

# Control of Yellow Star-thistle and Reintroduction of Native Perennial Bunchgrasses

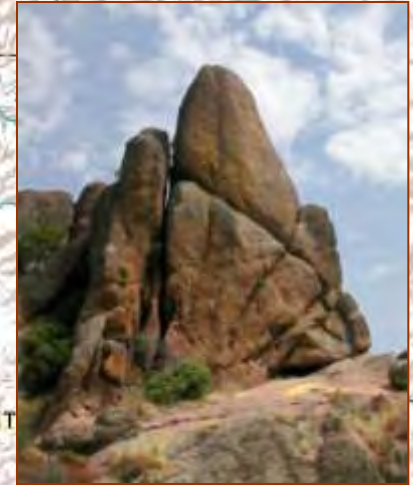
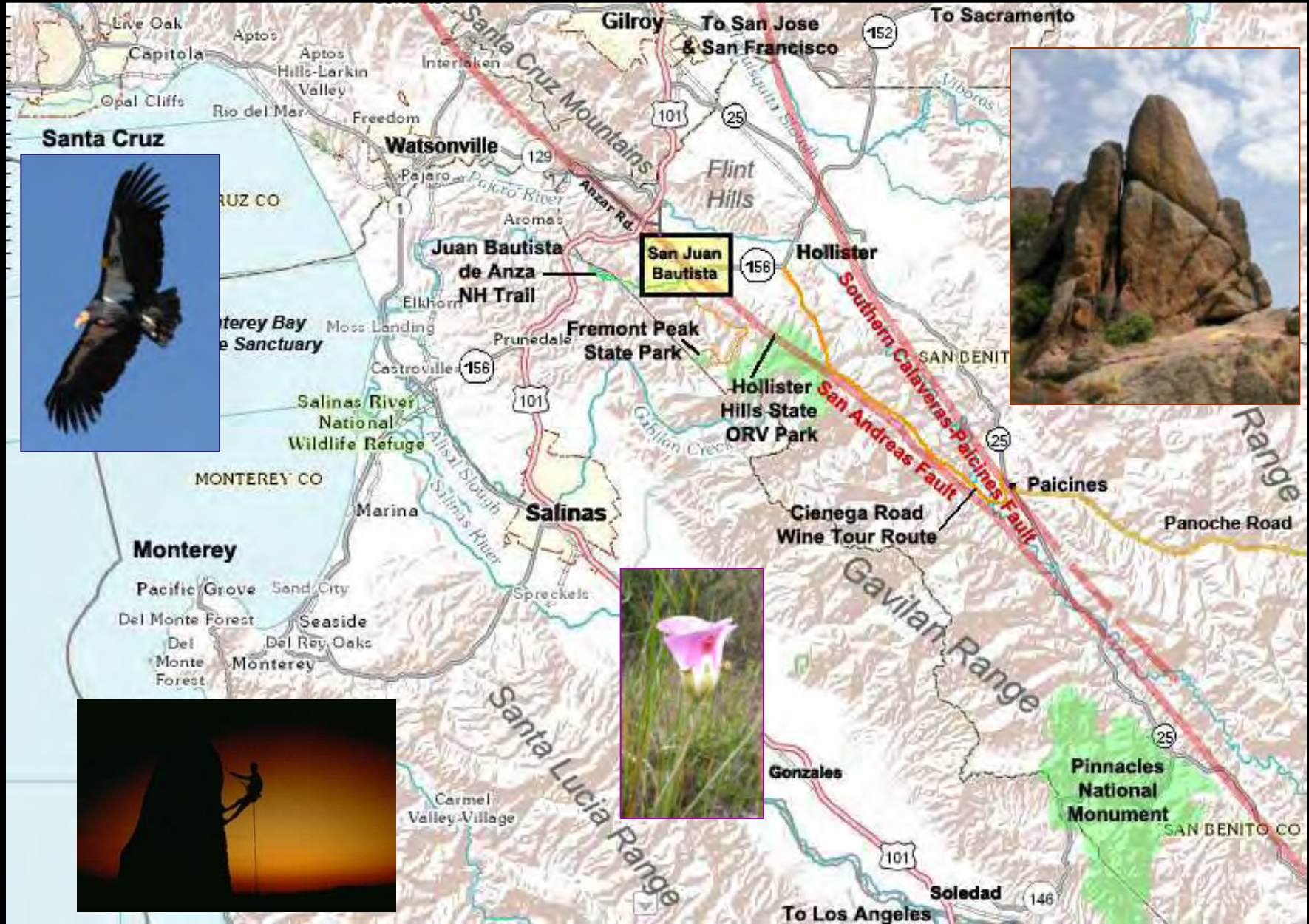


Restoration of a Valley Oak Savannah  
at Pinnacles National Monument

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Habitat Restoration Crew Leader

# Pinnacles National Monument

Paicines, CA



# Monument Expansion:

Acquisition of over  
2000 acres in 2006



- Pinnacles Campground
- CA Red-legged Frog & CA Tiger Salamander Habitats
- Ben Bacon Ranch Historic District
- Valley Oak Savannah & Grassland



# Valley Oak Savannah



# Invasive Plants Inhabiting the New Lands



- Black Mustard
- Blessed Thistle
- Bull Thistle
- Giant Reed
- Harding Grass
- Hoary Whitetop
- Horehound
- Italian Thistle
- Milk Thistle
- Perennial Pepperweed
- Periwinkle
- Poison Hemlock
- Puncturevine
- Russian Knapweed
- Slender-flowered Thistle
- **Summer Mustard**
- Tamarisk
- Tree Tobacco
- **Yellow Starthistle (YST)**

# Bottomlands Restoration Project 2009 - 2011

- Funding
  - NPS Natural Resources Program
  - NPS CA Exotic Plant Management Team
- Controlling Yellow Starthistle
  - Mapping and monitoring
  - IPM strategy
- Reintroduction of Native Perennial Bunchgrasses
  - Re-vegetation experimental plots
  - Research of plant community

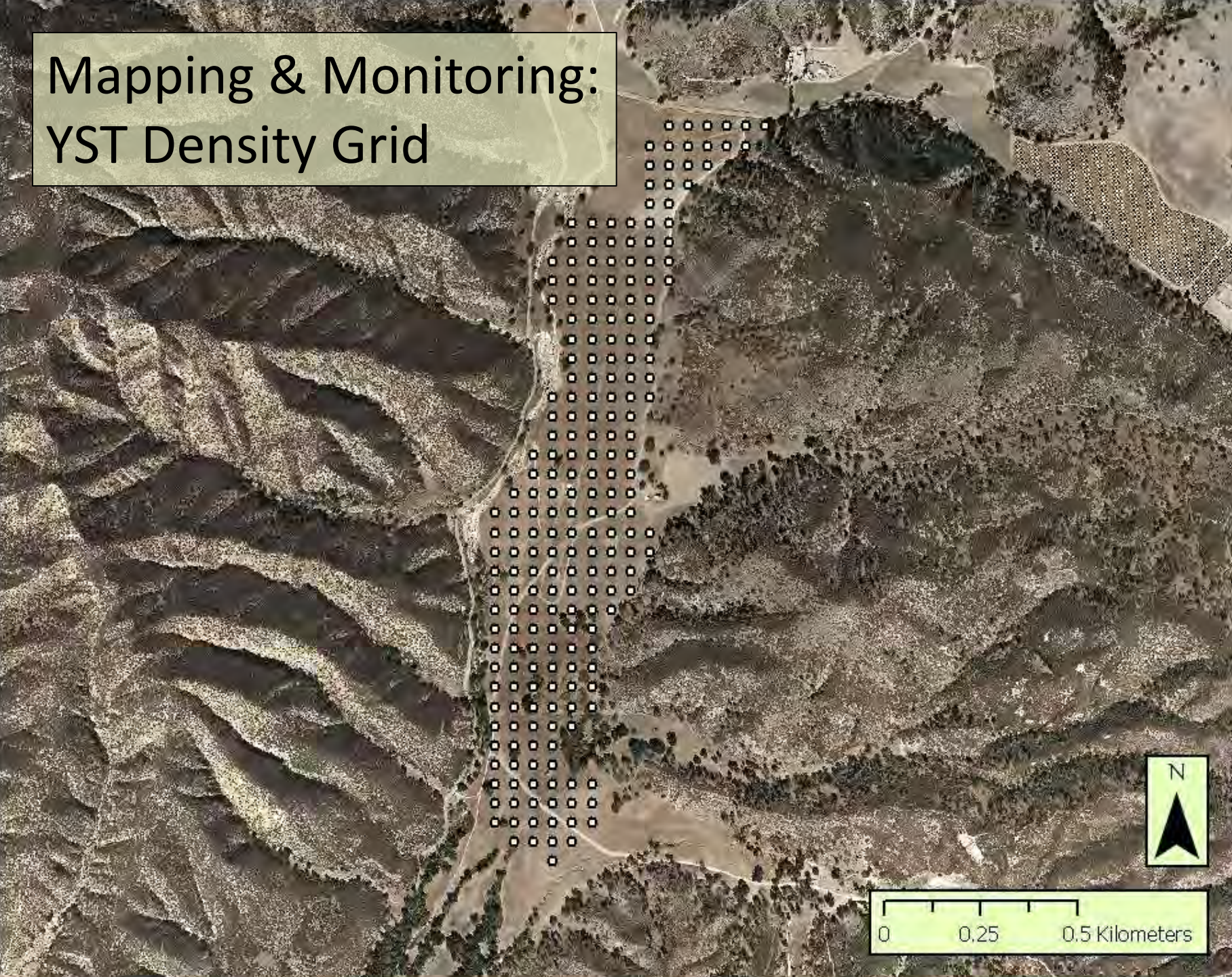


*Centaurea solstitialis*

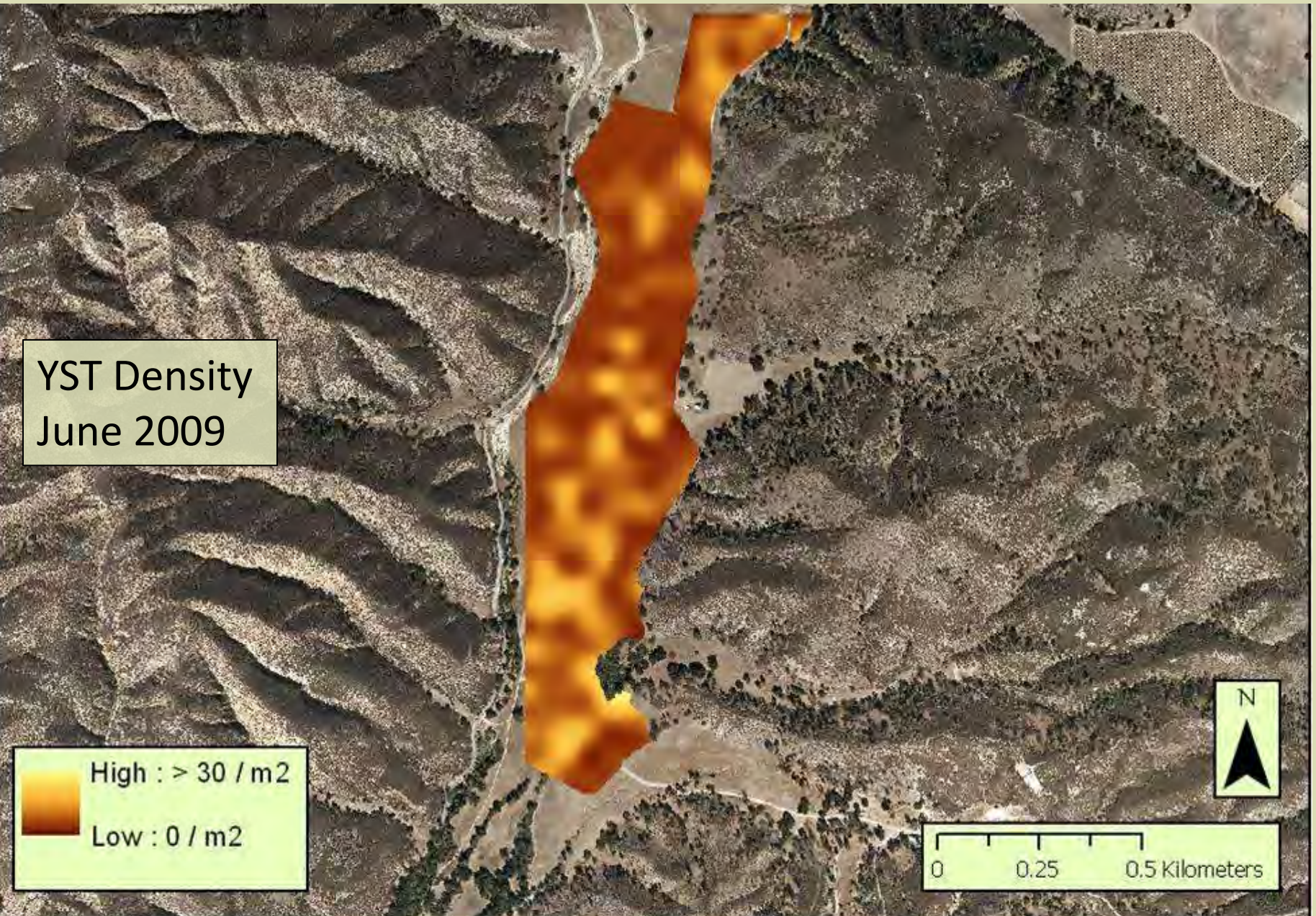


*Stipa pulchra*

# Mapping & Monitoring: YST Density Grid



# YST Density Before Any Treatments





# Integrated Pest Management Strategy for Controlling YST began in 2009



# Prescribed Burning Treatment June 2009



# 130 Acres of YST Burned



Goal: Prevent YST Seed Production



# Goal: Flush YST Seed Bank

← 24 Nov. 2009  
(5 months post-burn)



23 Apr. 2010 →  
(10 months post-burn)



# Broadcast Herbicide Treatment

## April 2010

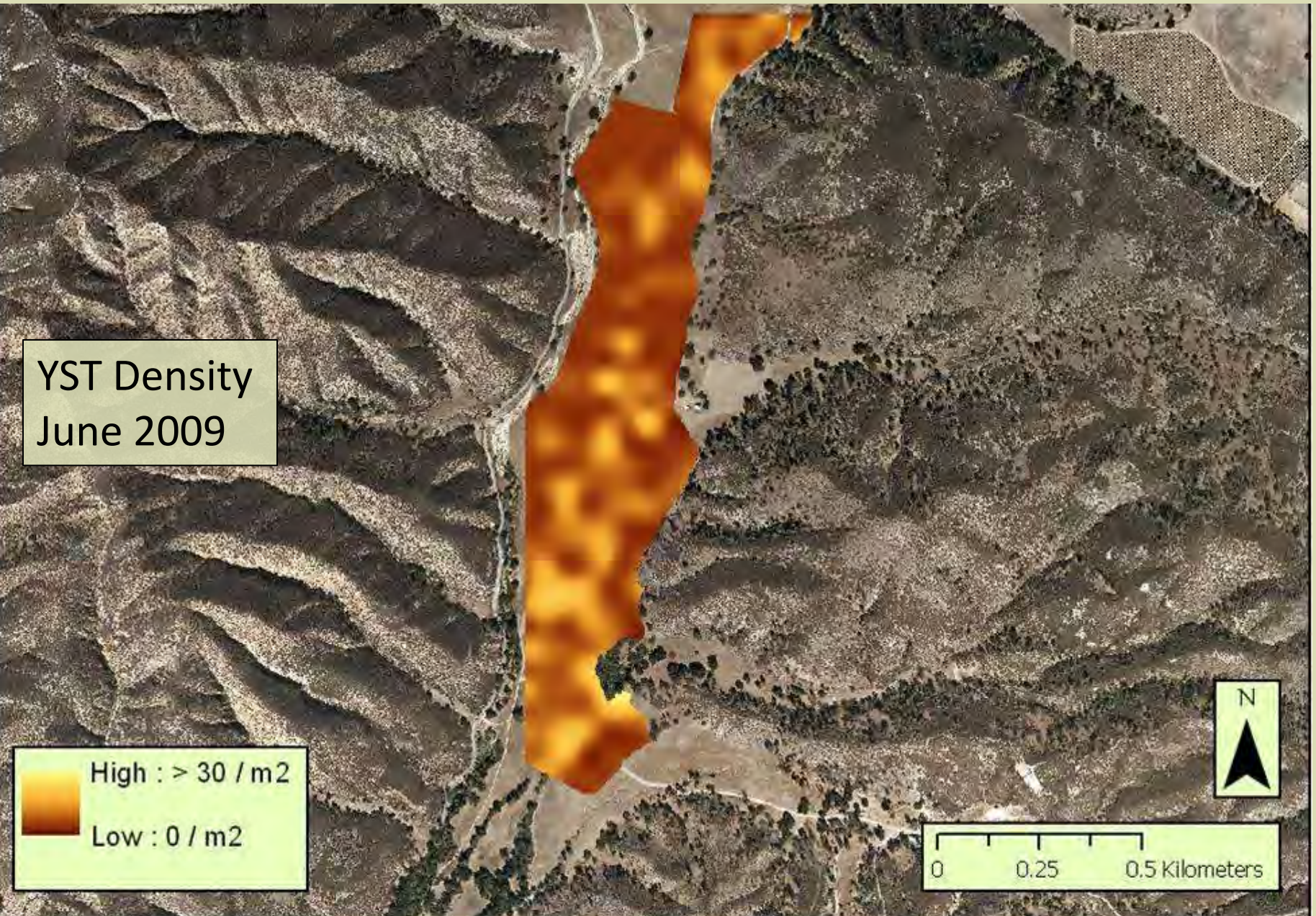


# Milestone<sup>®</sup> VM (Aminopyralid)

- Selective
- Low application rates
- Post-emergent application
- Residual pre-emergent properties

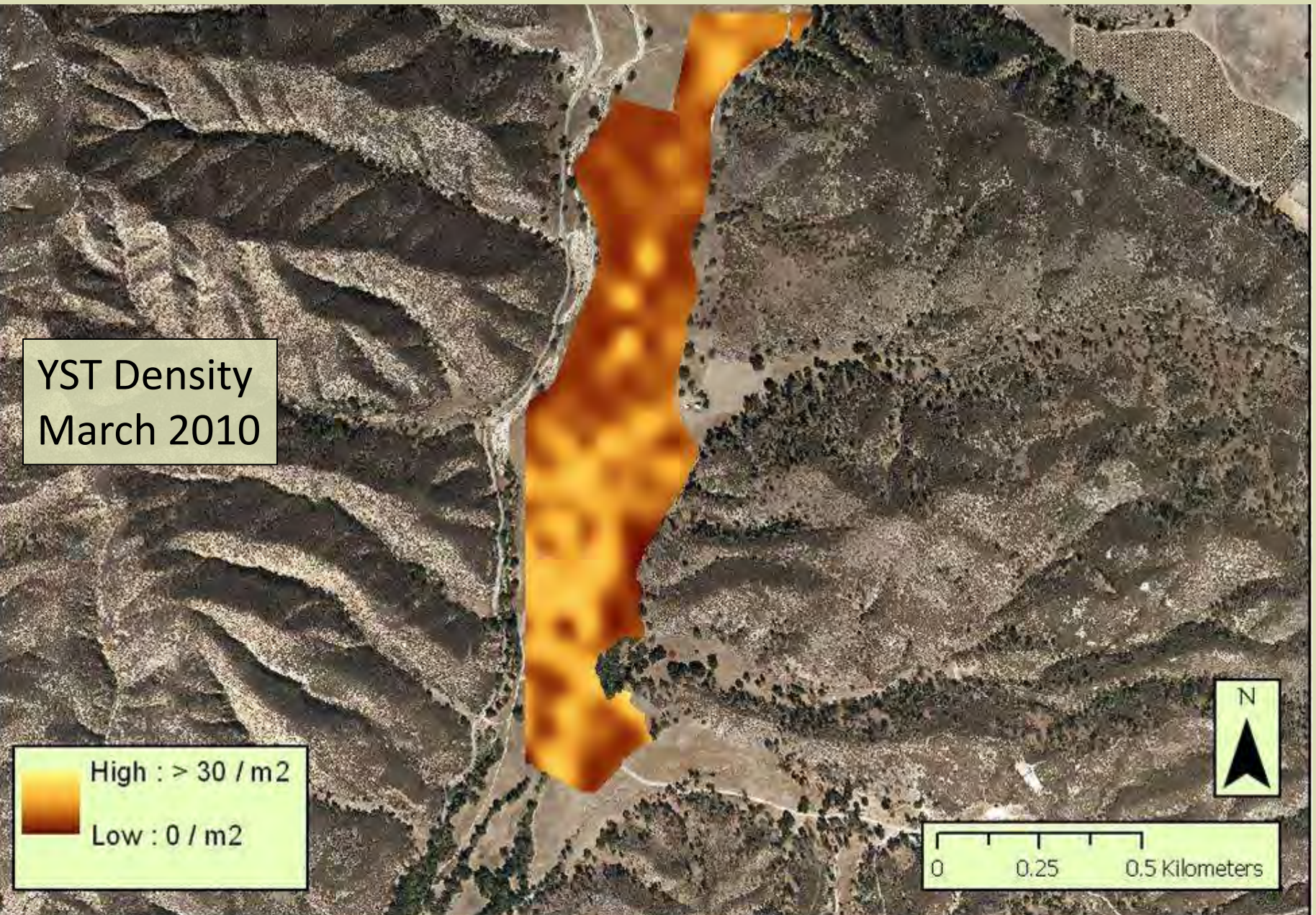


# YST Density Before Any Treatments

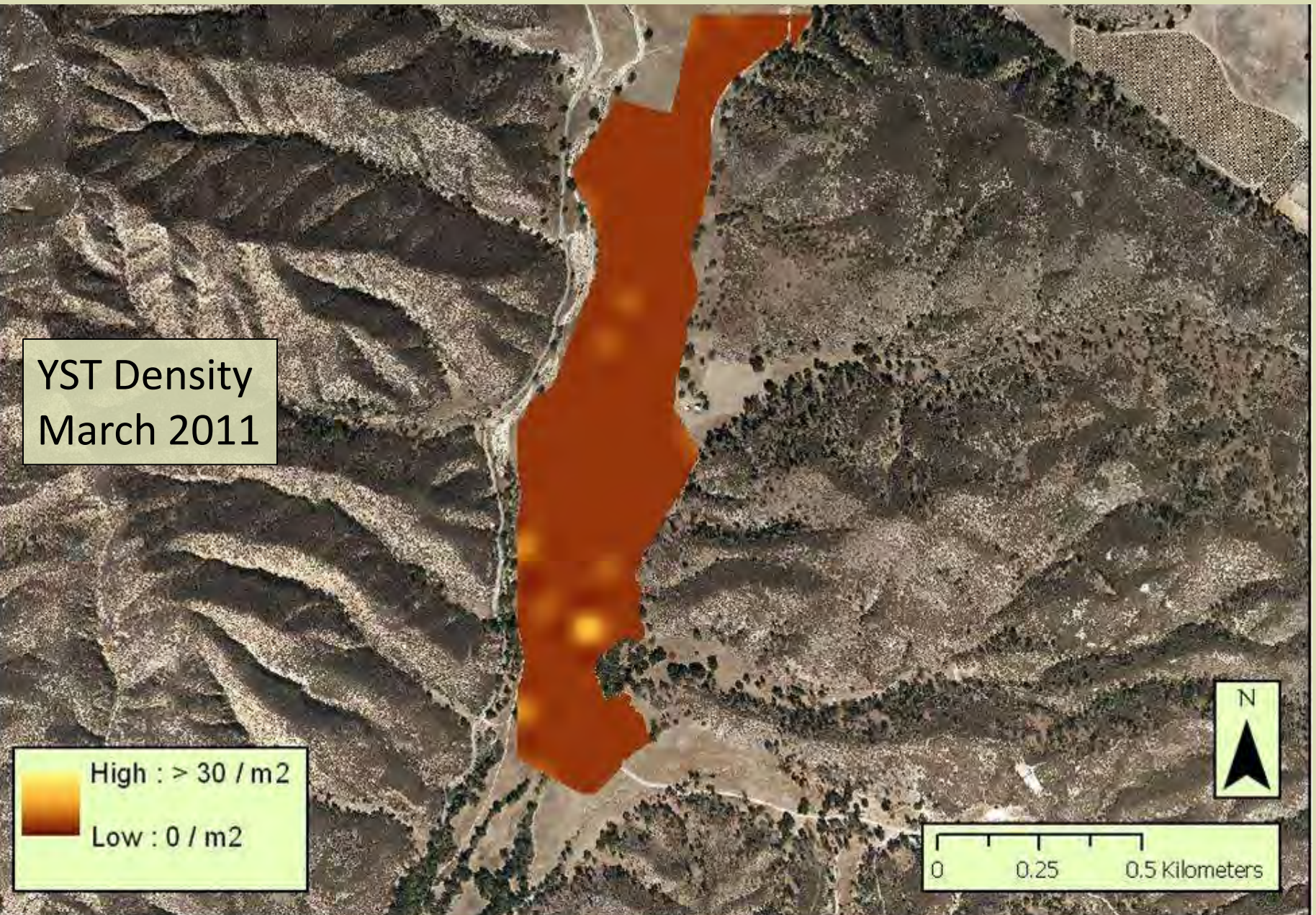




# YST Density After Prescribed Burning Treatment

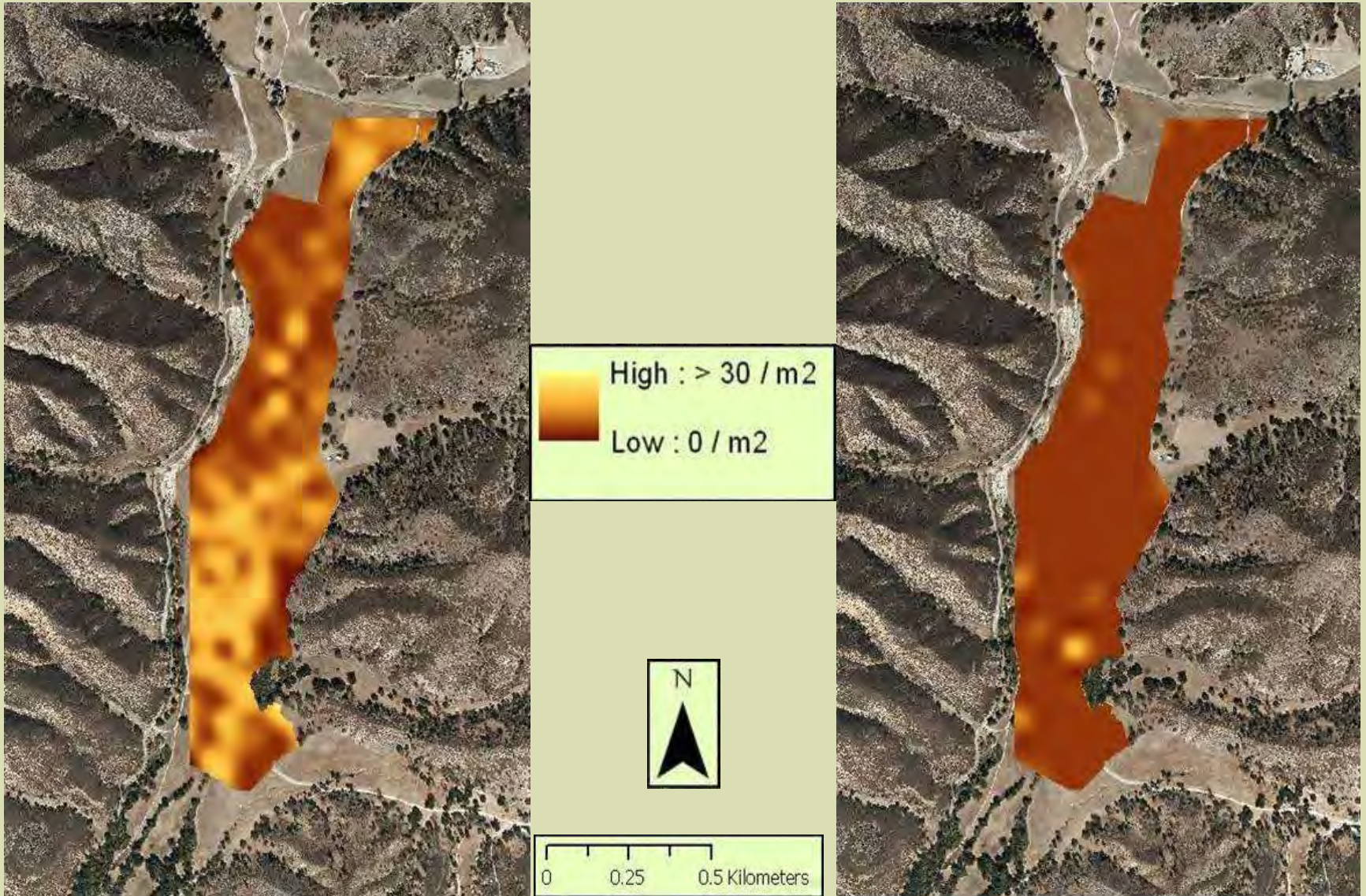


# YST Density After Broadcast Herbicide Treatment



YST Density March 2010  
(9 months post-burn)

YST Density March 2011  
(1 year post-spray)



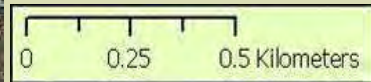
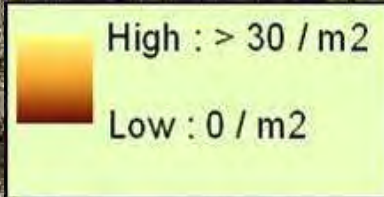
## Smaller Scale Work:

- Hoeing / Hand Pulling
- Brushcutting
- Backpack Spot Spray
- Pressure Hose Broadcast Spray





# YST Density March 2011



# YST Density March 2012



# Prescribed Grazing Treatment

## July 2010



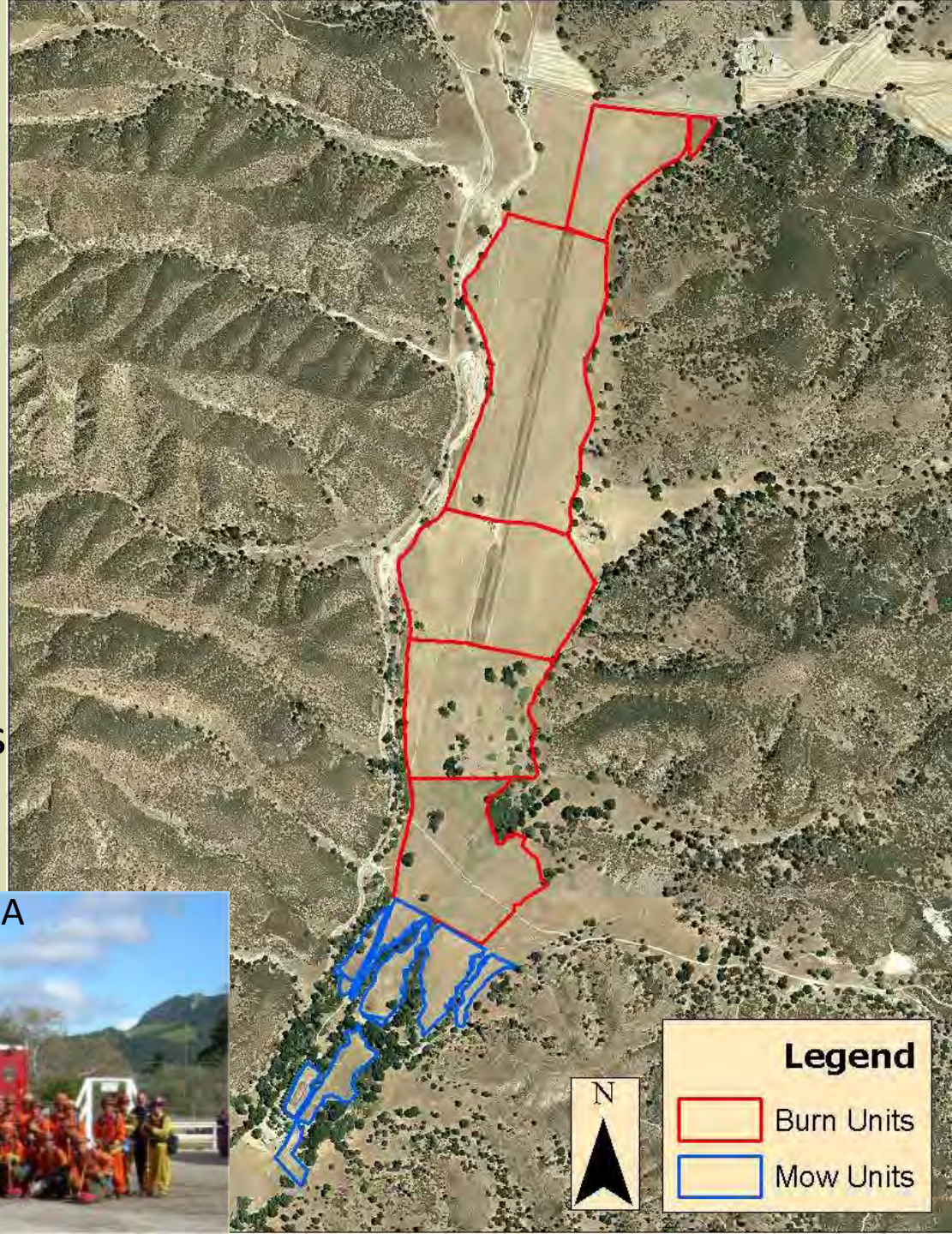
# Timed Mowing Treatments 2009-2012





# Timed Mowing Treatments

- Separate area than burn-spray area
- Approximately 20 acres
- July 2009, 2010, 2011, 2012
- Followed-up mowing with hand crews hoeing re-sprouts

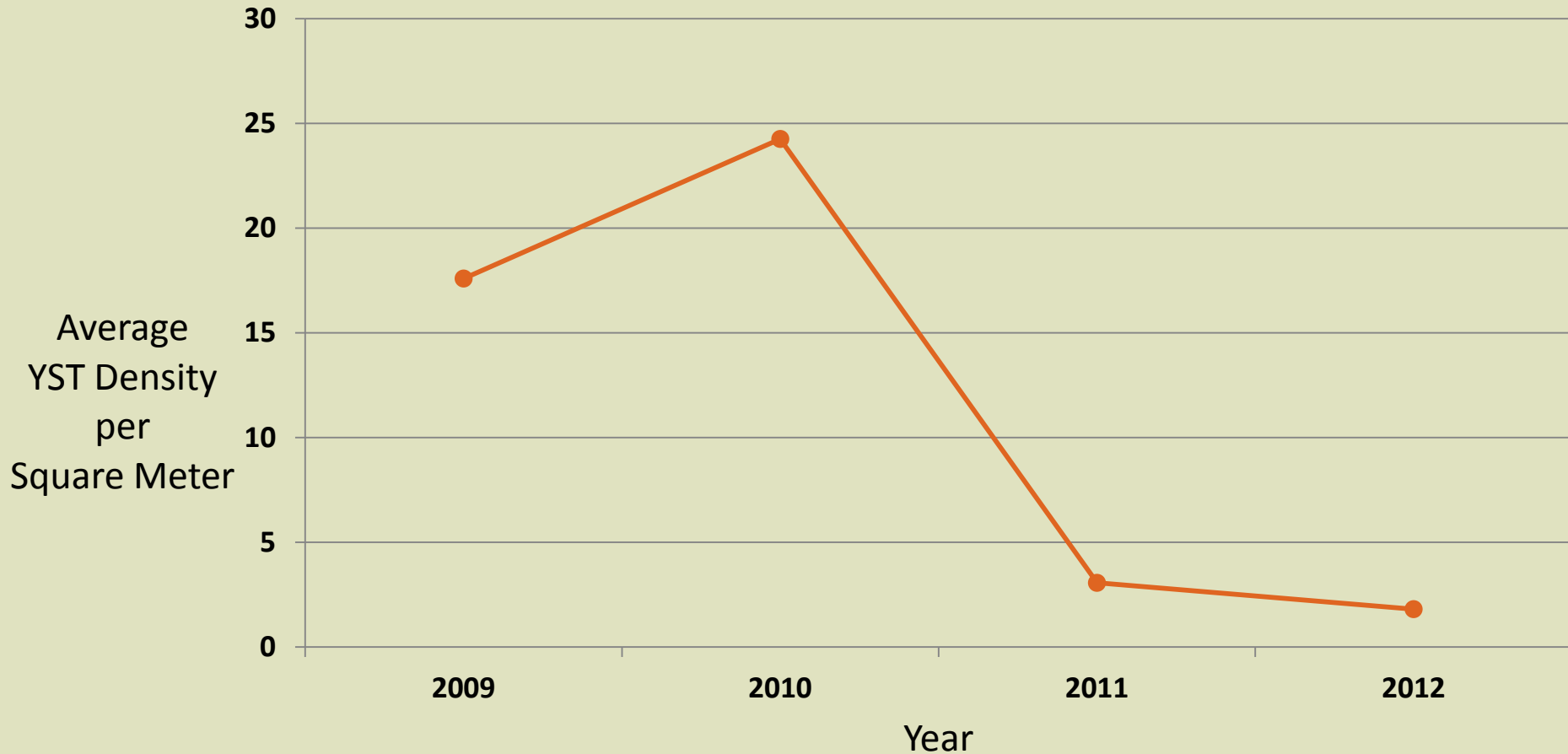


Gabilan Conservation Camp – Soledad, CA



# Timed Mowing Treatments Results

## Yellow Starthistle Density in Mow Units from 2009 to 2012



Repeated Measures MANOVA: YEAR

Univar G-G Epsilon=0.409; F1.22, 11.046=3.53; p=0.03

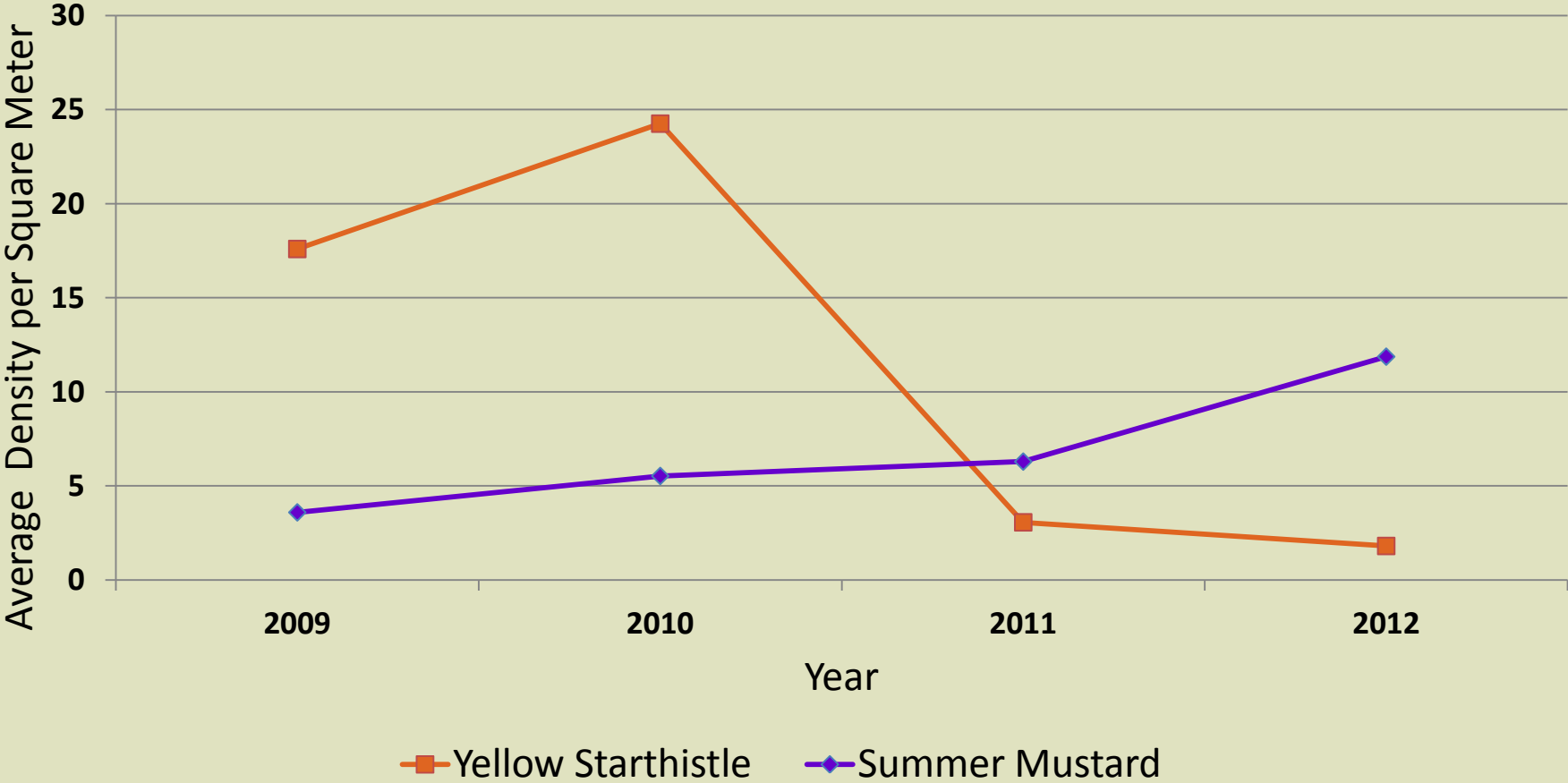
# Another Significant Invasive on the New Lands: Summer Mustard (*Hirschfeldia incanna*)

- No treatments targeting mustard
- Monitored mustard response to YST treatments



# Timed Mowing Treatment: YST vs. Mustard

## Density in Mow Units from 2009 to 2012



Repeated Measures MANOVA: YEAR  
Yellow Starthistle  
Univar G-G Epsilon=0.409; F1.22, 11.046=3.53; p=0.03

Repeated Measures MANOVA: YEAR  
Mustard  
Univar G-G Epsilon=0.631; F1.89, 17.06=24.80; p<0.0001

# Mustard Density

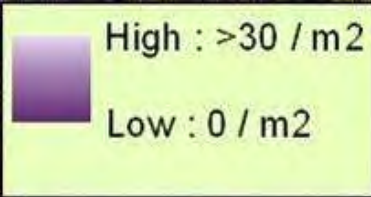
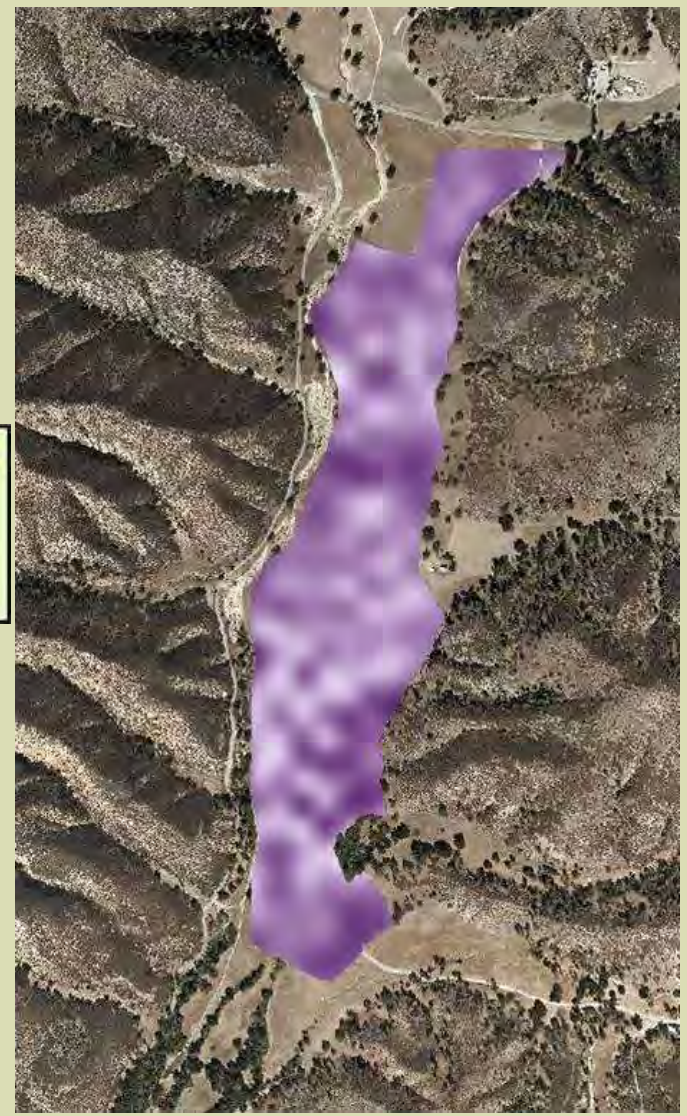
June 2009

(before any YST treatments)



March 2011

(1 year after herbicide)



# Mustard Explosion – June 2011



# Reintroduction of Native Perennial Bunchgrasses: Re-vegetation Experiment



# Two Planting Treatments – February 2010



← Seeds: manual planting  
(simulating seed drilling)

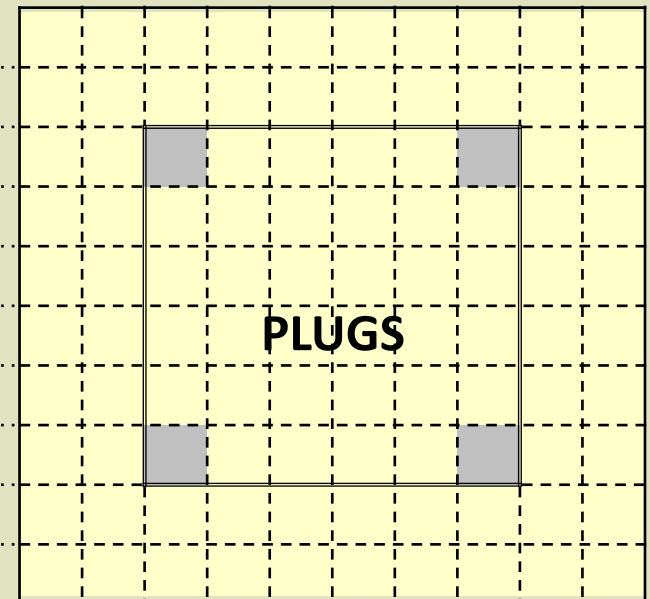
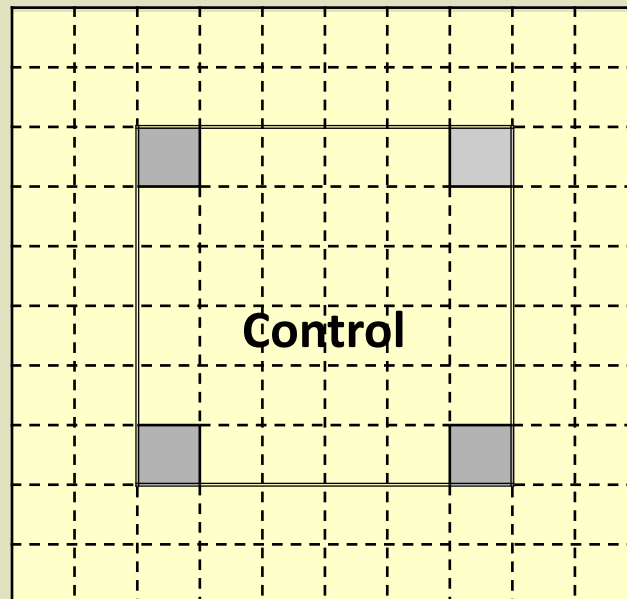
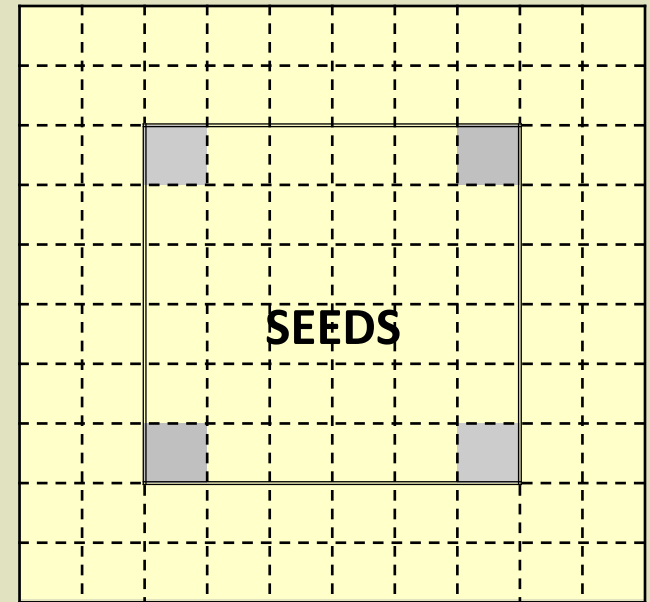
Plugs: manual planting of  
container grown plants





# Re-vegetation Experiment Plot Design & Monitoring

- 10 blocks with 3 plots per block.
- 1 treatments per plot (seeds, plugs or control).
- Plots planted 10mX10m with 2m buffer between.
- Percent cover monitored in four 1mX1m quadrats, using the point intercept of 25 points per quadrat.



# Re-vegetation Experiment Monitoring



# Re-vegetation Experiment Monitoring Results



Repeated Measures MANOVA: YEAR X TREATMENT  
interaction Pillai's trace = 0.831;  $F_{6.34} = 4.0311$ ;  $p = 0.0002$

# Conclusions:

## Bottomlands Restoration Project 2009-2011

- Have we reduced the density & area of YST? **YES**
- Have we learned about YST control methods? **YES**
- Have we increased the cover of native perennial bunchgrasses in the demonstration plots? **YES**
- Have we learned more about the ecological system of the Bottomlands vegetation? **YES**
- Are we finished restoring the Valley Oak Savannah? **NO**



# Next Steps – Native Perennial Bunchgrasses

- Proceed with large-scale native grass seeding
- Use mowing to reduce exotic annual grass thatch
- Consider use of periodic prescribed fires
- Reintroduction of controlled stock grazing



# Next Steps – Native Forbs

- Learn more about native forbs of the valley oak savannah
- Reintroduction of native annual & perennial forbs



# Next Steps – Weeds

- Continue to monitor and treat YST populations
- Continue to monitor mustard
- Mustard treatments – any suggestions?



# Acknowledgements:

- NPS California Exotic Plant Management Team (EPMT)
- American Conservation Experience (ACE)
- Yosemite Weeds Crew
- BLM Weeds Crew (Hollister Field Office & Ft. Ord)
- Cal-Fire / CDCR: Gabilan Conservation Camp
- Soledad Prison Horticulture Program
- Hedgerow Farms
- Crop Production Services
- Long's Custom Discing
- C&H Green Goats
- BLM Fire (Hollister)
- Point Reyes Fire







Thank you for coming to the presentation!