AJ Fox

Chief Operating Officer / Executive VP

Santa Ana River Watershed

Arundo Donax Mapping Using Drones





We believe in...

Nature Done Simply





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.

EARLY DETECTION

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

PRIMARY BIODIVERSITY THREAT

Vital to managing our unique biodiversity found in California.

ECONOMIC ANALYSIS

Estimated in California invasive pests cost 3 billion per year.



5

Identify where located to prevent infestation, manage spread and allocate resources to eradication.

LAND MANAGER'S GUIDE

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**.



IDENTIFYING LOCALES





Current Methods

Ground Based

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

Remote Methods

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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.





Fabiola Lr.

Director:

Past Those Cit. Event Dr. Hoursie Place 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.

Sources: Esri, HERE, Carmin, USGS, Internap, INCREMENT P. NRCan, Esri Japan, MET, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenSthatMap contributors, and the GIS User Community, Sources, Esri, HERE, Garmin, Infermap, Increment P. Coro, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NI, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community.







Areas	APN Coverage	Acres of Arundo	% of Arundo
APN 130080012	1.27	0.02	1.58
APN 130080015	7.11	2.12	29.82
APN 130090002	90.73	19.06	21.01
APN 130090001	63.34	29.22	46.13
APN 130080007	48.91	27.61	56.45
Total	211.36	78.03	36.92

Biologists

Frees up resources to complete other activities:

- \checkmark Conduct sensitive species surveys
- \checkmark Develop plans to eradicate an invasive species
- ✓ Remove more invasives
- ✓ Monitoring activities
- ✓ Analyze data
- ✓ Create new programs
- \checkmark Be able to apply for more permits
- ✓ Be able to do more biology!





Methods

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

Mission Log			
Mission Date	9/20/2018		
Mission Altitude	200 ft		
Weather Data			
Visibility	Clear		
Temperature (start)	64 °F		
Temperature (finish)	83 °F		
Cloud Cover %	<10		
Wind (mph)	2-5		
Wind Direction	Northwest		
Flight Data			
Flight Time (start)	6:39 AM		
Flight Time (finish)	4:02 PM		
Number of flights	6		

Validating Our Data

Part as





Variables...





Conclusions







Times Faster



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