Yellow Starthistle

Examining a New Biological Control Agent

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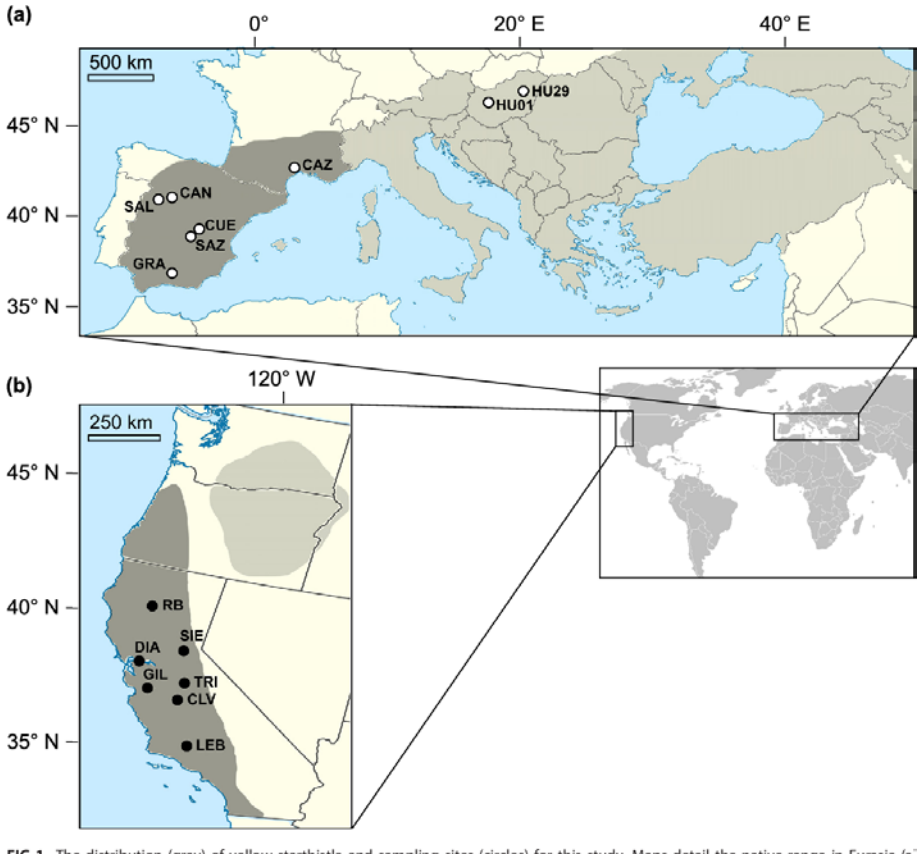
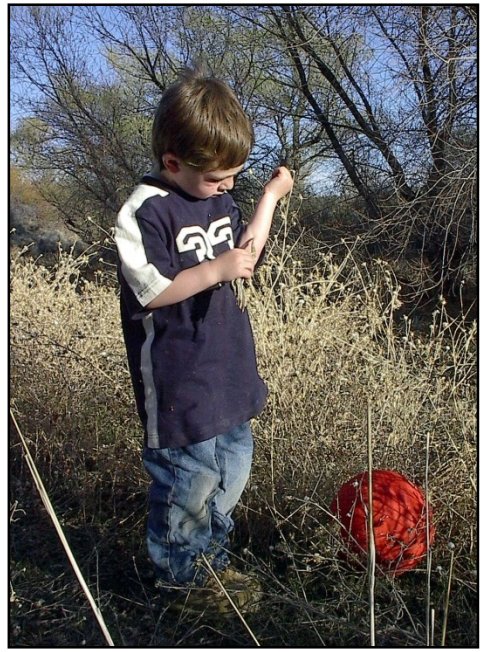
Background

- Member of sunflower family
- Native to Europe/Asia
- Introduced to California 1850s



Yellow Starthistle - the Problem

- Over 15 million acres in California
- Reduces value and carrying capacity of rangeland
- Reduces recreational values and access
- Major consumer of groundwater
- Toxic to horses
- Reduces plant diversity

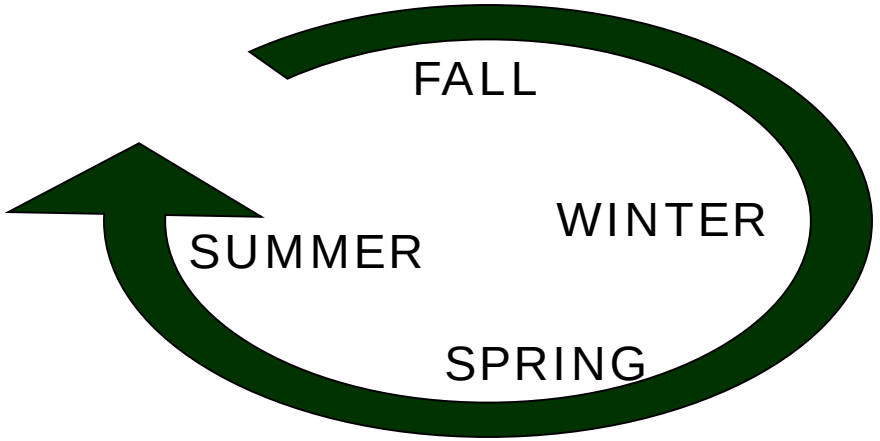


Seedling

Rosette

Flowering

Bolting



Annual life cycle

Yellow Starthistle Control

Cultural Control

- Grazing
- Burning

Mechanical Control

- Mowing
- Hand pulling and hoeing

Biological Control

- Insects
- Diseases

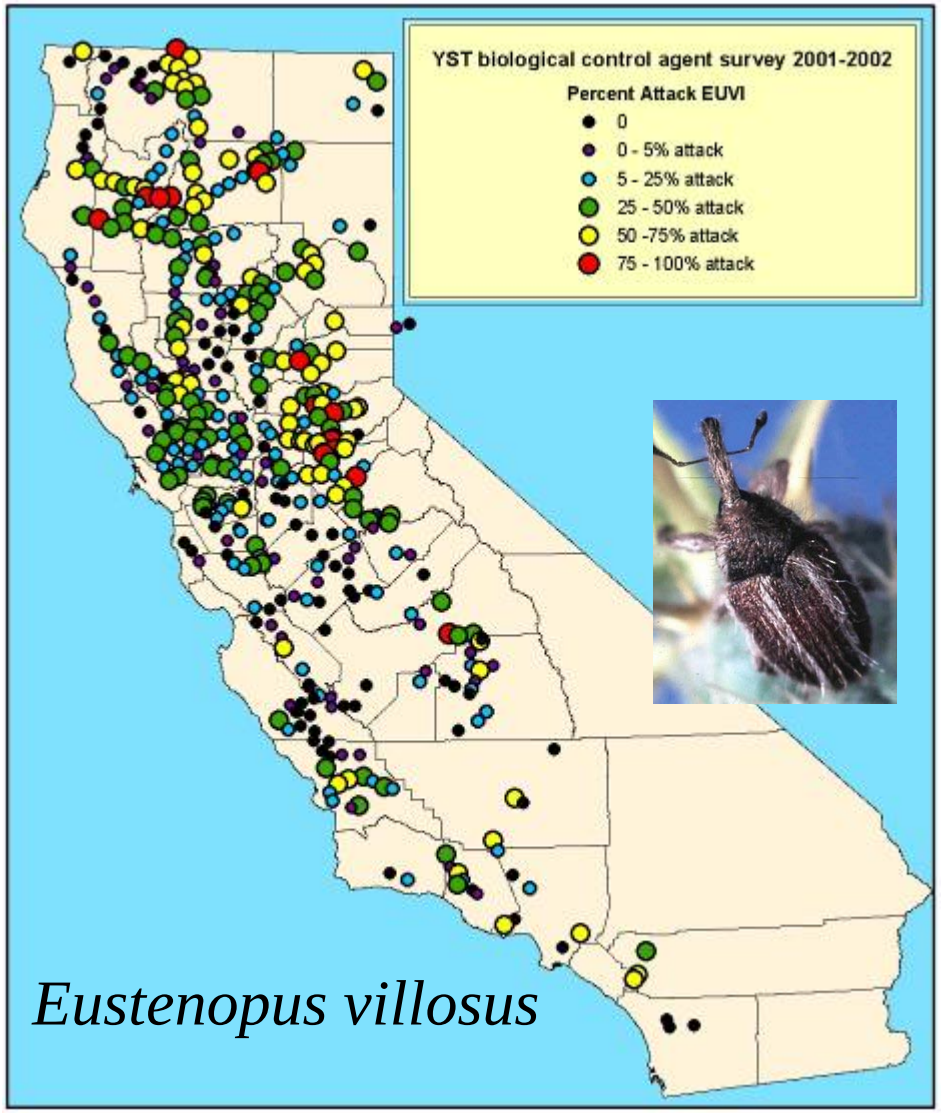
Chemical Control

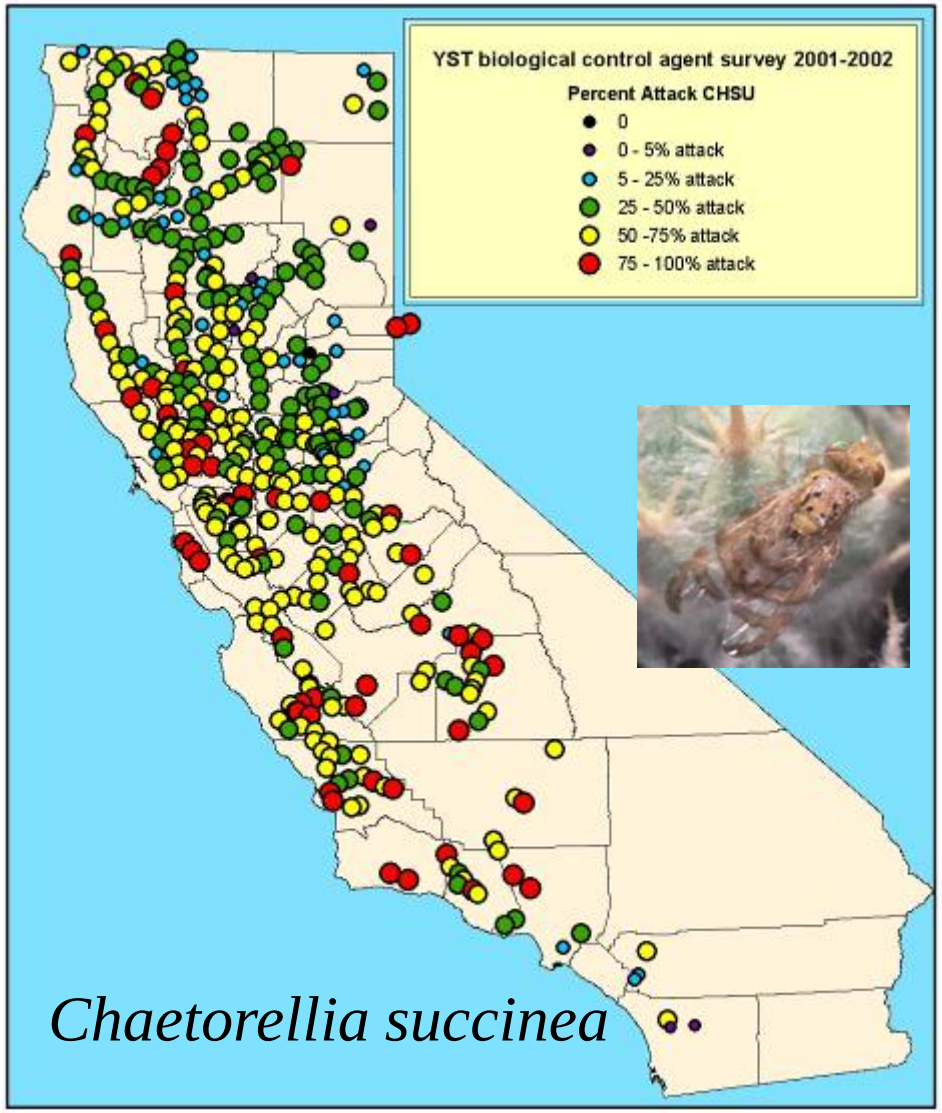
- Herbicides

Biological Control

- Hairy weevil
- Bud weevil
- Flower weevil
- Gall fly
- Peacock fly
- False peacock fly
- Rust fungus

Biocontrol distribution and attack rates in California



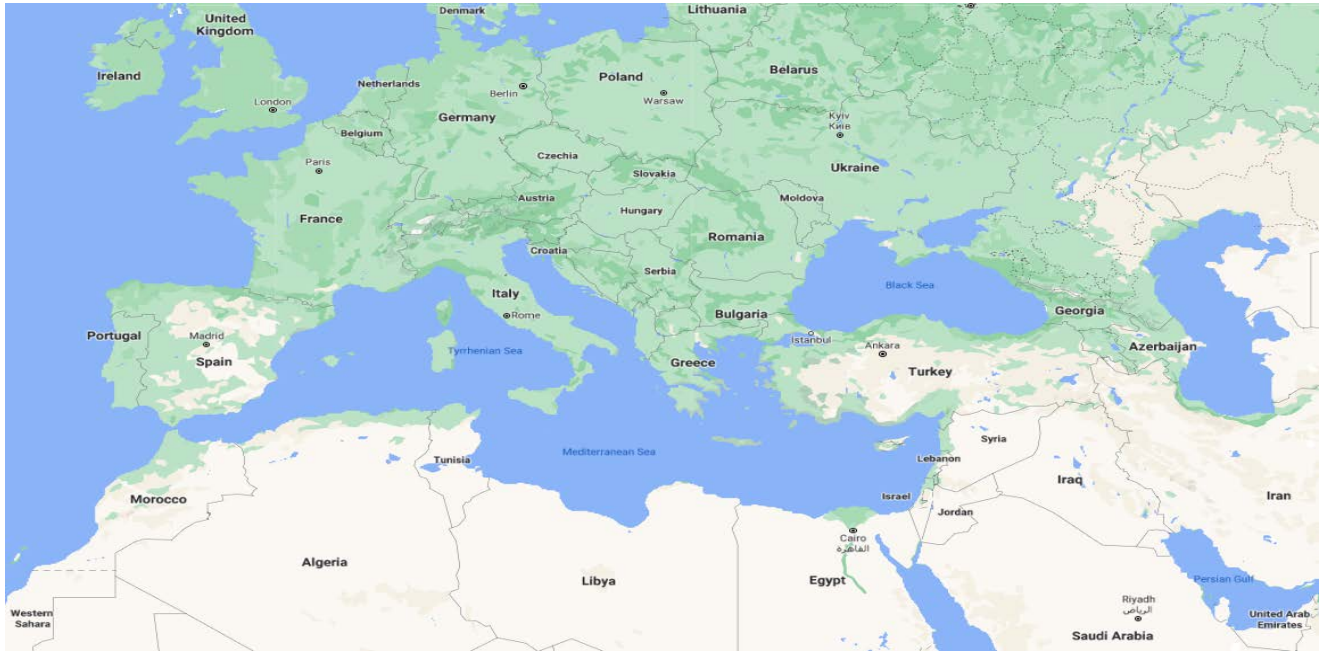


Jointly, hairy weevil and false peacock fly can reduce seed production by 50%

Yellow Starthistle Rosette Weevil

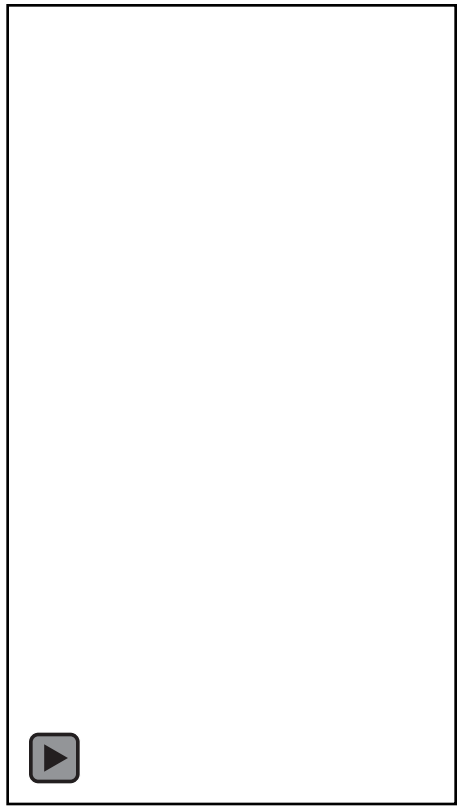
- First collected in Turkey in 1984
- Large geographical range
- Since 2001, it has been undergoing host specificity tests in Albany, CA

Ceratapion basicorne



Releases to Date

- Rosette weevil was approved for release in the U.S. in Sept 2019
- First release in North America was spring, 2020 in Solano, CA
- Second release was April 2021 in El Dorado County
- Third release was in April 2022 in Central Coast



U.S.D.I. BUREAU OF LAND MANAGEMENT
MAGNOLIA RANCH
TRAIL HEAD

Next Steps

- Monitoring of insect
  - Summer surveys; dissect bolted plants and look for mining from larvae
  - Spring surveys; sweep for adults and monitor for population growth
- If successful, sites will serve as a nursery for other releases
- If interested in being kept up to date: http://ucanr.edu/rosetteweevil

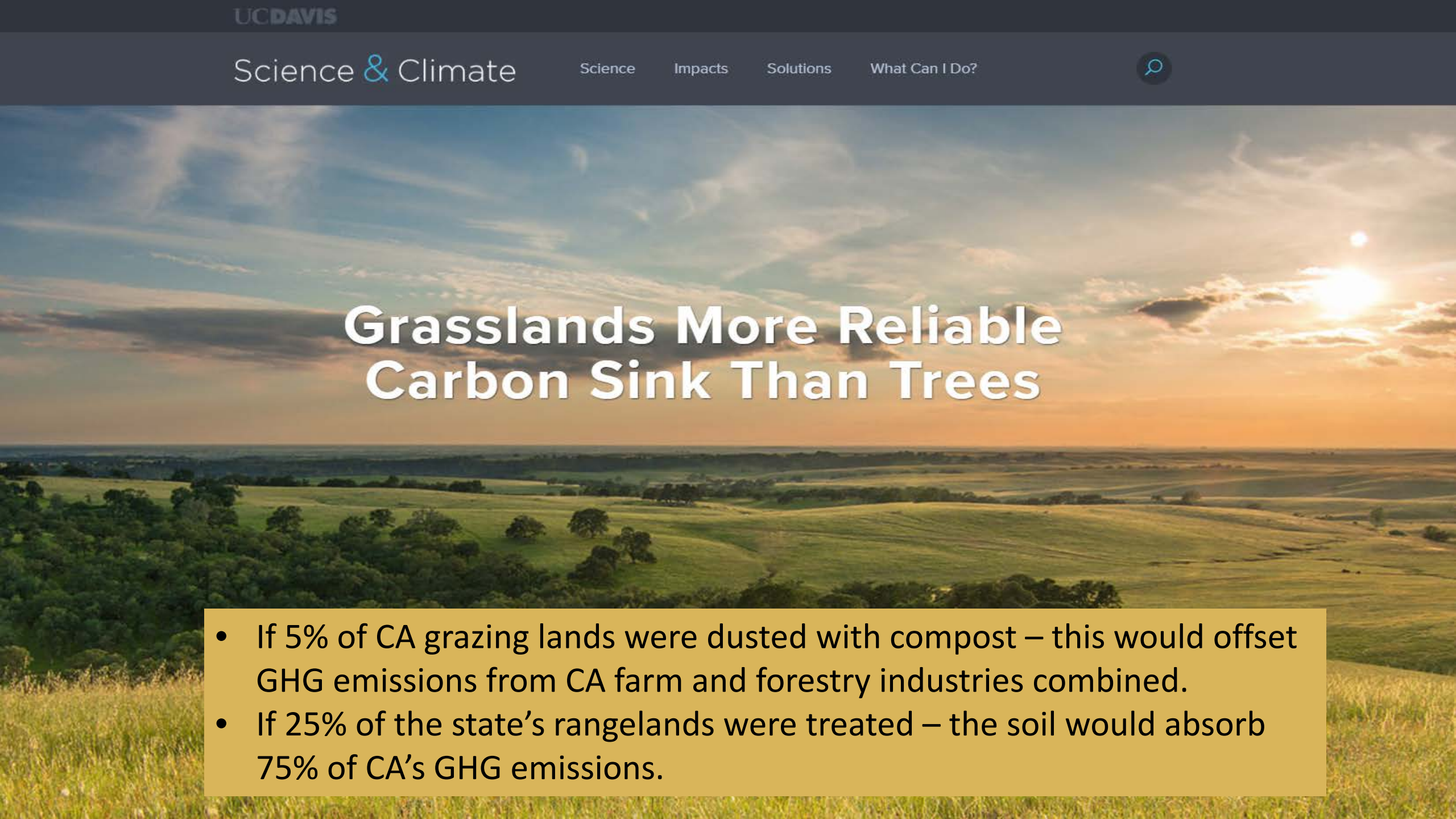
Benefits of Compost

- Adds organic matter
- Provides essential nutrients
- Increases nutrient exchange
- Helps buffer pH
- Promotes beneficial microorganisms
- Breaks down clay and silt soils
- Builds porosity
- Increases water infiltration
- Increases water holding capacity
- Increased plant growth

INCREASES SOIL CARBON

Grasslands hold considerable potential for soil carbon sequestration

- 30% of global land surface area
- 30% U.S. land area
- >50% of California land area



- If 5% of CA grazing lands were dusted with compost – this would offset GHG emissions from CA farm and forestry industries combined.
- If 25% of the state's rangelands were treated – the soil would absorb 75% of CA's GHG emissions.

Amador Rangeland Soil Health Research Project

(A partnership between UCANR, Amador Resource Conservation District and local ranchers)

- Provide localized data on the effectiveness of a one-time application of compost on annual rangeland.
- Determine if compost can increase the resiliency of desirable forages to outcompete noxious weeds.
- Determine if reseeding with desirable forbs and/or the addition of compost will increase forage quality and quantity.

Site Selection

- 5 ranches across Amador County
- Different soil types
- Similar grazing management
- Sites with noxious weeds
  - Yellow starthistle, medusahead, barbed goatgrass

Treatments

1. No treatment (control)
2. Seeded with clover cover crop
3. Compost
4. Compost applied & Seeded with clover mix

Setting up the Trial - Spring 2019

Each ranch has four treatments with each treatment replicated 3 times.

Each treatment measures 0.5 acre with a block of all four treatments measuring 2 acres.

Initial Soil Sampling - Spring 2019

Extensive soil sampling was conducted in spring 2019 to get a baseline of soil conditions

Compost Applications and Seeding - Fall 2019

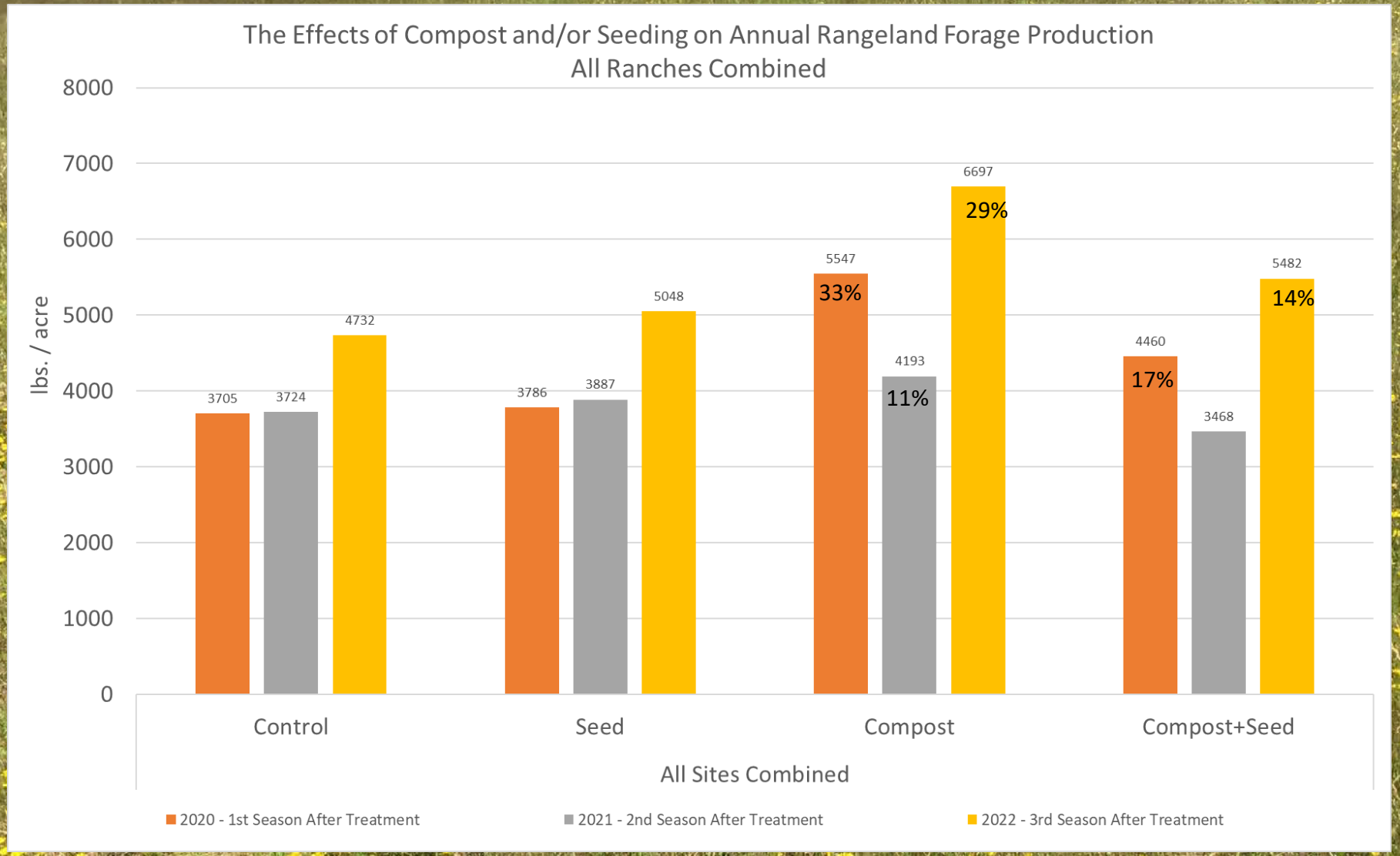
200 yards of compost was delivered to each ranch.

Compost was applied using a spreader at a rate of 1/2 inch (roughly 67 cubic yards/acre).

Clover cover crop mix was applied to two treatments; seed only, and seed plus compost

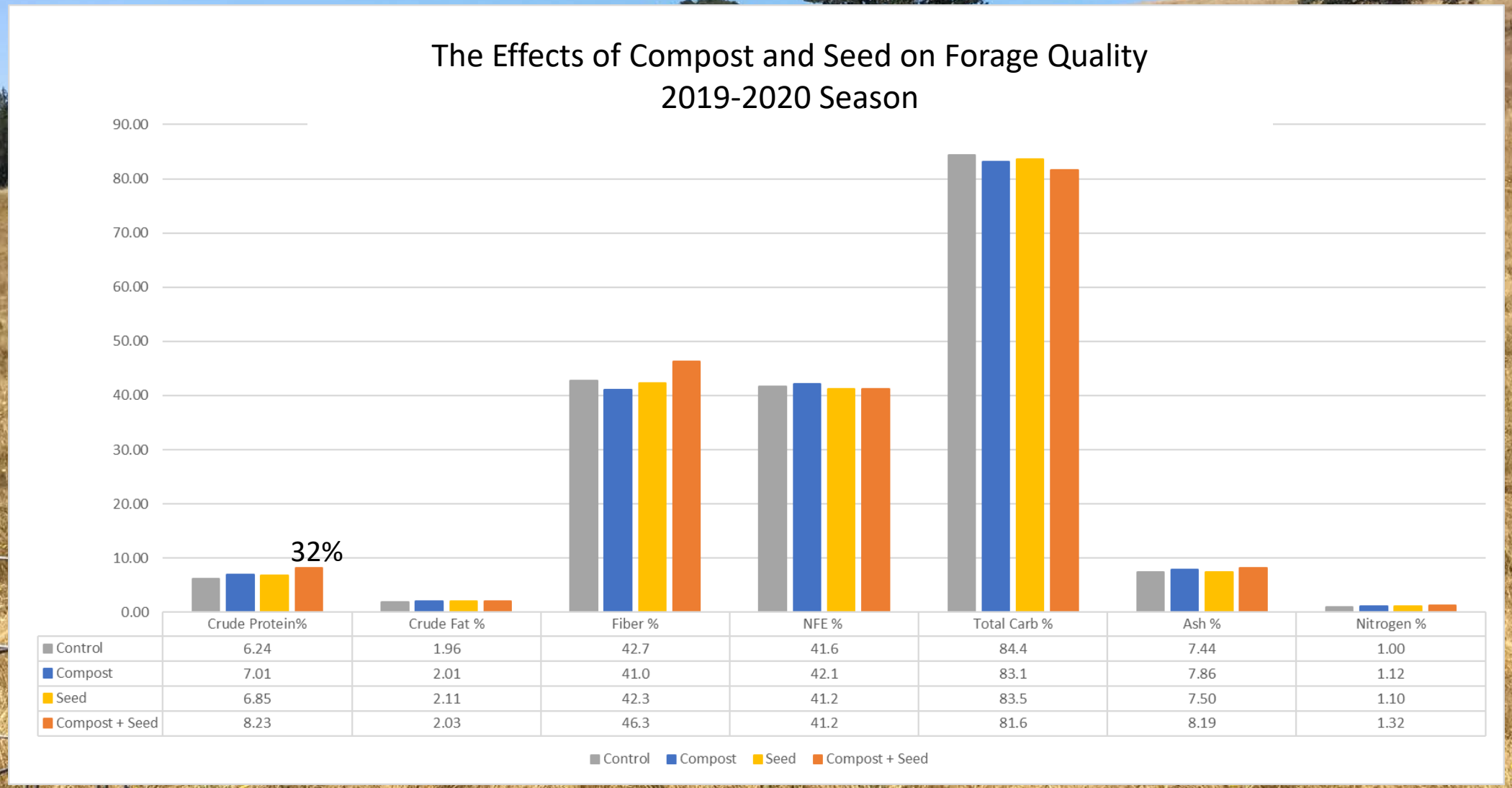
Forage Productivity

Total forage production is measured at peak standing crop, when the plants have reached their maximum total biomass.



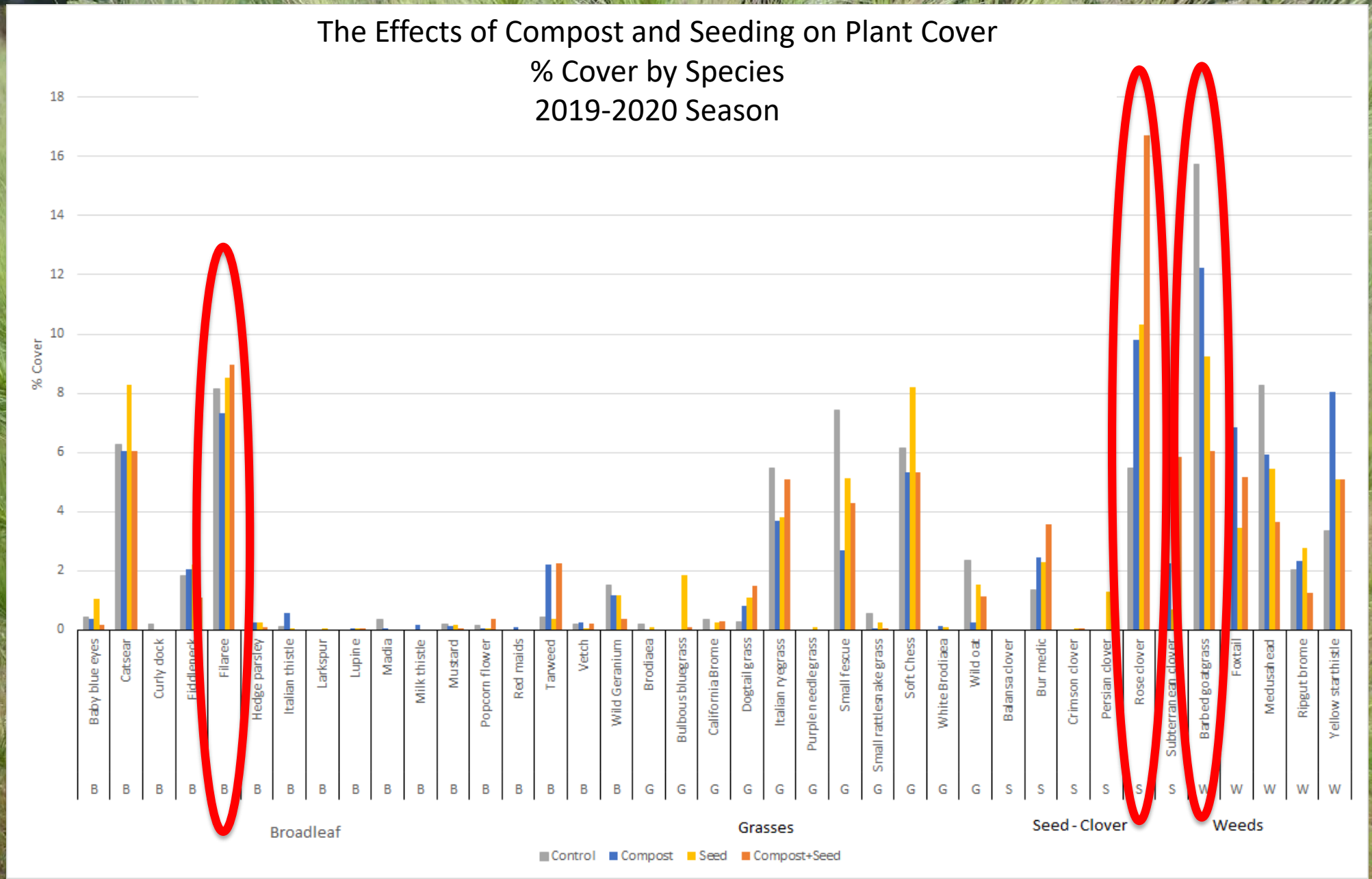
Forage Quality

Forage quality is a measurement of the nutrient value of forage. Indicators of high forage quality such as protein, energy, vitamins and minerals decline as the growing season progresses. Conversely, indicators of low quality such as fiber and lignin increase as forage plants mature. Samples were taken at peak standing when plants were at maturity.



	Crude Protein%	Crude Fat %	Fiber %	NFE %	Total Carb %	Ash %	Nitrogen %
Control	6.24	1.96	42.7	41.6	84.4	7.44	1.00
Compost	7.01	2.01	41.0	42.1	83.1	7.86	1.12
Seed	6.85	2.11	42.3	41.2	83.5	7.50	1.10
Compost + Seed	8.23	2.03	46.3	41.2	81.6	8.19	1.32

Plant Diversity



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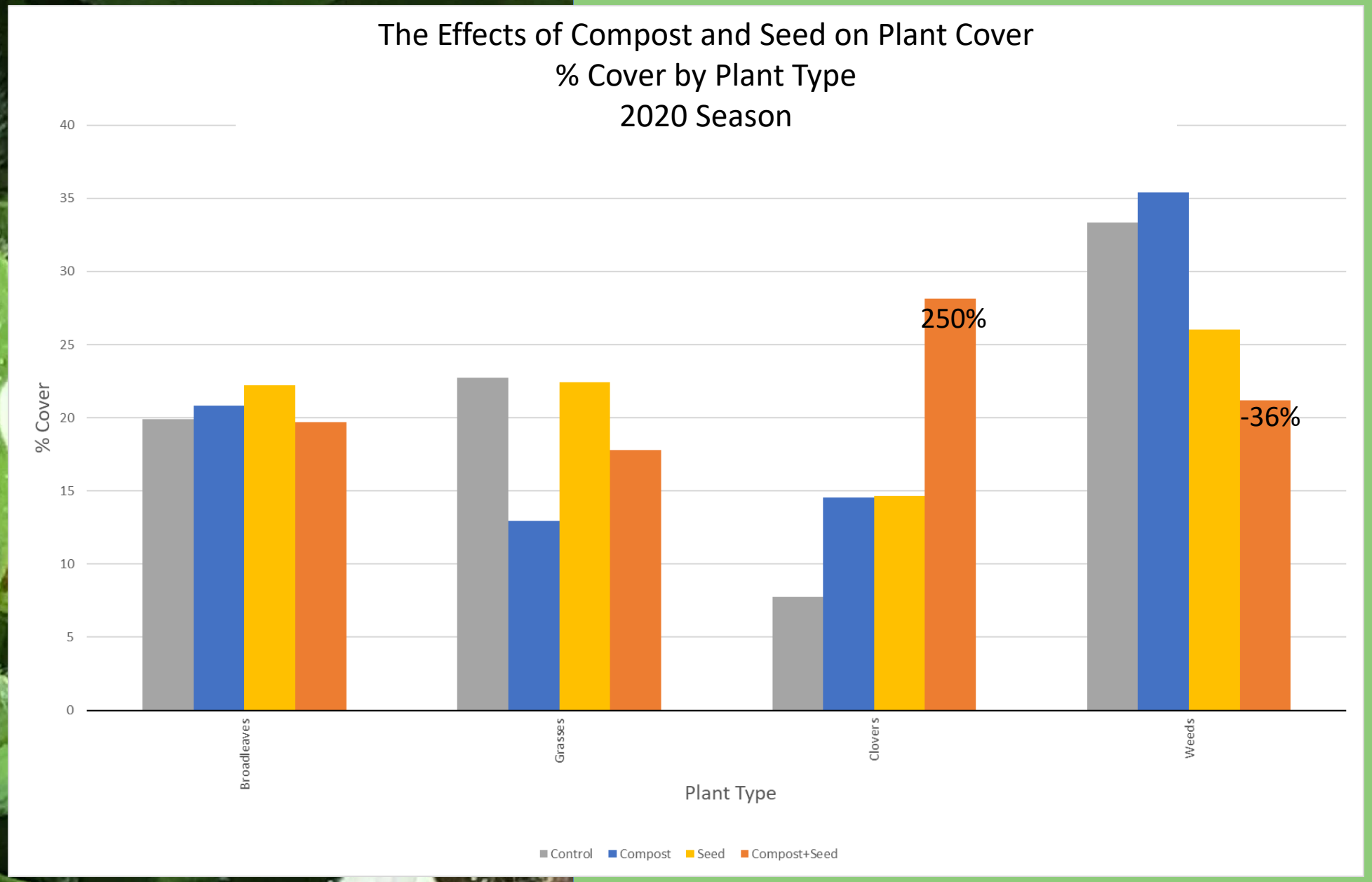

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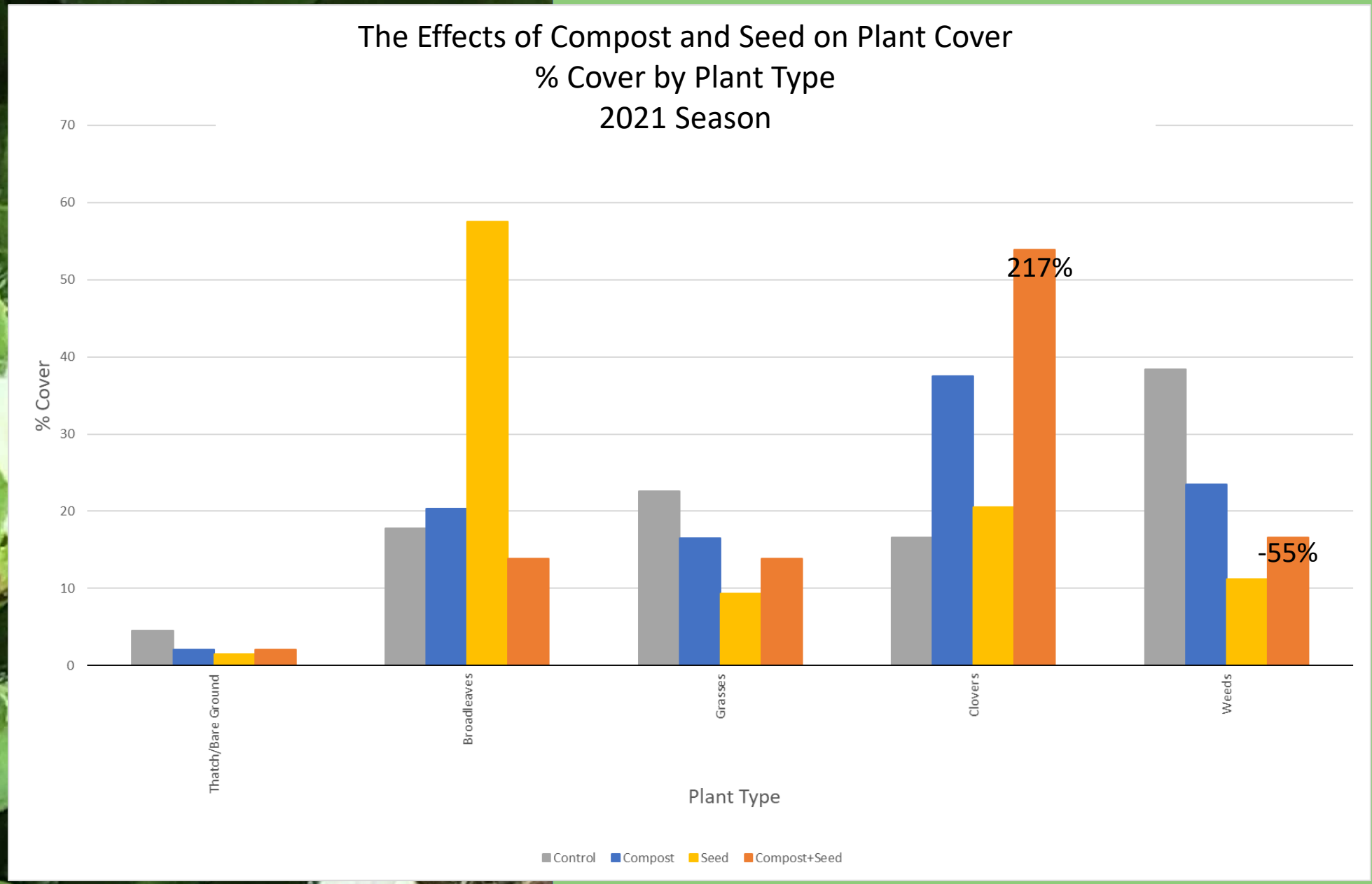
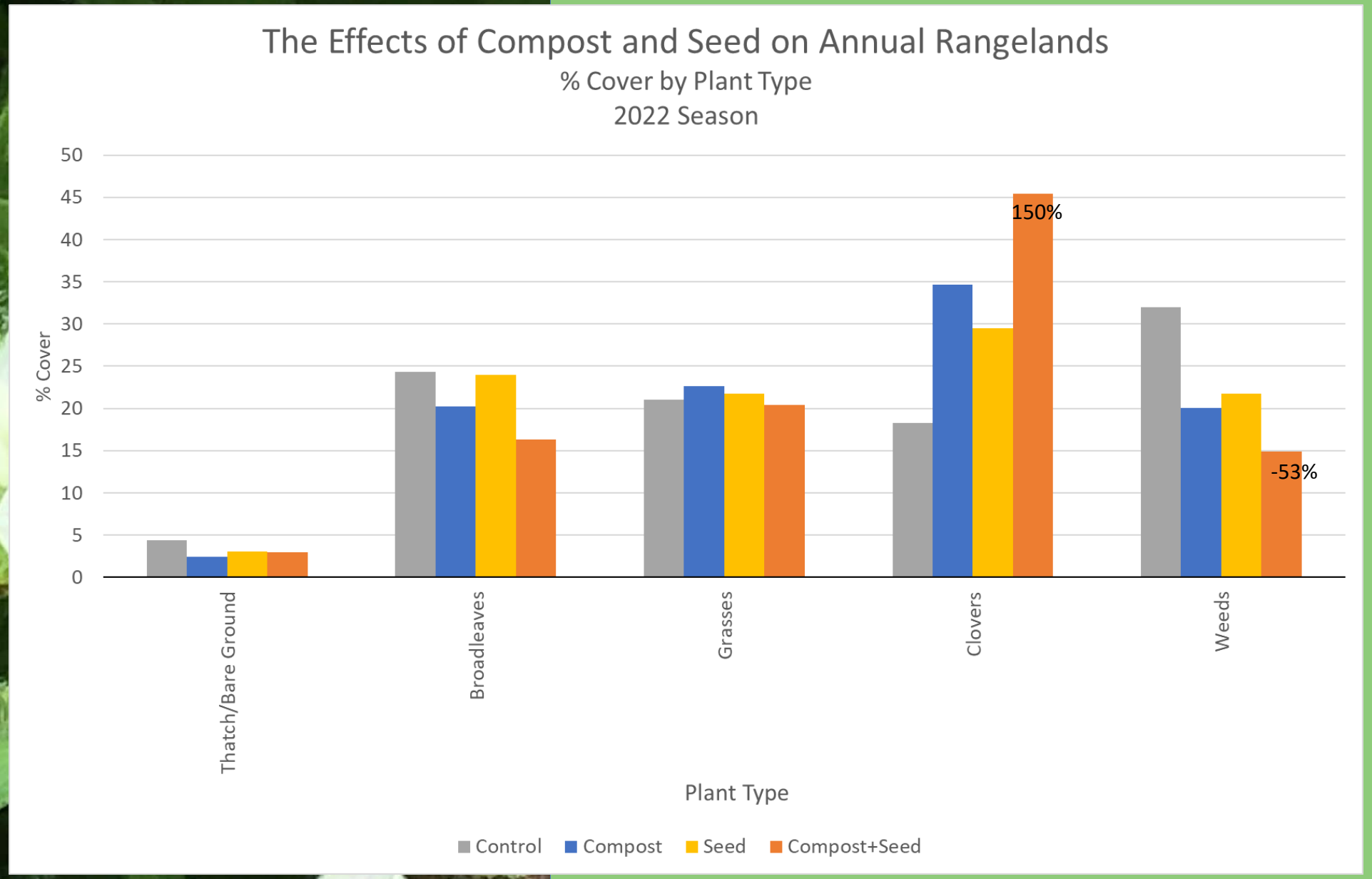
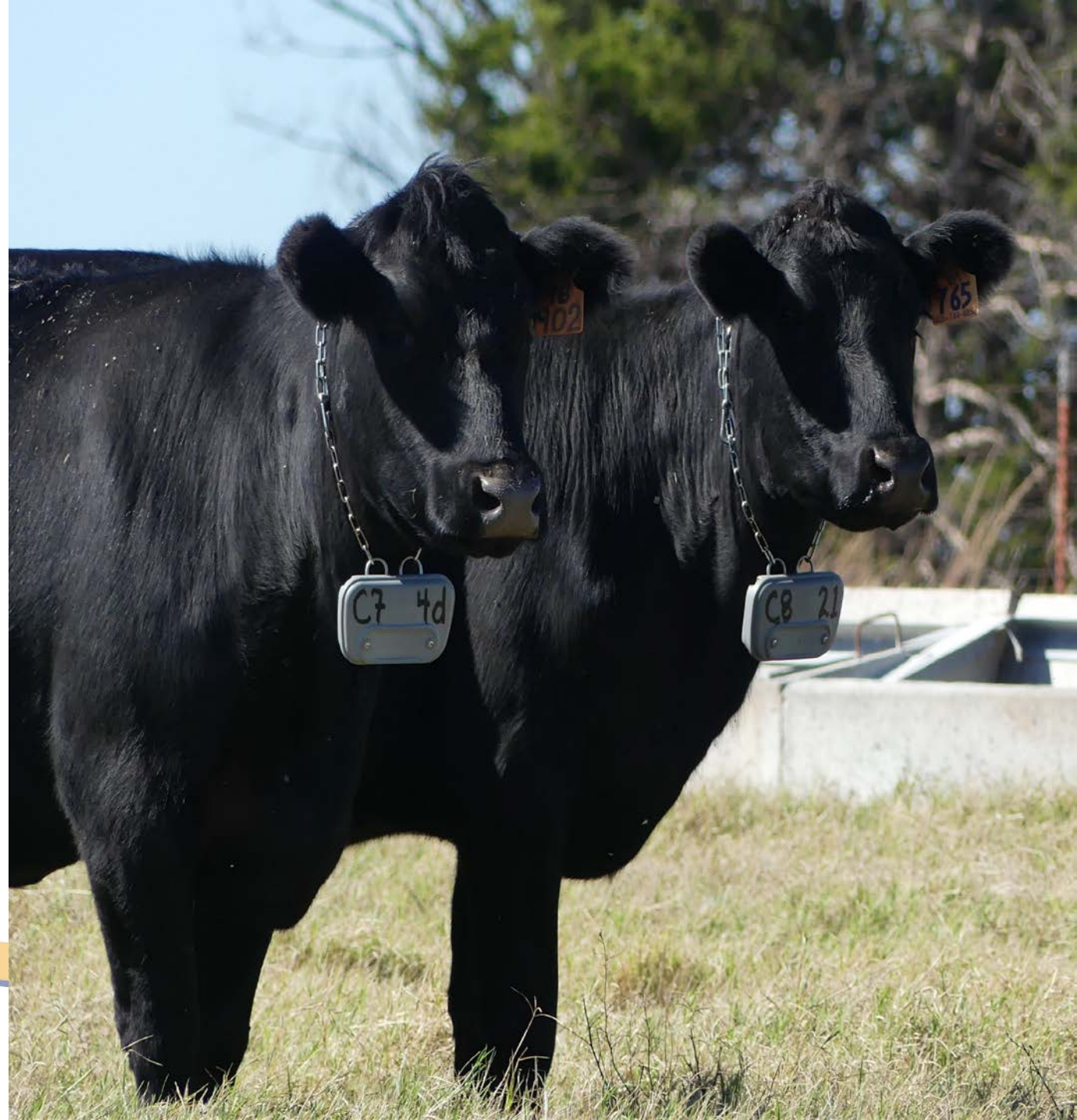


Plant Diversity



Virtual Fencing to Herd and Exclude Cattle



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What is Virtual Fencing (VF)?

Definition:

To contain cattle (livestock) without the use of a fixed fence, using signals to the animals – audio tone + electrical stimulus, via a collar

- Animal learns to avoid a virtual boundary based on audio tone

Applications

- Greater control of grazing and utilization of pasture
- Increased animal monitoring
- Protect environmentally sensitive areas
- Fence difficult terrain
- Reduce labor
- Reduce the amount of fixed (permanent fence) on the landscape – increase wildlife movement
- Concentrate grazing for weed control
- Concentrate grazing for creating fuel breaks
- Increased versatility for contract grazing

VF Grazing Trial, Sutter Creek CA

Oblong Spurge Control Project…

Protecting the Mokelumne Watershed from invasion

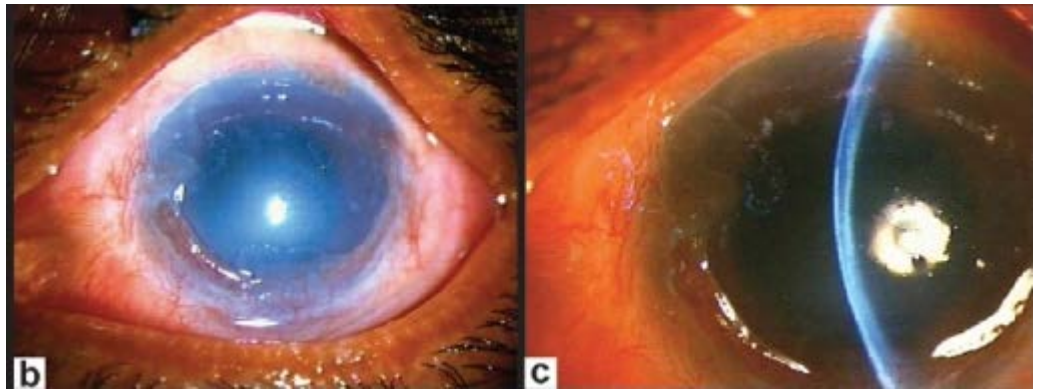
Euphorbia oblongata

- Oblong spurge, Egg leaf spurge, Balkan spurge
- Introduced in early 1900's from Turkey and Southeast Europe as an ornamental

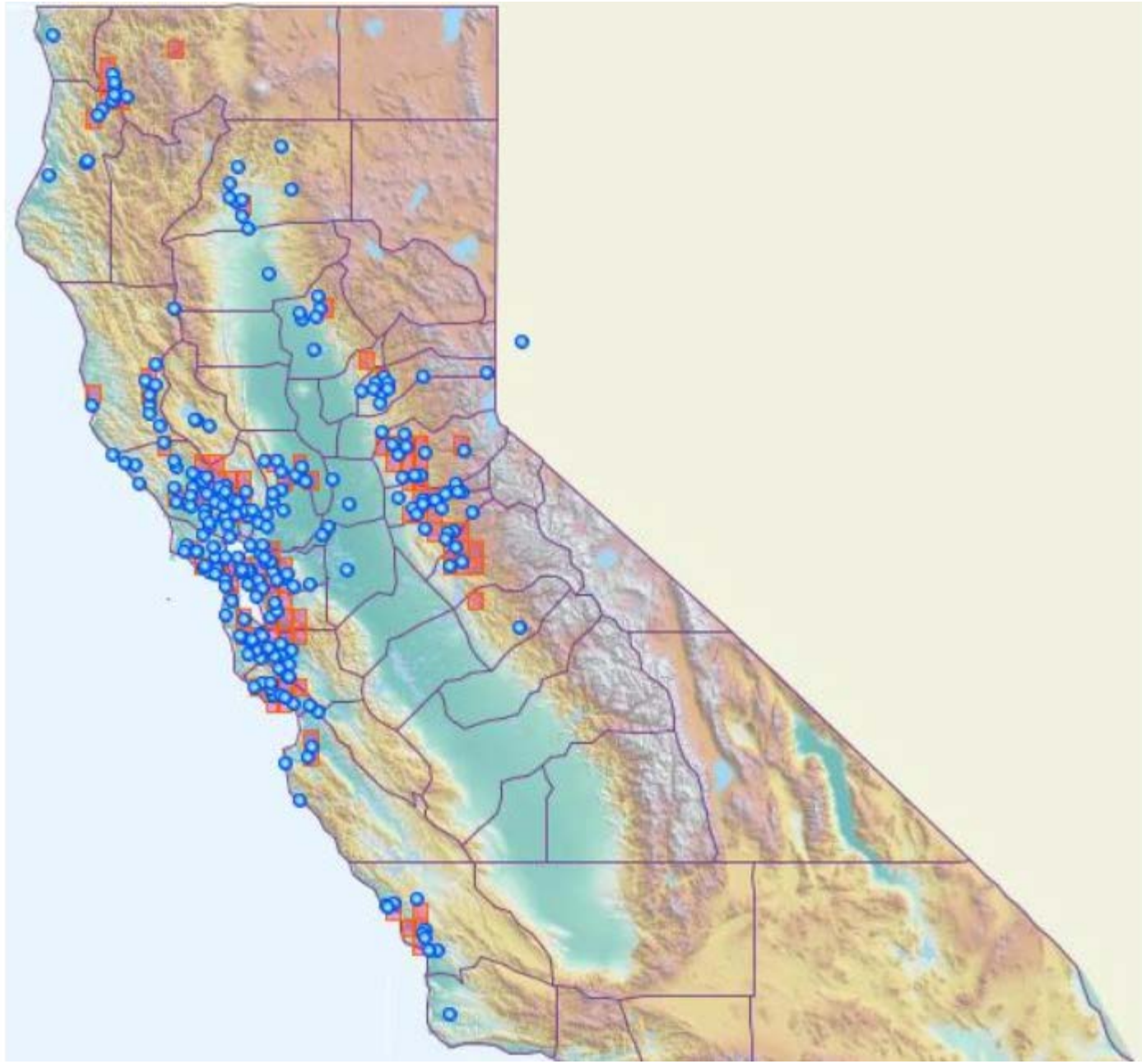
Oblong Spurge

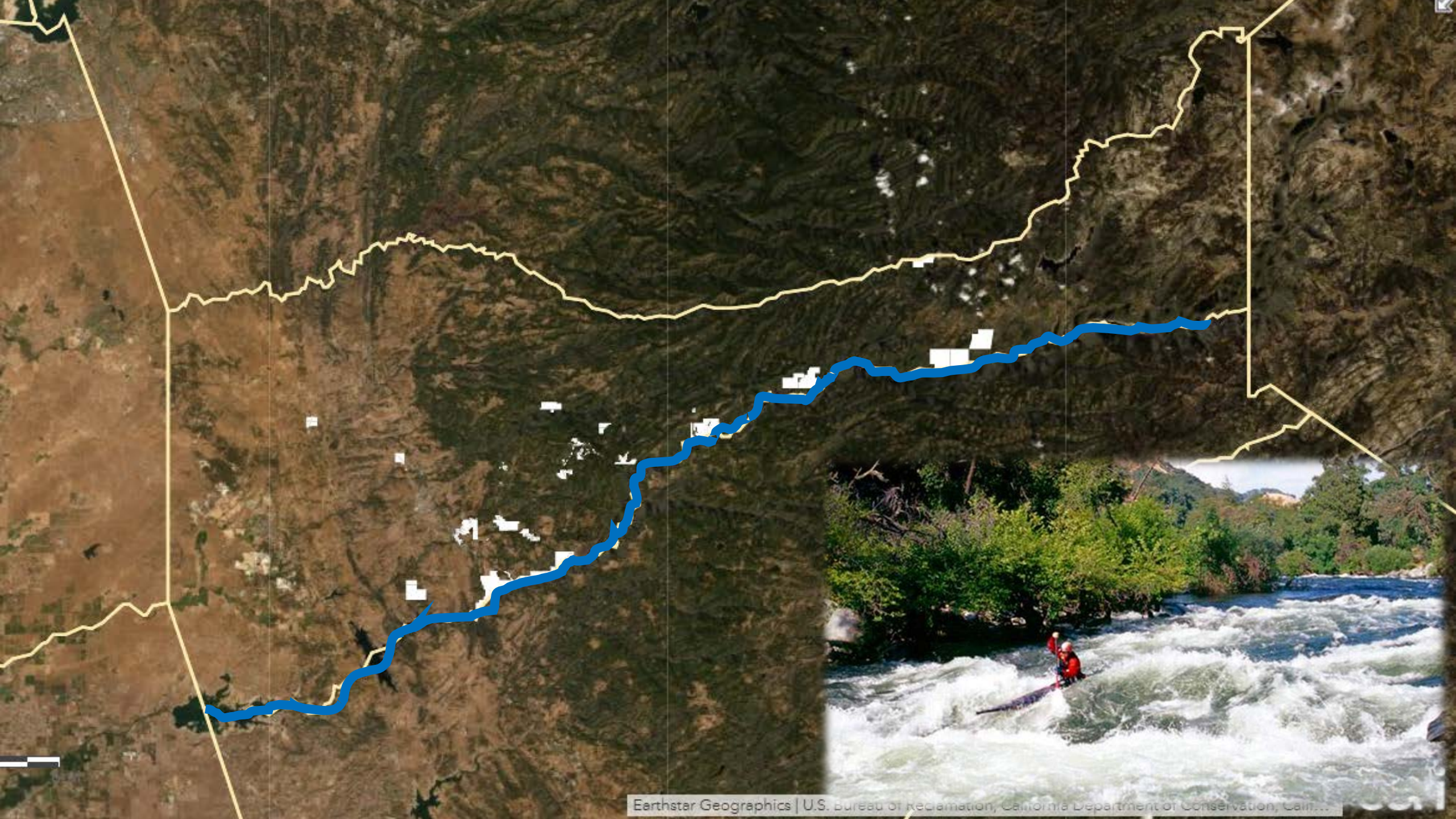
- Forms dense monotypic stands and outcompetes native plants
- Plants contain a toxic milky sap that can irritate skin and cause eye injury
- Can irritate skin and internal soft tissue of livestock when ingested

©CDFA



Large corneal epithelial lesion with stromal edema and mild anterior uveitis – two days after exposure to *E. neriifolia* sap




Earthstar Geographics | U.S. Bureau of Reclamation, California Department of Conservation, Esri,...

Concerns

- Proximity to water
- Sensitive habitats
- Desirable natives
- Public perception / acceptance
- Selectivity
- Accessibility

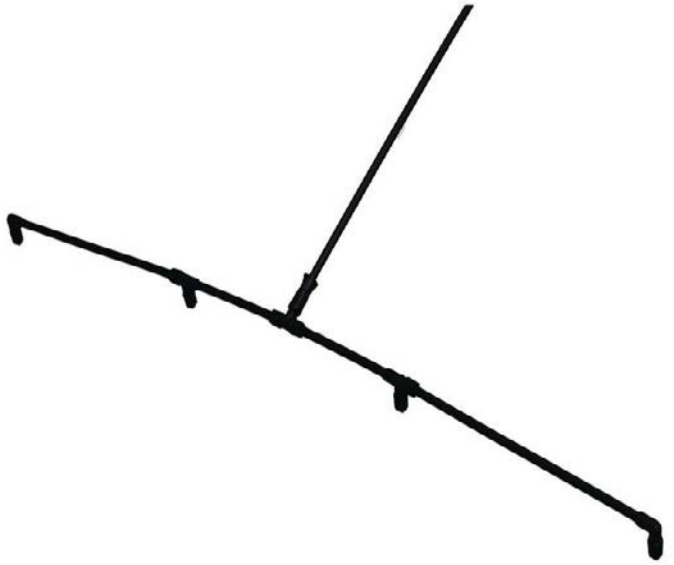
Can we selectively control oblong spurge in these sensitive habitats using herbicides?

Common Name	Trade Name	Rate (oz product/acre or % v/v)
glyphosate	Roundup Pro®	32
		64
		25% directed spray
imazapyr	Chopper®	32
		64
		25% directed spray
triclopyr ester	Garlon 4 Ultra®	64
		128
		25% directed spray
fluroxypyr ester	Vista XRT®	12
		23
aminopyralid / triclopyr	Capstone®	64
		128
		25% directed spray
chlorsulfuron / aminopyralid / triclopyr	Telar XP® / Capstone®	1 / 64
sulfometuron methyl / chlorsulfuron	Landmark®	2
		4
aminocyclopyrachlor / chlorsulfuron	Perspective®	4
		8

Test multiple herbicides, rates and application techniques

Broadcast
- Low conc./high vol.
- Application rates can range from 20 - 150 gallons spray solution / acre

Directed spray "drizzle"
- High conc./low vol.
- 2 gallons spray solution / acre



Low volume directed spray “drizzle”

Advantages of Drizzle

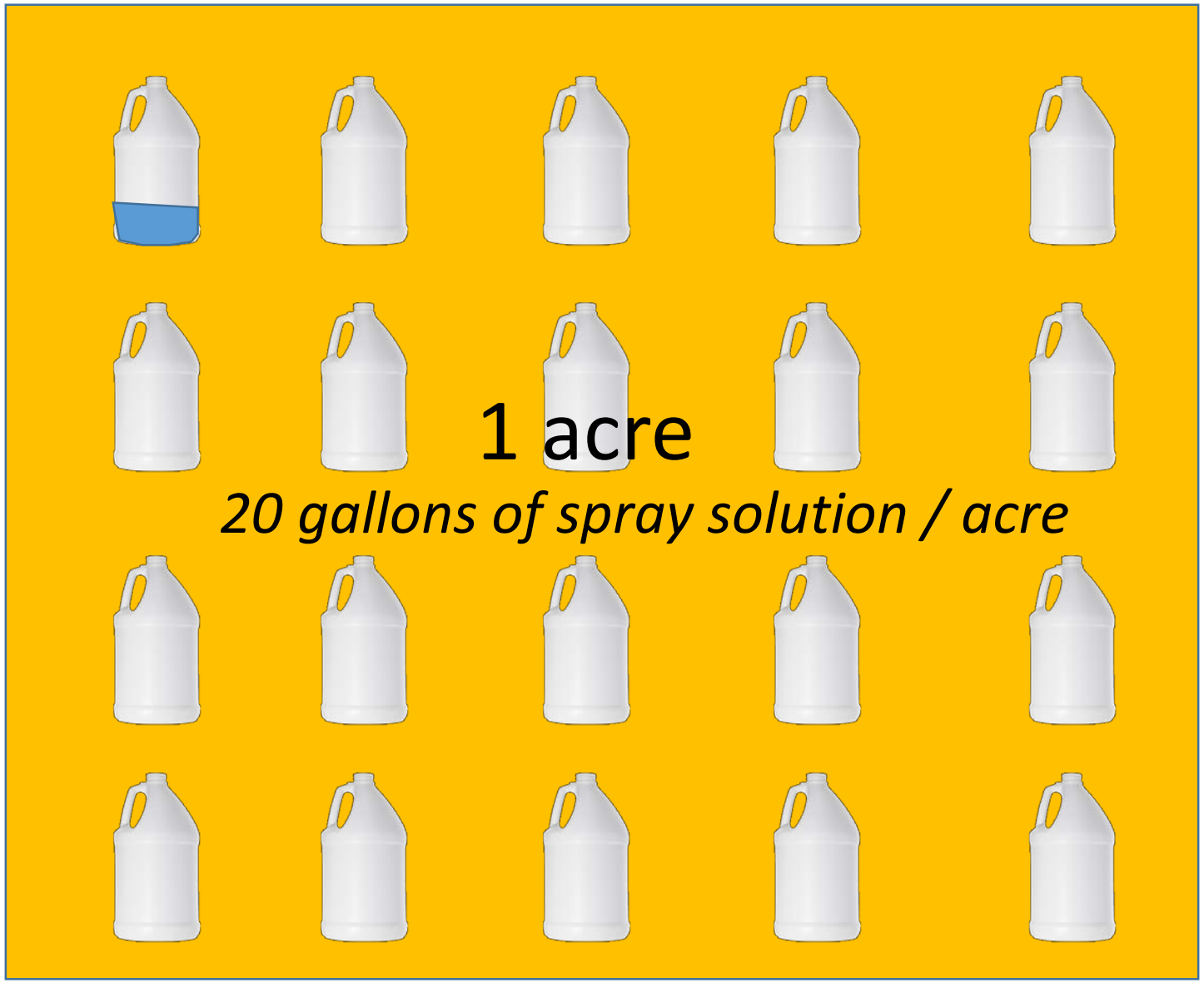
- Reduced weight
- Reduced time to treat
- Minimize drift
- Increased accuracy
- Increased versatility
- Increased safety

Applied at 2 gallons of spray solution per acre!

Broadcast Application

In this example:

- 1 qt herbicide applied at 20 gallons /acre



Foliar broadcast applications with a flat fan or adjustable nozzle can range from 20 – 150 gallons water / acre

Drizzle Application

In this example:

- 1 qt herbicide applied at 2 gallons /acre

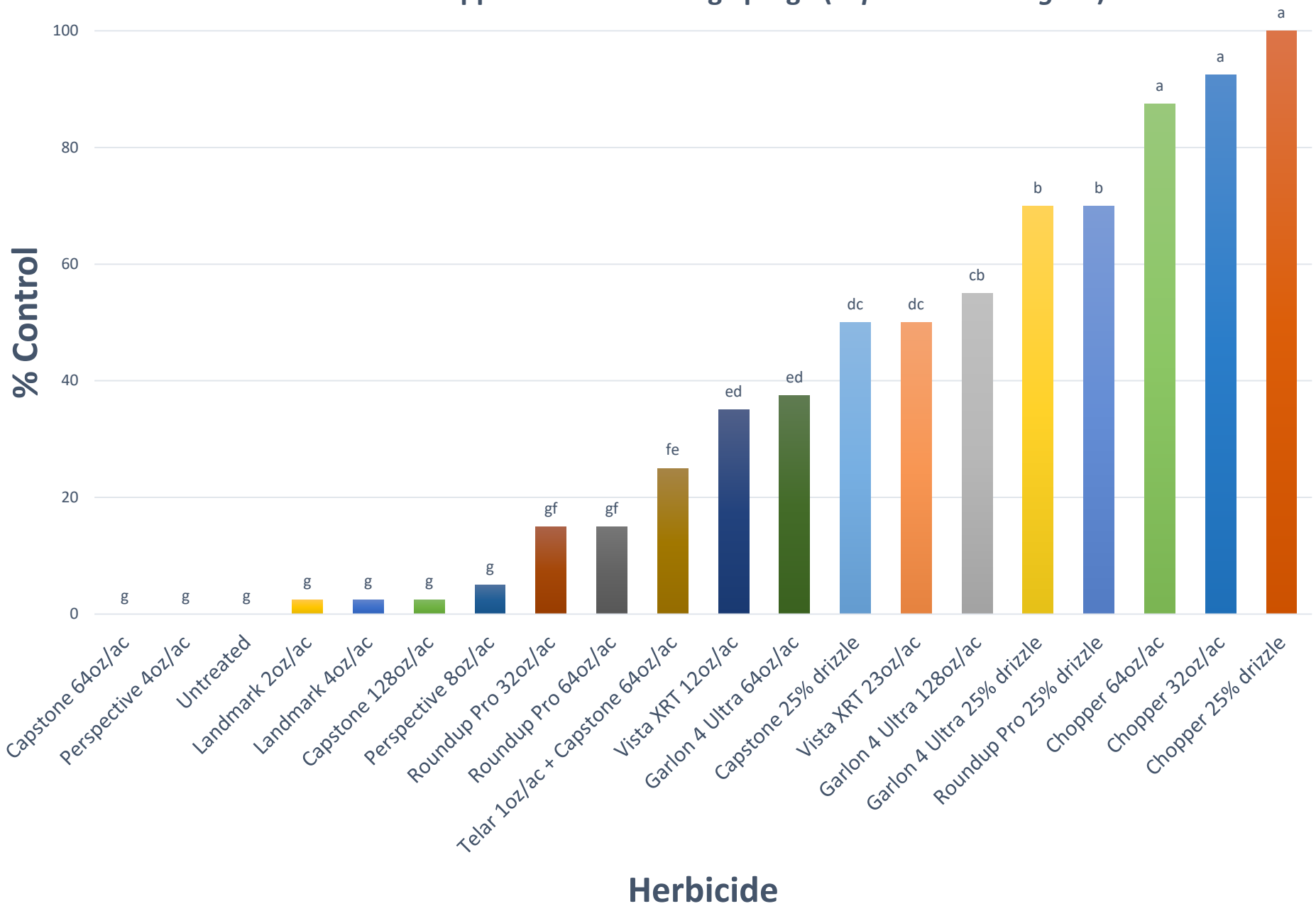
1 acre

2 gallons of spray solution / acre

=

3 drops / square foot

Foliar applications with a drizzle gun can be applied at much lower rates: 2 gallons water / acre


Effect of Herbicide Application on Oblong Spurge (*Euphorbia oblongata*)
% Control
100
80
60
40
20
0
g
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fe
ed
ed
dc
dc
cb
b
b
a
a
a
Capstone 64oz/ac
Perspective 4oz/ac
Untreated
Landmark 2oz/ac
Landmark 4oz/ac
Capstone 128oz/ac
Perspective 8oz/ac
Roundup Pro 32oz/ac
Roundup Pro 64oz/ac
Telar 1oz/ac + Capstone 64oz/ac
Vista XRT 12oz/ac
Garlon 4 Ultra 64oz/ac
Capstone 25% drizzle
Vista XRT 23oz/ac
Garlon 4 Ultra 128oz/ac
Garlon 4 Ultra 25% drizzle
Roundup Pro 25% drizzle
Chopper 64oz/ac
Chopper 32oz/ac
Chopper 25% drizzle
Herbicide

The Treatment

- Imazapyr 4SL
  - ALS Inhibitor
  - For the control of undesirable vegetation in forestry sites, aquatic sites, grass pasture, rangeland, fence rows, maintenance of wildlife openings, and industrial noncropland areas including railroad, utility, irrigation and non-irrigation ditchbanks, roads, transmission lines, and industrial bare ground areas.
  - Provides post and preemergence control
  - Caution
  - 24 oz/ac (3/4 qt.ac)
- Hasten EA
  - Modified vegetable oil concentrate, NPE free and designed for use in both terrestrial and aquatic applications.
  - Caution
  - 50 oz/ac (1.5 qt.ac)
- Applied at 2 gpa

Public Outreach

This plant has been spotted in your neighborhood and we need your help slowing the spread.

If you have this plant on your property contact the Amador County Department of Agriculture at:

209-223-6487

agriculture@amadorgov.org

IMPACTS

- Brought to the U.S. as an ornamental in the early 1900's. The plant has escaped cultivation and is spreading into native habitats.
- Toxic to animals.
- Plants exude white sap that can be caustic to skin and cause severe eye injury.
- Plants are spreading along riparian areas including the Wild & Scenic Mokelumne River and along Jackson Creek.
- More recently the plant is starting to become more widespread into dryer sites including annual rangelands, roadsides and the area within the Butte fire.

Easy to identify when flowering (May-August)

- To combat the spread the Amador County Department of Agriculture and University of California Cooperative Extension have received a state grant to help slow the spread of oblong spurge.
- If you have oblong spurge on your property call us immediately so that we can get permission to treat this invasive weed and slow its spread in the county. Treatments will take place between May - September 2020.
- Please return the enclosed permission form ASAP. Work cannot be done without permission. Forms can be returned by mail or email: Amador County Dept of Agriculture, 12200B Airport Rd., Jackson CA 95642 agriculture@amadorgov.org
- This project will be at no cost to landowners but we can't stop it unless you contact us. ***Call Today!***
- ***For more information: https://storymaps.arcgis.com/stories/1a1604aeae1e4c9891f8d040710e1bb4***

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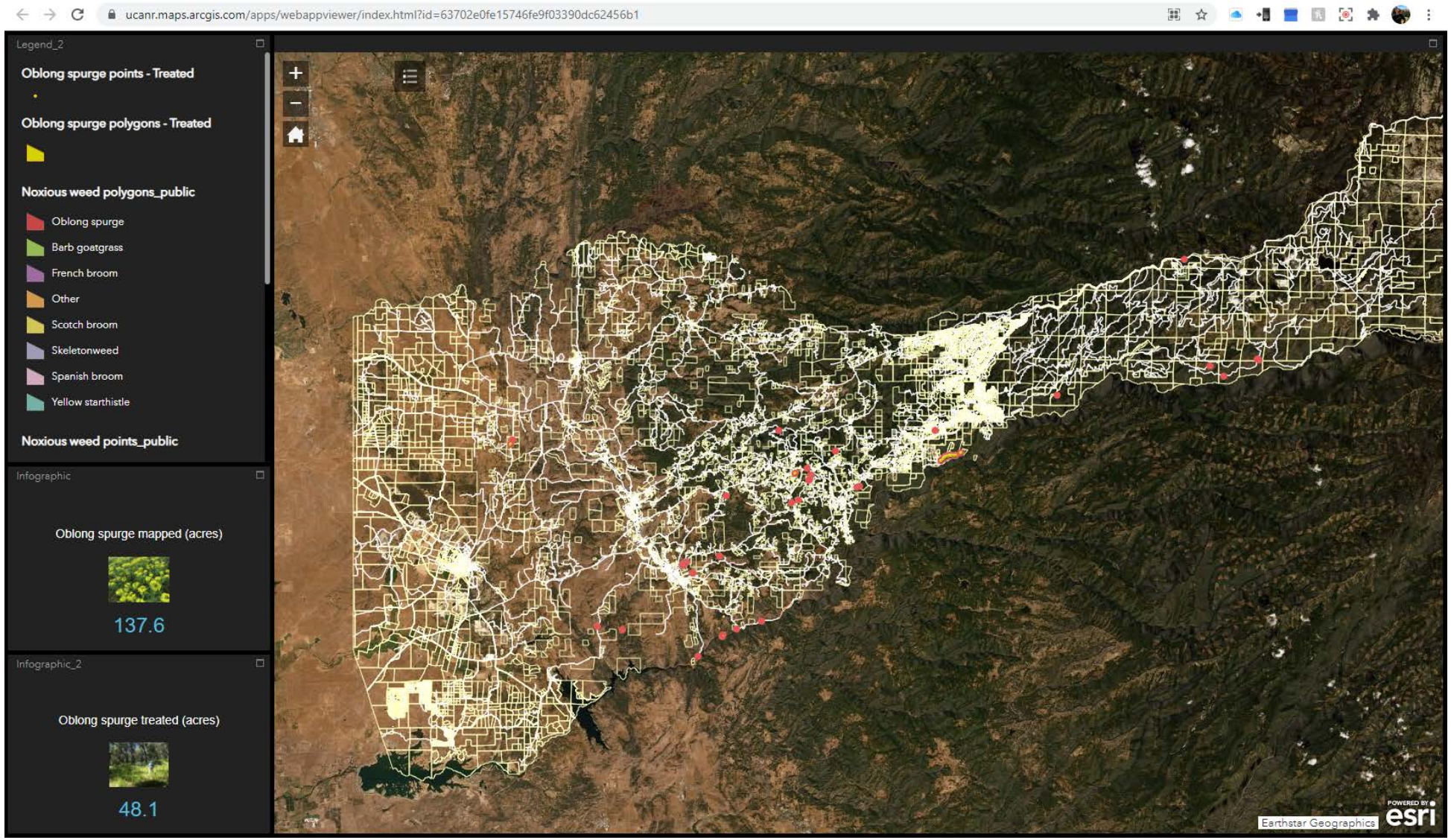
Measuring Success