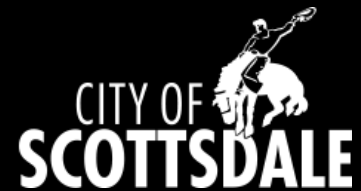


Mule Deer Corridor and Habitat Use in McDowell Sonoran Preserve

Scott Sprague, Susan Boe, Tiffany Sprague, Colin Beach, Emily Herring, & Jeff Gagnon

WILDLIFE CONTRACTS BRANCH



Warning!!!

**GRAPHIC IMAGES
(DEAD ANIMALS)
ON NEXT SLIDE**

Wildlife-Vehicle-Collisions

1-2 million large animals every year



100% Increase in 10 Years



200 human fatalities per year

Man killed avoiding elk

A two-vehicle collision resulted in death at milepost 299.4 on Interstate-17 Wednesday night. A red 2001 Saturn four-door SUV was northbound on I-17 about just before 9 p.m. when it struck an elk in the roadway. The collision with the animal caused the passenger car to veer into the path of a tractor-trailer truck and roll over. The semi driver pulled into the emergency lane and the driver of the Saturn, Matthew Manegold, 28, of Flagstaff and another male passenger were able to get out of the car that had come to rest in the slow speed lane. Manegold was still standing in the traffic lane when he was struck by a second commercial vehicle that was also attempting to avoid the elk carcass. Manegold was pronounced dead at the scene.

A second rollover not far away on the interstate an hour later, but the driver who was wearing seatbelts refused medical care.



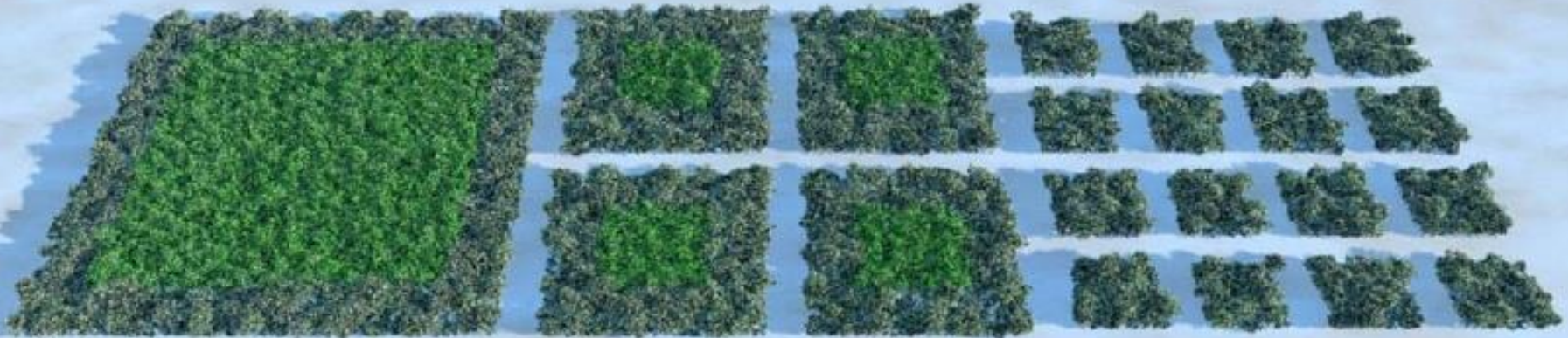
This collision with an elk caused the car to veer into the path of a tractor-trailer truck and roll over.

Courtesy photo

1 million vertebrates every day



Habitat Fragmentation

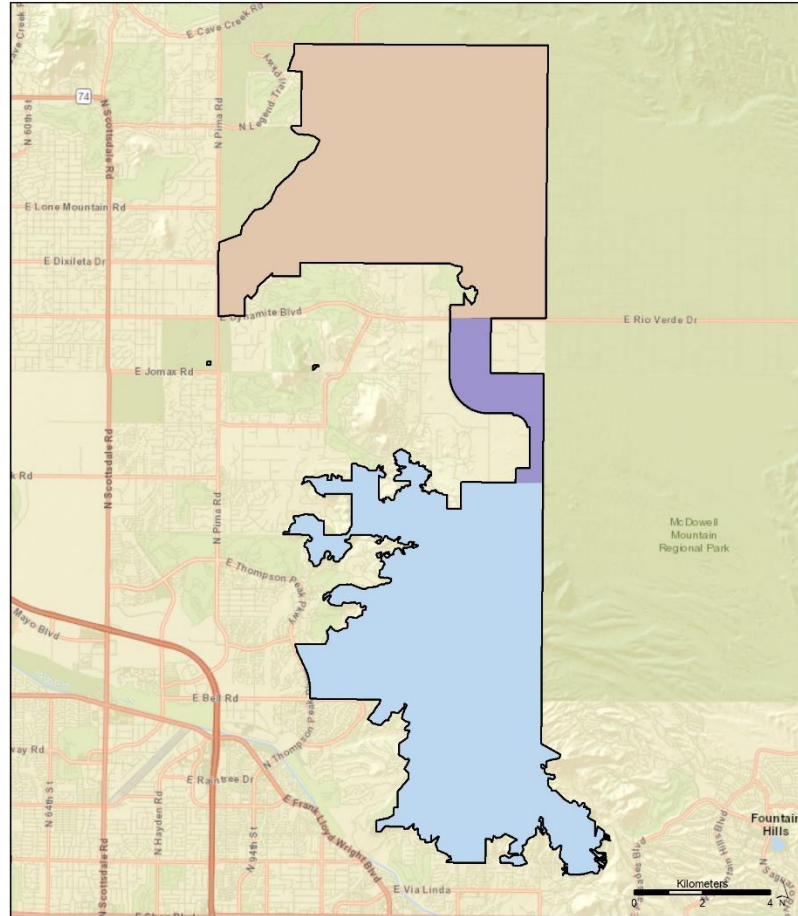


Contain more species types



Contain less species types

McDowell Sonoran Preserve



Study Regions
North
Central
South

Three Analysis Regions within the
McDowell Sonoran Preserve, Scottsdale AZ

Northern Region

- 56.6 km²

Central Region

- 6 km²

Southern Region

- 61.0 km²

Related Preserve Projects

Identification of Wildlife Road Mortality Hotspots and Wildlife Activity Patterns within the McDowell Sonoran Preserve Wildlife Linkage

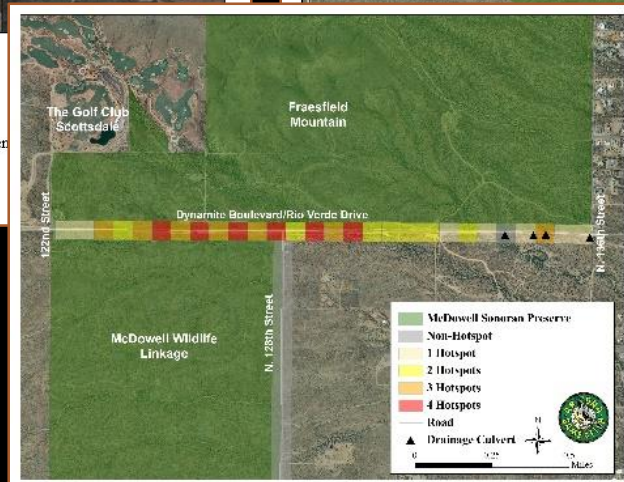
DRAFT REPORT



Prepared by:

David D. Grandmaison
Senior Project Manager
Arizona Game and Fish Department
Wildlife Contracts Branch

November 2012



Related Preserve Projects

Deer & Javelina Surveys

2013 Deer and Javelina Survey Results for the McDowell Sonoran Preserve / Game Management Unit 25M

Collaborative efforts between the Arizona Game and Fish Department (Department), the City of

Scottsdale (City) and the McDowell Sonoran Conservancy (MSC) resulted in aerial surveys of large mammals (deer and javelina) in the McDowell Sonoran Preserve (Preserve). In October of 2013, the Department and the City of Scottsdale renewed the Wildlife Study Agreement to secure funding for aerial surveys for deer and javelina for an additional five years. With data from these flights managers will be able to estimate deer and javelina populations within the Preserve for the length of the study agreement.

SURVEYS

On January 17th and 18th, 2013, the Department and the City of Scottsdale performed aerial surveys for deer and javelina. The total number of deer and javelina observed during the 2013 survey are shown in the table below.

The first survey was flown on the evening of January 17th. The second survey was flown on the morning of January 18th. The survey was flown over the northern portion of the Preserve. The survey was flown over the northern portion of the Preserve. The survey was flown over the northern portion of the Preserve.

MSP/GMU 25M Aerial Survey Location: Brown's Ranch	
Hours Surveyed: 1.5	
Deer	
Bucks	2
Does	1
Fawns	1
Total	4

The second survey was flown on the morning of January 18th. The survey was flown over the southern portion of the Preserve. The survey was flown over the southern portion of the Preserve. The survey was flown over the southern portion of the Preserve.

2014 Deer and Javelina Survey Results for the McDowell Sonoran Preserve / Game Management Unit 25M

Collaborative efforts between the Arizona Game and Fish Department (Department), the City of

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SURVEYS

On January 16th and 17th, 2014, the Department and the City of Scottsdale performed aerial surveys for deer and javelina. The total number of deer and javelina observed during the 2014 survey are shown in the table below.

2014 MSP/GMU 25M Aerial Survey Location: Brown's Ranch	
Hours Surveyed: 1.5	
Deer	
Bucks	6
Does	24
Fawns	14
Total	44

The second survey was flown on the morning of January 17th. The survey was flown over the southern portion of the Preserve. The survey was flown over the southern portion of the Preserve. The survey was flown over the southern portion of the Preserve.

2014 MSP/GMU 25M Aerial Survey Location: McDowell Mountain Range	
Hours Surveyed: 2.0	
Deer	
Bucks	17
Does	38
Fawns	6
Total	61

1

2015 Deer and Javelina Survey Results for the McDowell Sonoran Preserve / Game Management Unit 25M

Collaborative efforts between the Arizona Game and Fish Department (Department), the City of Scottsdale (City) and the McDowell Sonoran Conservancy (MSC) resulted in aerial surveys of large mammals (deer and javelina) in the McDowell Sonoran Preserve (Preserve). In October of 2015, the Department and the City of Scottsdale renewed the Wildlife Study Agreement to secure funding for aerial surveys for deer and javelina for an additional five years. With data from these flights managers will be able to estimate deer and javelina populations within the Preserve for the length of the study agreement.

SURVEYS

On January 12th and 13th, 2015, the Department and the City of Scottsdale performed aerial surveys for deer and javelina. The total number of deer and javelina observed during the 2015 survey are shown in the table below.

2015 MSP/GMU 25M Aerial Survey Location: Brown's Ranch	
Hours Surveyed: 1.5	
Deer	
Bucks	4
Does	10
Fawns	1
Total	15

Survey results for the McDowell Mountain Range are shown in the table below.

2015 MSP/GMU 25M Aerial Survey Location: McDowell Mountain Range	
Hours Surveyed: 2.0	
Deer	
Bucks	30
Does	74
Fawns	51
Total	155

This year's survey resulted in sixty-six more deer and two more javelinas than the 2014 survey. The total number of deer and javelina observed during the 2015 survey are shown in the table below.

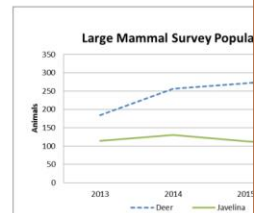
2016 Deer and Javelina Survey Results for the McDowell Sonoran Preserve

Collaborative efforts between the Arizona Game and Fish Department (Department), the City of Scottsdale (City) and the McDowell Sonoran Conservancy (MSC) resulted in aerial surveys of large mammals (deer and javelina) in the McDowell Sonoran Preserve (Preserve). In October of 2016, the Department and the City of Scottsdale renewed the Wildlife Study Agreement to secure funding for aerial surveys for deer and javelina for an additional five years. With data from these flights managers will be able to estimate deer and javelina populations within the Preserve for the length of the study agreement.

Low level helicopter surveys were performed on January 9th and 10th, 2016, by biologists from the Arizona Game and Fish Department and staff from the City of Scottsdale. The survey covered 179 miles of transect distributed throughout the Preserve. The survey was flown over the northern portion of the Preserve. The survey was flown over the northern portion of the Preserve.

POPULATION ESTIMATES:

Based on 2016 survey data the resulting population estimate for the Preserve is 205 deer and 87 javelina. The graph below shows annual population estimates for the Preserve since the inception of the wildlife study agreement in 2013.



While surveys allow for the calculation of a relative abundance of wildlife, managers historically place more emphasis on evaluating ratios of the population to make assessments and inferences about the health of hunted populations.

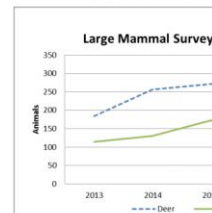
2017 Deer and Javelina Survey Results for the McDowell Sonoran Preserve

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DEER ANALYSIS

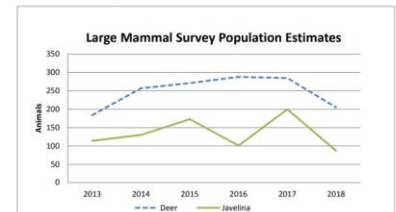
2018 Deer and Javelina Survey Results for the McDowell Sonoran Preserve

Collaborative efforts between the Arizona Game and Fish Department (Department), the City of Scottsdale (City) and the McDowell Sonoran Conservancy (MSC) resulted in aerial surveys of large mammals (deer and javelina) in the McDowell Sonoran Preserve (Preserve). In October of 2018, the Department and the City of Scottsdale renewed the Wildlife Study Agreement to secure funding for aerial surveys for deer and javelina for an additional five years. With data from these flights managers will be able to estimate deer and javelina populations within the Preserve for the length of the study agreement.

Low level helicopter surveys were performed on January 9th and 10th, 2018, by biologists from the Arizona Game and Fish Department and staff from the City of Scottsdale. The survey covered 179 miles of transect distributed throughout the Preserve (54 square miles). The total number of deer and javelina observed during the 2018 survey are included in the appendix at the end of this report.

POPULATION ESTIMATES:

Based on 2018 survey data the resulting population estimate for the Preserve is 205 deer and 87 javelina. The graph below shows annual population estimates for the Preserve since the inception of the wildlife study agreement in 2013.



While surveys allow for the calculation of a relative abundance of wildlife, managers historically place more emphasis on evaluating ratios of the numbers of males, females and juveniles within the population to make assessments and inferences about the health of hunted populations.

DEER ANALYSIS

2013 – 2019 Annual Mule Deer Population Estimates: 184-288

Project Objectives

- **How are deer using the Preserve?**
 - Effects of human activity on utilization
 - “Gooseneck” corridor connectivity
 - Other important linkages

Management recommendations to promote permeability and ecosystem viability

Collar Deployments

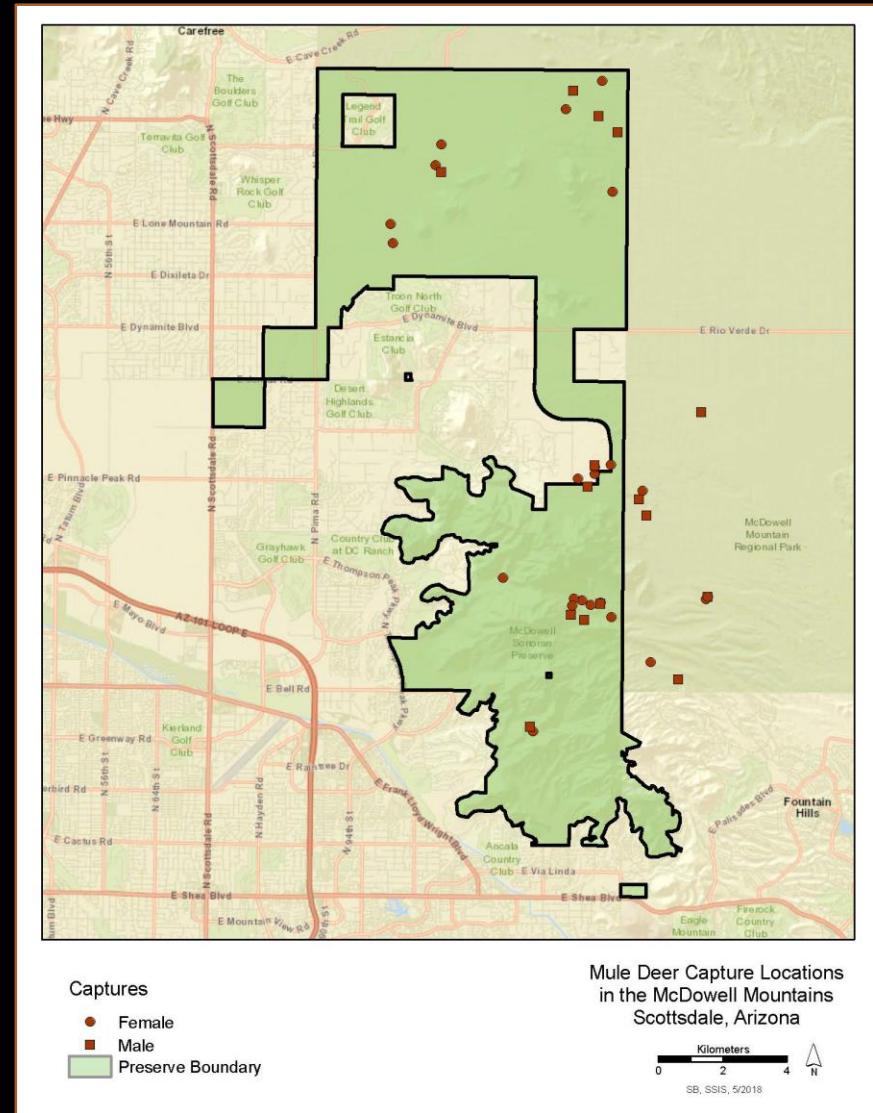


Collar Deployments



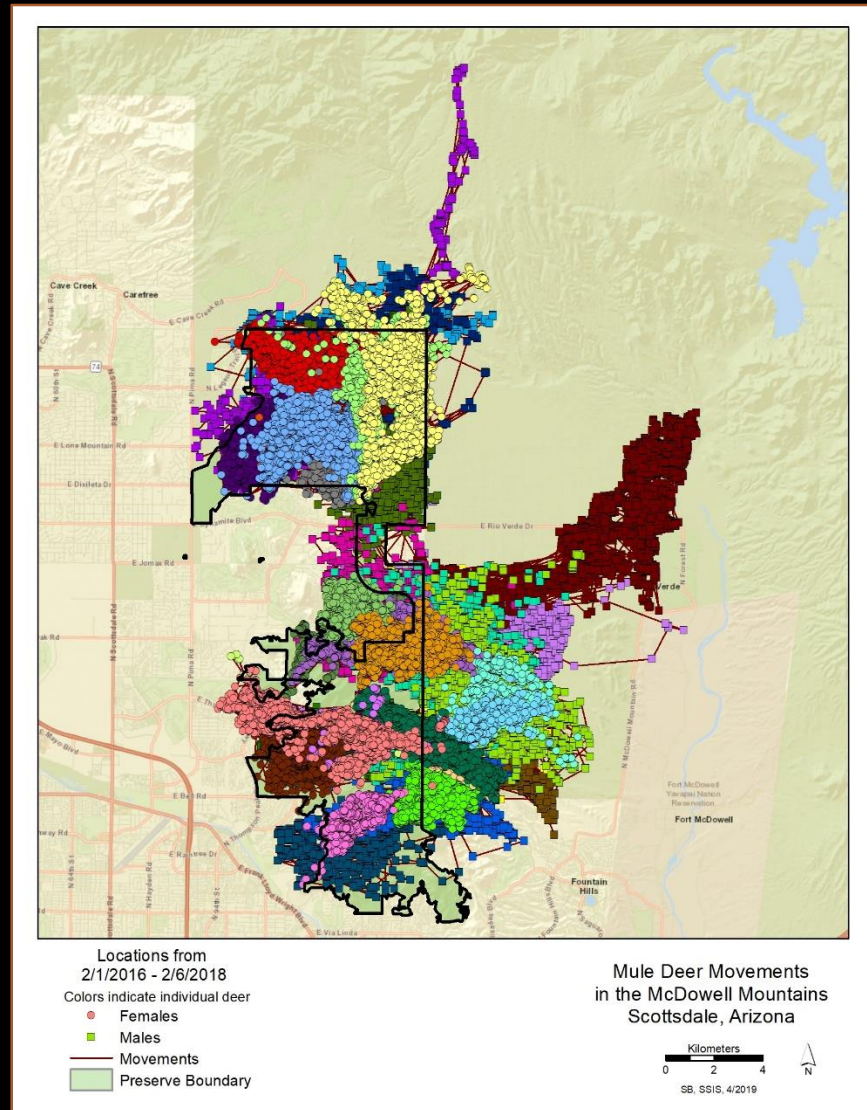
Collar Deployments

- **February 2016**
 - 32 Deployments
 - 19 ♀
 - 13 ♂
- **February 2017**
 - 6 Re-deployments
 - 4 ♀
 - 2 ♂

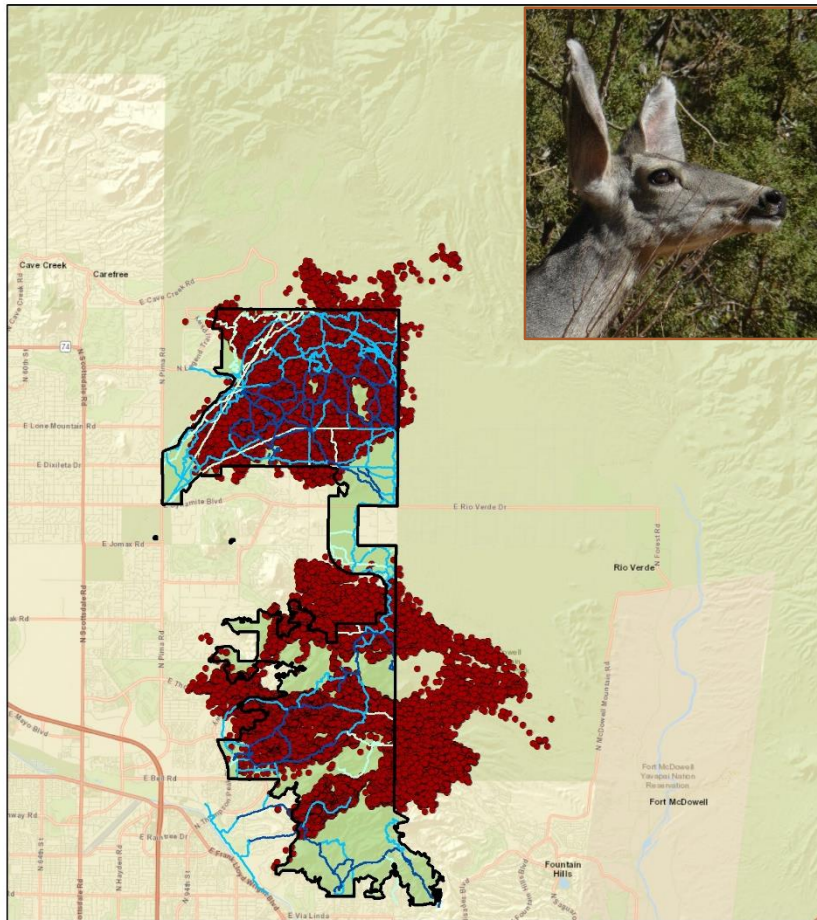


Collar & Data Recovery

- 12 Mortality recoveries
- 1 Disappeared (Sept 2017)
- 24 Dropped (6 Feb 2018)
- 1 Failed-Drop
- **38 Files (direct OL & SST)**
- **167,238 locations**



Mule Deer Locations & Trails

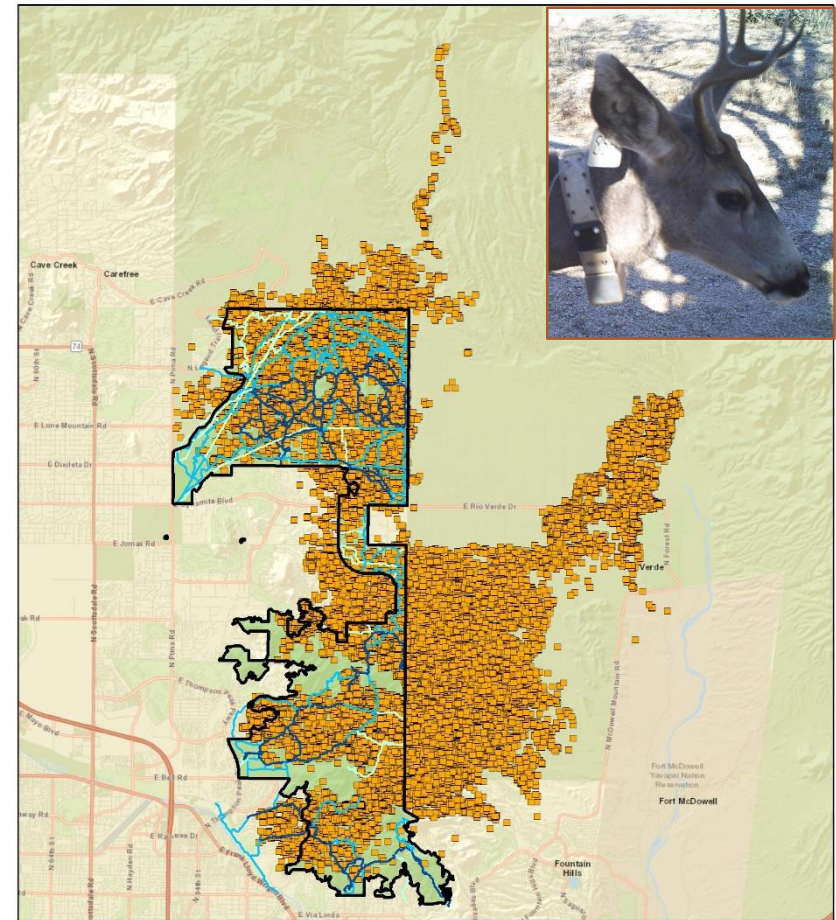
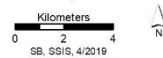


Locations from
2/1/2016 - 2/6/2018

- Female
- Low Use
- Medium Use
- High Use
- Preserve Boundary



Mule Deer Locations
and MSP Trails
in the McDowell Mountains
Scottsdale, Arizona

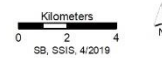


Locations from
2/1/2016 - 2/6/2018

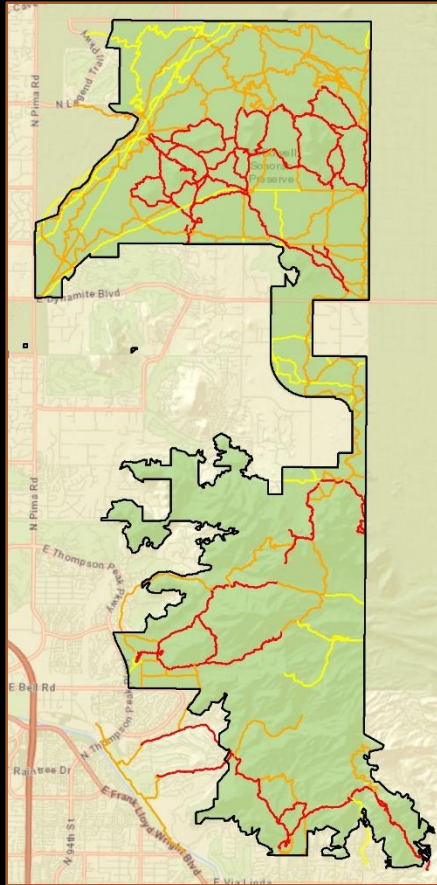
- Male
- Low Use
- Medium Use
- High Use
- Preserve Boundary



Mule Deer Locations
and MSP Trails
in the McDowell Mountains
Scottsdale, Arizona

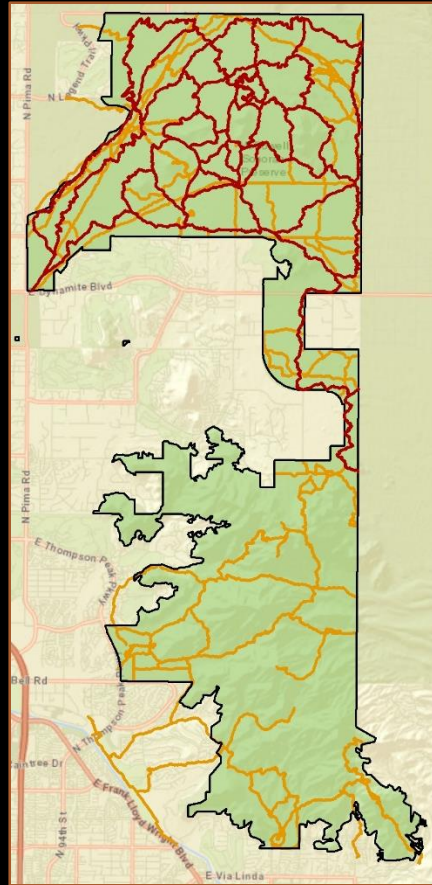


Preserve Trails

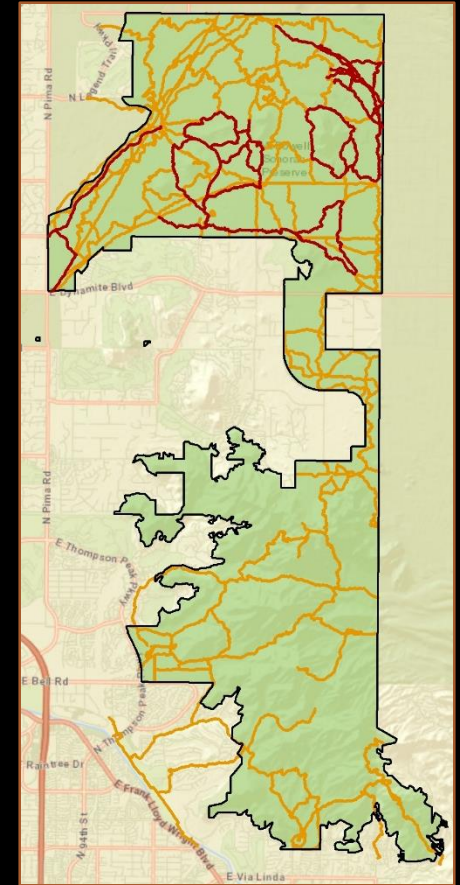


Trail Use

- High
- Med
- Low



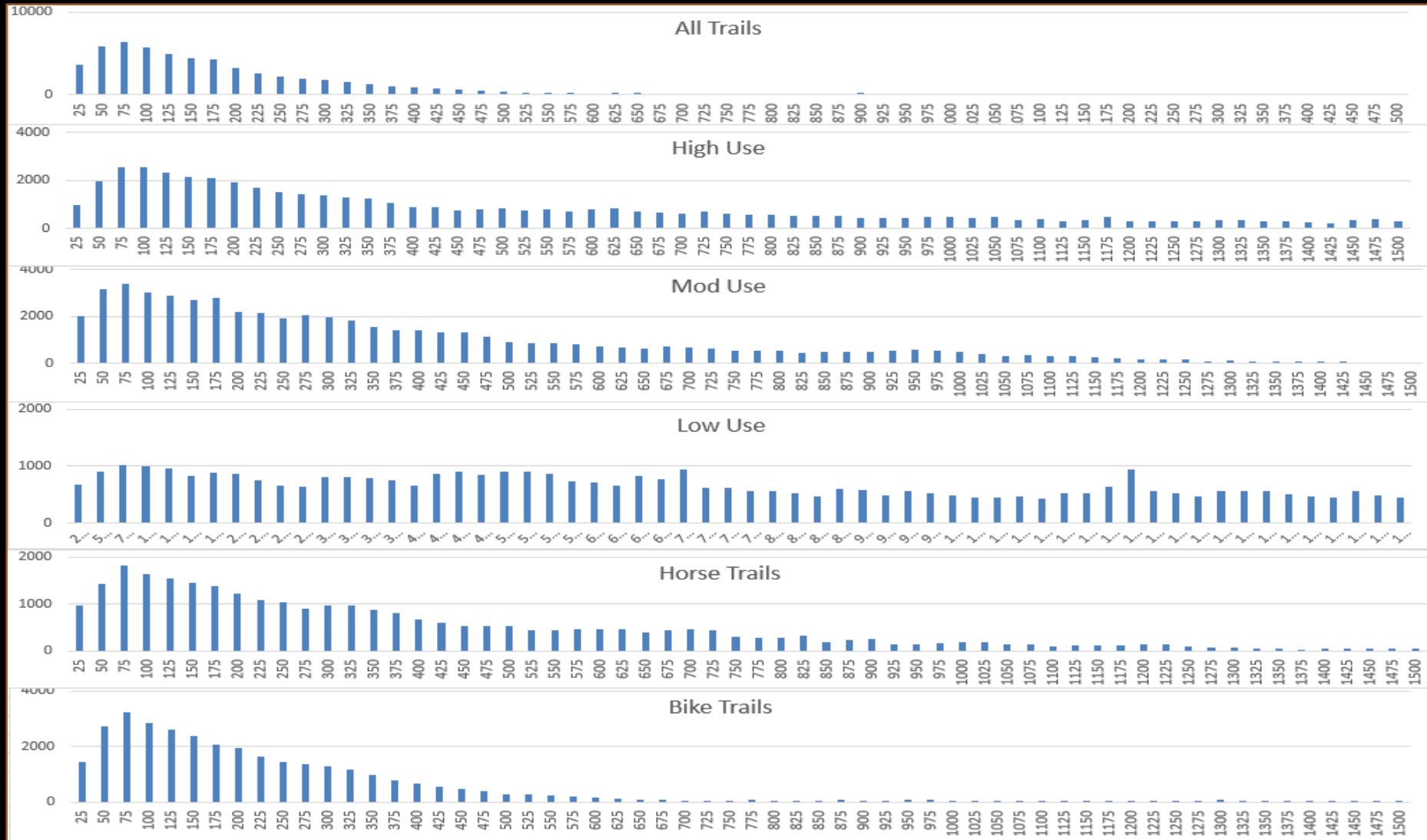
- Mountain Bike Trails
- Preserve Trails
- Preserve Boundary



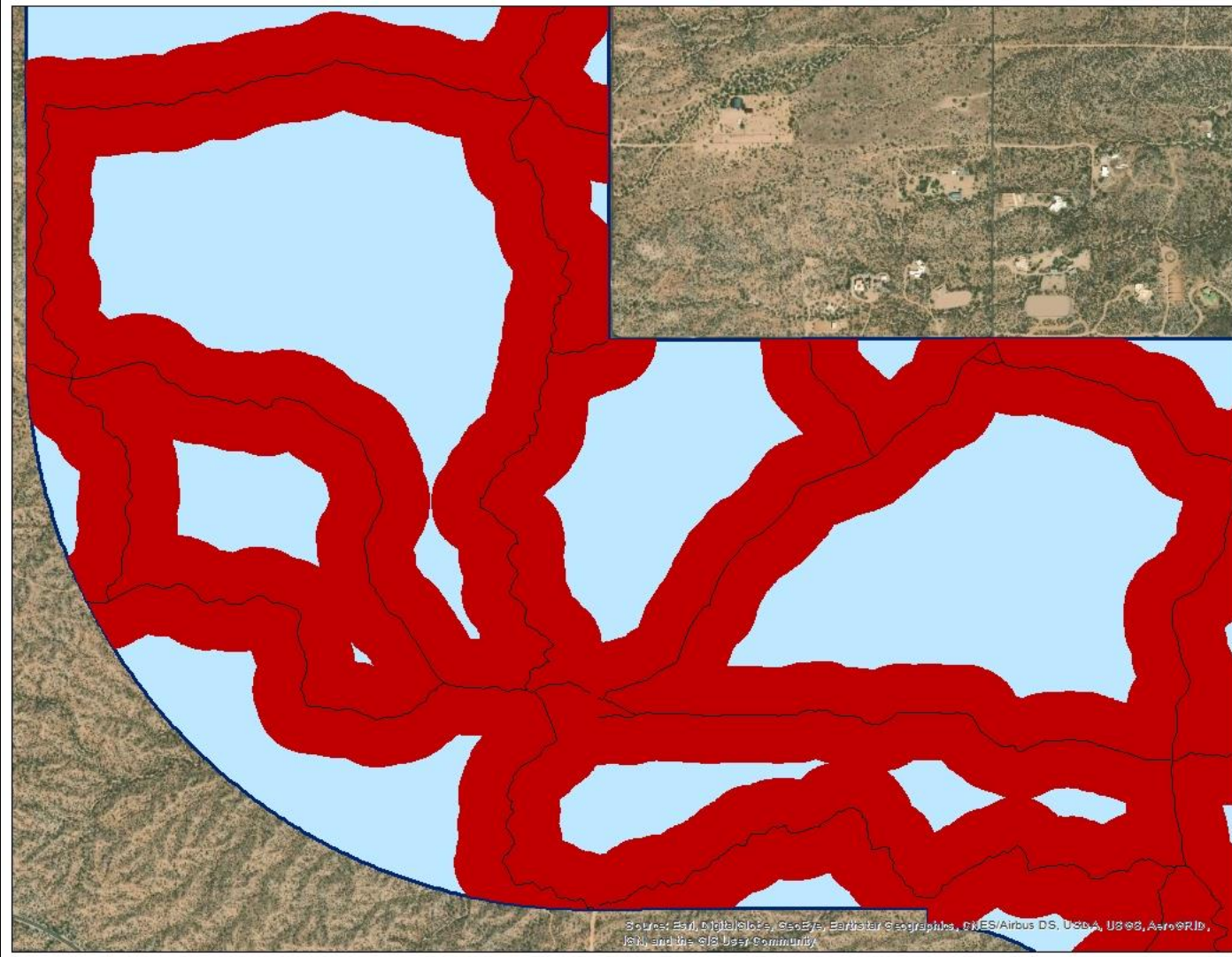
- Horse Trails
- Preserve Trails
- Preserve Boundary



Distance To Trails



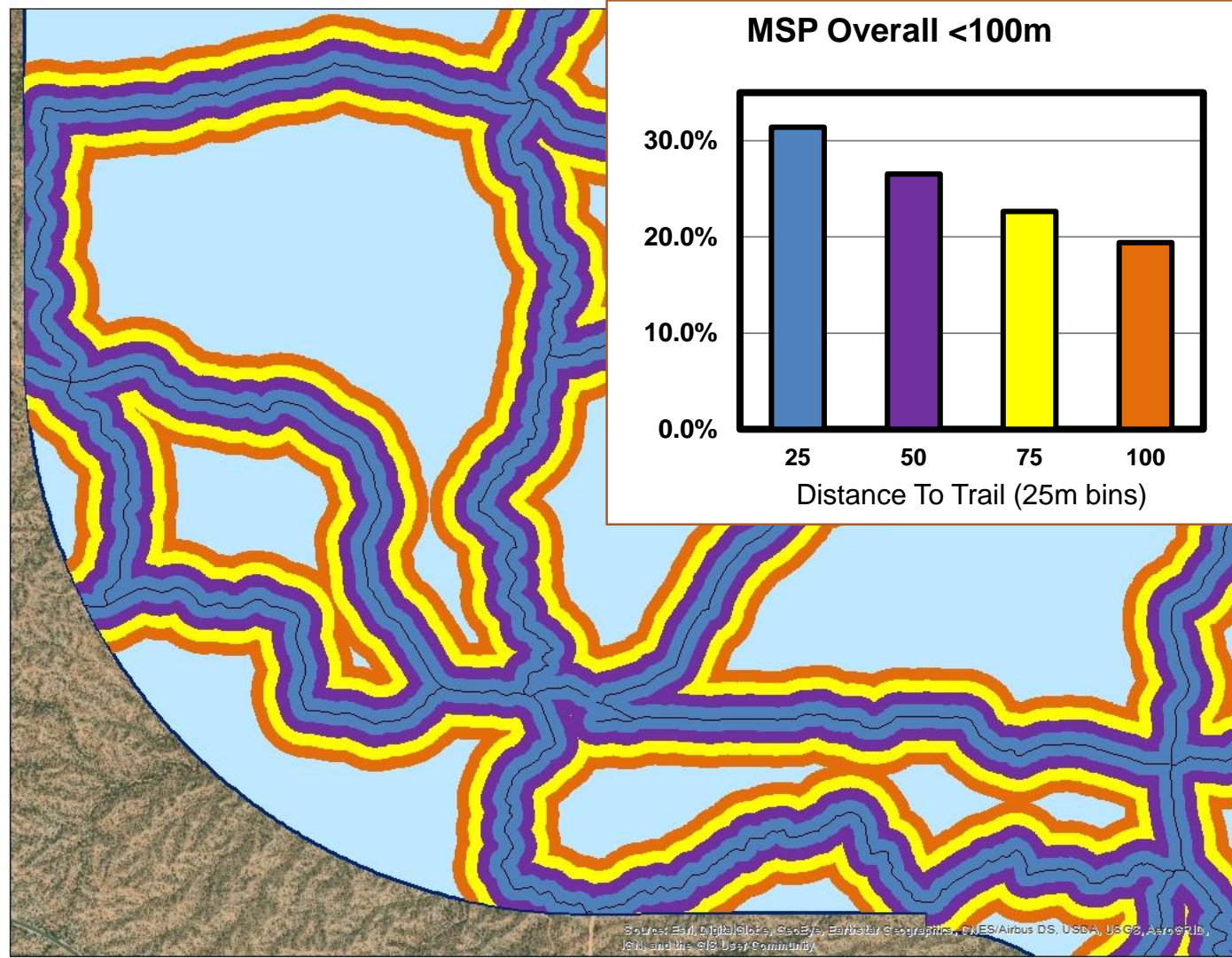
Distance To Trails: Available Area Within 100m



46.5 km²

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Distance To Trails: Available Area Within 100m



0-25m
14.5km²

25-50m
12.3km²

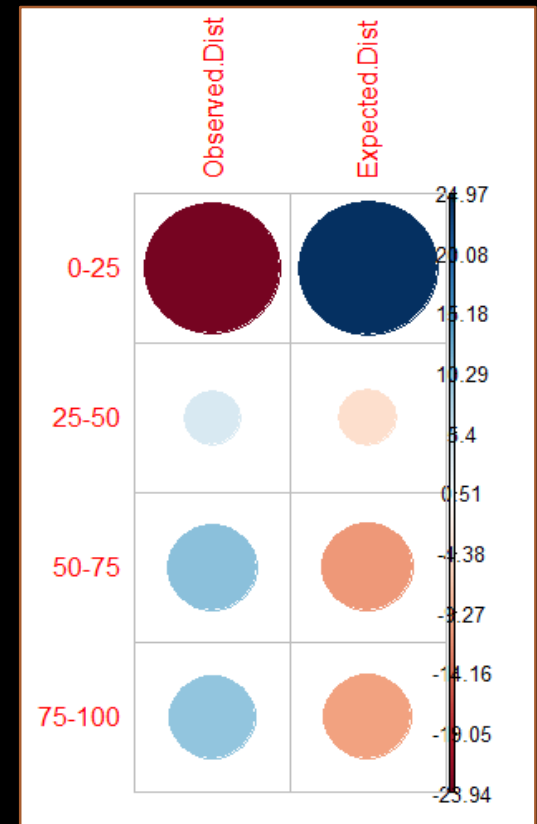
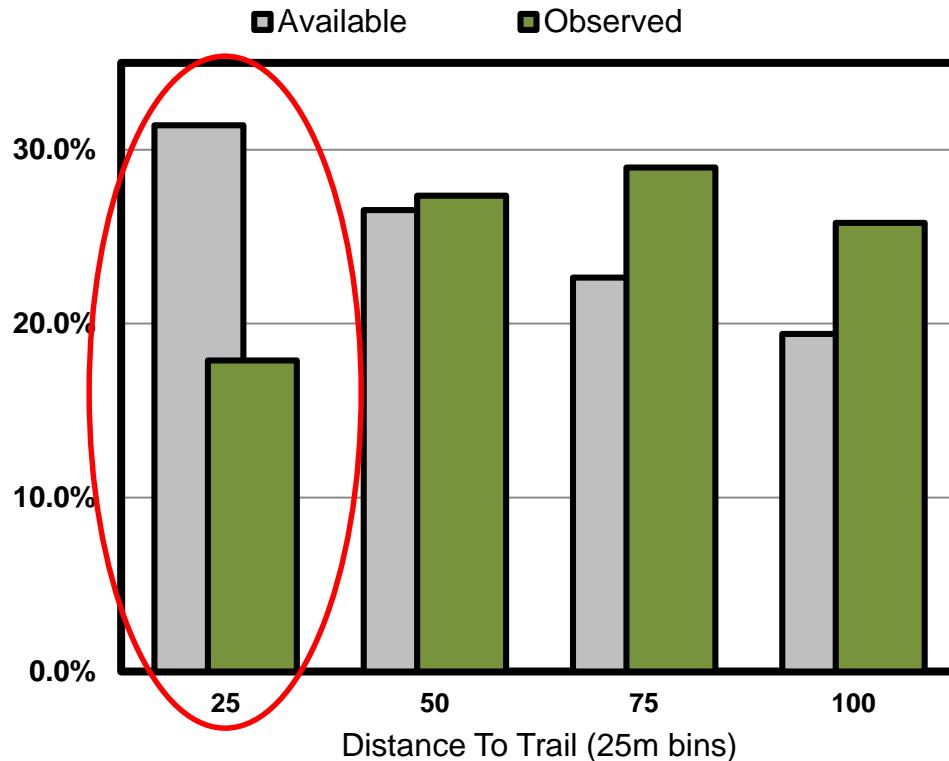
50-75m
10.5 km²

75-100m
09.0 km²

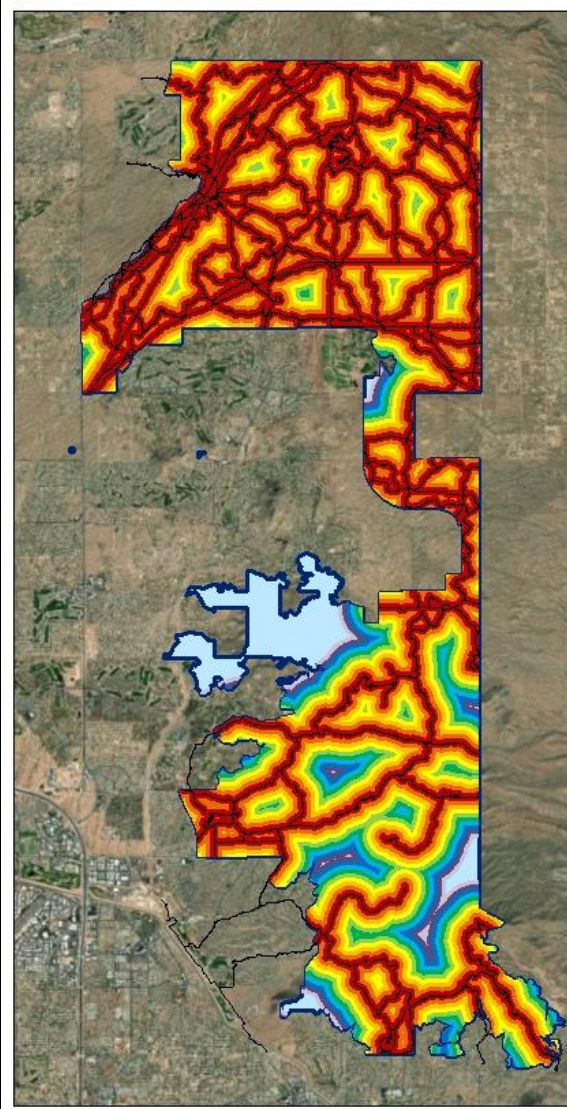
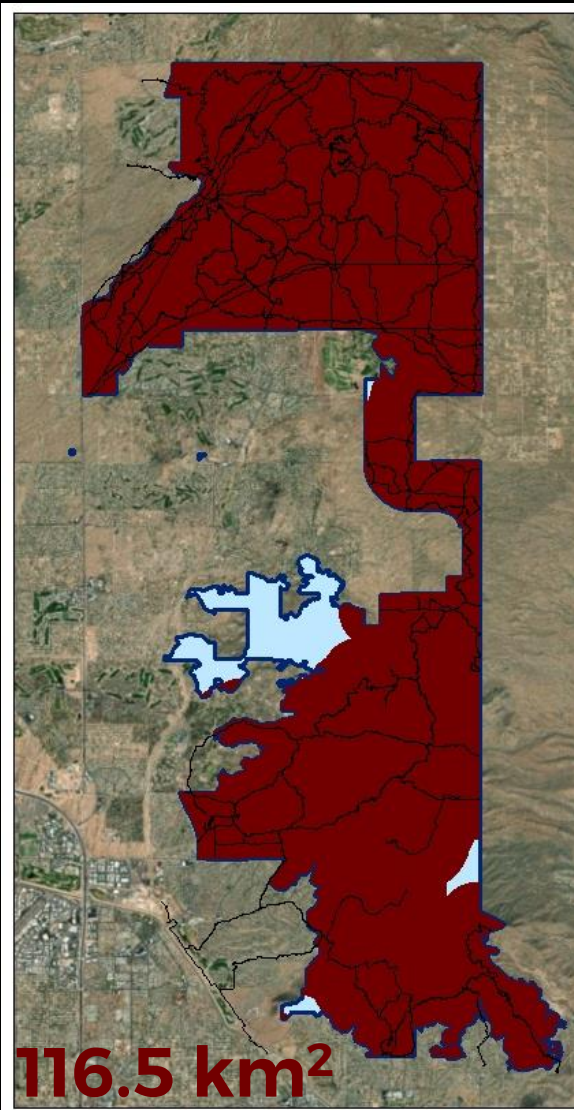
Distance To Trails: Observed vs. Expected

Ratio of Available Area = “Expected” Use

MSP Overall <100m



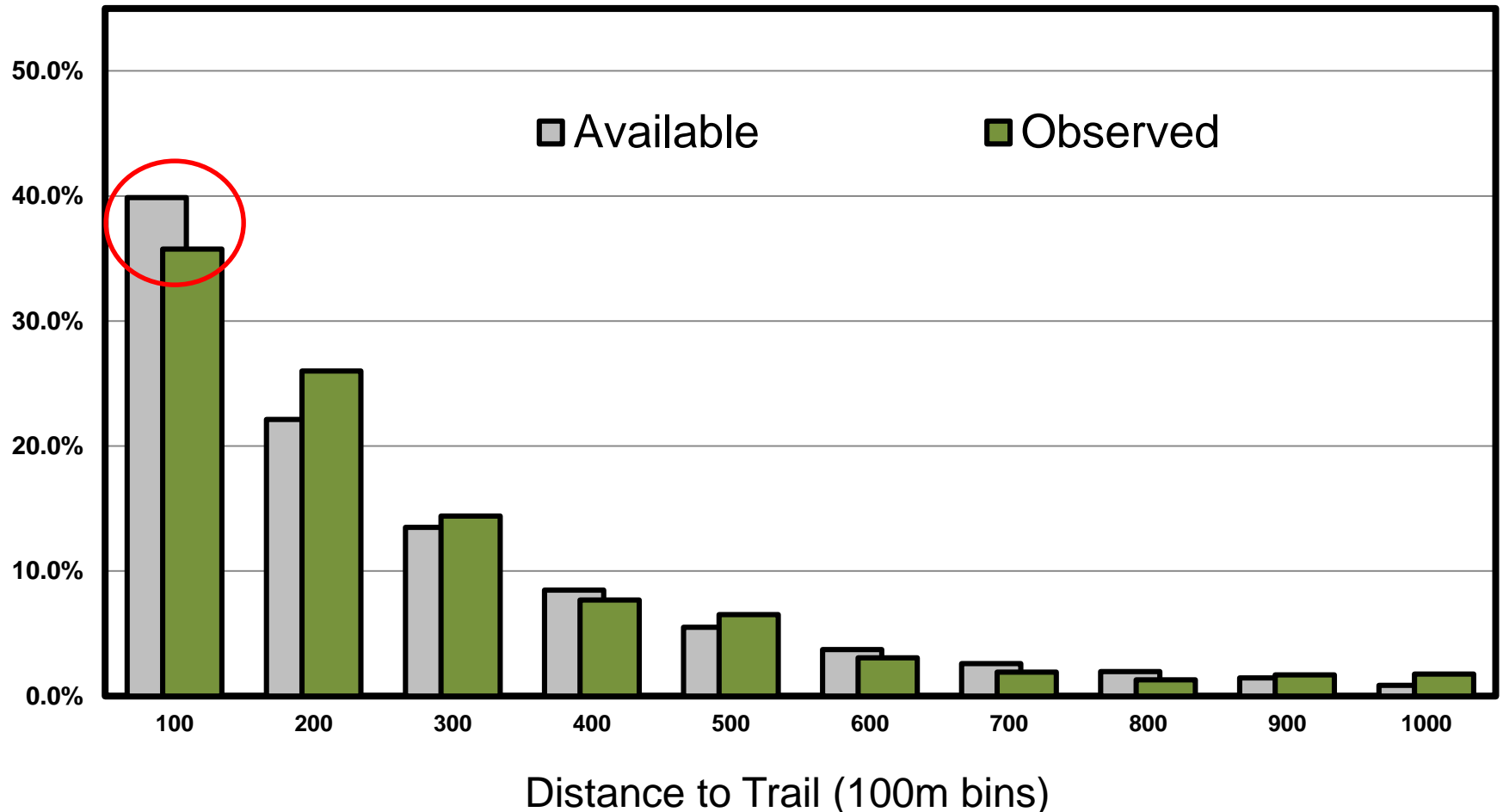
Distance To Trails: Available Area Within 1km



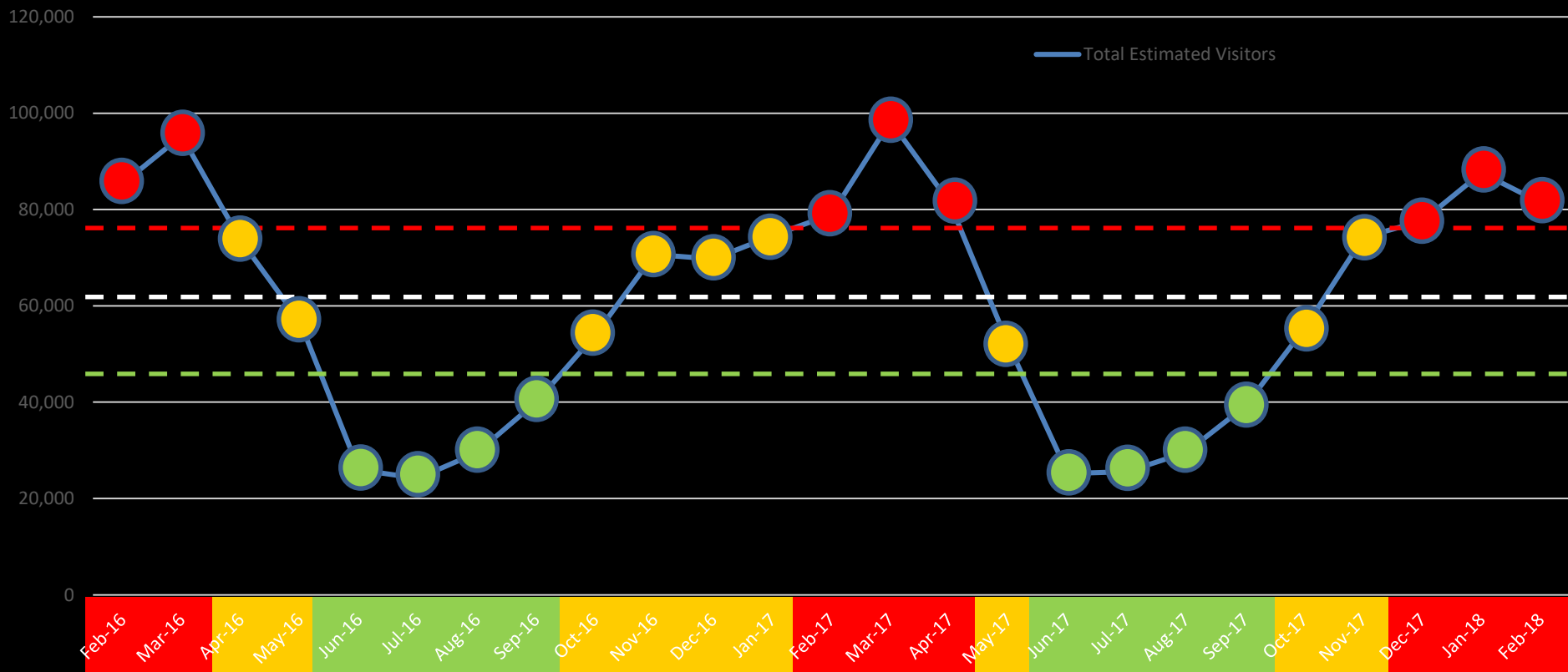
0-100m	46.5km ²
100-200m	25.8km ²
200-300m	15.7km ²
300-400m	9.9km ²
400-500m	6.4km ²
500-600m	4.3km ²
600-700m	3.0km ²
700-800m	2.3km ²
800-900m	1.7km ²
900-1000m	1.0km ²

Distance To Trails: Observed vs. Expected

Overall Observed vs. Available - Distance to Trail < 1km

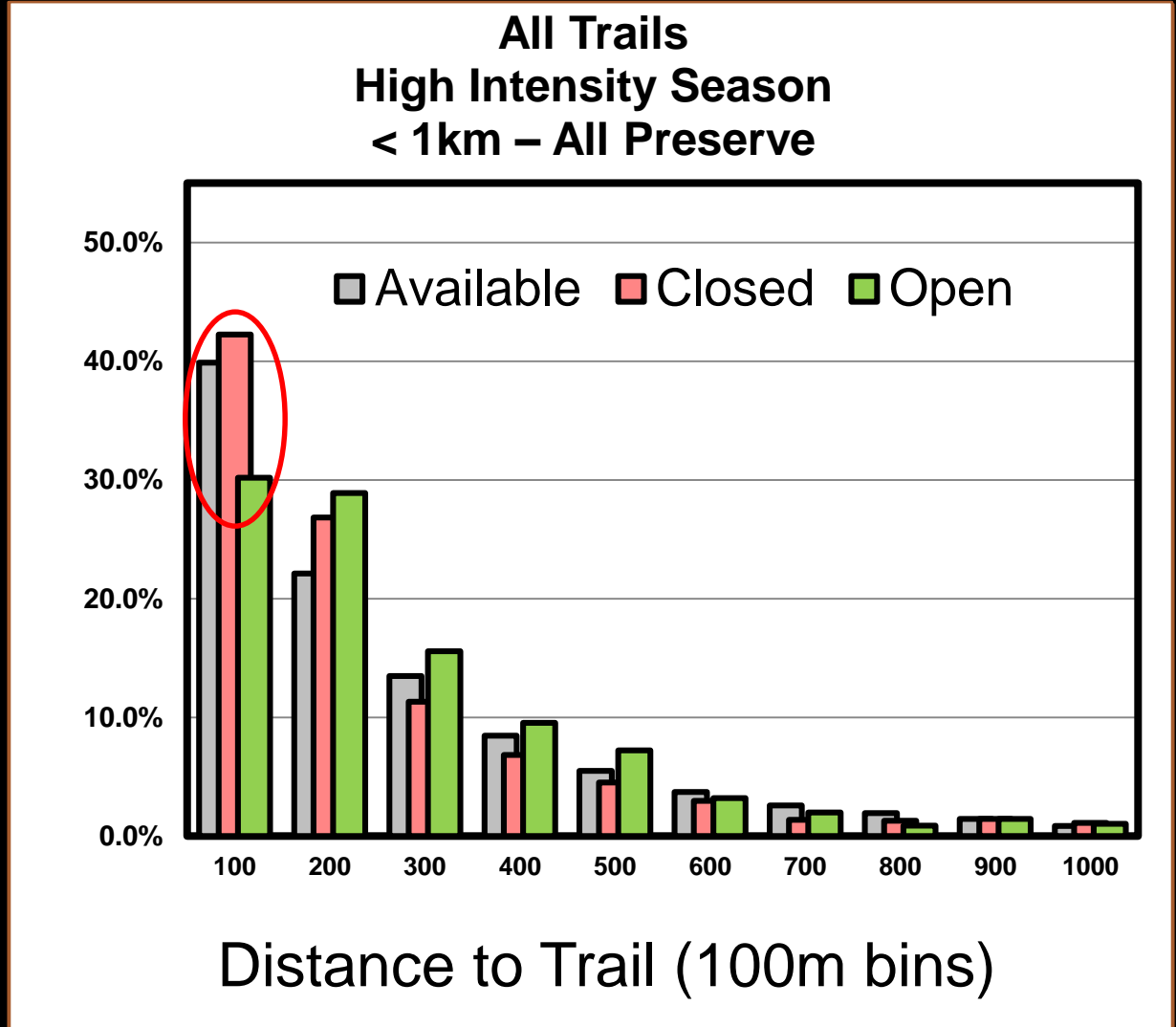
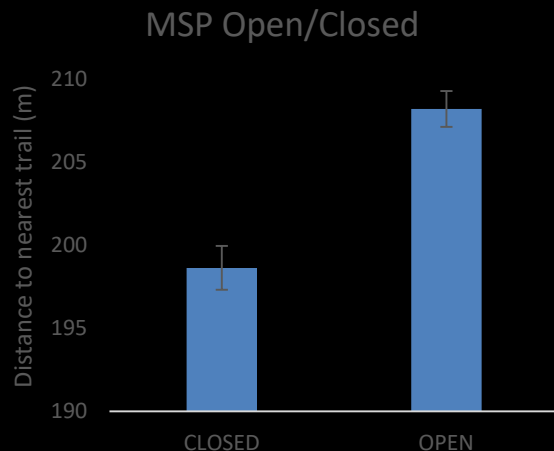
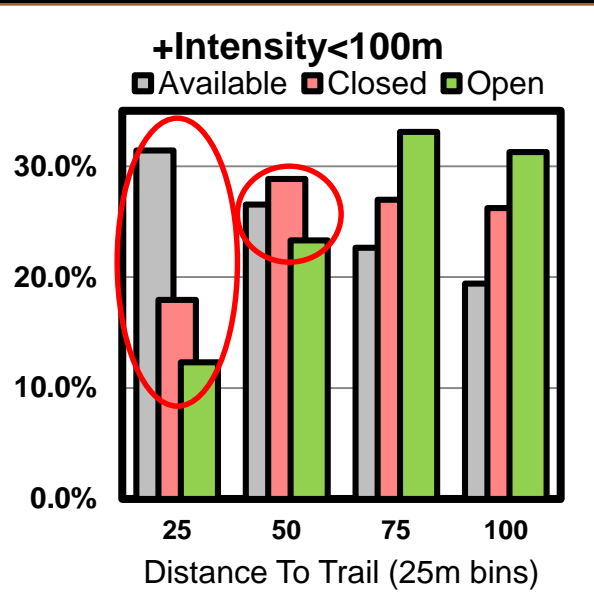


Seasonal Recreation Use

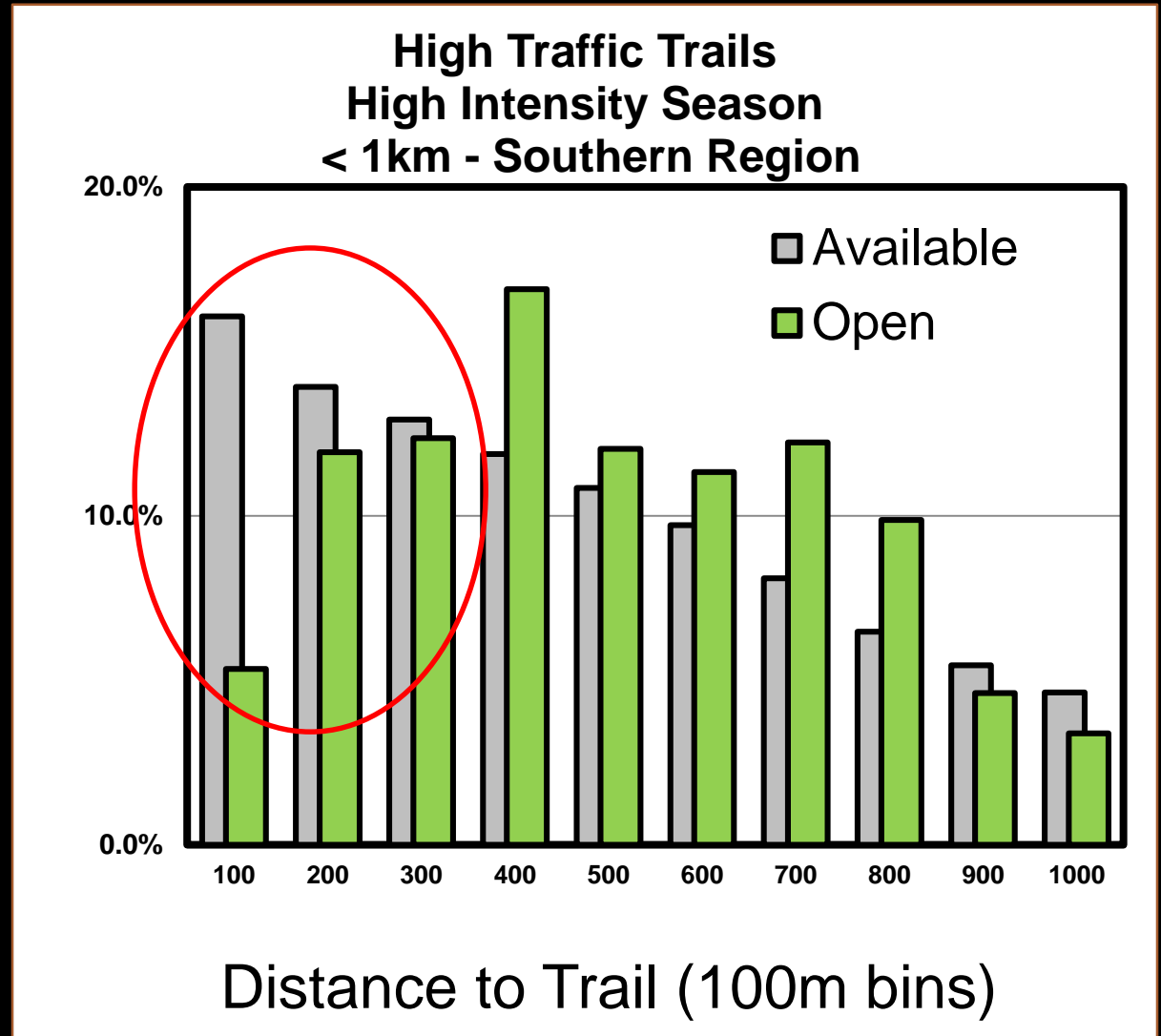
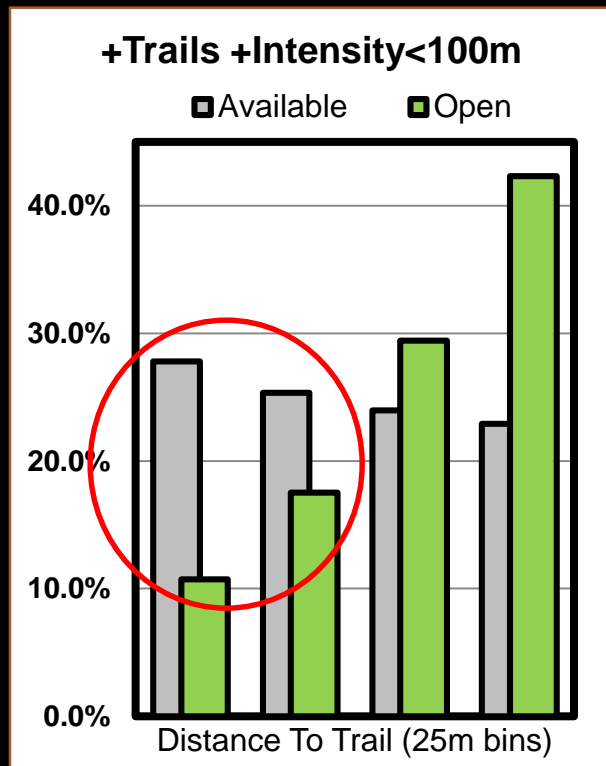


- **Mean Visitors/Month = 60,218**
- **High Intensity > 125% of mean = 75,237**
- **Low Intensity < 75% of mean = 45,164**

Distance To Trails: Open vs. Closed

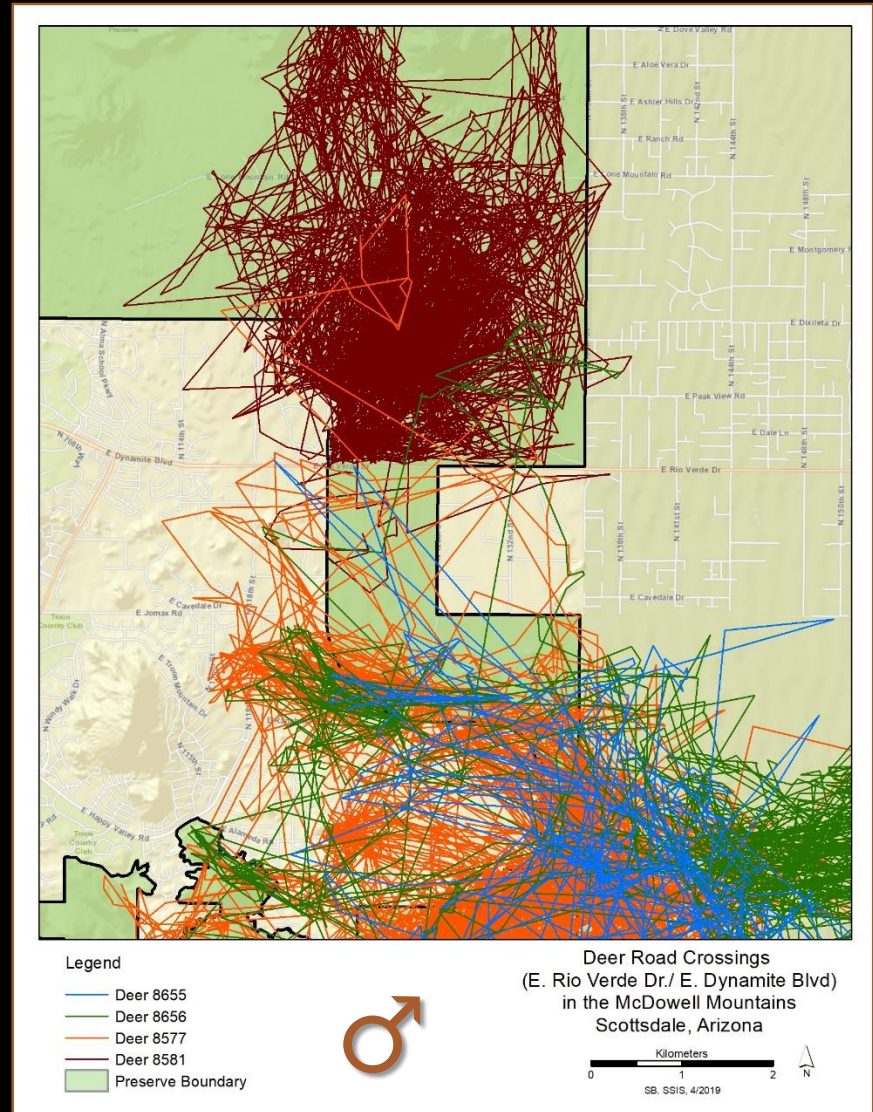
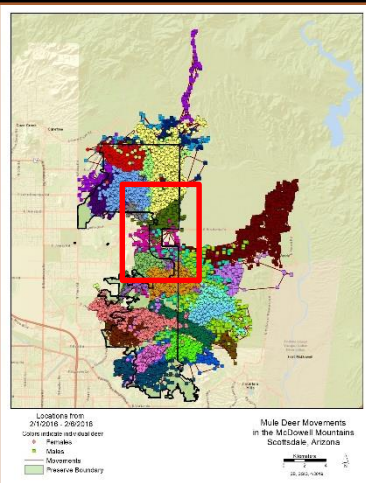


Distance To Trails: Peak Recreational Intensity

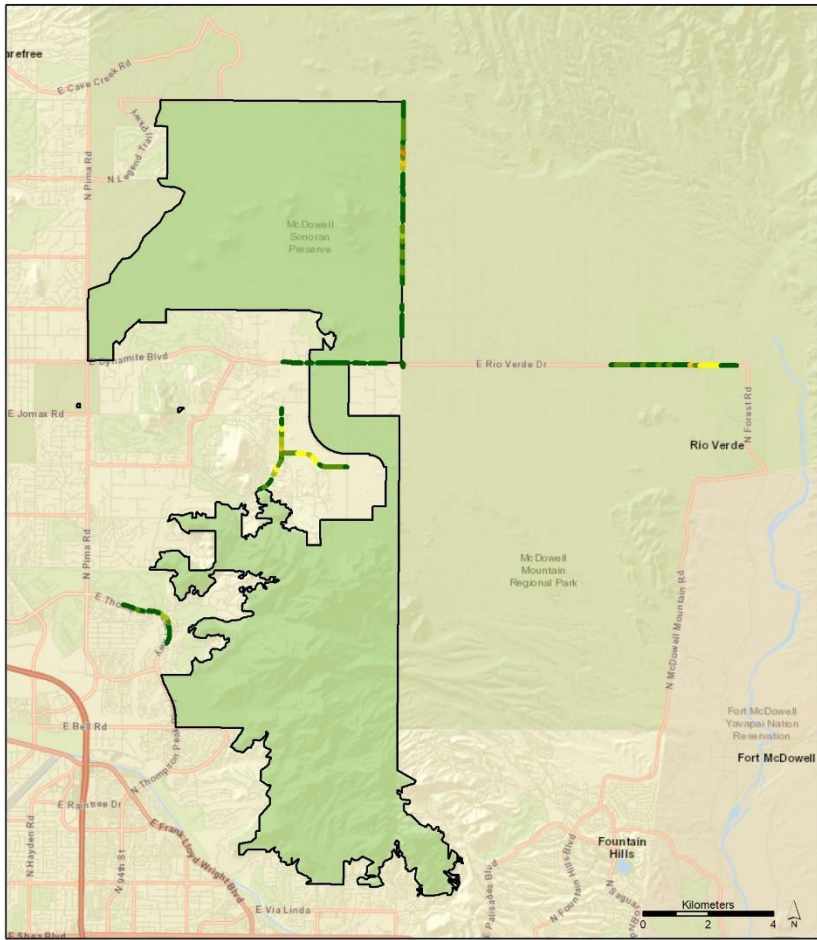


Dynamite Blvd./Rio Verde Dr.

25 crossings by
4 ♂ in or near
the Preserve



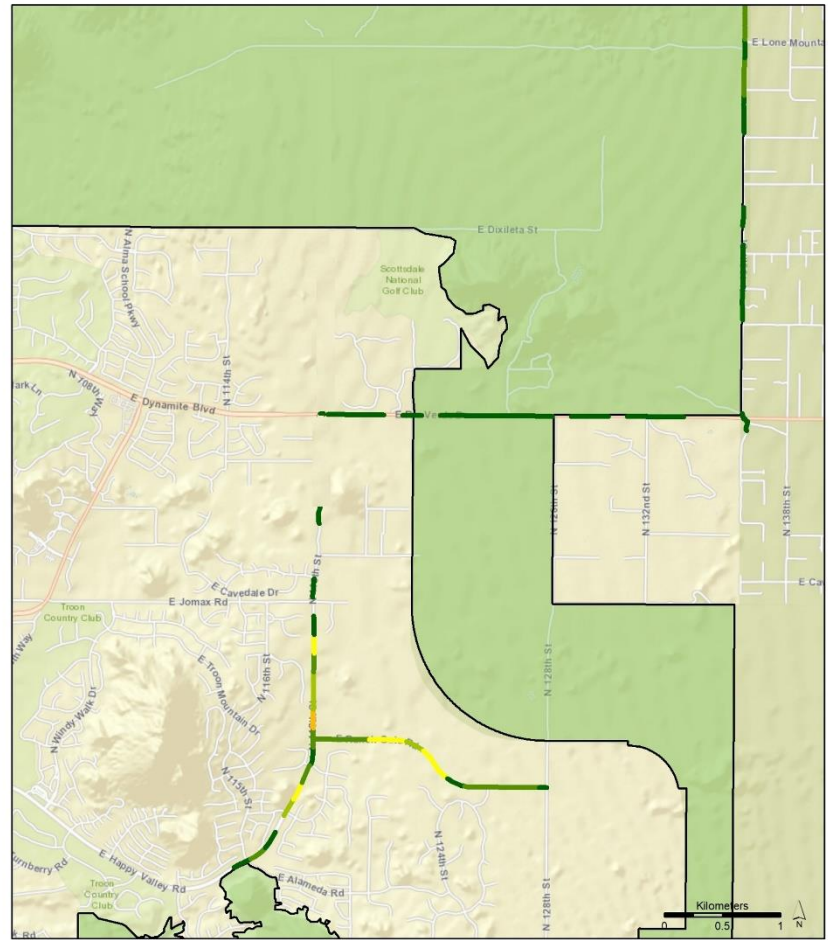
Road Crossing Distribution



1 - 5 21 - 30
 6 - 10 31 - 40
 11 - 15
 16 - 20 Preserve

Number of Deer Crossings near the
McDowell Sonoran Preserve, Scottsdale AZ
Crossings are by 1/10th mile segment

SB, SSIT 4/2019



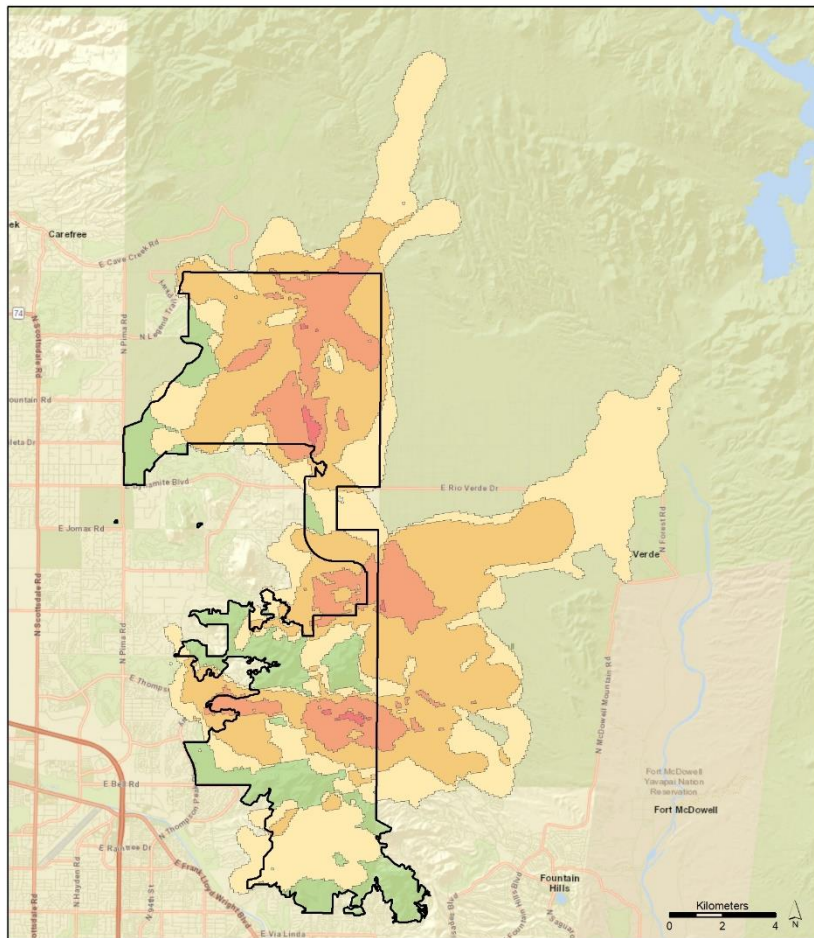
1 - 5 21 - 30
 6 - 10 31 - 40
 11 - 15
 16 - 20 Present

Number of Deer Crossings near the
McDowell Sonoran Preserve, Scottsdale AZ
Rio Verde Rd and 118th St

Crossings are by 1/10th mile segment

B. SSIT 4/2019

Core Mule Deer Use Areas & Movement Corridors

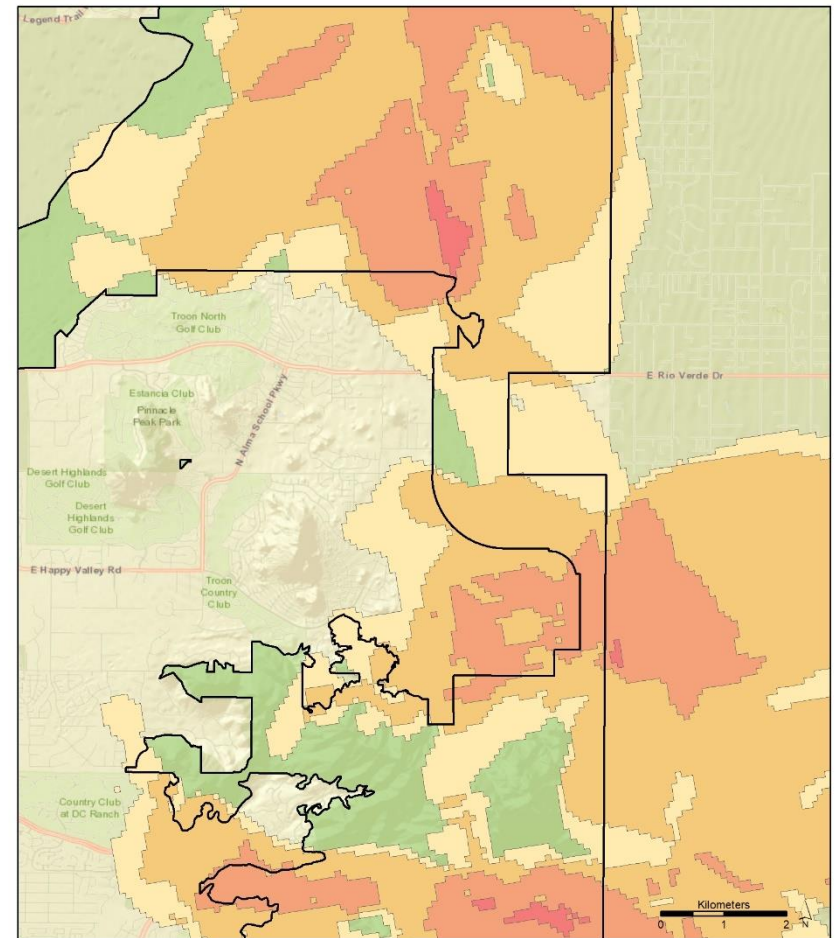


Deer Movement Corridors

- High Use
- Medium Use
- Low Use (2 or more)
- Low Use
- Preserve Boundary

Deer Movement Corridors
near the McDowell Sonoran Preserve,
Scottsdale AZ

580_S09T_4/2013



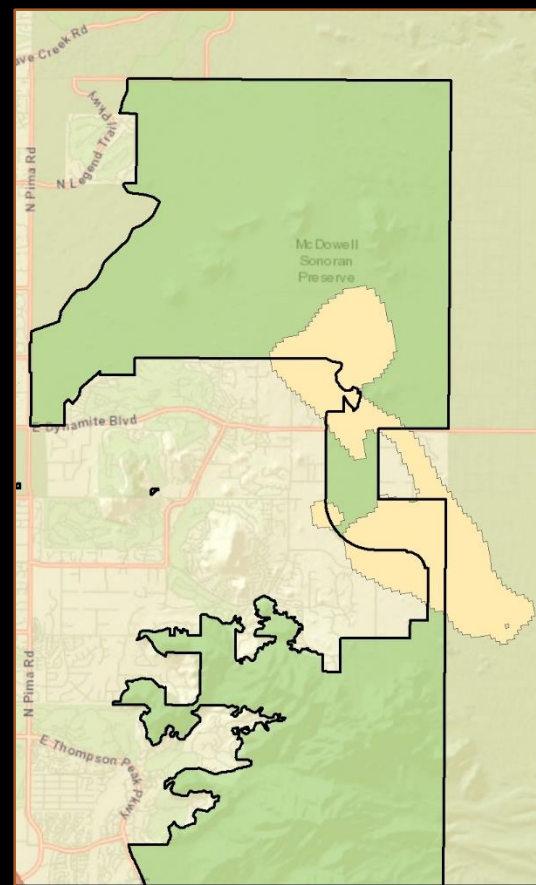
Deer Movement Corridors

- High Use
- Medium Use
- Low Use (2 or more)
- Low Use
- Preserve Boundary

Deer Movement Corridors
near the McDowell Sonoran Preserve
Scottsdale, AZ

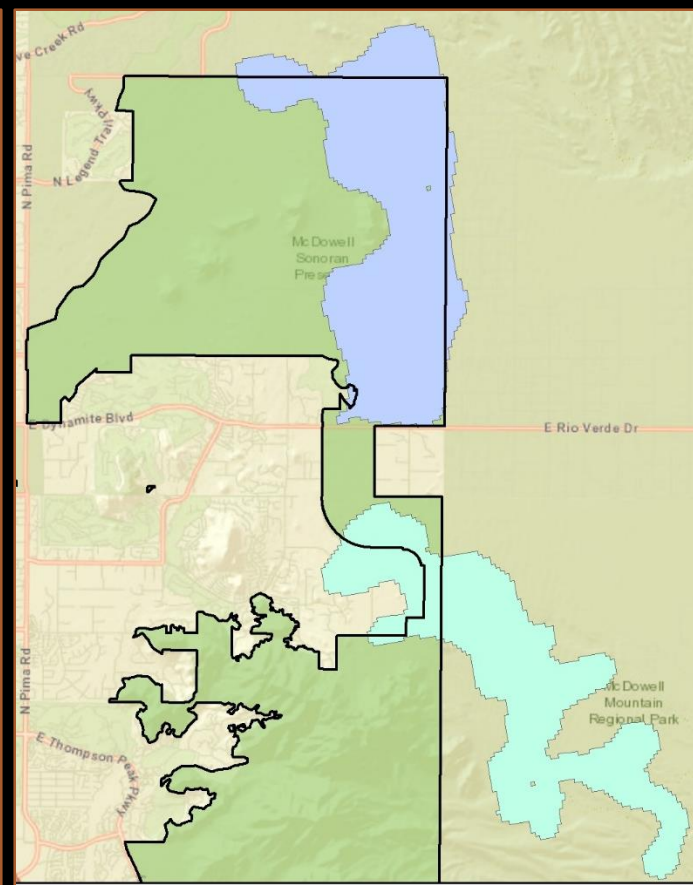
580_S09T_4/2013

Core Mule Deer Use Areas & Movement Corridors



Deer Movement Corridors

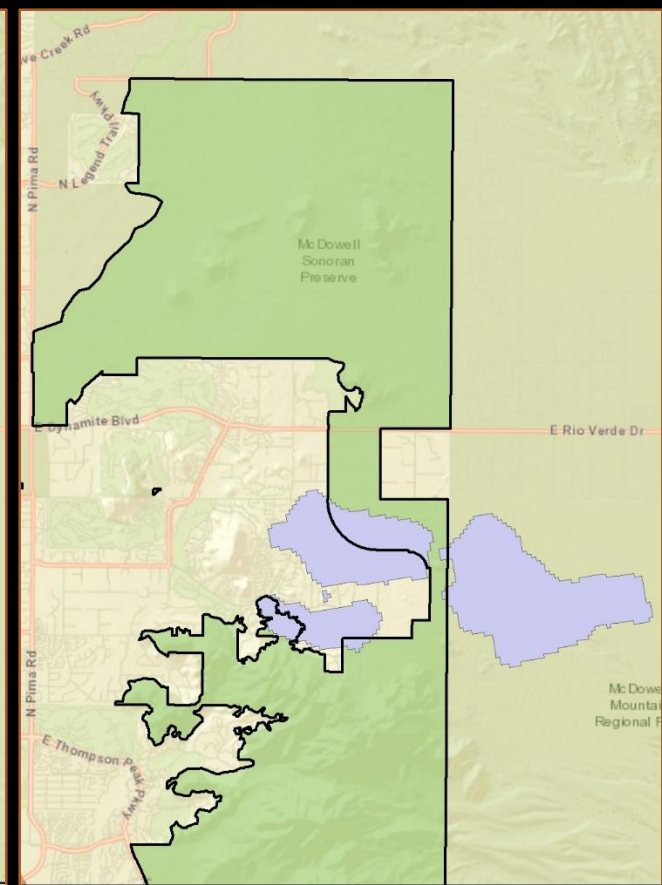
- Deer 8577
- Preserve Boundary



Deer Movement Corridors

- Deer 8655
- Deer 8581
- Preserve Boundary

Movement Corridors for Individual Deer
Near the McDowell Sonoran Preserve
Scottsdale, AZ

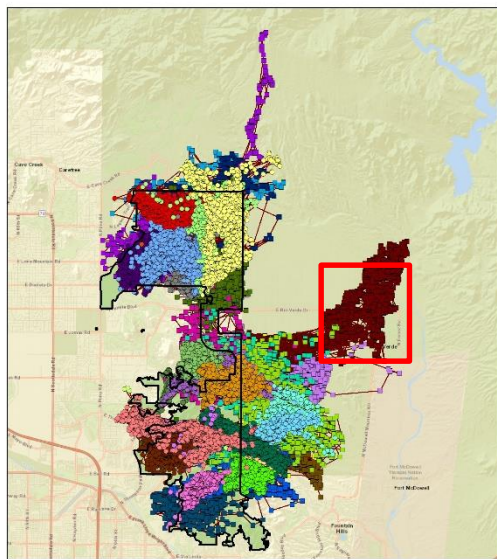


Deer Movement Corridors

- Deer 8656
- Preserve Boundary

Eastern Road Crossings

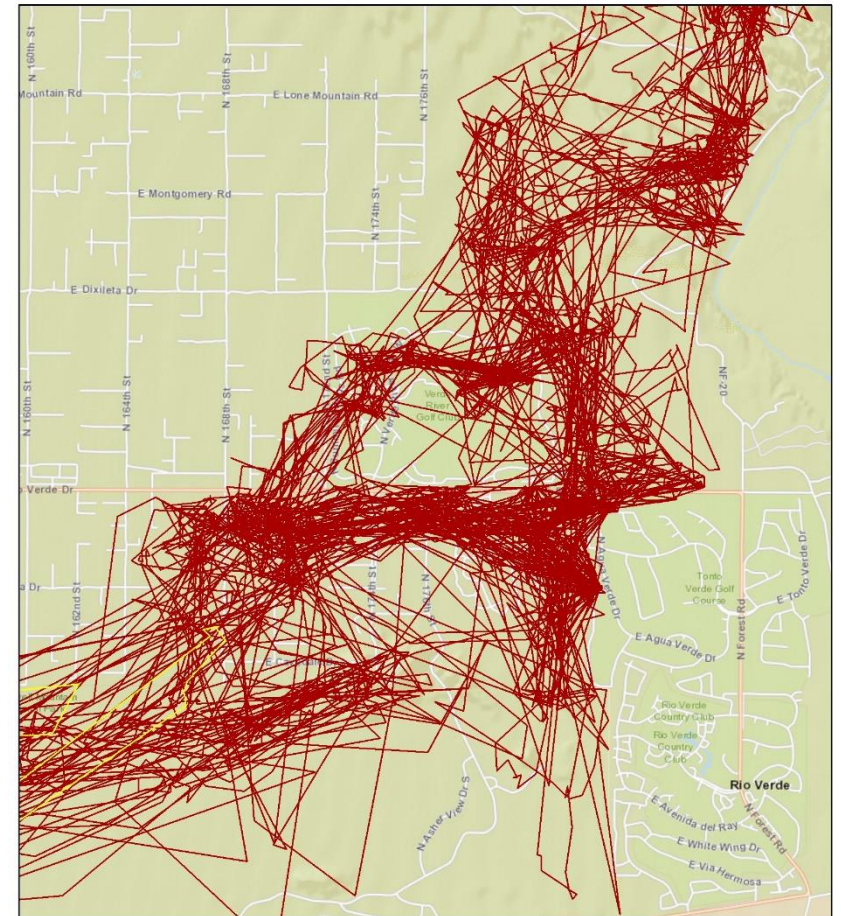
- 1 ♂ regularly crossed Rio Verde Dr. 5 miles east of the Preserve



Locations from
2/1/2016 - 2/6/2018
Colors indicate individual deer
● Females
● Males
— Movements
— Preserve Boundary

Mule Deer Movements
in the McDowell Mountains
Scottsdale, Arizona

0 1 2 Kilometers
SB, SSIS, 4/2019



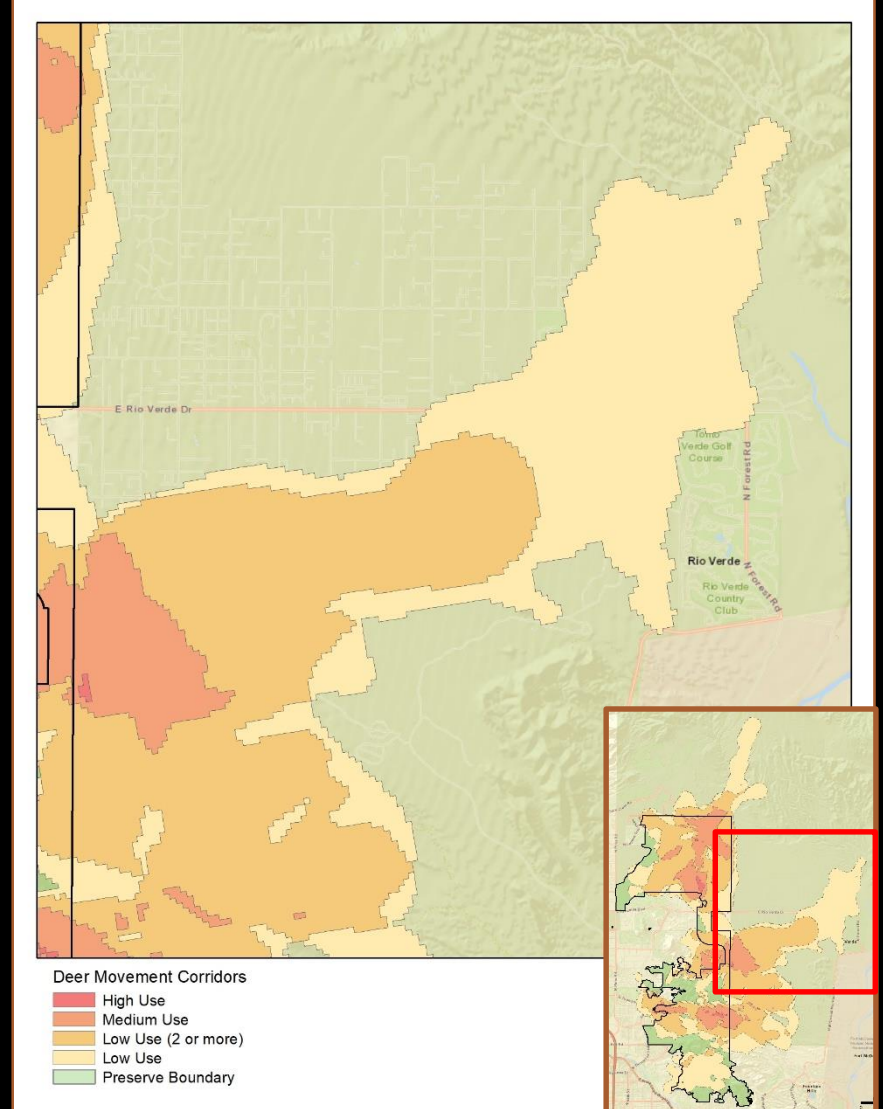
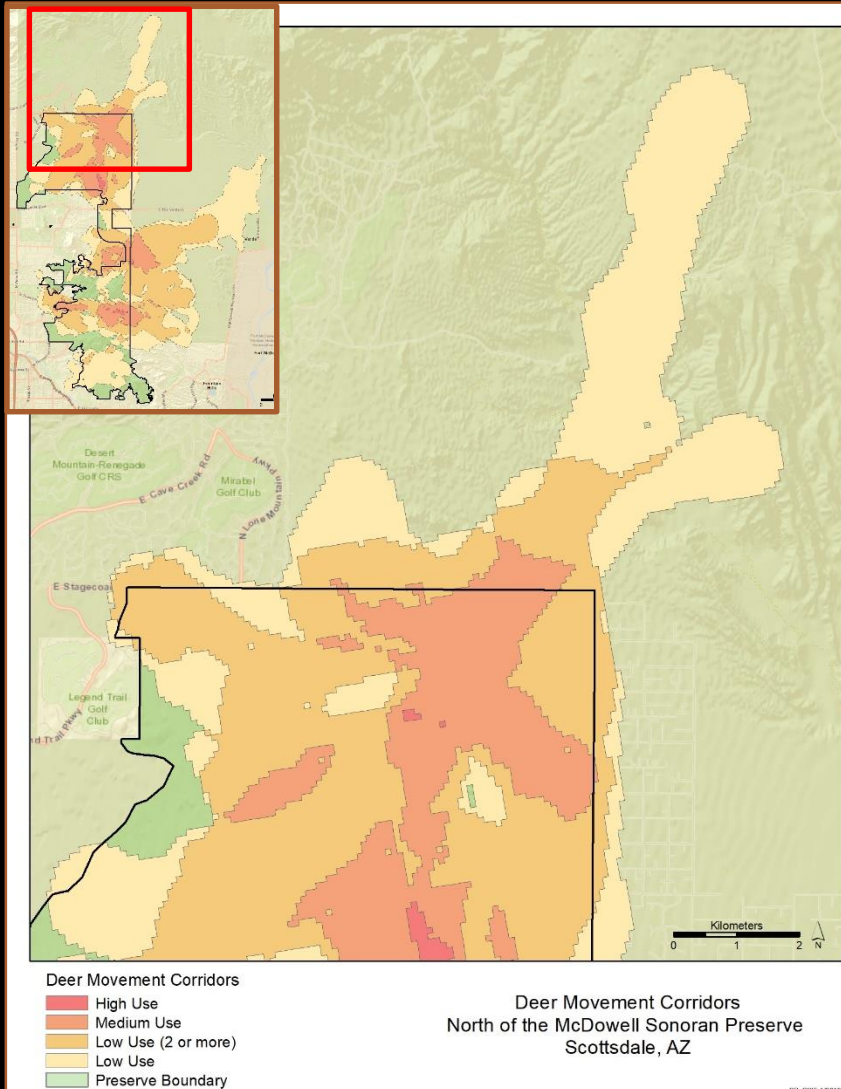
Legend
— Deer 8572
— Deer 8578



Deer Road Crossings
(E. Rio Verde Dr. near the Verde River Golf Club)
in the McDowell Mountains
Scottsdale, Arizona

0 1 2 Kilometers
SB, SSIS, 4/2019

Core Mule Deer Use Areas & Movement Corridors



Findings

Trails

- **Deer avoid areas near trails (always w/in 25m)**
- **Intensity of use amplifies avoidance**
 - Further from trail (up to 300m)
 - Greater disparity
- **Deer move closer when Preserve closes**

Dynamite Blvd./Rio Verde Drive

- **Bucks cross (infrequently)**

Gooseneck & Other Corridors

- **Some potentially important pathways depicted**

Future Implications

- **Maintain ordinances that limit stressors**
 - Sunset closure
 - Dogs leashed
 - Visitors on trails
 - No motorized vehicles/drones
- **Consider avoidance (25-80m) in planning**
 - Core use areas
 - Corridors
- **Connectivity = crossing Dynamite/Rio Verde**
 - Structures (Overpass or Underpass)
 - Funnel-fencing network
- **Dataset has lots of remaining potential**
- **Follow-up (5-10 years)**

Future Implications



**2 Collared Bucks Crossing the Oracle Road
(SR 77) Overpass in Oro Valley, AZ**

Questions?



NEW TONIGHT

EMPLOYEE NEARLY TRAMPLED BY DEER

PART OF STUDY ON WILDLIFE MOVEMENT IN NORTHEAST VALLEY

