Building a Fire Resilient Landscape
Using Aerial Tools for Invasive Plant Management

25th CAL-IPC Symposium
November 2016
Dana Backer
Outline

• Southern Arizona’s Issue ➔
  Buffelgrass (*Cenchrus ciliaris*)

• Department of Interior
  Office of Wildland Fire
  Wildland Fire Resilient Landscape Program

• Aerial Mapping

• Aerial Treatments
Transformation of the desert scrub

- Native species richness & diversity declines
- Native cover & density declines
- Buffelgrass is doubling every 2-7 years since 1988
- Rapid transformation <20yrs
Dept of Interior – Office of Wildland Fire Resilient Landscape Program

PURPOSE: Pilot Program
(1) to achieve fire resiliency goals across landscapes with collaborative efforts;
(2) restore and maintain landscapes across jurisdictions

APPROACH: integrated, partnership of place-based programs and activities to increase resilience to fire

PROPOSAL SELECTION: elevated risk posed by wildfire and where fire risk can be mitigated; ability to re-establish the ecological function

REQUIREMENTS: collaboration between wildland fire & resource mngt

FUNDING: $10M in FY2015
Resilient Landscape Projects

• Lead Agencies – BIA (1), BLM (4), NPS (3), USFWS (2)

• Southern Arizona Resilient Landscape Collaborative
  – Saguaro National Park lead agency

• Funded 2015, 2016, 2017......

• Only project not in a fire-adapted ecosystem

we are building a landscape that is resilient to fire
Southern Arizona Resilient Landscape Collaborative
Digital Aerial Sketch Mapping (DASM) uses GeoLink (GIS)

Differences b/w Forest Health uses
Aerial Mapping
Saguaro National Park

Partners in Wildland Fire Resilient Landscapes:
- BLM
- Buenos Aires National Wildlife Refuge
- NPS Saguaro NP
- Pima County
- Tohono O'odham Nation
- USFS- Coronado National Forest
Saguaro National Park
Rincon Mountain District (ground + aerial)
Summary of Aerial Mapping

- 4 days and 15 hours flight time
- Surveyed 32,500 acres below 5000 ft
- Only mapped inaccessible areas
- Mapped 2,125 polygons → 930 acres of buffelgrass
- Cost/acre = $1.04
Accuracy Assessment - Methods

- Field crews mapped on the ground (300 hours)
- 20 sample locations totaling 1105 acres

Spatial analyses included:
+/- mapped from air and on ground
+/- mapped from air and not on ground
-/+ not mapped from air and mapped on ground
-/- not mapped from air and not mapped on ground
RESULTS

• Mapped ground & air 7.1% (+/+)
• Not mapped ground & not mapped air 76.7% (-/-)
• Over 50% of aerially mapped polygons overlapped with ground mapped polygons
## Aerial Mapping in the Southern Arizona Resilient Landscape

### Survey Agency

<table>
<thead>
<tr>
<th>Survey Agency</th>
<th>Survey Unit Acres</th>
<th># polygons in unit</th>
<th>Acres mapped in unit</th>
<th>Avg Size of Polygon (ac)</th>
<th>Cost/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Service</td>
<td>76,111</td>
<td>679</td>
<td>2215</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>Tohono O'Odham</td>
<td>22,274</td>
<td>78</td>
<td>188</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Buenos Aires NWR</td>
<td>68,063</td>
<td>43</td>
<td>35</td>
<td>0.9</td>
<td>$ 0.26</td>
</tr>
<tr>
<td>Saguaro 2012</td>
<td>32,500</td>
<td>2125</td>
<td>930</td>
<td>0.44</td>
<td>$ 1.04</td>
</tr>
</tbody>
</table>

### Cost per Acre

- Forest Service: $ 0.26
- Tohono O'Odham: $ 0.26
- Buenos Aires NWR: $ 0.26
- Saguaro 2012: $ 1.04

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**Partners in Wildland Fire Resilient Landscapes**

- BLM
- Buenos Aires National Wildlife Refuge
- NPS Saguaro NP
- Pima County
- Tohono O'Odham Nation
- USFS- Coronado National Forest
Ground-based Manual Treatments

- Year Round
- Accessible
- Volunteers
Ground-based Herbicide Treatments

- Only when green
- Field staff
- More risks
Background Leading to Aerial Treatments

- 2009 Aerial Herbicide Application Workshop
- 2010 Aerial Demonstration Project
- 2012 Restoration Plan and Environmental Assessment (EA) initiated
  - Aerial Restoration Trmts (seeding, mulching, herbicide)
- 2014 EA completed
- Started aerial herbicide application in 2014
Demonstration Project
2010-2013

Evaluate:
- Safely navigate terrain
- Effectiveness of different herbicide concentrations and application rates for buffelgrass control
- Effects of herbicide on native vegetation.
- Herbicide drift outside the target location
From Demonstration to Operations – Adaptive Management

- Find a qualified vendor (bidding process)
- Contract
- Design a Monitoring Plan
  - Vegetation
  - Drift
- Field Implementation
- Purchase Herbicides
- Pray for rain before the helicopter is scheduled to arrive!
Herbicides and Equipment

- Glyphosate (formulation): 5 qt/ac (3.75 lbs ae/ac)
- Carrier Rates with water: 10 gal/ac
- Tank Carried: 50 gal/flight (~5 acres)
- Supply truck- fuel, water, mix tank
Navigation & Herbicide Equipment/Software

- SatLoc computer
- Trimble GPS System
- Auto-Calc Flow Control
- Flow Monitor
- Software tools in ArcView
Controlling for Drift

- Large droplet size
- Wind restrictions

Accu-flow nozzles with >500 micrometer (micron, µ)
Areas Treated by Helicopter, Panther Peak

Legend
Monitoring Plots
Treatment
- Green: Buffer
- Red: Control
- Blue: Spray

Produced by Joshua Conver, GIS Technician  Data Source: Saguaro National Park  October 2014
### Areas Treated by Helicopter, Panther Peak

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Miles with Spray Log</th>
<th>Miles without Spray Log</th>
<th>Total Fight Miles (Flight Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferry Miles</td>
<td>500.6 (47.5%)</td>
<td>474.3 (44.9%)</td>
<td>1055 (29.5 hrs)</td>
</tr>
<tr>
<td>Miles with Spray Log</td>
<td>79.9 (7.6%)</td>
<td>148 (47.5%)</td>
<td>79.9 (7.6%)</td>
</tr>
<tr>
<td>Miles without Spray Log</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Added spotter 2015
efficiency and pilot safety
overlapping swaths reduced
Upper Box Canyon (2 treatments)
Some Results

Costs

• 2014  $172/ac
• 2015  $150/ac
• Monitoring additional costs ($20K-$40K/year)

Treatments

2014 = 373 acres
2015 = 488 acres
2016 = 384 acres

Funding Sources

• Base
• Grants
• DOI – Resilient Landscape
• Fire/Fuel Reduction Program
Aerial Spot Sprayer
Look... It's also taken over conference room C.

BUFFEL GRASS!
Thank you

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Drift Card Placement in Relation to Spray Swaths

Legend
- Drift Cards
- 2015 Spray Swaths

Produced by Kara O'Brien, Biological Science Technician
Data Source: Saguaro National Park
May 2016
Card at 0m from spray zone
6.6% coverage
Card at 18m from spray zone
0.2% coverage
Card at 43m from spray zone
0.0% coverage