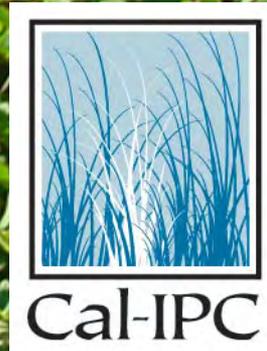




Follow the Weeds: Assessing the Risk of Future Spread

Elizabeth Brusati¹, Doug Johnson¹,
and Joseph DiTomaso²

¹Cal-IPC, ²UC Davis



What is risk assessment?

Predicting which plants will become problems and where they could spread.

- Which plants already present in California could be the next invaders?
- What species could cause problems if imported?
- Complicated in California due to our diverse geography

Risk assessment and WMAs



- WMA members have a wealth of information on local weeds.
- However, formal survey data rare.
- Which species should WMAs worry about?
- Where should scarce funding be focused?

Why this project?

- Controlling invasive plants early in invasion reduces cost.
- No statewide data for most species
 - CDFWA focuses on A-rated weeds
- Cal-IPC Inventory rates 200+ invasive plants in California but spatial data is rough.

Weed Risk Assessment for California

1. Where are weeds now?
Survey data from WMAs
2. Where could they spread?
Climate modeling
3. Which areas are most vulnerable?
Compare surveys to models
4. What else could invade?
Weeds from other Mediterranean ecosystems

Counties & Jepson Regions



The Jepson Manual
HIGHER PLANTS OF
CALIFORNIA

EDITED BY JAMES S. GILG



1. Where are weeds now?

Current Abundance



Low



Moderate



High



Widespread



No Data

Current Spread



Increasing rapidly

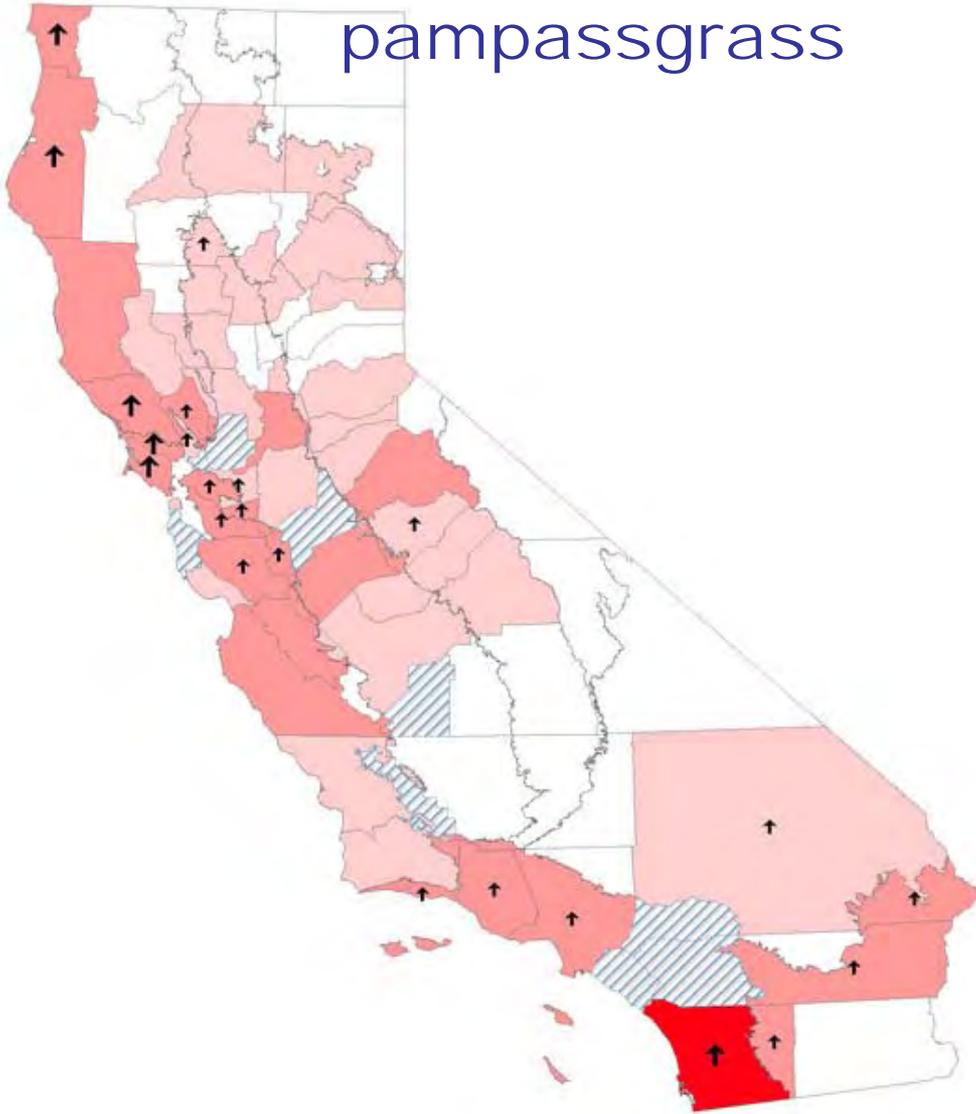


Increasing

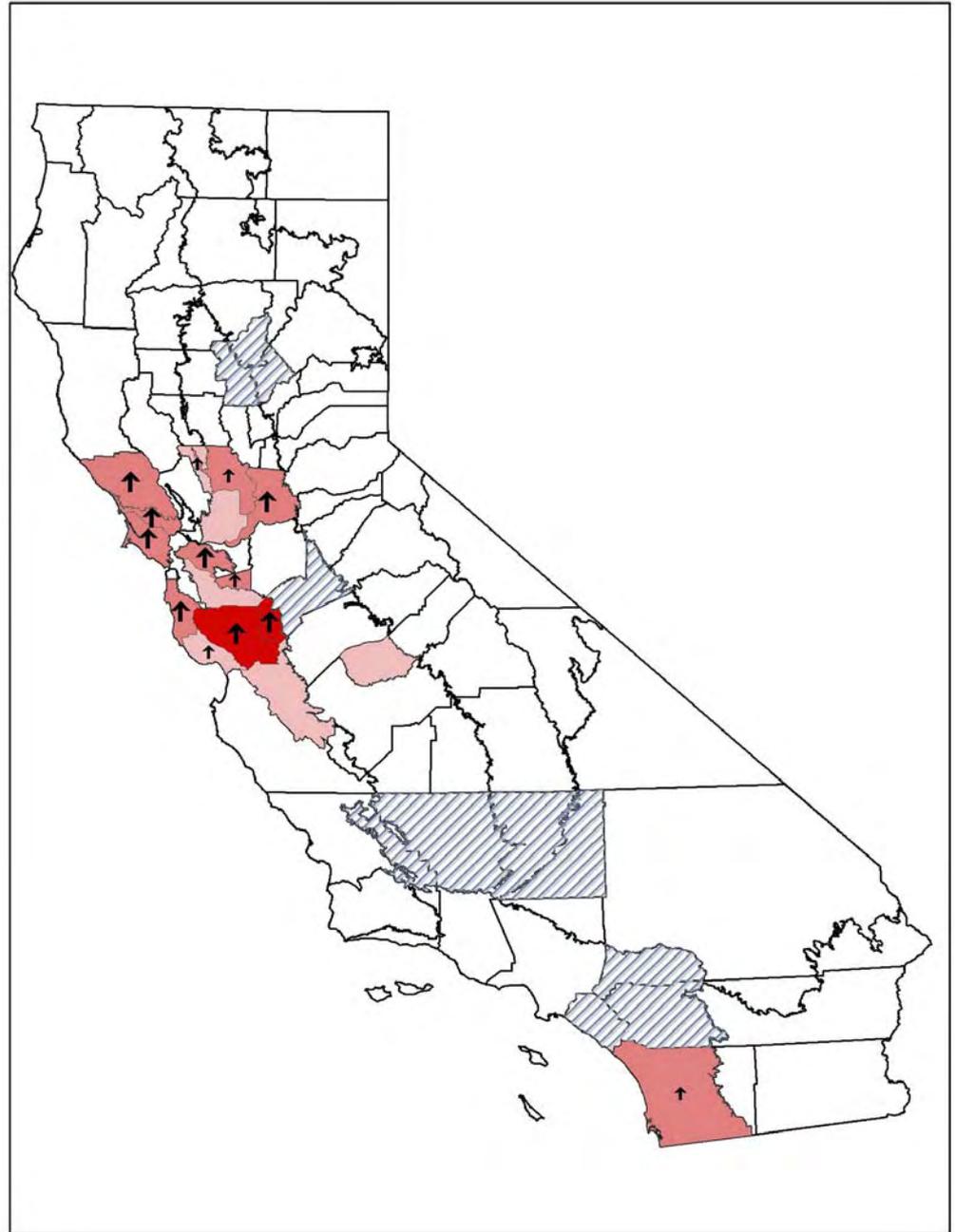


Declining

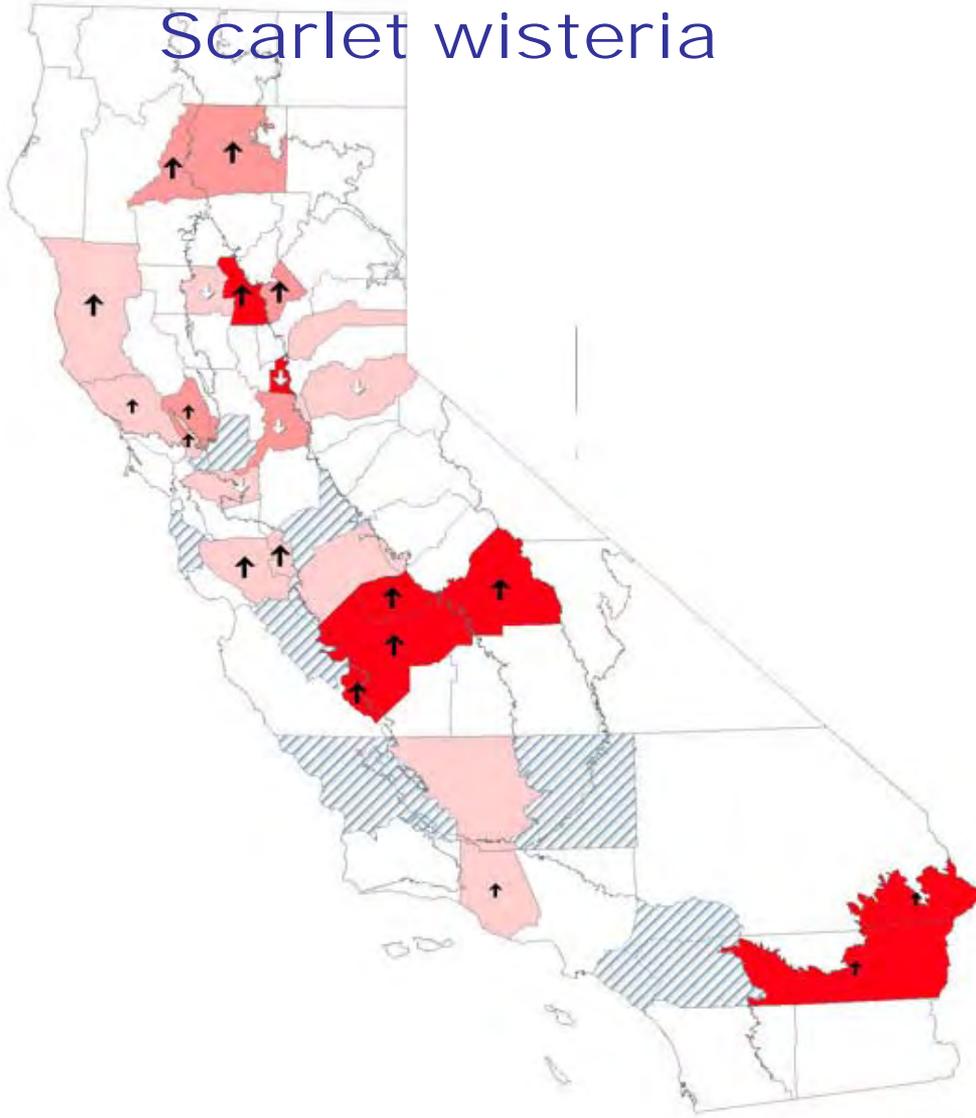
Cortaderia selloana
pampassgrass



Dittrichia graveolens
stinkwort



Sesbania punicea
Scarlet wisteria



2. Where can weeds spread?

Climate is most basic determinant of where a plant can grow

Climate models predict where plants can spread based on where they already grow

- Compare native and introduced ranges
- Calculate temp. and moisture tolerance

Climate models for California

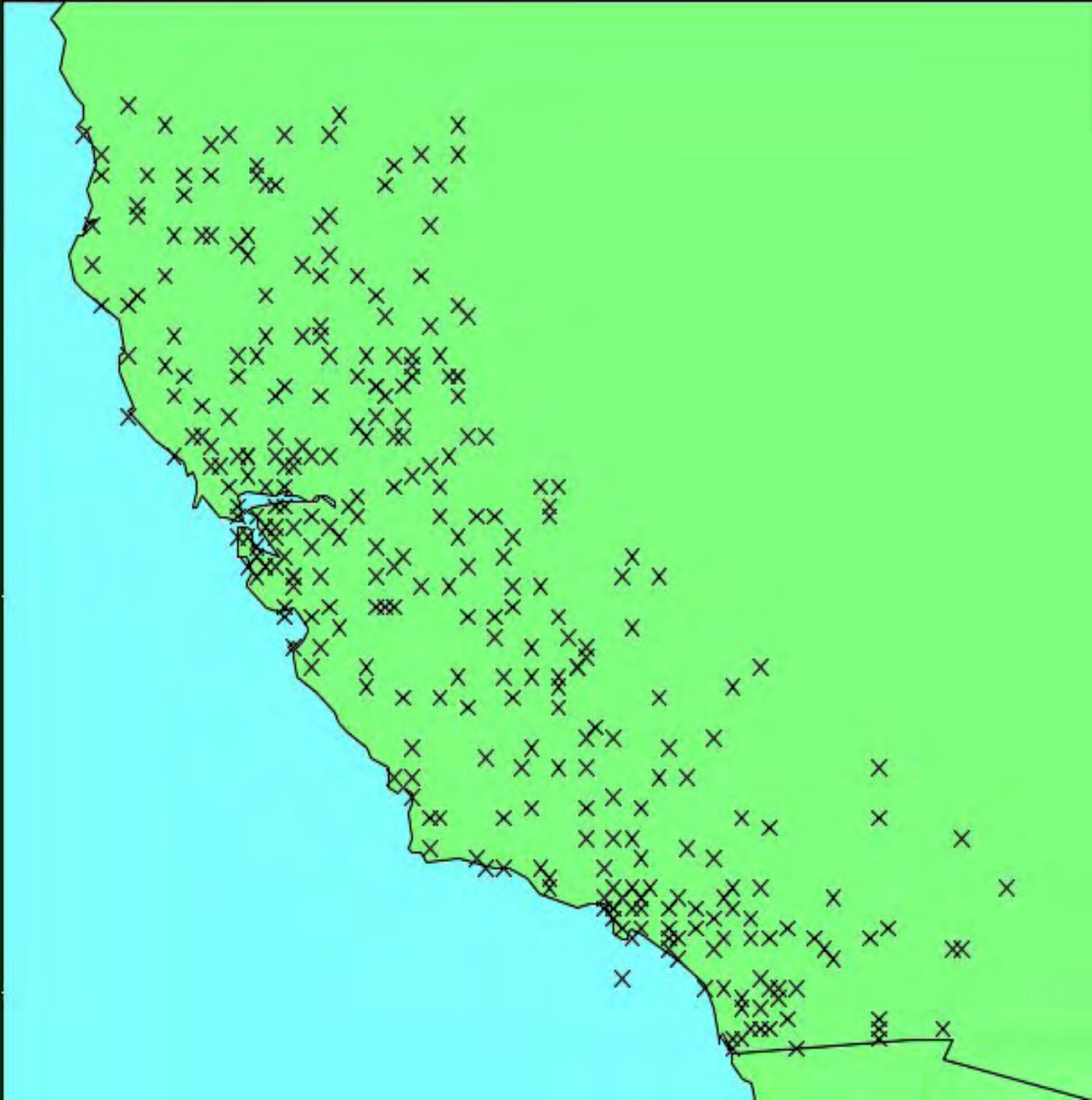
- *Sapium sebiferum*: Pattison and Mack 2008, Bower et al. in prep
- *Arbutilon theophrasti*: Holt and Boose 2000
- *Delairea odorata*: Robison 2007
- *Ulex europaea*: Steinmaus 2002, Hall 2007

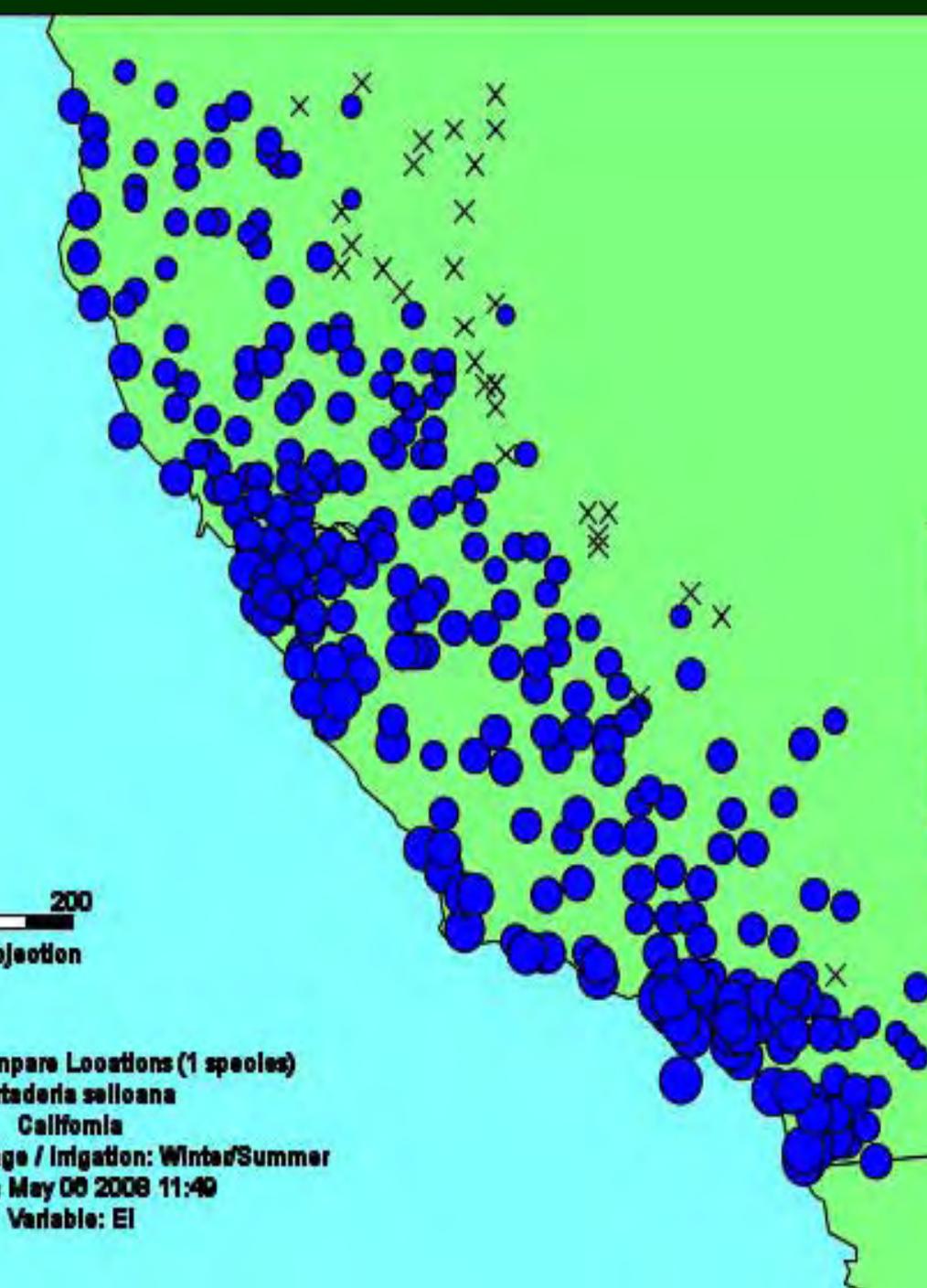
Our climate modeling

- 36 plants from Cal-IPC Inventory
 - **Researched native and intro ranges**
- California weather station data added into CLIMEX software
 - **“Ecoclimatic index” 0 - 100**

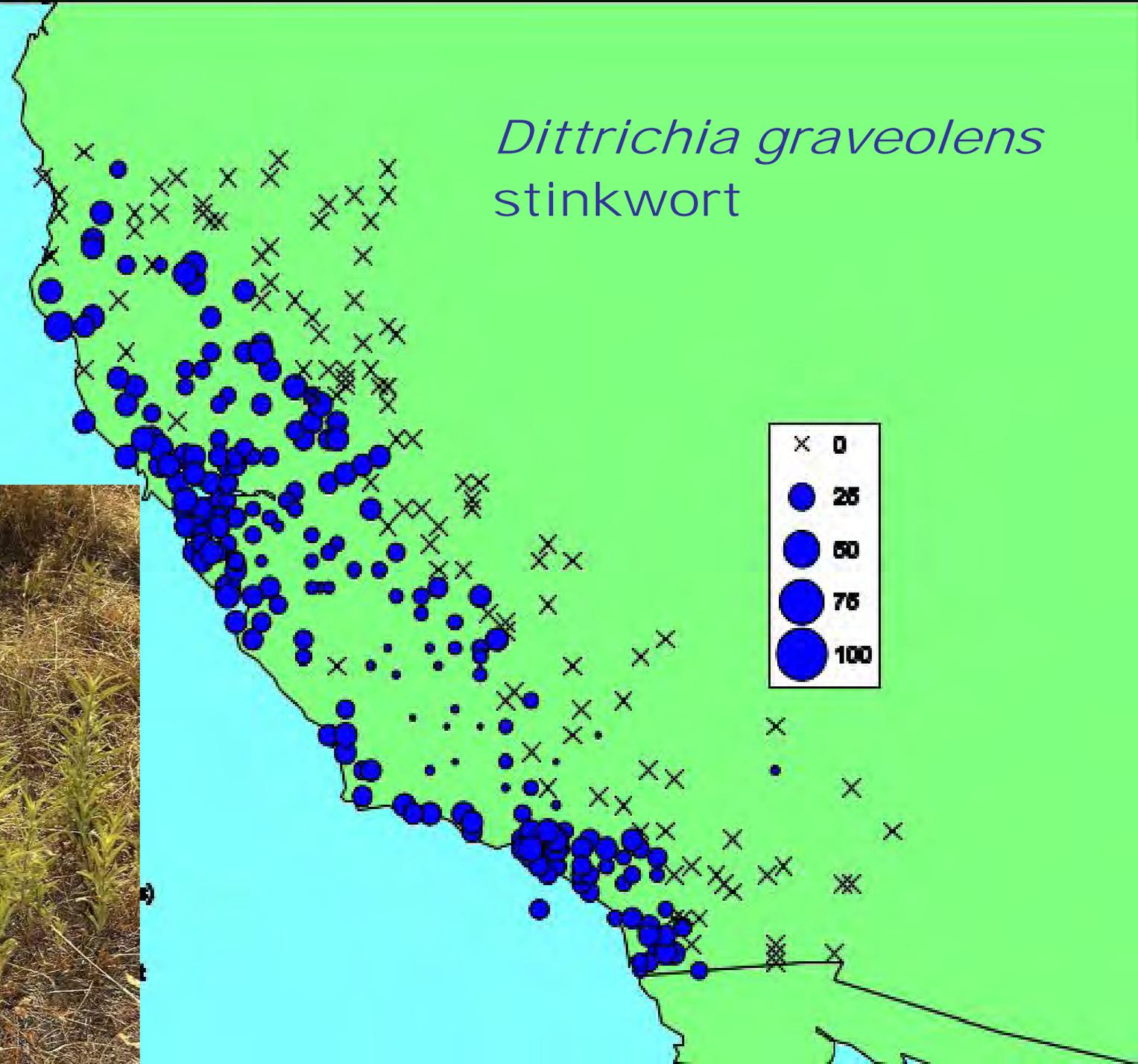


322
NOAA
weather
stations

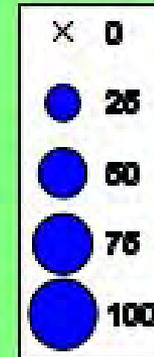




Dittrichia graveolens
stinkwort

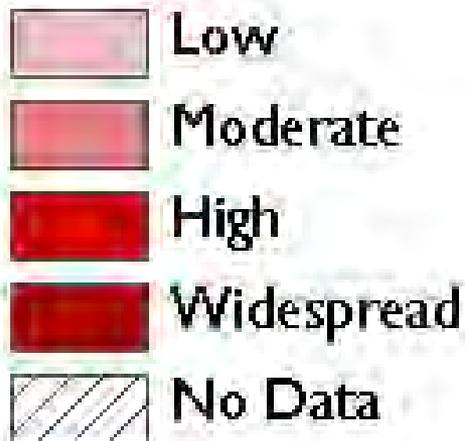


Sesbania punicea
Scarlet wisteria

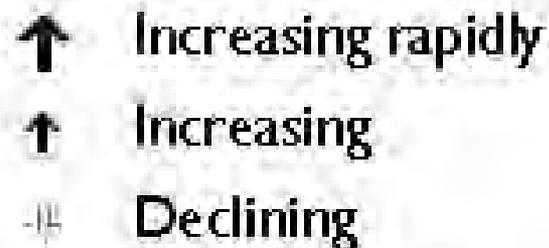


3. Which areas are most vulnerable?

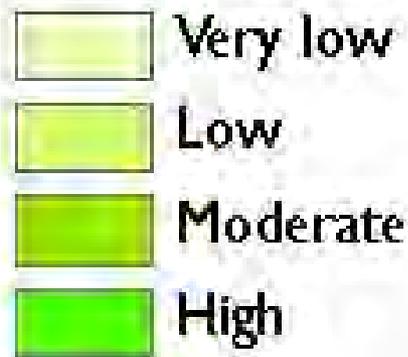
Current Abundance



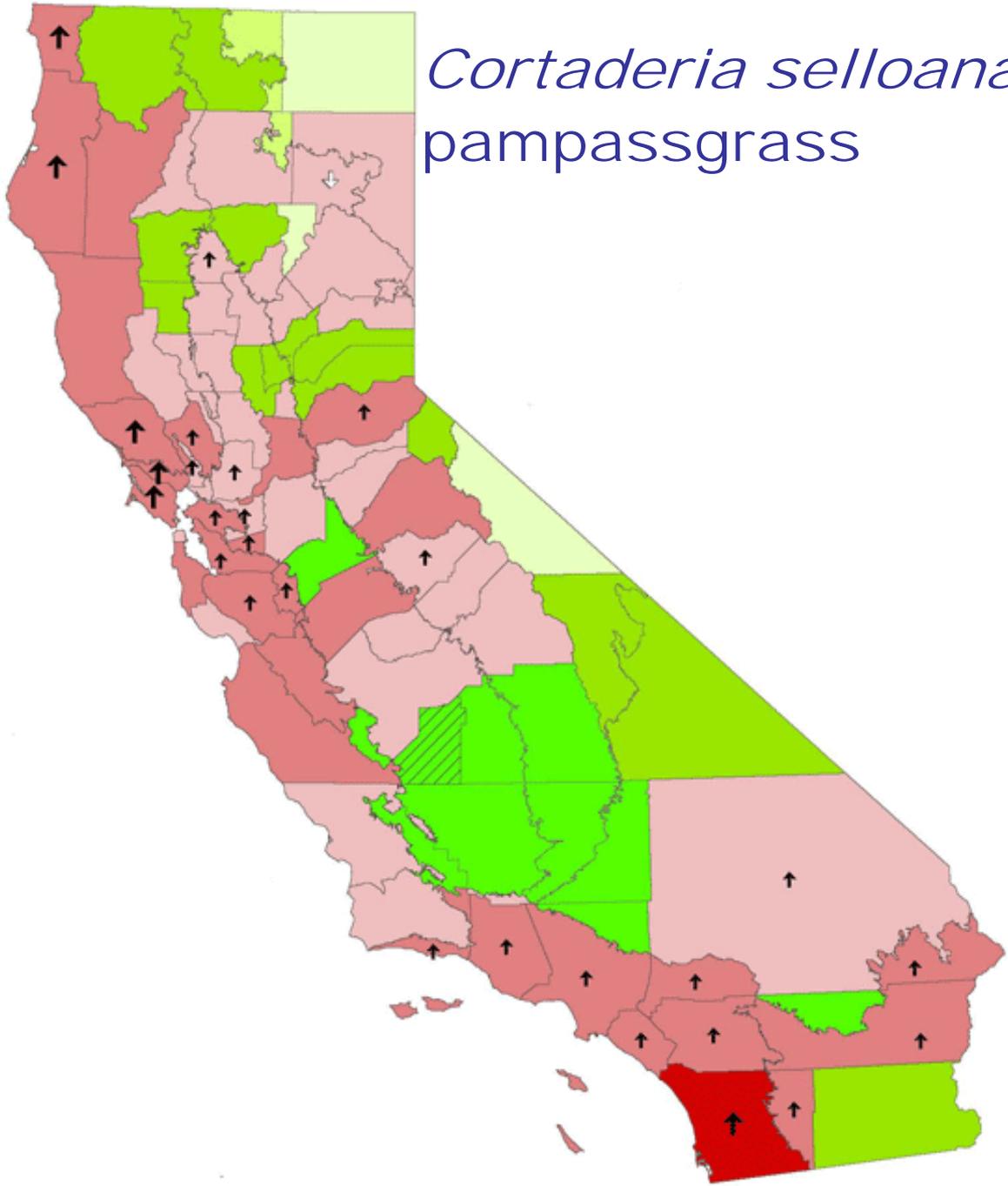
Current Spread



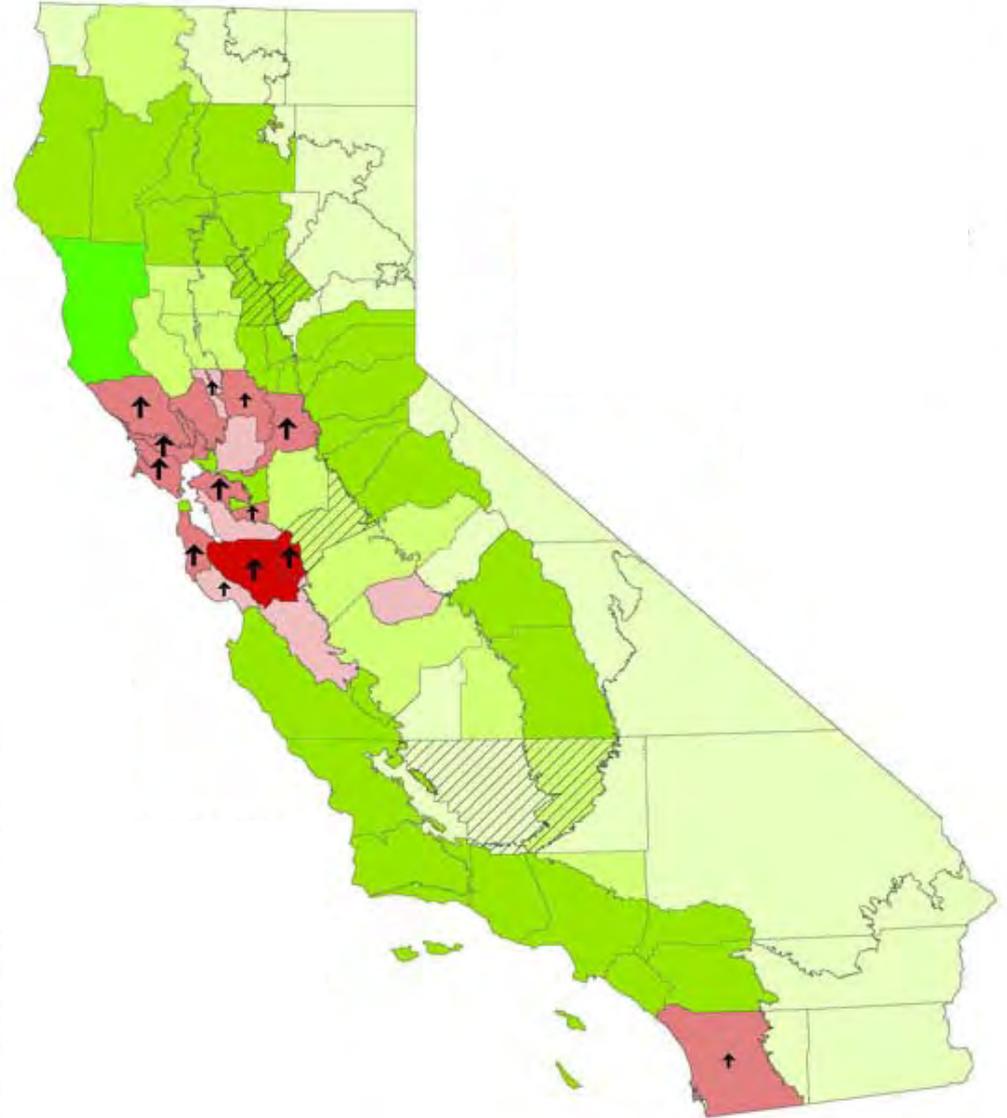
Potential Suitability



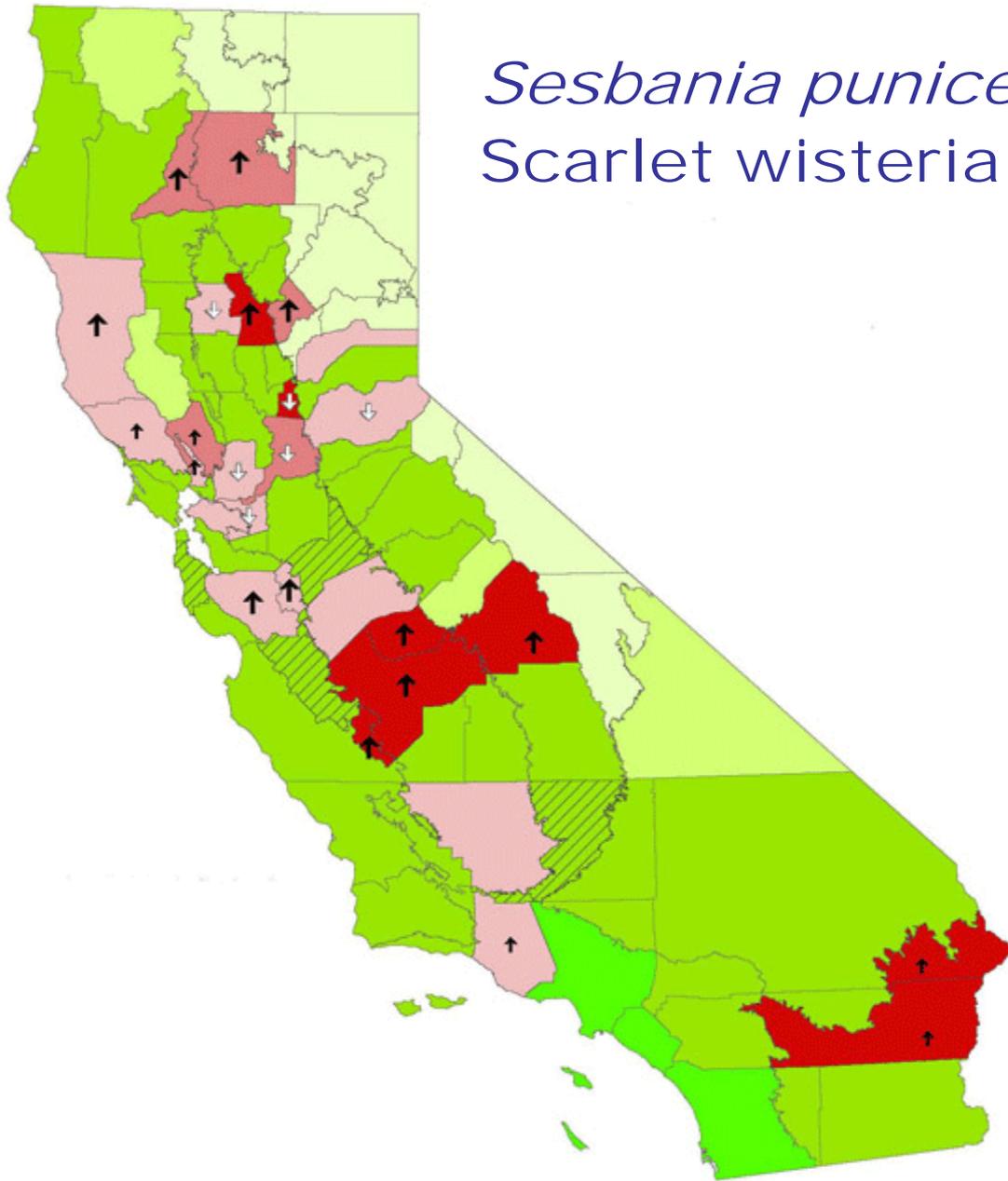
Cortaderia selloana
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Cal-IPC > Invasive Plants > Mapping > statewide maps > **Statewide Weed Maps**

Statewide Maps

Cal-IPC, in partnership with the California Dept. of Food & Agriculture, UC Davis, and the state's network of Weed Management Areas (WMAs), has begun conducting statewide surveys of wildland weed distribution and trend, the purpose is to create rough statewide maps that provide a landscape-level assessment of where each weed is currently found, and whether it's spreading.

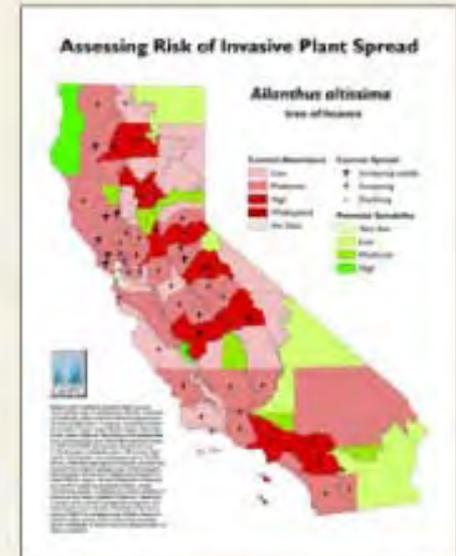
Mapped survey data for each plant is available below. (Surveys to date have covered 36 of the species in the Cal-IPC Inventory.) The maps are the product of input from those working in the field locally, and are not meant to be definitive; ongoing input is welcome (contact info@cal-ipc.org).

The data in these maps will be used in conjunction with modeling to predict the extent to which each plant might spread in the state. This information can be used to support "early detection/rapid response" activities.

Abundance is rated in four cover classes, spread in three. Polygons are determined by combining county boundaries with major Jepson vegetation regions. Surveys were conducted summer 2007.

Help collect data for all of the invasive plants in our Inventory. Download the [California County Weed Survey \(Excel\)](#) with instructions.

Download [survey data \(Excel\)](#) shown on maps.



Sample map.

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Tools & Maps

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California Inventory

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Research

Mapping & Early Detection

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Field Courses

Policy & Advocacy

Responsible Landscaping

WMAs

Outreach & Education

Publications & Resources

Related Sites

Contact Us

Climate change and weeds

Possible effects of climate change:

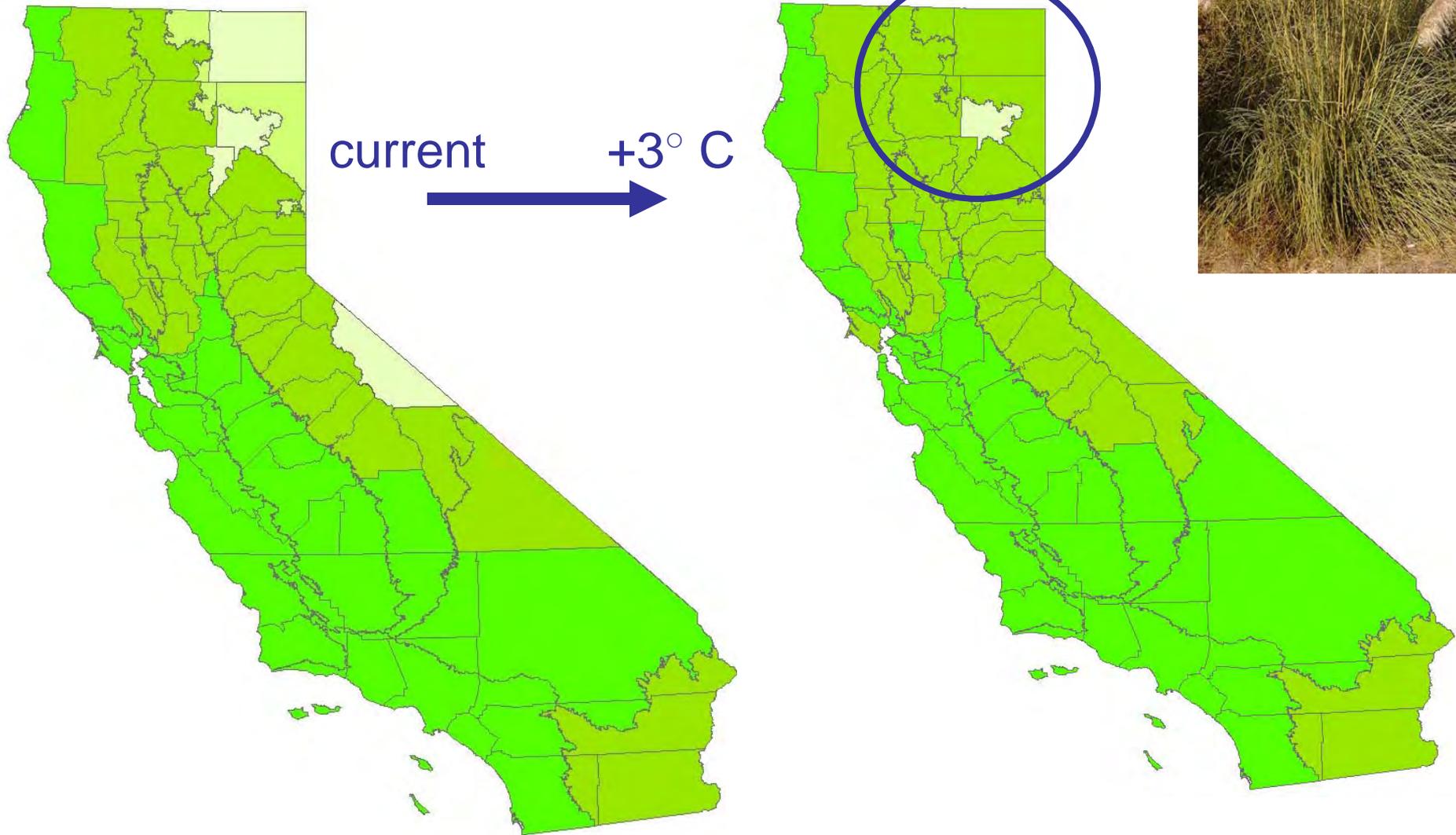
- Distributions shift to higher elevations and higher latitudes
- Increased CO₂ -> increased growth
- Increased fire -> habitat type conversion
- 66% of native CA plants could lose >80% of their range (Loarie et al. 2008)

Our climate change models

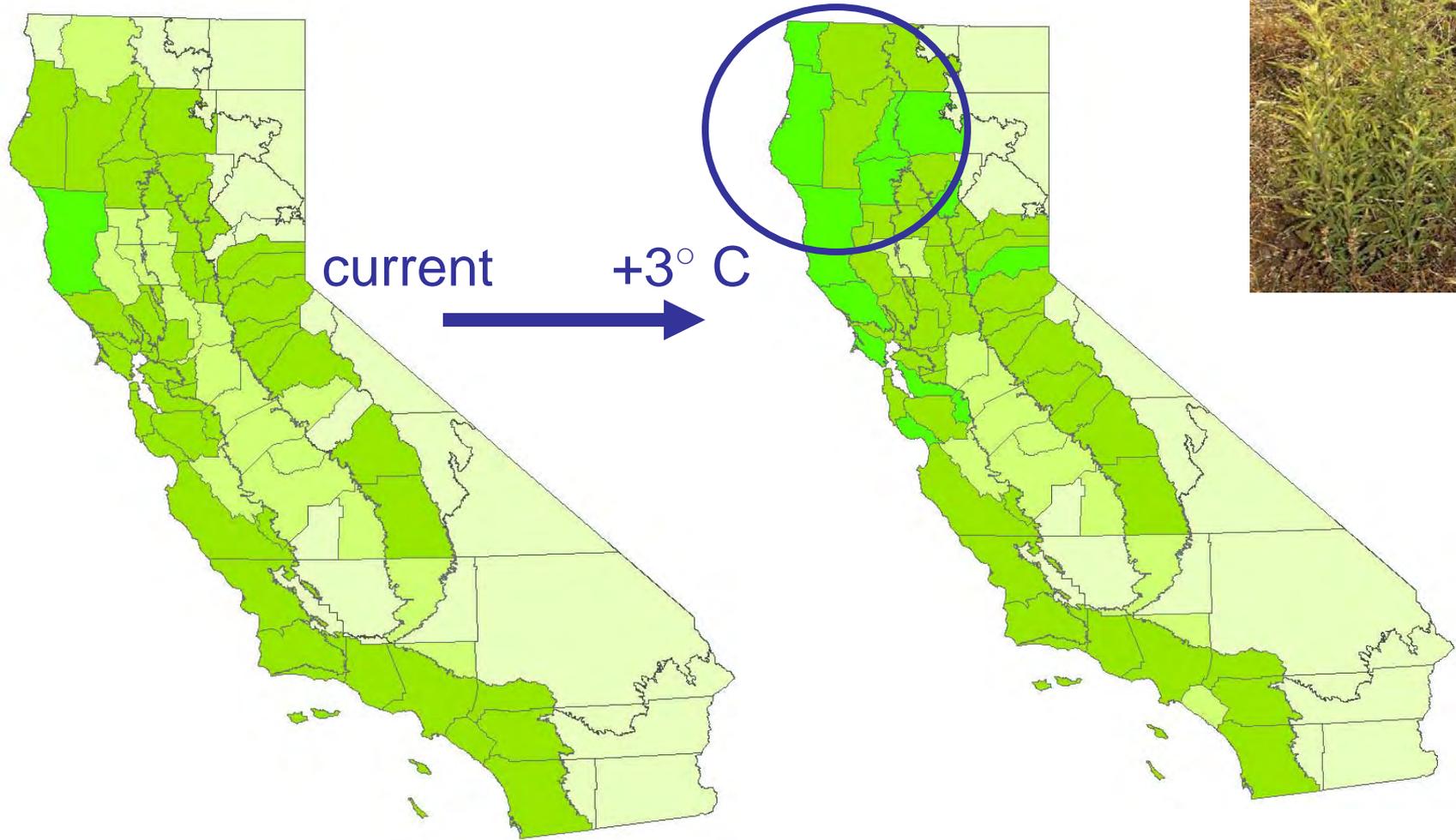
Based on 3° C increase

Compared predictions to ecoclimatic index
under current conditions

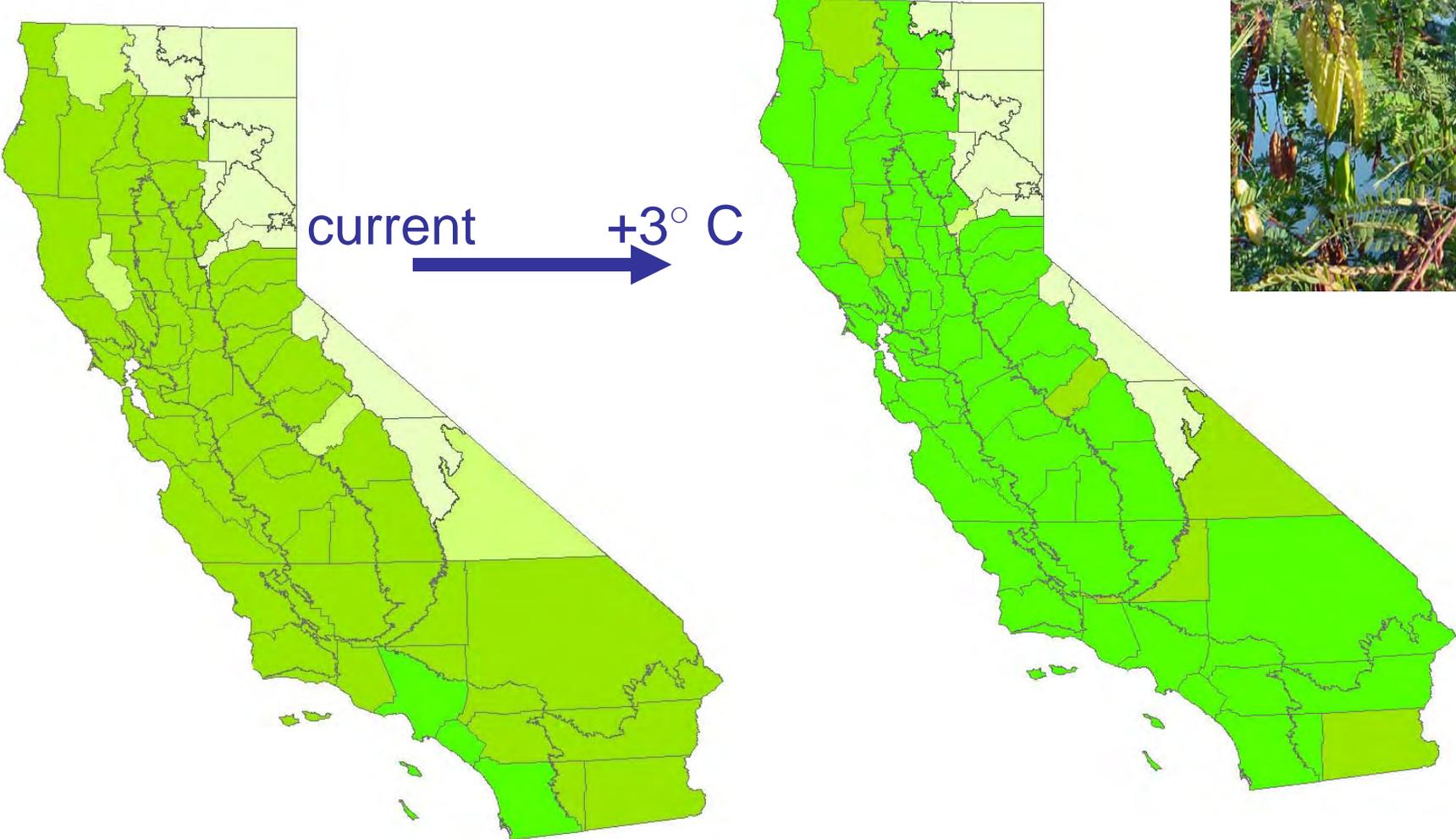
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Climate change and weeds

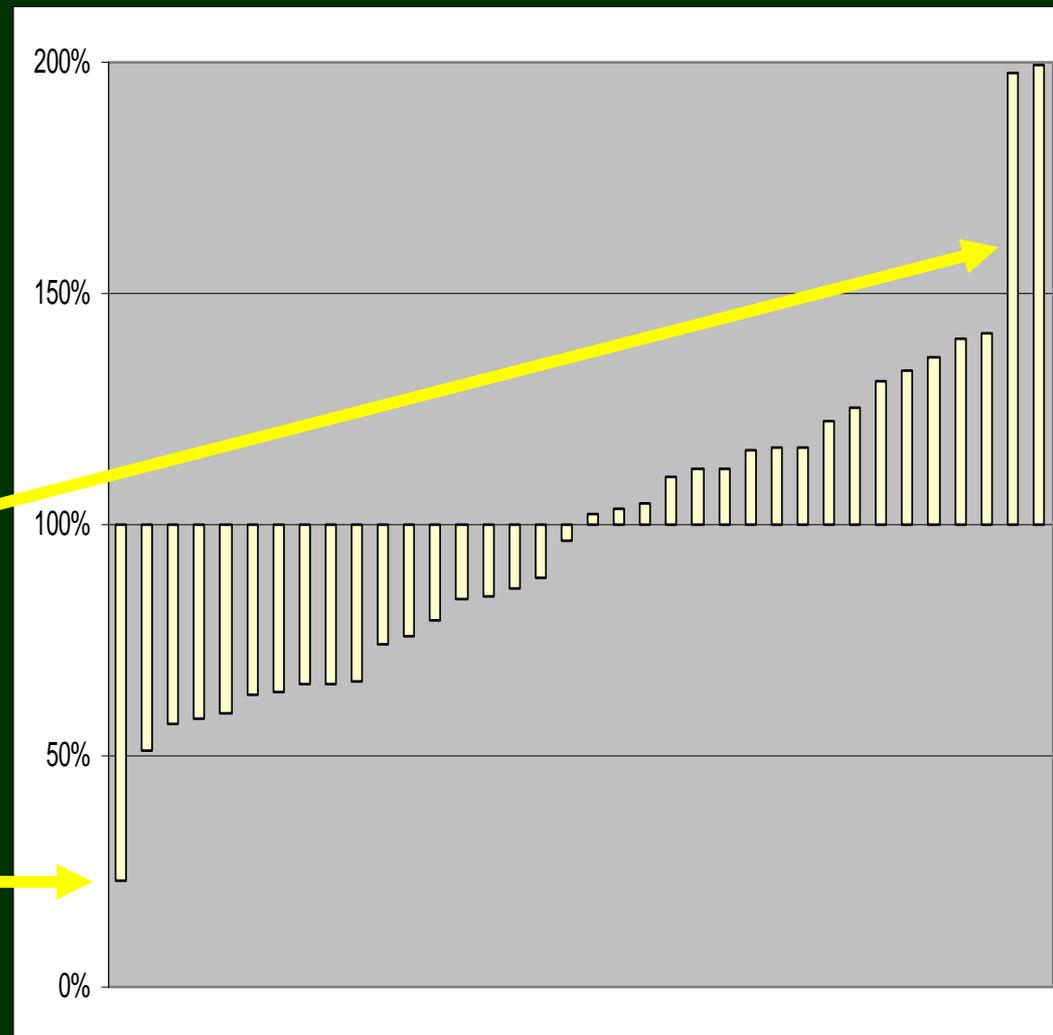
Overall "ecoclimatic index" for 36 modeled weeds was virtually unchanged (+2%)

Winners:

- castor bean (*Ricinus communis*) +99%
- fountaingrass (*Pennisetum setaceum*) +98%

Loser:

- Chinese tallow (*Sapium sebiferum*) -77%





A few caveats

- Weather station data are individual points, while WMA surveys extrapolate to entire county
 - **Stations are not distributed evenly**
- Does not consider other factors
 - **Soils, competition, geographic barriers**

4. What else could invade?

Best predictor of a species' invasiveness here is invasiveness elsewhere

- **5 Mediterranean-type ecosystems: Mediterranean, W. Australia, S. Africa Cape region, central Chile, California**
 - Compiled lists of invasive plants
 - Compared to records from California
 - Definition of "invasive" varies

California data

- Jepson Online Interchange & Consortium of California Herbaria
- CalFlora
- Ornaments: Sunset Garden Book, Plant Locator





International weeds - results

774 listed in other Mediterranean regions

391 not
naturalized

383
naturalized

319
eliminated

143
ornamental

45
ornamental

27
not sold in CA

116
sold in CA

39
sold in CA

6
not sold in CA

Example:

Rhamnus alaternus

Italian buckthorn

- Cal-IPC Red Alerts 2008
- Invasive in Australia
- Ornamental species sold in California





Connecting with other Cal-IPC projects

Early detection

- Regional Early Detection networks (e.g. Bay Area)

Cal-HIP & PlantRight

- Refining information on weeds
- List of plants to screen

Research Needs Assessment

- Climate change identified as area needing study

Next Steps

Mapping:

- Post maps of all species on website
- Create tools for generating online maps

Predictions:

- Provide “watch lists” to WMAs
- Model additional species (pending \$\$)
- Add more detail to models (pending \$\$)

International Weeds:

- Assess with Cal-HIP screening tool

A photograph of a person standing in a field of purple flowers. The person is wearing a white t-shirt, blue shorts, and a blue cap. A white net is on the ground in front of them. The background shows trees and a clear sky.

Thank you to...

WMAs for
survey data

UC Integrated
Pest
Management
(funding)

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of Fish & Game

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San Luis Obispo

Colleen Murphy, CDFA

Len Liu, GIS consultant

Jon Hall, Cal Poly SLO

Rob Klinger, UCD

Mike Pitcairn, CDFA

Bertha McKinley, Cal-IPC

Jeremiah Mann, UC Davis