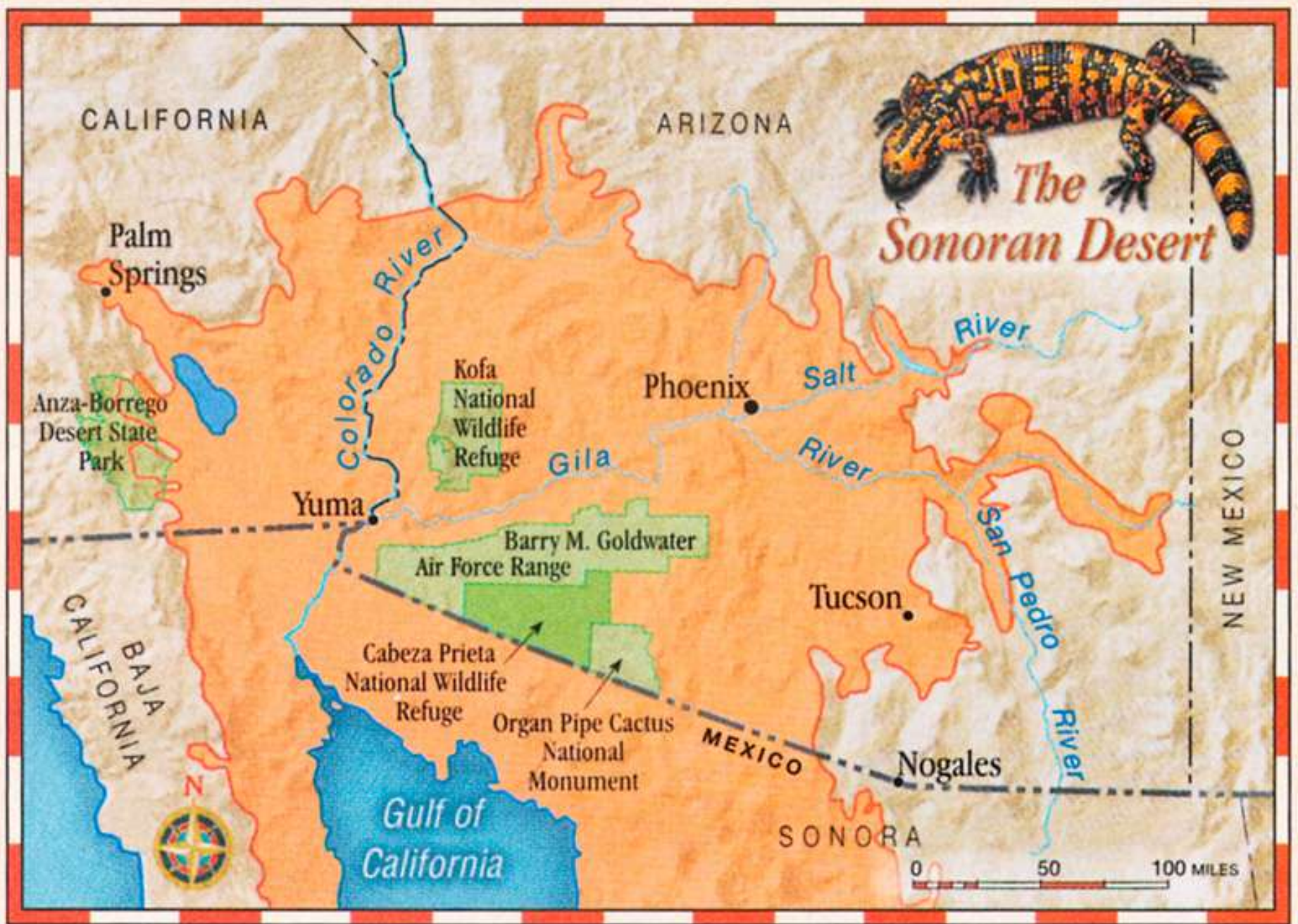


The U.S. Marine Corps versus the Sahara Mustard



Jim Malusa
malusa@email.arizona.edu





Sahara mustard = *Brassica tournefortii*



Buffelgrass top and fountain grass below.



Illustration by Sue Rutman











COMMANDER'S GUIDE ON INVASIVE SPECIES

KEY ISSUES TO CONSIDER

- Installation Commanders may want to consider the following questions when they encounter a new or already established invasive species population on their installation:
- How will this species impact training?
- Does this species pose a health risk to installation personnel?
- Will this species cause federal endangered species listings, and consequently halt or limit training?
- Can we engage in partnerships to minimize this species?
- How did this species reach the installation?
- How can we better monitor the installation to prevent future invasive species introductions?
- What are the fastest, safest, and most practical ways to manage this species on my installation?



Seek and Destroy Goals:

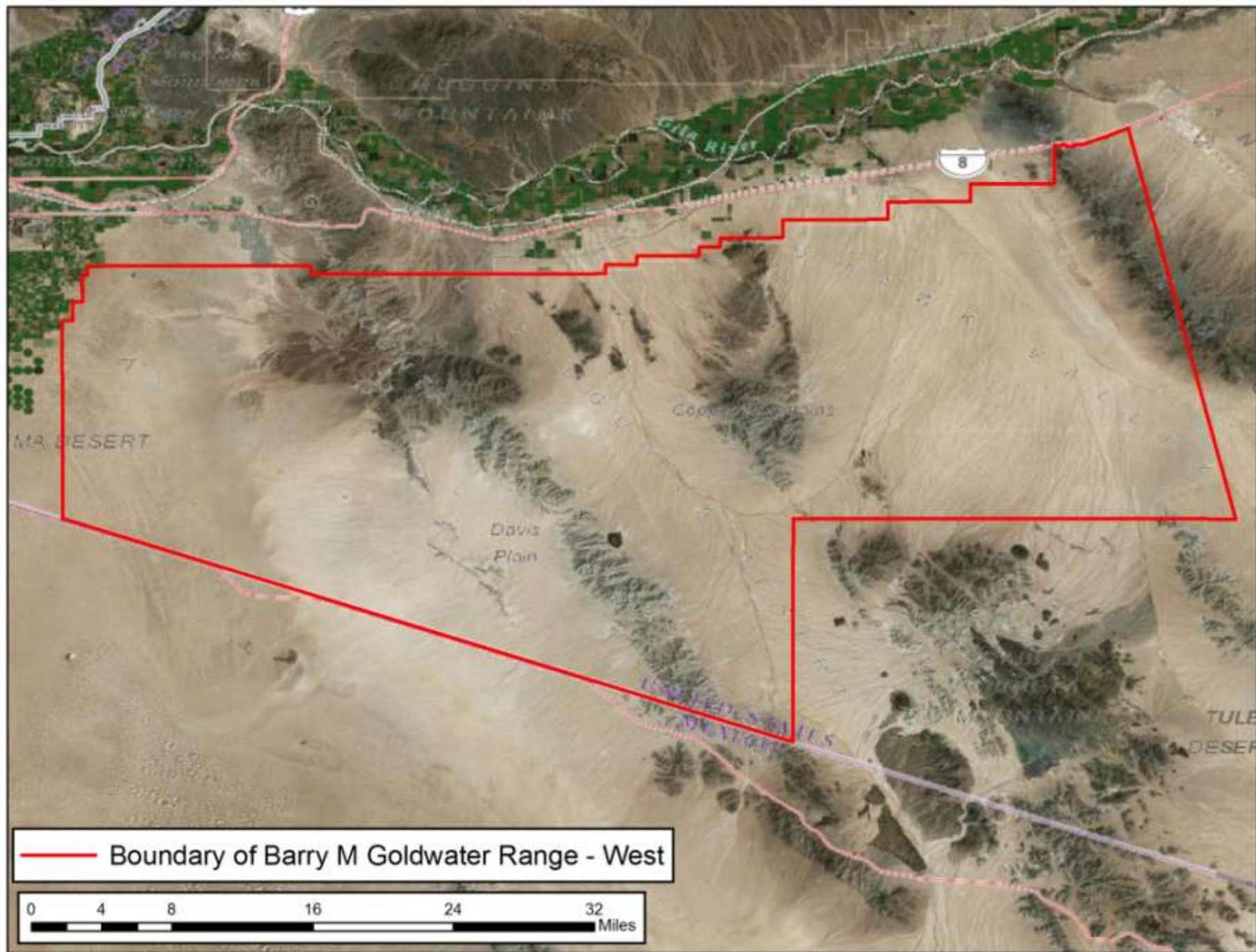
Seek – document the location and density of Sahara mustard

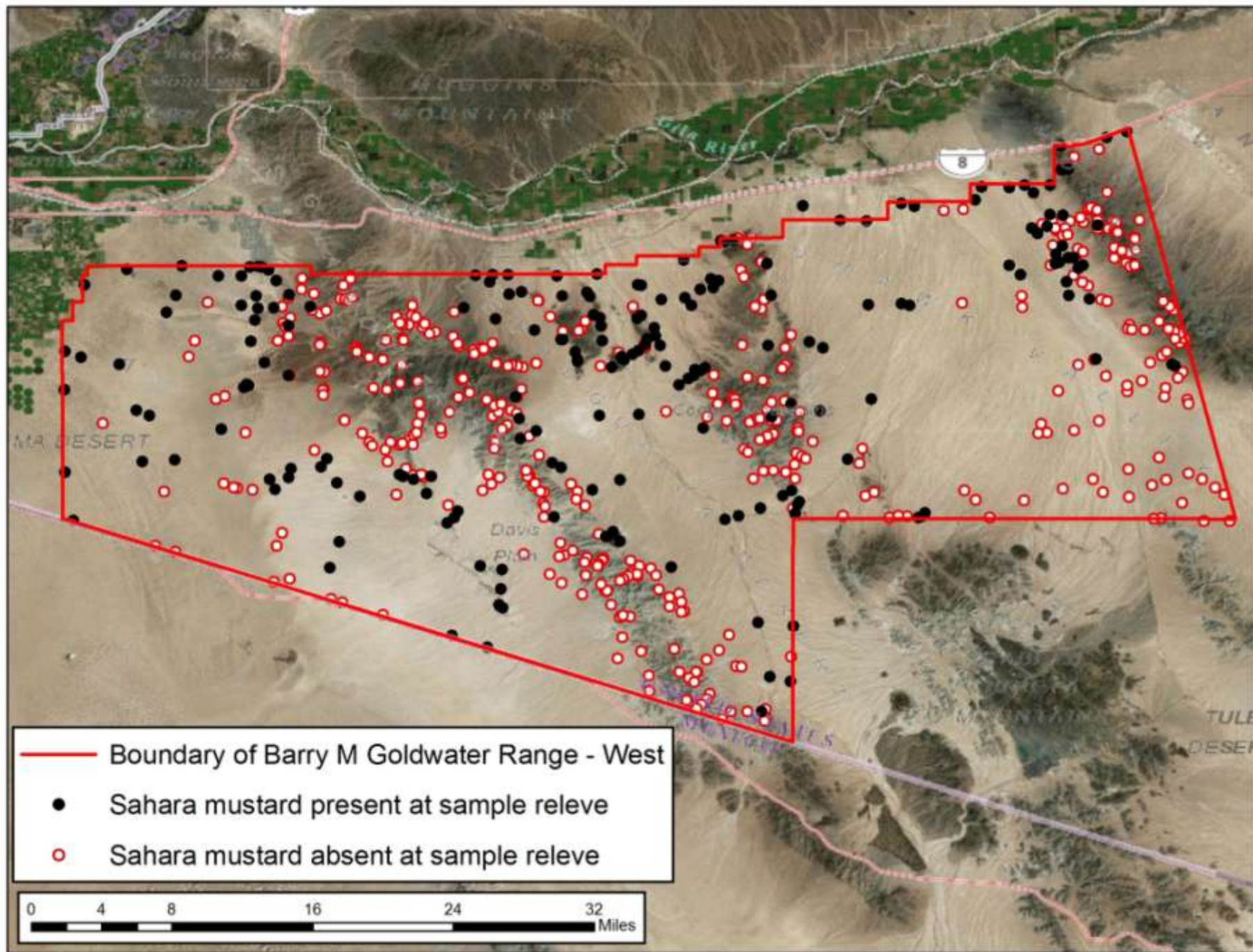
Destroy – get this information quickly to the weed assassins

The Seekers: Citizen Science to the Rescue?

Nope – it's a military base, with
few visitors.

And it's huge – over 1000 square
miles.

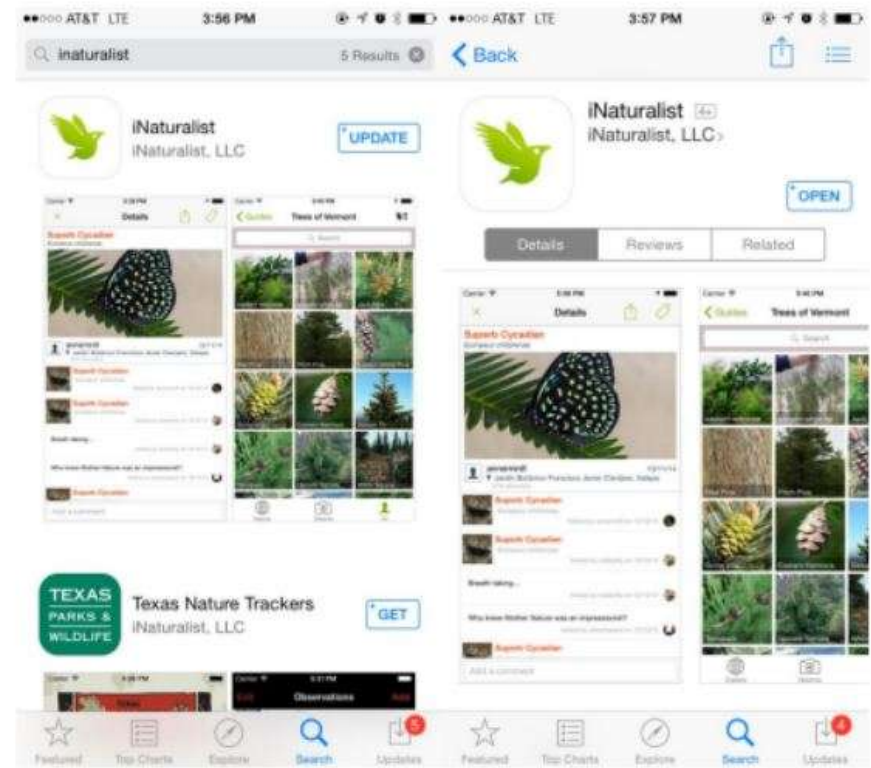
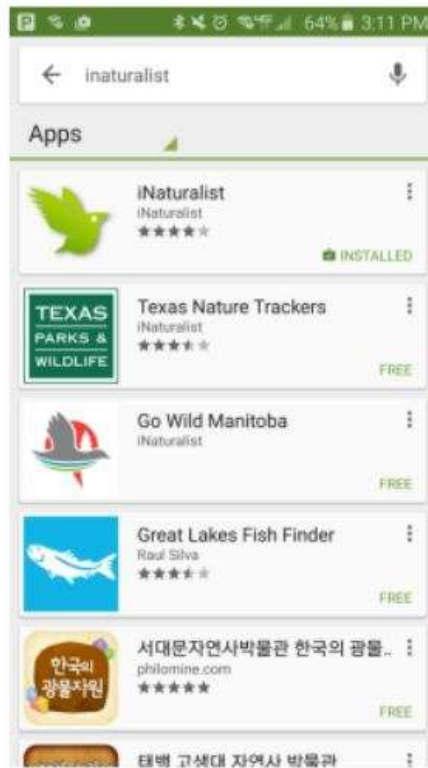






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- Google Play or App Store: Search iNaturalist.
- Click Install



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- ▶ Field Data Collection
- ▶ Data and Team Management
- ▶ Map Editing and Sharing





Goldwater Weeds



Species

☐ Sahara mustard

☐ Buffelgrass

☐ Fountain grass

☐ Other

Abundance within 100 feet of photo

☐ 0

☐ 1-5

☐ 6-100

☐ More than 100



Send



Queue



Map



Settings



Goldwater Weeds



Photo (can be more than one)



Album

Camera



Audio

Record

Play

Delete

Notes

Date



Choose date



Send



Queue



Map



Settings



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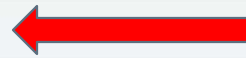


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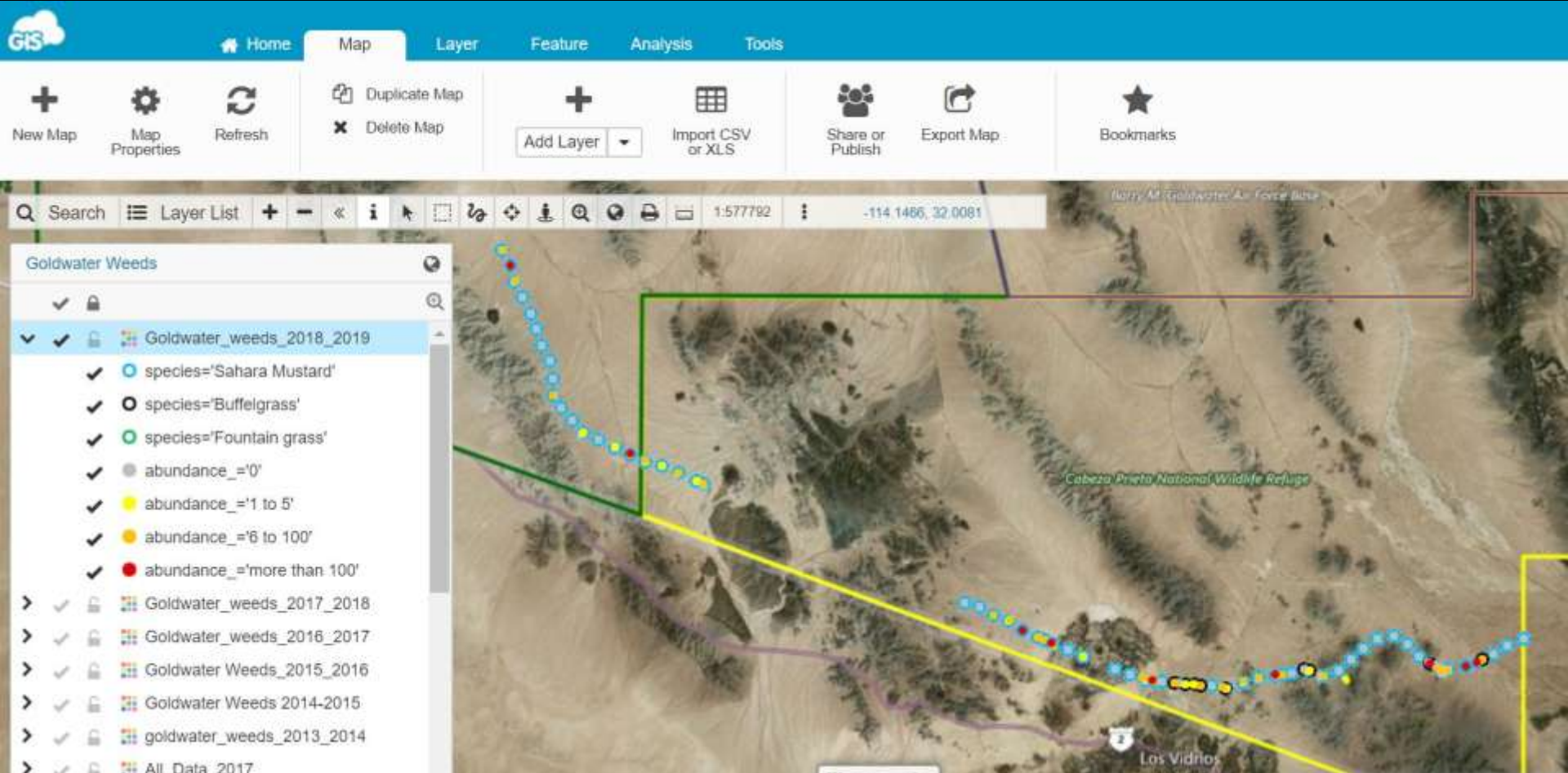
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Add Layer



Edit Layer



Share Layer



Duplicate Layer



Remove Layer



Zoom to Layer



Select all Layers



Import CSV
or XLS



Export
Layer



Report

Search

Layer List



1:36112

-113.1913, 32.094

Selected objects: 1

Goldwater Weeds



Goldwater_weeds_2018_2019



Goldwater_weeds_2017_2018

Goldwater_weeds_2016_2017

Goldwater Weeds_2015_2016

Goldwater Weeds 2014-2015

goldwater_weeds_2013_2014



DoD policy requires
that only trained
and certified applicators
may apply pesticides
on DoD installations.



A white National Park Service vehicle, possibly a patrol car or maintenance truck, is parked on a sandy dirt road. The vehicle has a white storage box mounted on its side and a large red cooler on top. A black and white sign is affixed to the side of the vehicle, identifying it as belonging to the National Park Service and the Lake Mead Exotic Plant Management Team. The background shows a vast, open landscape with sparse vegetation and distant mountains under a cloudy sky.

National Park Service

Lake Mead Exotic Plant
Management Team



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Zoom to Layer



Select all Layers



Import CSV
or XLS



Export
Layer



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Search

Layer List



1:36112

-113.1913, 32.094

Selected objects: 1

Goldwater Weeds



Goldwater_weeds_2018_2019



species='Sahara Mustard'



species='Buffelgrass'



species='Fountain grass'



abundance_='0'



abundance_='1 to 5'



abundance_='6 to 100'



abundance_='more than 100'

Goldwater_weeds_2017_2018

Goldwater_weeds_2016_2017

Goldwater Weeds_2015_2016

Goldwater Weeds 2014-2015

goldwater_weeds_2013_2014



Add Layer



Edit Layer



Share Layer



Layers



Close

Export

Layer(s) chosen for export: Goldwater_weeds_2018_2019

1. Select output format:

ESRI ShapeFile

MapInfo

KML

DXF

CSV

Close

Search Layer List

Goldwater Weeds



Goldwater_weeds_2018_2019



species='Sahara Mustard'



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> Goldwater_weeds_2017_2018

> Goldwater_weeds_2016_2017

> Goldwater Weeds_2015_2016

> Goldwater Weeds 2014-2015

> goldwater_weeds_2013_2014

> All_Data_2017





Cost after somebody figures out
setup of 4 phones: \$1500-\$2000/yr

\$20/month GISCloud per phone
(can be suspended during off-season)

\$55/month for GISCloud 'Map Editor'
(quality control, data manager)

If users desire cell service, \$25-\$50/month for
"Ting" cell service for 4 phones.
(\$6/device base charge, plus usage)



Many thanks to
Marine Corps
Air Station -Yuma





Richard Cerka 9/14/15

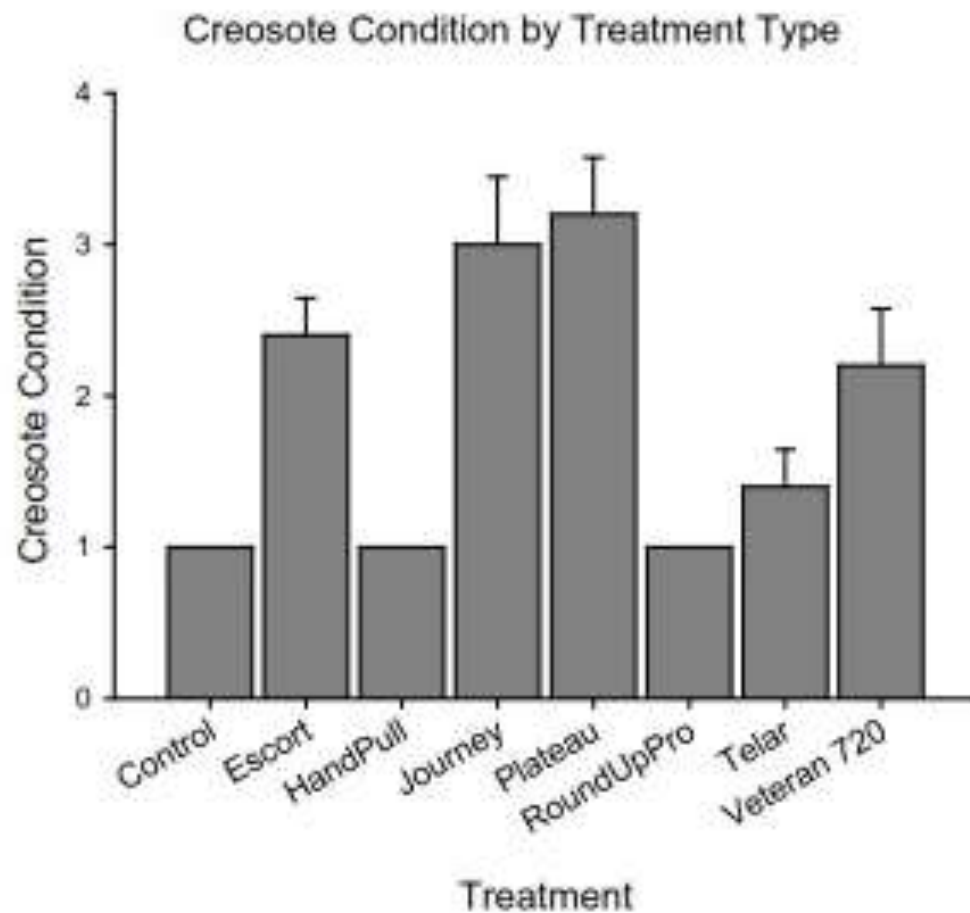
To: Jim Malusa Cc: Rosenberg CIV Abigail S

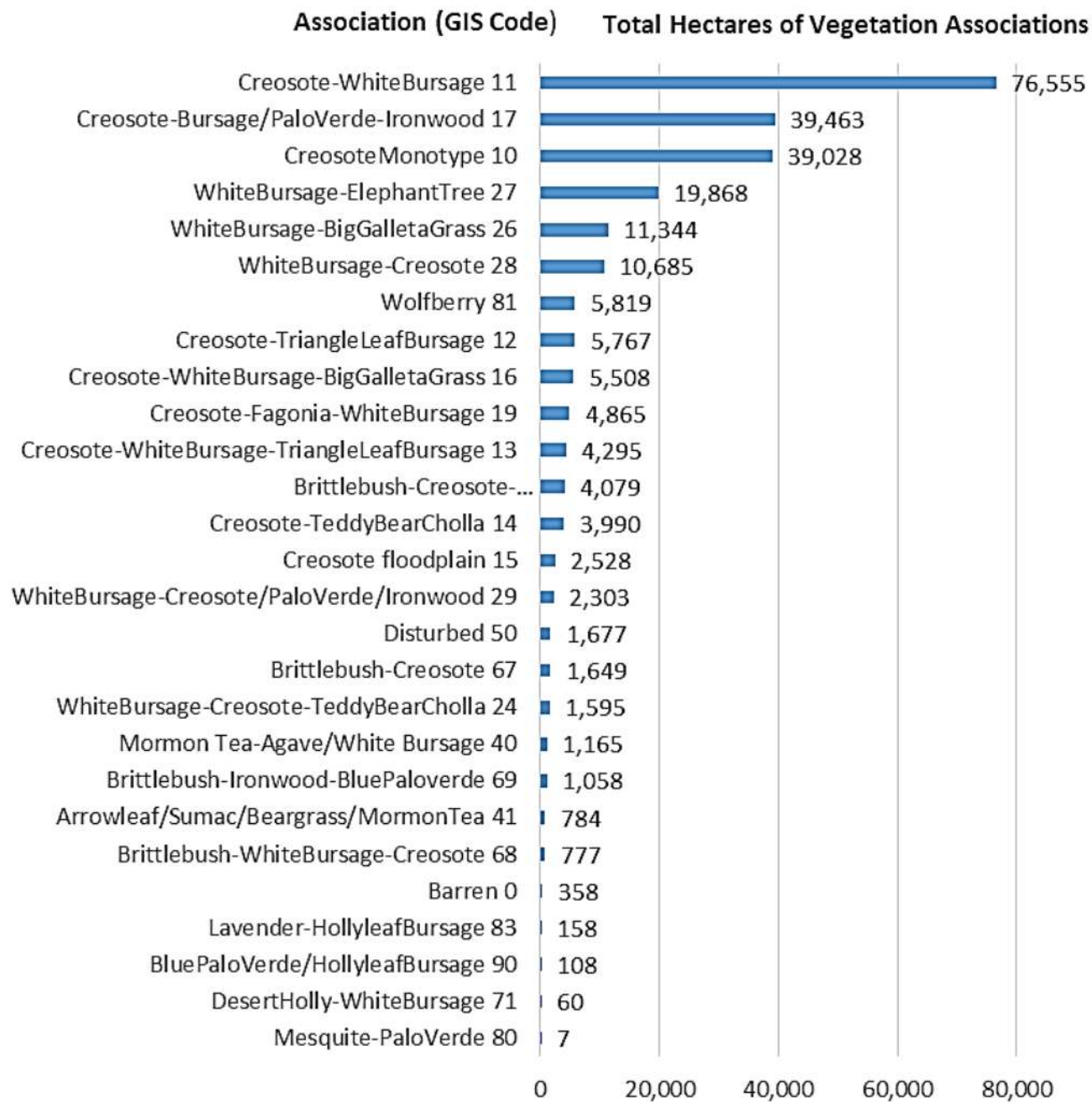
I walked a little bit of the treated areas about a week ago. Everywhere I knew Bufflegrass to have existed, it is completely gone. All that remains are dead stalks. The location in Wellton was particularly surprising, to Abigail and I, how effective it was. I got to admit, I thought the treatment was a waste of time... I stand corrected.

R/S,

R. Cerka

Preliminary USGS Data: Mohave County, AZ





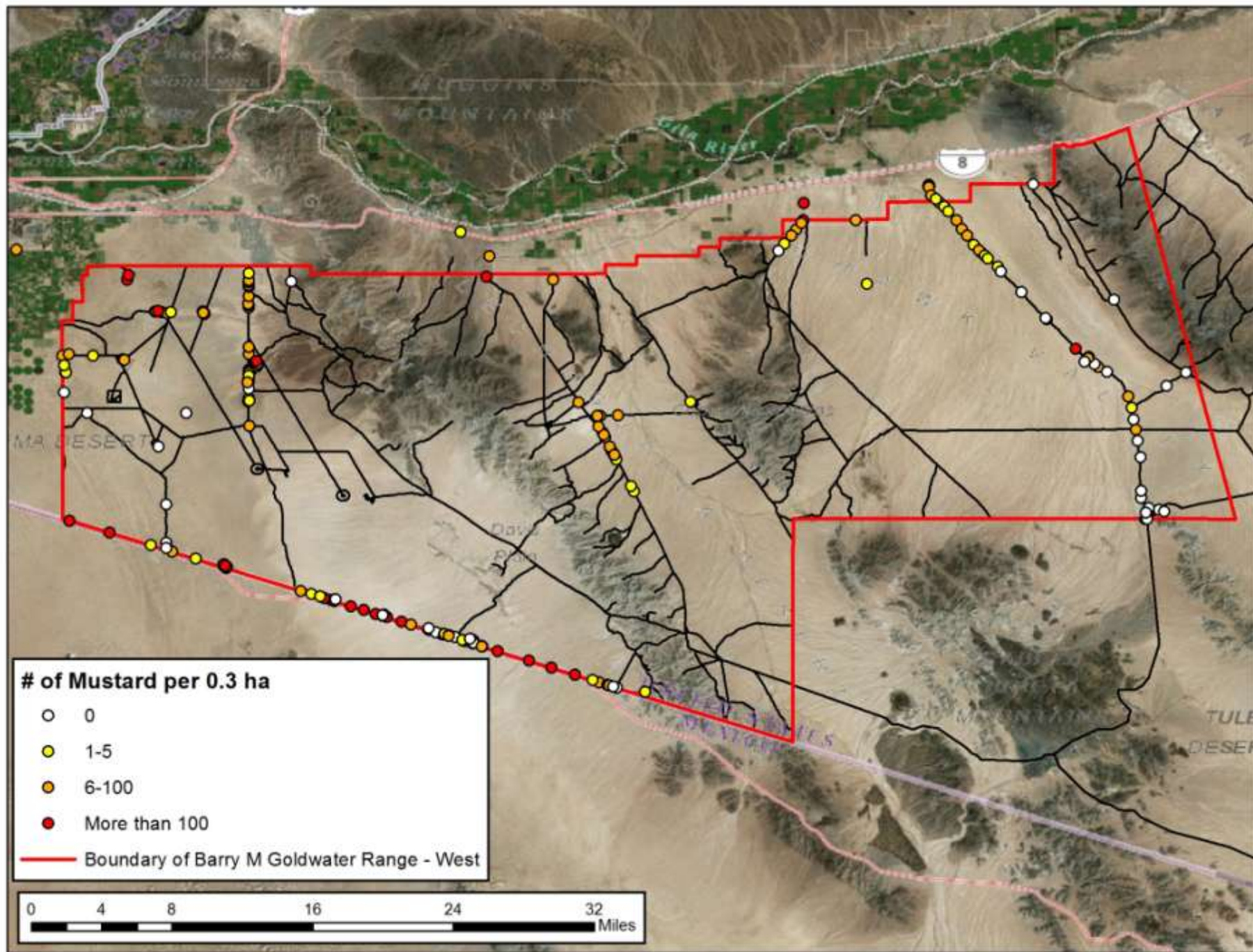


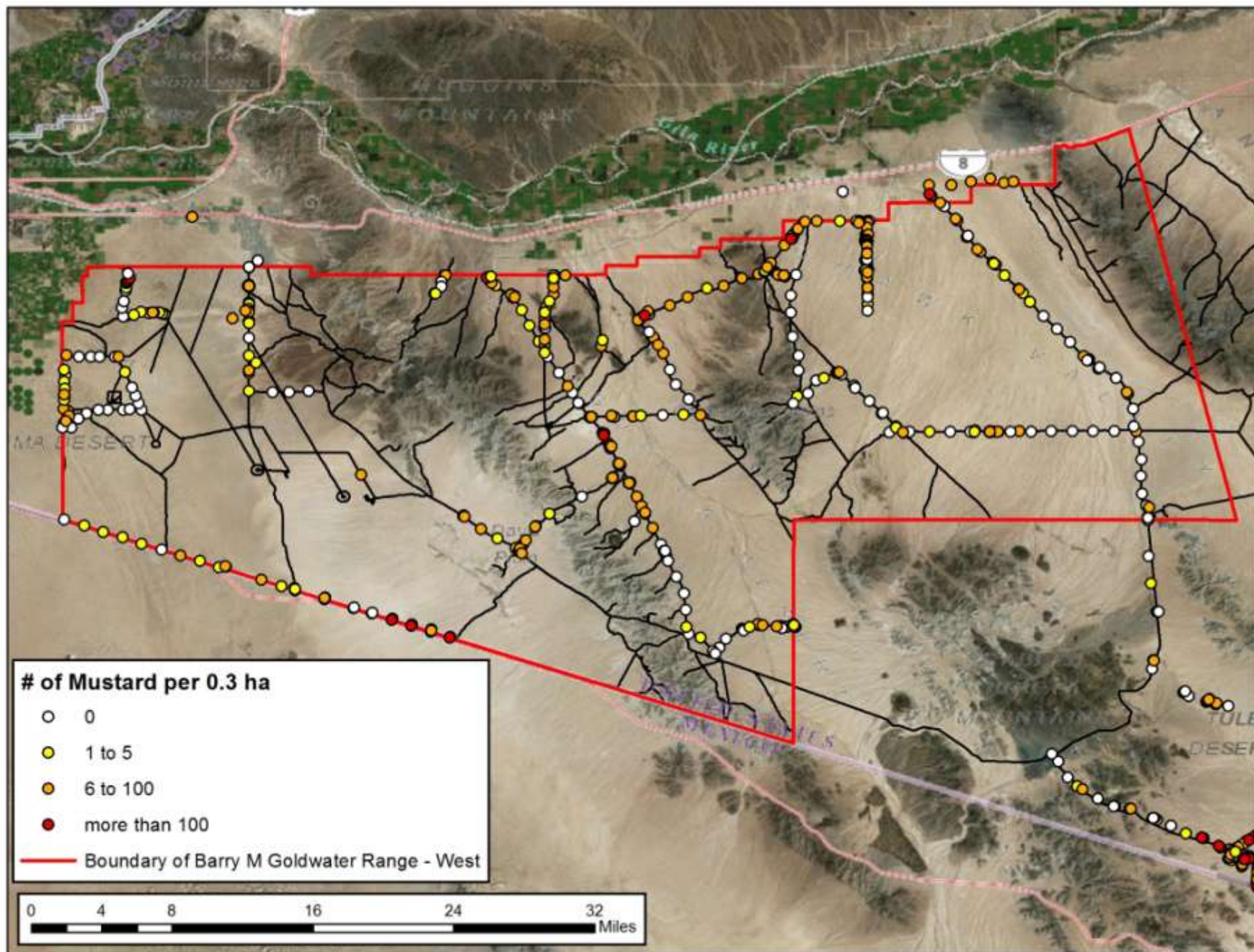
NO MILITARY
VEHICLES
BEYOND
THIS POINT

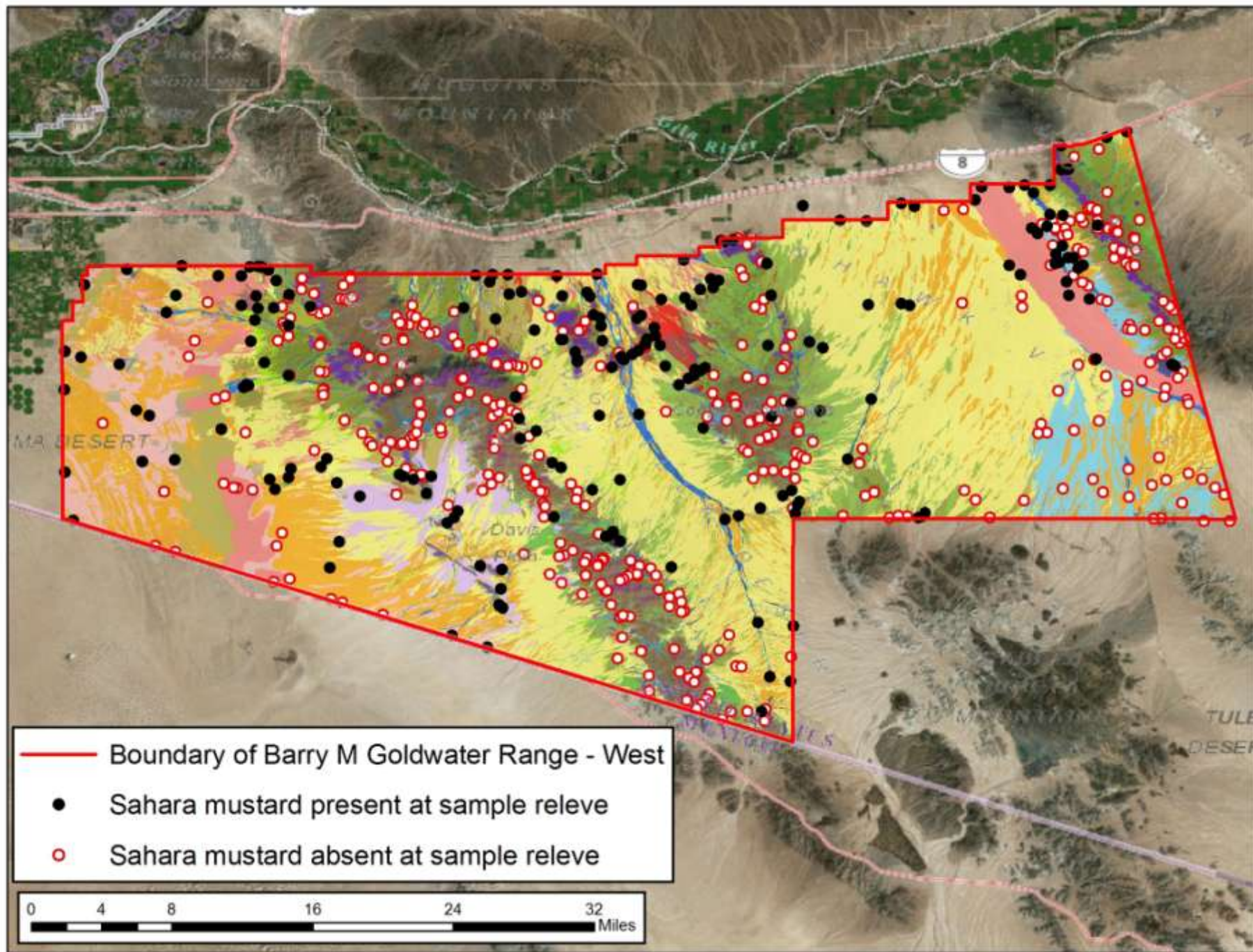


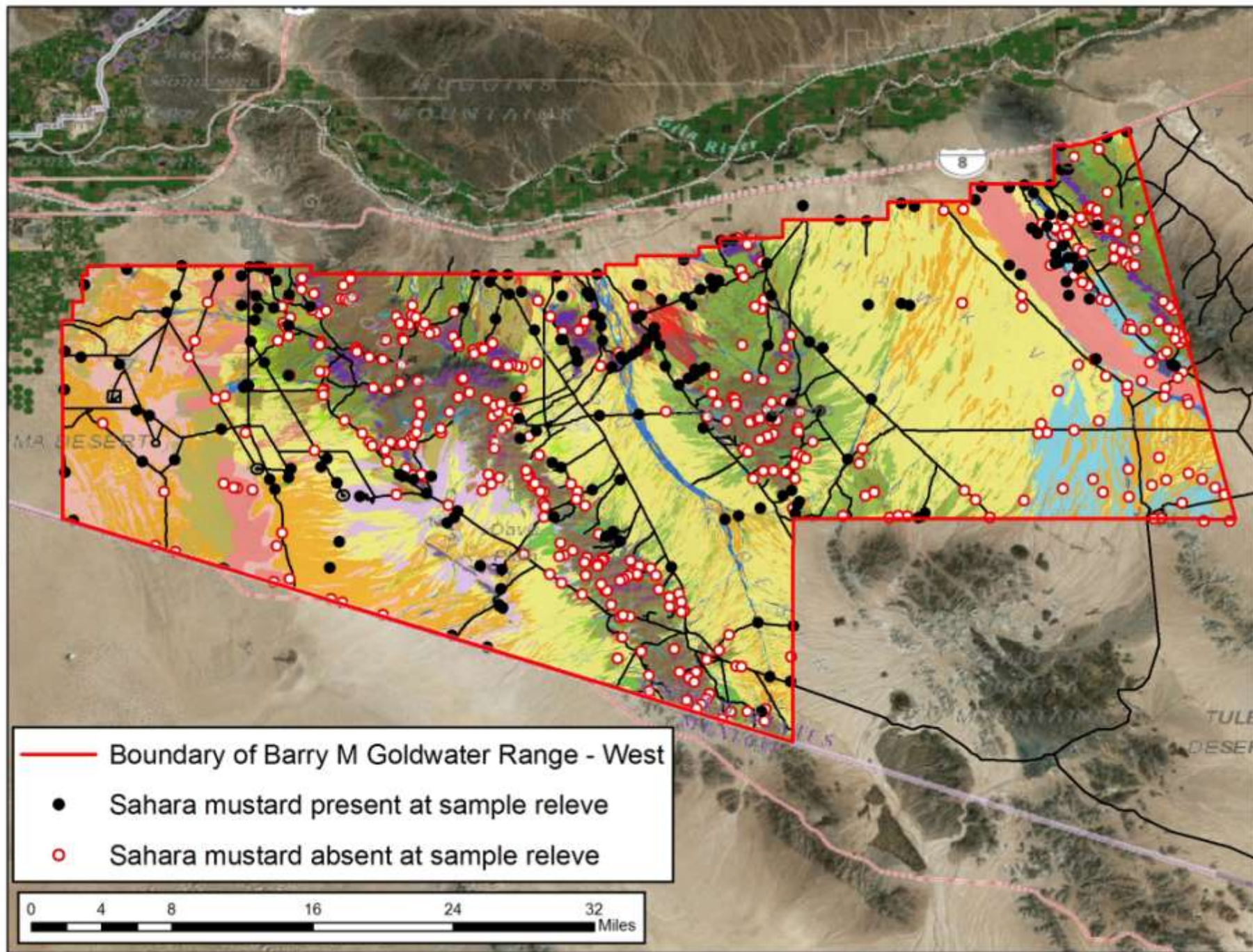
**NOT the time/place to spray glyphosate.
Instead, hope for a dry winter, and let the weather kill off the mustard.**













Distribution of the
exotic mustard
Brassica tournefortii
Gouan
In the Mohawk Dunes
and Mountains, March,
2001

Jim Malusa, Bill Halvorson, and Deborah
Angell
Sonoran Desert Field Station
US Geological Survey
School of Renewable Natural Resources
University of Arizona
Tucson, Arizona 85716







Tucson Basin Buffelgrass Assessment

MAY 2010

Prepared for
Southern Arizona Buffelgrass
Coordination Center
1955 East Sixth Street
Tucson, Arizona 85719



Prepared by
LOGAN SIMPSON DESIGN INC.
33 North Stone Avenue
Suite 1460
Tucson, Arizona 85701





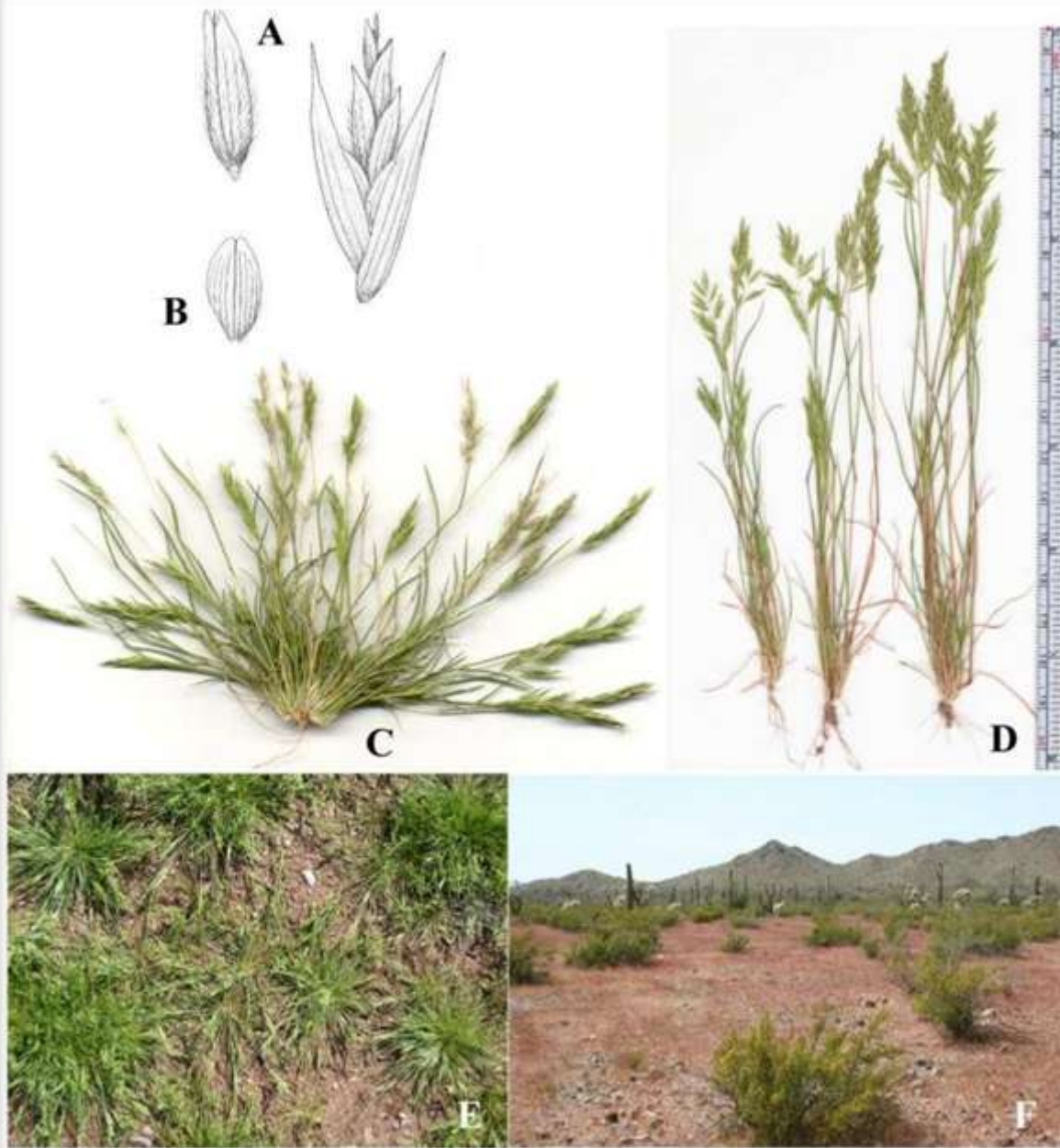
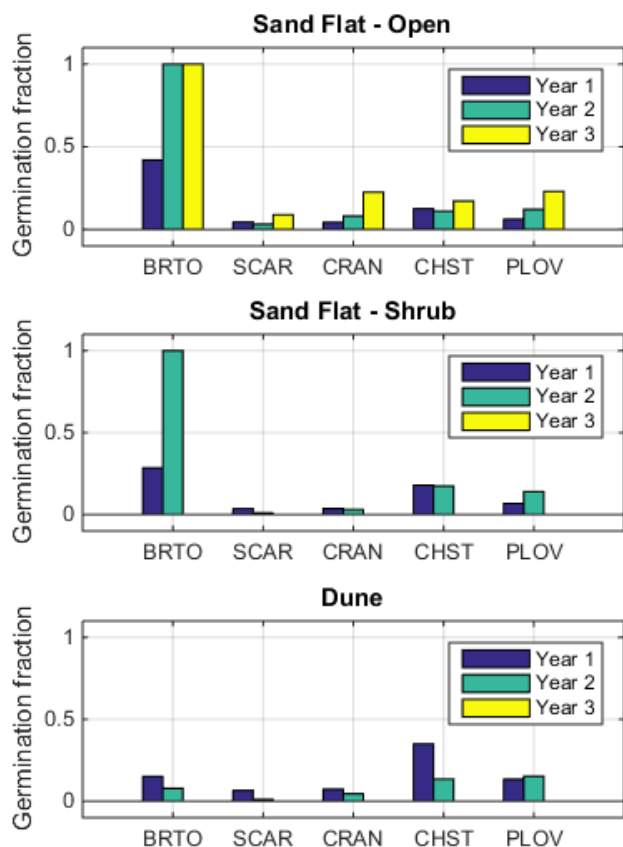


Illustration by Sue Rutman

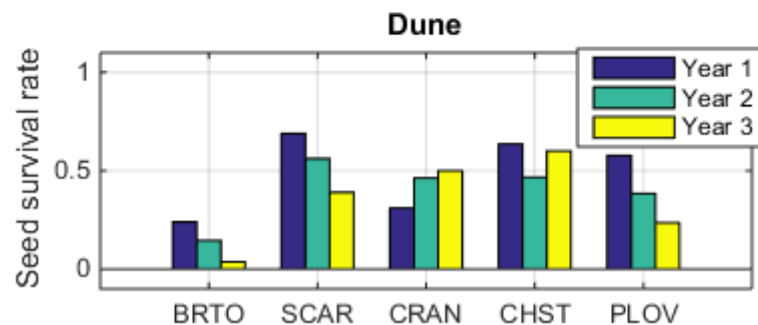
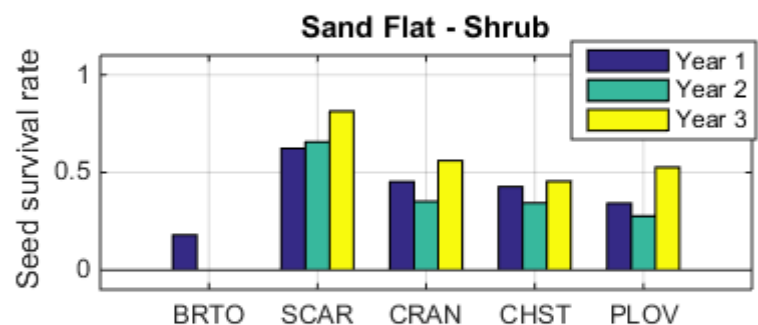
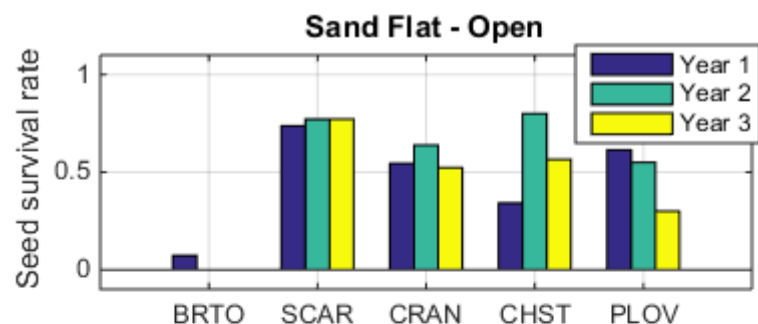
Variation in germination fraction



	Year	Species x Habitat	Habitat	Species x Year
Invasive included	1	$\chi^2_8 = 23.06$ $p = 0.0033$	Sand Flat – Open	$\chi^2_8 = 45.38$ $p < 10^{-7}$
	2	$\chi^2_8 = 41.30$ $p < 10^{-5}$	Sand Flat – Shrub	$\chi^2_4 = 31.86$ $p < 10^{-6}$
	3	N/A	Dune	$\chi^2_4 = 17.98$ $p = 0.001$
Native only	1	$\chi^2_4 = 10.64$ $p = 0.031$	Sand Flat – Open	$\chi^2_4 = 17.72$ $p = 0.001$
	2	$\chi^2_4 = 25.86$ $p < 10^{-5}$	Sand Flat – Shrub	$\chi^2_2 = 5.4$ $p = 0.067$
	3	N/A	Dune	$\chi^2_2 = 7.1$ $p = 0.029$

Significant Species x Habitat and Species x Year interaction indicate species-specific germination response

Variation in seed survival rate



- Combining seed survival rate over all three years
- Sahara mustard has significantly higher seed survival on the dune ($\chi^2_2 = 6.34$, $p = 0.042$)
- *Schismus arabicus* has significantly lower seed survival on the dune ($\chi^2_2 = 25.13$, $p < 10^{-6}$)

Arabian grass is similar to native annuals.
Some seeds wait, and they can wait a long time.

Mustard bets it all...or almost all. Poor seed survival.
Successive wet winters needed for major outbreak.

Wild card: the dunes. A spatial refuge.
Dunes make up about 3% of the range.
About 30% is 'sand flats'.

Simple phone app - the form

Simple data collection – only points

Simple review - No username, no password

Simple sharing –

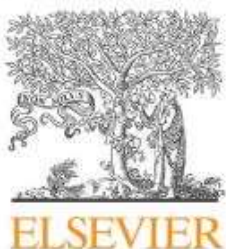
iNaturalist

Survey 1 2 3

Bugwood



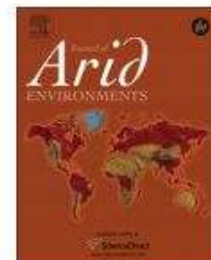




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Journal of Arid Environments

journal homepage: www.elsevier.com/locate/jaridenv



Cheatgrass die-offs as an opportunity for restoration in the Great Basin, USA: Will local or commercial native plants succeed where exotic invaders fail?

Owen W. Baughman ^{a,*}, Susan E. Meyer ^b, Zachary T. Aanderud ^c, Elizabeth A. Leger ^a

^a Department of Natural Resources and Environmental Science, University of Nevada Reno, 1664 N. Virginia St., Reno, NV 89557, USA

^b U.S. Forest Service Rocky Mountain Research Station, Shrub Sciences Laboratory, 735 North 500 East, Provo, UT 84606, USA

^c College of Life Sciences, Brigham Young University, 4125 LSB, Provo, UT 84602, USA

Wait until the time is right, and the mustard is weak.

But if there are only small populations,
how do you find them? And how to mobilize the troops?



BMGR Vegetation Map

FM

Malva

:7 50 426 N: 36 11 287

Fortune Wash, Gile Mt,

Date:

Elevation

Photo #

Orienta

Slope %

Aspect

Assoc:

214

and Fine Sand Sil

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