

The End at the Beginning

- E. terracina is capable of:
 - Invading cool, wet areas
 - Invading hot, dry areas
 - Forming monocultures
 - Has toxic sap
- E. terracina populations are currently EXPLODING in southern California
- Seed is moving towards you very rapidly

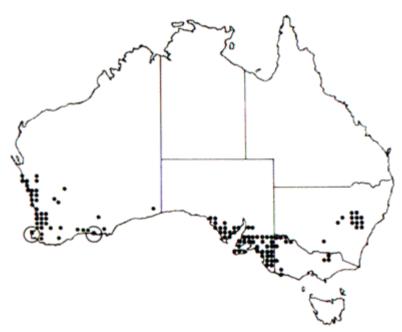
E. Terracina Outline

- What we know from Australia
- What happened in southern California
- Research we have done in So. Cal.
- The Future



E. Terracina in Australia

- Capable of invading healthy bushland
- Invaded mostly coastal areas
- Infestations include both high density and scattered populations
- Spreads only by seed
- Seedbank lasts 3-5 years



Map from Parsons and Cuthbertson 1992

Control Info. From Australia

- Hand removal
- Plants three weeks of age and older will resprout from root crown
- Cutting plants after seeding will kill them
- Triclopyr, Chlorsulfuron, metsulfuron methyl + MCPA, and glyphosate will all kill plants

E. Terracina in the United States

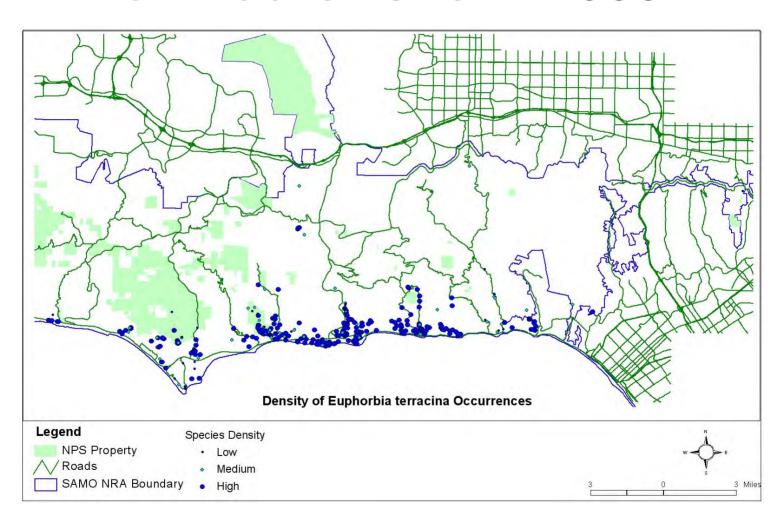
- Southern California and Pennsylvania
- First reported in California in Madrono 1997 (Solstice since at least 1987)
- Invades large and small scale disturbance



E. Terracina Distribution in S. California

- Populations appear to be exploding
- Populations now found at:
 - Inland sites in Los Angeles
 - Coastal sites south of Los Angeles (Ballonas wetlands)
 - Ventura County
- Colonizes wide range of habitats including:
 - Coastal sage scrub
 - Grasslands
 - Chaparral edges

Density of *Euphorbia* Occurrences on Public Land in 2003



Euphorbia in Solstice Canyon







Pattern of Distribution and Colonization

- Initially colonized disturbed coastal sites in early to mid-1980's
- Populations at Solstice Canyon increased in area and density after fire
- Localized movement into fuel mod. zones in Malibu in mid to late 1990s
- Large scale movement throughout the region 2005-2006

Patterns of Movement

- Between sites = along roadways
- Within sites = up hill, down hill, along streams
- Colonizes both small and large-scale disturbances
- Moving inland from coast via all cross mountain roads
- Satellite populations show it survives in hot, dry interior conditions

LAG TIME!!!

- E. terracina moved slowly from 1980's to early 2000's
- Current rapid movement most likely due to:
 - Many large populations
 - Massive seed production
 - Movement of construction equipment
 - Movement of soil
 - NPS has unintentionally moved seeds via:
 - Rocks
 - Power equipment

So. Cal. Research

- We have studied:
 - Effectiveness of glyphosate
 - Effectiveness of manual removal
 - Effectiveness of mulch
 - Effectiveness of native plant competition
 - Response to fire
 - Ecophysiology

Glyphosate

- Sprayed monotypic stands of E. terracina
- 100% mortality of sprayed plants in year 1
- Cleared areas had 86.5 +/- 12.2 % cover *E. terracina* seedlings one month after clearing
- Spray only areas *E. terracina* free for 2 years
- Spray only areas 100% cover *E. terracina* in year 3

Manual Removal





Manual Removal

- Brush cutting of mature stands (woody, several years old) after seed set killed adult plants
- Massive germination out of the seed bank in cleared areas
- Cutting or hand pulling of younger plants (less than one year old) prior to seed set = bushy plants

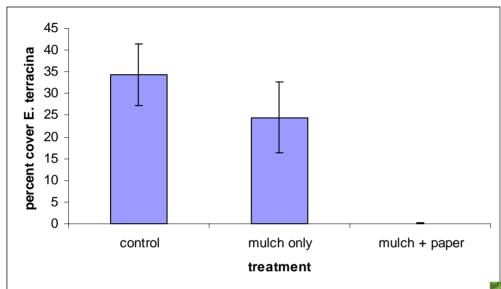
Mulch

- Goal: to reduce seed germination in restoration areas
- Tried sterile organic mulch, control, newspaper + mulch
- Mulched 3-5 inches deep





Results (6 months)



Differences among groups are significant, p=0.002



Results

- Mulch was effective at reducing E. terracina seedlings over short-term
- Mulch was also effective at suppressing black mustard and annual grasses
- Cover of cheeseweed was highest in mulch + paper plots
- Two years after study, can't find plots in all the weeds – EUPHORBIA CAME BACK

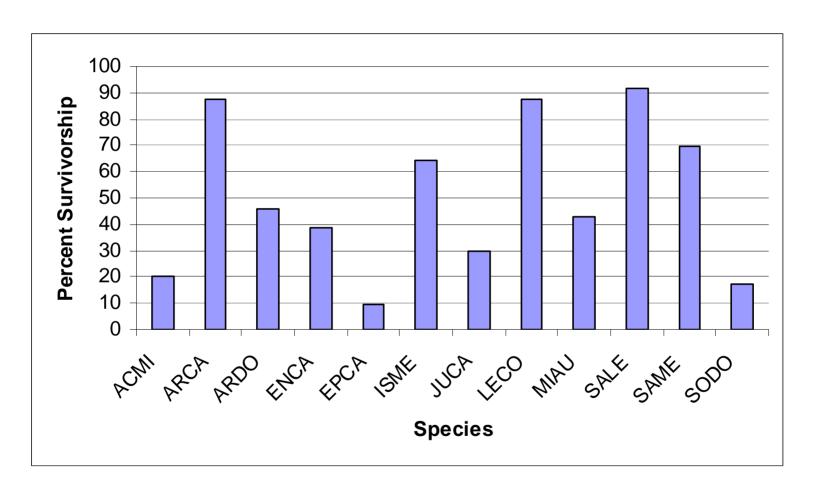
Native Plant Competition

- Started restoration plantings in Euphorbia areas at Solstice in 2003
- Used fast-growing coastal sage scrub species
- Plants installed by high school students, partners, and park staff

Planting



Native Survivorship Was High



Restoration Plantings Now

- Oldest plots are keeping out *E. terracina* and other weeds
- Takes 3 years to get canopy closure and weed suppression
- Until then, a lot of hand weeding!!
- Oldest plots were mistaken for native





Response to Fire

- Corral Fire in October of 2004
- Stand was mixed coastal sage scrub, native grass with scattered E. terracina
- After fire:
 - Massive germination from seed bank
 - Some resprouting from base
- Stand is now dominated by E. terracina

E. Terracina and Fire







EcoPhysiology

- Work done by Erin Riordan and Phil Rundel at UCLA
- Found that E. terracina does well in both shaded and high light environments
- E. terracina showed the ability to adapt morphologically to high and low light environments

Impacts of Research on Current Management of *E. terracina*

- All invaded areas are re-planted (failure of herbicide alone)
- All treated areas are not disturbed until ready to plant
- Using a combination of herbicide and manual treatment to remove E. terracina
- Experimenting with solarization as a postclearing, pre-restoration treatment

Conclusions

- Watch out for this plant
- E. terracina no where near carrying capacity in CA.
- Look for this plant in a construction site, fuel modification zone, riparian area near you
- Please take a flyer
- If you see it, kill it immediately