



Gopher Tortoises and test ranges: developing an understanding for the wildlife-habitat relationships of this novel habitat (DoD Legacy Projects 16-818 & 17-818)

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Introduction-The Gopher Tortoise



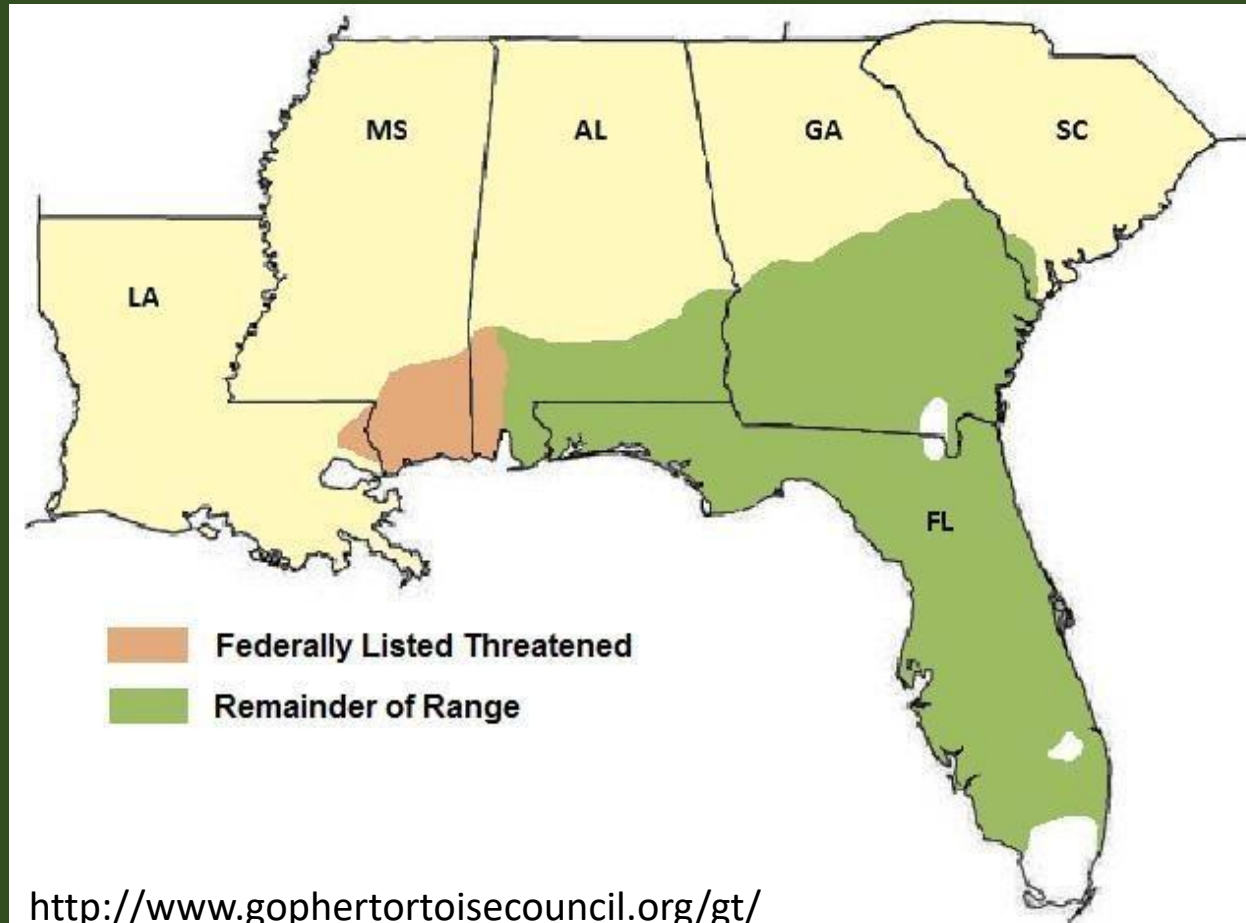
Photo Credit: Ryann Rossi



Photo Credit: Steve Goodman

Distribution and Conservation Status

- Upland habitats of Atlantic and Gulf Coastal Plains
- Federally threatened in LA, MS, and AL
- Candidate for range-wide listing
- Range-wide population declines
- Importance of Military Installations



Habitat & Diet

- Fire-maintained
- Xeric soils
- Open-canopy
- Diverse herbaceous understory = Primary forage



The Burrow

- Burrow width and carapace length closely correlated
- Multiple burrows may be used simultaneously
 - Active burrows not 1:1 ratio
- Still can provide rough abundance/density estimates

Active



Inactive



Abandoned



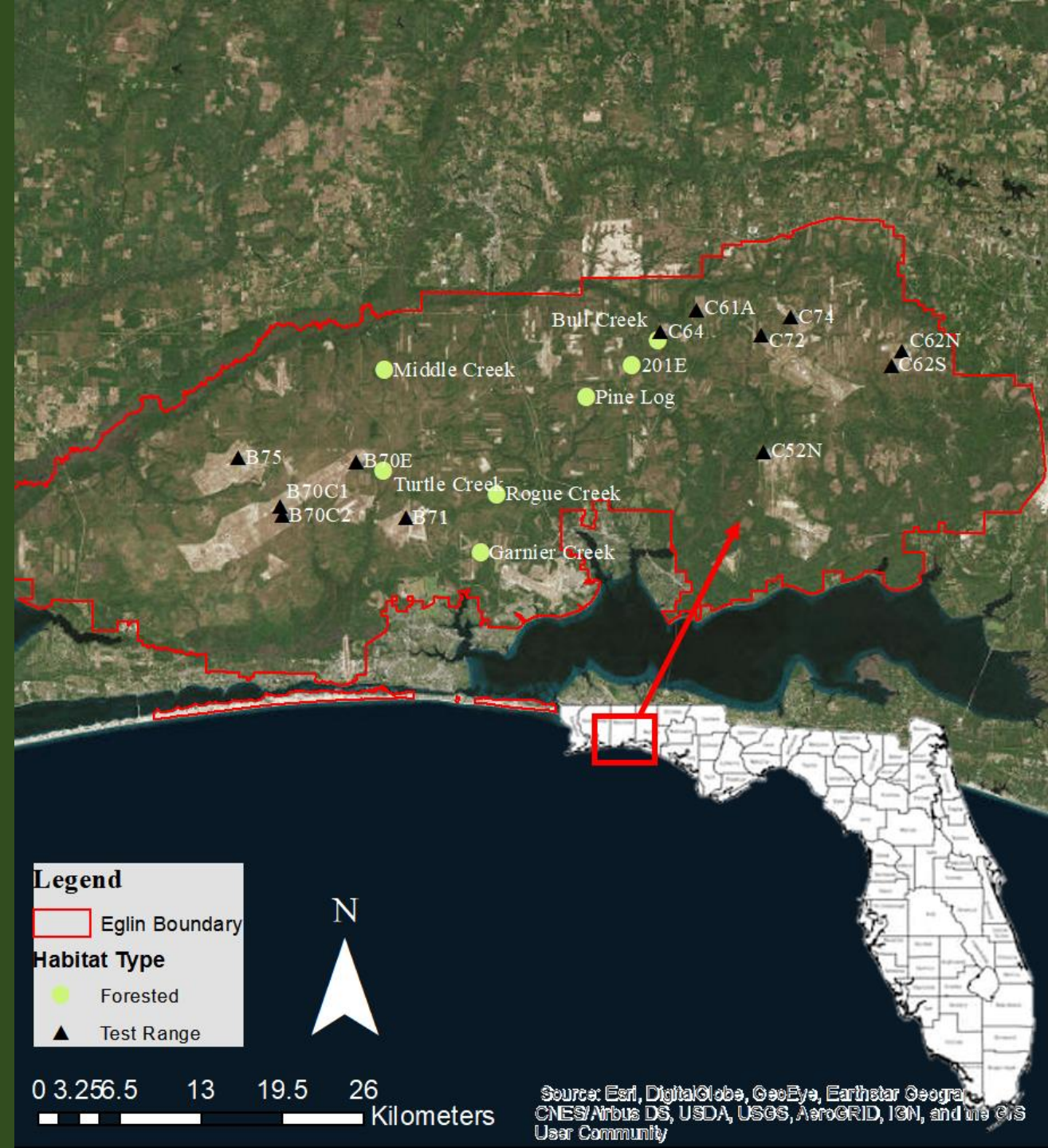
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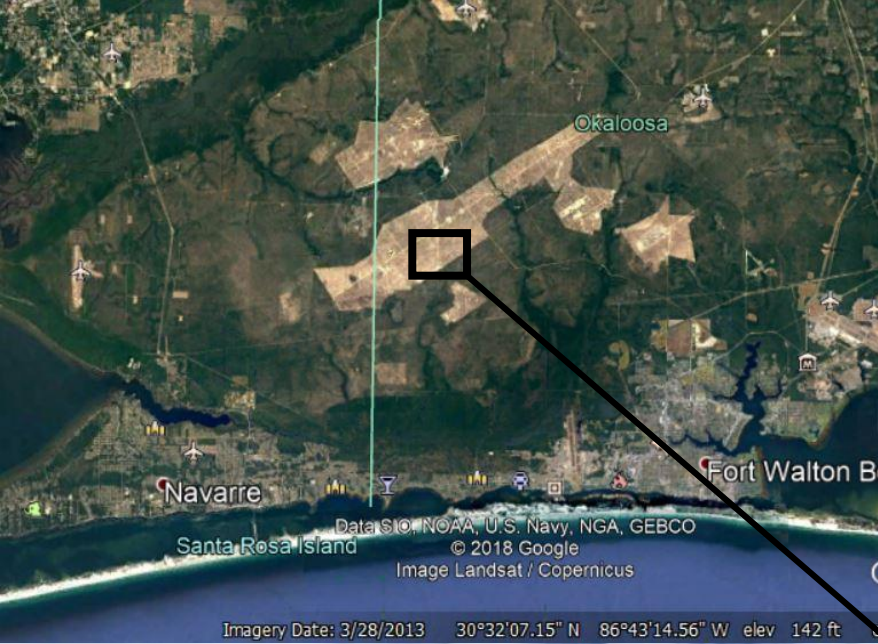
Eglin AFB

- ~155,000 ha of potential habitat
- Extensive contiguous tracts of longleaf sandhill
- Frequent application of prescribed fire

Study Sites

- 19 sites
- 7 forested sites, 12 sites on 9 test ranges
- Survey areas ~10 ha – 16.9 ha





Test Range vs. Forested Sandhill



Test Range Management and Mission Use

- Mowing and fire
- Roller-drum chopping in past
- Testing and training activities variable
 - Dictate management intensity

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Fire, Groundcover, and Canopy Closure



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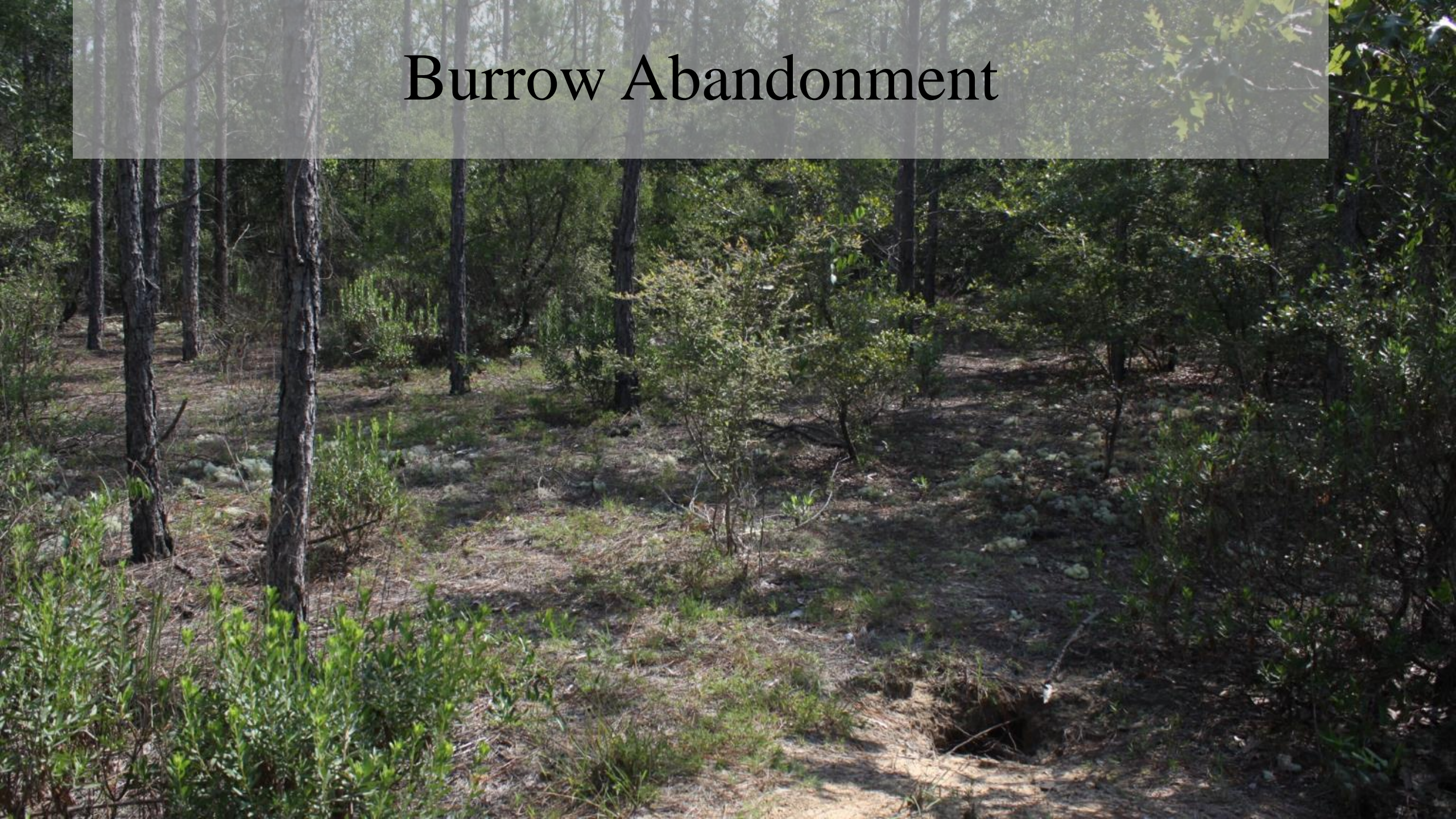
Frequent fire....



Without fire....



Burrow Abandonment

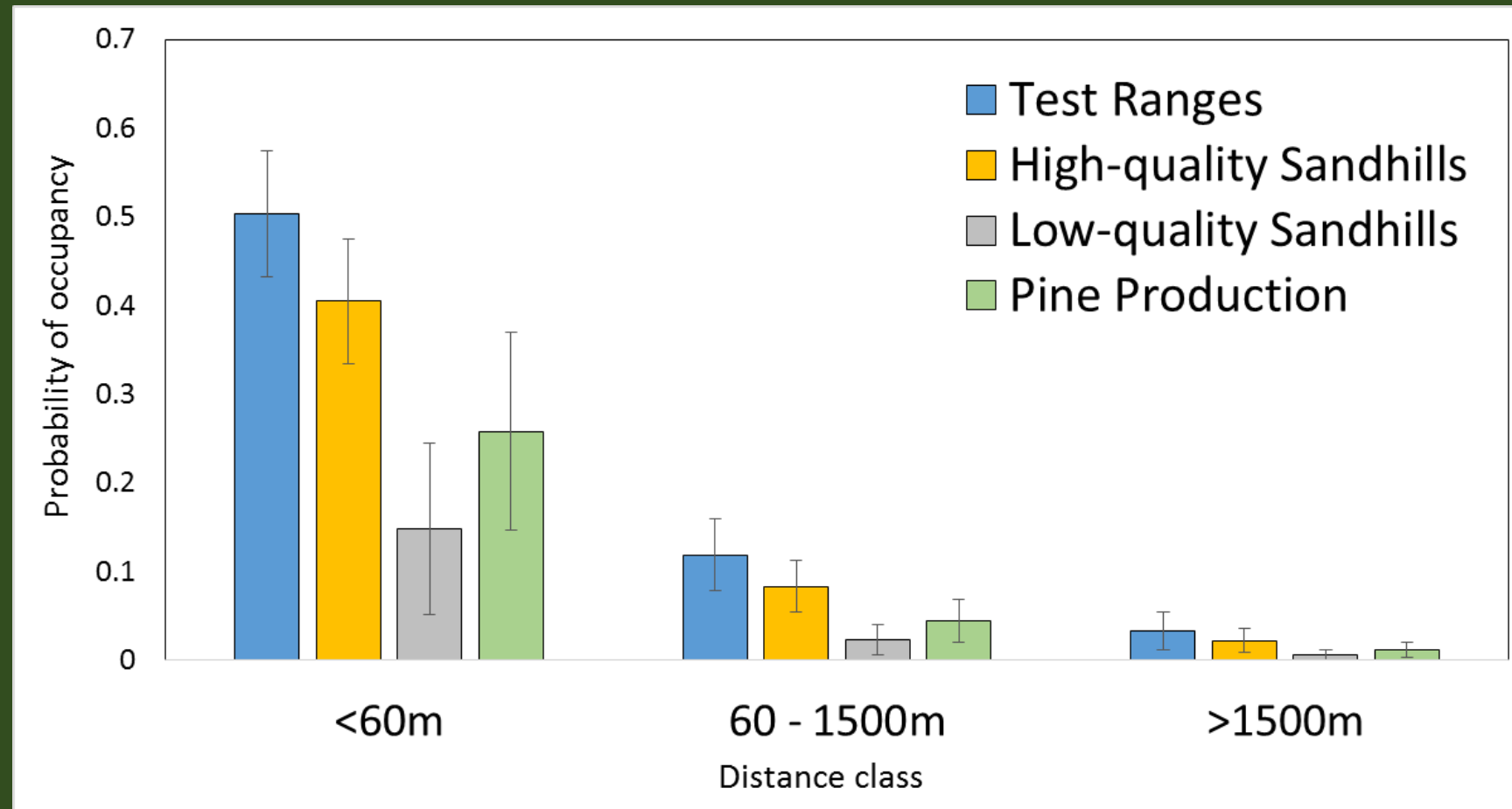


Emigration to Open, Disturbed Habitats?

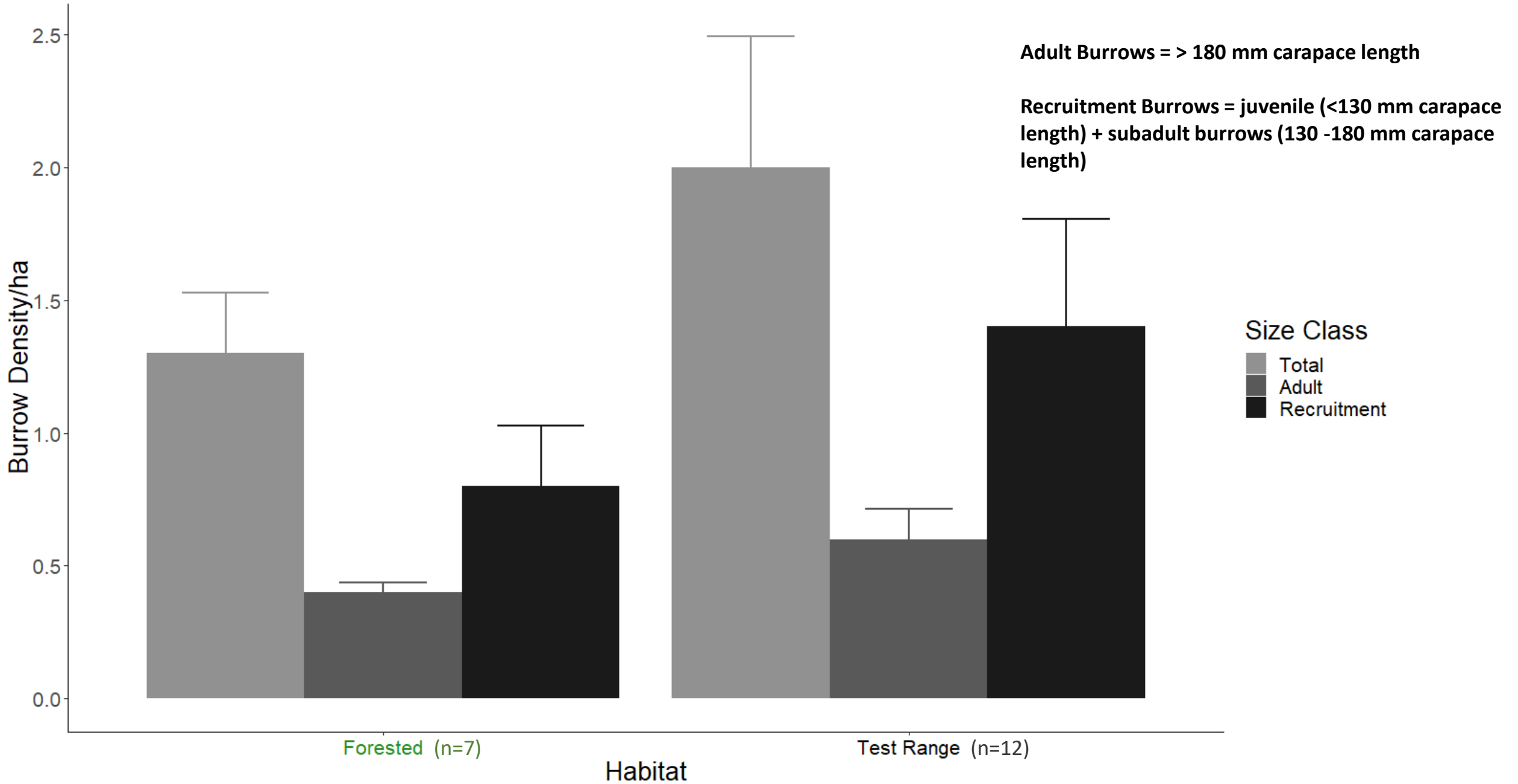


Base-wide Occupancy (Project 14-762) Recap

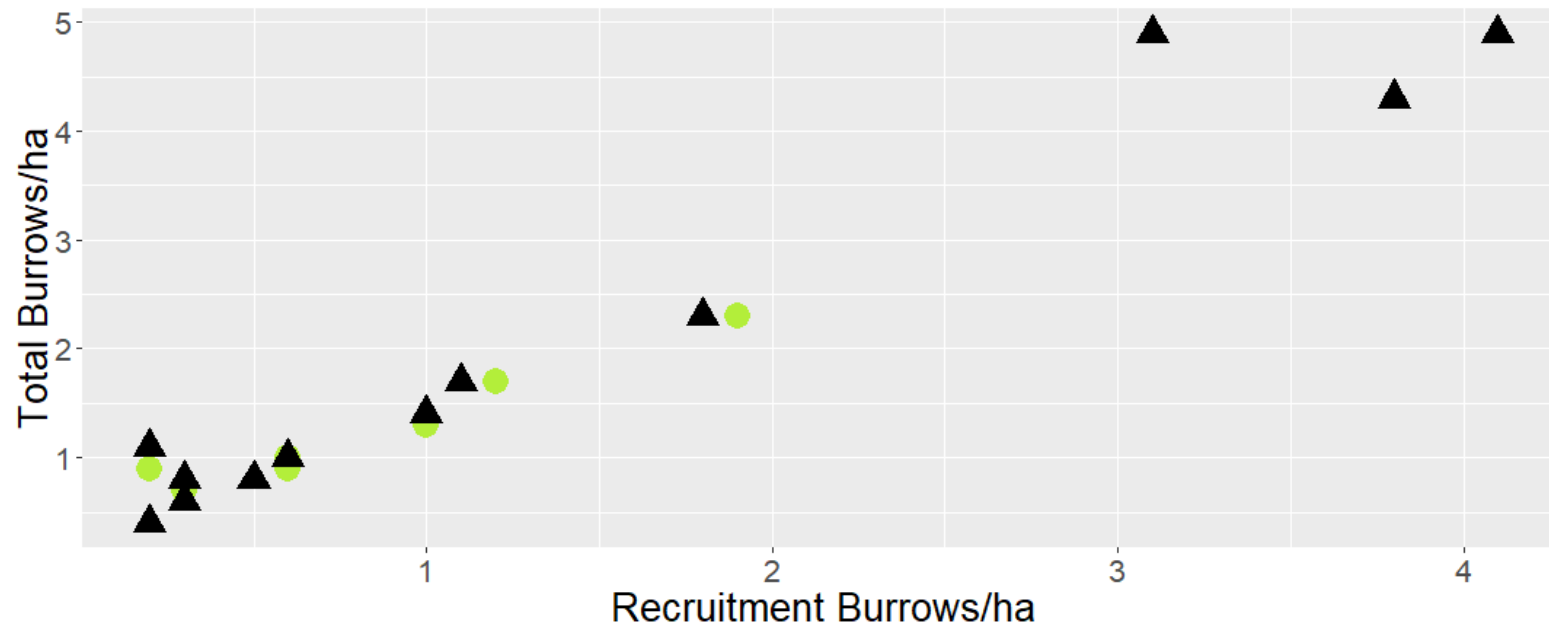
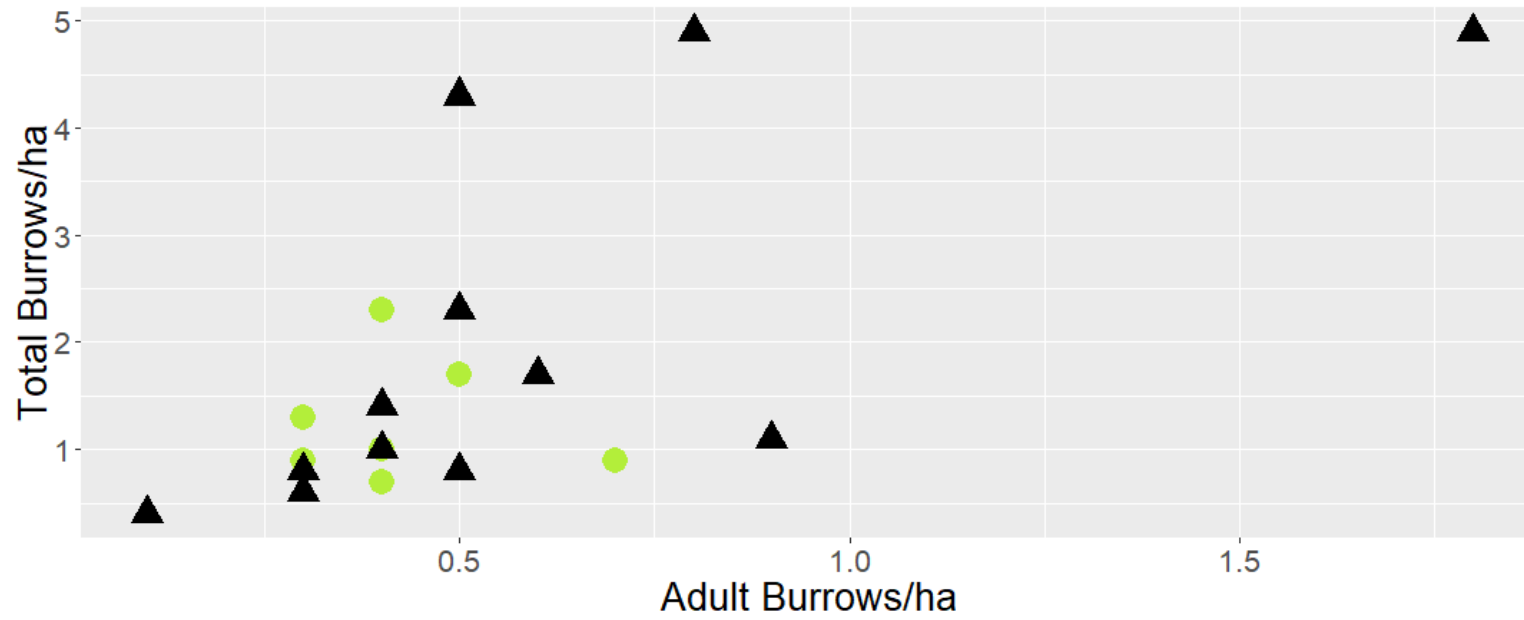
- Highest occupancy on some test ranges
- Occupancy declined significantly beyond 60 m of previously known site



Burrow Densities Across Base



Wide range in Burrow Densities among Sites



Relationship Between Habitat, Management and Burrow Densities?

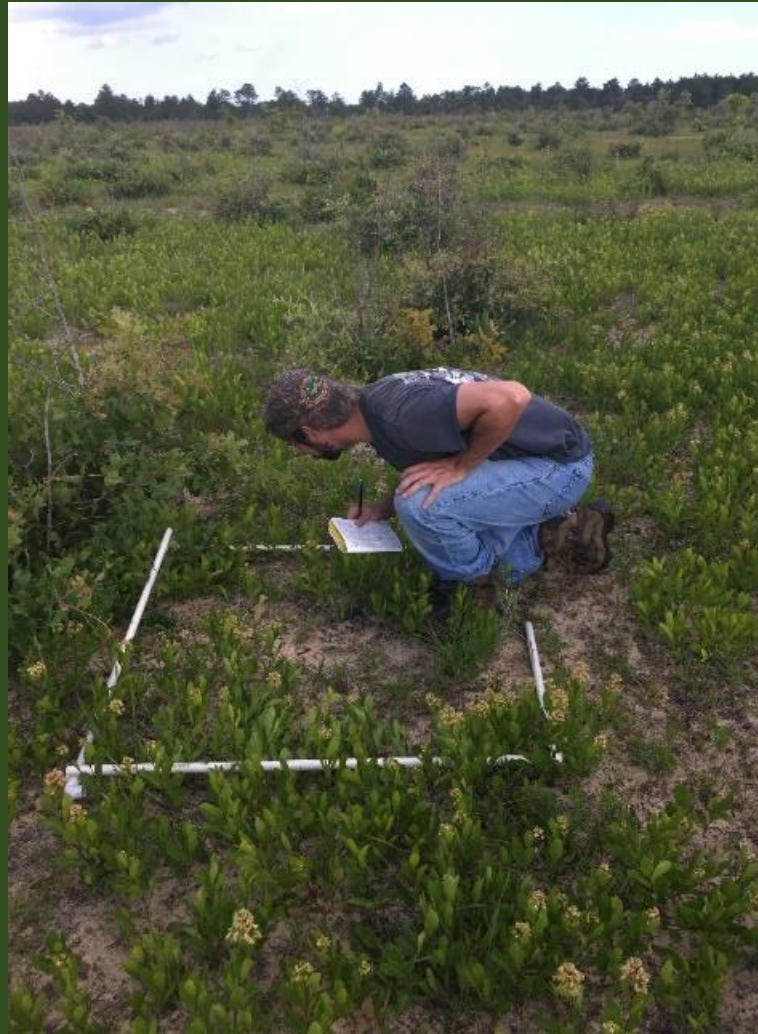


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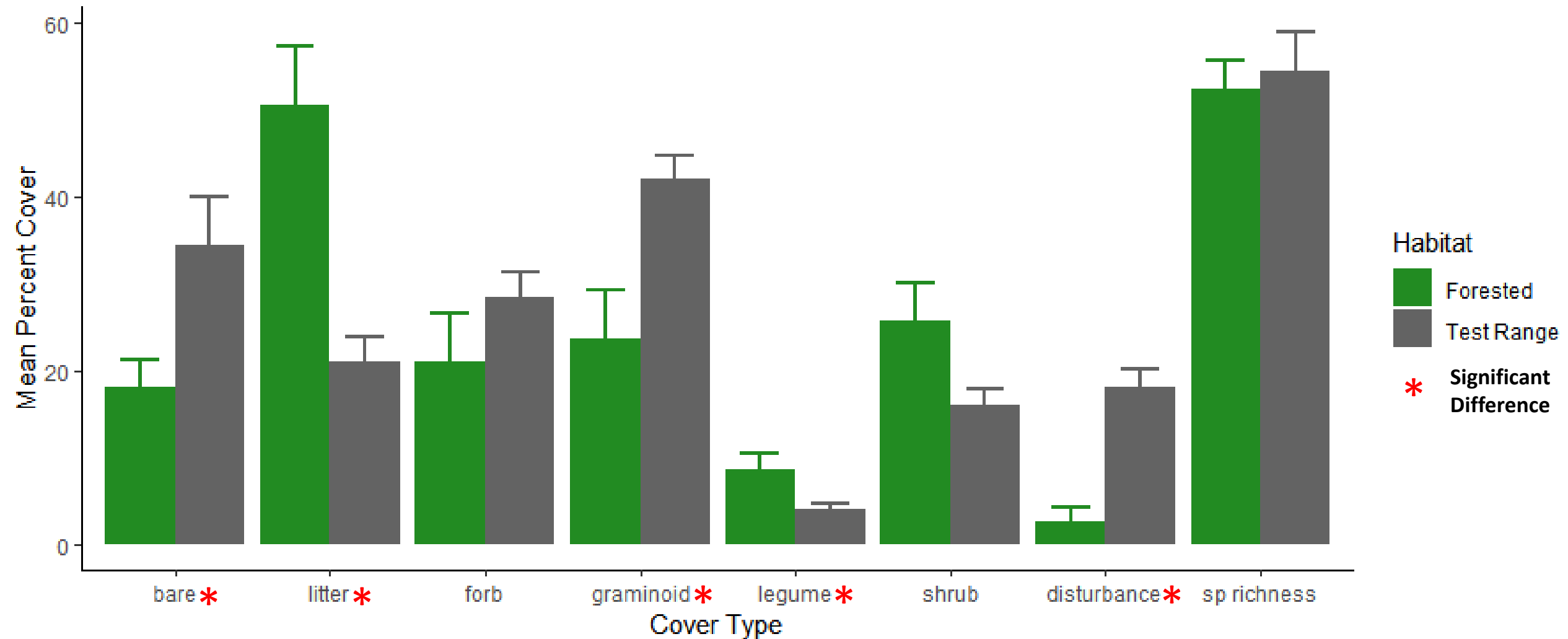


Vegetation Surveys - Emphasis on Herbaceous Cover

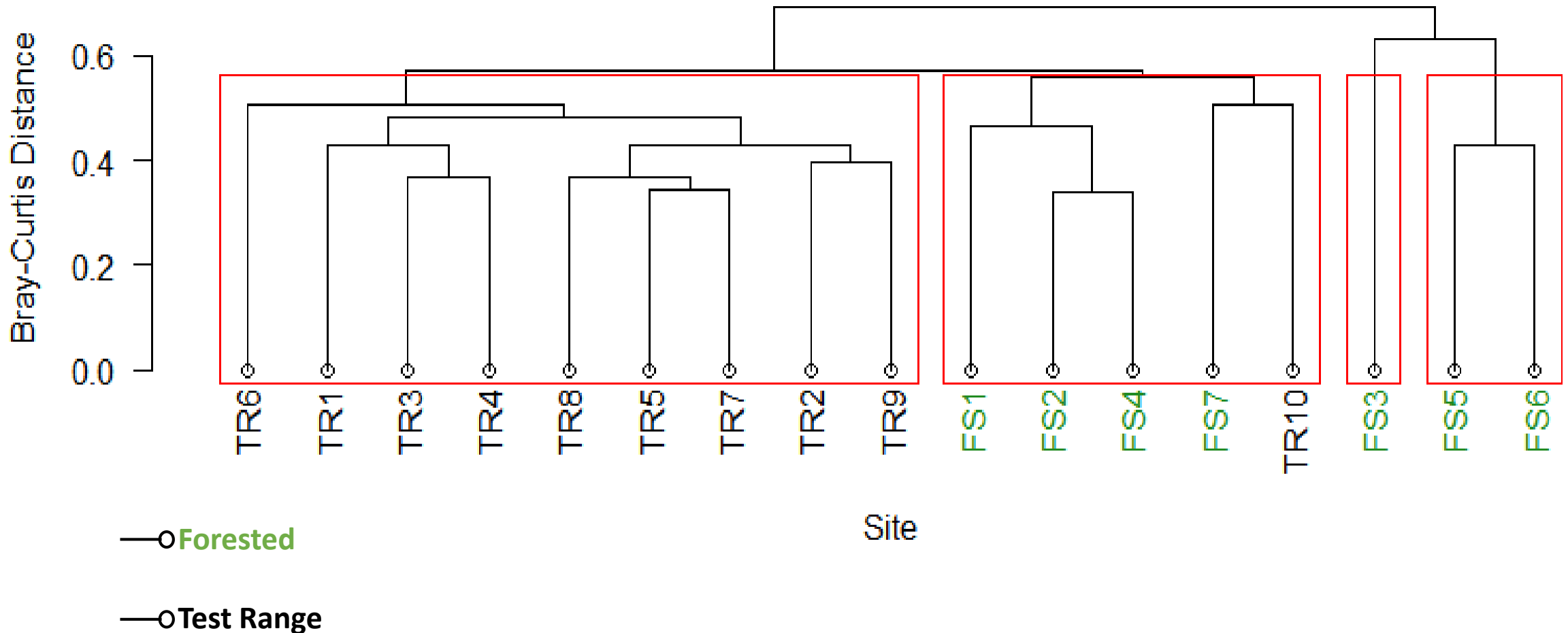
- Compared herbaceous communities
- Explored if/how vegetative cover types influenced burrow site selection
- Relationship between management practices, current vegetation condition, and burrow densities?



Percent Cover Varied Between Forested Sites and Test Ranges for Key Vegetative Cover Types



Herbaceous Communities were Distinct between Forested Sites & Test Ranges



Burrow Site Selection: Compositional Analysis

Rank	Habitat	
	Forested	Test Range
	Cover Type	
1	Graminoid*	Legume
2	Bare	Shrub
3	Forb	Litter
4	Legume	Graminoid
5	Shrub	Forb
6	Litter	Bare*
7	Vine	Vine*
8	Fern*	N/A

Pairwise Comparisons
Among Cover Types

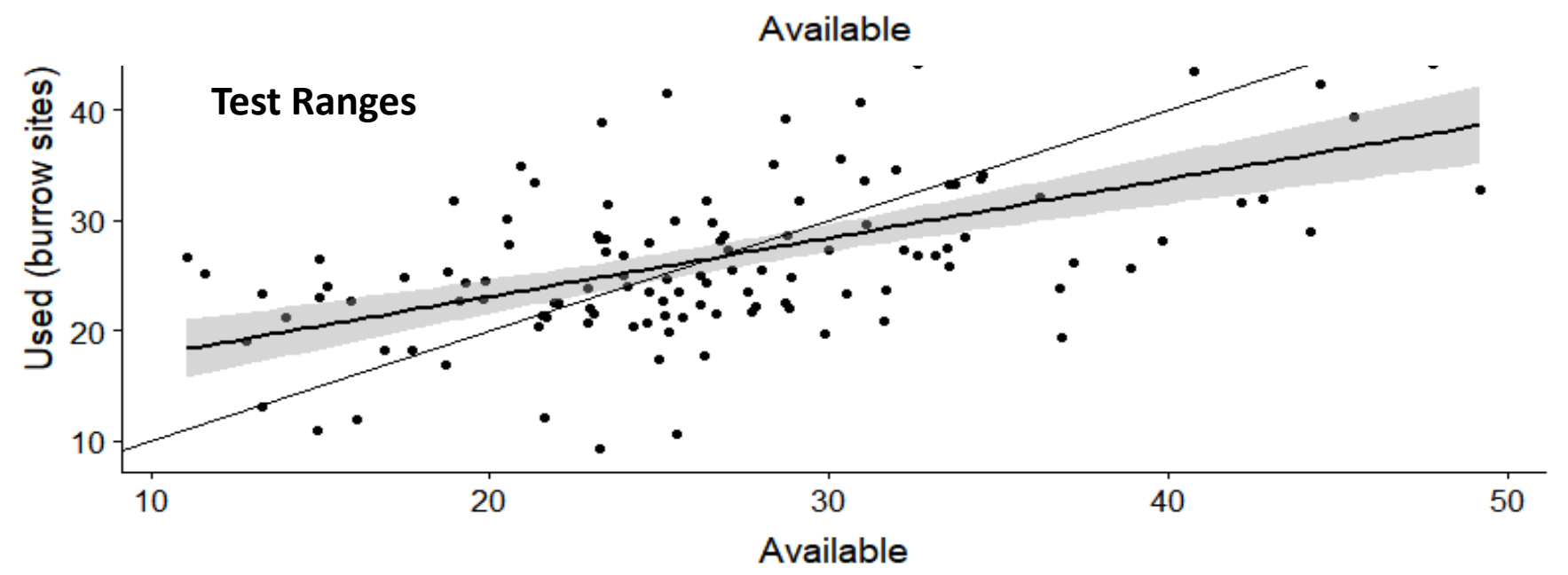
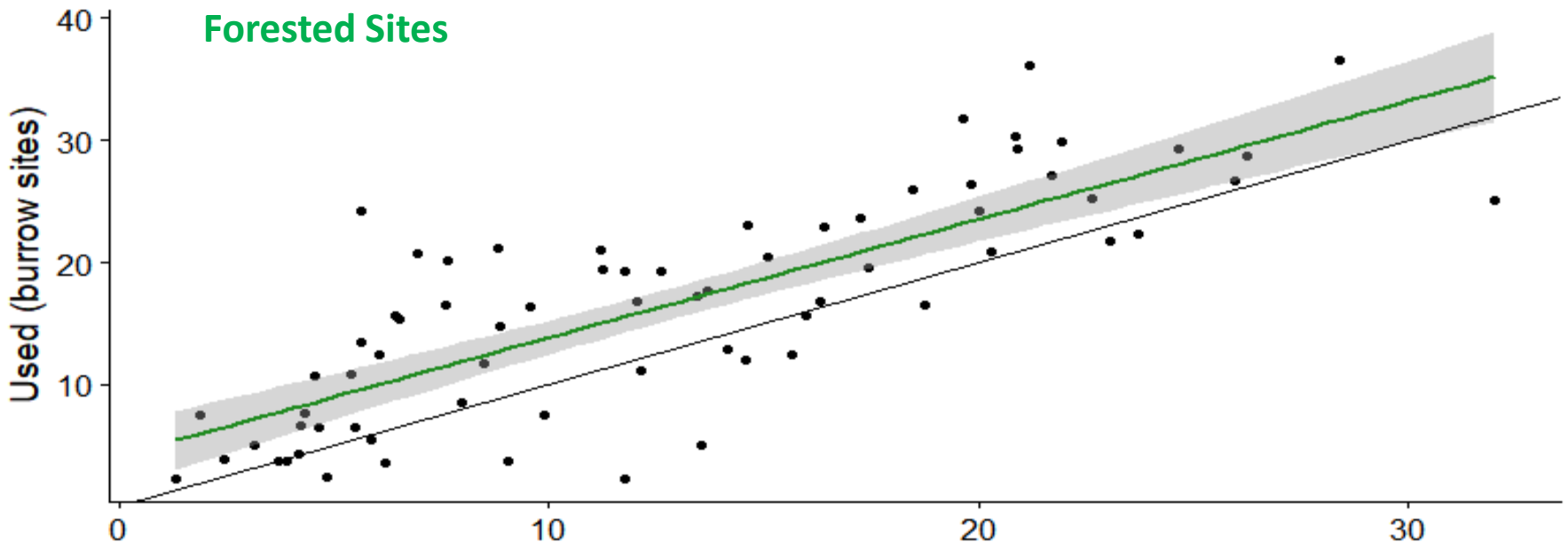
No Significant Preference

Strongly Preferred*

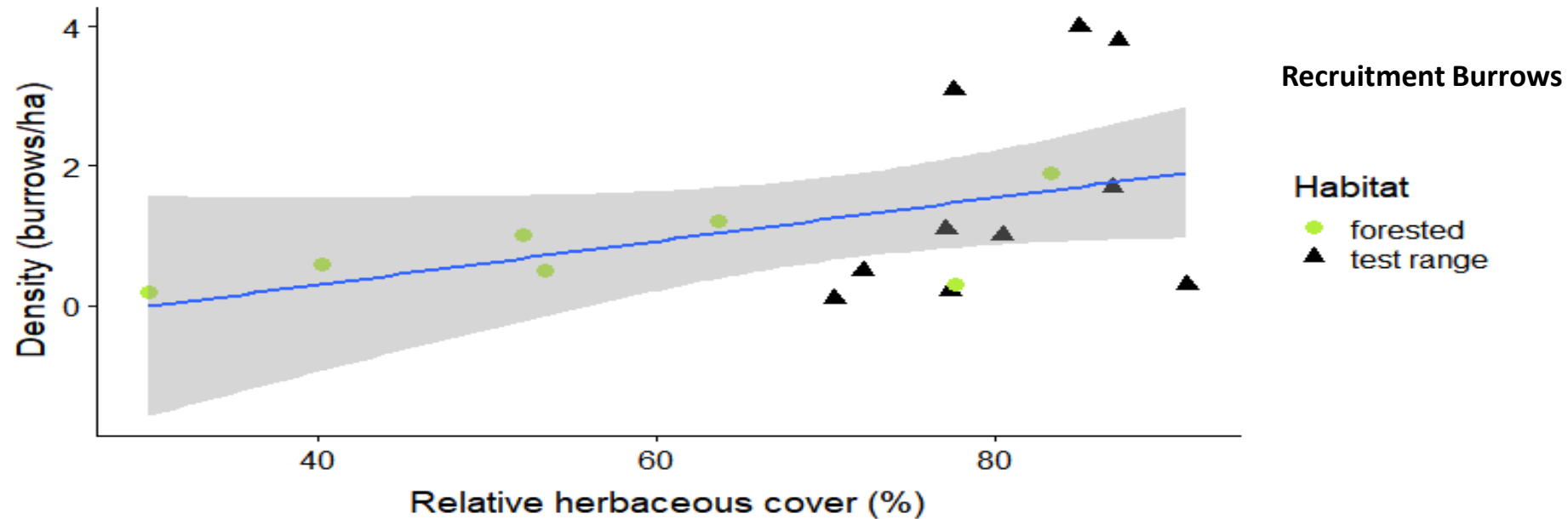
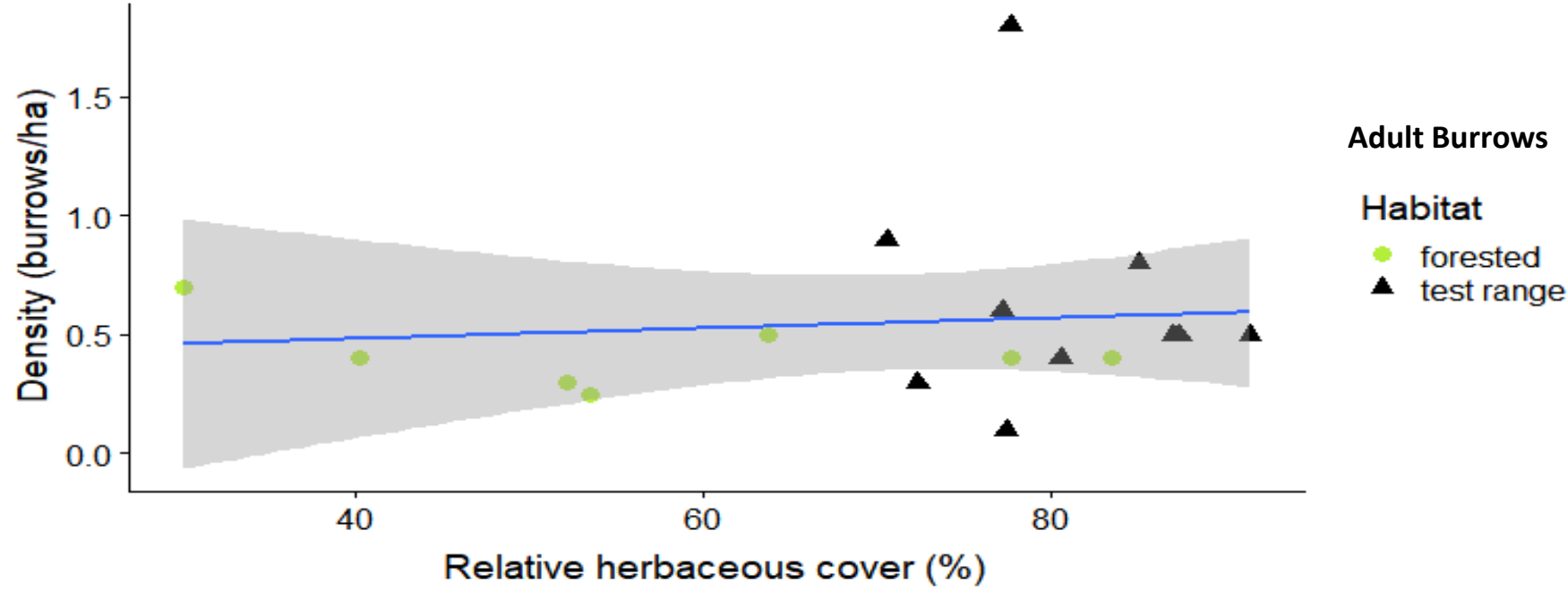
Strongly Avoided*



Graminoids were Only Strongly Preferred Cover Type in either Forested Sites or Test Ranges



No Relationship between Cover Types and Burrow Densities



What else might be happening with Eglin's tortoises?

- Test ranges *may* provide suitable habitat...
 - Management practices still an uncertainty
- Current habitat characteristics alone did not explain burrow density differences among sites
- Surveyed NR personnel at other installations



How are test ranges managed on other installations?

- Responses from personnel at 8 installations
- Mechanical management applied everywhere

Management Practice	# Installations	% Installations
Fire	6	75
Herbicide	7	87.5
Mechanical	8	100
Chainsawing/Logging	5	62.5
Mowing/Bush-Hogging	8	100
Roller-Drum Chopping	2	25



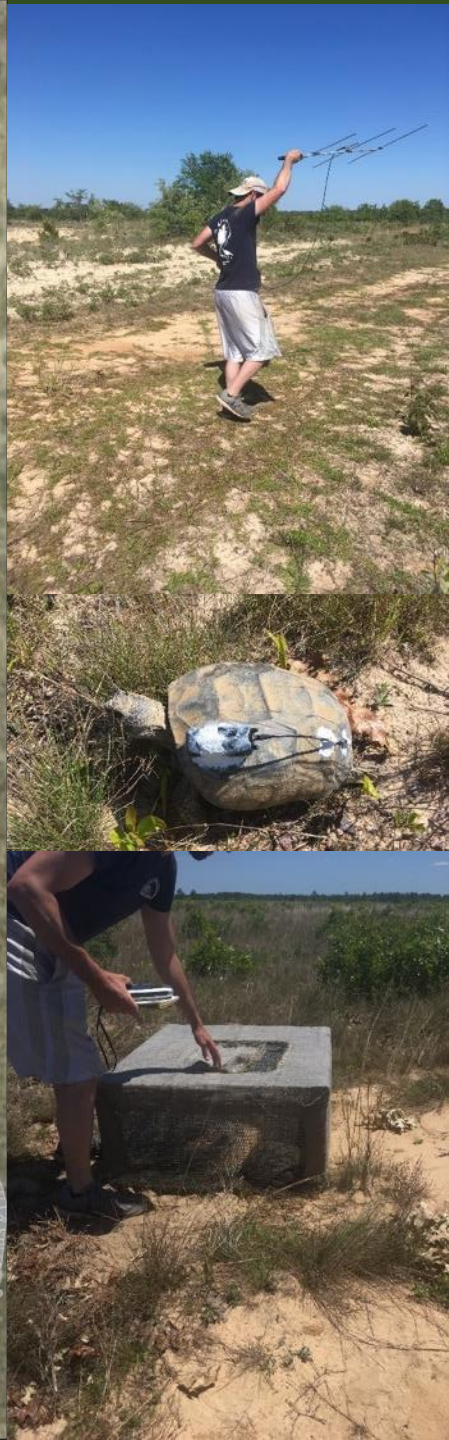
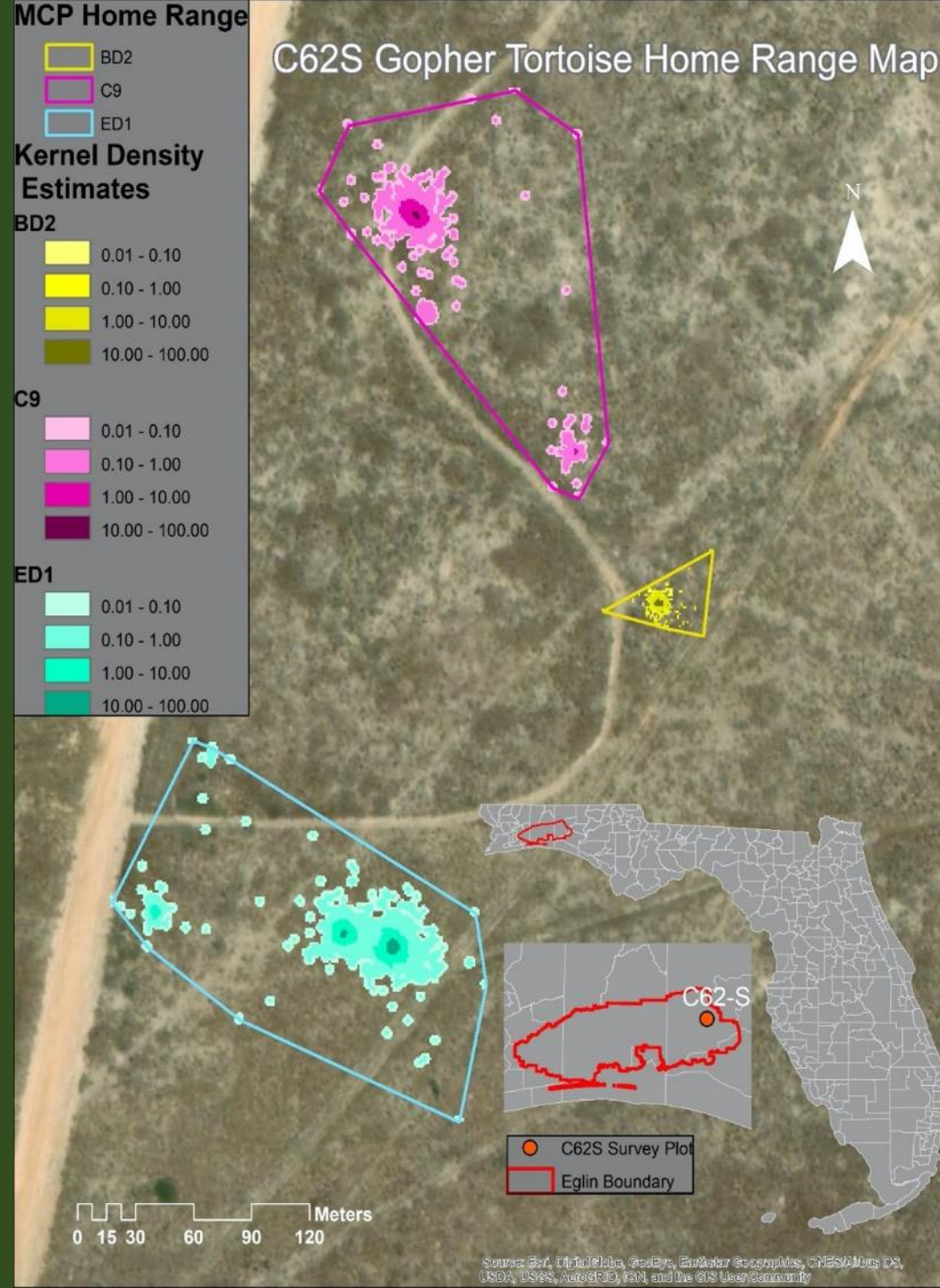
Management Considerations and Future Directions

- Communication with test range managers
 - Avoid burrows and aprons when mowing
 - Compatibility between management, mission goals and tortoise population persistence
- Is translocation the best option?
- Nest success, juvenile growth, survival and recruitment
- Landscape use and movement patterns



Other Legacy-funded Research

- Spatial Ecology in altered landscape with low density populations
 - GPS telemetry



Other Legacy-funded Research

- Commensal Species on test ranges



Photo Credit: Steve Goodman

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How do Human-altered Habitats Factor into Conservation Efforts?

- Larger emphasis on human-altered habitats
- Similar situations elsewhere?
- Questions?



Supplemental Slides

Minimum Convex Polygon (MCP) Home Range, Movement, and Burrow Use Summary Statistics

Habitat	Site	Tortoise ID	Deployment Period	Sex	MCP area (ha)	Burrows Used	Max Distance Traveled (m)
Forested n=4	201E	KV5	12 May-3 Oct.	F	8.3	2	407.0
	Bull Creek	BC3	29 June-2 Oct.	F	1.7	2	113.0
	Bull Creek	BC7	30 June-2 Oct.	F	1.9	2	138.0
	Garnier Creek	GD11	25 Aug.-6 Sept.	M	2.7	2	559.0
Test Range n=5	C62N	BD5	19 June-3 Oct.	M	2.7	2	163.0
	C62N	SG9	28 April-3 June	M	1.0	2	110.0
	C62S	BD2	28 April-23 May	F	0.1	2	37.0
	C62S	C9	22 June-14 Aug.	F	1.7	3	138.0
	C62S	ED1	19 June-3 Oct.	F	1.9	4	113.0
					MCP Area (ha)	Burrows Used	Max Distance Traveled (m)
Forested Average					3.7±1.6	2.0±0.0	304.3±107.9
Test Range Average					1.5±0.4	2.6±0.4	112.2±21.1
Average All Tortoises					2.4±0.8	2.3±0.2	197.6±63.0

NMDS Commensal Community Differences

