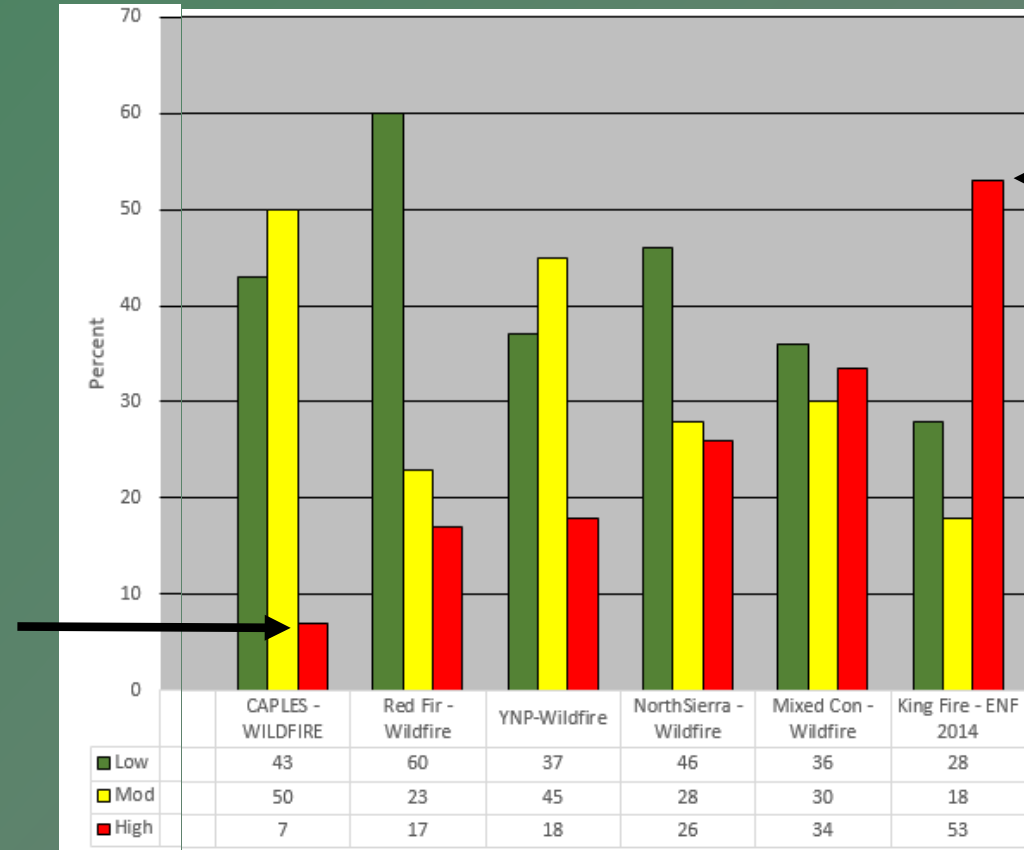Caples Fire: How bad could it have been?

- Comparison to 2014 King Fire on the Eldorado NF
- Occurred at same time of year (September)
- Similar elevation range
- Similar vegetation/fuel types
- Different: King Fire occurred during severe drought (2014-2017)… Caples Fire occurred on the heals of that drought

Results

Overall Burn Severity: Caples Fire compared to the King FIre

King Fire:
53% High Severity

Caples Wildfire:
7% High Severity

	CAPLES - WILDFIRE	Red Fir - Wildfire	YNP-Wildfire	NorthSierra - Wildfire	Mixed Con - Wildfire	King Fire - ENF 2014
Low	43	60	37	46	36	28
Mod	50	23	45	28	30	18
High	7	17	18	26	34	53

Results

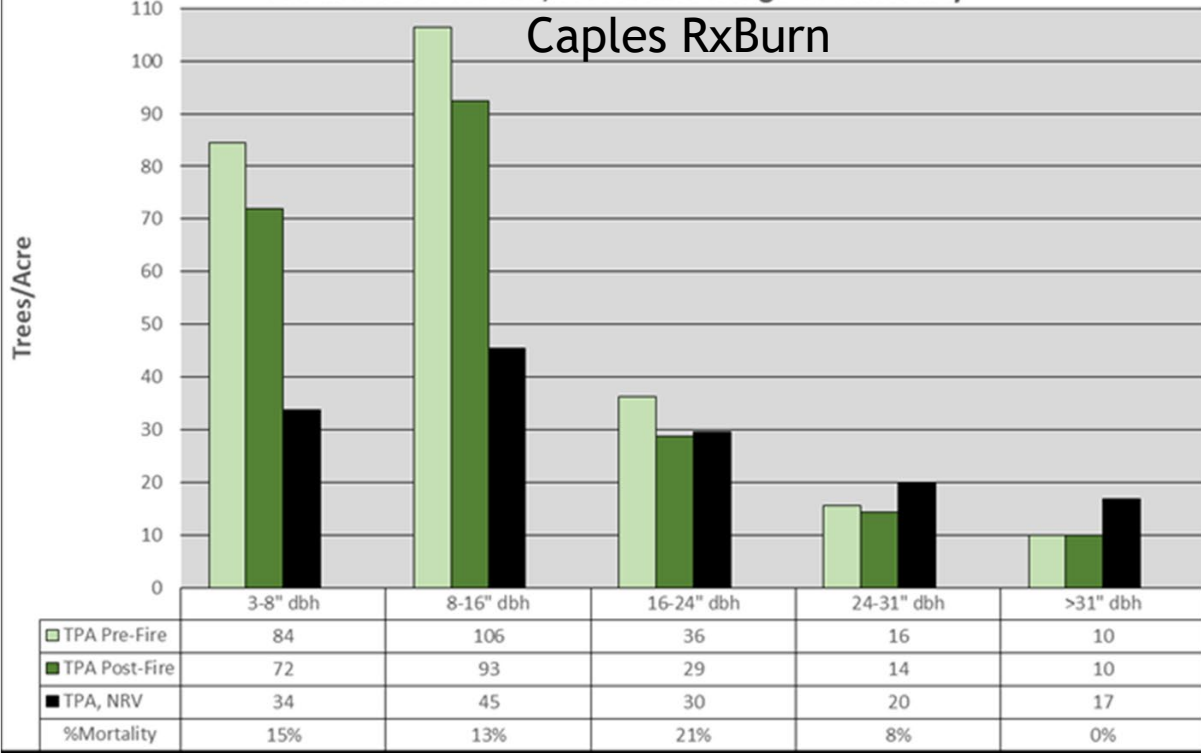Large Tree Mortality: Were Caples Prescribed Burn Plan Objectives Met?

- Burn Plan Objective: Tree mortality for trees >30in DBH was 5%

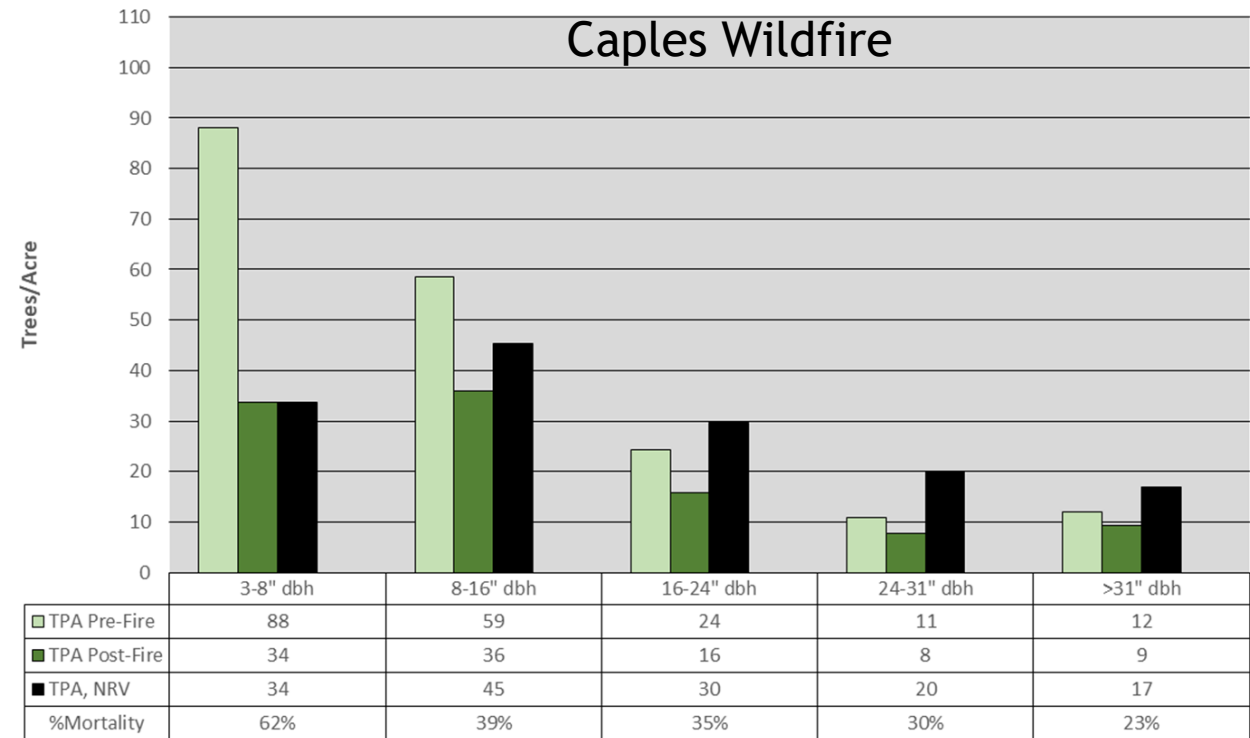- Prescribed burn areas: 0% = YES
- Wildfire areas: 23%

Tree density: Prescribed burn and Wildfire Compared to the NRV

Tree Density by Size Class, Forested Plots in 2019 Caples Prescribed Burn: Pre-fire and Post-fire, vs. Natural Range of Variability

Caples RxBurn

	3-8" dbh	8-16" dbh	16-24" dbh	24-31" dbh	>31" dbh
TPA Pre-Fire	84	106	36	16	10
TPA Post-Fire	72	93	29	14	10
TPA, NRV	34	45	30	20	17
%Mortality	15%	13%	21%	8%	0%

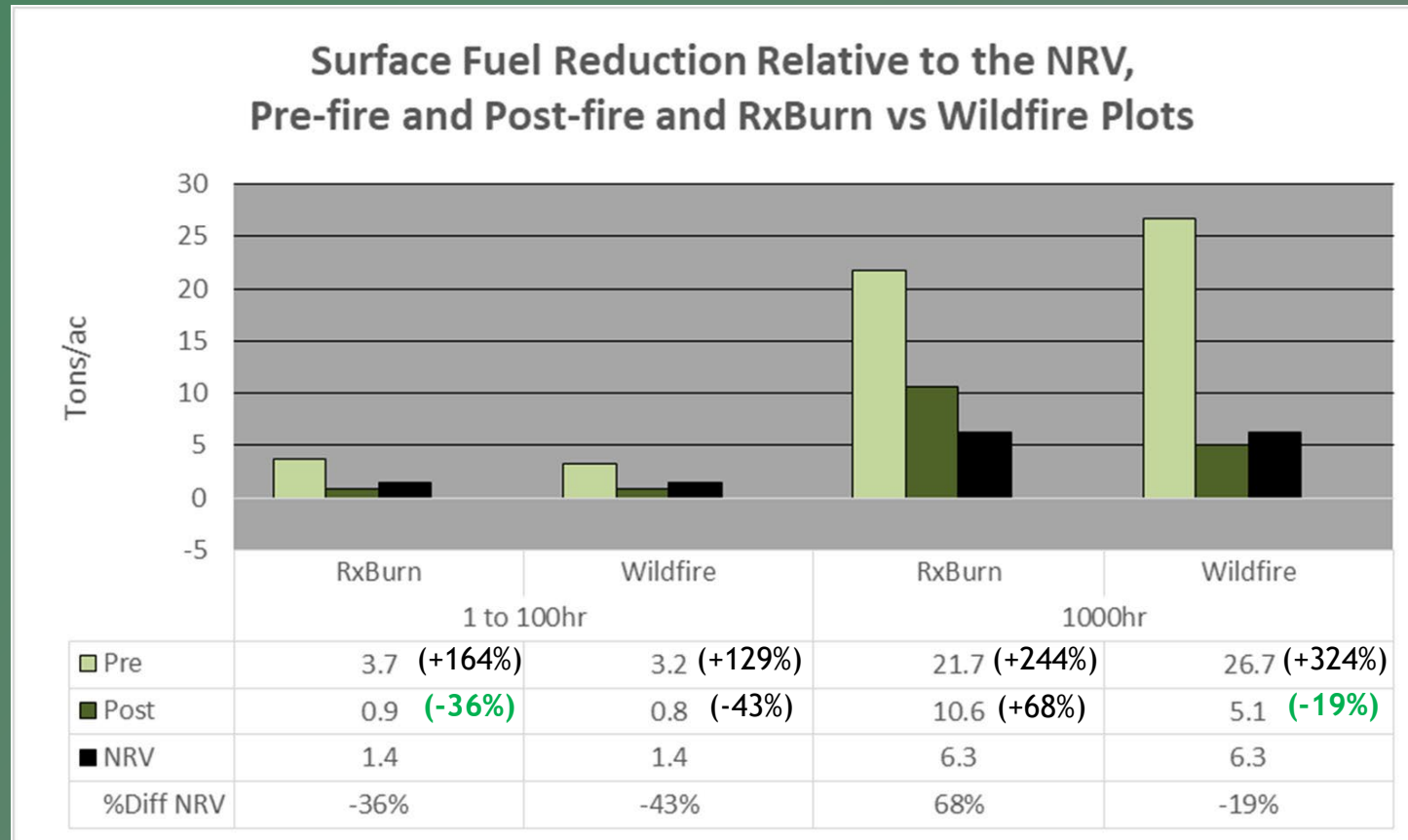Tree Density by Size Class, Forested Plots in 2019 Caples Wildfire: Pre-fire and Post-fire, and Natural Range of Variability

Caples Wildfire

	3-8" dbh	8-16" dbh	16-24" dbh	24-31" dbh	>31" dbh
TPA Pre-Fire	88	59	24	11	12
TPA Post-Fire	34	36	16	8	9
TPA, NRV	34	45	30	20	17
%Mortality	62%	39%	35%	30%	23%

Results

Fuel Load Reduction: Are conditions closer to the Natural Range of Variability?

Surface Fuel Reduction Relative to the NRV, Pre-fire and Post-fire and RxBurn vs Wildfire Plots

	RxBurn (1 to 100hr)	Wildfire (1 to 100hr)	RxBurn (1000hr)	Wildfire (1000hr)
Pre	3.7 (+164%)	3.2 (+129%)	21.7 (+244%)	26.7 (+324%)
Post	0.9 (-36%)	0.8 (-43%)	10.6 (+68%)	5.1 (-19%)
NRV	1.4	1.4	6.3	6.3
%Diff NRV	-36%	-43%	68%	-19%

Results

Fuel Load Reduction: Are conditions closer to the Natural Range of Variability?

Litter+duff depths:

- NRV is 0.6 inches
- Pre-fire: 2.2 inches (267% above NRV)
- Post-fire: 0.2 inches (67% below NRV)

Results

Surface Fuel Load Reduction: Were burn plan objectives met?

- Surface Fuels <1inch size class:
  - Objective: 70% reduction, Acceptable Range: 50-80%
  - Reduction: 73% = Objective met

- Surface Fuels 1 to 3 inch and >3 inch size classes:
  - 1 to 3 inch Objective = 50% reduction (30-60% Acceptable Range)
  - Reduction: 77% = Exceeded Objective
  - >3 inch: Objective = 25% reduction (10-35% Acceptable Range)
  - Reduction: 74% = Exceeded Objective

Results

Shrub Cover Reduction: Were Caples RxBurn Plan objectives met?

- Objective: 70% reduction.
- Estimated reduction: 73%. YES.

Results

Raked Trees Evaluation

- Prior to the Caples rxburn, efforts been made to provide protection to large legacy trees by removing fuels at base of trees

- A plan was being put in place to monitor tree raking, but it wasn't possible to carry this out prior to the Caples Fire.

- FBAT requested to collect raked trees data

- Challenge for FBAT field crews to ID raked trees

- 15 likely trees identified

Results

Raked Tree Stats:

- Species treated: 53% Jeffery pine, 20% Ponderosa pine, 13% White fir, lesser amounts of sugar pine, and incense cedar.
- Mean diam: 52.5" dbh. Largest: 69"
- Mean bole char height: 4.9 ft.
- In 1 of 15 cases, tree raking stopped fire from creating char on the tree bole
- Mean estimate of pre-fire duff depth: 5.4 " Max depth: 15.7"
- Percent of surrounding trees killed within 1/10th acre:
  - 6-12" dbh = 48%
  - > 12" dbh = 0%

Results

Photos – Raked Trees (2 photos each, base)

Results

Photos – Raked Trees (2 photos each, crown)

Results

Photos – Raked Trees (4 photos each, surroundings)

Results

Photos – Raked Trees (2 photos each, base)

Photos – Raked Trees (2 photos each, crown)

Results

Photos – Raked Trees (4 photos each, surroundings)

Photos – Raked Trees (2 photos each, base)

Results

Photos – Raked Trees (2 photos each, crown)

Results

Photos – Raked Trees (4 photos each, surroundings)

Questions?

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