



Prescribed Fire and Herbicide to Control Weeds

Ryan O'Dell, BLM Central Coast Field Office

Amelia Ryan, Pinnacles National Park

Devii Rao, UC Cooperative Extension



Recommended reference -

<https://www.cal-ipc.org/docs/ip/management/pdf/YSTMgmtweb.pdf>

Yellow Starthistle

Management Guide



Yellow starthistle control projects –

- BLM Clear Creek Management Area – Clear Creek (West Entrance)
- Pinnacles National Park – Bear Valley (East Entrance)
- UC Cooperative Extension – Bitterwater – Prescribed Burn Association



BLM Clear Creek Management Area

2006 – Start of project



Methods of control

- **Physical-Mechanical** – hand pulling, hoeing, discing, mowing



June 2006 - mowing



August 2006 – resprouts ☹️





Pincushions. If mowed too early, yellow starthistle may recover and form a "pincushion" of low-growing flowerheads.

Why doesn't mowing work well?

- Mowing height is *too high* –
- Plant recovers from buds in crown base

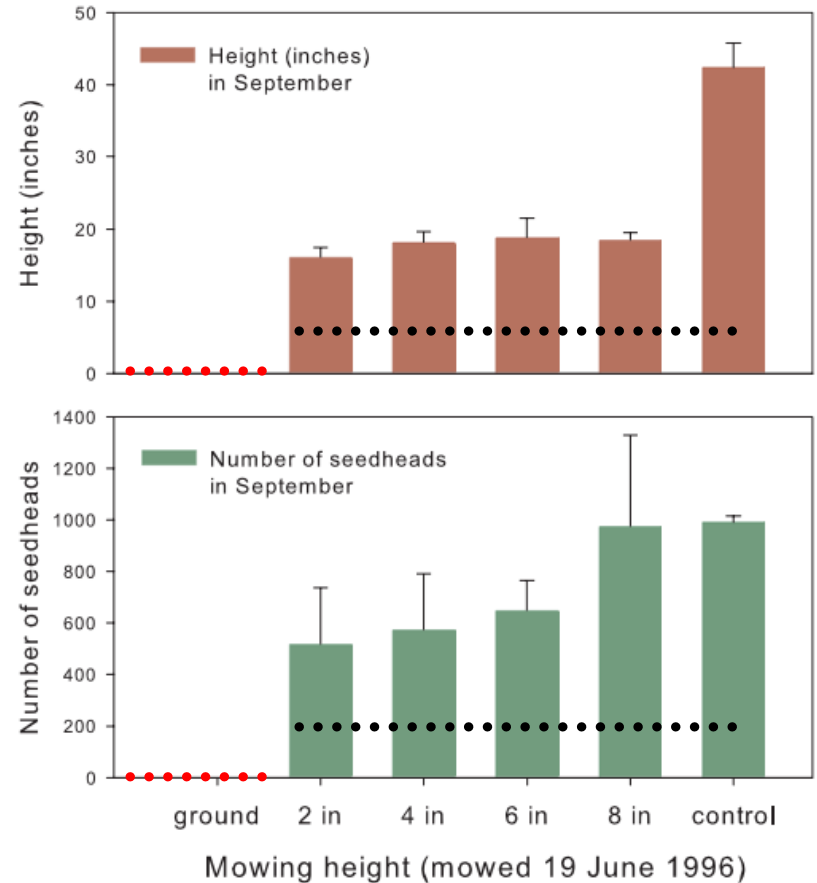


Fig. 12. Effect of mowing height on seed heads. Mowing yellow starthistle above the basal branches does not prevent development of seed heads (Benfield et al. 1999).

But,
Cattle *can* graze lower than 2 inches!

2007 to present – alternate prescribed fire and herbicide

?



Integrating prescribed burning and clopyralid for the management of yellow starthistle (*Centaurea solstitialis*)



Joseph M. DiTomaso
Corresponding author. Department of Plant
Sciences, Mail Stop 4, One Shields Avenue,
University of California, Davis, CA 95616;
jmditomaso@ucdavis.edu

Guy B. Kyser
Department of Plant Sciences, Mail Stop 4, One
Shields Avenue, University of California, Davis, CA
95616

Jessica R. Miller
3913 Carson Road, Camino, CA 95709

Sergio Garcia
Cooperative Extension San Benito County, P.O. Box
1956, Hollister, CA 95024-1956

Richard F. Smith
Cooperative Extension County Offices, 1432 Abbott
Street, Salinas, CA 93901

Glenn Nader
Cooperative Extension Sutter-Yuba Counties, 142-A
Garden Highway, Sutter County Agricultural
Building, Yuba City, CA 95991-5593

J. Michael Connor
Sierra Foothill Research & Extension Center, 8279
Scott Forbes Road, Browns Valley, CA 95918

Steve B. Orloff
Cooperative Extension Siskiyou County, 1655 South
Main Street, Yreka, CA 96097

Prescribed burning and the herbicide clopyralid are very effective tools for the management of yellow starthistle. However, repeated use of either can be impractical or can present other problems. The potential solution is the development of an effective integrated weed management strategy using a combination of the two approaches. In small plot studies (0.2 ha), we tested one of five possible treatments: (1) untreated control, (2) 2 consecutive yr of clopyralid (0.105 kg ha⁻¹), (3) 2 consecutive yr of prescribed summer burning, (4) first-year clopyralid followed by second-year prescribed burning, and (5) first-year prescribed burning followed by second-year clopyralid. Treatments were made in 1999 and 2000 at three study sites in California (San Benito, Yuba, and Siskiyou counties). In 2001, the year following the final treatment, 2 consecutive yr of clopyralid or first-year burning followed by second-year clopyralid consistently reduced yellow starthistle cover in the following year by 92 to 100%. However, at the Yuba site, clopyralid alone increased medusahead and ripgut brome cover. Although 2 consecutive yr of burning was effective in Yuba, very high levels of starthistle infestation in San Benito were not completely burned in the second year because of the lack of available consumable fuel. Clopyralid treatment the first year followed by prescribed burning in the second year stimulated yellow starthistle germination and did not reduce the infestation. In a large-scale study conducted at two sites (13 and 81 ha) in southern Monterey County, we used a first-year burn followed by either 2 yr of clopyralid (0.158 kg ha⁻¹) or a single year of clopyralid (0.210 kg ha⁻¹) and a subsequent burn. Results were in close agreement with those found in the small-scale studies. In the year following the final treatment, control of yellow starthistle was greater than 99% when the burn was followed by 2 yr of clopyralid. In contrast, when a prescribed burn was used in the last year of the program, the level of control was not as good, probably because of the increased germination of the remaining soil seedbank. These results indicate that a first-year prescribed burn followed by a second-year clopyralid treatment can provide consistently good control of yellow starthistle, as well as reduced levels of noxious annual grasses, including medusahead and ripgut brome.

Nomenclature: Medusahead, *Taeniatherum caput-medusae* (L.) Nevski ELYCM; ripgut brome, *Bromus diandrus* Roth BRODI; yellow starthistle, *Centaurea solstitialis* L. CENSO.

Key words: Fire, grassland, invasive plant management, rangeland, seedbank, species richness.

Goal – kill emergent plants and deplete the soil seed bank

Early Summer – prescribed fire – clears thatch (clean slate)

Prescribed burning	
Advantages	Very effective control when complete burn can be achieved. Can stimulate native plants, particularly legumes and perennial grasses. Releases the yellow starthistle seedbank for control the following year.
Disadvantages	Harmful to biological control agents. May injure some late season natives.
Risks	Escaped fires and air quality issues. Can cause animal mortality.
Timing	Very early flowering stage ($\leq 2\%$ of spiny heads in flower).
Best fit in strategic management plan	Can be used in the first, second or third year of a long-term management strategy. If burning can be used only once, it is probably best in the first year when an herbicide can be applied in the second year. Because fire will stimulate yellow starthistle germination it should not be used in the last year of a long-term program.

Fall/Winter – flushes YST soil seed bank (mass emergence)

Spring – broadcast spray herbicide – kill YST, suppress future emergence

Clopyralid (Transline®) and Aminopyralid (Milestone™)	
Advantages	Provide excellent control at low rates. Give both pre- and postemergence activity for full season control. Low toxicity. No grazing restrictions. Very selective, no injury to grasses and many broadleaf species.
Disadvantages	Can injure legumes (Fabaceae) and other desirable members of the sunflower family (Asteraceae). May lead to selection for other invasive annual grasses. Resistant biotypes have been reported for other herbicides with this mode of action, but only in Washington.
Risks	Herbicide drift. Applicator safety.
Timing	From late fall to early spring is best, when plants are in rosette stage. Can still get good control in mid-spring, but may have to use higher rates. In states other than California, a combination of 2,4-D and clopyralid (Curtail®) can be used in spring.
Best fit in strategic management plan	Very effective in the first year of a long-term management strategy. Can also be used in the second year.

May 2019 – prescribed fire – BLM + Cal Fire



Funding -



May 2019 – after prescribed fire – cleared thatch



March 2020 – flushed YST soil seed bank



April 2020 – herbicide application – Transline (clopyralid)



2007



2020





Recovery of
native wildflowers



Better habitat
for wildlife

Pinnacles NP – Bear Valley



Integrated Pest Management to Control YST began in 2009



Prescribed Burning Treatment June 2009







120 Acres of YST Burned



120 Acres of YST Burned



120 Acres of YST Burned



Goal: Prevent YST Seed Production



Flush YST Seed Bank

← 24 Nov. 2009
(5 months post-burn)



23 Apr. 2010 →
(10 months post-burn)



Broadcast Herbicide Treatment April 2010



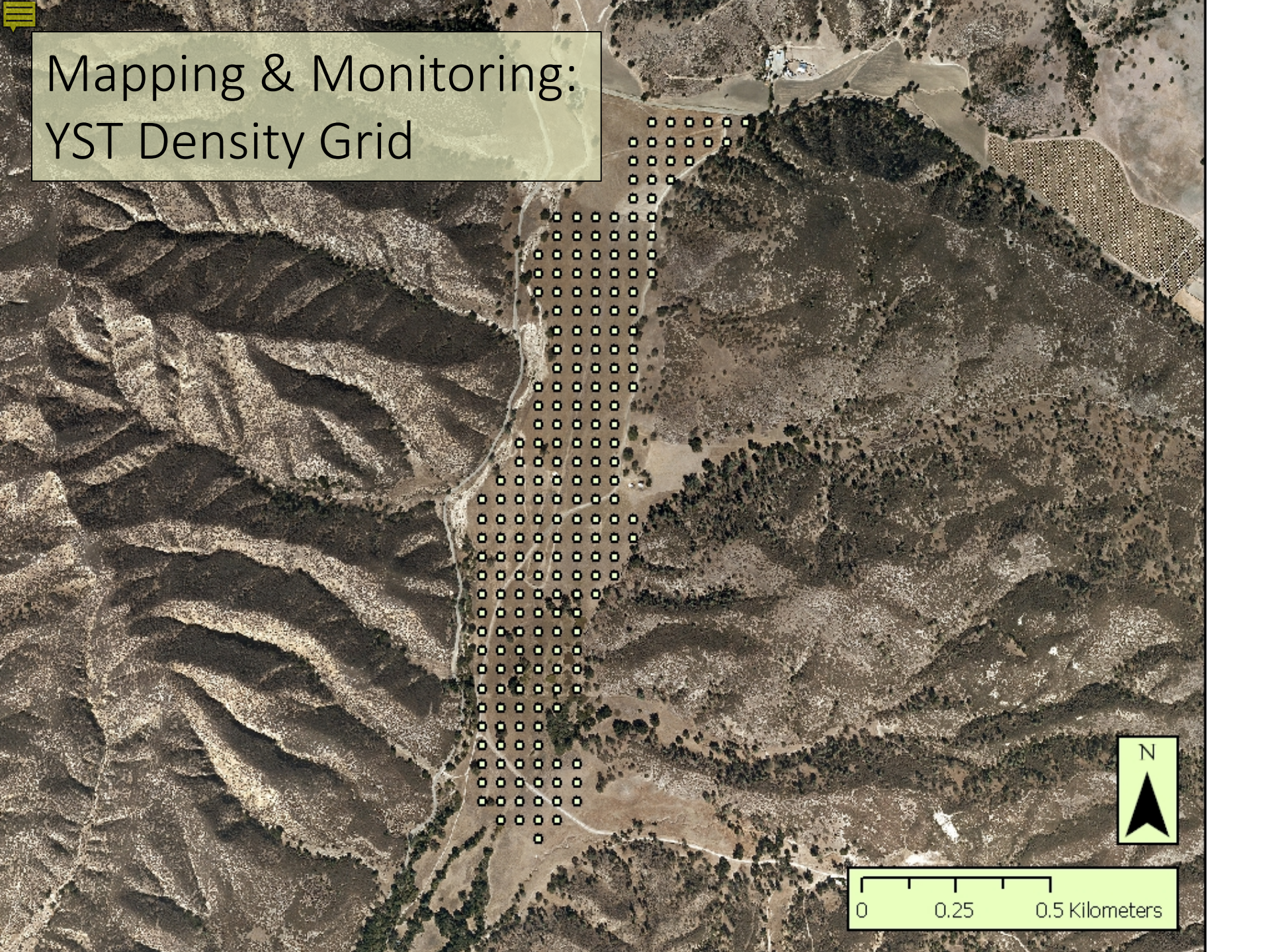
Milestone (aminopyralid)

- Selective
- Low application rates

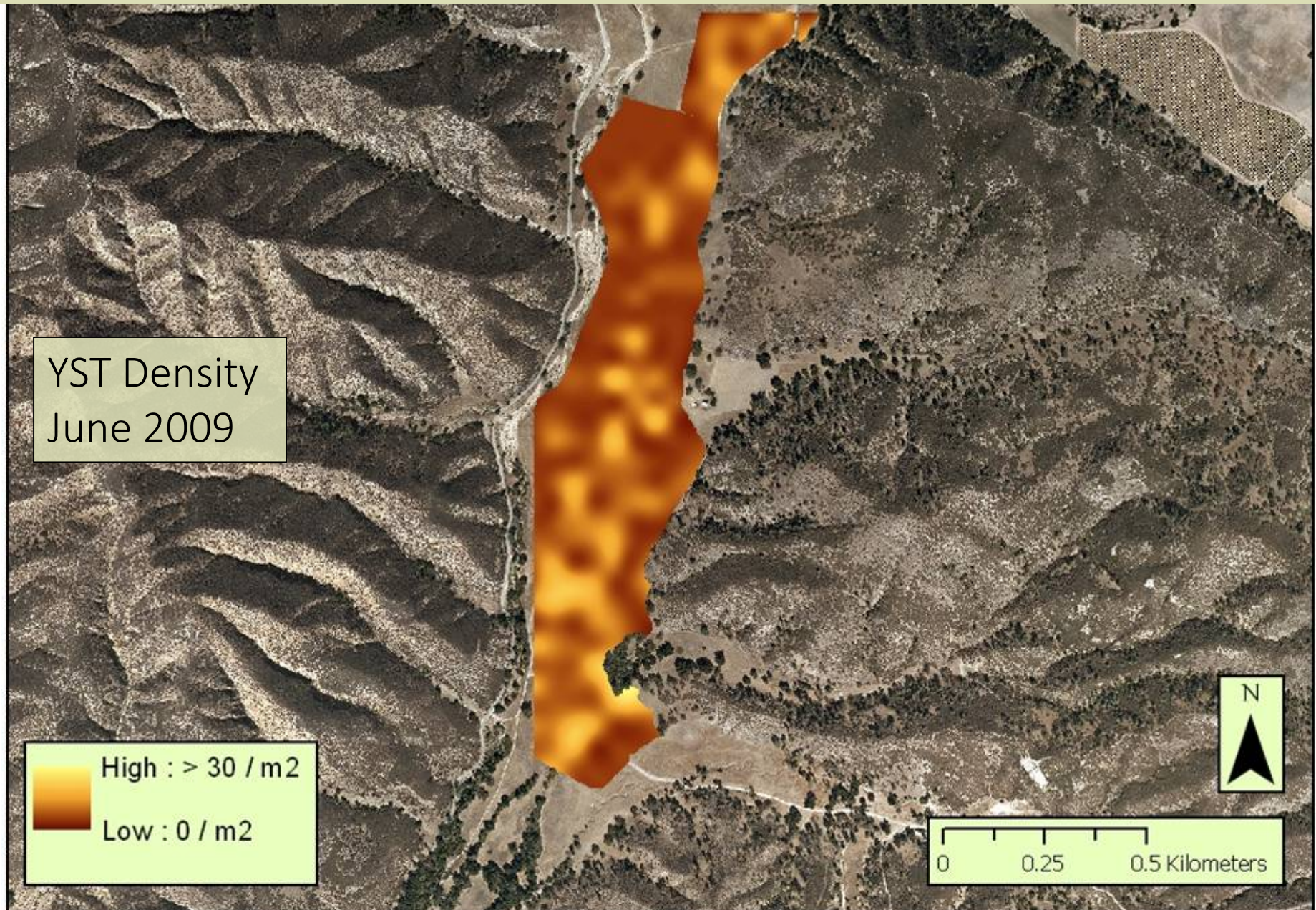
- Post-emergent application
- Residual pre-emergent properties



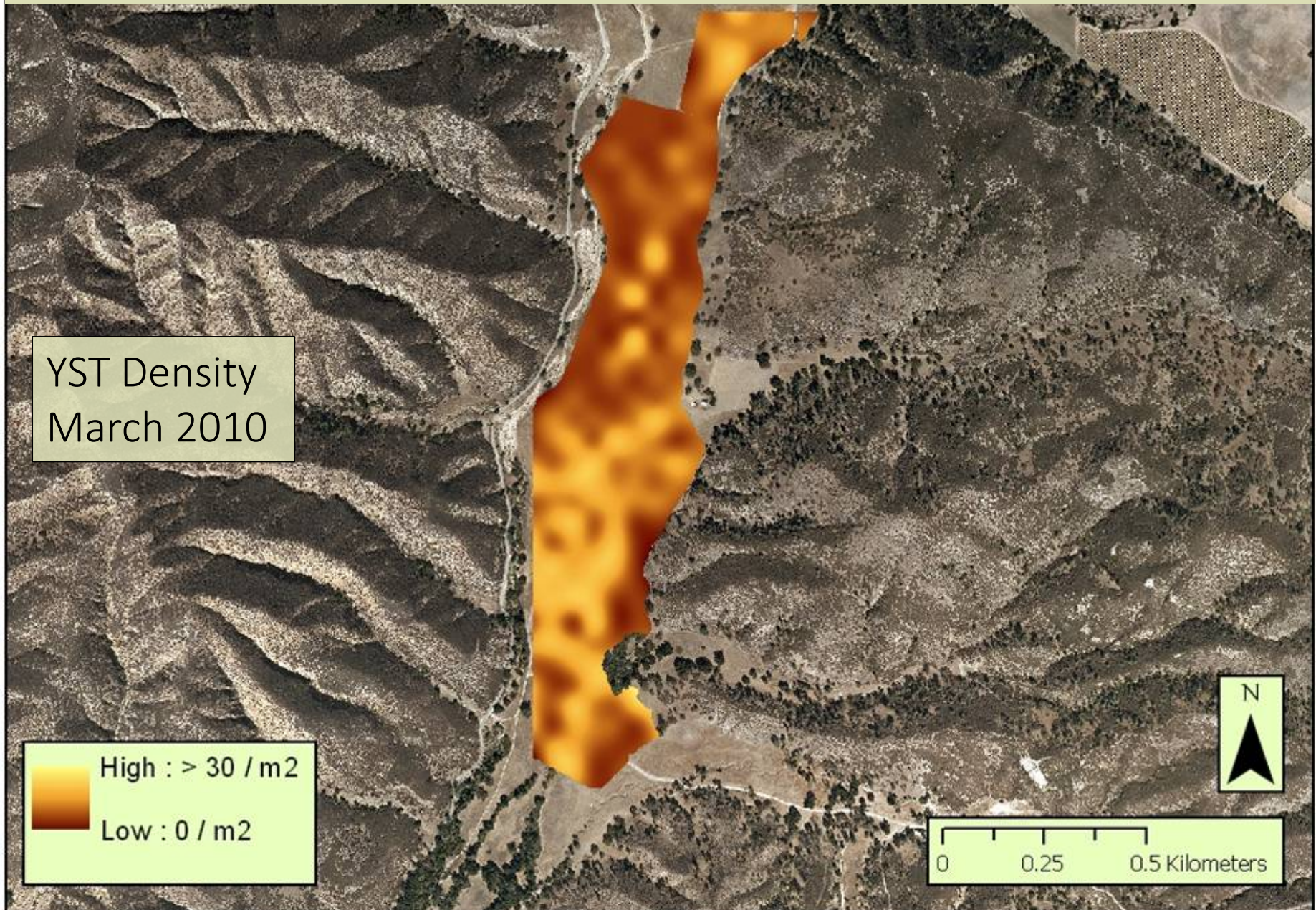
Mapping & Monitoring: YST Density Grid



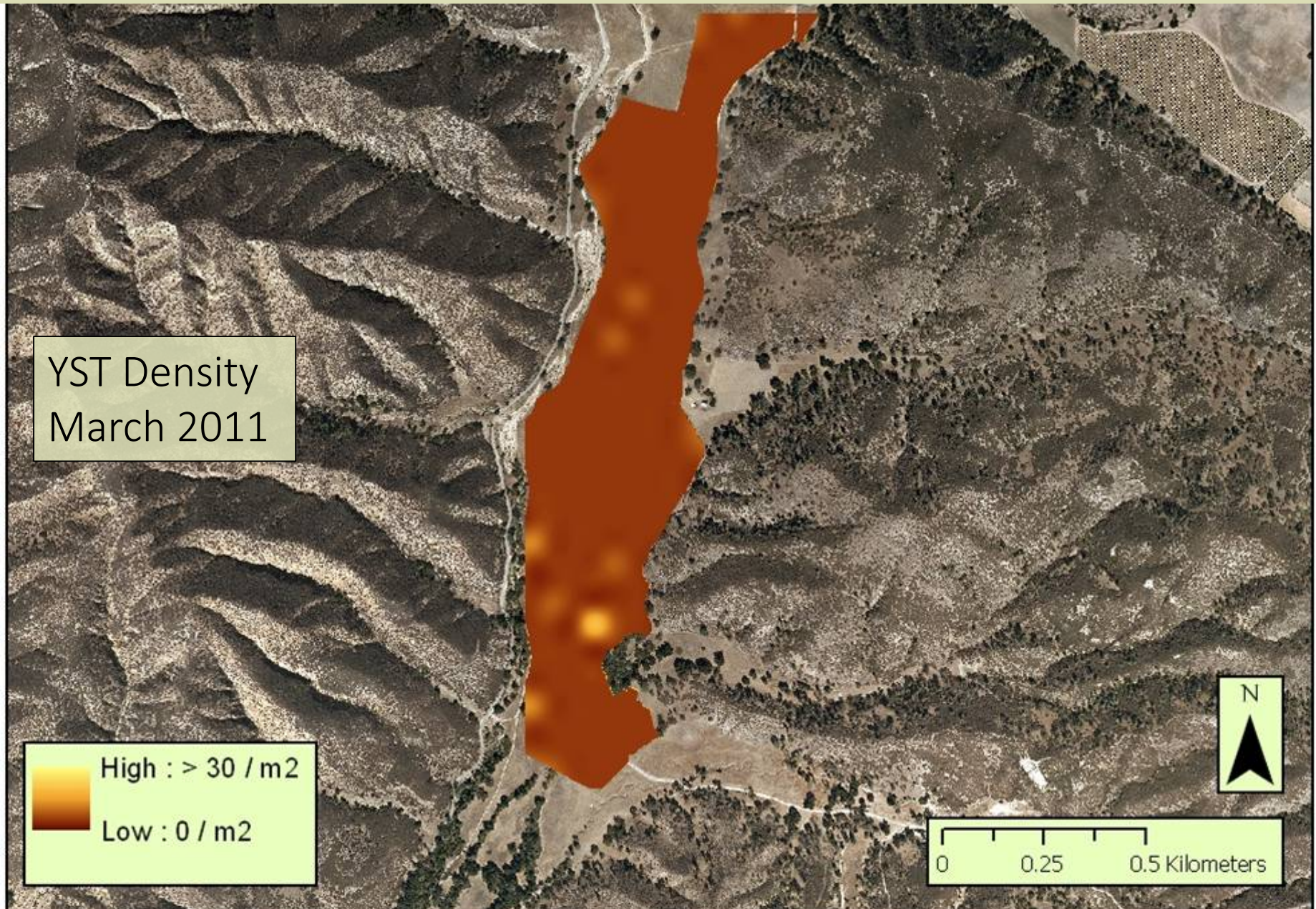
YST Density Before Any Treatments



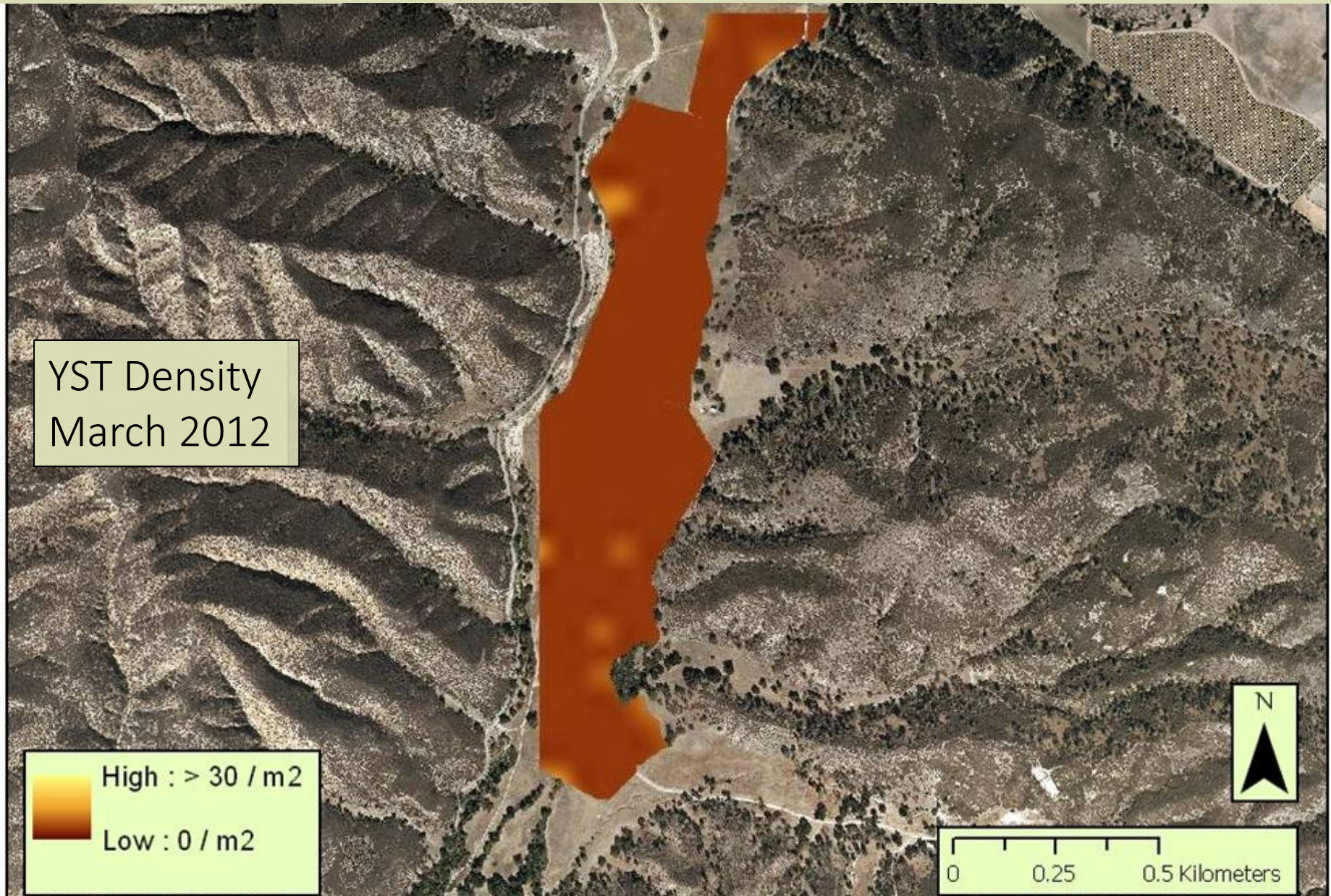
YST Density After Prescribed Burning Treatment



YST Density After Broadcast Herbicide Treatment

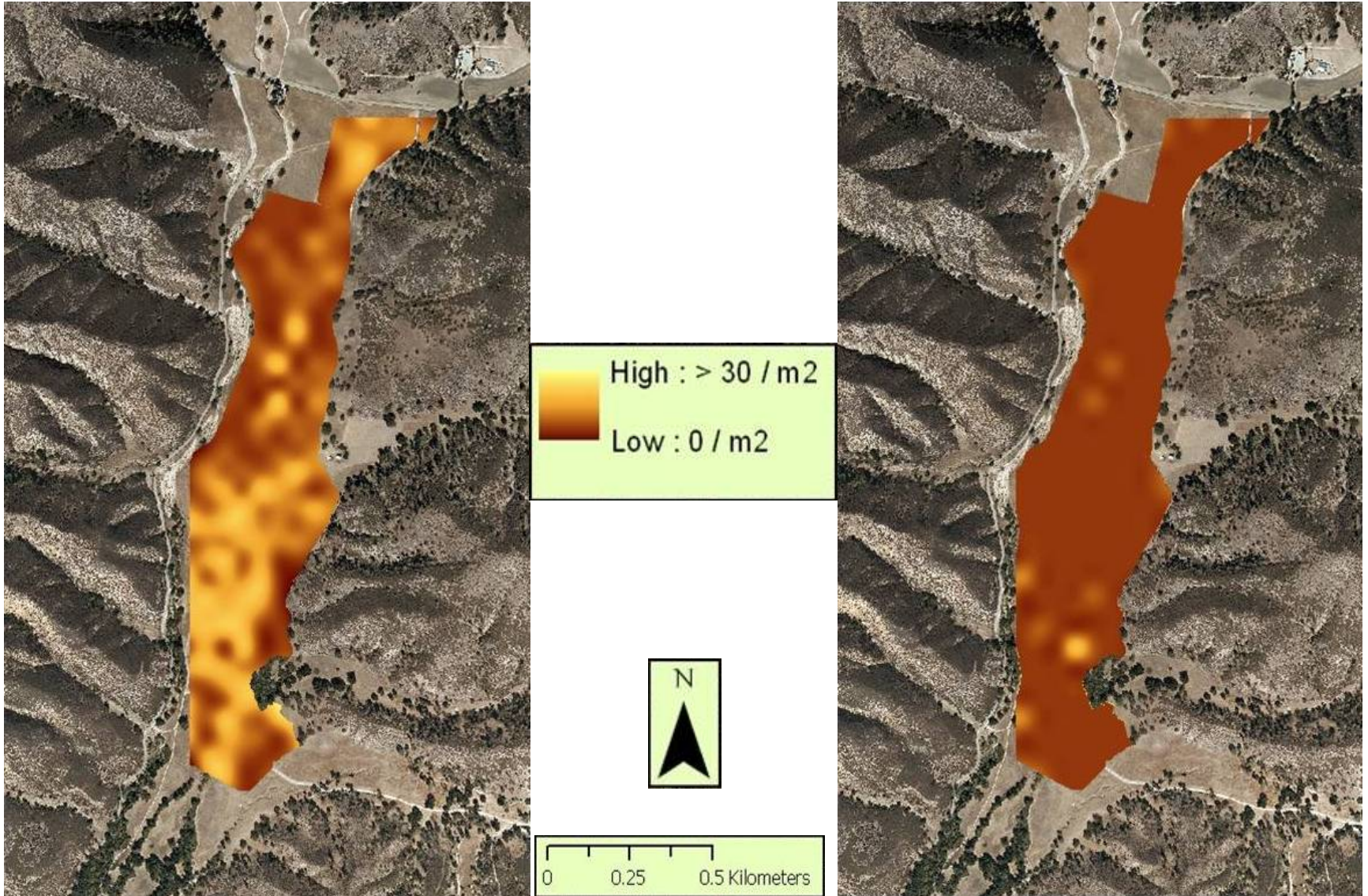


YST Density After Broadcast Herbicide Treatment



YST Density March 2010
(pre-spray)

YST Density March 2011
(1 year post-spray)



Maintained for 10 years @ <math><0.1\%</math> using spot treatments or hand tools





Future?

