Community Scientists Help to Map Post-Fire Recovery on California's Central Coast

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Project work by Stephanie Calloway, Zac Canter, Kylie Etter, Josie Lesage, John Gallo, Denise Knapp, and Steve Windhager
1. Project Background
   • Who/What/Where/When/Why
   • How – apps and training
2. Volunteer outcomes
   • Engagement
   • Contributions
3. Lessons learned
At the time: largest recorded fire (281,893 acres) in California
• Now 9th place

Are ecosystems recovering after fire?

<table>
<thead>
<tr>
<th>Chicago, IL</th>
<th>New York, NY</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Chicago Map" /></td>
<td><img src="image2.png" alt="New York Map" /></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Bay Area, CA</th>
<th>Los Angeles, CA</th>
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<tbody>
<tr>
<td><img src="image3.png" alt="Bay Area Map" /></td>
<td><img src="image4.png" alt="Los Angeles Map" /></td>
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</tbody>
</table>

LA Times
1. Survey fire scars to prioritize areas in need of restoration
   a. Map invasive species
   b. Map rare species
   c. Identify areas that need restoration
      • At risk of erosion
      • Native species not recovering
      • Other signs of environmental damage

2. Engage community scientists
   a. Test effectiveness of volunteer community scientists for rapid post-fire assessment
   b. Develop community of volunteer botanists in our “backyard”
Project Goals

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Who:
Community scientists

- 200+ people registered in 2020...
  ... but then COVID-19 pandemic

- **101 total volunteers**
  - 58 participants in 2020
  - 50 participants in 2021
    - 7 repeat participants

- A **range of botanical skill**: newbies to grizzled dichotomous key vets

- Each volunteer was assigned a trail to hike and chose to look for **12 or 24 invasive species**
Focal invasive species

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common name</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ageratina adenophora</em></td>
<td>Sticky snakeroor</td>
<td>Level 1</td>
</tr>
<tr>
<td><em>Arundo donax</em></td>
<td>Giant reed</td>
<td>Level 1</td>
</tr>
<tr>
<td><em>Asphodelus fistulosus</em></td>
<td>Onion-leaved-asphodel</td>
<td>Level 1</td>
</tr>
<tr>
<td><em>Cenchrus setaceus</em></td>
<td>Fountain grass</td>
<td>Level 2</td>
</tr>
<tr>
<td><em>Centaurea melitensis</em></td>
<td>Maltese star thistle</td>
<td>Level 2</td>
</tr>
<tr>
<td><em>Centaurea solstitialis</em></td>
<td>Yellow star thistle</td>
<td>Level 2</td>
</tr>
<tr>
<td><em>Cortaderia selloana</em></td>
<td>Pampas grass</td>
<td>Level 1</td>
</tr>
<tr>
<td><em>Delairea odorata</em></td>
<td>Cape ivy</td>
<td>Level 1</td>
</tr>
<tr>
<td><em>Foeniculum vulgare</em></td>
<td>Fennel</td>
<td>Level 1</td>
</tr>
<tr>
<td><em>Nicotiana glauca</em></td>
<td>Tree tobacco</td>
<td>Level 1</td>
</tr>
</tbody>
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Total of 24 species
Split into two levels of 12 species
Data collection with iNaturalist

• Easy to use
• Beginner-friendly
• Active community of data verifiers
• Data verification easy to implement
• Public data access

We also collected data using AnecData.org for landscape-scale data
Volunteer Training

2020:
• Classroom and field training to introduce apps and plants
• Booklets to help with ID

2021:
• Virtual (zoom) training and video to introduce apps and plants
• Booklets to help with ID

Example ID guide page:
Surveyed *maintained* and *accessible* routes in the Thomas Fire scar

*surveyed in Whittier Fire scar too; not shown*

Focus today on the Santa Barbara front range

Largest volunteer contribution
Project results
Volunteer contributions

Collectively, volunteers contributed 1,337 hours to the project

Training:
• 990 hours (including those who left project)
• 353 hours (data collectors only)

Surveying:
• 347 hours

At $28.54/hour, this would cost $38,158
Who participated?

Most of our volunteers had some botanical ID experience

No statistical difference in the ID experience of those who collected data vs. who did not

(chi-square test, $p = 0.778$)
Who participated?

Volunteers who self-identified with higher botanical ID experience chose to look for more species.
Staff and volunteers collected over 4,000 plant observations.
Roughly half of volunteer data was for **focal** invasive species.
Example of knowledge gained: Ageratina adenophora
Example of knowledge gained: Ageratina adenophora
Challenges to working with volunteers and iNaturalist

• Volunteers can only possibly cover **the weeds they know to look for**
  • Potential to miss new and incoming weeds

• Volunteers have different skill levels, attention to detail – **data quality varies**
  • Redundancy is helpful – build it in
  • Some plants have common look-alikes: *Arundo vs. Leymus condensatus*

Which is *Leymus* and which is *Arundo*?
Challenges to working with volunteers and iNaturalist

• Expect a high falloff rate – only ¼ to ½ of volunteers will contribute.

• iNaturalist is good for point data, but additional data (area, density, # of plants) are difficult to capture:
  • No polygon or line data options.
Successes and lessons learned

• Provide specific **locations** and **timeframes** for data collection
  • We provided maps and suggested hiking between April and June
  • Gritty detail could be even better
  • Not all weeds are IDable at the same time – time hikes for peak ID

• Focus on **specific weeds**
  • 24 was probably too many
  • Only search for species of concern or that need info
Successes and lessons learned

• Provide **thorough training in app use** and **ID skills**
  • We trained on how to take **good photos** of plants and advised **taking multiple photos**
  • Spend more time on botanical ID skills training
    • Flower parts, morphology, life stages

• **Test your materials** before giving to volunteers!
Thank you!

Questions?

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Focal Non-native Species

Full focal invasive species list (47 species)

Araujia sericifera (cruel vine)
Arundo donax (giant reed)
Asphodelus fistulosus (onionweed)
Carthamus lanatus (woolly distaff thistle)
Centaurea maculosa (spotted knapweed)
Chondrilla juncea (skeletonweed)
Delairea odorata (Cape Ivy)
Foeniculum vulgare (wild fennel)
Nicotiana glauca (tree tobacco)
Pennisetum setaceum (fountaingrass)
Ricinus communis (castor bean)
Stipa (Nasella) tenuissima (feather grass)

Ageratina adenophora (sticky snakeroot)
Ailanthus altissima (tree of heaven)
Brassica tournefortii (Saharan Mustard)
Centaurea melitensis (tocalote)
Centaurea solstitialis (yellow star thistle)
Cistus incanus (haairy rockrose)
Cortaderia spp. (pampas grasses)
Cynara cardunculus (artichoke thistle)
Cytisus scoparius (Scotch broom)
Euphorbia terracina (carnation weed)
Genista monspessulana (French broom)
Spartium junceum (Spanish broom)

Green: beginner species (12)
Orange: intermediate species (24+)
Black: staff-level species (47)

Acacia baileyana (cootamundra wattle)
Acacia paradoxa (kangaroo thorn)
Acaena novae-zelandiae (biddy biddy)
Bromus tectorum (cheatgrass)
Carpobrotus edulis (ice plant)
Cucumis melo (cantaloupe melon)
Echium plantagineum (salvation echium)
Ehrharta calycina (veldt grass)
Eichhornia crassipes (water hyacinth)
Elymus caput-medusae (medusa head)
Hedera canariensis (Canary ivy)
Hedera helix (English ivy)
Lepidium latifolium (perennial pepperweed)
Ludwigia hexapetala (water primrose)
Ludwigia peploides (marsh purslane)
Onopordum acanthium (Scotch cottonthistle)
Rubus armeniacus (Himalayan blackberry)
Tagetes minuta (little marigold)
3 Tamarix spp. (Tamarisk)
Staff and Community Scientists saw the same plants!

- **Observed by community scientist**
  - March 19, 2020

- **Observed by staff**
  - April 23, 2020

*Ageratina adenophora*  
(Sticky snakeroot)
Staff and Community Scientists saw the same plants!

Observed by community scientist
March 21, 2021

Observed by staff
June 28, 2021

*Foeniculum vulgare*  
(Fennel)
Spatial prioritization model

Using both our collected data and pre-existing spatial information, we will identify key areas for restoration.

Early model of intervention areas (dark red) based on satellite and collected data.