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

Christy Brigham Ph.D.
National Park Service – Santa Monica Mountains N.R.A.
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...
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• Instantly out of date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
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 recycling infrastructure, and to learn more about when, where, and what materials get thrown away on campus. Students in the Education for Sustainable Living (ESLP) Program at UCLA along with interested students involved with CENS 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 coverage (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.
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...
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.
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.
measure walking activity by leveraging cell phone, gis, and widely available sensors

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

The footprint 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
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. Monuments872
2. Imageability
3. Juncture

Featured Articles:
networked naturalist

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.
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
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.
One, Few, or Many is the amount of invasives you see.

Photo on/off to add a photo to your observation.

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

Select the weed name and the phone will record your position and send the weed location to the What’s Invasive! website.

Making a contribution with the data that is needed.
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.
Poison Hemlock
Conium maculatum

Poison Hemlock is a Biennial herb, 3 to 8 ft tall. Stems: Stout, hollow and purple spotted with distinct ridges and extensive branching. It is found Moist fields, meadows, along roadsides and scattered in riparian areas. It is common along...
The Settings button brings you to a page where you can change your location manually, enable automatic uploads, and reset your login.

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.
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.

User-configurable for data collection under your control.
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

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

(invasive parks available soon!)

Invasive Species in the News

Master Gardener: Invasive plants harming area’s native biodiversity
Maine Independent-Journal
Of the 29 highest-priority invasive species at PFNS (excluding a dock invasive plant) 18 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!

Native grass, Poirot Pepperweed, Poison hemlock, Spanish broom, Terracotta spurge, Yellow Starthistle

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

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

**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.

**Help** is available for every step.
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.
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 your My Data & Photos page.
View and sort your collected data, or make new observations.
Select your photo or non-photo observations for review and editing.

Edit your photos and observations.

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

Please contact the project manager for more info: egraham at 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
Pepperweed Spread 2005-2009
Poison Hemlock Spread 2005-2009

Poison Hemlock
- historic
- what's invasive
Yellow Starthistle Spread 2005-2009
Harding Grass 2005-2009
Spanish Broom 2005-2009
Terracina Spurge 2005-2009

Terracina spurge

- historic
- what's invasive
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
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?