Santa Ana River Watershed
Arundo Donax Mapping Using Drones
We believe in...

Nature Done Simply
726
Problem With INVASIVE SPECIES
Arundo Donax

Ecological Threat- Arundo (Arundo donax) invades wetlands such as ditches, stream banks and lake shores. Arundo competes for water, nutrients and radiation, suppresses and excludes native vegetation which degrades wildlife habitat, increases fire risks and interferes with flood control. Arundo is native to India and was introduced into the United States in the early 1800s for ornamental purposes.
Invasive species reduce wildlife habitat, significant cause for extinction and endangered species.

Identification critical for documenting new and highly invasive species for eradication before they become established, widespread and cause economic and ecological harm.

Vital to managing our unique biodiversity found in California.

Estimated in California invasive pests cost $3 billion per year.

Identify where located to prevent infestation, manage spread and allocate resources to eradication.
Over the long term, the intent may be to manage invasive plants across all areas within the Plan’s spatial scope, but when resources are limited, area priorities help inform where to use those resources.
What species are of the greatest concern?

Create SMART goals.

Where do they occur?

Develop efficient and effective strategies.

How much is present?

Evaluate long-term effectiveness.
Corridor surveys, grid-based surveys, full coverage swaths, opportunistic sampling, line transects, belt transects, permanent plot monitoring, and photo points.

Sensors deployed on planes, helicopters, and drones from which visual data are collected (collectively referred to as remote sensing). Remote methods also include aerial mapping of invasive plant populations by human observers from a helicopter.
US FOREST SERVICE

need to develop and implement *less costly* ways to obtain needed resource information...

The Forest Services Remote Sensing Applications Center (RSAC)
Remote Methods
What If...

"You could identify the densities of Arundo within your project area? For example, your watershed."
Provided the Santa Ana Watershed Association (SAWA) with a plant species recognition flight of 211 acres upstream of River Road Bridge to identify Arundo concentrations.
Deliverables
<table>
<thead>
<tr>
<th>Areas</th>
<th>APN Coverage</th>
<th>Acres of Arundo</th>
<th>% of Arundo</th>
</tr>
</thead>
<tbody>
<tr>
<td>APN 130080012</td>
<td>1.27</td>
<td>0.02</td>
<td>1.58</td>
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<tr>
<td>APN 130080015</td>
<td>7.11</td>
<td>2.12</td>
<td>29.82</td>
</tr>
<tr>
<td>APN 130090002</td>
<td>90.73</td>
<td>19.06</td>
<td>21.01</td>
</tr>
<tr>
<td>APN 130090001</td>
<td>63.34</td>
<td>29.22</td>
<td>46.13</td>
</tr>
<tr>
<td>APN 130080007</td>
<td>48.91</td>
<td>27.61</td>
<td>56.45</td>
</tr>
<tr>
<td>Total</td>
<td>211.36</td>
<td>78.03</td>
<td>36.92</td>
</tr>
</tbody>
</table>
Biologists

Frees up resources to complete other activities:
✓ Conduct sensitive species surveys
✓ Develop plans to eradicate an invasive species
✓ Remove more invasives
✓ Monitoring activities
✓ Analyze data
✓ Create new programs
✓ Be able to apply for more permits
✓ Be able to do more biology!
Methods

- **U.S. Patent No. 9,984,455**
- **Unmanned Aerial Vehicle (Drone) platform**
- **Ultra-high resolution 4K digital camera**
- **Images were stitched to form an orthomosaic output**
- **Deep learning species recognition software**

### Mission Log

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mission Date</strong></td>
<td>9/20/2018</td>
</tr>
<tr>
<td><strong>Mission Altitude</strong></td>
<td>200 ft</td>
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### Weather Data

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Visibility</strong></td>
<td>Clear</td>
</tr>
<tr>
<td><strong>Temperature (start)</strong></td>
<td>64°F</td>
</tr>
<tr>
<td><strong>Temperature (finish)</strong></td>
<td>83°F</td>
</tr>
<tr>
<td><strong>Cloud Cover %</strong></td>
<td>&lt;10</td>
</tr>
<tr>
<td><strong>Wind (mph)</strong></td>
<td>2-5</td>
</tr>
<tr>
<td><strong>Wind Direction</strong></td>
<td>Northwest</td>
</tr>
</tbody>
</table>

### Flight Data

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Flight Time (start)</strong></td>
<td>6:39 AM</td>
</tr>
<tr>
<td><strong>Flight Time (finish)</strong></td>
<td>4:02 PM</td>
</tr>
<tr>
<td><strong>Number of flights</strong></td>
<td>6</td>
</tr>
</tbody>
</table>
Validating Our Data
Variables...

01 Canopy
Canopy cover allotted for in software but not in pedestrian survey.

02 Access
Access issues make ground truthing difficult.

03 Native
If native covering the Arundo Donax at the birds eye view then not counted by software.
Conclusions

Spend
50%-90% Lower cost.

Accuracy
97%-99% Accuracy over entire land mass.

SUCCESS

Complete Data
Demonstrable data for whole site leading to better planning.

Free Up
Free up manpower and budget to actually tackle eradication plan.
Contact Us:

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Download: