



# CalWeedMapper

Mapping the Spread of  
Invasive Plant Species

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**TERRA GIS**  
TERRESTRIAL ENVIRONMENT REGIONAL ANALYSIS

Seattle

# ■ The CalWeedMapper Project

- this presentation is about the expert online editing tool (part of larger project)

## ■ Approach

- Organizational
- Technical Tools ⇒ design

## ■ Technical make-up: online tools

## ■ Project Outlook

# CalWeedMapper

## Project by CAL-IPC

„map the spread to stop the spread“

## Multiple (non-profit) Partners

CALIPC, CALFLORA, BAEDN,  
Sonoma Ecology Center

## Funding

American Reinvestment and Recovery Act (ARRA)  
and others...

USDA Forest Service, State and Private Forestry Program,  
California Department of Food & Agriculture, National Fish and  
Wildlife, Resources Legacy Fund, Richard and Rhoda Goldman  
Fund



California Invasive Plant Council

Cal-IPC

Protecting California's wildlands through science, education, and policy

**CALIPC - a non profit with the goal to protect California's wildlands**



Calflora

information on **wild California plants** for conservation, education, and appreciation

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Bay Area Early Detection Network

Revolutionizing invasive plant management in the San Francisco Bay Area



# ■ CalWeedMapper Approach

- Organizational

- Technical tools ⇒ design

# Data collection efforts

- schedule field staff for interviews
  - edit sessions with plant species experts
- reference USGS mapping quad boundaries
- 200 plant species (4 priority levels)
- many to many relationships
  - over time many records per species / quad combination
- supported by online tools

# California Weed Management Areas (WMA)

California Department of Food and Agriculture

## Interview partners

mostly biologists & land managers

NPS, USFS, BLM, Military

US Fish and Wild Life Service

Caltrans

Agriculture Departments

CA Fish & Game

Cattlemen associations & some tribes

University of California University Extension

some private contractors working for these orgs



# Workflow data entry

- Define work area  
(pre-selection)
- Enter session information
- Enter species information :  
**observation values**
- Records are saved in  
PostGIS database
- Session submitted
- **Map Layer is updated  
according to priorities**  
-> multiple options

5 low increasing (despite treatment)

0 absent

1 low, stable

2 low, increasing

3 medium, rapidly increasing

4 high, stable

5 low increasing (despite treatment)

6 low stable or decreasing (because of treatment)

7 medium increasing (despite treatment)

8 medium, stable or decreasing (bc of treatment)

9 high, increasing (despite treatment)

10 high stable or decreasing (bc of treatment)

11 absent, monitoring (eradicated)

13 absent, super null

20 might be present

30 present no specific

33 planted, horticultural not escaped

97 know the species but do not know whether present

98 I do not know the species

99 I do not know

## Legend

### Abundance

- absent
- low abundance
- medium abundance
- high abundance
- do not know

### Spread

- stable
- ↗ increasing
- ↑ rapidly increasing
- ⇒ low stable or decreasing

### Treatment

- yes: hatched (in respective color)
- no: no symbol



# Map the Spread!

# CalWeedMapper.org

Map the spread to stop the spread.

## Map the Spread!

Where do invasive plants grow in California, and where are they spreading? Good spatial information helps land managers make smart decisions about early detection, rapid response, and long-term management priorities. And, of course, good maps can also help you get funding. With an array of new tools coming online, now is the time to Map the Spread!

Cal-IPC is partnering with [Calflora](#), the [Bay Area Early Detection Network \(BAEDN\)](#), [Sonoma Ecology Center](#), and others to Map the Spread.

### 1. Share observations!

Register with [Calflora](#) to record your observations on their online maps. Calflora is developing a [suite of tools to collect and display weed data](#). You may even become a beta tester for their new [smart phone app](#) that uploads data automatically, including GPS location and photos!

See [Calflora's data collection brochure](#)

### 2. Share GIS datasets!

If your organization maps invasive plants in a GIS, you can upload an *entire* GIS dataset to [Calflora](#). And, of course, look at the data other folks are uploading in your area!

### 3. Share expert knowledge!

Cal-IPC is building an atlas of wildland weed distribution based on the expert knowledge of land managers across the state. We are collecting this information for over 100 species for each USGS quadrangle (7.5') in California. Our online "[Quad Mapper](#)" will make it easy to keep up-to-date on what is spreading and where. Our mapping team is visiting Weed Management Areas (WMA) around the state – see our [schedule and materials](#) to participate!



Home

Quad Mapper

Quad Mapping Tool

Meeting Materials

Calflora submissions

Submit Observations

Upload GIS data

Background Information

Tools & Partners

# CalWeedMapper Online Tool

**CALIPC QUAD MAPPING**

**Log In**

Username:

Password:

Log In

**Invasive Species**

Species Group:

Invasive Species:

Species names:  Scientific Name  Common Name

**Legend**

**Boundaries**

- Mapping Quad
- Preselection
- Quadselection
- Watershed
- County Boundary

**Invasive Species**

Abundance	Spread
absent	→ stable
low abundance	↗ increasing
medium abundance	↑ rapidly increase
high abundance	↘ low stable or decreasing
do not know	

**Treatment**

yes: hatched (in respective color)  
no: no symbol

**Public lands**

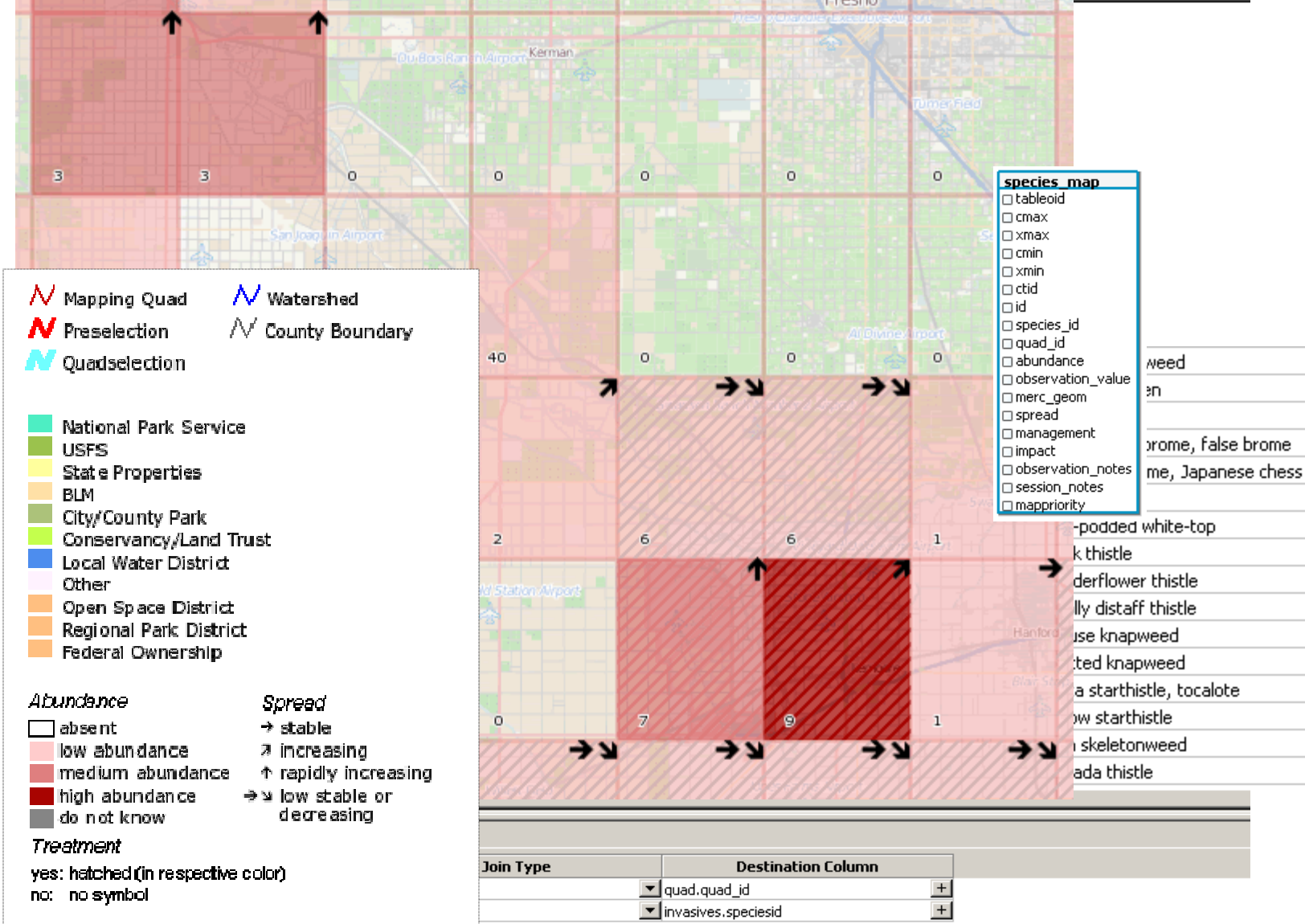
- National Park Service
- USFS
- State Properties
- BLM
- City/County Park
- Conservancy/Land Trust

Mapping Invasive Plant Species



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# 200 dynamic plant species layers



# Technical details of the tools

# ■ Technical Framework

■ Server running Apache on HostGIS  
Linux (Slackware)

■ PostGIS database



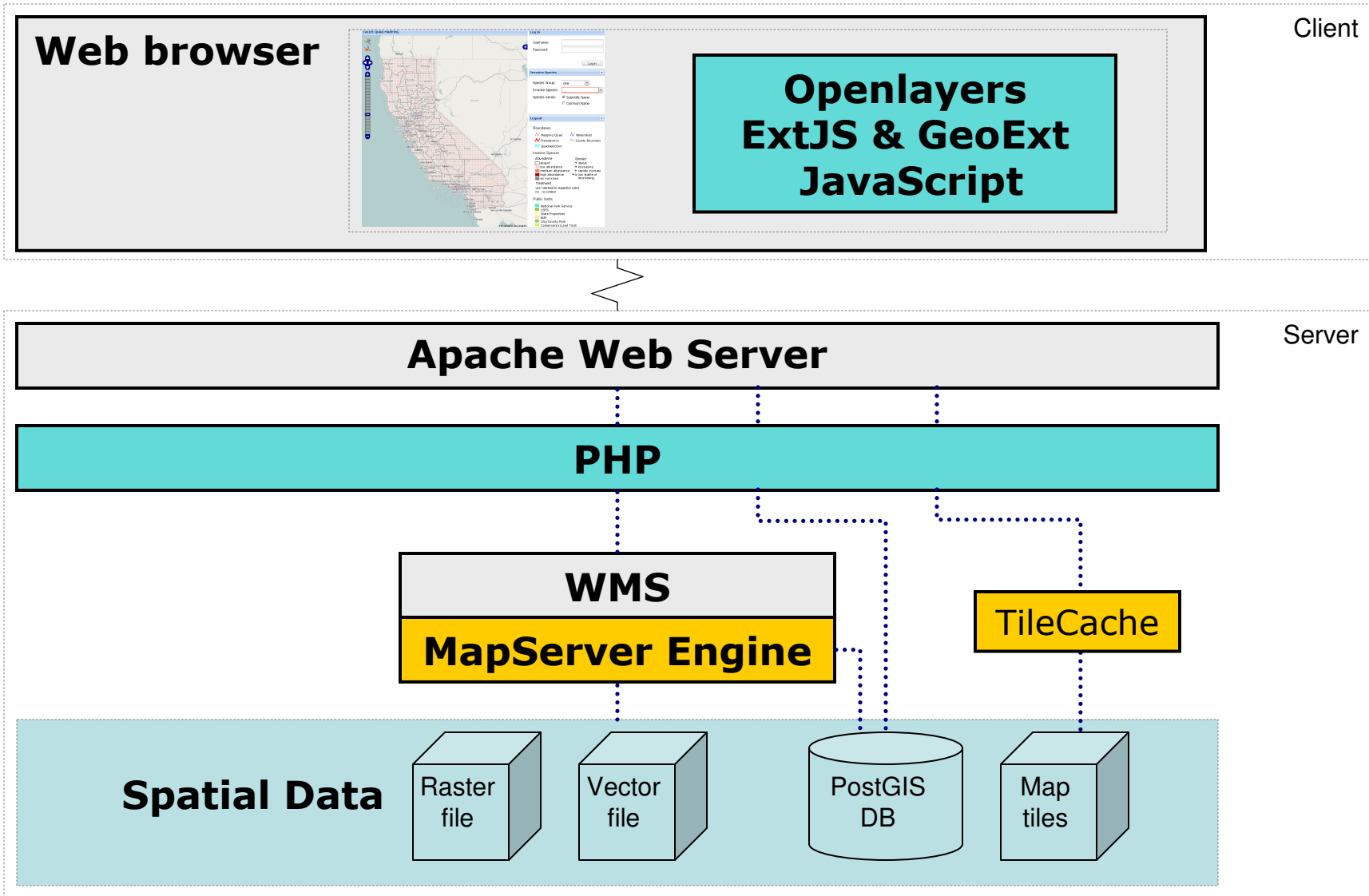
■ MapServer (University of Minnesota)  
Map rendering engine



■ OpenLayers Viewer



# CalWeedMapper Web Tool



## ■ Map rendering Engine MapServer

open source web mapping

Originally developed at the University of Minnesota (UMN), short “MapServer”

- one of the most mature open source projects
- written in C

### Main Focus

- rendering spatial data
- development environment for spatially-enabled internet applications

### Map output

- CGI mapserv (Linux) and mapserv.exe (windows)
- MapScript API available for Python, PHP, Perl, and Java
- Map/Layer configuration text file .map

### Formats

- In: PostGIS, Oracle Spatial ArcSDE, WMS, GDAL and OGR formats
- Out: GIF, JPG, PNG, all GDAL formats, WFS and WMS



## PostGIS – Spatial Database

- PostGIS is an extension for PostgreSQL
- adds support for geographic objects to PostgreSQL
- enables PostgreSQL server to be used as a backend spatial database for GIS
- Spatial operations and analysis simply mean running a (spatial) SQL query in the database
- Similar functions as SDE and much more ....



## ■ Open Layers OpenLayers

Main supporter “MetaCarta”

- object-oriented JavaScript library (using Prototype.js and Rico library)

Lets you add maps to any web page by embedding OpenLayer.js

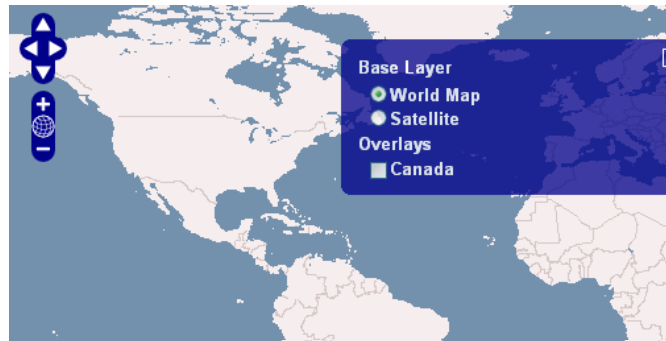
- no server-side dependencies
- Easily reusable component  
...similar to Google Maps and MSN Virtual Earth Web Mapping APIs
- “Slippy map style”

Input Formats

- Tile sources: Bing, Worldwind, Yahoo & Google Maps, WMS
- Vector layer input: KaMap, MapServer, GeoRSS, WFS, [KML]

Standard Tools

- Google-like zoom bar, standard functions like zoom in/out pan



# Project Outlook funding until Spring 2012

## ■ Phases I and II completed

Onlinetool Design & edit tool implementation

## ■ Phase III – started

Integration of CALFLORA point, line and polygon data

## ■ Phase IV– started

Design and Implementation of public facing website for volunteers to easily update map quads

## ■ Intergration of climate change modeling– started

CMMA modeling using Marxan, quads split 15\*15  
species status prediction for 2050  
statistics summary by quad

After funding ends to be maintained by **CALFLORA**