

# Perennial Pepperweed

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## Integrated Pest Management

- Information
  - System
  - Pest
  - Multiple Management Strategies

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## Outline

- Impacts
- Biology
- Control

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## Legal Status

- B list noxious weed California
- Cal IPC - aggressive invader

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## Impacts

- Displaces native species
  - Plants
  - Animals
- Decreased Wildlife Habitat
- Not desirable forage
  - Young growth more palatable
  - Lower protein content
- Weed Free Hay



## Impacts

- Riparian areas
- Erosion along waterways
- Can alters biophysical soil processes



Photo courtesy of: UC Davis

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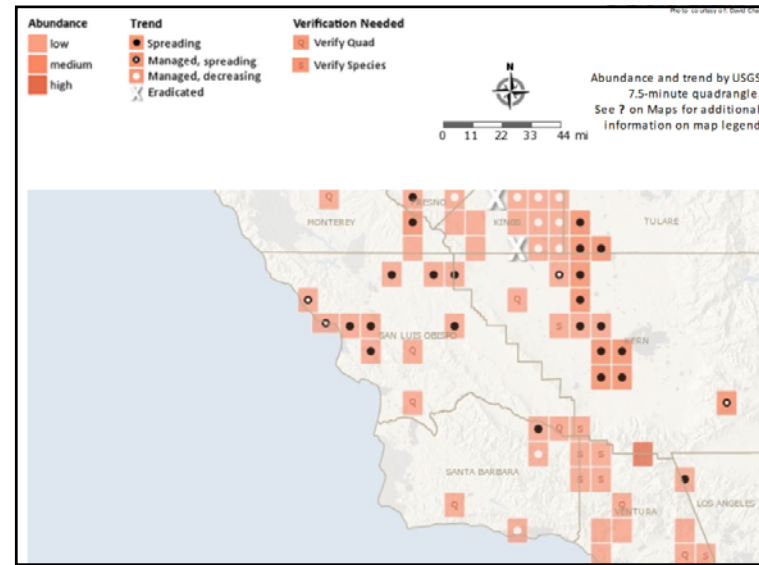
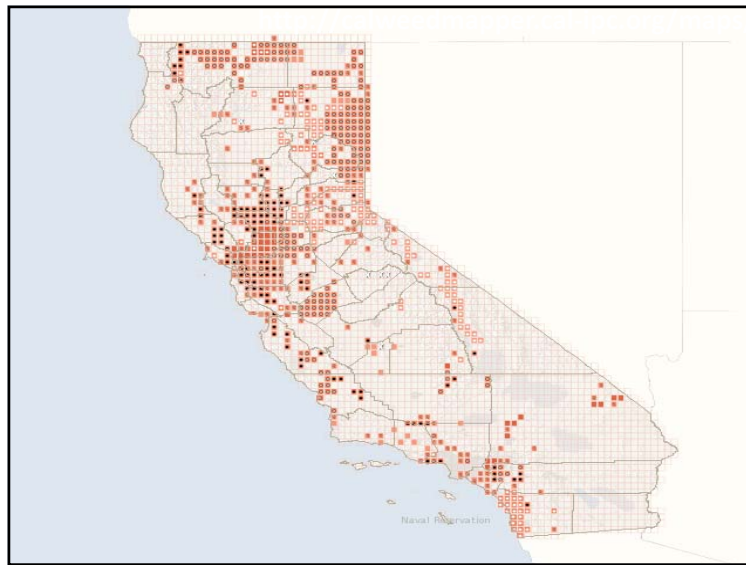
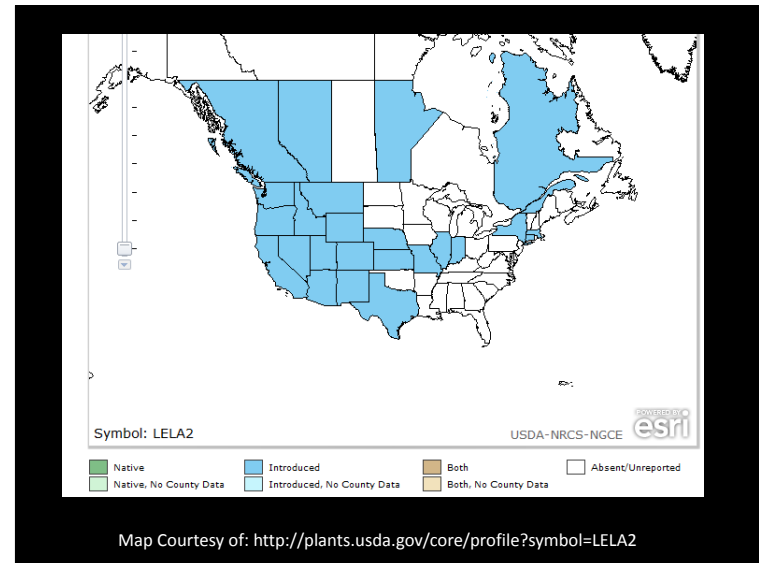
# Distribution

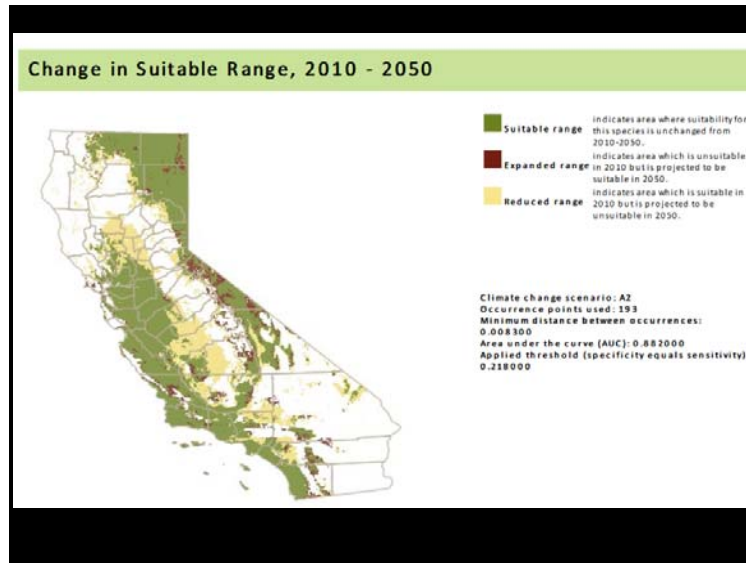
- Native to Eurasia
  - Europe to Himalayas
- North America sugar beet seed containment 1900ish
- 820,000 acres in West US 2005



Photo Courtesy of: [geneticliteracyproject.org](http://geneticliteracyproject.org)

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## Very diverse ecotypes

- Coastal marshes, tidal shores, wetlands
- Riparian areas
- Grasslands
- Native meadows
- Hayfields
- Dryland pastures
- Salty soils/poor soils
- Around sagebrush
- California- sea level to 8200 feet
- In Himalayas - up to 14,600 feet!!!
- 50 SRM range types!!

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## Lepidium Latifolium

- Brassicaceae (mustard family)
- Five other introduced Lepidiums
- 15 native Lepidium species
  - Much smaller stature
- Edible



Photo Courtesy of: Health.com

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## Biology

- Basal Rosettes
  - Fall/Spring
- Plants "bolt"
  - April-June
- 3-8 ft. tall
- Leaf Area maximized at the Bud Stage
- Dry down after flowering
- Thatch up to 4 cm thick (Renz)





## Roots

- Coarse roots
- Tap roots up to 9 feet deep!
- Penetrate restrictive layers
- Young et. al.
  - 19% roots-top 4 inches soil
  - 85% roots-top 24 inches soil



## Reproduction

- Flowers
  - May through August
  - Flower arrangements
- Insect pollinated
- 6.5 billion seed/acre at 18 stems per foot<sup>2</sup>
- At least 2 year soil seed life



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## Dispersal

- Water
  - Root chunks float
  - Seeds sink
  - Mucilage forms...
  - Seeds float!!!
- Wind
- Animals
- Humans
- Seeds drop all winter long...



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## Carpinelli et. al. 2005



Ruminant digestion germination experiment

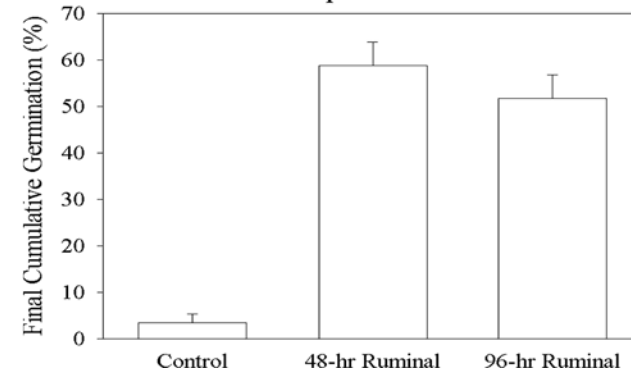
Photo Courtesy of Stephanie Stockley at [www.the-standard.org](http://www.the-standard.org)

## Carpinelli et. al. 2005

- Two experiments
- Incubation in cannulated cow
  - Seed in mesh bags
  - 48 and 96 hours
- Incubation in water and Ruminant digestion
  - Inserted and passed in mesh bags

## Tall Whitetop Germination

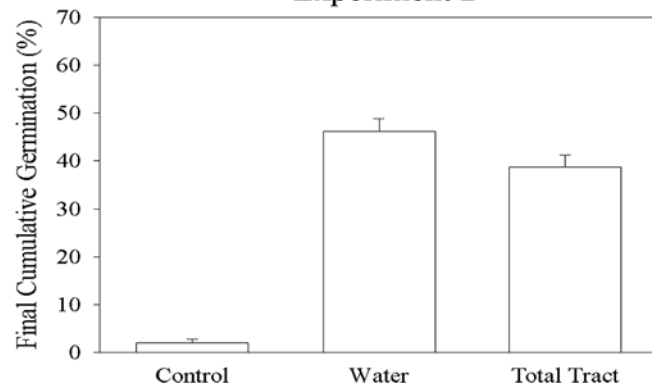
### Experiment 1



Carpinelli et. al. 2005

## Tall Whitetop Germination

### Experiment 2



Carpinelli et. al. 2005

## Root Spread

- Renz: 3-6 feet per year
- Young et. al.
- Area 131 feet\*131 feet
  - 1993 to 2000
    - 20 Stems to 100 stems/yard



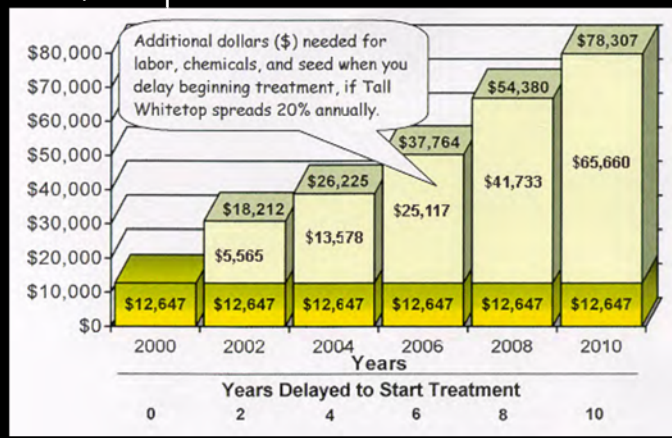
## Control

- Single plant!
- Before root establishment
- Annual species

## Economics

- Is it worth it to control?

## Eiseworth et. al. 2008 20% Expansion rate



## How to Control

- Mechanical
- Biological
- Chemical
- Need to control root!
- Need to prevent seed!
- Need to establish competitive vegetation!

## Mechanical

- Disking
  - Roots resistant to drying
  - Renz spread 3 X faster with disking
  - Continual disking has potential
  - Terrain/Water limiting
- Mowing
  - Reduce stored sugars
  - Multiple times a year
  - Mow at bud stage
  - Reduce litter
    - Allow grazing
    - Allow herbicide

## Biocontrol

- Species being investigated
  - Testing for efficacy
  - Testing for no target hosts
    - Native Lepidium
    - Related crops
  - Gall-forming weevil *Ceutorhynchus marginellus*
    - Other species support adult development
  - Stem-mining flea beetle *Phyllotreta reitteri*
    - Testing

## Williams et. al. 2014

- Native Attackers!
- Weevils
- Flea beetles
- Leafhoppers
- White Rust (Albugo)
  - Wet years reduce seed production

## Targeted Grazing Handbook (Idaho)

- Sheep and goats
- Graze off 85% growth
  - Every 3-4 weeks
- Multiple years to eliminate
- Combine with herbicide



## Young et. al. 1998

- Disking and herbicides study
- Disking
  - Lead to initial control
  - One year after no difference
- 2,4-D (ester) June application
  - Next April 2% cover
  - Next October 85% cover
- Glyphosate June application
  - October that year 45% cover
  - April following year 85% cover
- Chlorsulfuron June application
  - 5% cover 2 years after
- Disking + 2,4-D didn't increase control

## Renz and DiTomaso 2006

- Three locations
  - Susanville
  - Roadside
  - Floodplain
- Herbicides- Bud Stage
  - Telar
  - Roundup
  - 2,4-D
- Mowing + herbicides sickle bar mower 1-2 inches

## Renz and DiTomaso 2006

- Biomass reduction 1 year after treatment
- Herbicide alone
  - Chlorsulfuron (Telar)
    - 74-99%
  - Roundup (inconsistent)
    - Increase 20% one site
    - 32%
    - 84%
  - 2,4-D (inconsistent)
    - 13 to 74%

## Renz and DiTomaso 2006

- Biomass reduction 1 year after treatment
- Herbicides + Mowing
  - Mowing alone
    - 2-28%
  - Mowing before Telar
    - 99%-100%
  - Mowing before Roundup
    - 98% and 81% - at two low elevation sites
    - 87% reduction high elevation
  - Mowing before 2,4-D
    - 9% and 62% reduction low elevation
    - 92% reduction high elevation

## Tarping: Hutchinson and Viers 2011

- South of Sacramento
- Study two locations
- Treatments
  - Control
  - Mowing
  - Mowing + tarping
  - Mowing + tilling + tarping
  - Mowing + Glyphosate (Roundup)
  - Mowing + Chlorsulfuron (Telar)

## Hutchinson and Viers 2011

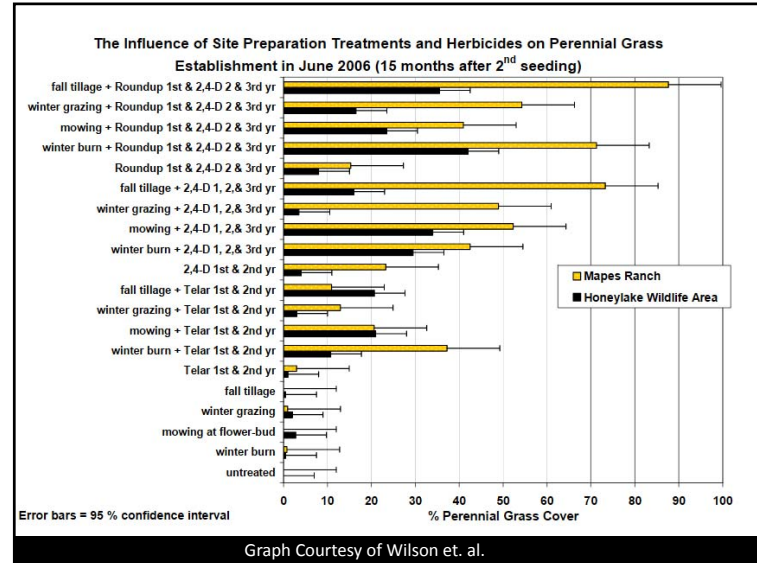
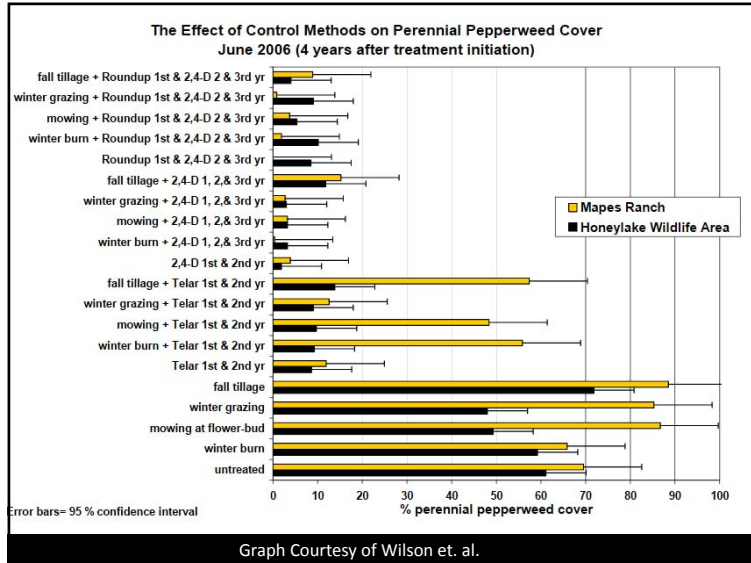
- 2 years after treatment change in stem density
  - Control - 15% increase
  - Mow - 70% reduction
  - Mow + tarp - 12%
  - Mow + till + tarp - 94%
  - Mow + glyphosate - 99.5%
  - Mow + chlorsulfuron - 100%

## Hutchinson and Viers 2011

- Mow + till + tarp - did reduce stems
- Authors say
  - More labor intensive
  - More costly
  - More rehabilitation
  - Less favorable than herbicides on natives
- But no herbicide!

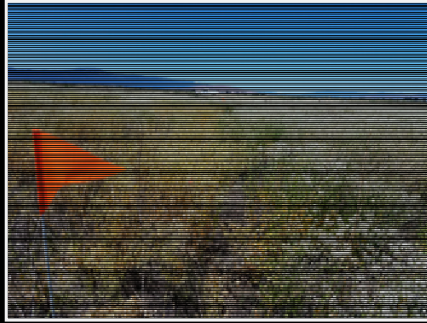
## Wilson et. al. 2008

- Two sites by Susanville
- 50-70% live cover Tall Whitetop
- 4 year study
- Physical treatments
  - Burning
  - Grazing
  - Disking
  - Mowing
- In combination Herbicide Treatments
  - 2,4-D
  - Telar
  - Roundup
- Seeding



## Drizzle Method

- Reduce Carrier Volume
- 2/5 gallons per acre
- Potential for backcountry backpack applications
- Results to come



## Conclusions

- Invasive
  - Economic and ecological impacts
- Perennial
  - Hard to control
  - Need to focus on seeds and roots
- Control
  - Use combination of physical and chemical methods
  - Telar - effective established grasses
  - 2,4-D-Glyphosate - areas needed to be planted

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## Questions?

