Exploring the Boundaries of Virtual Fence

Webinar 2

VF Applications for Rangeland & Livestock Management

October 17, 2024

Supported by USDA NIFA WSARE (WPDP22-016), AFRI IDEAS (2022-10726), Arizona Experiment Station, the Marley Endowment for Sustainable Rangeland Stewardship & The Nature Conservancy

Exploring the Boundaries of Virtual Fence

Brandon Mayer, University of Arizona

Exclude livestock from riparian ecosystems

Chad Boyd, US Department of Agriculture–Agricultural Research Service

Reduce fine fuel accumulation for proactive fire management

Logan Vandermark, South Dakota State University Extension

Track animal behavior, stress, and performance

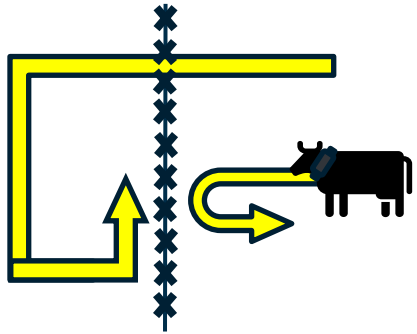
Question & Answer Session

Supported by USDA NIFA WSARE (WPDP22-016), AFRI IDEAS (2022-10726), Arizona Experiment Station, the Marley Endowment for Sustainable Rangeland Stewardship & The Nature Conservancy

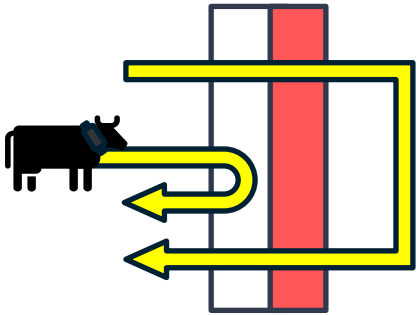
Streamlining Management: Virtual Fencing for Effective Riparian Exclusions

Brandon Mayer, Research Professional, UArizona
Aaron Lien, Professor, UArizona

Physical Fencing Vs Virtual Fencing



- Nearly 100%
- Potential for entrapment
- Fence Breaks and unpredictability



- Less than 100%
- No risk of entrapment
- Measurable and Predictable

Using Virtual Fencing For Exclusions

Theoretically a good idea

- Reduced risk of entrapment
- Flexible application
- No need for fence monitoring
- Discernable and predictable use of excluded area

Caveats

- Only affects managed cattle (entire herd needs to be collared)
- A lot of preparation
  - Infrastructure
  - Fencing adjustments

SRER trials: 2022, 2023, 2024

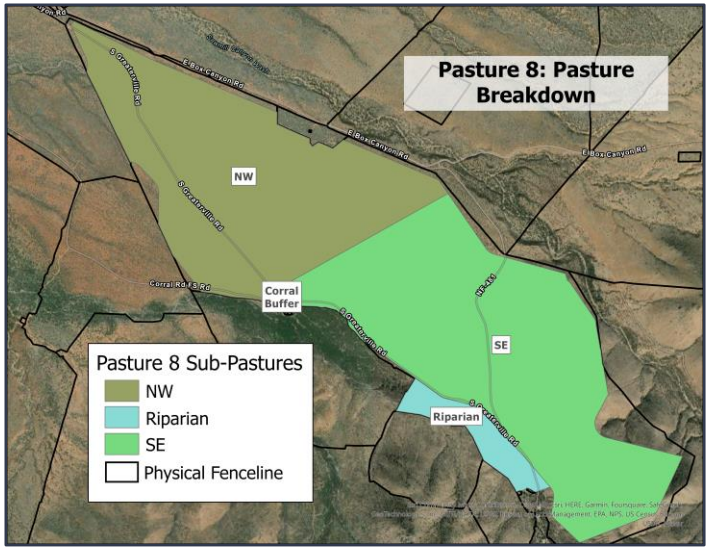
Santa Rita Experimental Range issues

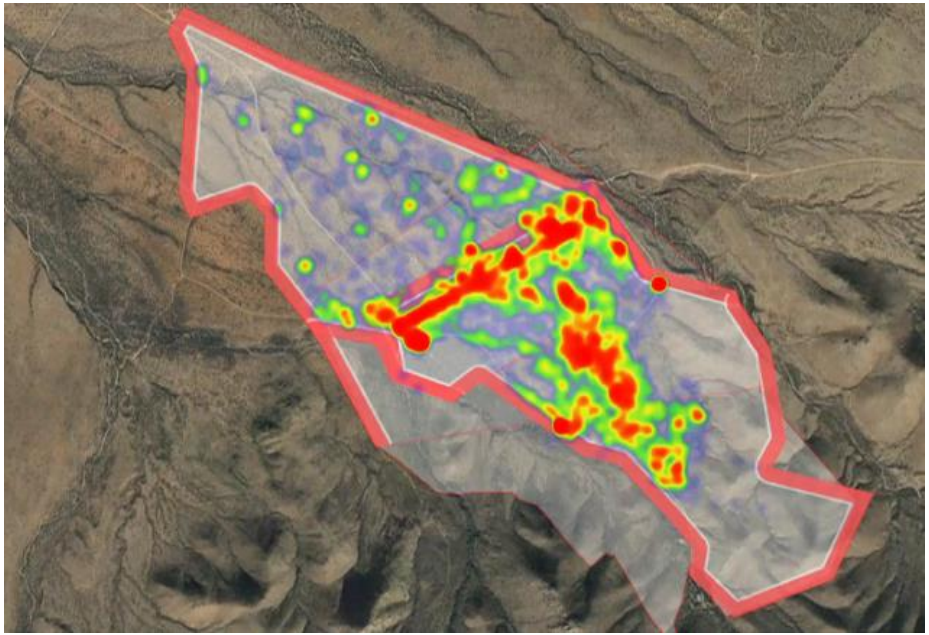
- Riparian habitat for the Yellow billed cuckoo
- Pressure to exclude all grazing

Trials

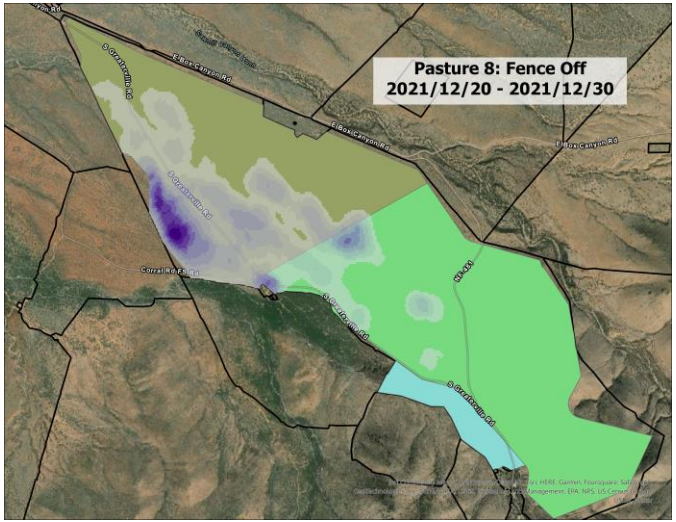
- 2022: Sub-pastured and excluded
  - Sub-pasturing concentrated grazing activity near the exposed portion of riparian habitat and elevated grazing density
- 2023: Sub-pastured with fencing adjustments
  - Rotated fencing access to introduce the herd riparian habitat prior to exclusion
- 2024: Sub-pastured 3 ways with increased density
  - Elevated exclusion pressure

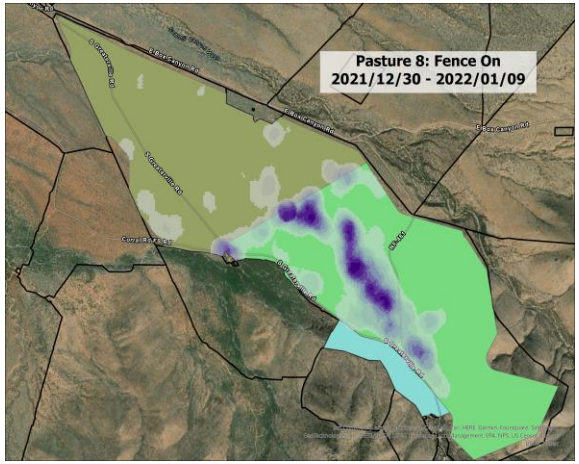
Sub-Pasturing and Riparian Exclosure with barrier

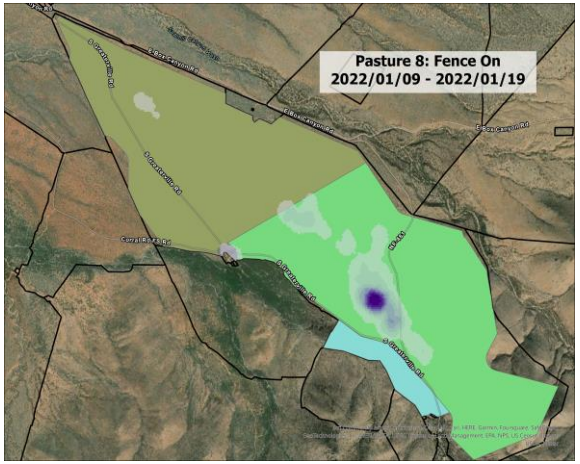


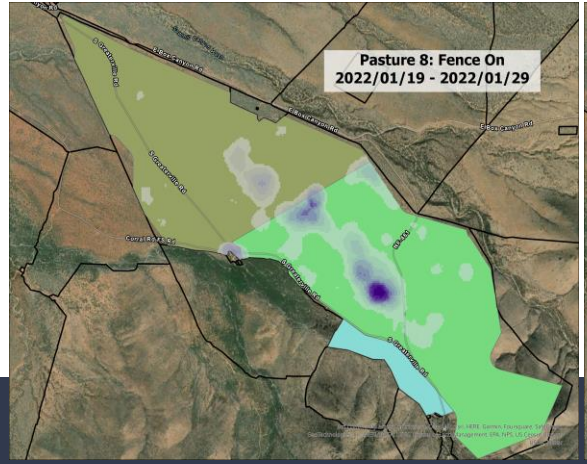


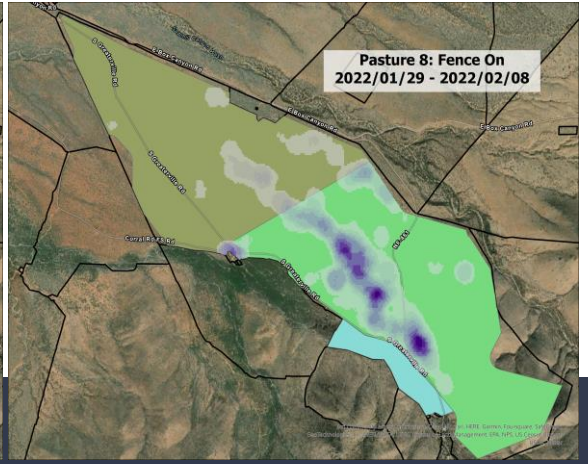
Sub-Pasture Compliance



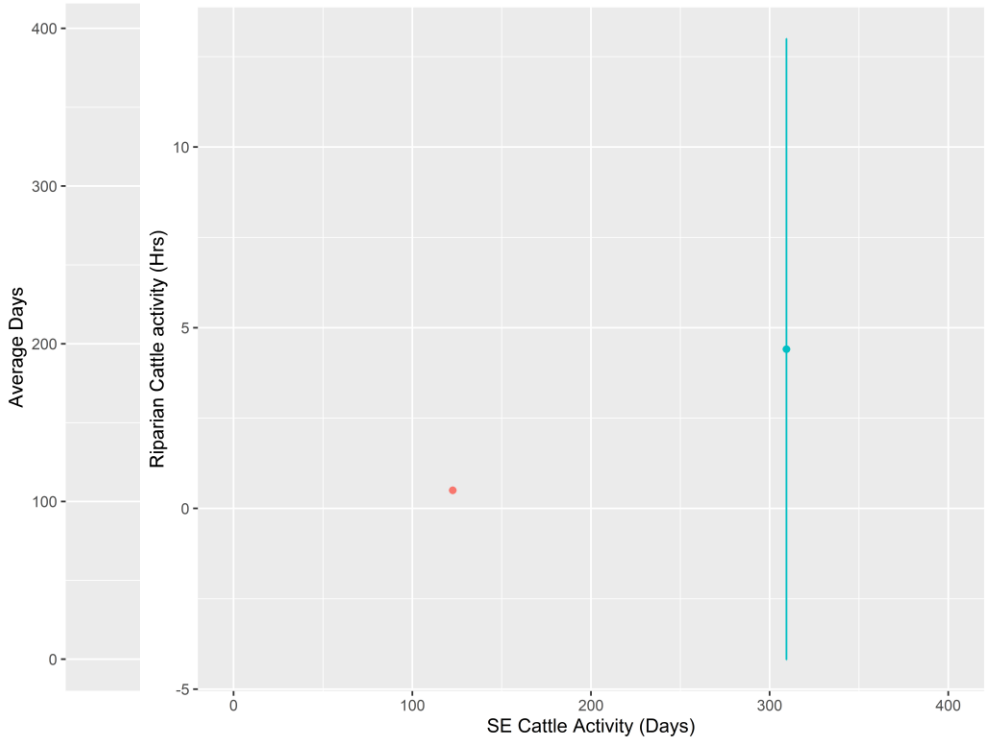


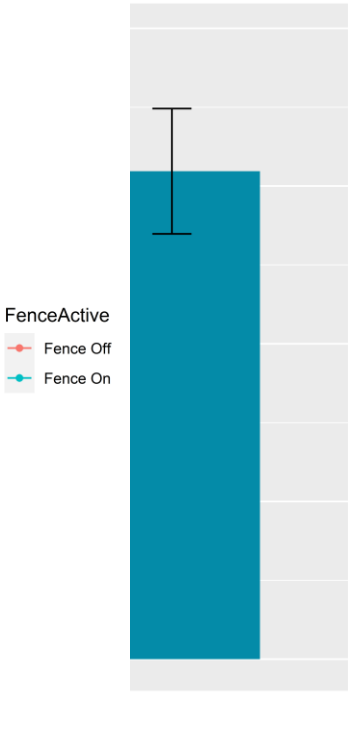




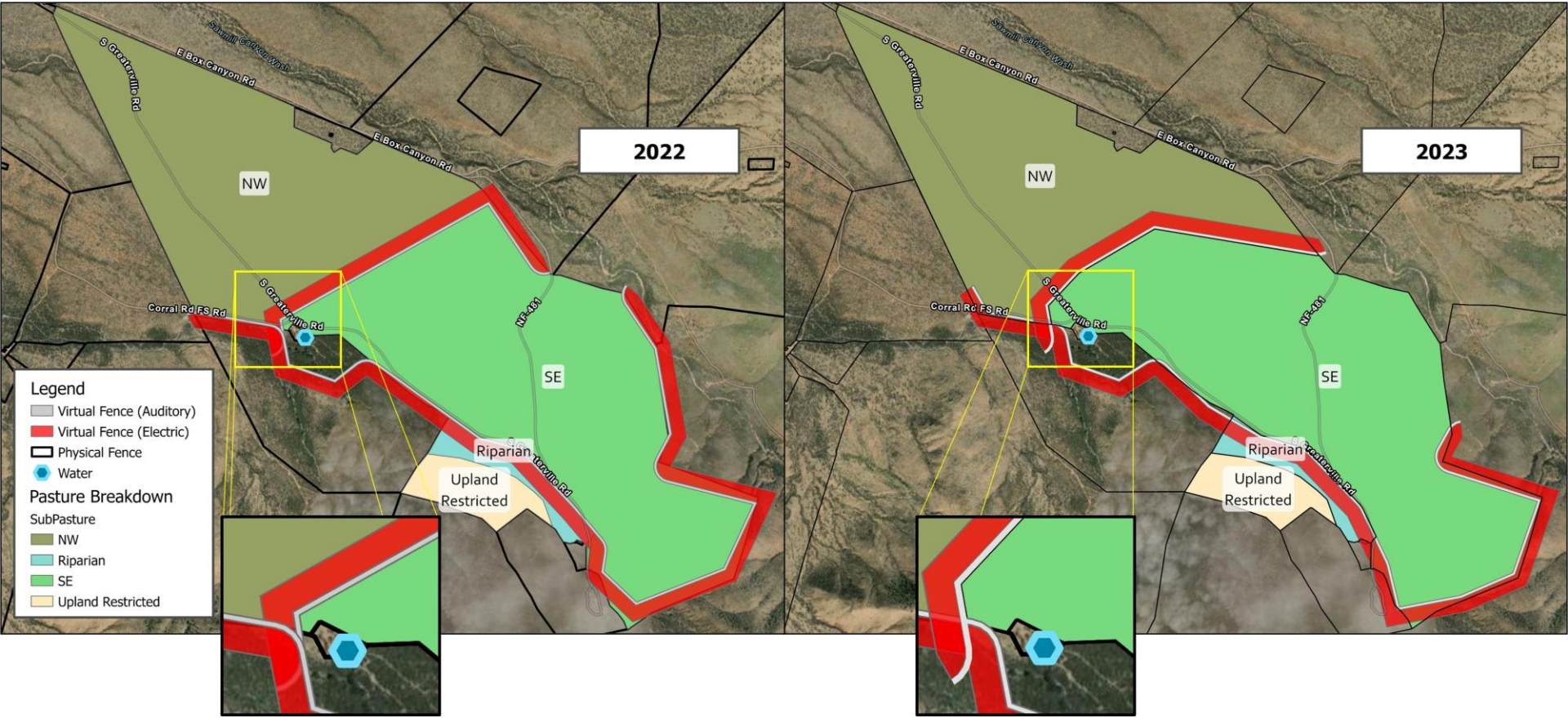


Sub-Pasture Compliance & Exclusion Results

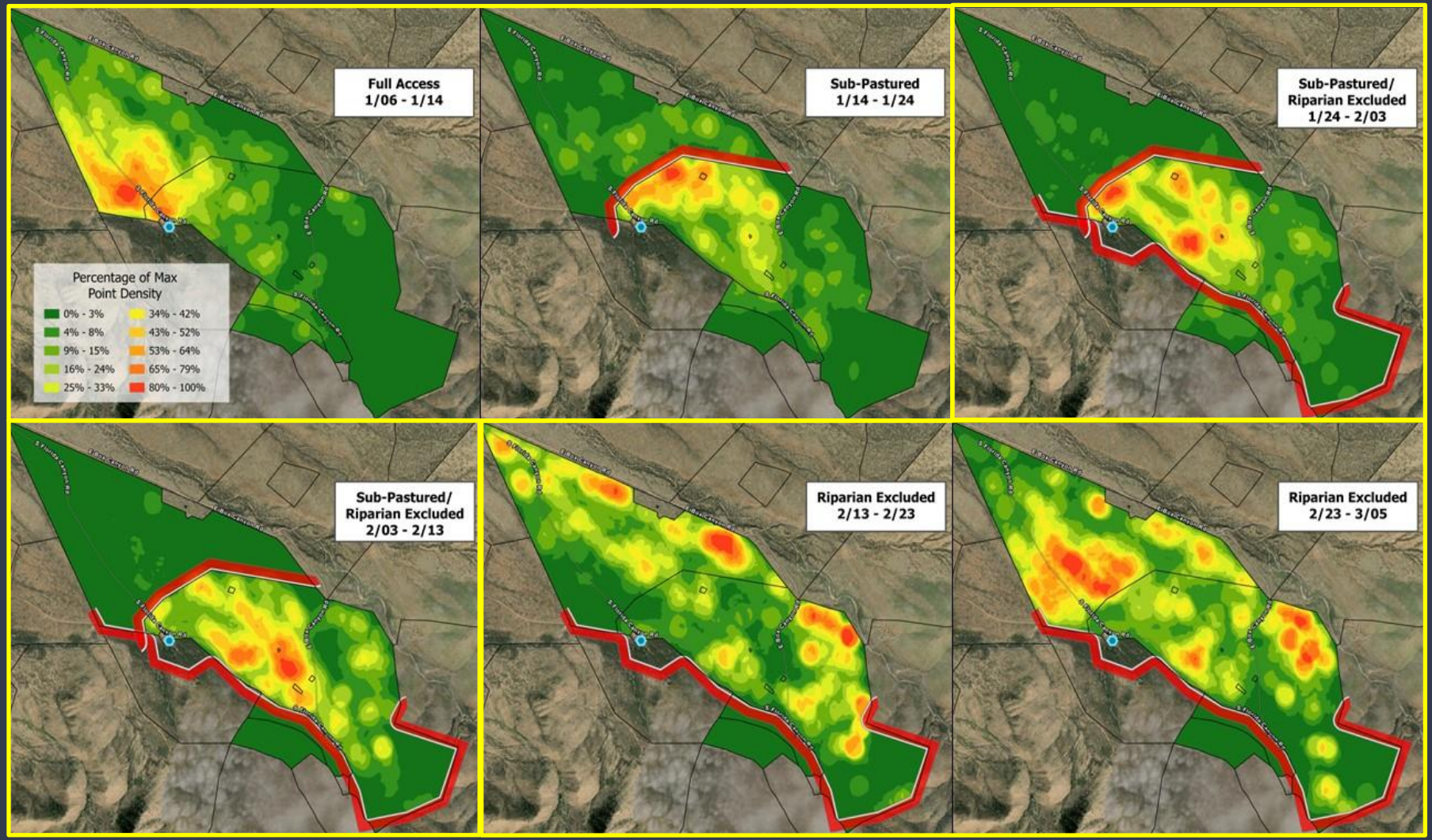


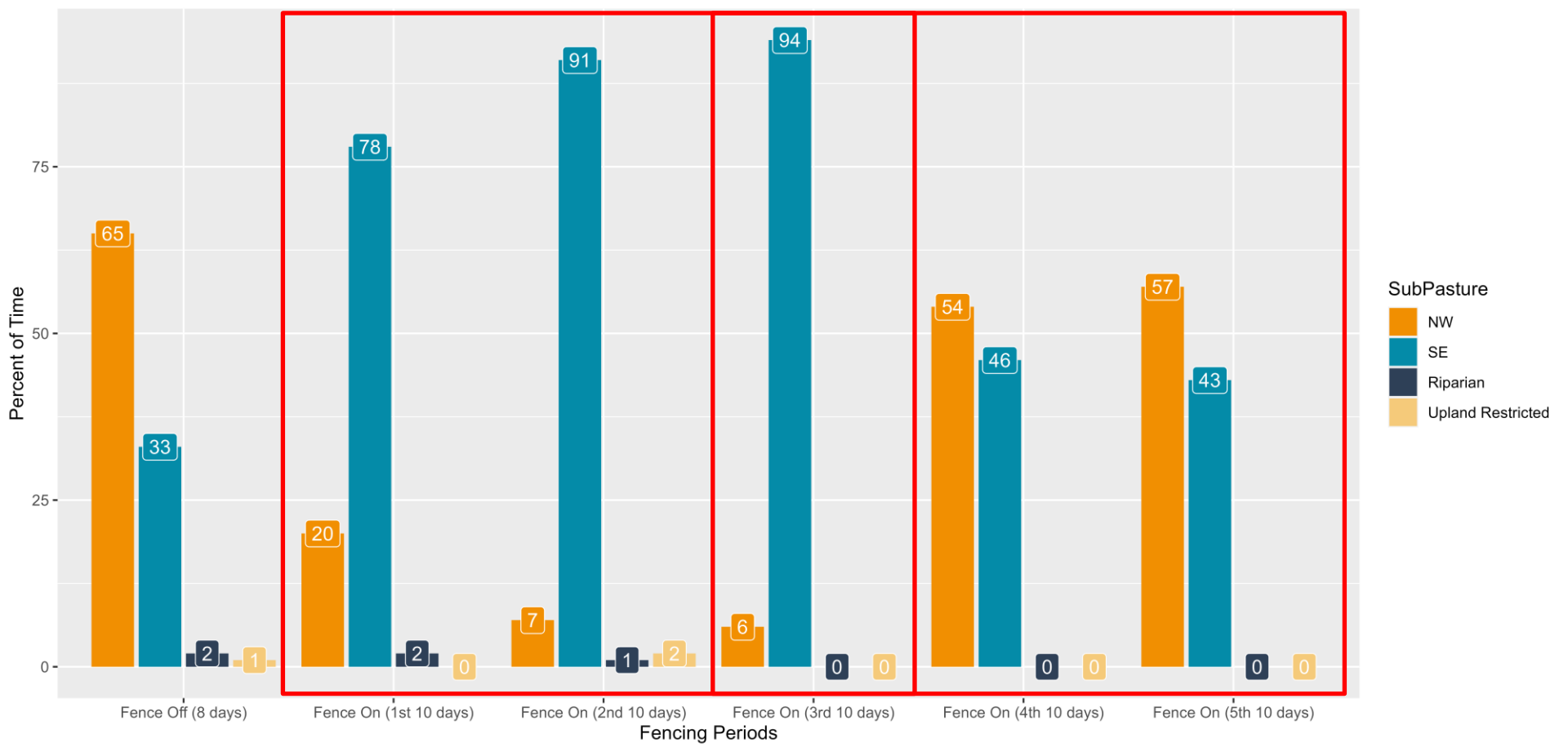


- Cattle activity within the SE pasture was significantly larger during the fenced period when compared to activity with the virtual fence off (one-sample t-test, $p < 0.0001$).
- Average cattle activity during the “Fence On” period was 186.77 days higher in SE than during the “Fence Off” Period with a total 152% increase in activity.



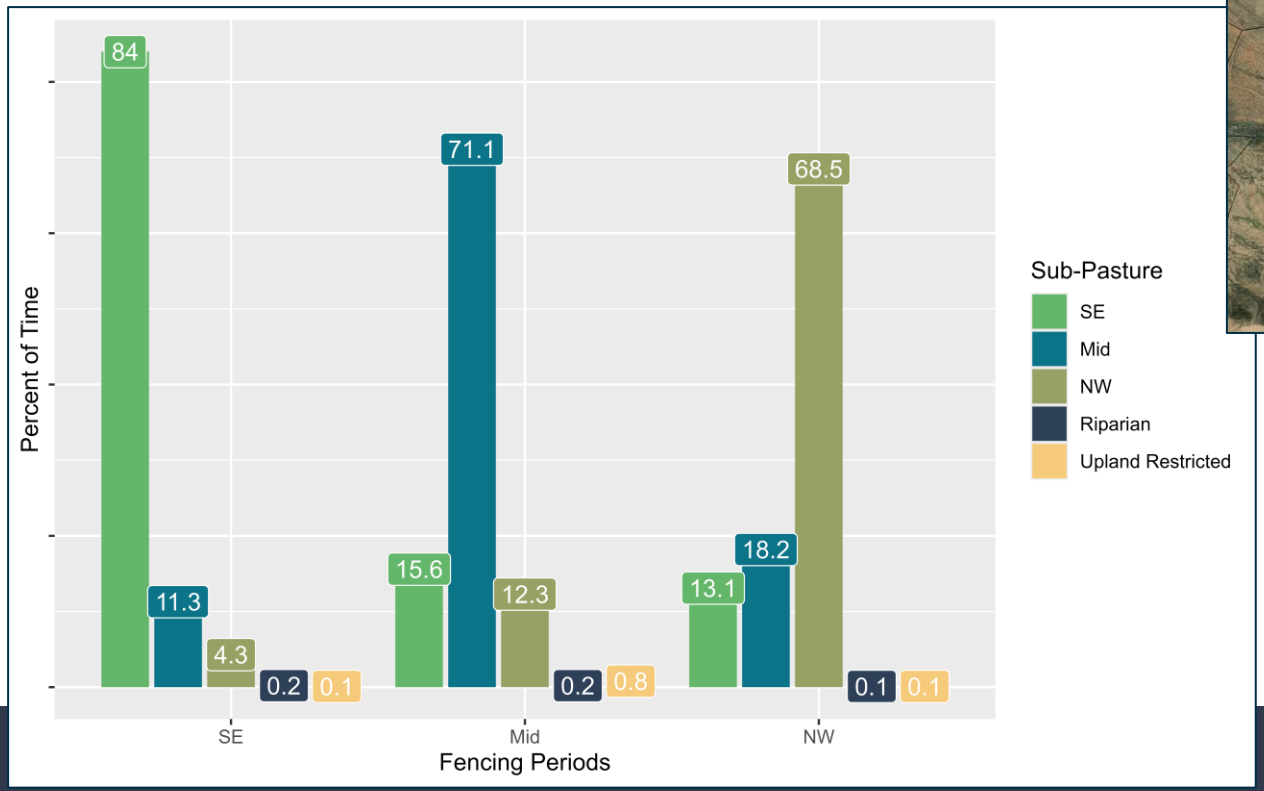
But what if they never wanted to go into the riparian area? 2023 Pilot

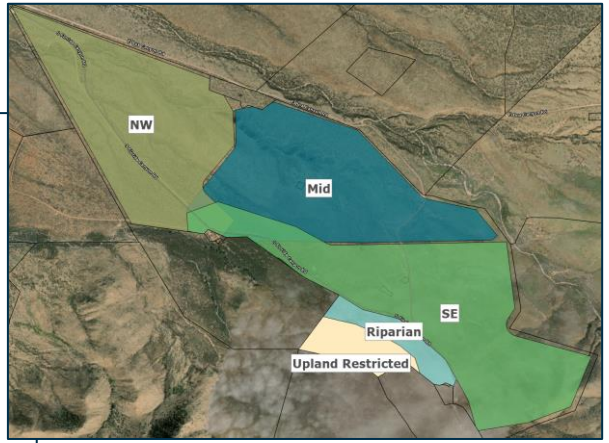

Full Access
1/06 - 1/14
Sub-Pastured
1/14 - 1/24
Sub-Pastured/
Riparian Excluded
1/24 - 2/03
Sub-Pastured/
Riparian Excluded
2/03 - 2/13
Riparian Excluded
2/13 - 2/23
Riparian Excluded
2/23 - 3/05
Percentage of Max
Point Density
0% - 3%
4% - 8%
9% - 15%
16% - 24%
25% - 33%
34% - 42%
43% - 52%
53% - 64%
65% - 79%
80% - 100%


Percent of Time
0
25
50
75
65
33
2
1
20
78
2
0
7
91
1
2
6
94
0
0
54
46
0
0
57
43
0
0
Fence Off (8 days)
Fence On (1st 10 days)
Fence On (2nd 10 days)
Fence On (3rd 10 days)
Fence On (4th 10 days)
Fence On (5th 10 days)
Fencing Periods
SubPasture
NW
SE
Riparian
Upland Restricted

A Virtual Rotation: Adding Complication because we can.

Results!

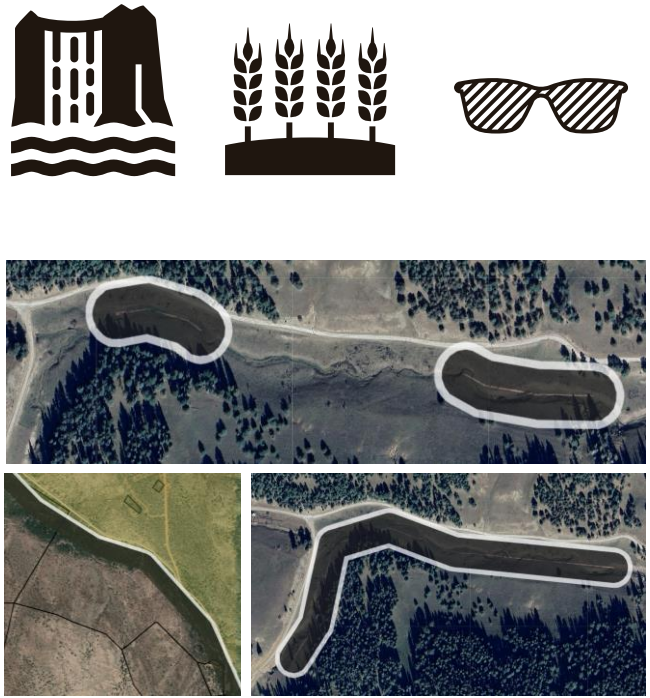

Percent of Time
84
11.3
4.3
0.2
0.1
15.6
71.1
12.3
0.2
0.8
13.1
18.2
68.5
0.1
0.1
SE
Mid
NW
Fencing Periods
Sub-Pasture
SE
Mid
NW
Riparian
Upland Restricted


NW
Mid
SE
Riparian
Upland Restricted


Sub-Pasture SE
30 days

Final thoughts

- Seasonality and incentives
- Fencing design
- Practicality of exclusions



The University of Arizona

Virtual Fence Program

THE UNIVERSITY OF ARIZONA
Arizona
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Cooperative Extension

COLLEGE OF AGRICULTURE, LIFE & ENVIRONMENTAL SCIENCES
Natural Resources
& the Environment

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