

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

**25<sup>th</sup> CAL-IPC Symposium**

**November 2016**

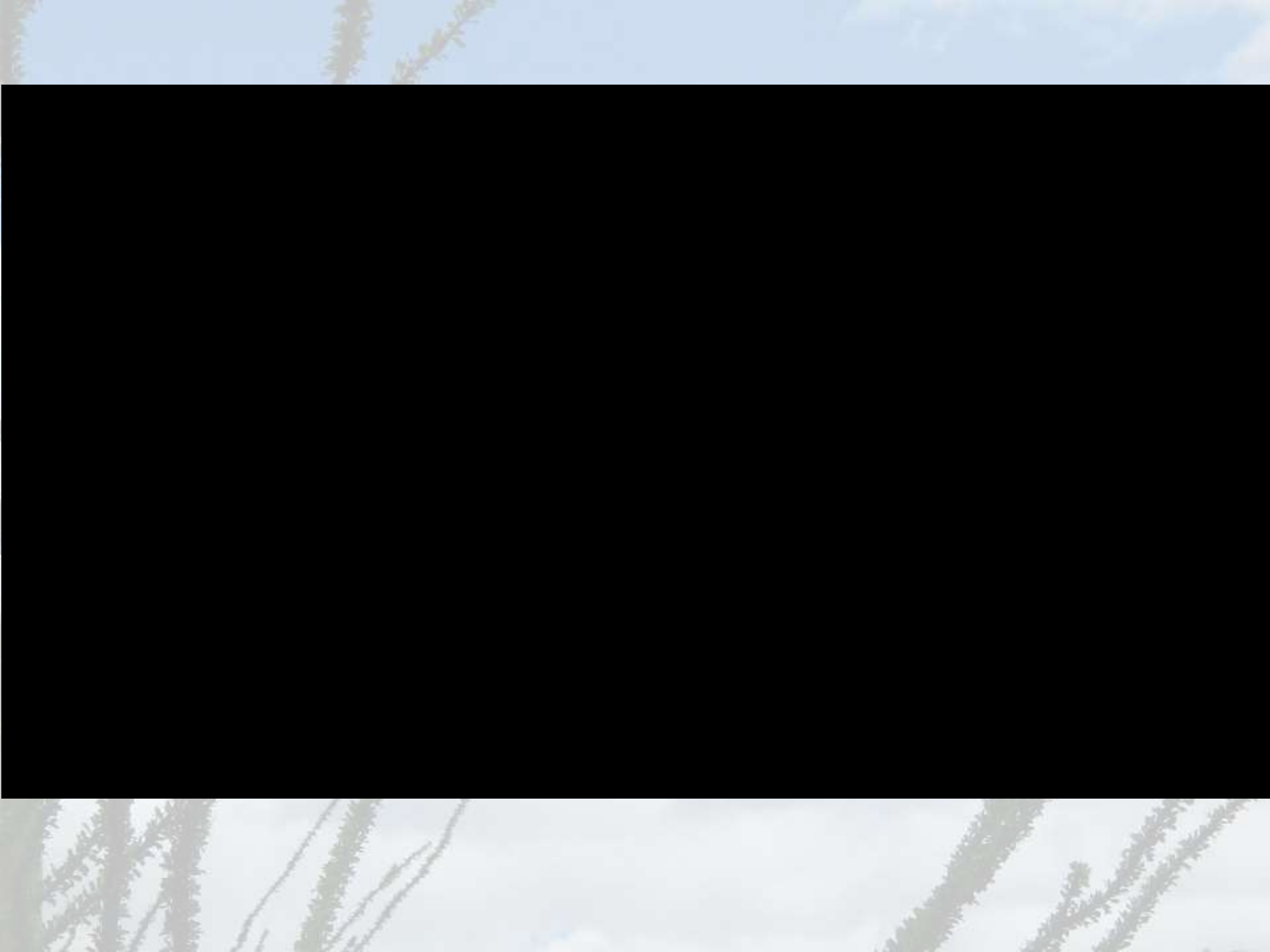
**Dana Backer**



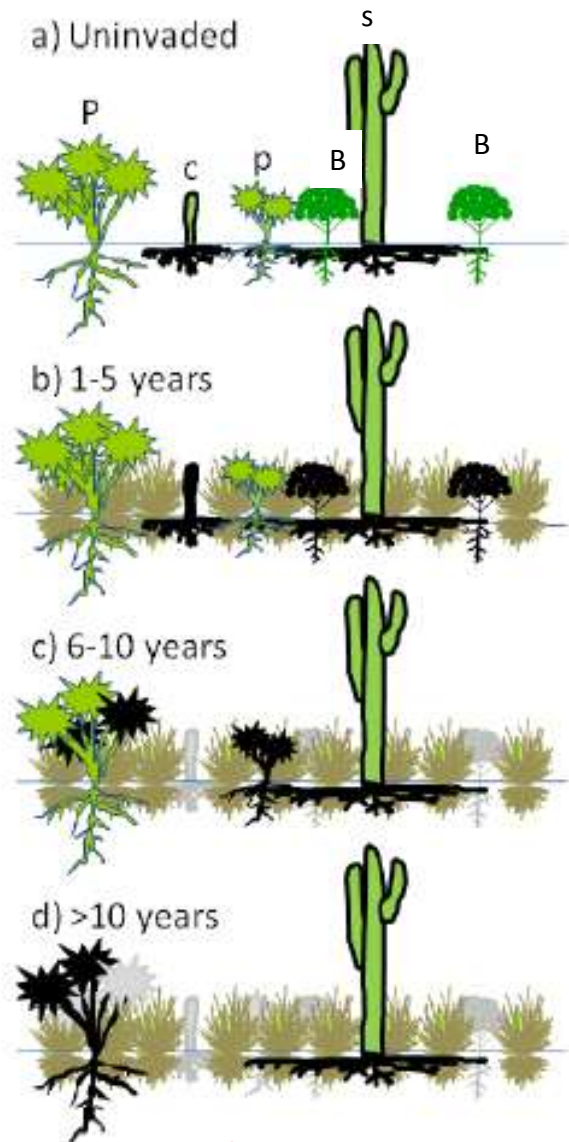
# Outline



- 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



Aaryn Olsson 2010

- 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**

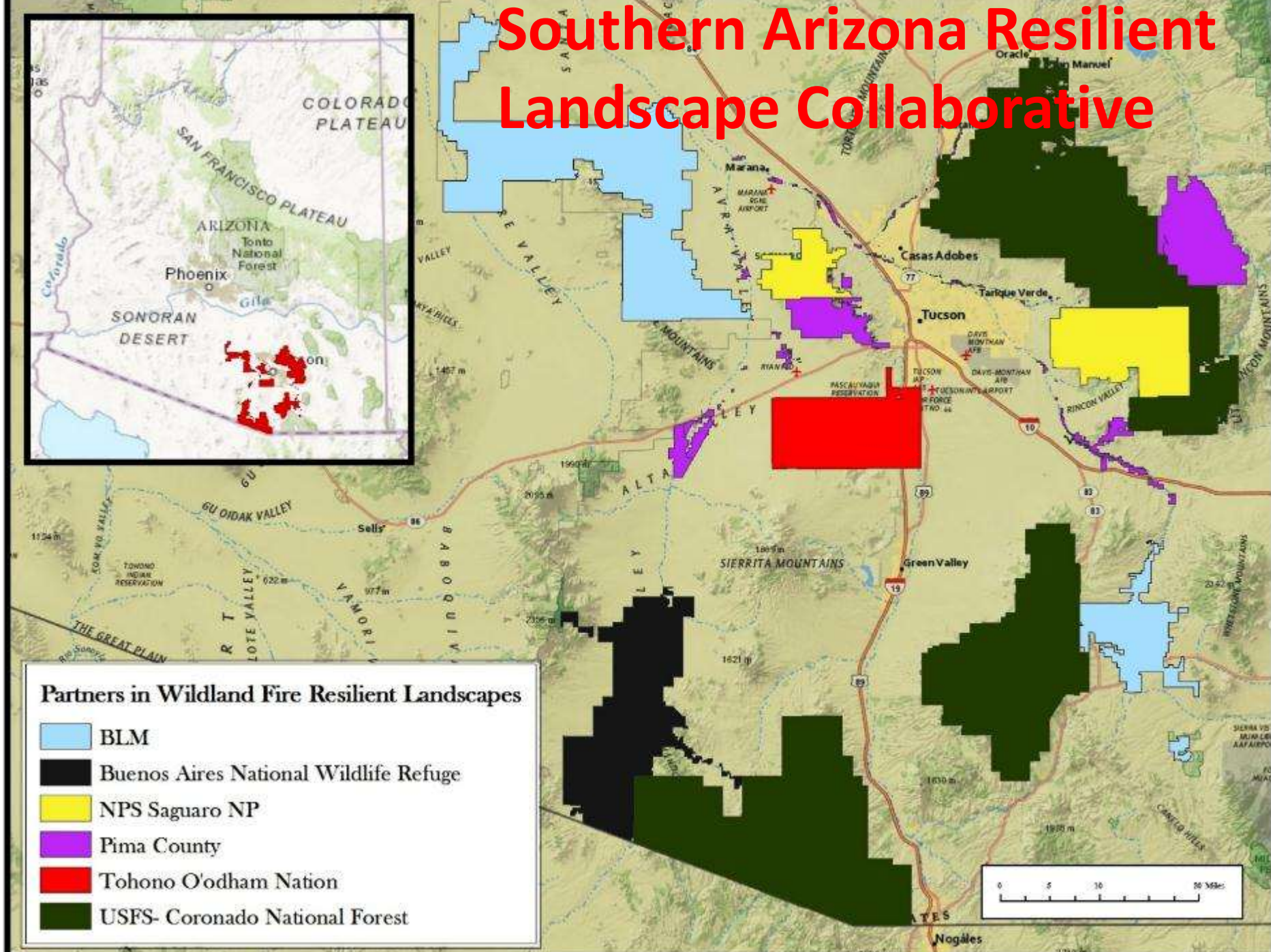
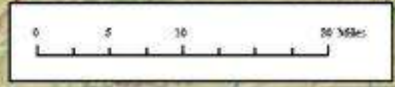


# Southern Arizona Resilient Landscape Collaborative



**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





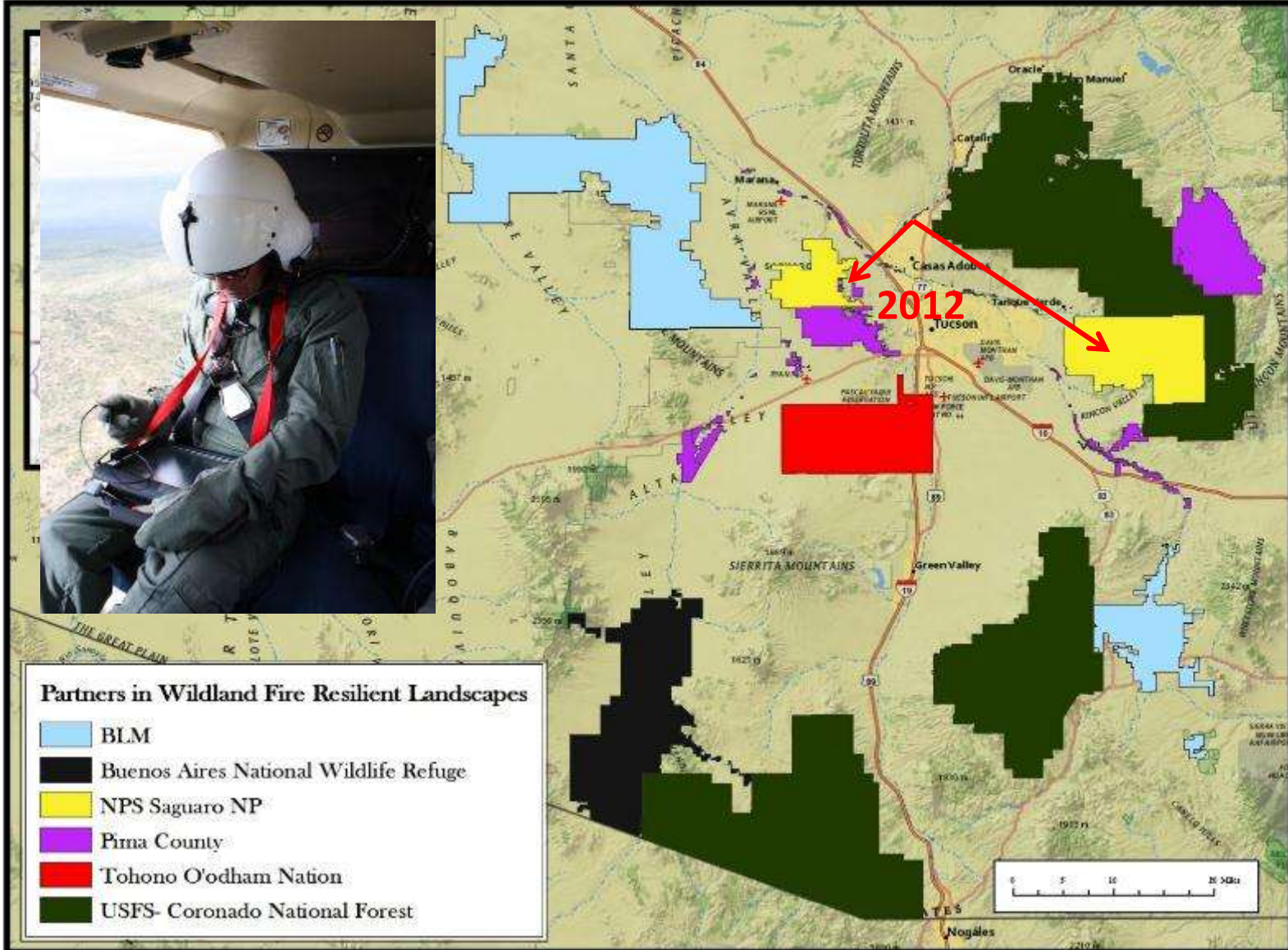
# Digital Aerial Sketch Mapping (DASM) uses GeoLink (GIS)

Differences b/w Forest Health uses



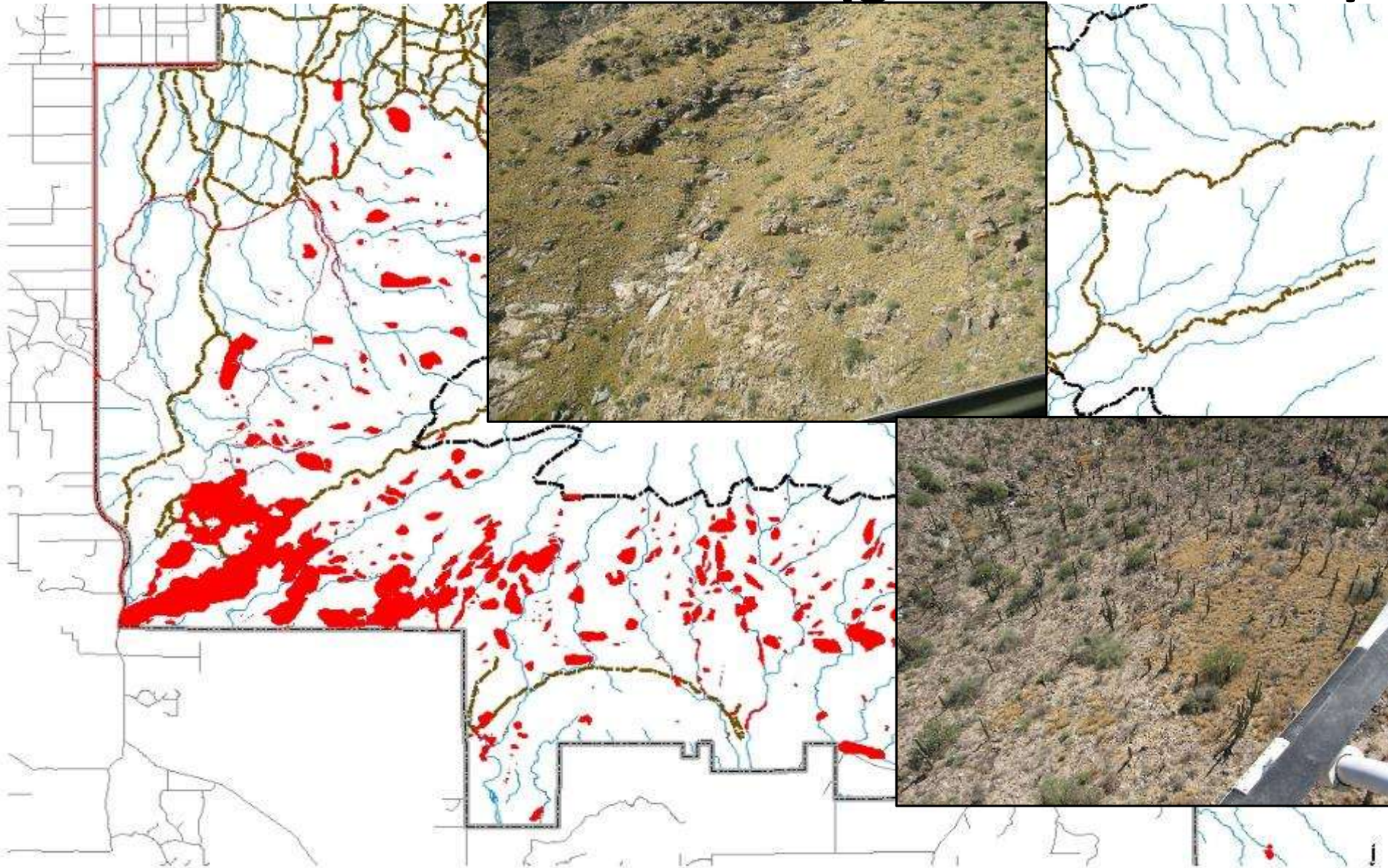
# Aerial Mapping

## Saguaro National Park



# 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

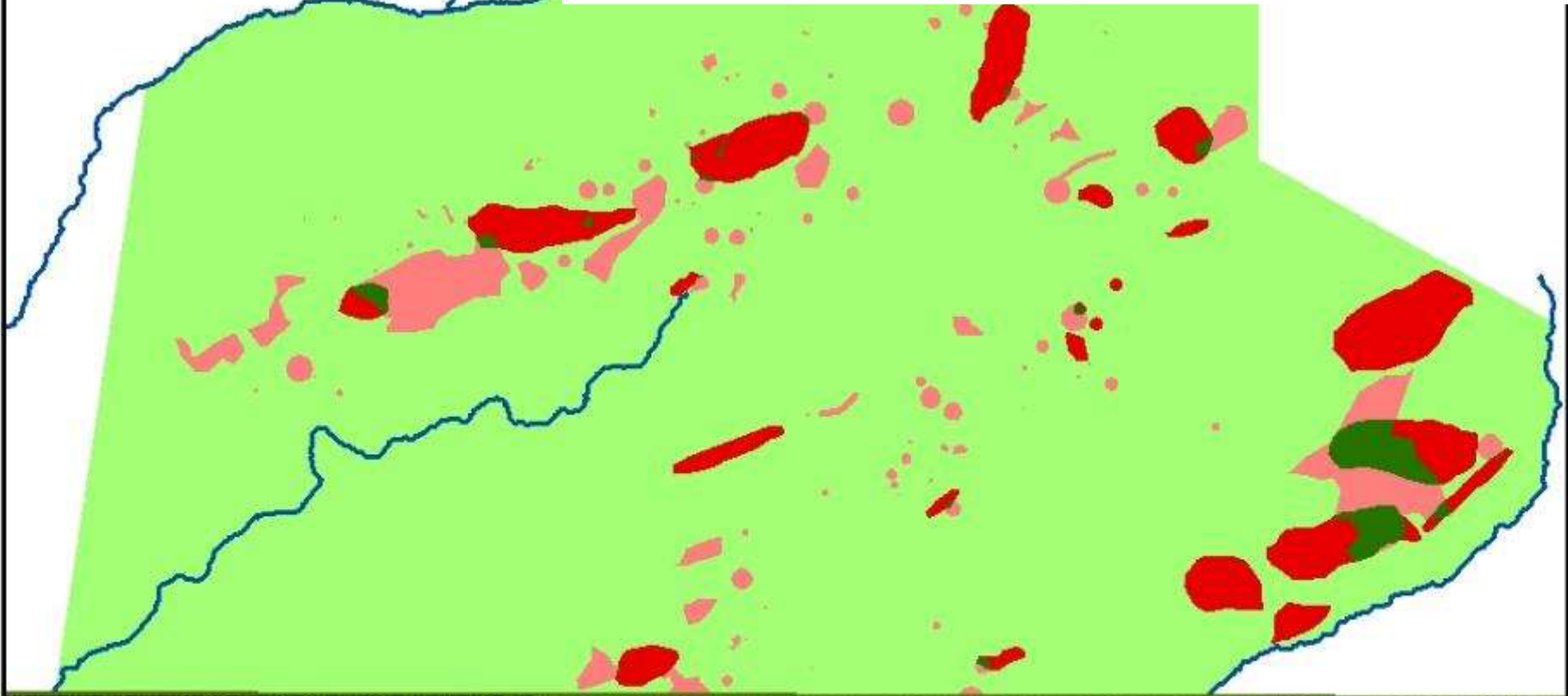
## Legend

-  Aerially Mapped/ Present on Ground
-  Not Aerially Mapped/ Not Present on Ground
-  Aerially Mapped/ Not Present Ground
-  Not Aerially Mapped/ Present on Ground
-  Drainages
-  Saguaro National Park Boundary

0 0.1 0.2 Miles

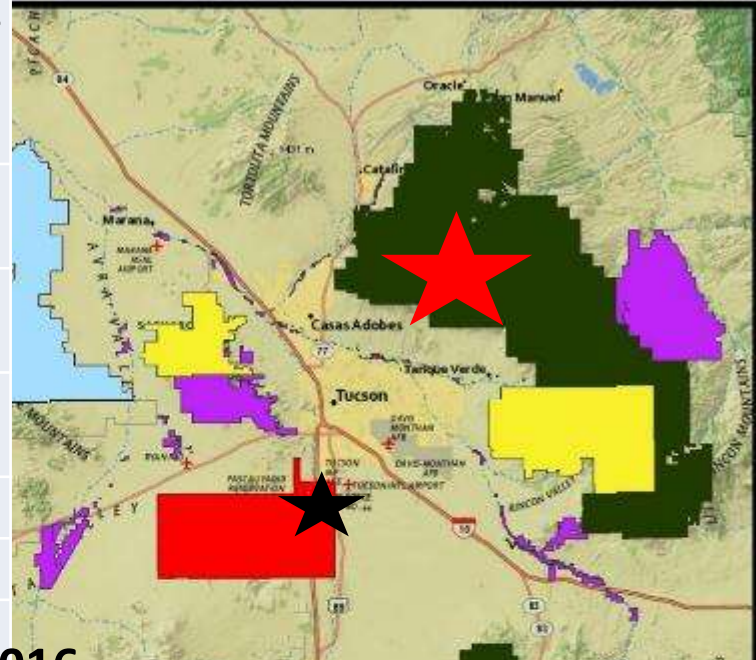
## RESULTS

- Mapped ground & air 7.1% (+/+)
- Not mapped ground & not mapped air 76.7% (-/-)
- Over 50% of aerially mapped polygons overlapped with ground mapped polygons

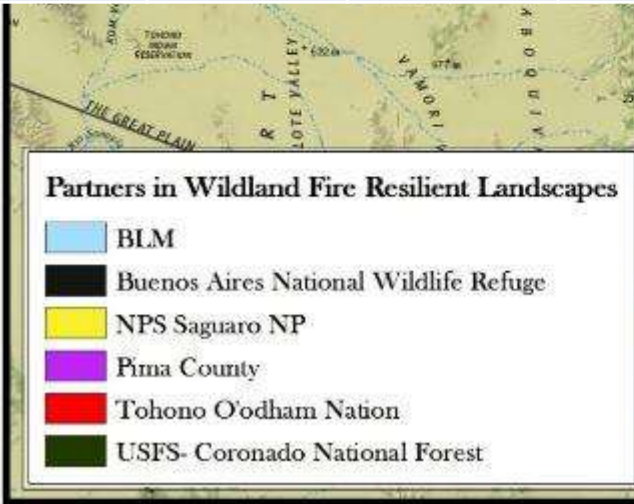
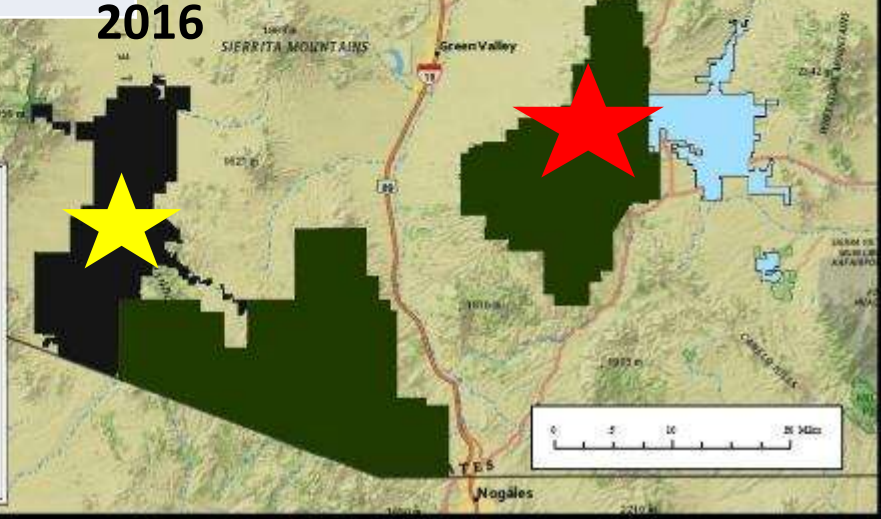


# Aerial Mapping in the Southern Arizona Resilient Landscape

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



2016



# Ground-based Manual Treatments

- Year Round
- Accessible
- Volunteers






# Ground-based Herbicide Treatments



- Only when green
- Field staff
- More risks

# Background Leading to Aerial Treatments

- 
- A helicopter is shown in flight, viewed from a low angle, flying over a field of tall, thin cacti. The helicopter is positioned in the upper left quadrant of the frame, with its rotors blurred due to motion. The background is a clear blue sky. The cacti in the foreground are dark green and appear to be cholla or similar species.
- 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

An aerial view of a helicopter equipped with a large cylindrical tank and a long boom with multiple nozzles, flying over a vast, green, hilly landscape. The helicopter is positioned centrally, with its main rotor blades blurred from motion. The terrain below is a mix of green vegetation and some cleared areas.

# 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!

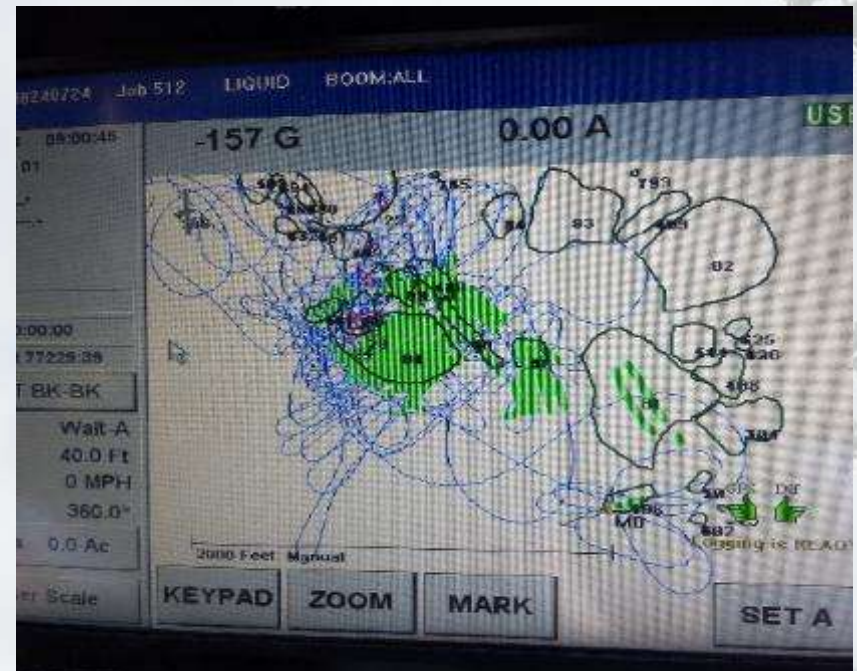
# Herbicides and Equipment

- 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



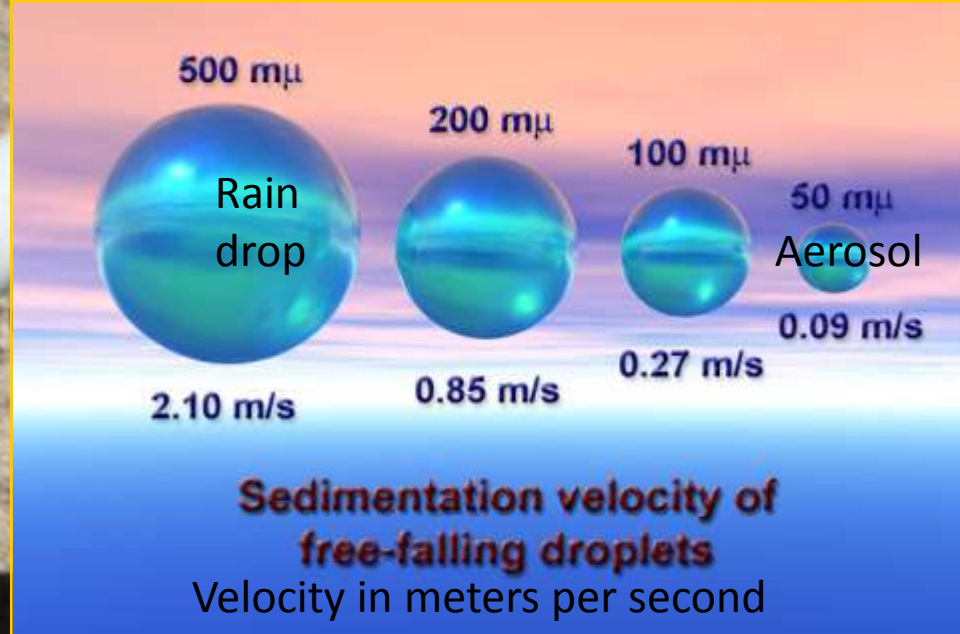
# Navigation & Herbicide Equipment/Software

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



# Controlling for Drift

- Large droplet size
- Wind restrictions

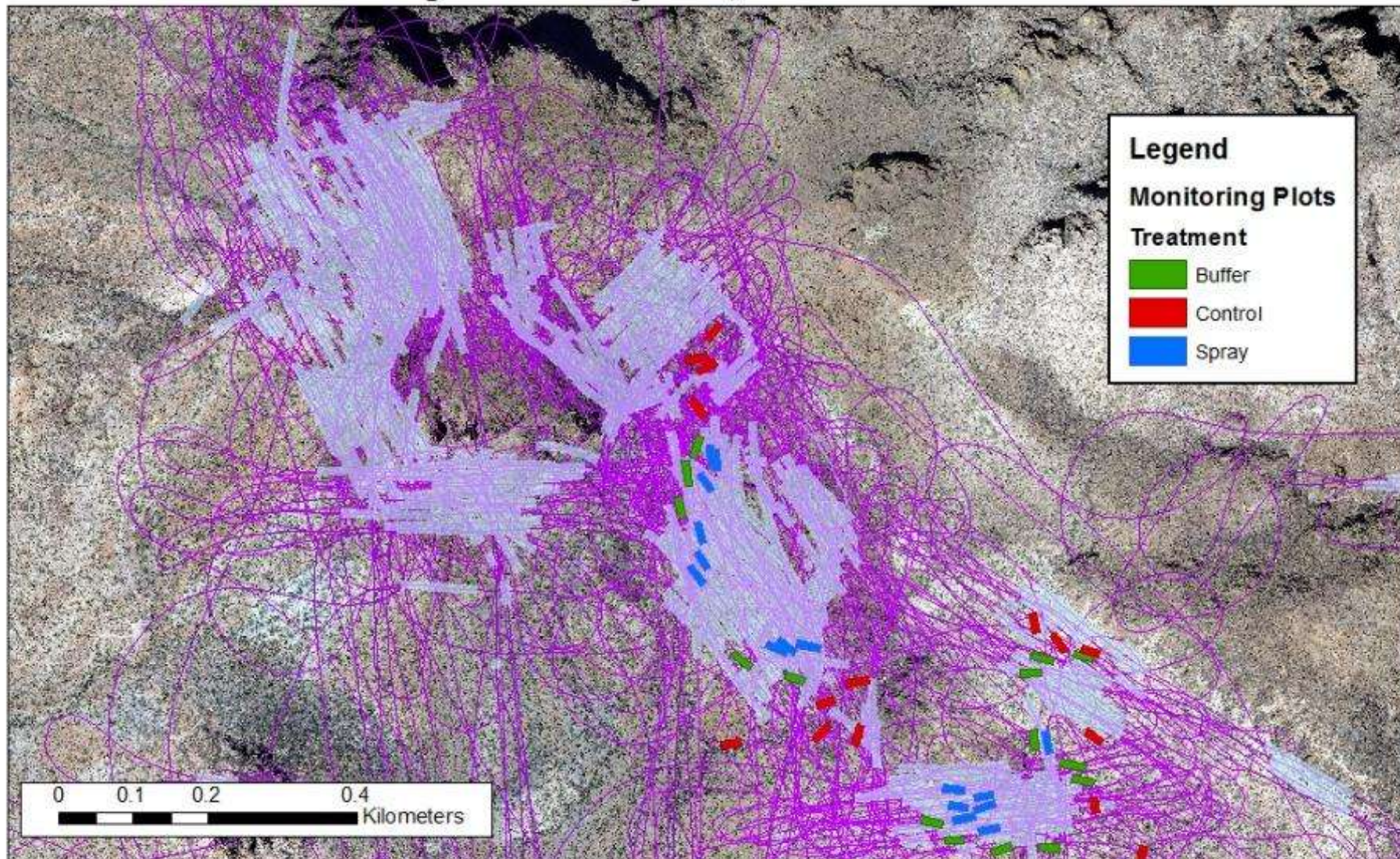


Accu-flow nozzles w  $>500$  micrometer (micron,  $\mu$ )





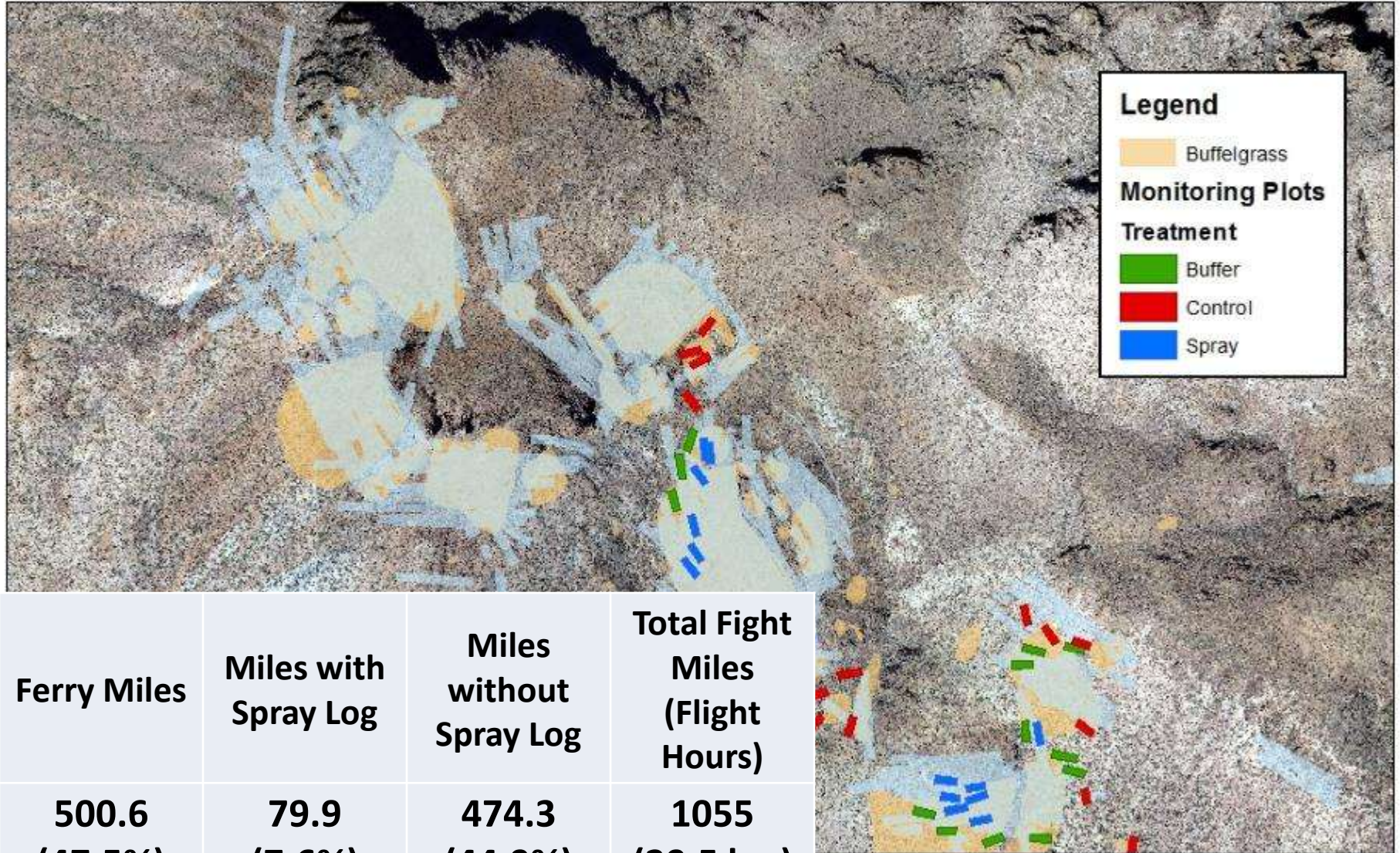
# Areas Treated by Helicopter, Panther Peak







# Areas Treated by Helicopter, Panther Peak



Ferry Miles	Miles with Spray Log	Miles without Spray Log	Total Flight Miles (Flight Hours)
500.6 (47.5%)	79.9 (7.6%)	474.3 (44.9%)	1055 (29.5 hrs)



**August 19, 2014**

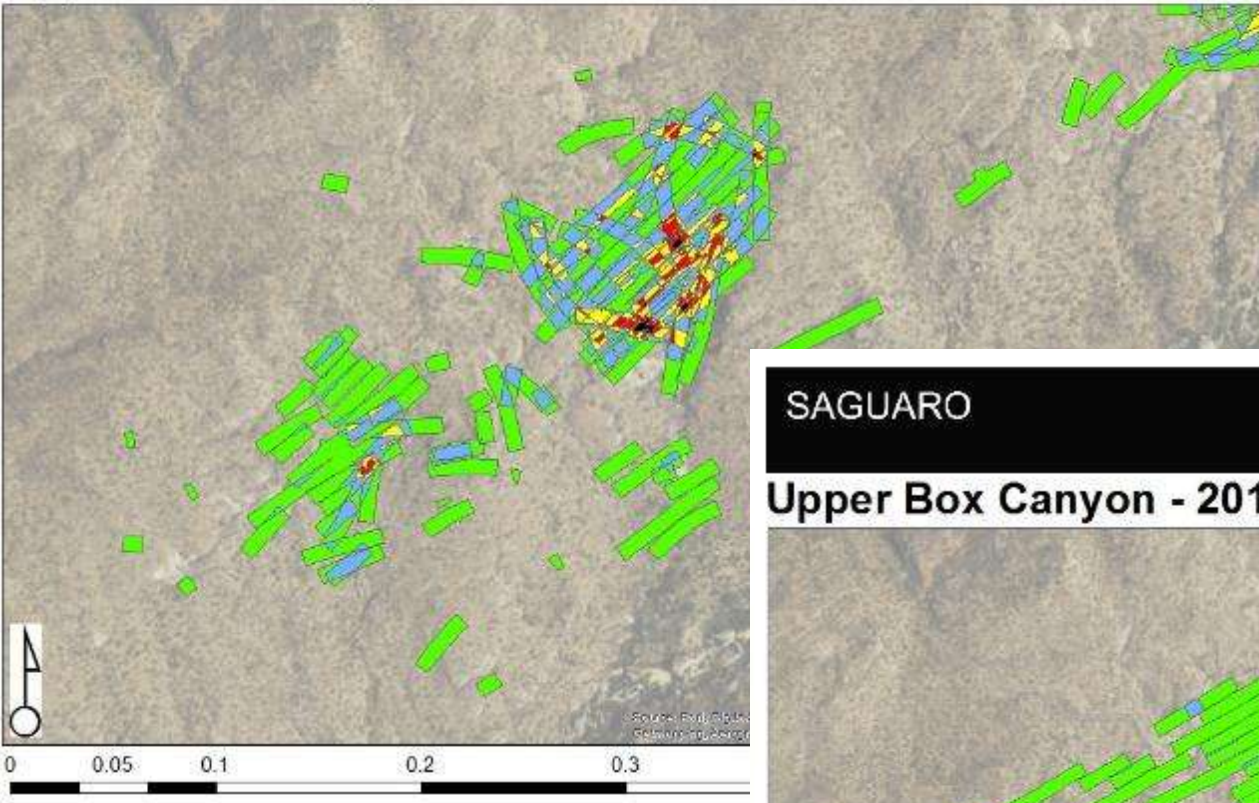


**August 24, 2014**





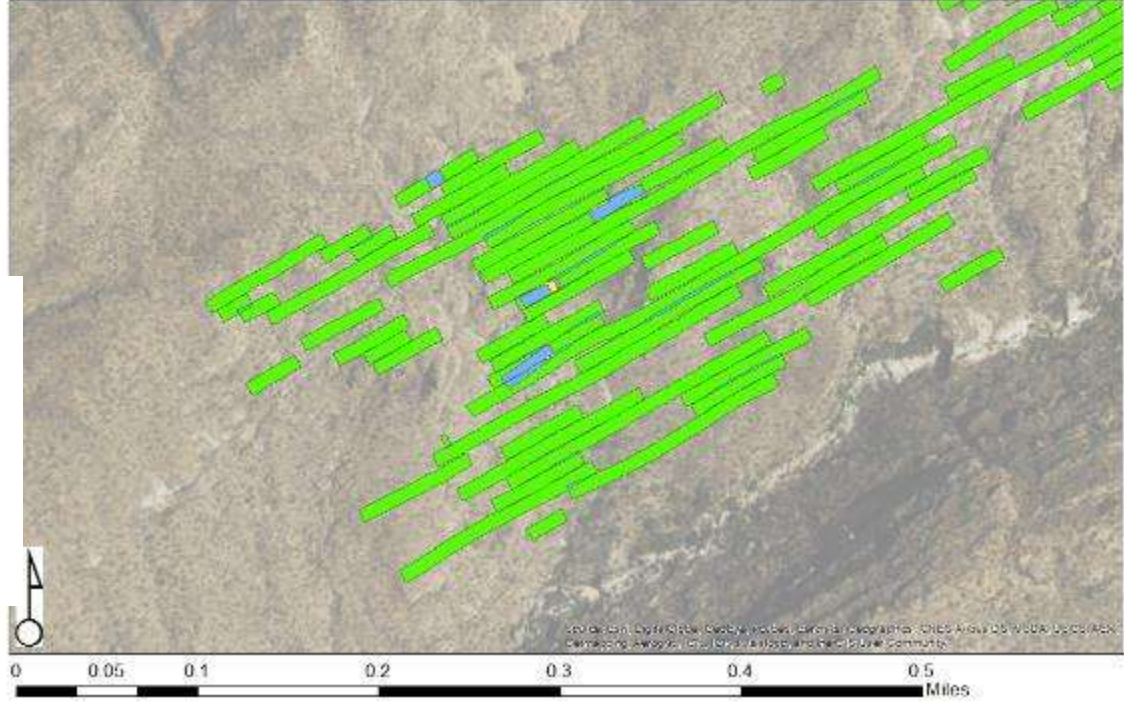
## Upper Box Canyon - 2014



SAGUARO

Saguaro National Park

## Upper Box Canyon - 2016



Added spotter 2015  
efficiency and pilot safety  
overlapping swaths reduced



## Upper Box Canyon - 2014



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, Aero, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



# 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".

1207\$  
BUFFEL  
GRASS!



Hargis@ITB

Thank you

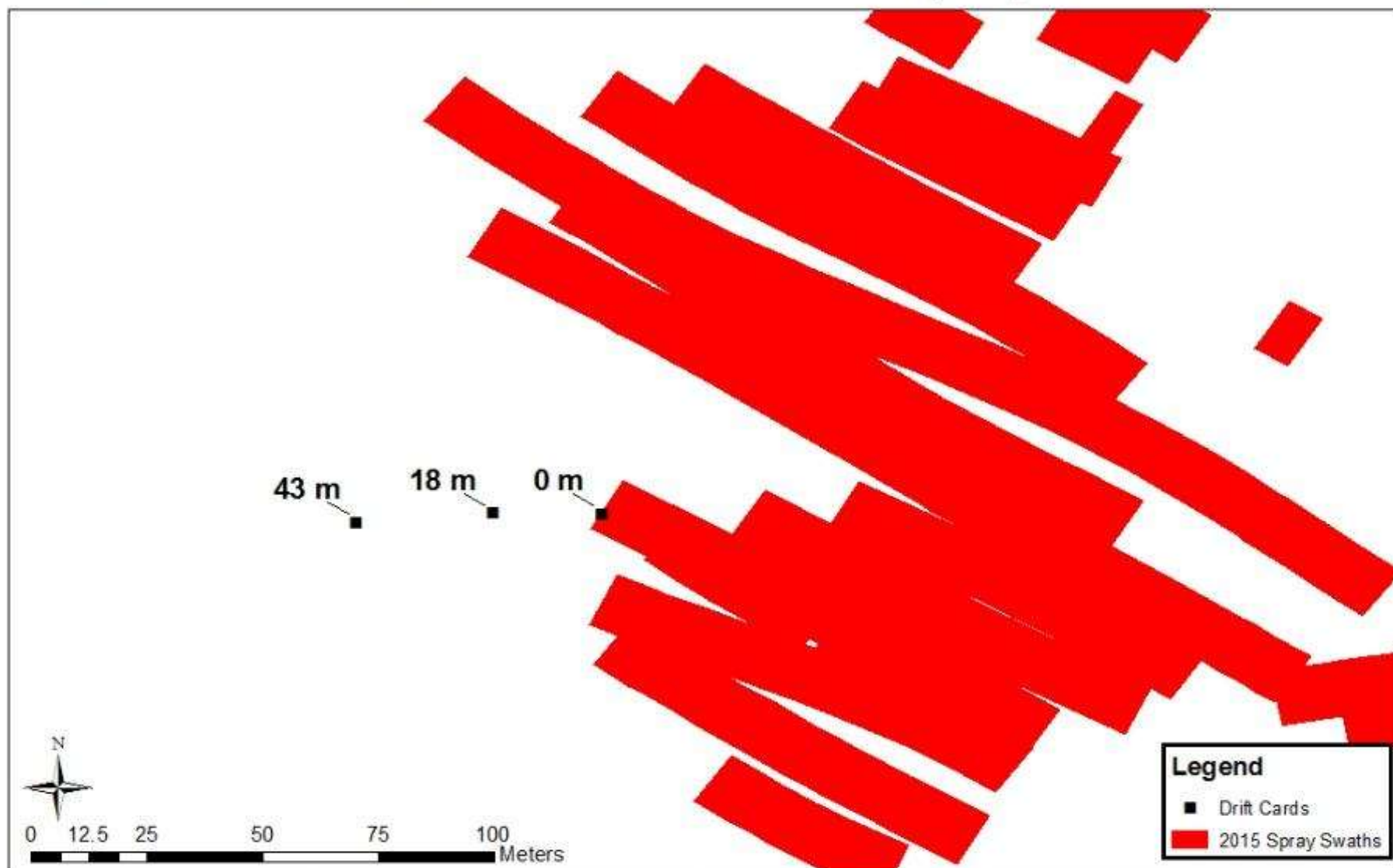


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# Drift Card Placement in Relation to Spray Swaths



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

