

Using mobile phones and citizen scientists to map invasive species and track weed spread over time

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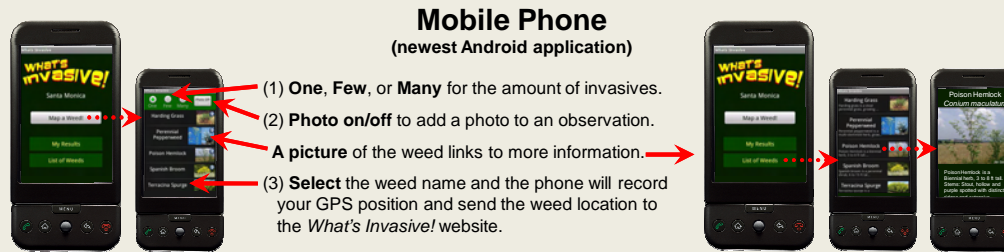


Introduction

- **Weed maps** are important tools that allow managers to identify the extent of invasive species problems, look for threats to high priority areas or conservation targets, develop budgets, create timelines, and generate grant proposals for weed control.
- **Two drawbacks** of typical weed maps are the high cost of producing these documents (hundreds to thousands of hours in the field) and the fact that they rapidly go out of date due to either continuing expansion of invasive species or effective control work decreasing weed abundances.
- **Rapid detection and removal** of invasive species infestations when they are small (under one hectare in size) increases the likelihood of treatment success and reduces treatment cost (Pitcairn and Rejmanek 2002).
- **Mobile phones** are ubiquitous and can be used to allow citizen scientists and staff to quickly document and track invasive species infestations including documenting new occurrences or tracking spread over time.

Logistics

- **Six target invasive species** with limited distribution and large ecological impact were provided by NPS scientists as the focus of our mapping efforts. These included:
Perennial pepperweed (*Lepidium latifolium*), Terracina spurge (*Euphorbia terracina*), Spanish broom (*Spartium junceum*), Yellow starthistle (*Centaurea solstitialis*), Poison hemlock (*Conium maculatum*), Harding grass (*Phalaris aquatica*).
- **What's Invasive!** software for the Nokia N95 smart phones and a website were created by CENS scientists and staff.
- **Field testing** occurred for two weeks by eight National Park Service field staff in a variety of jobs who were provided with phones and photographed any of the six weeds encountered inside the park.
- **A one-hour training** occurred prior to collecting data in the field on how to use the phones and how to identify the target species.



Home page, Santa Monica NRA

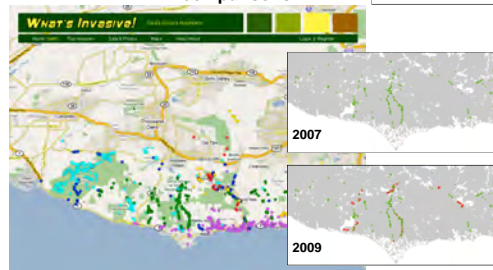


Website

Mapping, Data, and Weed Information



Real-time mapping, comparisons



Results and Discussion

- **811 weed occurrences** were detected over 14 days by 8 people, which is almost 1/4 of the total detected over a two-year survey.
- **An additional 23 people** have signed up since the pilot and have detected an additional 293 weed occurrences.
- **Mapping has validated** the new observations from the pilot, with consistent overlap with previously detected occurrences. Expansion of invasive species into new areas has also been detected.
- **Feedback** by the volunteers during the pilot have resulted in new versions of the software (shown here), with the ability to record abundance information, allow for rapid non-photo observations, and expand data collection with email and web-based upload of observations.

Future Work

- **Further field trials** with park volunteers.
- **Updates** to the software and webpage, including multiple-park capabilities.
- **A full public launch** of the application and website.

Conclusions

For natural areas with weed problems and good GPS reception, visitors or volunteers with mobile phones may be extremely efficient for mapping and early detection of weed problems. Our mobile phone applications and web system tools can facilitate this citizen science activity, increasing participation, involvement, and interest in natural areas and management.

Would you like to become a *What's Invasive!* field site? Do you have your own target species lists or maps? Contact us via e-mail or through the website:

<http://whatsinvasive.com>

References

Pitcairn, M. and M. Rejmanek, 2002. When is eradication of exotic pest plants a realistic goal? Pages 249-253 in Vitich, C.R. and Clout, M.N., eds. Turning the tide: eradication of invasive species. IUCN, Gland, Switzerland.

