Is Yellow Starthistle (*Centaurea solstitalis*) Adapting to Serpentine Soils?

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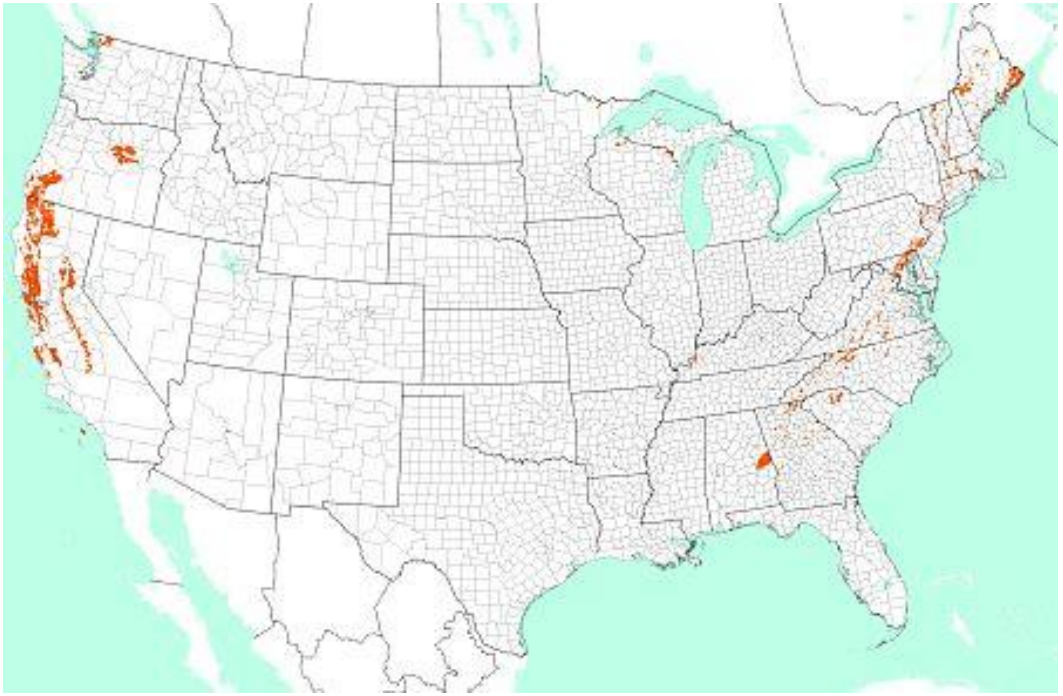
Serpentine Soils

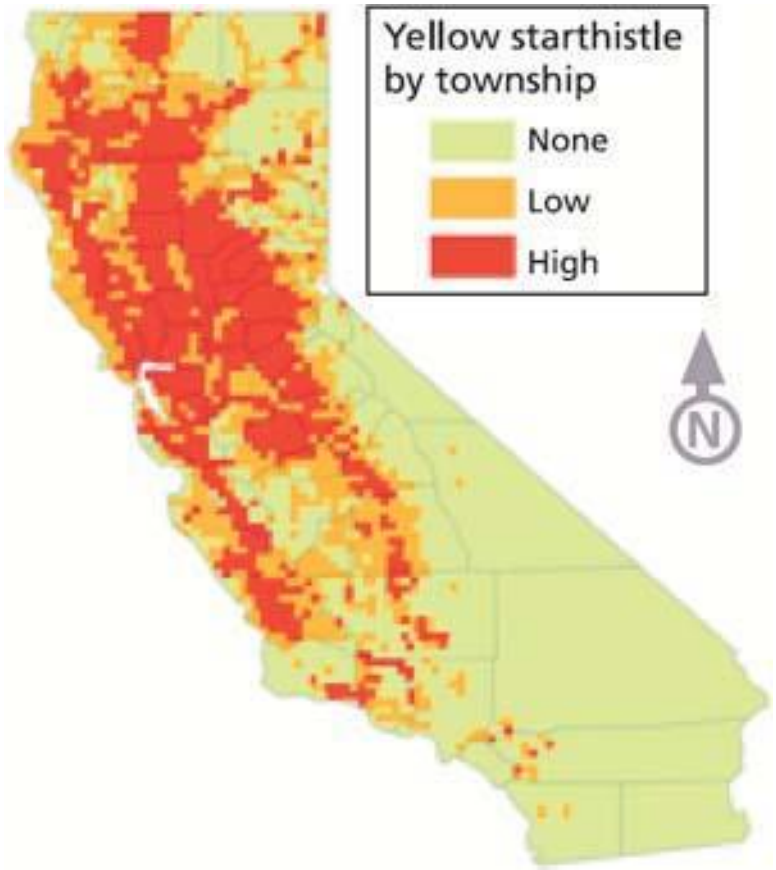
Serpentine outcrop and soil at McLaughlin Reserve
Photo Credit: K. Brafford



Serpentine and ultramafic soils and/or possible outcrops
Photo Credit: Soil Types and Related Map Samples Contained Within BONAP's Floristic Synthesis -- by Schmidt, Nishino and Kartesz. 2011. Retreived from http://www.bonap.org/2008_Soil/SoilTypesRelatedMaps.html

Starthistle in California

Starthistle flowering in field
Photo credit: K. Brafford



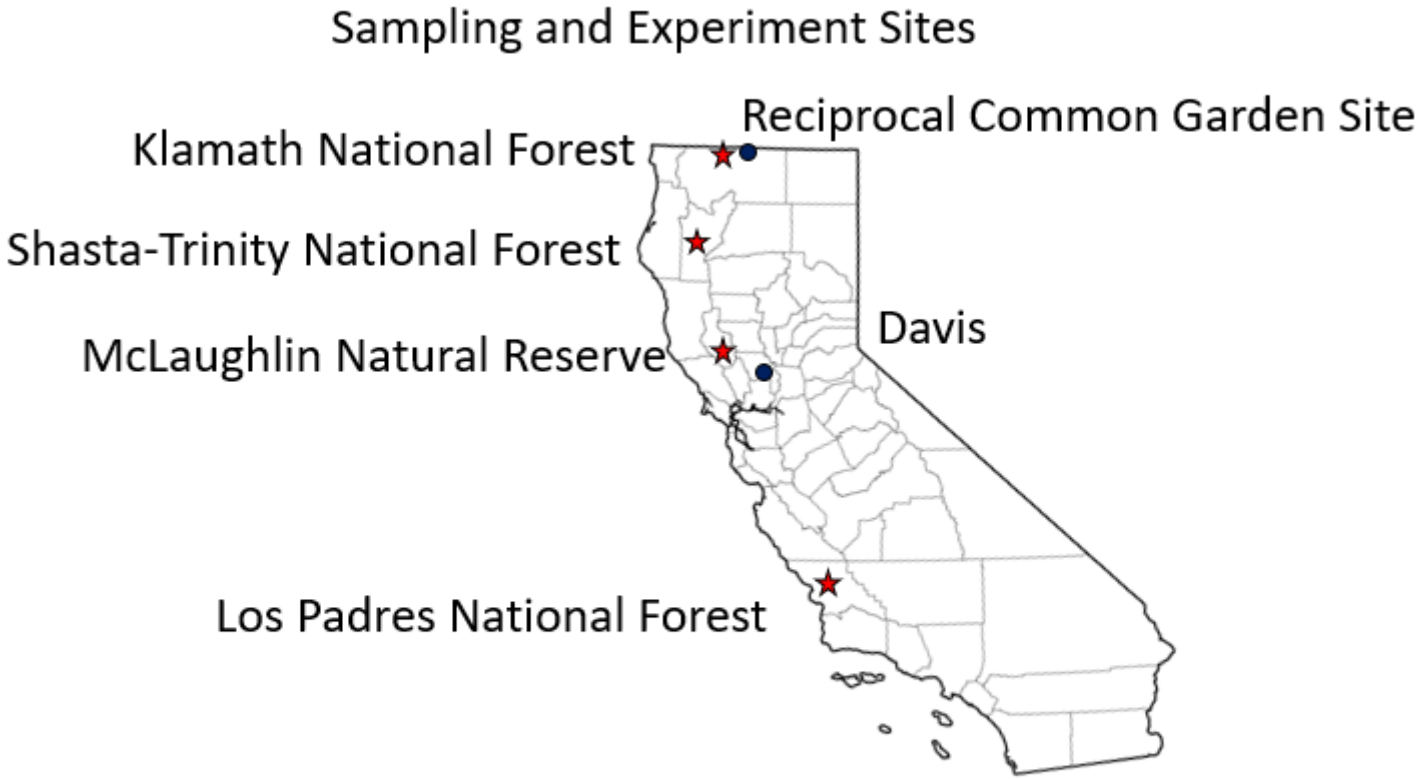
Presence of starthistle by township in CA as of 2002
Photo credit: Yellow starthistle continues its spread in California-- by Pitcairn et al. 2006. Retrieved from http://calag.ucanr.edu/Archive/?article=ca.v060n02p83

Research Objective:

- Test if some populations of starthistle in CA are adapting to grow and compete on serpentine soils.

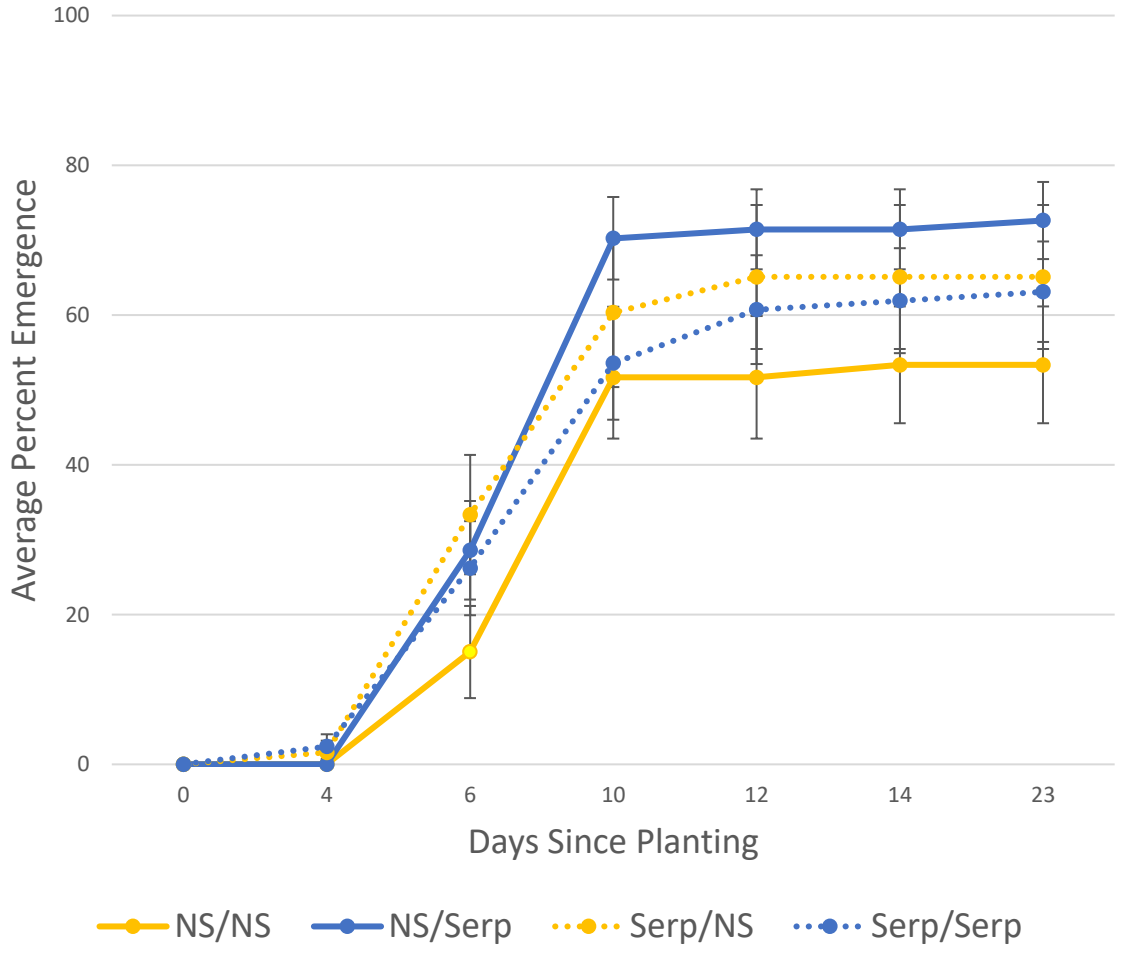
Methods

- Collected materials from 4 areas (8 populations) across CA.
- Reciprocal Common Garden Experiment.



Emergence

- No overall trends in emergence correlated with soil type, seed type, or soil by seed type.
- Significant differences in emergence between soil types within locations.



Seedling emergence over time by soil type and seed type

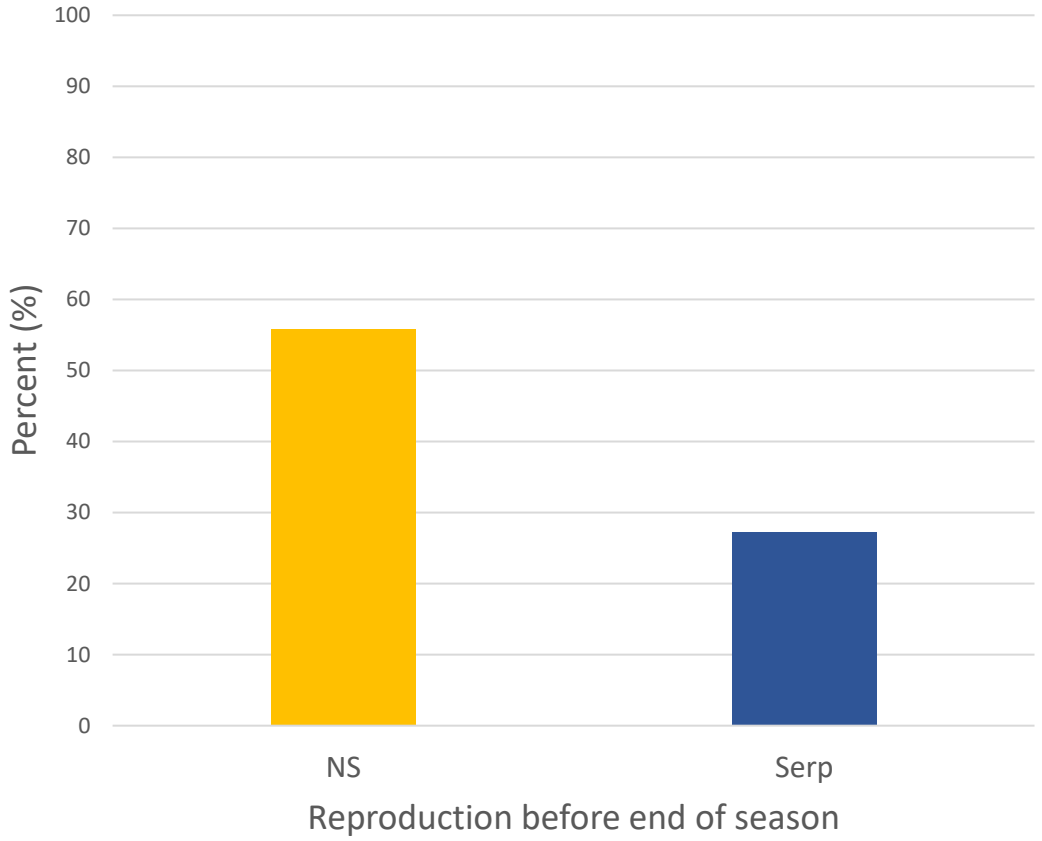
Bolting Time

- Numerically more plants in non-serpentine soil bolted by June 17.
- Significantly more plants in non-serpentine soil bolted by July 8 (*P*<0.001).
- No significant differences between plants from serpentine vs. non-serpentine populations.

Percent bolted by June 17 and July 8

Reproduced by End of Season

- Significantly more plants growing on non-serpentine soil reached reproduction than plants on non-serpentine (*P*=0.0130).
- No significant differences between plants from serpentine vs. non-serpentine populations.



Percent plants reproduced before end of season

Conclusions and Implications

- No conclusions can be reached yet about potential genetic adaptation to serpentine soils.
- All populations showed the ability to sprout, grow, and reproduce (though less well) on serpentine soil in pots when biotic factors are removed.
- Serpentine soil habitats are not “immune” from starthistle by virtue of their basic soil chemical or physical properties.
- Some other factors of serpentine soil habitats must provide resistance to starthistle.
- Subjective apparent increase in starthistle in serpentine soil habitats may be due to other factors.

Acknowledgments

Mentorship Support

- Dr. Mohsen Mesgaran
- Dr. Jennifer Funk
- Dr. Dan Kleibenstein and Spring 2019 PLS 188
- MURALS Staff Raynell Hamilton & Marinka Swift
- Dr. Kate M Scow
- Dr. Kit Batten

Advice & Allowing Sample Collection

- Klamath National Forest staff, especially Erin Lonergan
- Los Padres National Forest staff, especially Dr. Lloyd G. Simpson, Jr. & Jonathan Schwartz
- McLaughlin Reserve staff, especially Catherine Koehler & Dr. Paul Aigner
- Shasta-Trinity National Forest staff, especially Julie Kierstead Nelson, Ashley Knight, & Lusetta S Sims
- Klamath National Forest staff, especially Erin Lonergan

Funding

- Weed Science Society of America for John Jachetta Undergraduate Research Award
- Milton & Mary Miller Plant Sciences Award

Research Support

- Mesgaran lab members especially Dr. O. Adewale Osipitan, Wenzhuo (Winnie) Wu, Noah Shepherd, & Jamie Ng.
- Liberty Galvin
- Funk Lab members especially Monica Nguyen
- Ryan Deering
- UC Davis Herbarium
- Aguste Sharma, Dylan Elmer, Grant Ciffone, Hannah Duane, & Steven Palomares-Mymala
- SDC staff, especially Sarah Cohen, Corey Chomes, Joshua Hori, Jennifer Billeci, Russell Zochowski, & Arden Gabor
- Adam Hudgins
- Karen Ward
- Carolyn Brafford