

Prescribed burning and herpetofaunal diversity patterns in Northern Longleaf Ecosystem restoration



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Herpetofauna and fire: a history

- Herps important to ecological functioning
- Relationships currently not well known to date
- Common issues in design/analysis
- Recent research suggests need for an understanding across multiple spatial scales



Longleaf Ecosystems

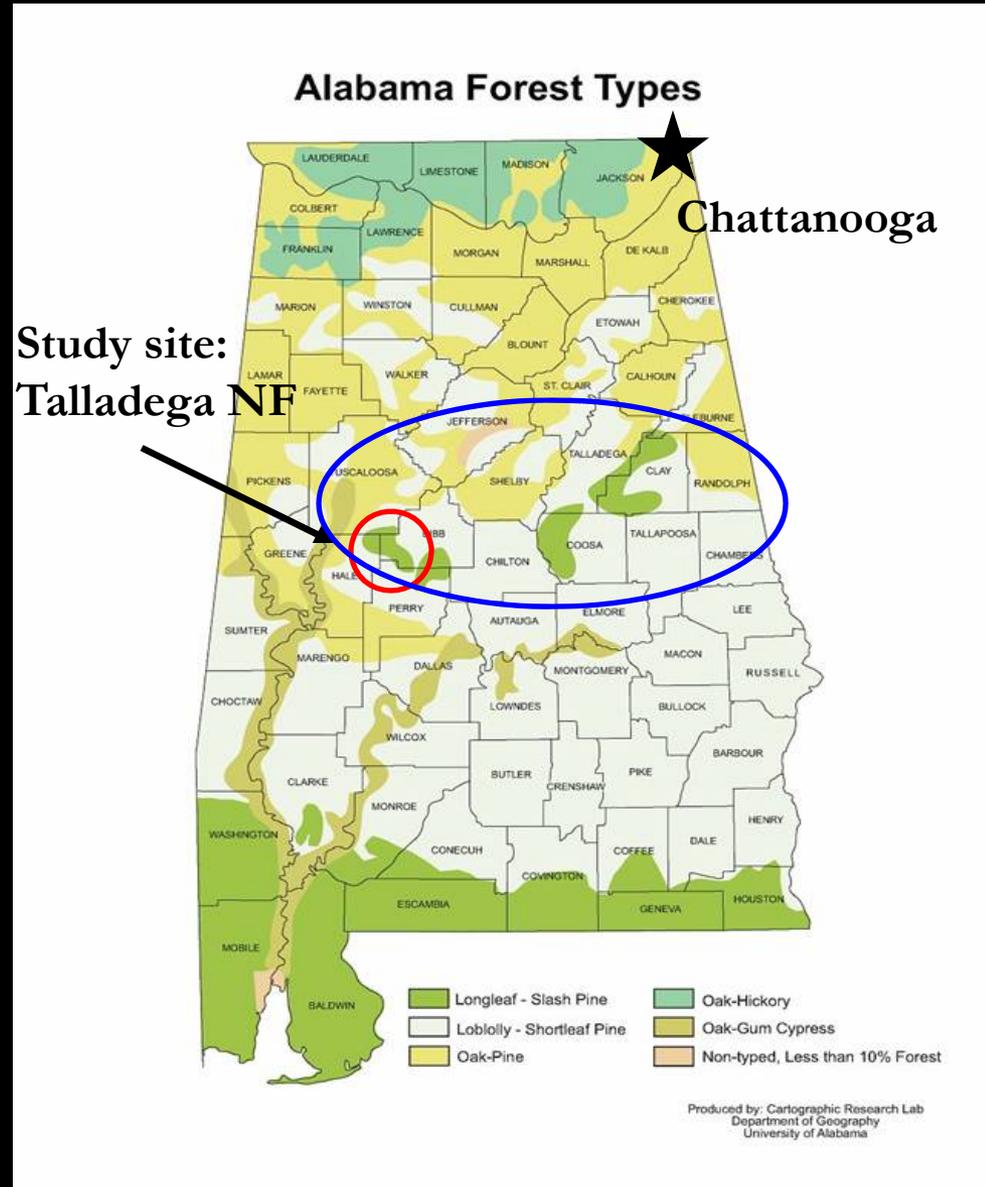


- ‘Traditional’ Longleaf
 - Primarily flat
 - Savanna/sandhill communities
- Upland Longleaf
 - Restricted to ridgetops
 - Occur within a matrix of hardwoods, mixed forest

Longleaf Ecosystems



- Upland Longleaf
 - Currently undergoing restoration
 - Herpetofaunal aspects never studied

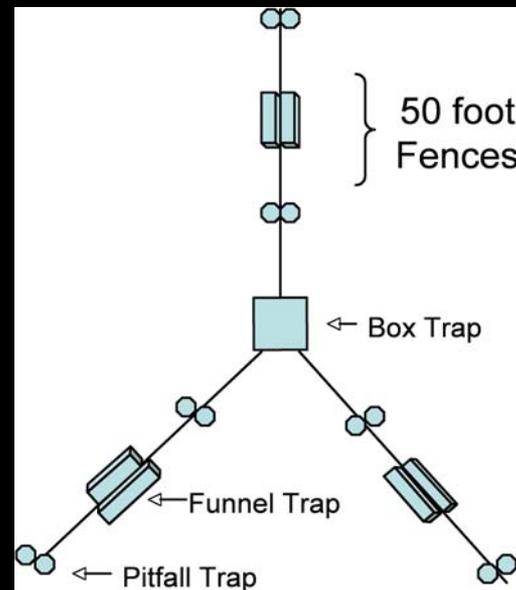
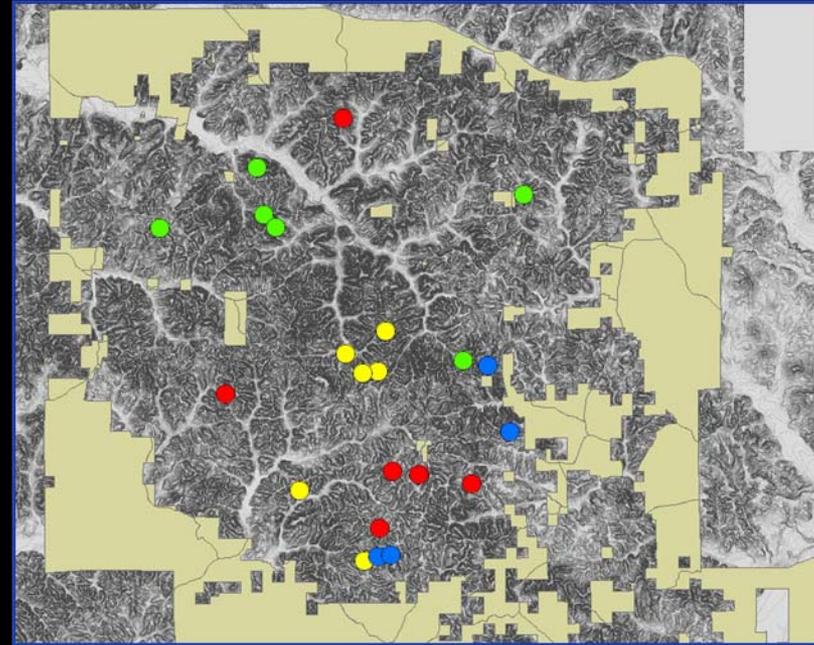


Overall Goals

- Inventory herpetofauna of upland longleaf
- Relate diversity patterns to prescribed fire regimes
- Use data to gauge applicability of herpetofauna to overall ecosystem restoration

Experimental Design

- Arrays sampled Jan. 2006 – July 2008
- Arrays installed
- Captures identified to species level, sexed, aged, standardized, herpetological and 0-7 years since last burn
- Replication: 6 reps. each for 0-1, 3-4, 6-7 years since last burn
- Individuals marked for recapture to ensure statistical independence
- 4 captures for ≥ 20 years since last burn



Statistical Analysis

- Historic metrics: abundance, spp. richness, Shannon/Simpson indices
- Pluralistic approach taken: common measures and multivariate techniques (MDS, ANOSIM) utilized

Results

- 2,170 individuals, 45 species captured (16 amphibian, 29 reptile species)
- Statistical measures show no relation between diversity patterns, season of burn
- Species inventory atypical of 'classic' longleaf forests



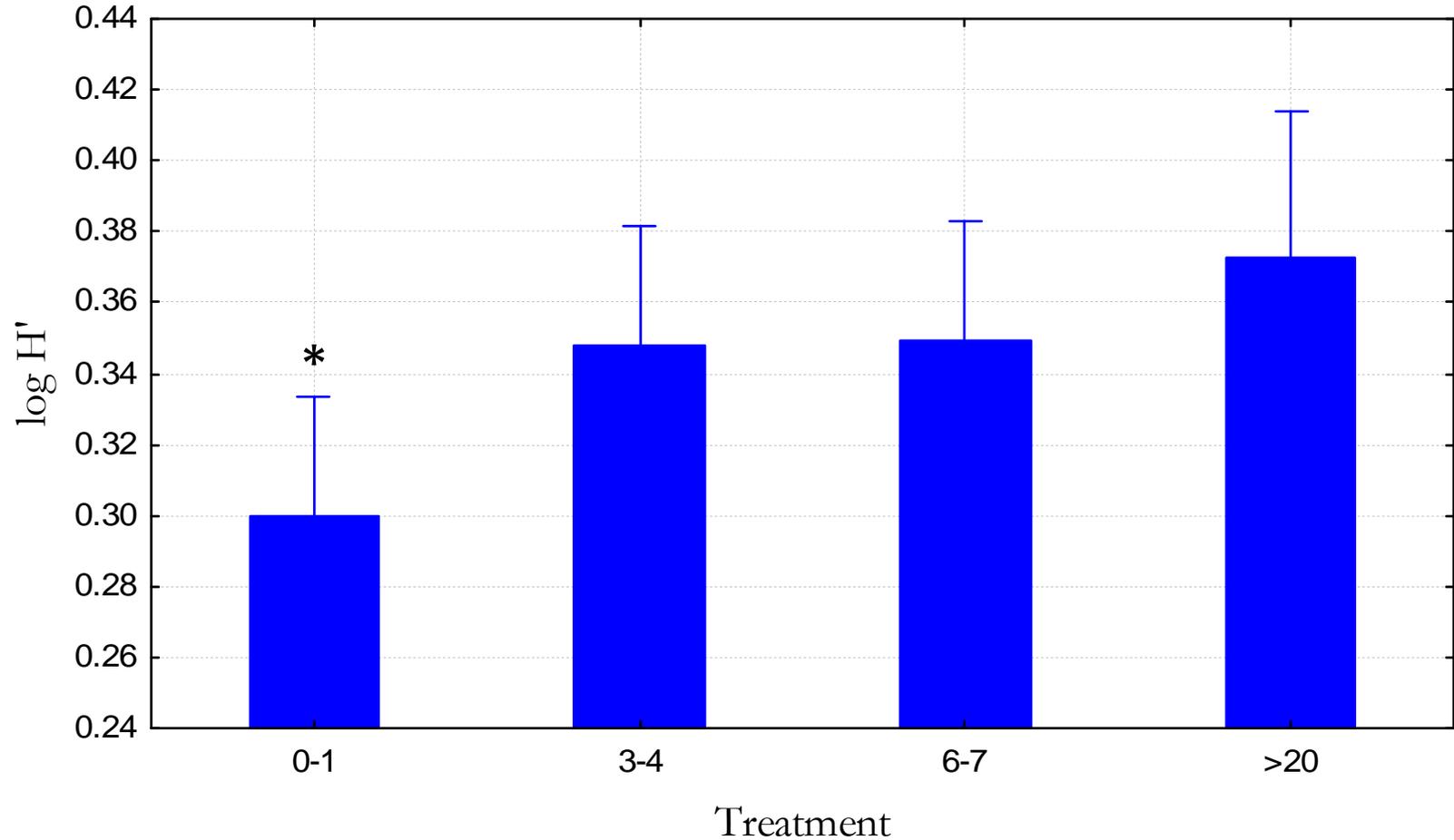
Results

- No relation between abundance, species richness and time since last burn
- Evenness (Shannon derived) did not significantly vary between burn intervals

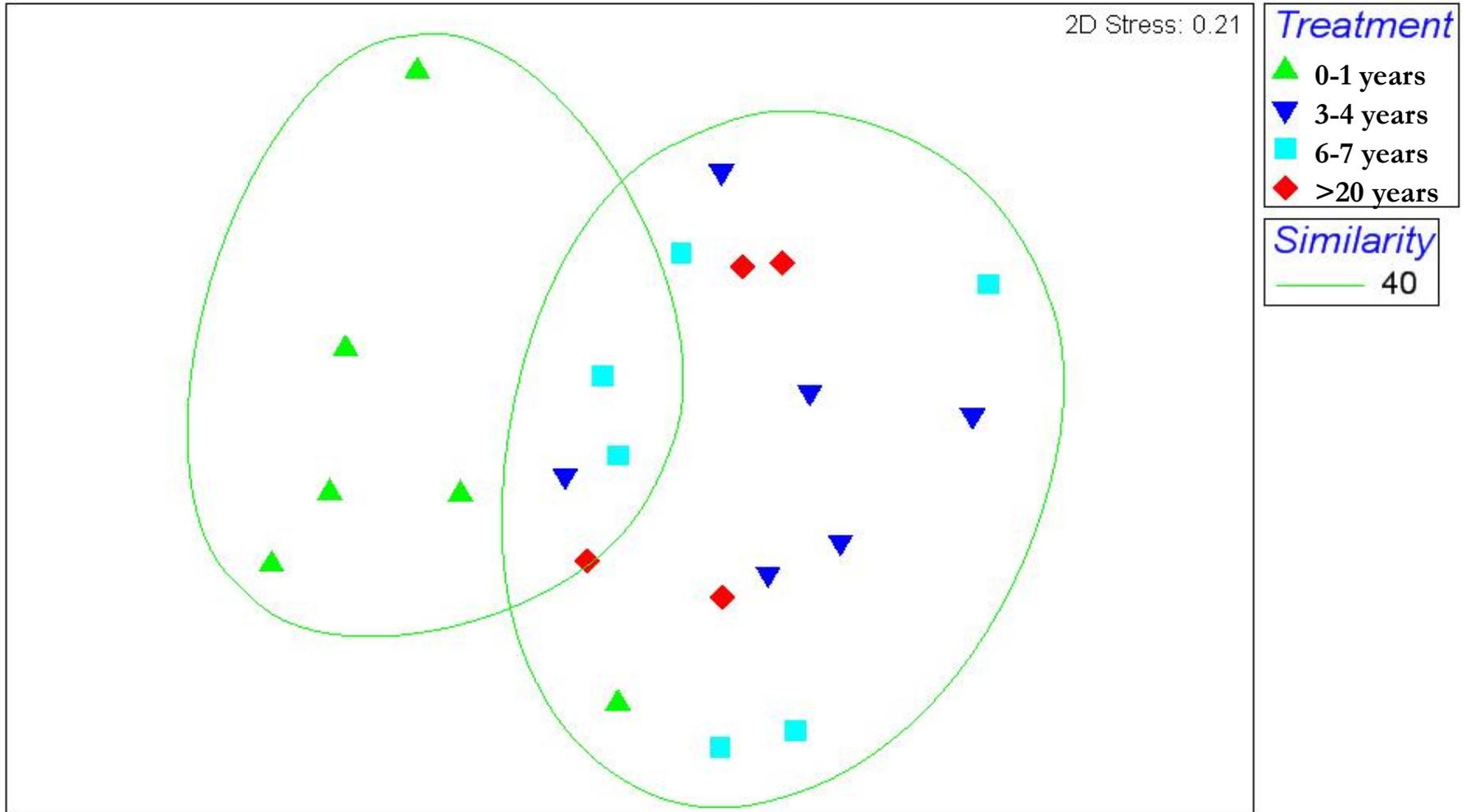
ANCOVA of Mean Herpetofaunal Diversity (Shannon Index) by Burn Interval (Time Since Last Burn)

$F(3, 17)=3.2431, p=.04$

Covariate: Distance to Stand Edge (m)



MDS Analysis



ANOSIM Results: Treatment group 1 (0-1 years since last burn) significantly different from all other groups ($p < 0.01$)

Results

- Concordance between H' , MDS, and ANOSIM showing statistically unique species assemblages in 0-1 year managed stands
- What species characterize these assemblages?

Species discriminance

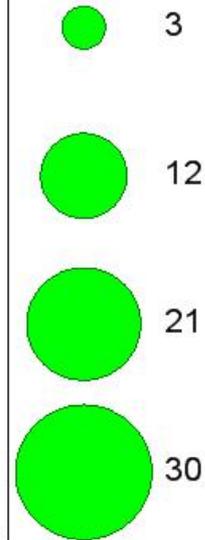
- SIMPER analysis shows 5 of 12 species highly characteristic of 0-1 year stand communities: *Sceloporus undulatus*, *Notophthalmus viridescens*, *Cnemidophorus sexlineatus*, *Gastrophryne carolinensis*, and *Bufo terrestris* (61.27% contribution to community composition)
- Conversely, all other treatment stands are consistently most characterized by *Scincella lateralis*, *Eumeces laticeps*, and *Anolis carolinensis*

2D Stress: 0.21

Cnemidophorus sexlineatus

0-1 year interval

All other intervals

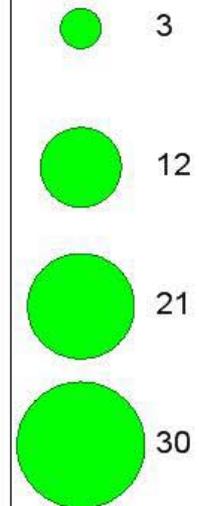


2D Stress: 0.21

Gastrophryne carolinensis

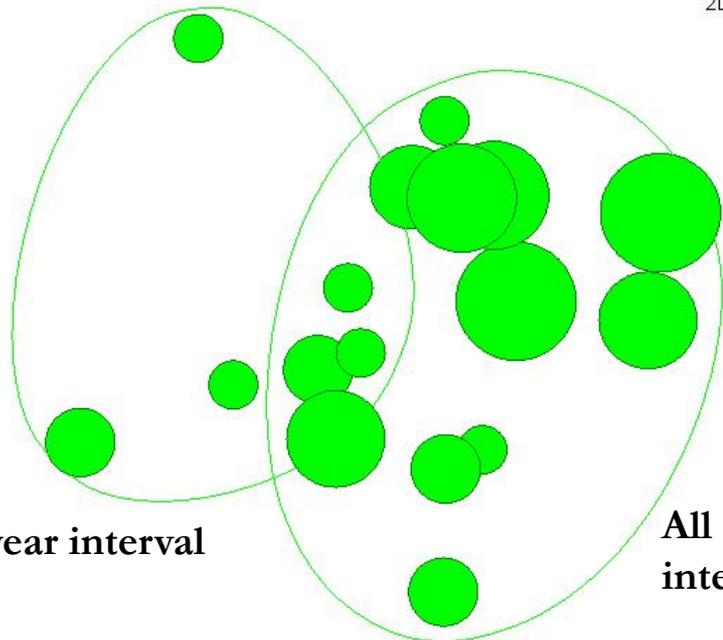
0-1 year interval

All other intervals



2D Stress: 0.21

Eumeces laticeps



0-1 year interval

All other intervals

0.6

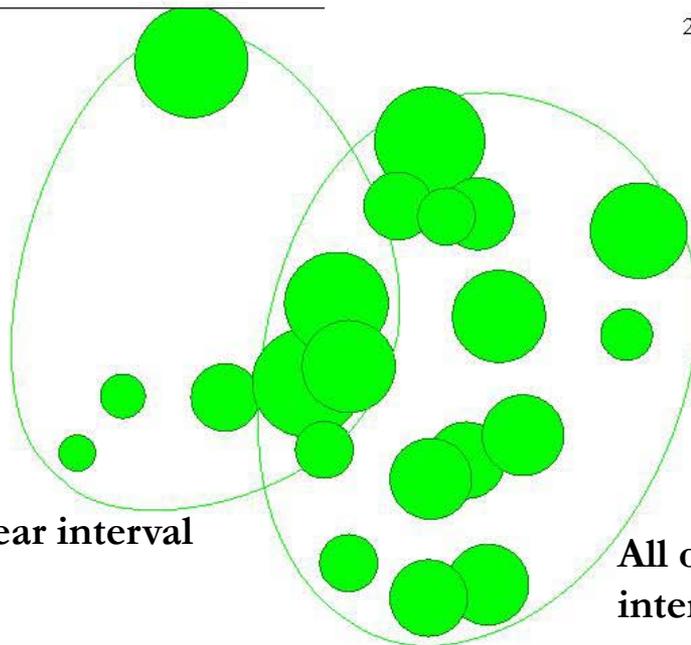
2.4

4.2

6

2D Stress: 0.21

Scincella lateralis



0-1 year interval

All other intervals

2

8

14

20

Species Discriminance

- *Cnemidophorus sexlineatus* contributed highest to dissimilarity between species assemblages (3.88-4.87%)
- May have utility as a discriminant species for monitoring restoration efforts



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Conclusions

- Restoration activities of longleaf pine result in a significantly unique herpetofaunal community composition in recently burned forest stands
- Herpetofauna of upland longleaf likely exist in a dynamic mosaic of community compositions that shift spatially and temporally with succession

Conclusions

- Monitoring herpetofauna in this ecosystem, especially discriminant species, may provide insight into restoration progress at a stand level outside of structural habitat monitoring alone
- Herpetofauna often cited as ideal indicators for restoration monitoring
- A community-scale, comprehensive approach is still lacking

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