

VEGETATION SUCCESSIONAL PATTERNS FOLLOWING A FOREST FIRE IN NORTHERN CALIFORNIA



Sierra Pacific Industries
Anderson, CA

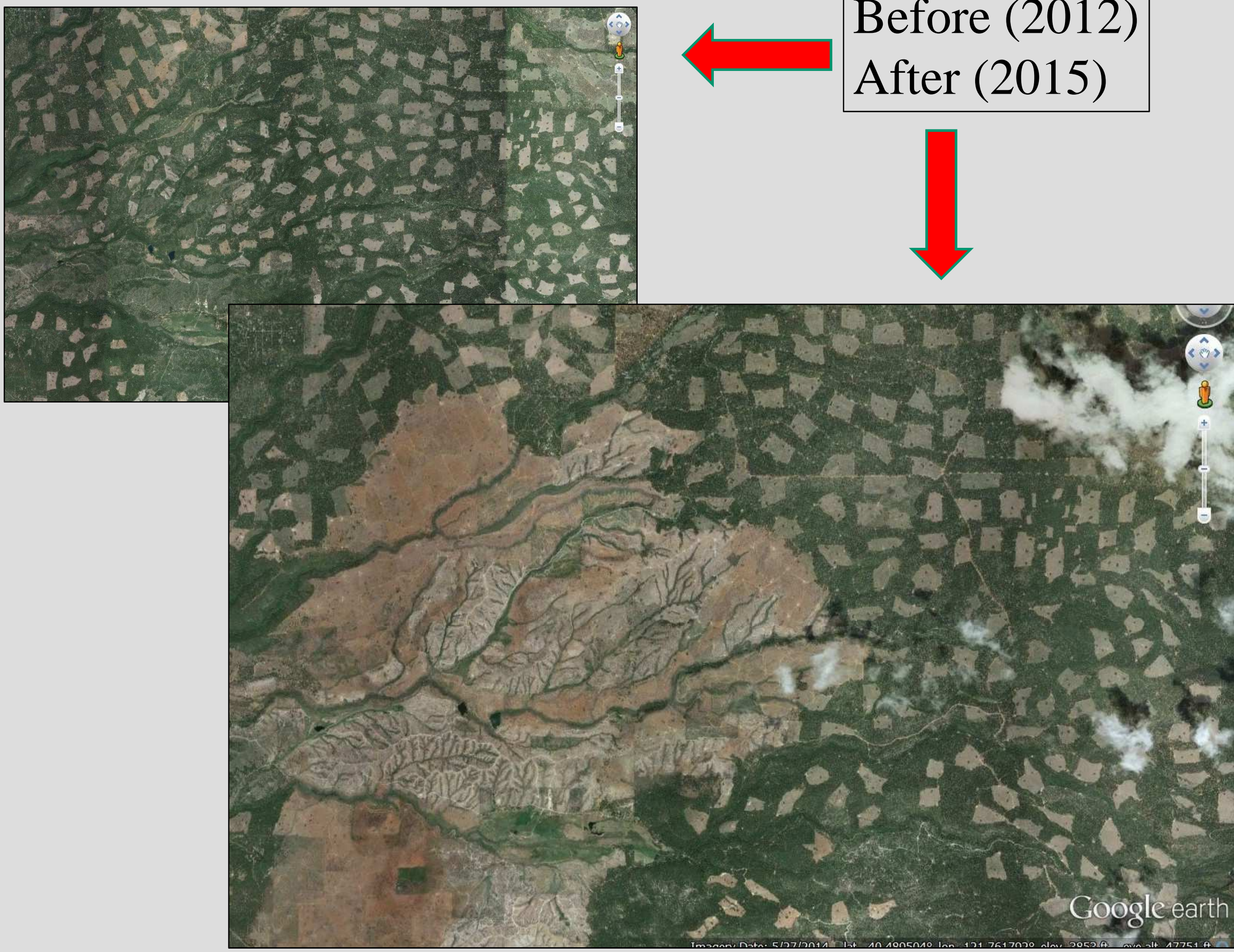
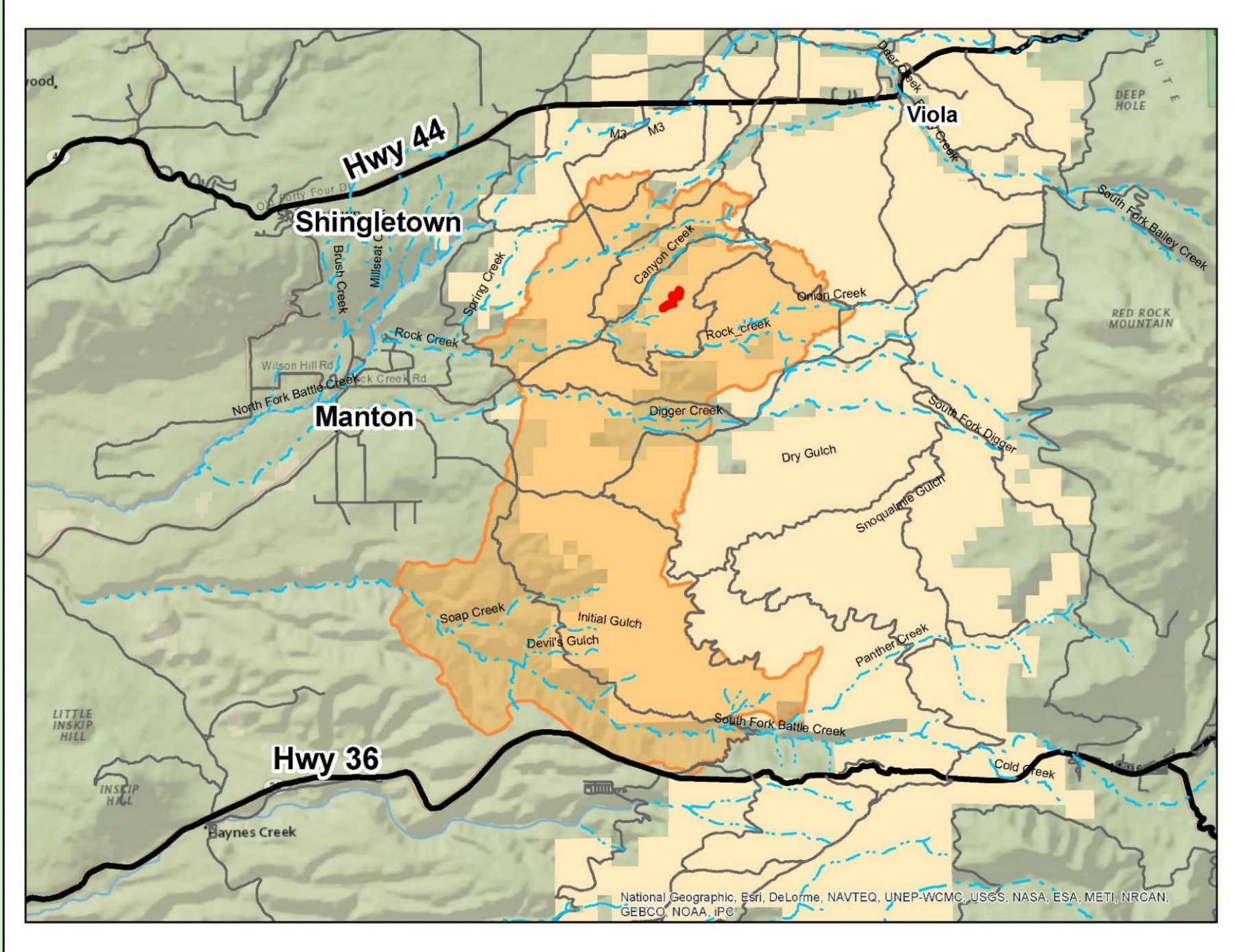
Cajun James, Ph.D & Dean Wm. Taylor, Ph.D (with Tom Engstrom, Stephanie Puentes, Jessica O'Brien and Jennifer Poore)

The Problem - California Conifer Forest Fires – Successional patterns following fires are poorly described!
Over the past decade, many large, catastrophic wildfires have raced through forests in Northern California. Some studies have indicated that increases in fire severity, frequency and size of catastrophic fires are already underway, others indicate fire severity will increase with climate change.
The floristic composition of post-fire early forest seral vegetation has been published only from a few sites, and most studies measure only vegetation cover not composition.

The Site - Sierra Pacific timberlands in Shasta County, in mixed conifer forests which have been under harvest for about 100 years. About 30% of the landscape was in young conifer plantations.

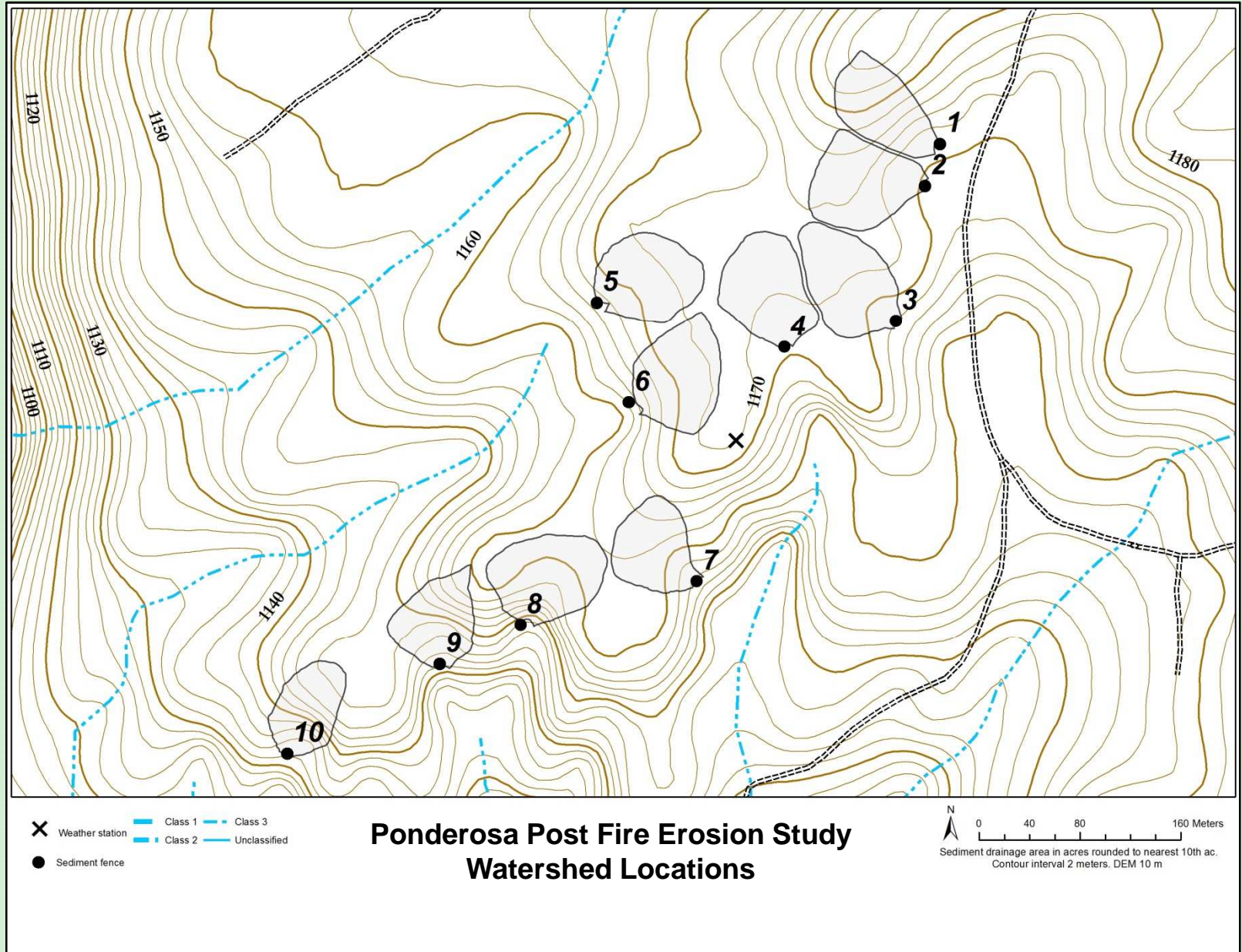
The Ponderosa Fire

- August 2012
- Very high severity
- Most conifers killed
- Ca. 28,000 acres
- Ca. 80% mixed conifer forest
- Study Watersheds in Red



10 Study Watersheds

- 10 small watersheds
 - Ca. 1 acre each
 - Varying silviculture treatments
 - Yearly vegetation sampling
 - 1x1 meter quadrats
 - Permanent transects
 - Erosion yield under study
- by Dr. James



Vegetation Quadrats Sampled Each Year

Exemplar quadrat shown in 1st then 2nd growing season

- 2013 – 0 taxa, 0 cover
- 2014 – 7 taxa, 45% cover

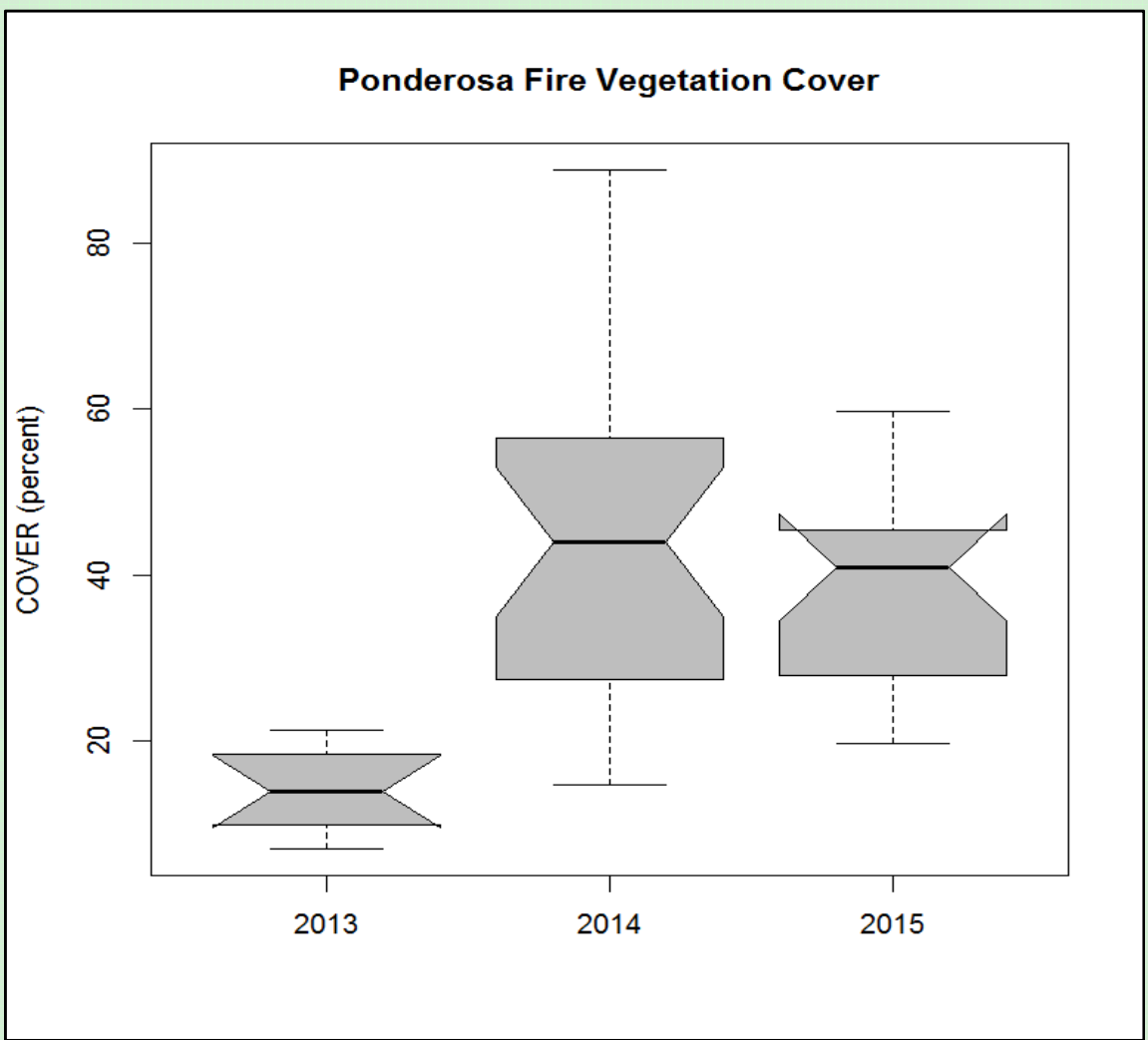


Quantitative Vegetation Trends – Initial Successional Pattern is a Divergence

Vegetation cover increased from $8.9 \pm 4.6\%$ in the first growing season to $45.0 \pm 18.8\%$ in the third. Cover doubled between the first growing season and the second, but variation in cover in the second growing season was much higher than in the third.

Cover Summary

- 1st year – low cover
- 2nd year – patchy cover
- 3rd year – cover more uniform

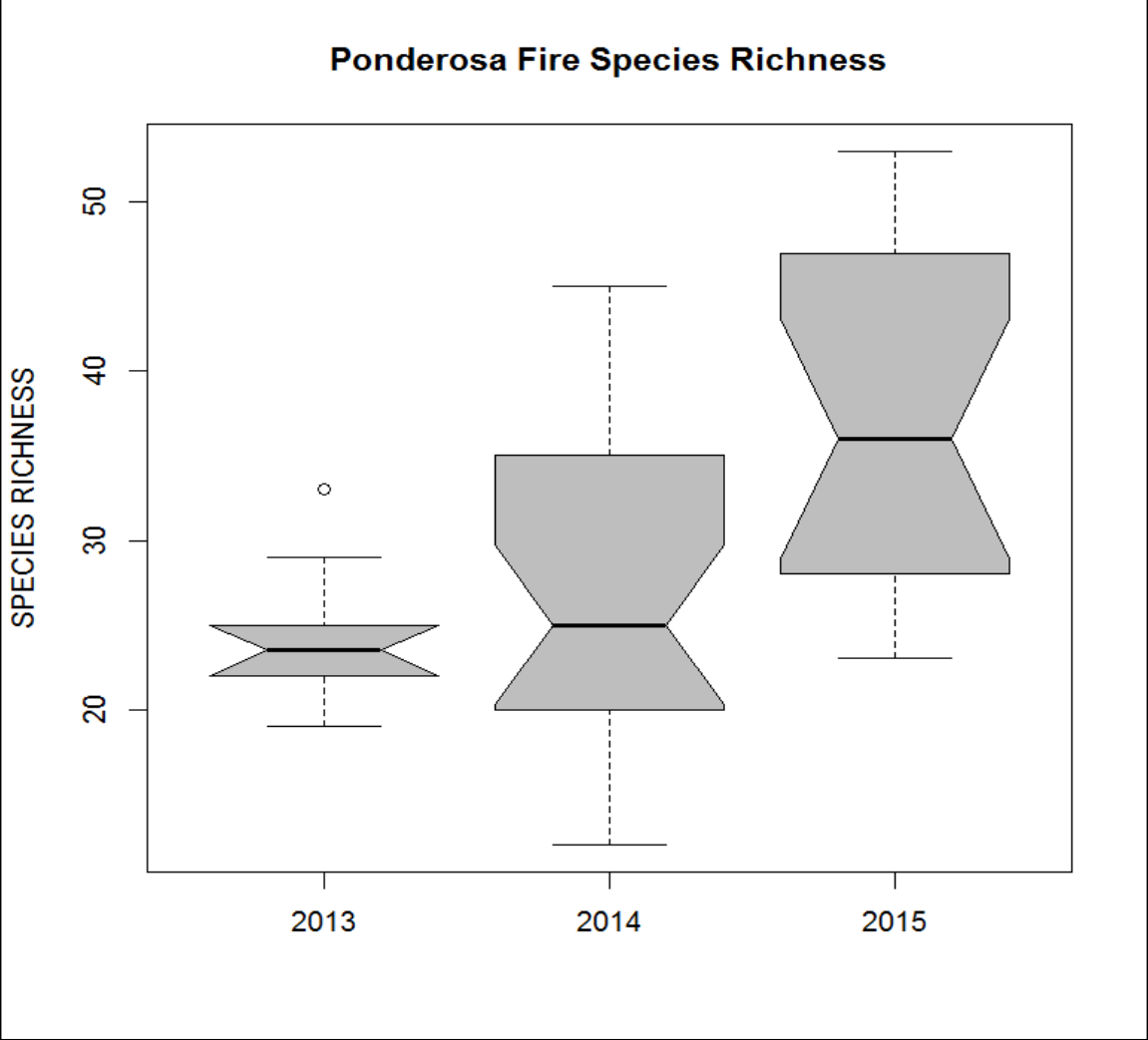


Species Richness Summary (per watershed)

- 1st year – 24.4 ± 4.0 taxa
62 total taxa
- 3rd year – 37.6 ± 18.8 taxa
110 total taxa

Rarefaction Analysis (Chao2)

- 3rd year suggests...
 133 ± 4 taxa total are present in the vicinity

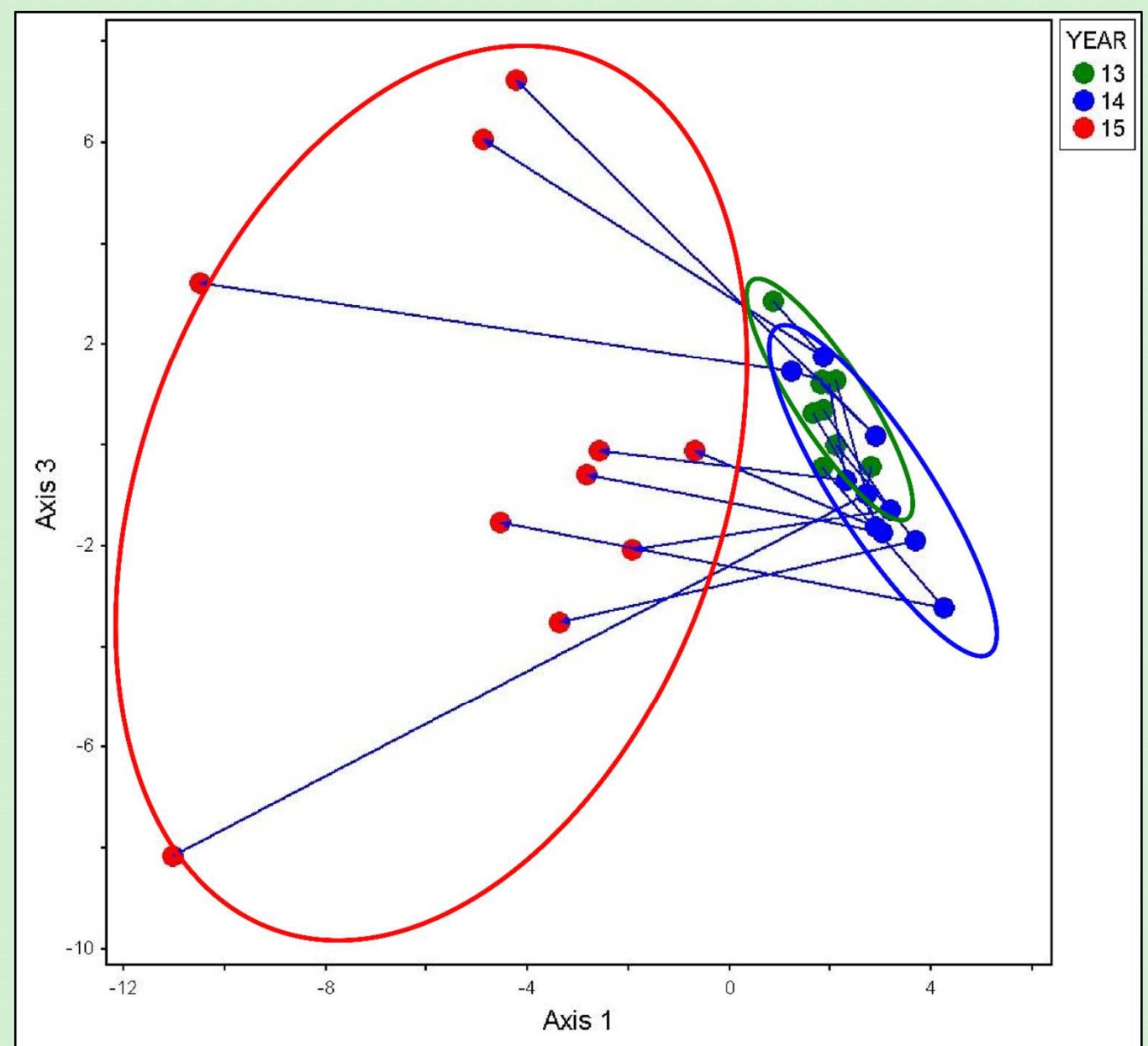


Divergence During Succession

Multivariate analysis of cover shows strong divergence between the watersheds as a function of time, the degree of divergence increasing greatly in the third season.

Lines shown depict the trajectory of the vegetation data within the PCA space for the 10 individual study watersheds.

Principal Coordinates Analysis based on Bray-Curtis cover similarity.



EDITORIAL

Ecological theory has not yet zeroed in on a universal model for successional trajectory. Literature is about equally divided between examples of convergence vs. divergence.

Theory has yet to encompass state change models--whereby initial divergence is then followed by convergence, or cyclical reversals thereof.

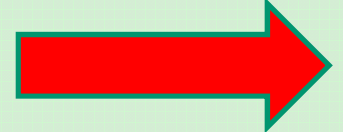
In our opinion, the state change model is likely in this landscape setting.

MORE THEORETICAL STUDY
NEEDED

Top Native Herbs

Polygala cornuta var. *cornuta*
Lathyrus sulphureus var. *sulphureus*
Carex multicaulis
Dichelostemma multiflorum
Calystegia occidentalis var. *tomentella*
Madia gracilis
Calochortus monophyllus
Clarkia rhomboidea
Galium bolanderi
Claytonia rubra ssp. *rubra*

2013 - *Clarkia rhomboidea* was patchy in the first year, then zonal in the second year – implying initial patches came from buried viable seed



Floristic Patterns (averaged over the 3 years)

Shrubs

8 shrubs appeared (abundance order)
Ceanothus integerrimus
Arctostaphylos manzanita ssp. *wieslanderi*
Ceanothus prostratus
Ceanothus cuneatus
**Cercocarpus betuloides* var. *betuloides*
Arctostaphylos viscida ssp. *viscida*
**Arctostaphylos manzanita* ssp. *roofii*
Ceanothus lemmonii
* = sprouter

- shrub seedling density was very high by the second year
- by the 3rd year self thinning was evident



Exotics

Lactuca serriola trending

- 2013 0.2% cover
- 2014 3.4% cover



Two vascular plants were present ONLY in the first year: (*Acmispon grandiflorus*, *Nemacladus capillaris*) What's up with that??