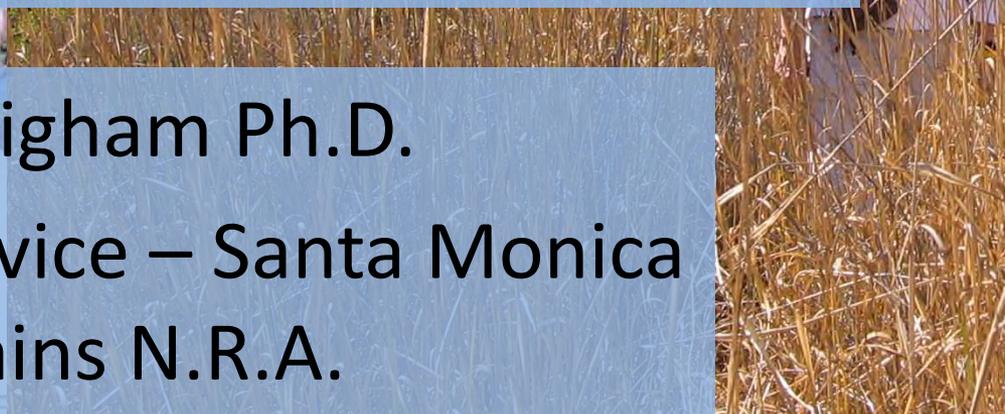


There's an App. for That: Weed Mapping with Your Phone



Christy Brigham Ph.D.
National Park Service – Santa Monica
Mountains N.R.A.

ies in the Santa Monica Mountains

Legend

-  Survey Area
-  SMMNRA
-  Unprotected Area
-  Protected Area

Weeds

- | | | |
|--|---|--|
|  ACRE |  ELITE |  PHAQ |
|  AIAL |  FOVU |  RICO |
|  ARDO |  LELA |  SAAU |
|  CESO |  MYLA |  SPJU |
|  COJU |  NIGL |  VIMA |

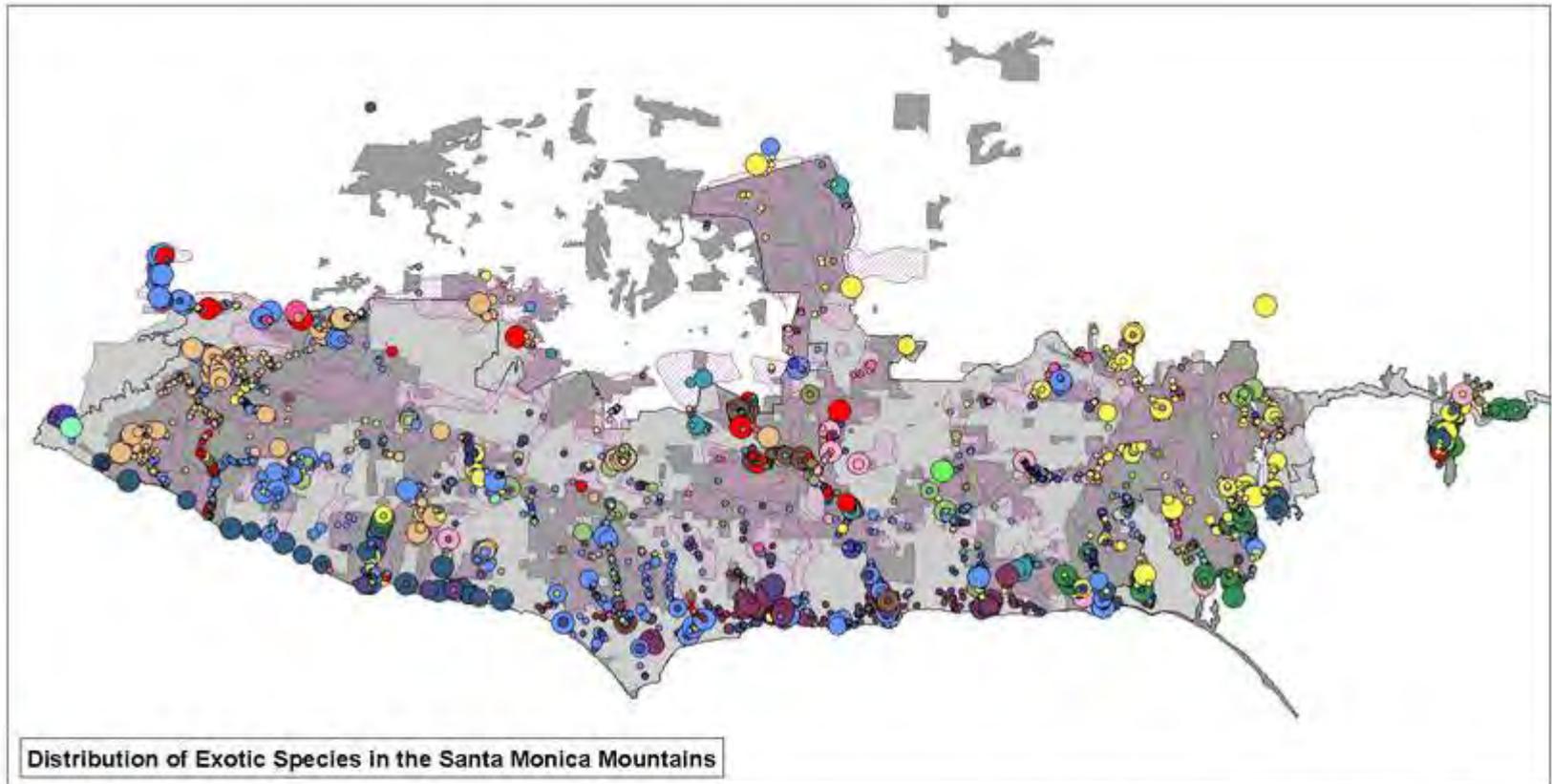


There's an App for What??

- The problem
- A partnership
- Project development
- Testing
- Results
- Promising thoughts
- Not so promising thoughts
- Future work



Part of the Problem...



0 5 10 Km



Legend

- Survey Area
- SMMNRA
- Unprotected Area
- Protected Area

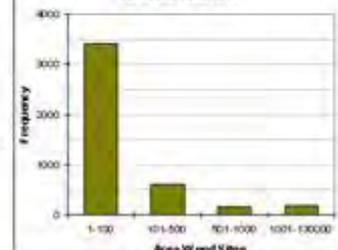
Weeds

- | | | |
|------|-------|---------|
| ACRE | ELITE | PHAG |
| AIAL | FOVU | RICO |
| ARDO | LELA | SAAU |
| CESO | MYLA | SPJU |
| COJU | NIGL | VIMA |
| COMA | PESE | UNKNOWN |
| DEOD | | |

Area m²

- 0 - 100
- 101 - 500
- 501 - 1000
- 1001 - 130000

Area Distribution



Another Part of the Problem

- 2 years of field work with 2 people in the field 70% of the time
- Multiple ownerships
- Not linked to weed killing database
- No input from others killing weeds
- Instantly out of date



Looking for a Problem

- Center for Embedded Networked Sensing at UCLA
- Participatory sensing



About CENS



QUICK LINKS

CENS: *Embedding the Physical World*

garbage watch

▲ DATA FEED

sustainability environmental impact ...

team members		view full team
	Sasank Reddy	<input type="checkbox"/>
	Jeff Burke	<input type="checkbox"/>
	Deborah Estrin	<input type="checkbox"/>
	Mark Hansen	<input type="checkbox"/>

enable individuals to collect images of trash on campus to determine the best places for new recycle bins and also to perform waste audits

[GarbageWatch](#) is a project that asks members of the UCLA community to perform a coordinated waste audit using their mobile phones. Individuals use their phones to collect and upload geo-tagged images of the contents of garbage bins to help UCLA Facilities determine where new recycle bins should be placed, the effectiveness of existing recycle infrastructure, and to learn more about when, where, and what materials get thrown away on campus. Student members of the Education for Sustainable Living (ESLP) Program at UCLA along with interested students involved with CENS were recruited to collect data. The use of mobile phones made it easy for the many concerned students to contribute to this campus-wide effort. Through GarbageWatch, we also investigated models of involved individuals covering (availability) and participation for the purpose of recruiting and maintaining the data collection campaign. For more information in regards to participant analytics for "recruitment" of individuals for campaigns, please visit the [project](#).



discovery + connected participation = change

Google Custom Search



- vision
- blog
- projects
- technology
- resources
- results
- contact



featuring
peir

personalized estimates of environmental exposure and impact PEIR, the Personal Environmental Impact Report, is a new kind of online tool that allows you to use your mobile phone to explore and share how you impact the environment and how the environment impacts you. What's unique about PEIR? Taking a step ...

[view project](#)

wellbeing

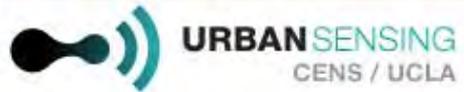
health

public safety

urban planning

community

fitness



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DATA FEED

help bikers find good routes and collect data to improve them

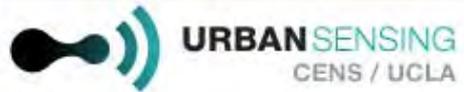
Commuting by bike in Los Angeles can be complicated: road and path availability, air quality, traffic and accidents, and bright sunlight all affect the quality of the ride. What if a convenient web-based technology could give bike commuters daily feedback on the quality and safety of their preferred routes, and suggest quality-of-ride modifications in route and time of day? What if bike commuters could work together as a community to document hazards to biking and make positive changes to their local routes? UCLA's Center for Embedded Networked Sensing (CENS) is collaborating with Los Angeles bikers to make this vision a reality. We are designing an application that runs on mobile phones that enables bike commuters to log their bike route using GPS and provide geo-tagged annotations (images, text notes) along with automatic sensor data (accelerometer / sound) to infer the roughness and traffic density of the road. Using this information, we plan to create an interface to enable bike commuters to plan their route based on both safety and interest vectors.

We are currently running a pilot, [Biketastic](#), in which bikers can share their routes which are automatically annotated by noise level, roughness, variation in elevation and duration of stops.



cyclesense media stream





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smartphone data acquisition and analysis for monitoring food choices

DietSense is an online service that allows you to self-monitor your food choices and further request comments from dietary specialists. Mobile phones with CENS participatory sensing platform will let you record photographs of your meal everyday, either automatically or by sensible notifications (based on time of the day or location). In addition to photos, you are encouraged to annotate the photos with voice or text messages providing information not captured by the images (e.g. diet soda as opposed to regular soda). Data (daily photos, timestamp, location via localization techniques or user-reported), and annotations (text/voice) are stored in password-protected accounts on web servers for self-review and specialist assisted analysis. When you log on to your DietSense profile you will see personalized presentation of your dietary habit. Dietary specialists can provide further analysis if you configure your profile to be shared.

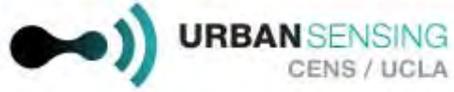


dietsense media stream



publications & results





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- technology
- resources
- results
- contact



DATA FEED

health self-reflective personal activity-classification step counting location time ...

measure walking activity by leveraging cell phone, gis, and widely available sensors

How much do you walk, and where do you do it?

The footstep project measures walking activity by leveraging cell phone, GIS, and sensor technologies. The philosophy is that an accurate and individual feedback is essential in addressing and improving awareness of exercise patterns.

The first-generation system targets to provide an easy to understand heat-map of walking traces, a comprehensive data histogram, and a trend-analyzer. <http://footstep.cens.ucla.edu>

team members [view full team](#)

	Deborah Estrin	<input type="checkbox"/>
	Nicolai Munk Petersen	<input type="checkbox"/>
	Taimur Hassan	<input type="checkbox"/>

TOOLS

WIKI SOURCE CODE



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vision blog projects technology resources results contact



DATA FEED

bottom-up hobbies networking learning community building community visualization images audio video time-location culture history memory Los Angeles ...

participatory design of technology expressing neighborhoods' cultures and identities

Remapping LA is a project that aims to facilitate fluid and inclusive expressions of Los Angeles as communities explore their environments, culture and identities and retell their histories with technology built in a process they shape—perhaps seeding a new “collective memory”. The process uses mobile devices to help communities in discovering, mapping and documenting the city and adding to this “collective memory.” Mapping of the histories, and cultural identities by communities is a way of community asset-mapping.

[Engaged Media Workshop](#) is a course associated with this RemappingLA.

Remapping LA Events and Installations:

1. [Monumento872](#)
2. [Imageability](#)
3. [Juncture](#)

Featured Articles:

team members [view full team](#)

- Deborah Estrin
- Jeff Burke
- Fabian Wagmister
- Vids Samanta

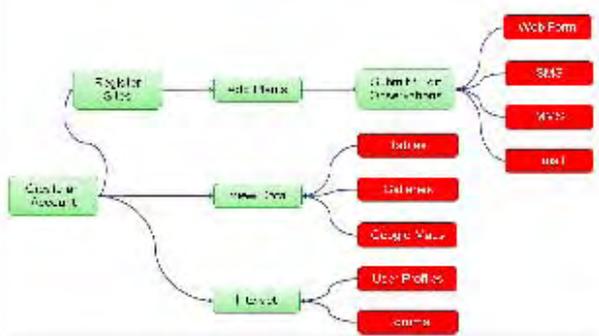


discovery + connected participation = change

Google Custom Search



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- blog
- projects
- technology
- resources
- results
- contact



engaging the public in ecological research

We are creating a flexible data collection campaigns for the modern, *connected* citizen scientist

Citizen Science allows individual volunteers or groups to observe, measure, and *contribute* to scientific environmental studies. How have we made this experience even better?

Networked Naturalist is a collection of tools that allows anybody to participate in the growing list of popular citizen scientist projects, all designed to harness the power of people who are not only concerned about their environments but also want to do something about it.

On-the-go, flexible data collection schemes, tailored to your busy schedule, allow you to use your *cell phone* text, email, and picture messages for data collection, as well as sending us *email* or *web forms* from your computer.

See your data, see how your data fits in with other people's data, and see how involved scientists interpret those data — all *in real-time*.

naturalist media stream



The Partnership

CENS:

- Built mobile phone app
- Provided phones for field testing
- Built web interface
- Built data processing programs
- Provided instruction for field tests

NPS:

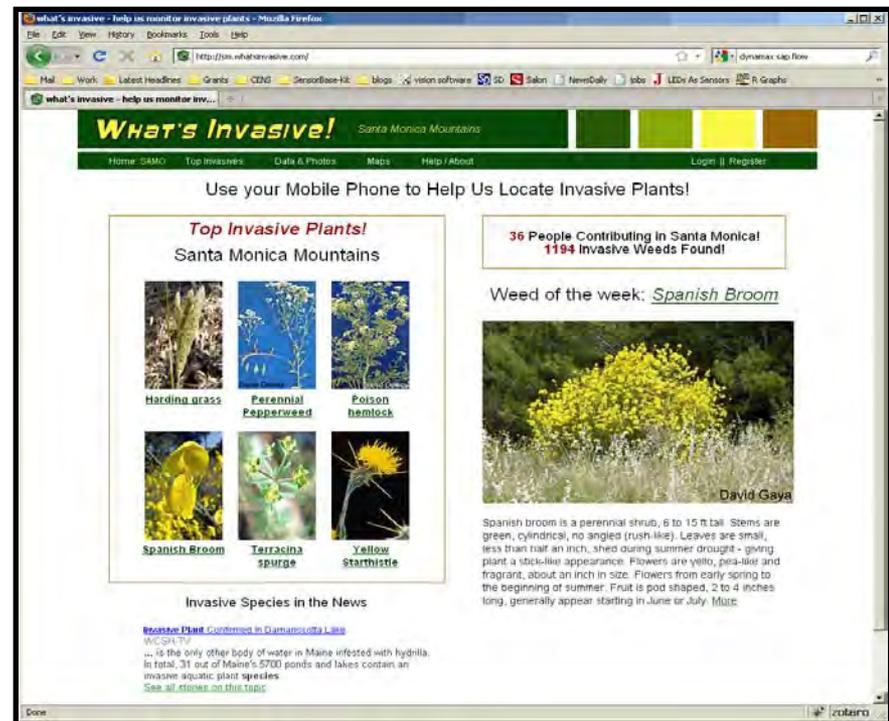
- Selected species
- Provided text and pictures
- Performed field tests
- Provided feedback



What's Invasive!

How can you help locate invasive plants in your area?

An introduction to the *What's Invasive!* Android phone application and Website
<http://www.whatsinvasive.com>



The main *What's Invasive!* Android phone features and functions.

After registering and logging into the application...

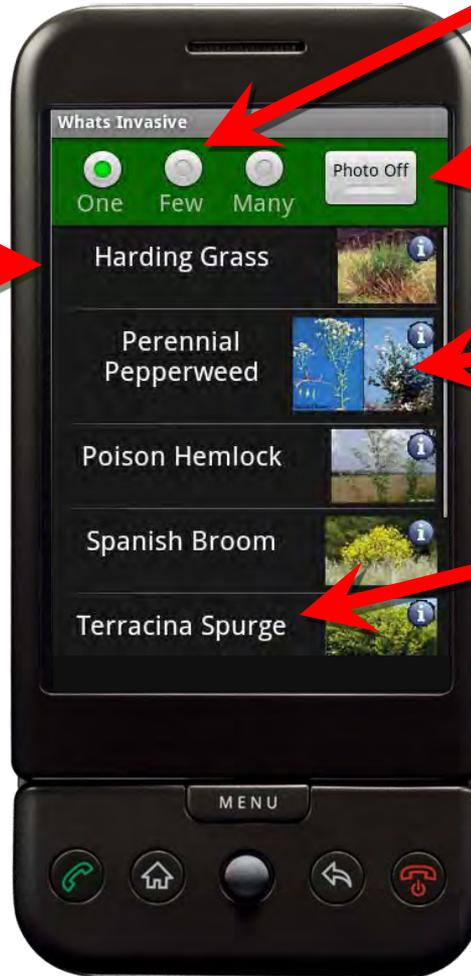
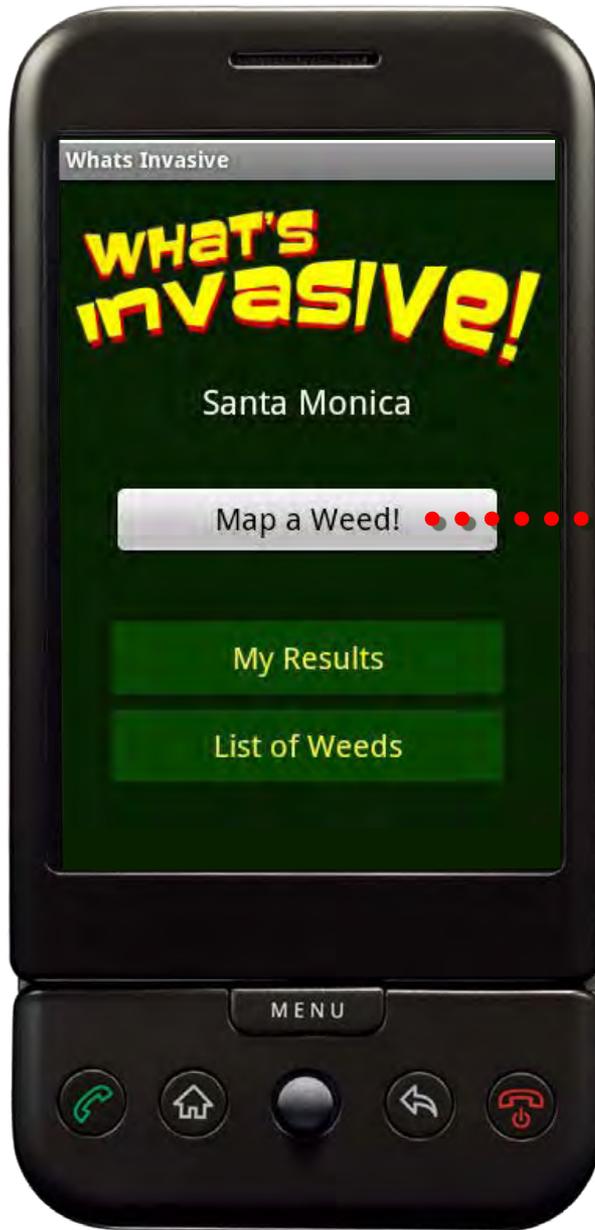


Location for the list of weeds is automatically selected, based on your GPS location.

Map a Weed! button is how you identify and locate a weed

My Results and **List of Weeds** buttons allow you to see the information you have gathered and browse the top invasive weeds in the selected area.

Making a contribution with the data that is needed.



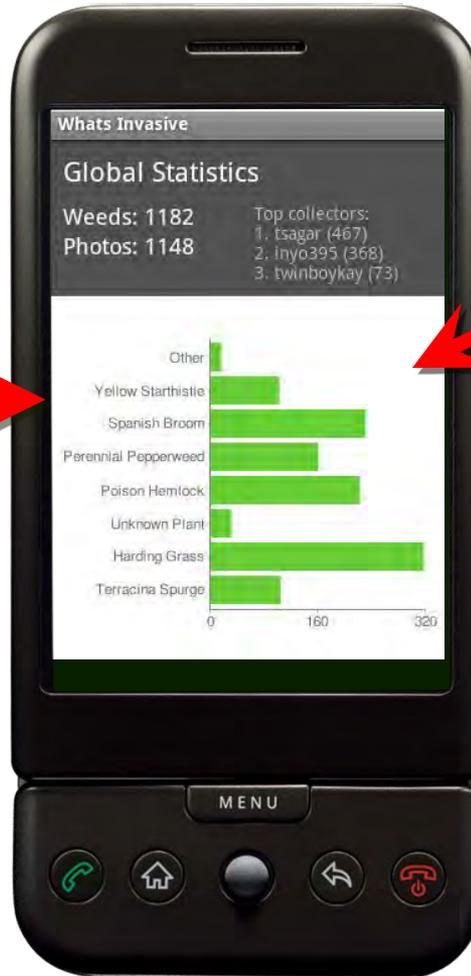
(1) **One, Few, or Many** is the amount of invasives you see.

(2) **Photo on/off** to add a photo to your observation.

A picture of the weed links to more information about it.

(3) **Select** the weed name and the phone will record your position and send the weed location to the *What's Invasive!* website.

Keeping track of your contributions and progress.



Global and Personal statistics are both available on the phone and also on the website.

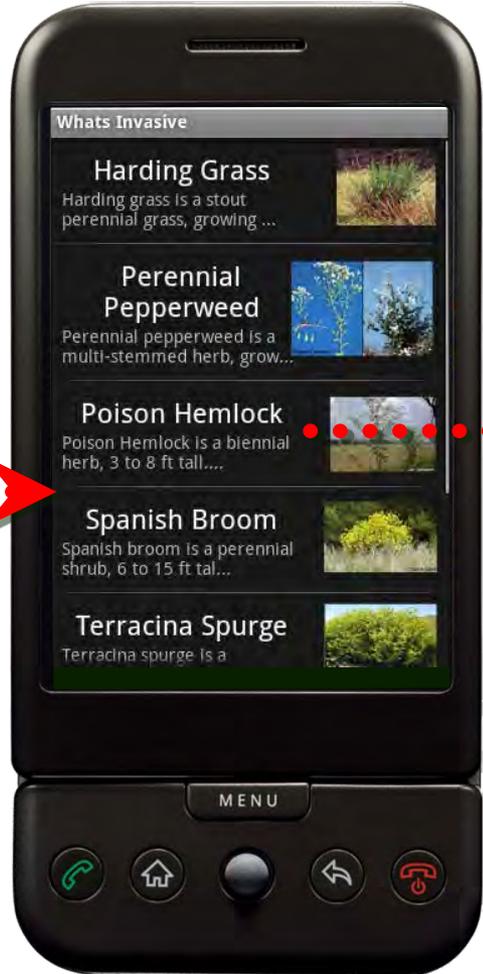
View your participation statistics as well as how the entire campaign is going.

On the website, you can also edit or delete your observations made from the phone.

Useful pictures and text at your fingertips.



Weed identification in the field



Help and configuration pages are always available.

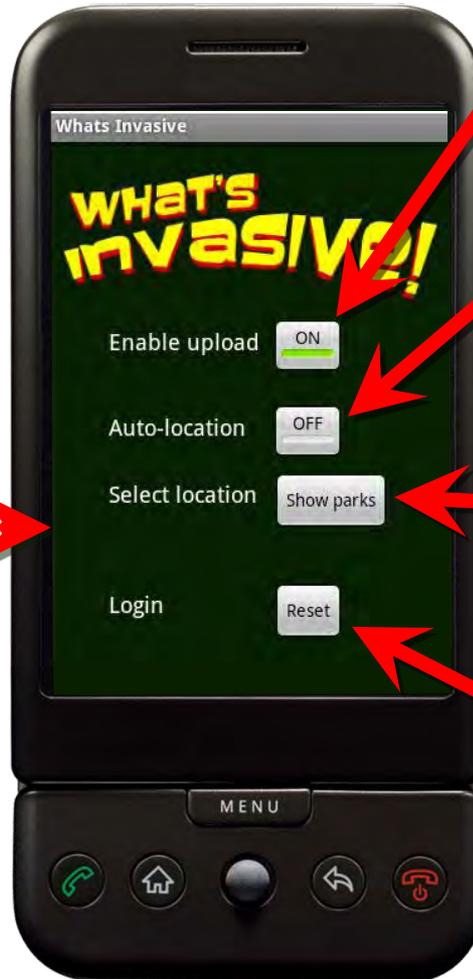


The **MENU** button exposes Help and Settings functions

The **Queue** stores your observations for *one minute* after you have recorded them for you to review and delete if needed.

The **Settings** button brings you to a page where you can change your location manually, enable automatic uploads, and reset your login.

User-configurable for data collection under your control.



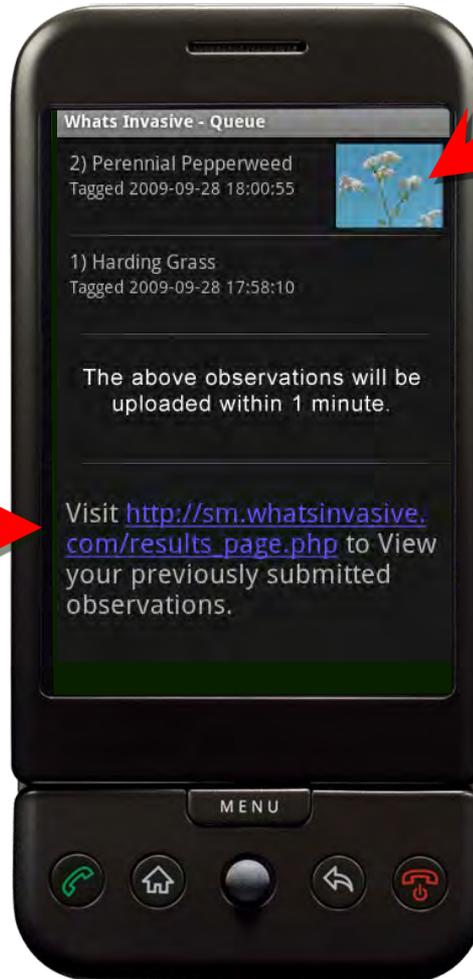
Enable upload will automatically send your observations to the website.

Auto-location picks the location and weed list nearest your present location based on GPS.

Select location allows you to manually pick your location and weed list.

Login reset allows multiple users to use the same mobile phone.

Flexible data transfer for when connectivity is an issue.



The **Queue** will store your captured photos and location data for one minute to allow you to review your observation and, if needed, delete the entry (for instance, if the photo was blurry or of the wrong weed).

For more time to review, disable the **Automatic Upload** of observations.

The Website and Database

<http://whatsinvasive.com>

The screenshot shows a Mozilla Firefox browser window displaying the website 'what's invasive - help us monitor invasive plants'. The browser's address bar shows the URL 'http://www.whatsinvasive.com/'. The website's header features the title 'What's Invasive!' in a stylized font, followed by the subtitle 'Community Invasive Plants Watch'. Below the header is a navigation menu with links for 'Parks', 'Data & Photos', 'Maps', 'Help / About', and 'Phone & Web Tutorial!'. The main content area is titled 'Use your Mobile Phone to Help Us Locate Invasive Plants!'. It is divided into two columns. The left column features an image of a mobile phone displaying the website's interface, with text encouraging users to use their phones to help locate invasive plants. It also mentions that version 1.0 of Android and iPhone applications are available soon and provides a link to sign up and start participating. The right column lists 'Currently Supported Park: Santa Monica Mountains National Recreation Area' and 'Be on the Lookout - Top Invasive Plants!'. It displays six images of invasive plants: Harding grass, Perennial Pepperweed, Poison hemlock, Spanish Broom, Terracina spurge, and Yellow Starthistle. At the bottom of the page, there are logos for UCLA and CENS, and a Zotero icon in the bottom right corner.

what's invasive - help us monitor inv...
File Edit View History Bookmarks Tools Help
http://www.whatsinvasive.com/
what's invasive - help us monitor inv...
What's Invasive! Community Invasive Plants Watch
Parks Data & Photos Maps Help / About Phone & Web Tutorial!
Use your Mobile Phone to Help Us Locate Invasive Plants!

 Using your iPhone or Android mobile phone, help us locate invasive plants!
You can also participate using a digital camera, email, or our web forms.
[Find out more!](#)

News Flash: version 1.0 of Android and iPhone applications available soon!
[Sign up and start participating](#)
(More parks available soon!)

Invasive Species in the News
[Master Gardener: Invasive plants harming area's native biodiversity](#)
Marin Independent-Journal
Of the 29 highest-priority invasive species at PRNS (included in a draft **invasive plant plan**), 14 are escaped ornamental garden plants. ...
[See all stories on this topic](#)

Currently Supported Park:
[Santa Monica Mountains](#)
[National Recreation Area](#)

Be on the Lookout - Top Invasive Plants!

 **Harding grass**
 **Perennial Pepperweed**
 **Poison hemlock**

 **Spanish Broom**
 **Terracina spurge**
 **Yellow Starthistle**

UCLA CENS
Done Zotero

The main **What's Invasive!** website is a portal to all the participating locations that have lists of invasive plants that need locating.

A **Maps** page lets you see all participating areas and the locations of user-identified weeds.

A **Data & Photos** page lets you view user-collected from all locations.

A **Parks** page lets you select participating parks and areas that have lists of invasive plants in your area.

Help is available for every step.

Maps

Help / About

Instructions: Phone

Instructions: Email

Instructions: My Data

About this Project

User Agreement

Contact Us

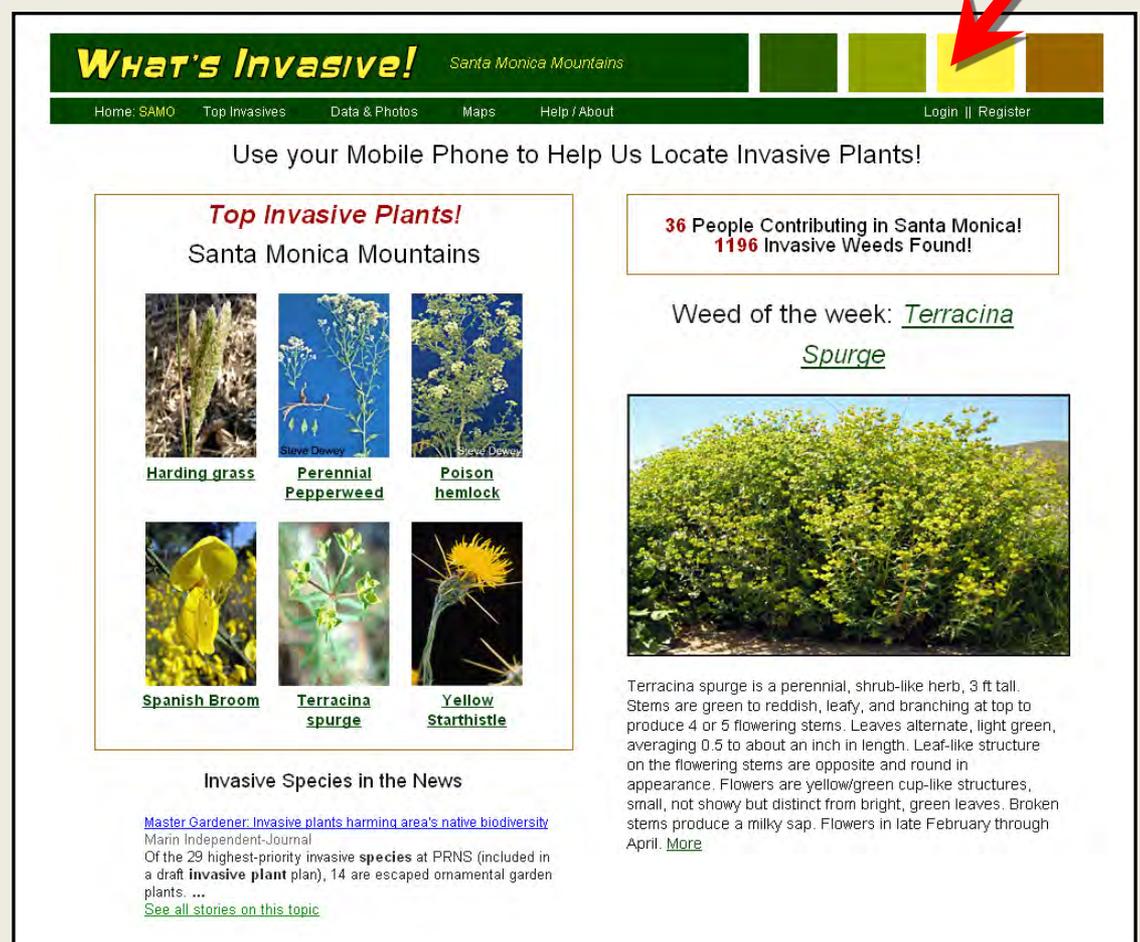
Select a **Park** and you will be able to see location-specific information.

The main page of any **Park** will present you with information on:

- **Top Invasive Species**
- **Campaign Statistics**
- **Plant of the Week**

With links to more data on each species and campaign information

“*Invasive species in the news*” provides links to the latest information on weed threats.



What's Invasive! Santa Monica Mountains

Home: SAMO Top Invasives Data & Photos Maps Help / About Login || Register

Use your Mobile Phone to Help Us Locate Invasive Plants!

Top Invasive Plants!
Santa Monica Mountains

 Harding grass	 Perennial Pepperweed	 Poison hemlock
 Spanish Broom	 Terracina spurge	 Yellow Starthistle

Invasive Species in the News

[Master Gardener: Invasive plants harming area's native biodiversity](#)
Marin Independent-Journal
Of the 29 highest-priority invasive species at PRNS (included in a draft invasive plant plan), 14 are escaped ornamental garden plants. ...
[See all stories on this topic](#)

**36 People Contributing in Santa Monica!
1196 Invasive Weeds Found!**

Weed of the week: Terracina Spurge



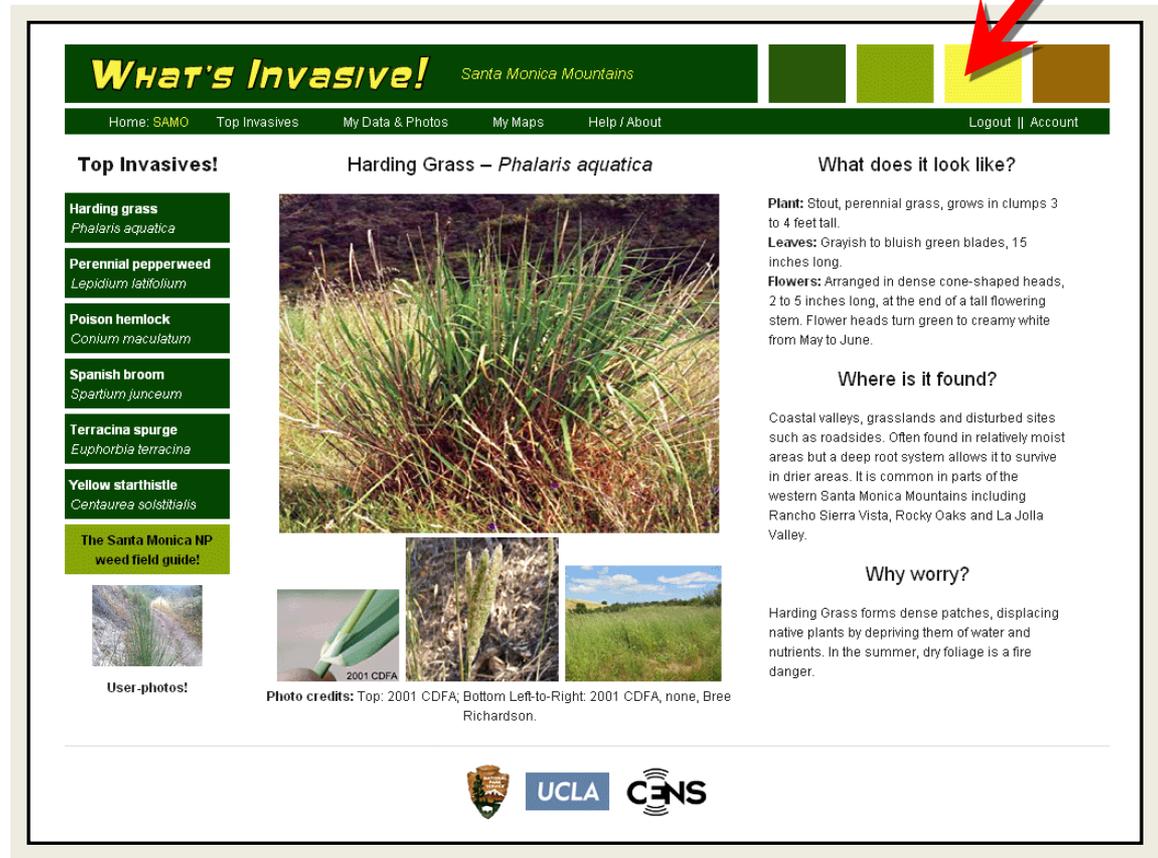
Terracina spurge is a perennial, shrub-like herb, 3 ft tall. Stems are green to reddish, leafy, and branching at top to produce 4 or 5 flowering stems. Leaves alternate, light green, averaging 0.5 to about an inch in length. Leaf-like structure on the flowering stems are opposite and round in appearance. Flowers are yellow/green cup-like structures, small, not showy but distinct from bright, green leaves. Broken stems produce a milky sap. Flowers in late February through April. [More](#)

Top Invasives has lots more information for weeds to look out for!

Content is constantly being updated on the Top Invasive plant species and their habits in the participating area.

Other species of interest and other information will soon be added.

Login to see you're My Data & Photos page.



What's Invasive! Santa Monica Mountains

Home: SAMO Top Invasives My Data & Photos My Maps Help / About Logout || Account

Top Invasives!

- Harding grass**
Phalaris aquatica
- Perennial pepperweed**
Lepidium latifolium
- Poison hemlock**
Conium maculatum
- Spanish broom**
Spartium junceum
- Terracina spurge**
Euphorbia terracina
- Yellow starthistle**
Centaurea solstitialis

The Santa Monica NP weed field guide!

Harding Grass – *Phalaris aquatica*



What does it look like?

Plant: Stout, perennial grass, grows in clumps 3 to 4 feet tall.
Leaves: Grayish to bluish green blades, 15 inches long.
Flowers: Arranged in dense cone-shaped heads, 2 to 5 inches long, at the end of a tall flowering stem. Flower heads turn green to creamy white from May to June.

Where is it found?

Coastal valleys, grasslands and disturbed sites such as roadsides. Often found in relatively moist areas but a deep root system allows it to survive in drier areas. It is common in parts of the western Santa Monica Mountains including Rancho Sierra Vista, Rocky Oaks and La Jolla Valley.

Why worry?

Harding Grass forms dense patches, displacing native plants by depriving them of water and nutrients. In the summer, dry foliage is a fire danger.

User-photos!



Photo credits: Top: 2001 CDFA; Bottom Left-to-Right: 2001 CDFA, none, Bree Richardson.

UCLA CENS

Data & Photos

Welcome egraham! Here is a summary of your participation:

Total Number of Observations: **16**

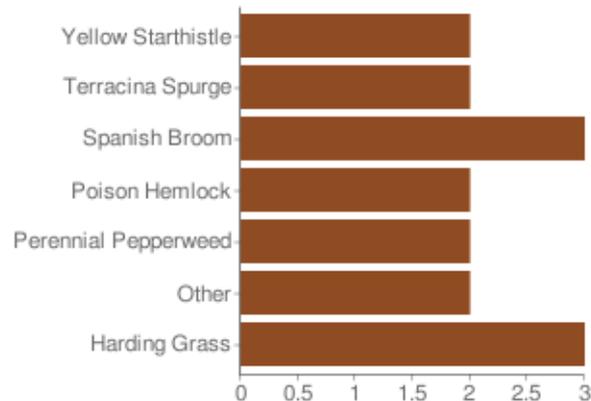
Breakdown by Species:

You Have Collected:

3% compared to the total collected by tsagar (top collector).

24% of that collected by the average user (who has 67 observations).

0 days of data collection.



What other kind of statistics would you like to see? Tell us [here](#)

View and sort your collected data, or make new observations.



Statistics on your participation.

Data & Photos

My Data

SAMO Data

My Photos

Plant Filter

Geo Filter

Sort By

My Non-Photo Data

SAMO Photos

Create Observation

My Photo-Based Observations

Filter by Plants: *All plants* , Geo: *Both tagged and untagged* , Sort: *Most recent*

Editing Image 3949450588



Title: Harding Grass
Link: [Photo: 3949450588](#)
Tags: hardinggrass
0373fb672bbda92172fe85c980112ced
Wf: patesamo
Date Uploaded: Wed, Sep 23 09 18:17:12
Last Updated: Wed, Sep 23 09 18:17:14

Delete Image Only

Completely Delete Submission

Modify Title:

Harding Grass

Modify Plant Tag:

Harding Grass

Perennial Pepperweed

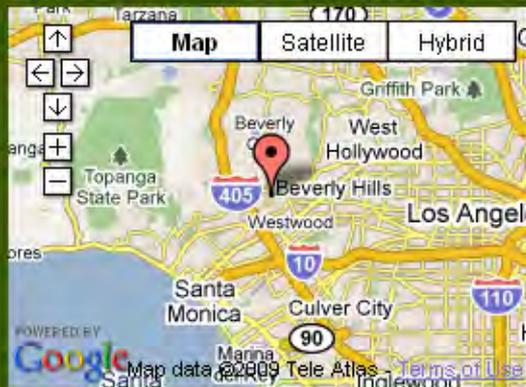
Poison Hemlock

Enter Loc:

GPS

(34.069275,-118.443031)

Save Changes



edit

Edit your photos and observations.

Update or delete your collected data, make changes to the location, photos, or correct mis-identification of plants.

Select your photo or non-photo observations for review and editing.

What's Invasive!

Santa Monica Mountains

Home: SAMO

Top Invasives

My Data & Photos

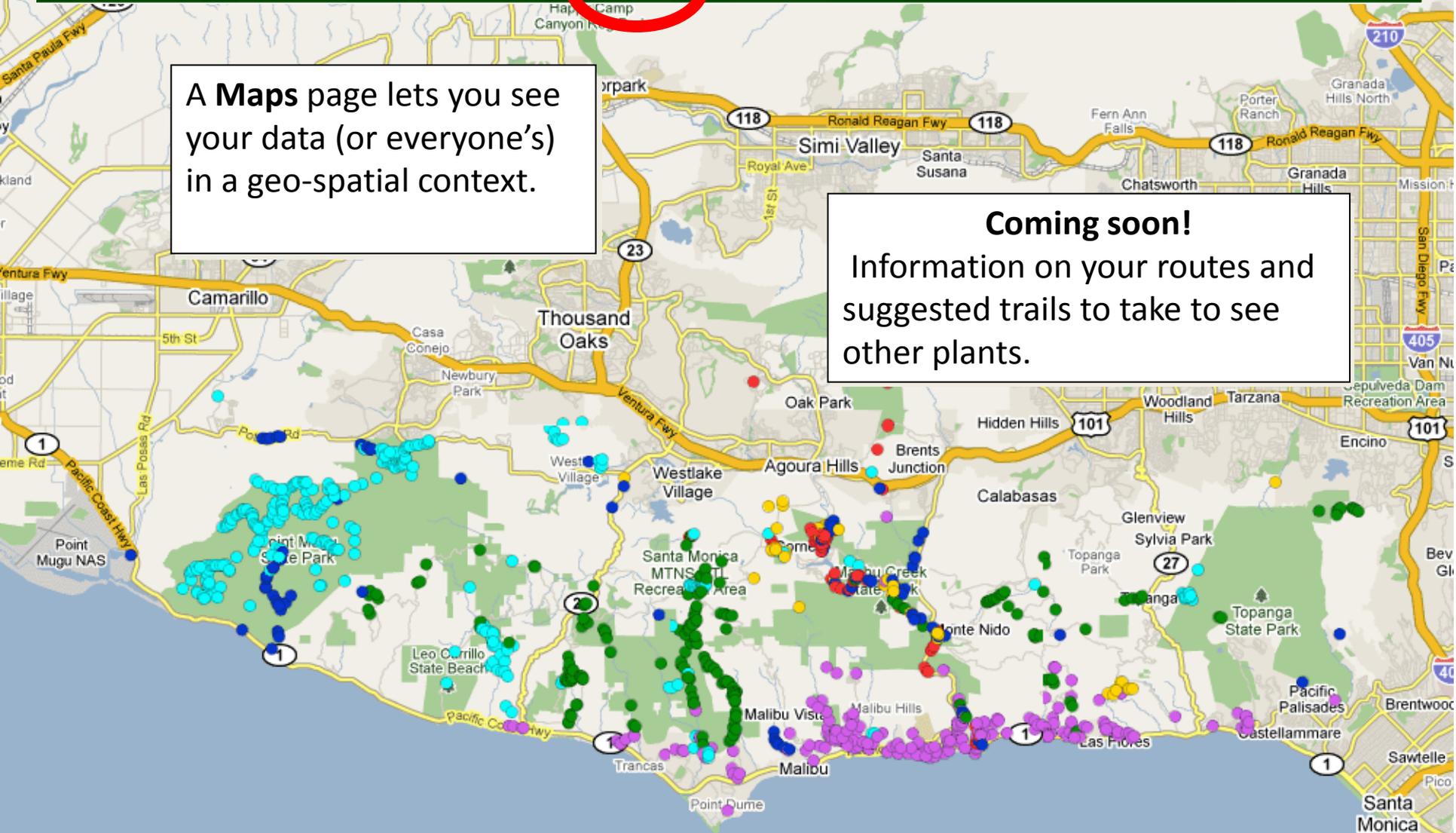
My Maps

Help / About

Logout || Account

A **Maps** page lets you see your data (or everyone's) in a geo-spatial context.

Coming soon!
Information on your routes and suggested trails to take to see other plants.



So **Register** and help start collecting invasive plant species info in your area!

Download the **Android G1** phone application to get started:

<http://whatsinvasive.com/dl>

The **iPhone** application is currently pending.



Registration:

Please complete the form below (* required field):

Username*:	<input type="password"/>
Password*:	<input type="password"/>
Repeat Password*:	<input type="password"/>
Email:	<input type="text"/>
First Name:	<input type="text"/>
Last Name:	<input type="text"/>



Please contact the project manager for more info: egraham@cens.ucla.edu

The Field Trial

- Six NPS staff
- In the field for two weeks
- Collected over 800 photos and points
- Photos stored on flickr
- Data stored in the cloud



Data Accuracy

- Sampled 50 photos for two species
- Perennial Pepperweed (90% accurate)
 - 3 undetermined
 - 2 incorrect
 - 45 correct
- Harding Grass (92% accurate)
 - 2 undetermined
 - 2 incorrect
 - 46 correct



RESULTS

What's Invasive! Santa Monica

Data & Photos

All SAMO Summary
Global statistics

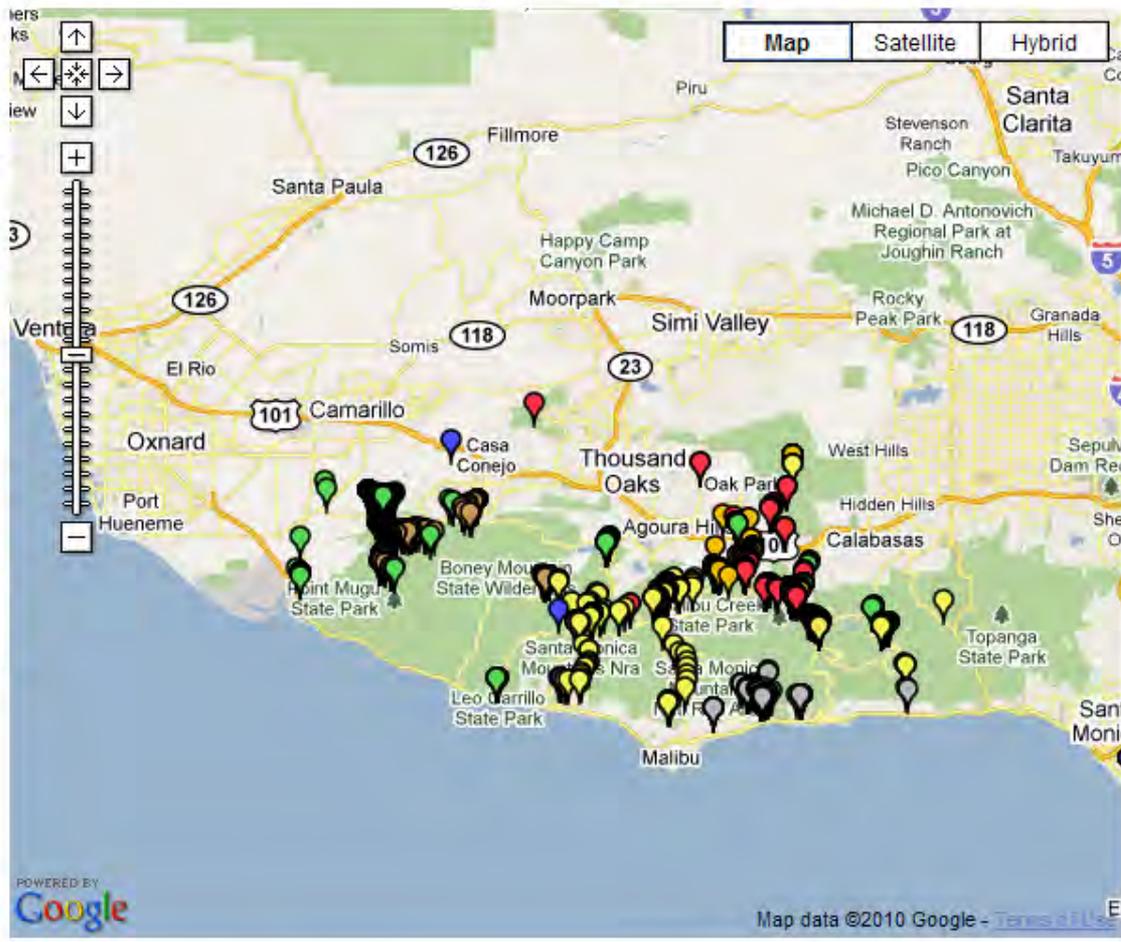
All SAMO Data
Current data

All SAMO Map
Current map of all data

Create an Observation
Enter web form data

Send Data to EddMaps
Make observation official

Download the Data
Get all data from park



All data collected in SAMO

Plants

- Harding Grass
- Other
- Perennial Pepperweed
- Poison Hemlock
- Spanish Broom
- Terracina Spurge
- Yellow Starthistle

Animals

What's Invasive! Santa Monica

Data & Photos

All SAMO Summary
Global statistics

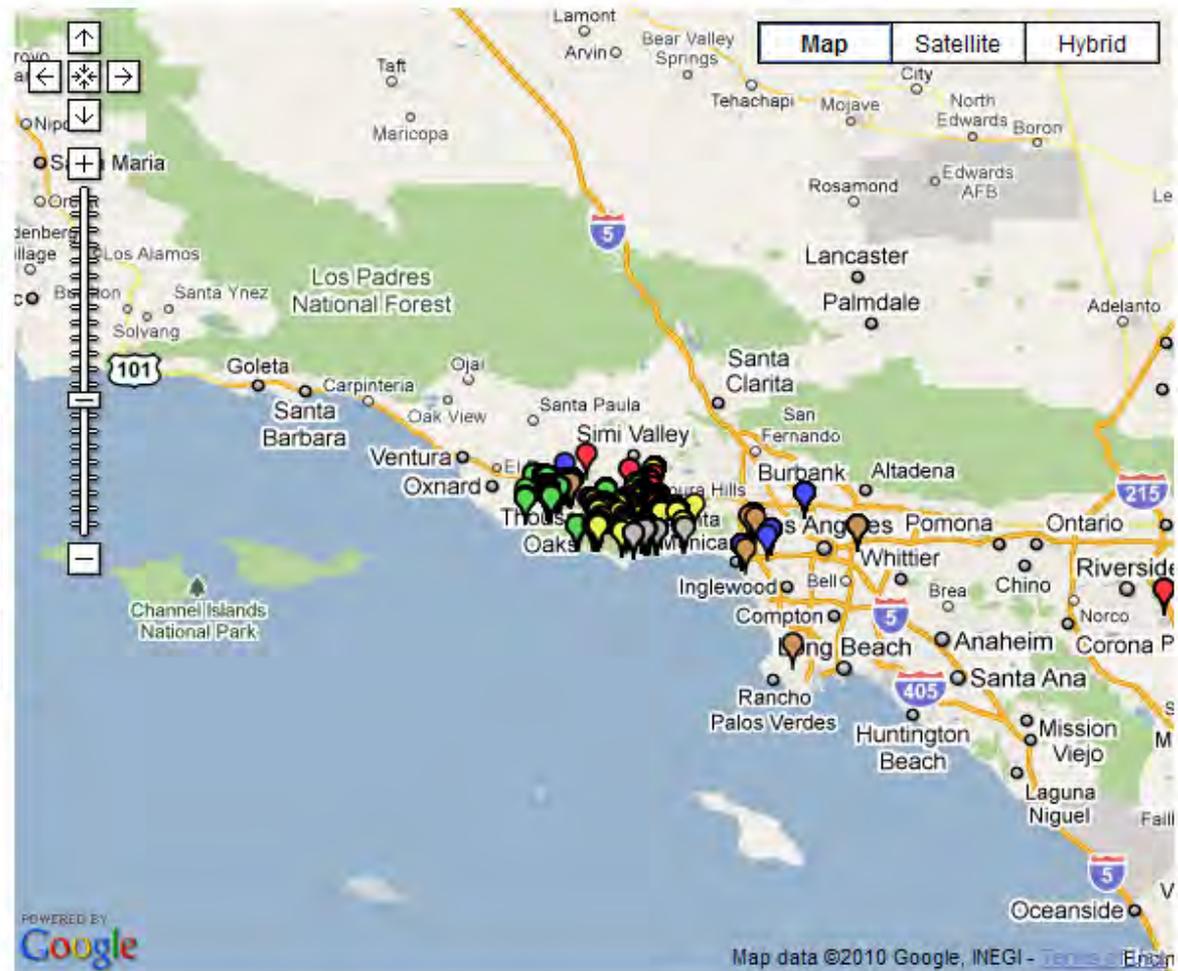
All SAMO Data
Current data

All SAMO Map
Current map of all data

Create an Observation
Enter web form data

Send Data to EddMaps
Make observation official

Download the Data
Get all data from park



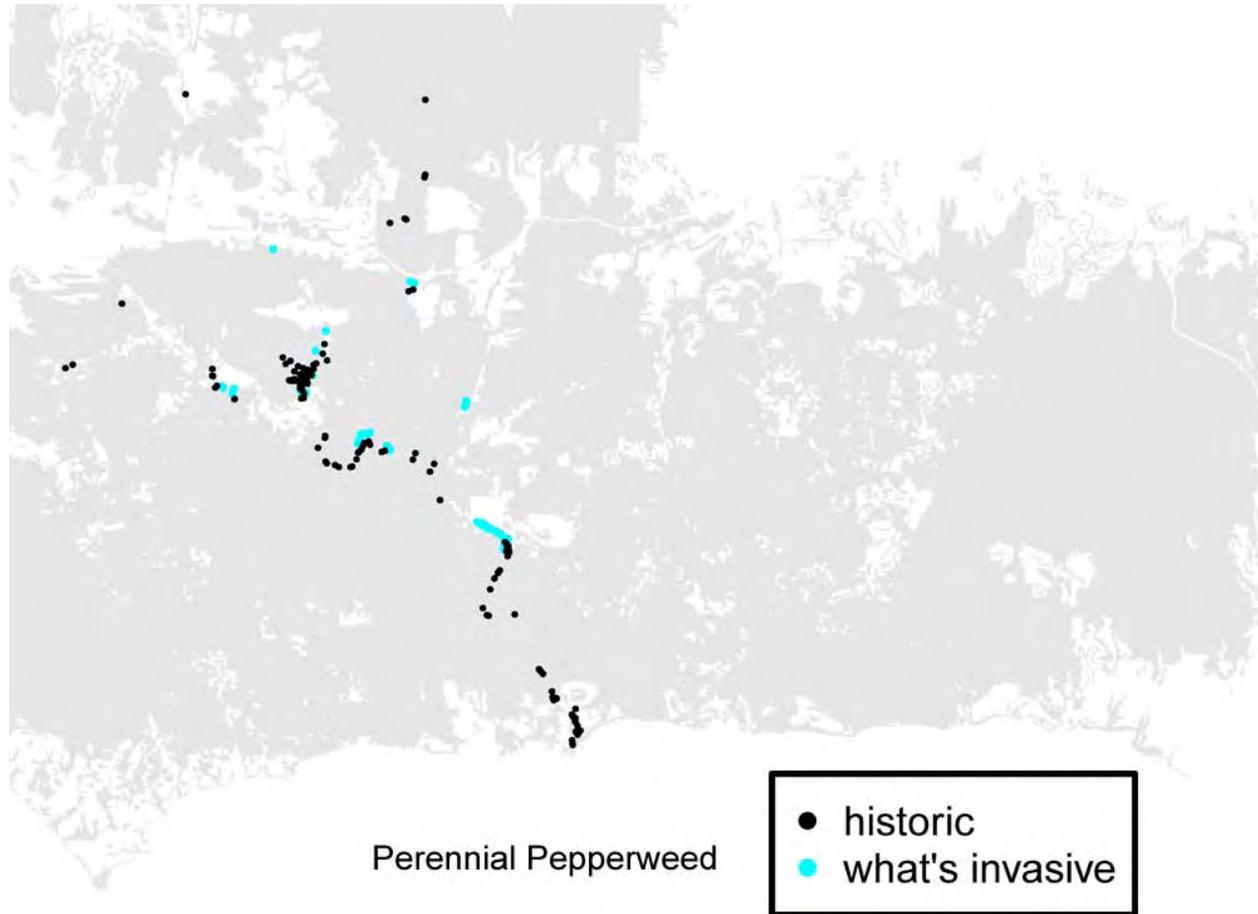
All data collected in SAMO

Plants

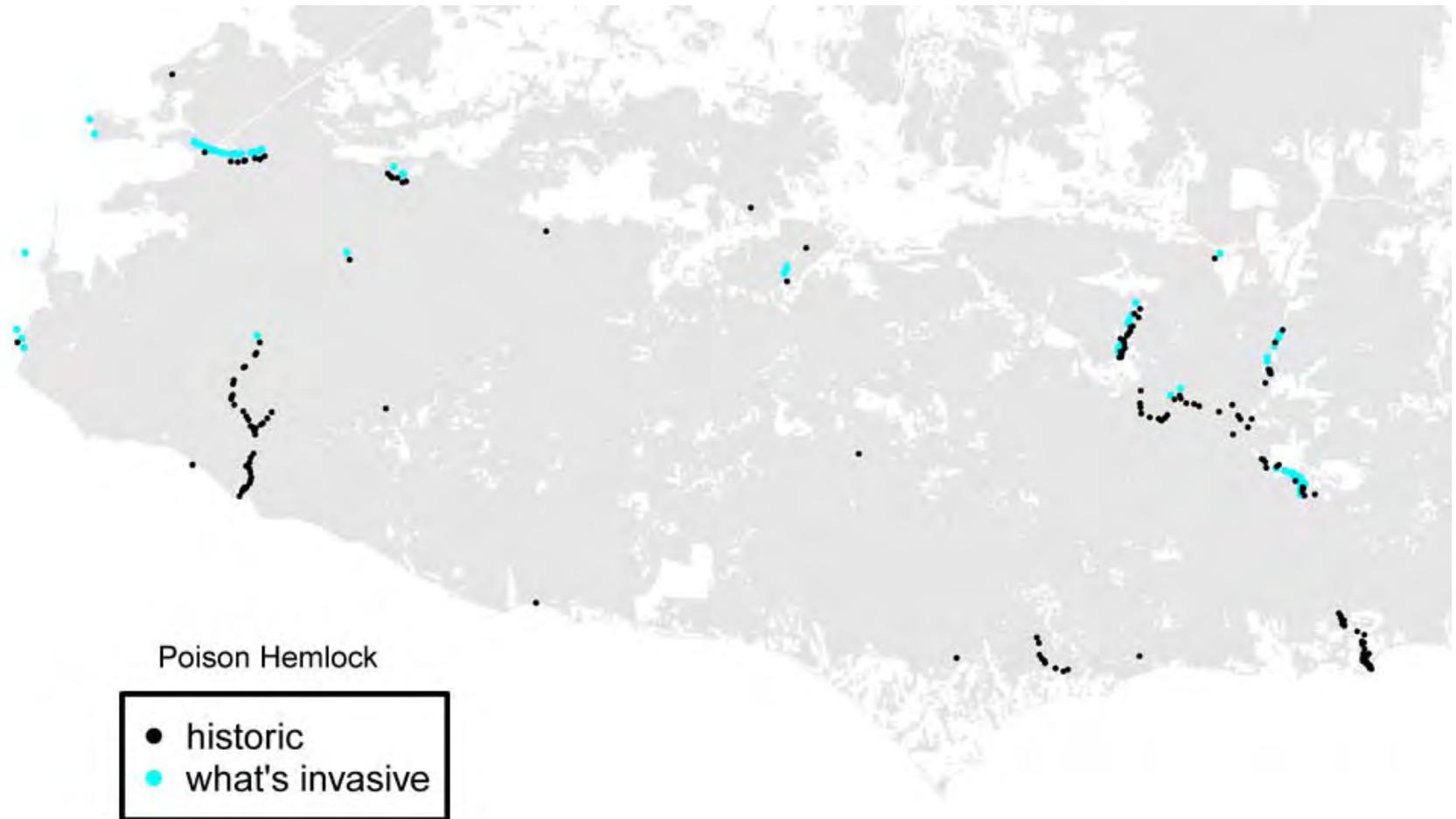
- Harding Grass
- Other
- Perennial Pepperweed
- Poison Hemlock
- Spanish Broom
- Terracina Spurge
- Yellow Starthistle

Animals

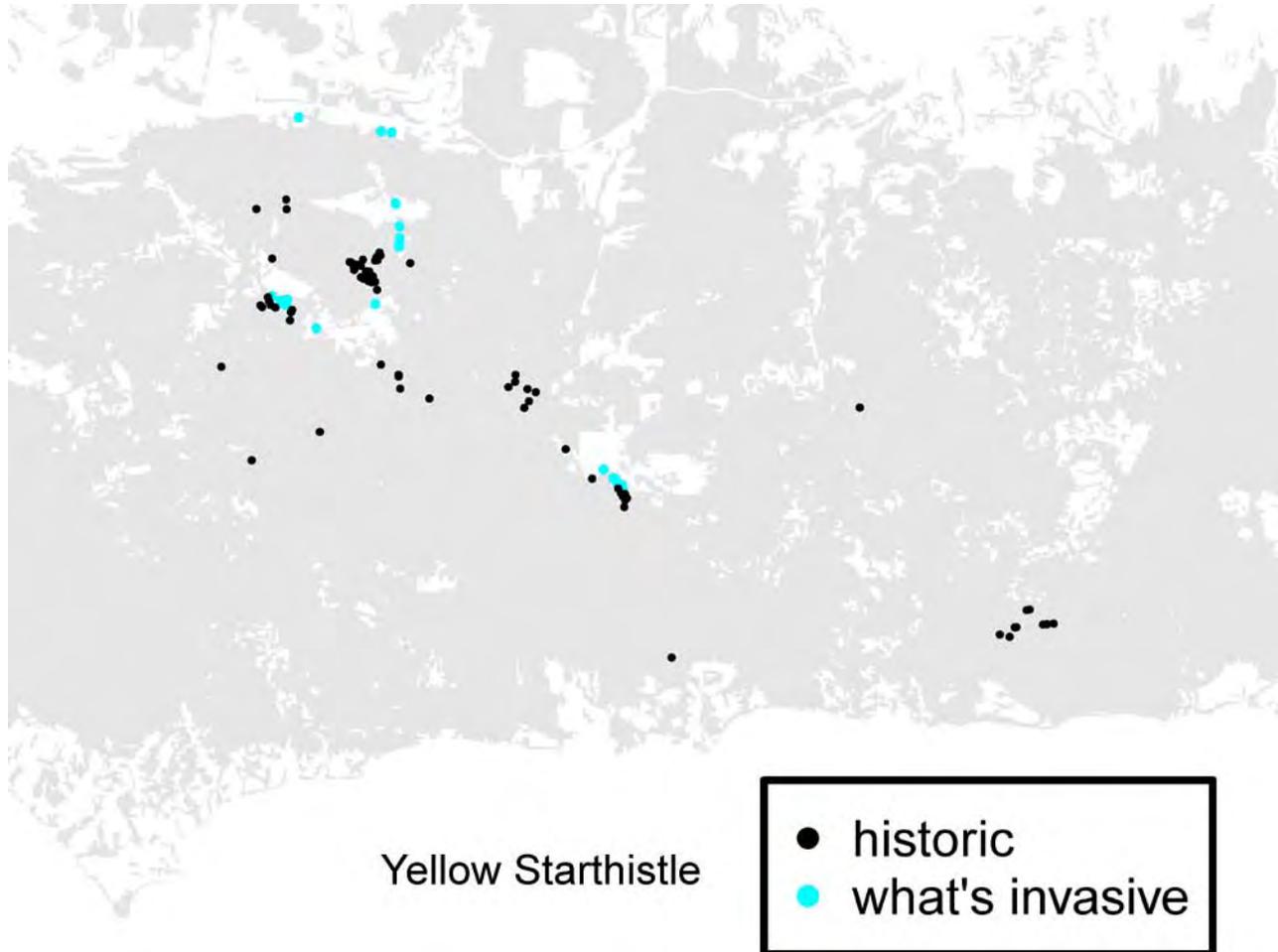
Pepperweed Spread 2005-2009



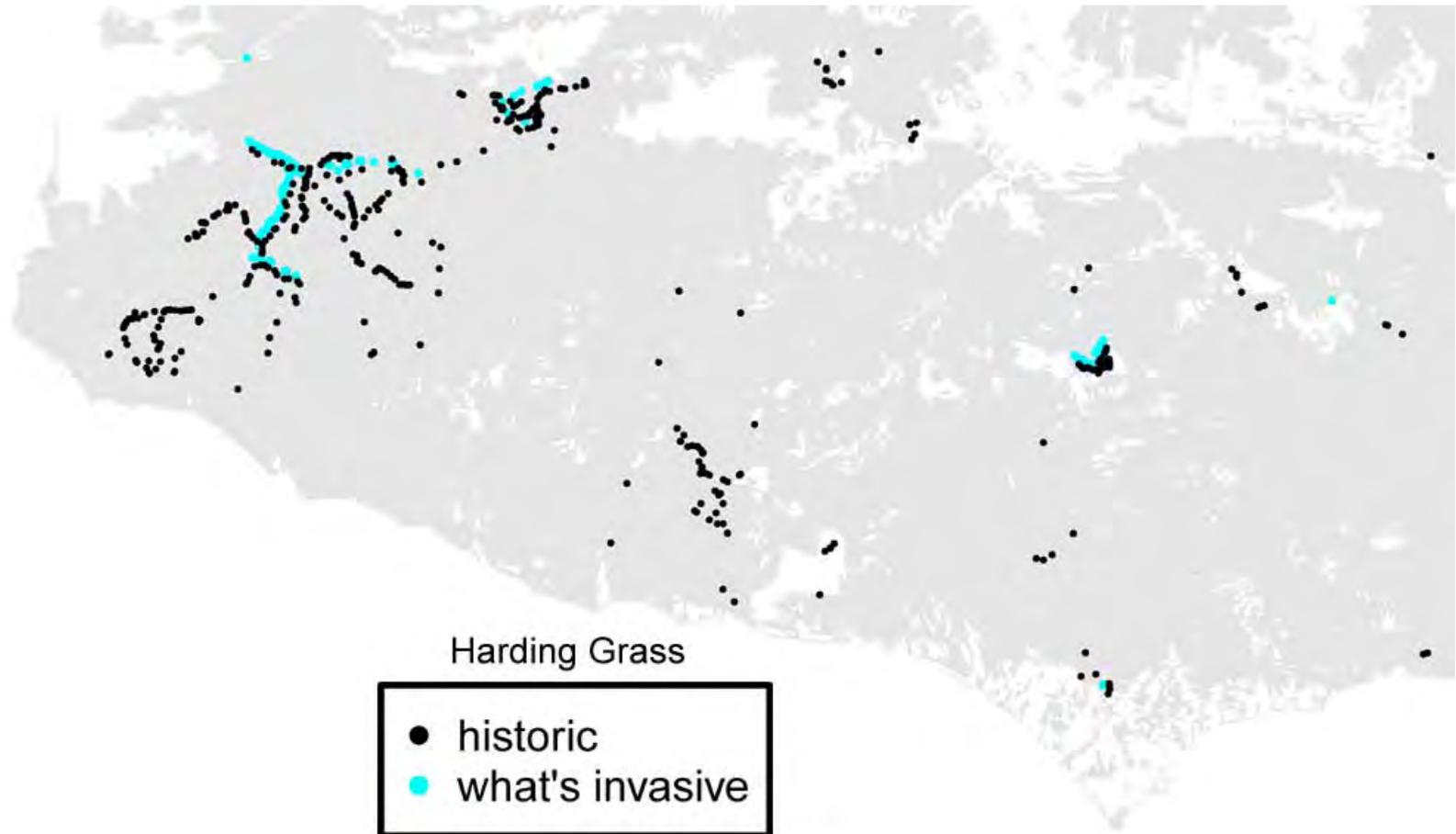
Poison Hemlock Spread 2005-2009



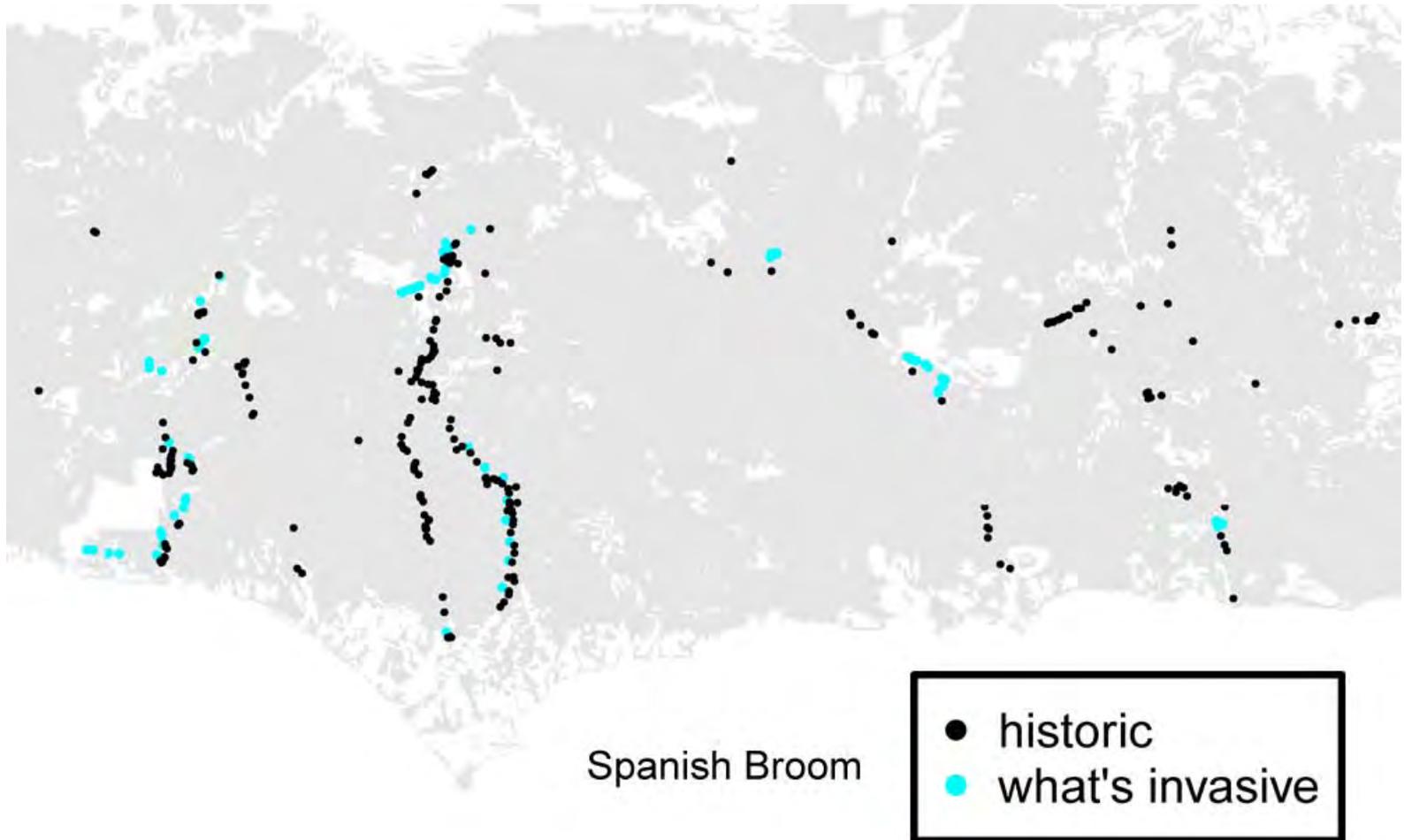
Yellow Starthistle Spread 2005-2009



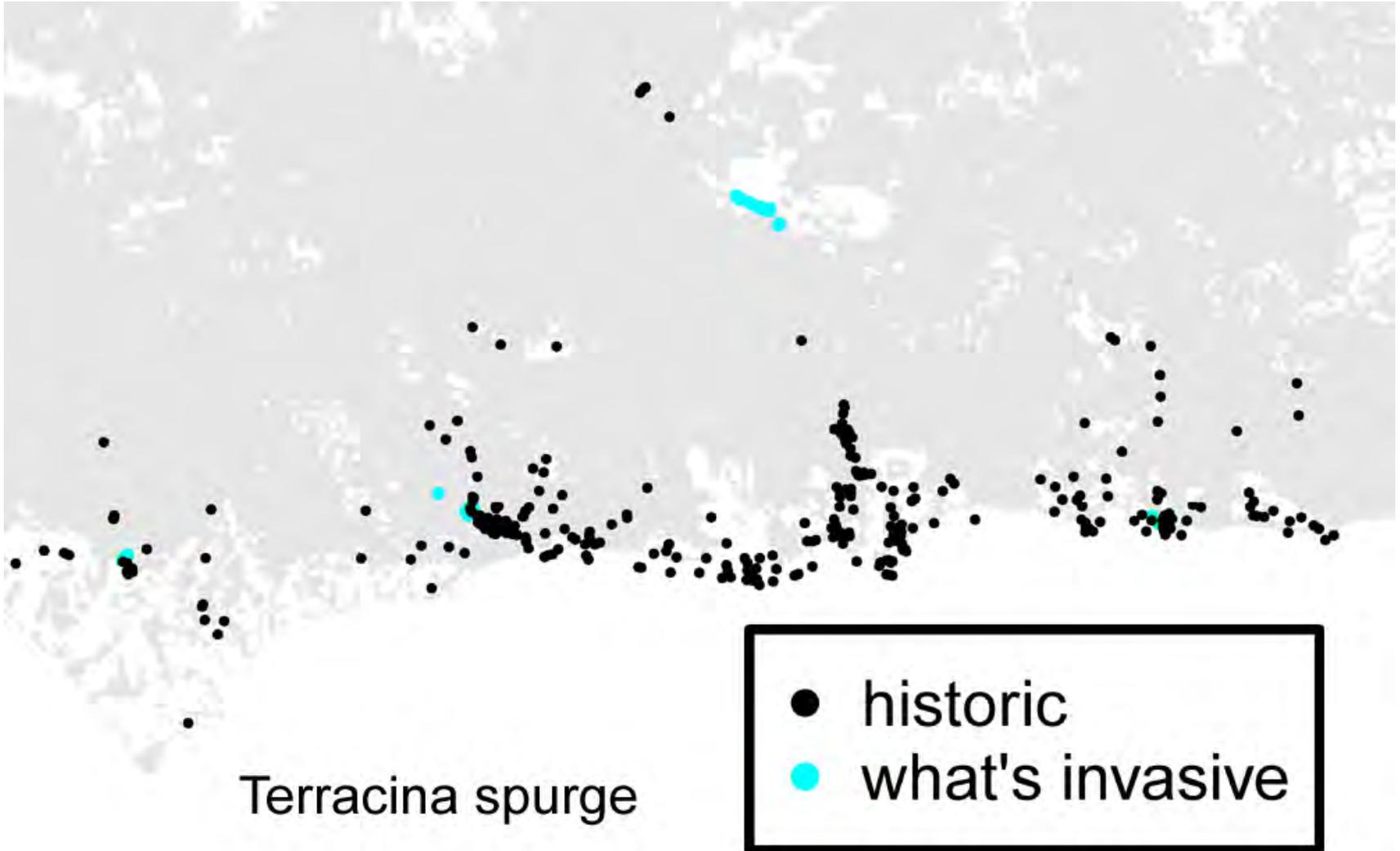
Harding Grass 2005-2009



Spanish Broom 2005-2009



Terracina Spurge 2005-2009



Current Status of What's Invasive

- SAMO – 28 users, 1111 plants
- Global Stats:
 - 18 parks
 - 941 users
 - 2897 observations
- Channel Islands
- Catalina Island
- PV Peninsula
- Denmark
- Skamania Co, WA
- Hawaii
- Indian Hills High School, NJ

What's Invasive! IHHS

Home | IHHS Top Invasives Data & Photos Maps Help & About News & Events Login Register

2 People Contributing 11 Invasive Weeds 0 Invasive Animals

Top Invasive Plants!

 Common Reed	 Crown Vetch	 English Ivy
 Japanese Barberry	 Japanese Honeysuckle	 Japanese Knotweed
 Japanese Barberry	 Japanese Honeysuckle	 Japanese Knotweed

Indian Hills Regional High School



INDIAN HILLS HIGH SCHOOL
97 Yawpo Avenue, Oakland, NJ 07436

Photo credit: IHHS

Indian Hills is a regional high school in Northern New Jersey, USA. A few of our horticulture classes are working to create an invasives map of our school campus.

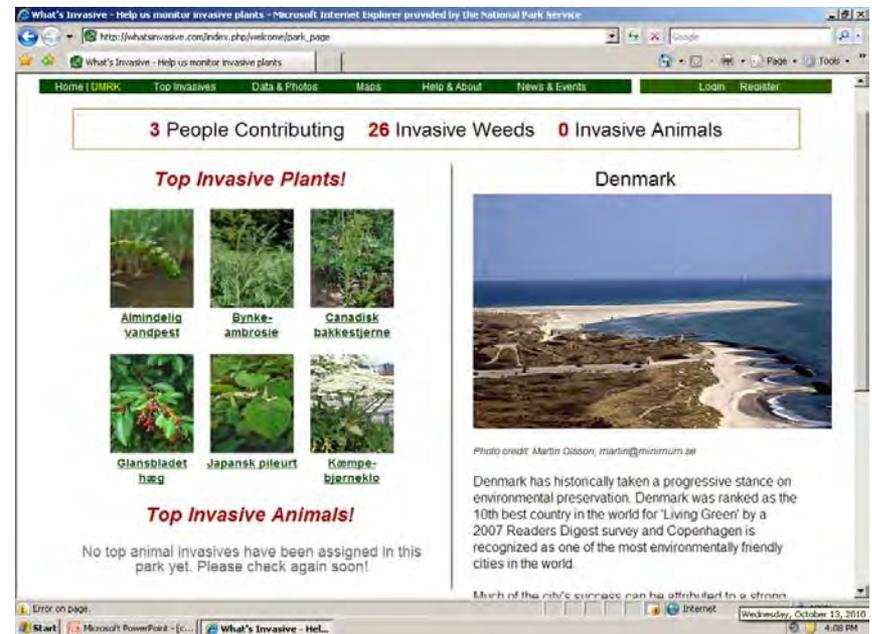
<http://www.rih.org/page.cfm?p=12>

Done, but with errors on page.

Start Microsoft PowerPoint - [c... What's Invasive - Hel... Internet 100% 4:02 PM

The Good

- Appeals to young and tech savvy
- Extremely low maintenance
- Photos work for verification
- Easy to use
- Of large interest to school groups
- Can be used in areas lacking cell coverage
- Great tool for non-plant staff



The Not So Good

- Might not work with lots of species
- Might not work with lots of i.d. info.
- Technical difficulties
- Check your datum
- Costly phones and phone service
- Doesn't actually kill the weeds for you...



Future Work

- Involve more schools with What's Invasive
- Develop What's Blooming in partnership with Project BudBurst
- Start to use data in control work
- Directed surveys via phone updates?

