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

Restoration of a Valley Oak Savannah at Pinnacles National Monument

Jennifer Tiehm
Biological Science Technician
Habitat Restoration Crew Leader
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

*Quercus lobata*
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 solsticialis
Stipa pulchra
Mapping & Monitoring: YST Density Grid
YST Density Before Any Treatments

YST Density
June 2009

High: > 30 / m²
Low: 0 / m²
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® VM (Aminopyralid)

- Selective
- Low application rates
- Post-emergent application
- Residual pre-emergent properties
YST Density Before Any Treatments

YST Density June 2009

High: > 30 / m²
Low: 0 / m²
YST Density After Prescribed Burning Treatment

YST Density March 2010

High: > 30 / m²
Low: 0 / m²
YST Density After Broadcast Herbicide Treatment

YST Density
March 2011

High: > 30 / m²
Low: 0 / m²
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
Prescribed Grazing Treatment
July 2010
Timed Mowing Treatments 2009-2012
Timed Mowing Treatments

• Separate area than burn-spray area
• Approximately 20 acres
• Followed-up mowing with hand crews hoeing re-sprouts
Timed Mowing Treatments Results

Yellow Starthistle Density in Mow Units from 2009 to 2012

Repeate 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 treatment 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?
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• Long’s Custom Discing
• C&H Green Goats
• BLM Fire (Hollister)
• Point Reyes Fire
Thank you for coming to the presentation!