Annual Variation in Northern Bobwhite Survival and Cause-specific Mortality in Relation to Ground Cover and Phenology of Raptor Migration

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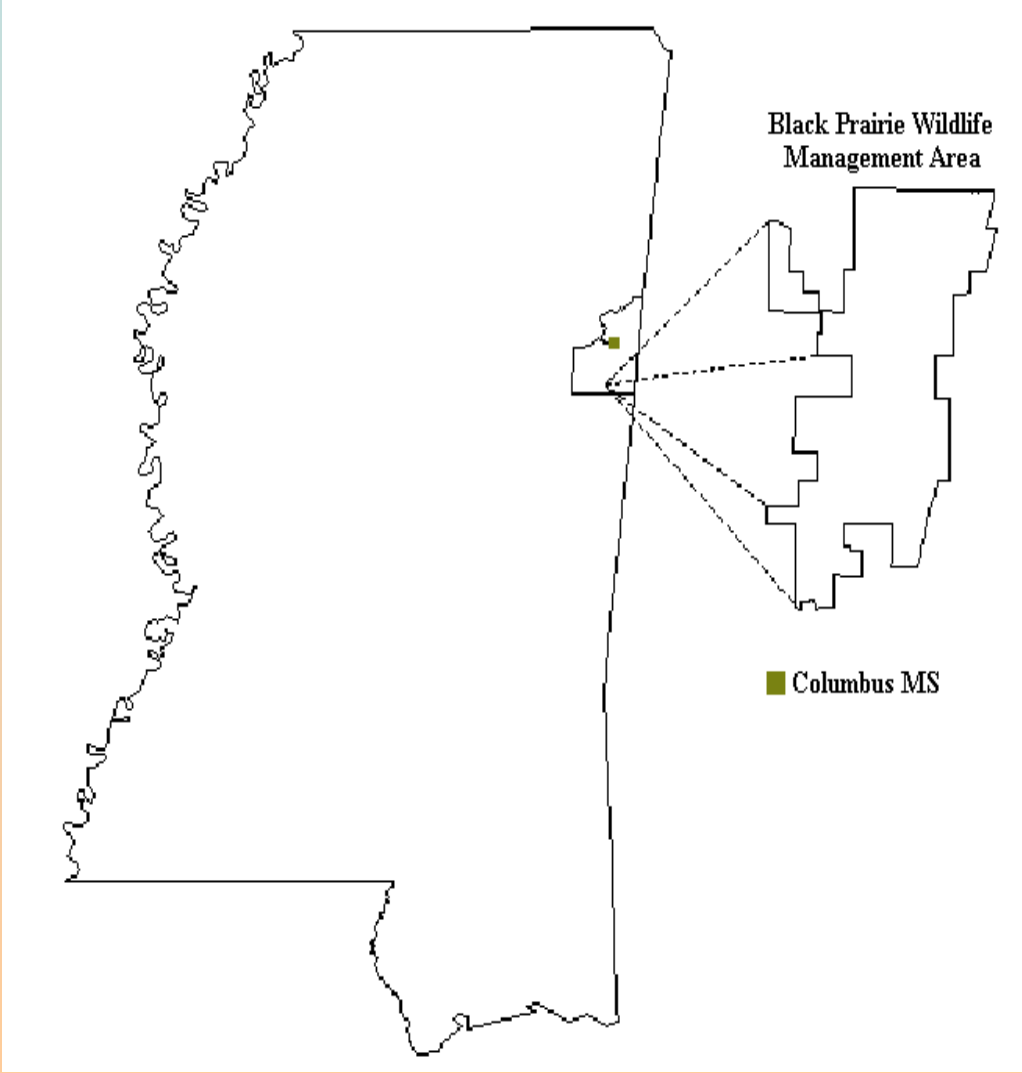
Introduction

- 2-year Over-winter ecology study (1 September-28 February 2000-2002)

- Black Prairie Wildlife Management Area in the Blackland Prairie physiographic region of northeast Mississippi



Introduction

- Bird capture in September and November each year
- Birds fitted with 5-6 g necklace style transmitter
- Birds relocated ≥ 5 days/week
- Survival estimated using Kaplan- Meier method modified for staggered entry

Survival Estimates

2000-2001 (n = 173)	0.027 (SE = 0.0087)
2001-2002 (n = 71)	0.362 (SE = 0.0765)

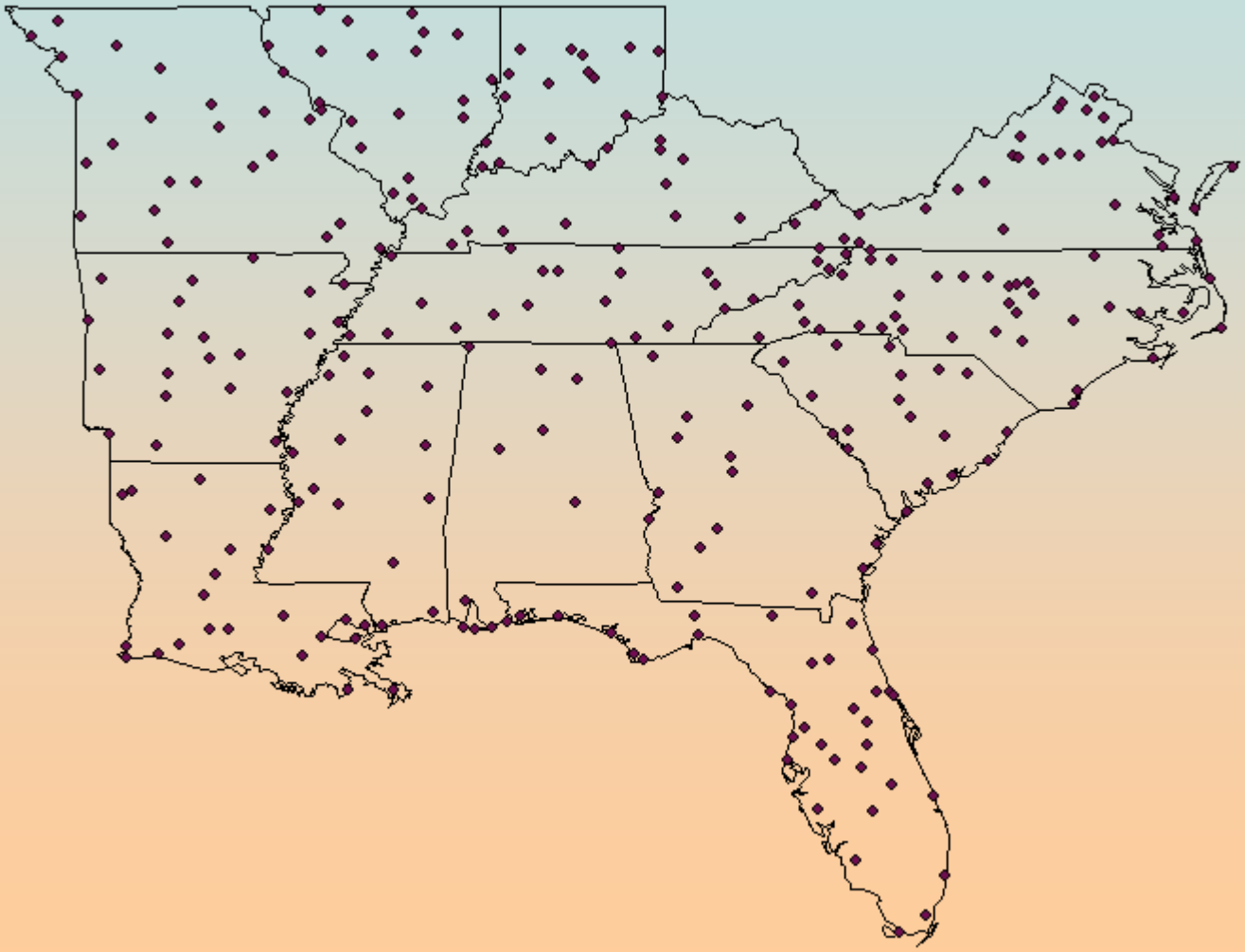
Cause-specific Mortality

	Avian	Mammalian	Unknown	Other
2000-2001	49.6% (SE = 0.040)	37.1% (SE = 0.039)	8.6% (SE = 0.023)	1.3% (SE = 0.009)
2001-2002	28.0% (SE = 0.071)	22.9% (SE = 0.067)	12.7% (SE = 0.053)	0

Raptor Migration Phenology

- Christmas Bird Count (CBC) data downloaded from the National Audubon Society (conducted between 14 December and 5 January each year)
- Downloaded data for the years 1985-2001
- Downloaded data for a 14 state region
- Downloaded data for 181 locations
  - Ranging from 120 in 1985 to 177 in 1998
  - 176 in 2000
  - 173 in 2001
- Data downloaded for 4 species of migratory raptors
  - Sharp-shinned hawks
  - Cooper’s hawks
  - Northern harriers
  - Red-tailed hawks

Raptor Migration Phenology

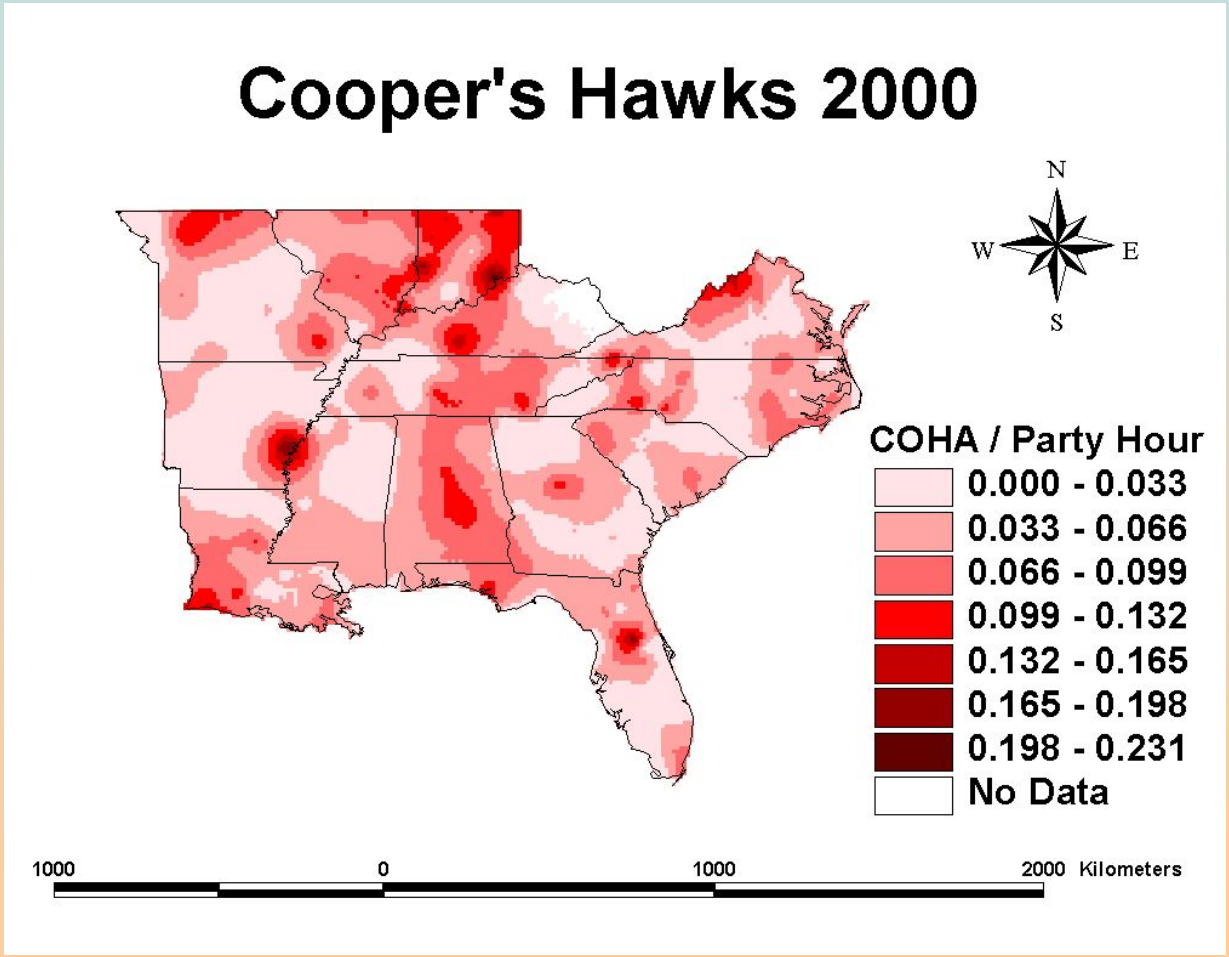


Raptor Migration Phenology

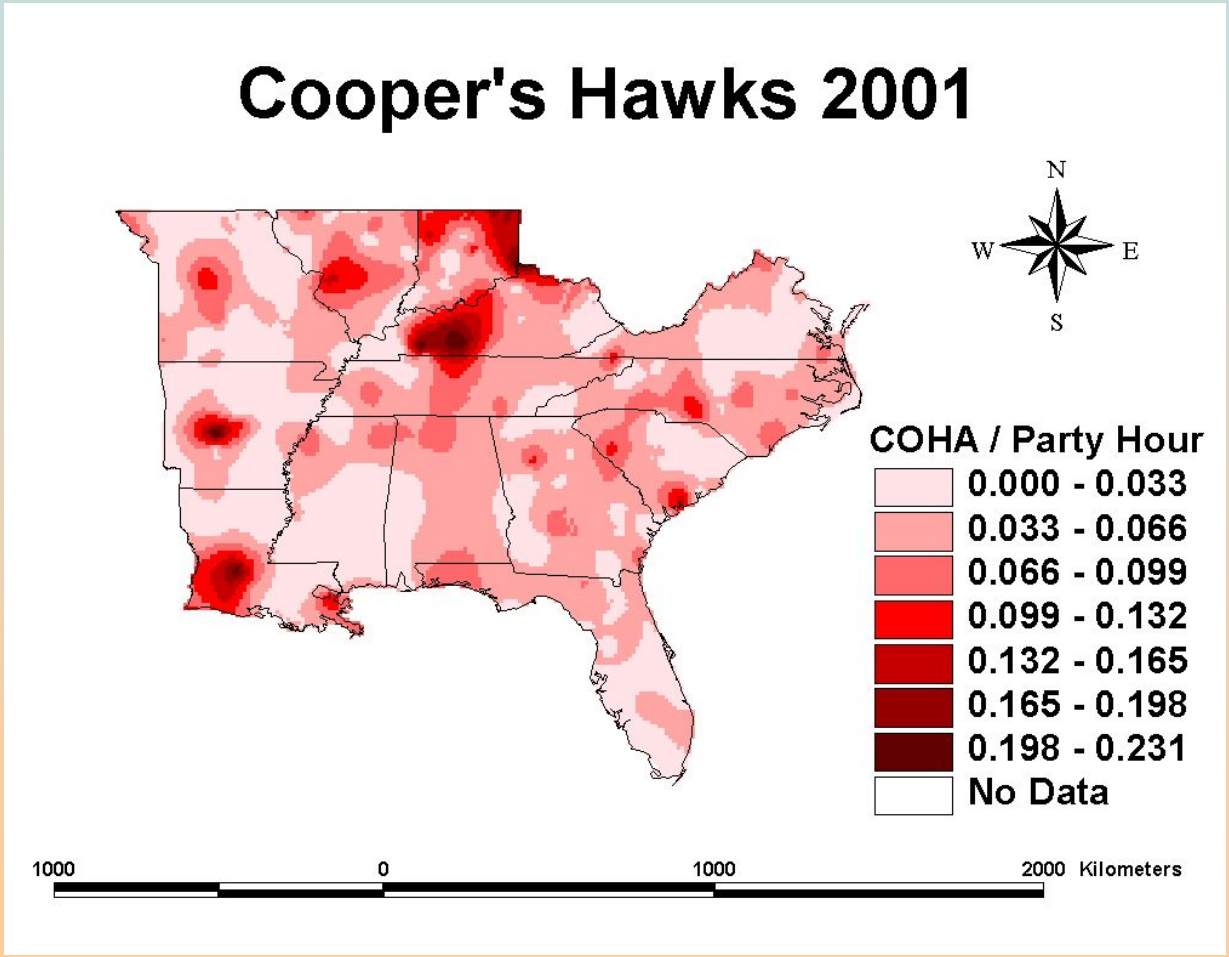
Kriging

- Interpolation procedure that uses a set of points with z values to generate an estimated surface that incorporates spatial structure
- Universal kriging allows for trends in the spatial data
- Kriged surfaces developed with a cell size of 0.1^2 decimal degrees (~ 10424 ha)

Raptor Migration Phenology



Raptor Migration Phenology



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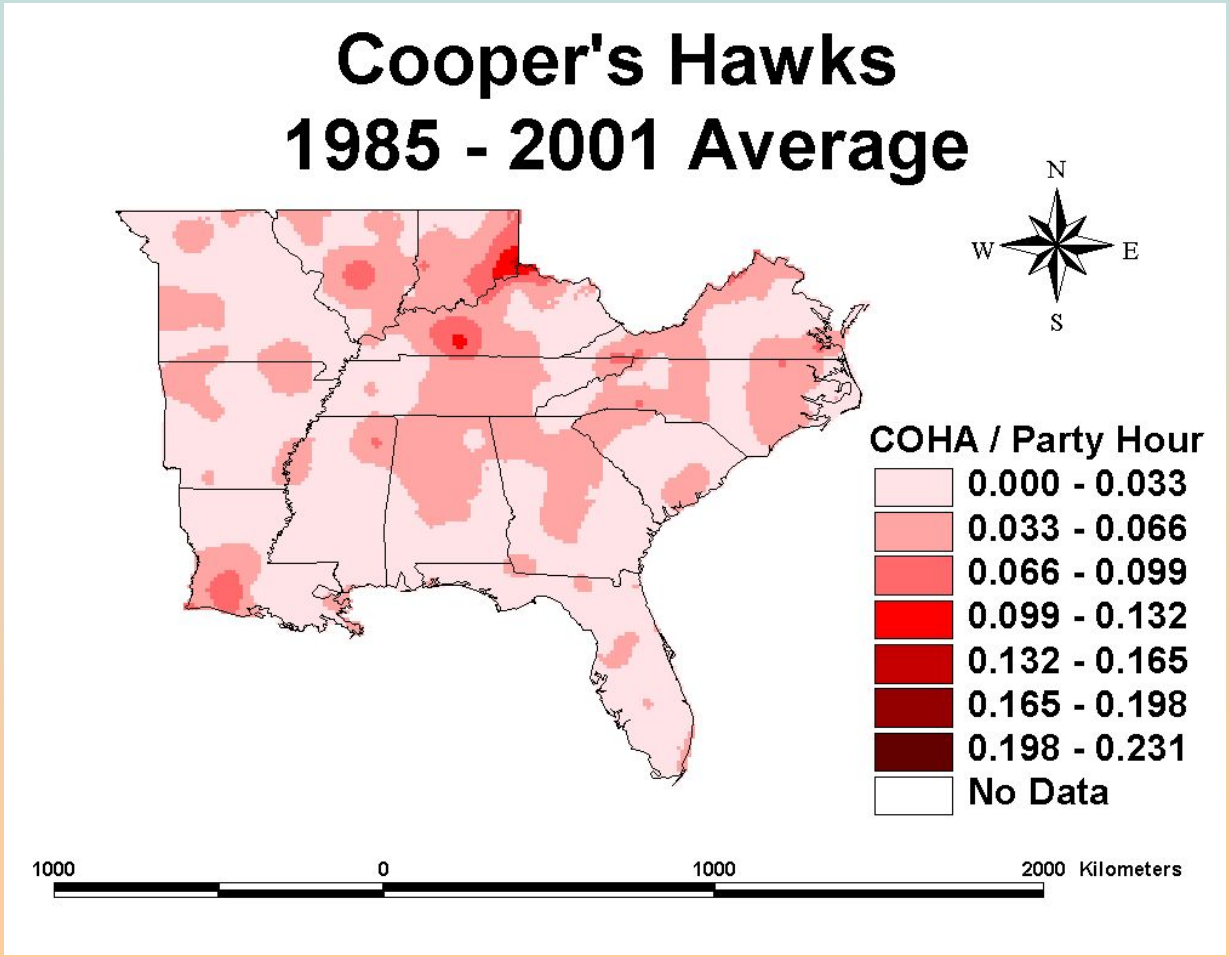

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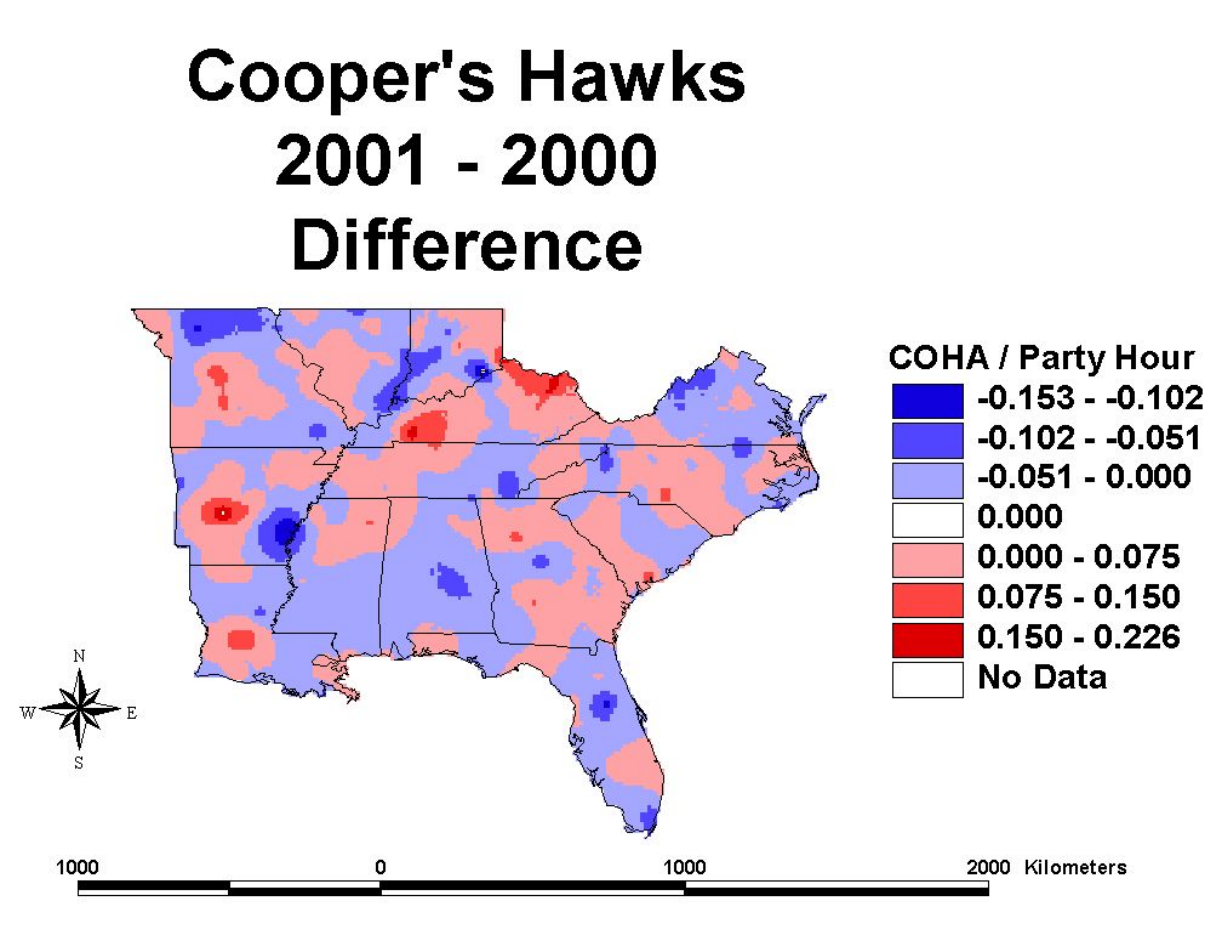

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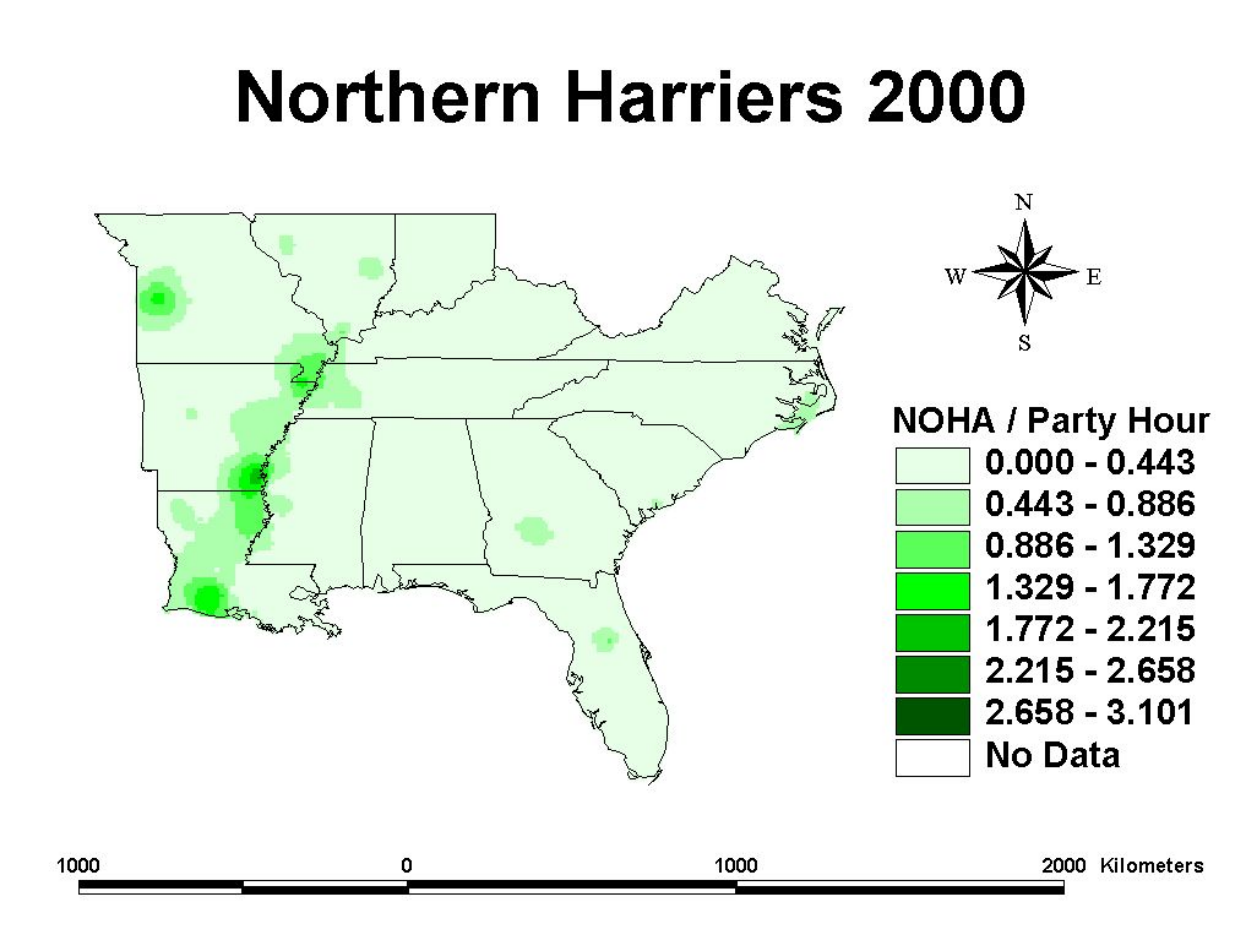

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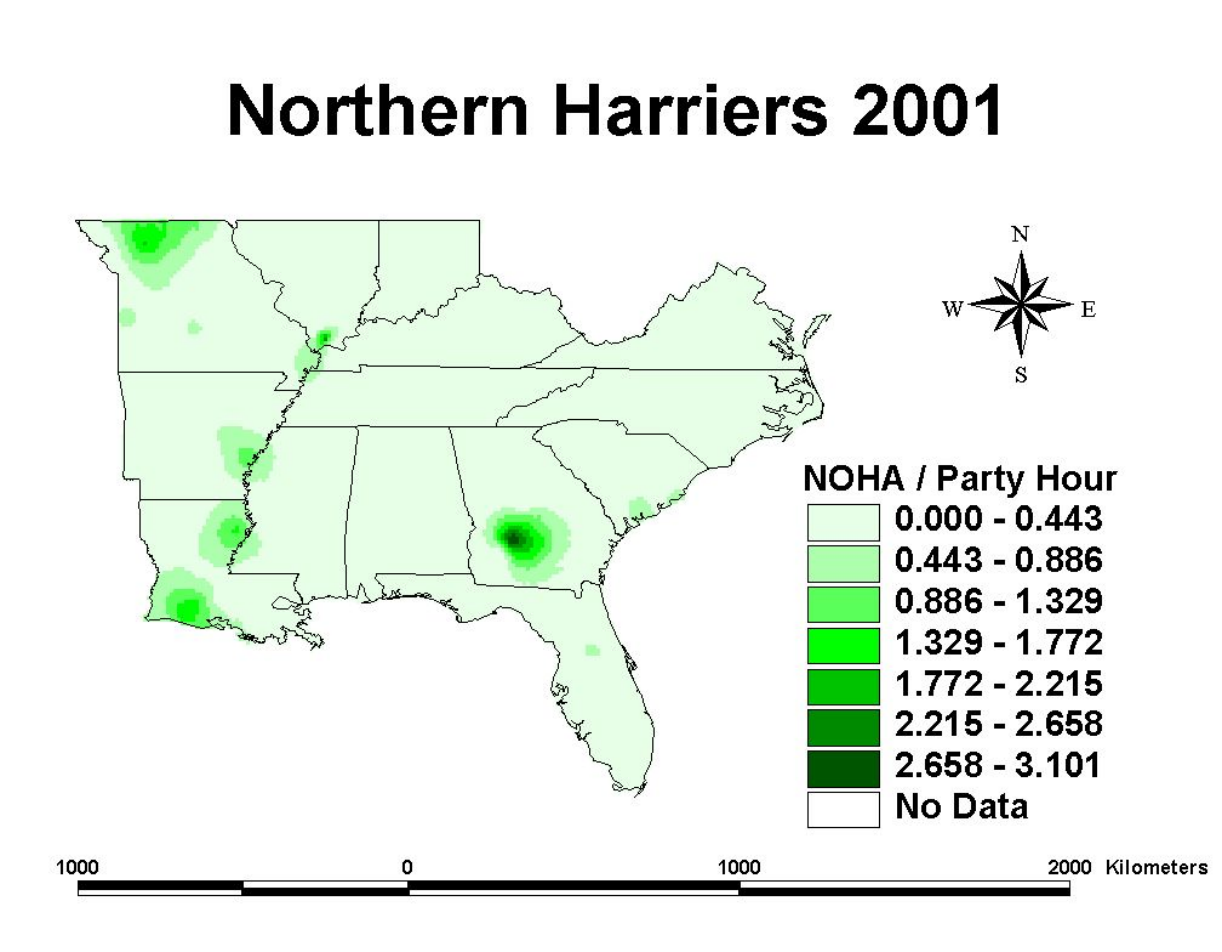

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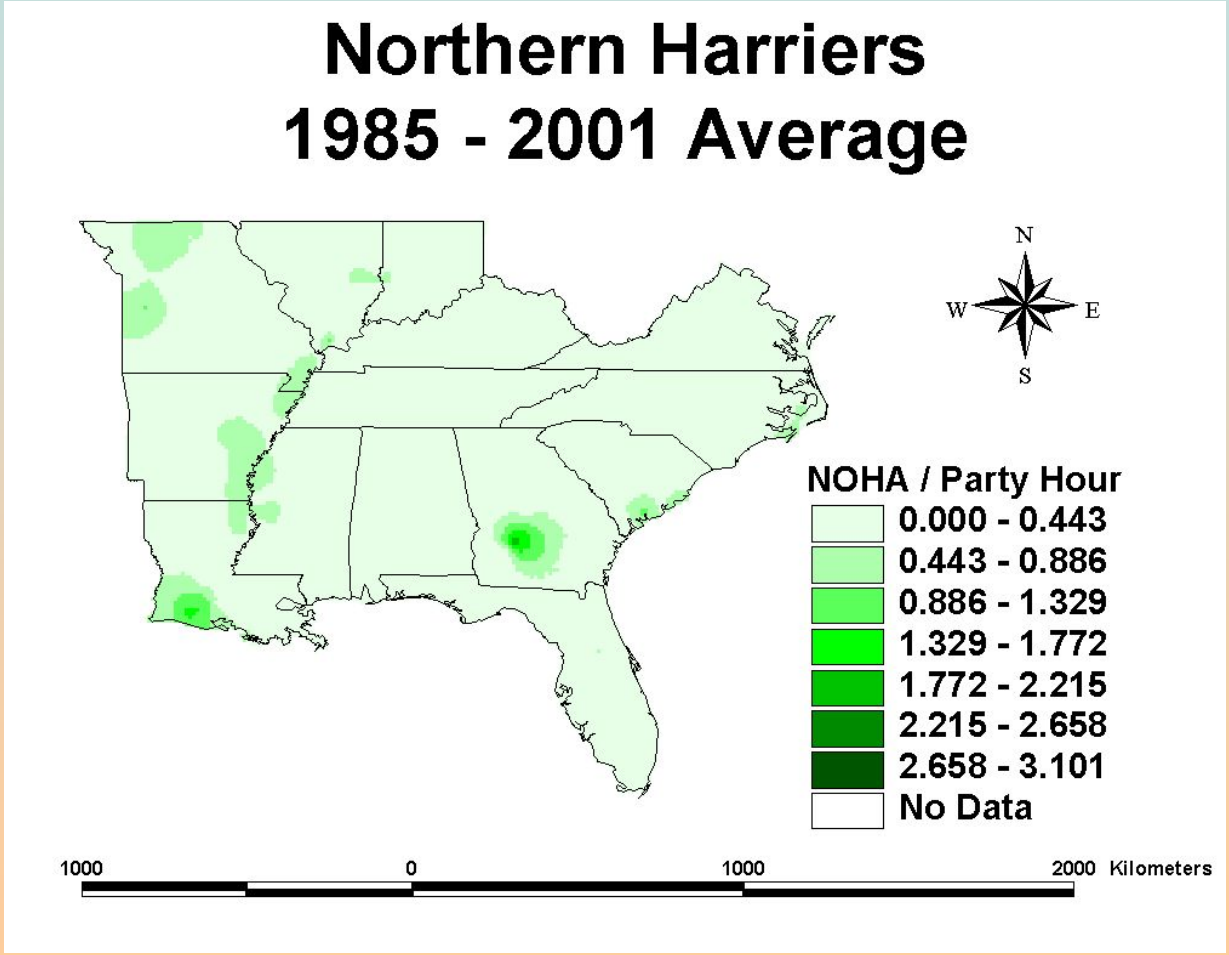

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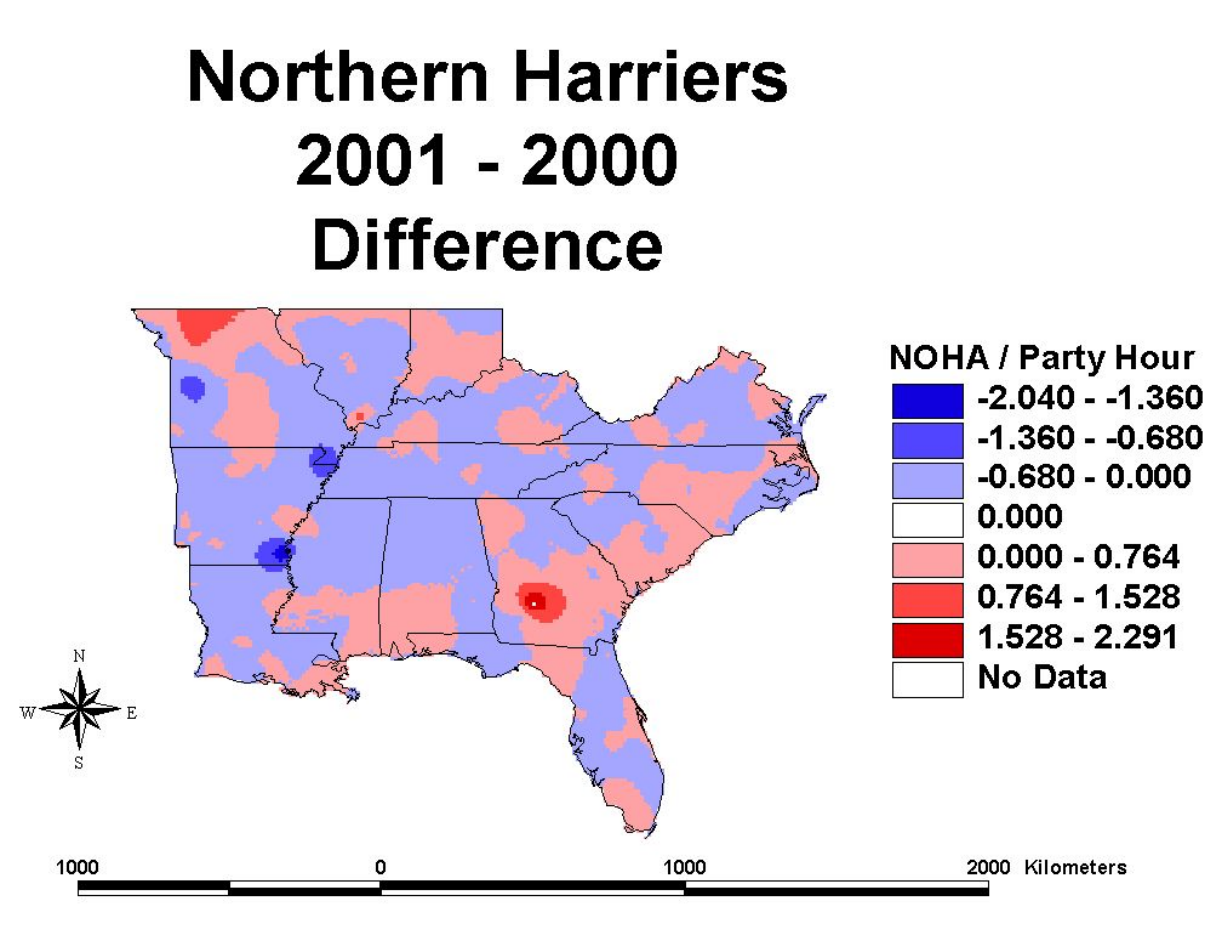

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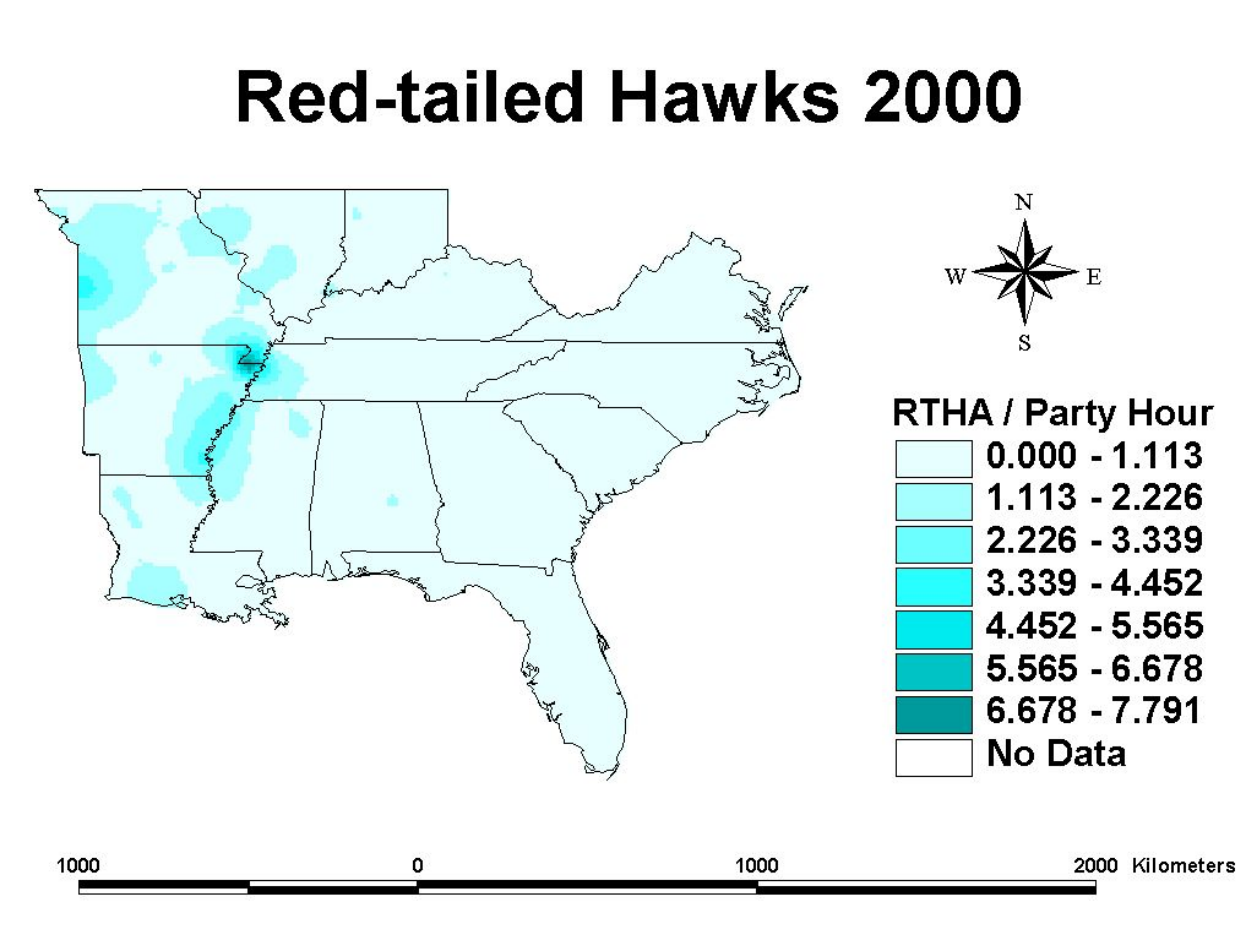

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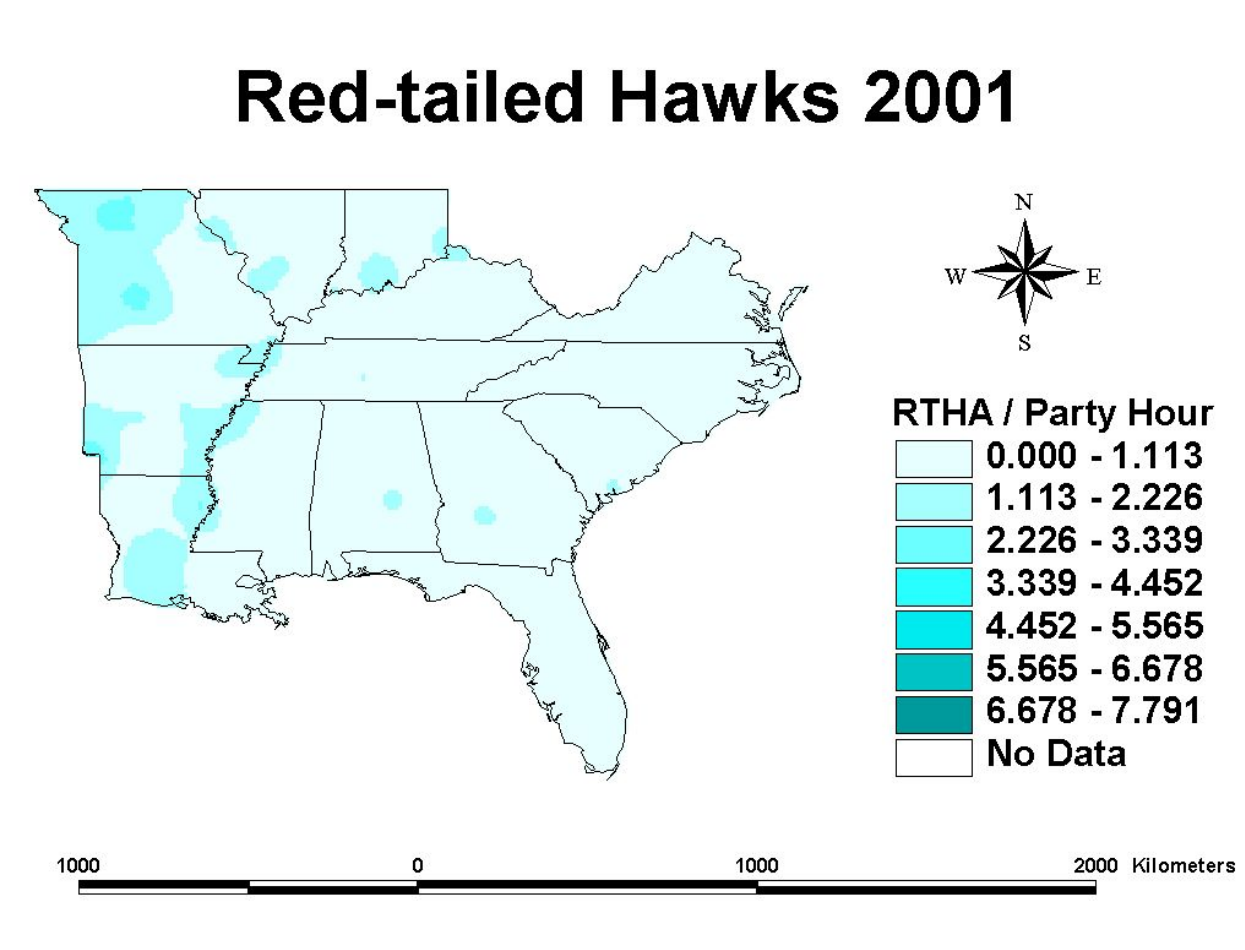

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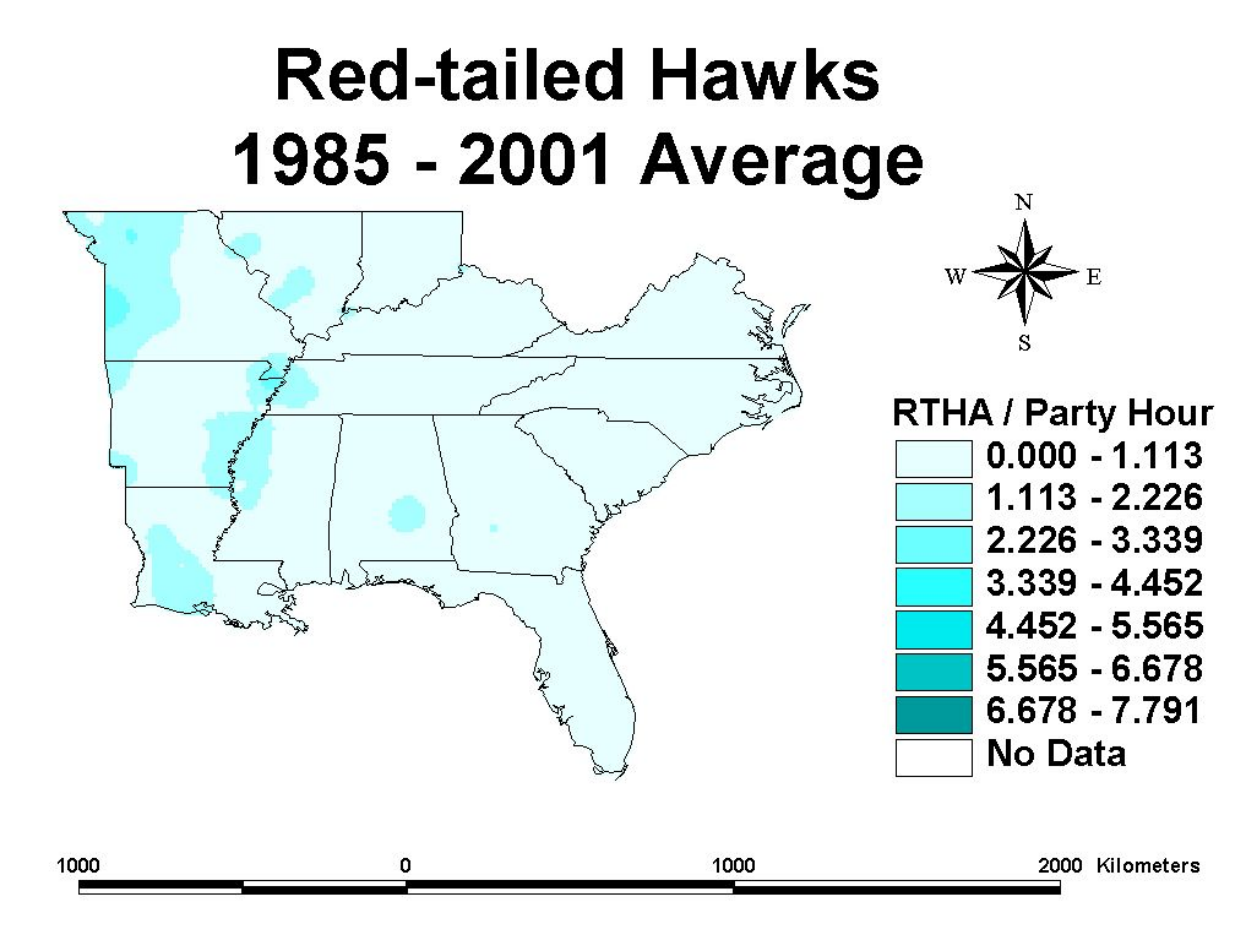

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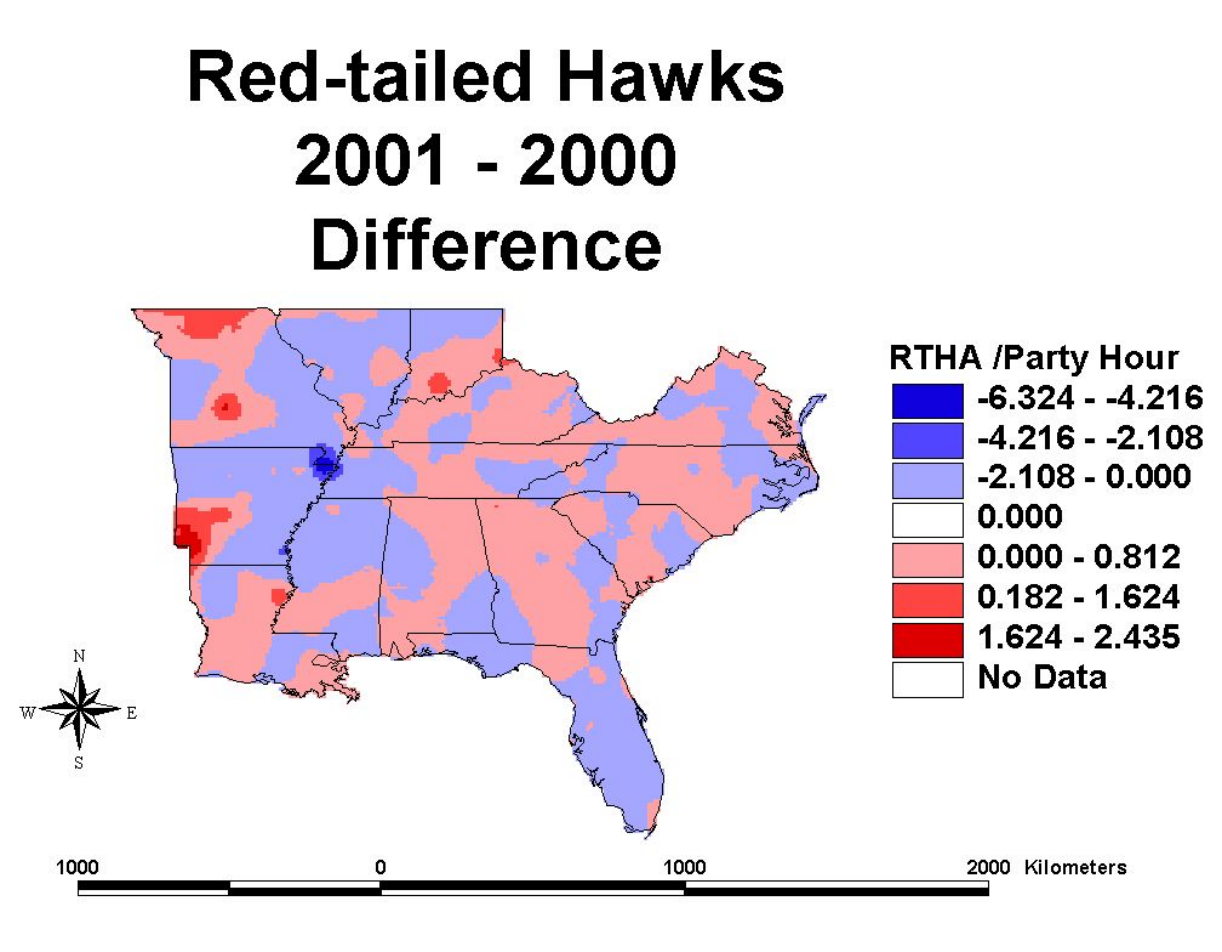

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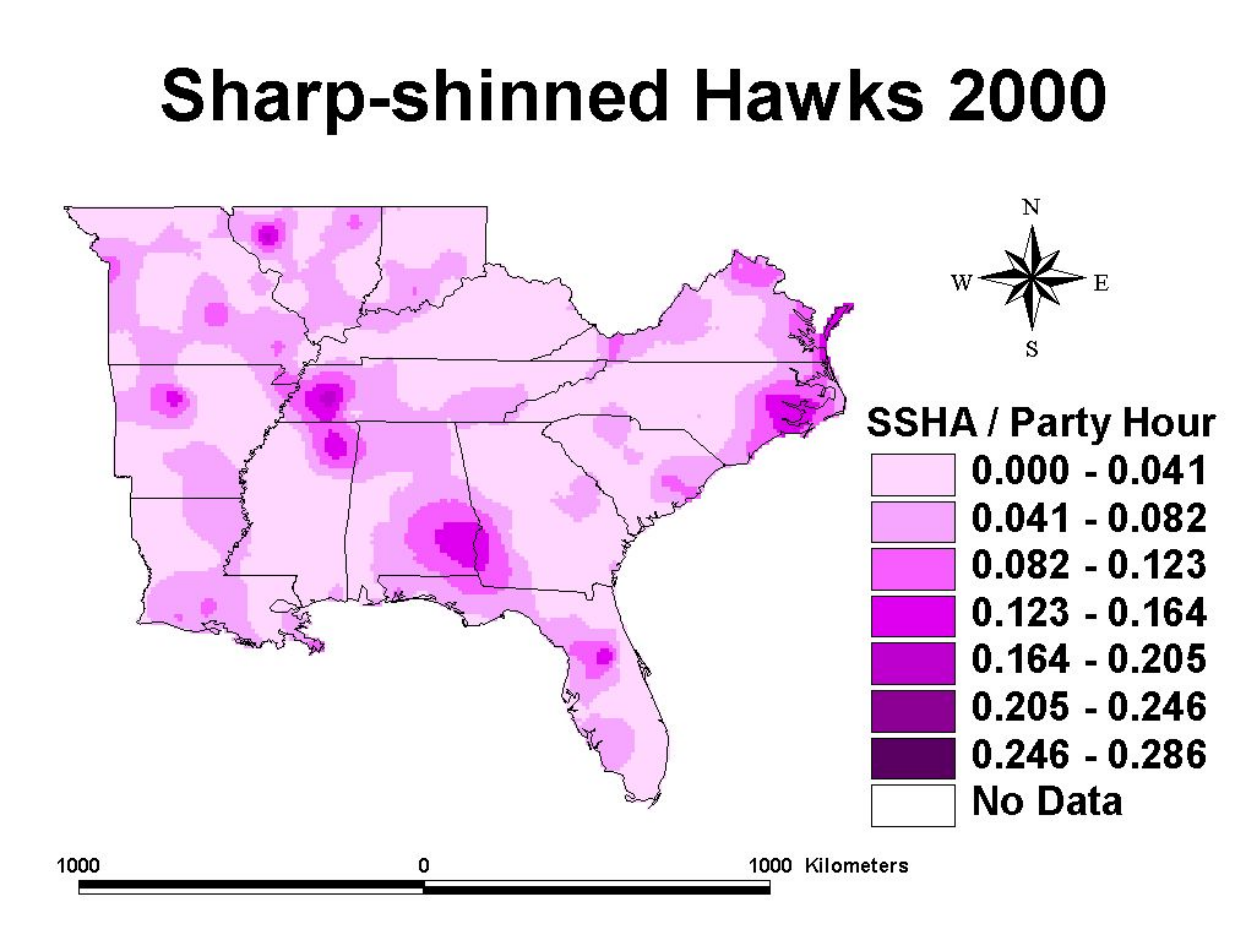

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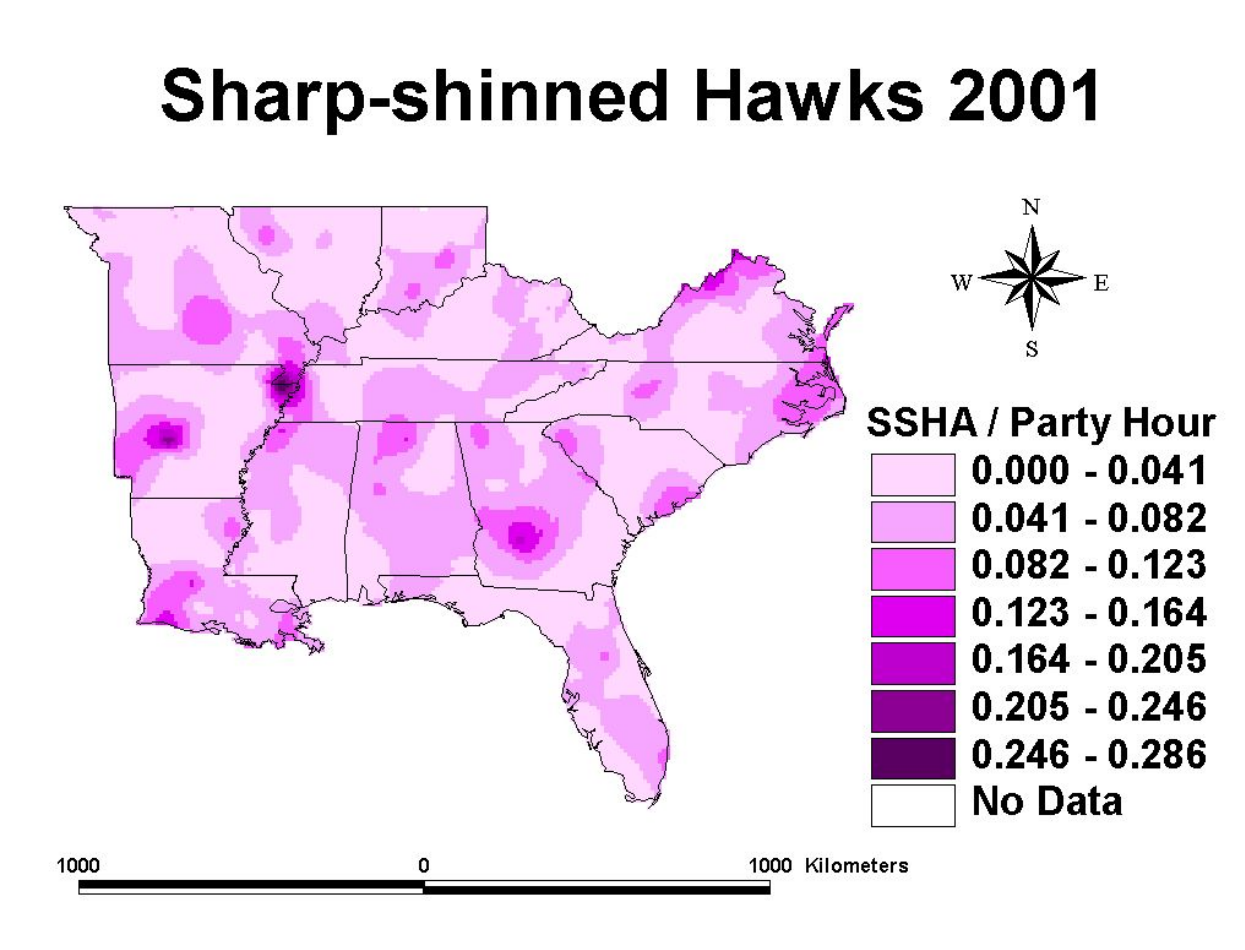

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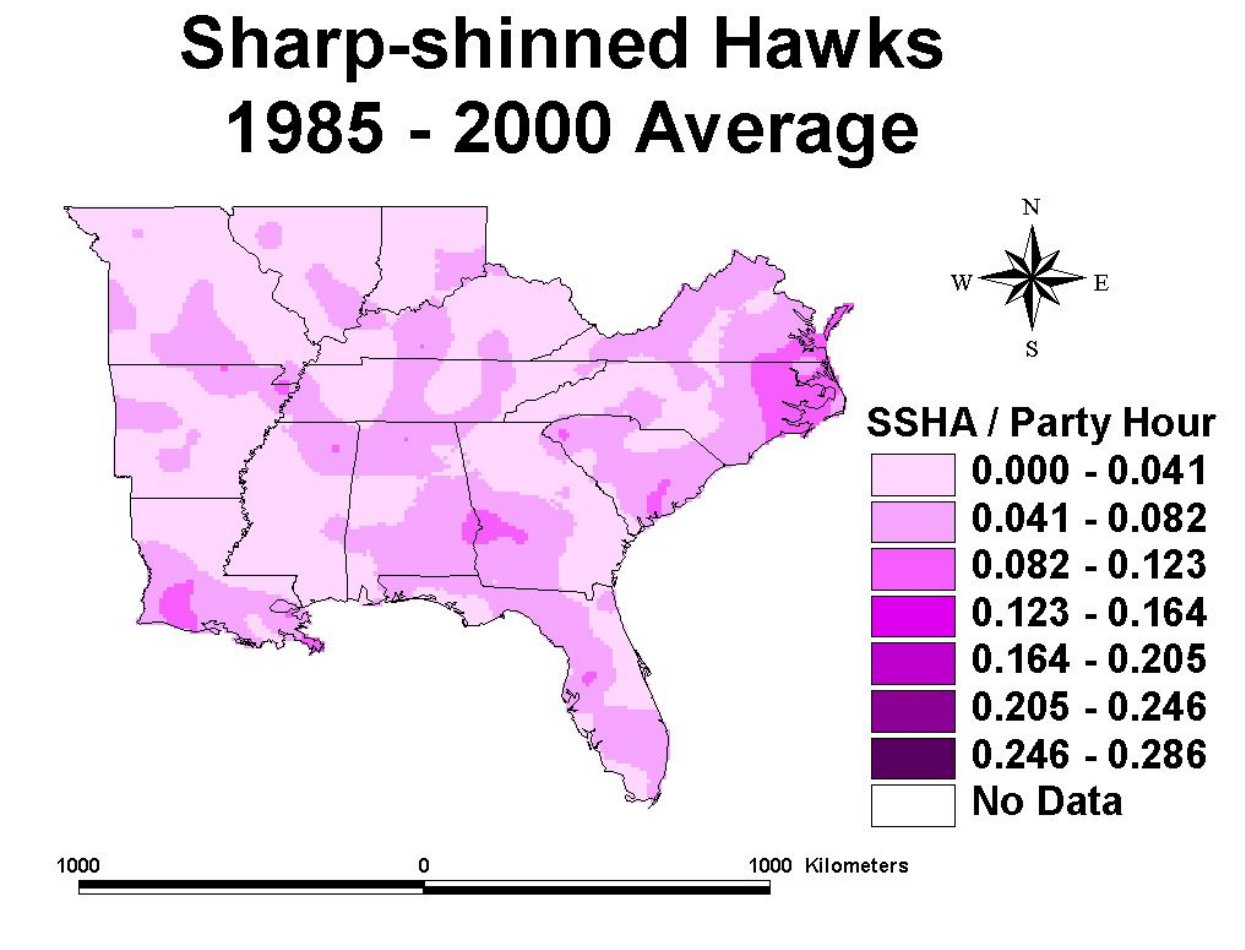

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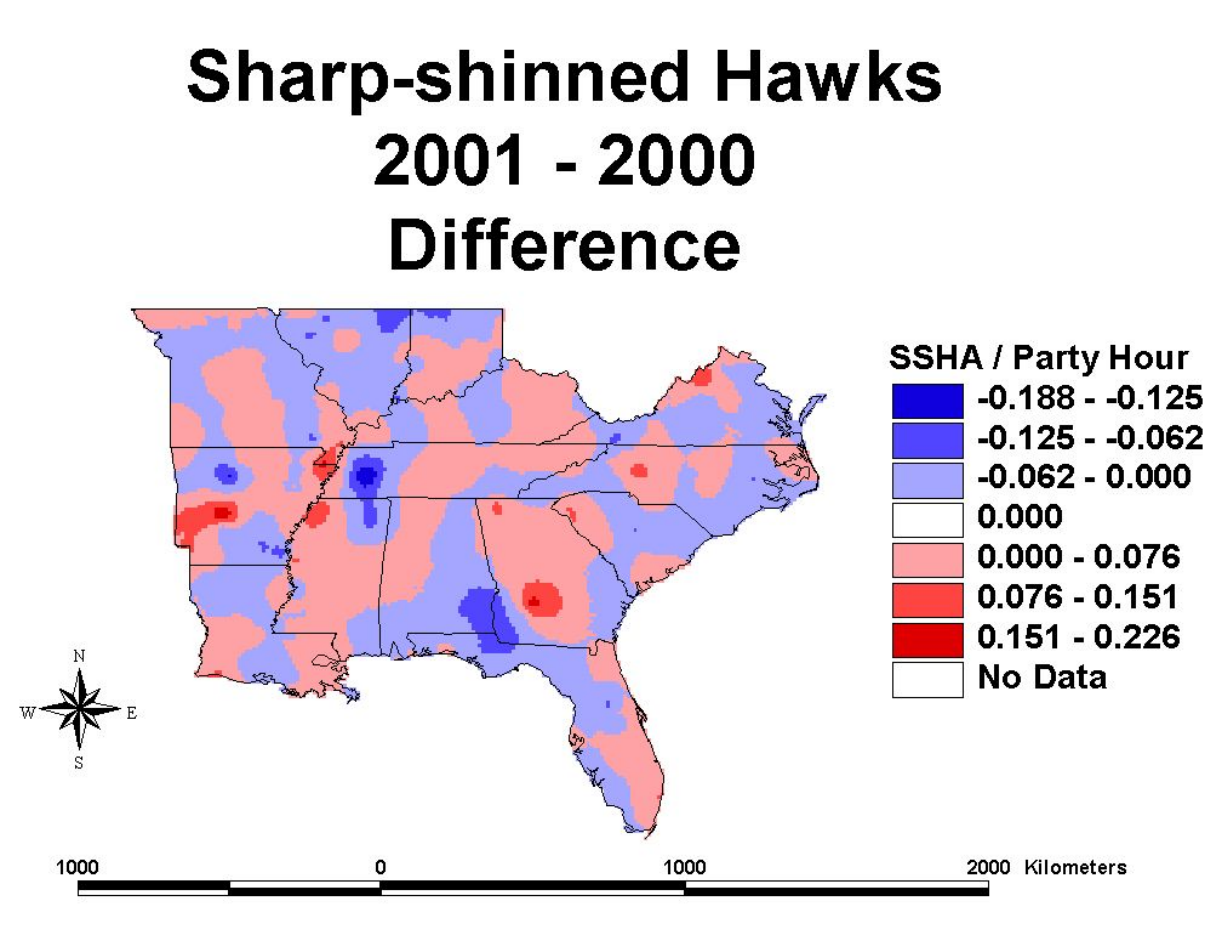
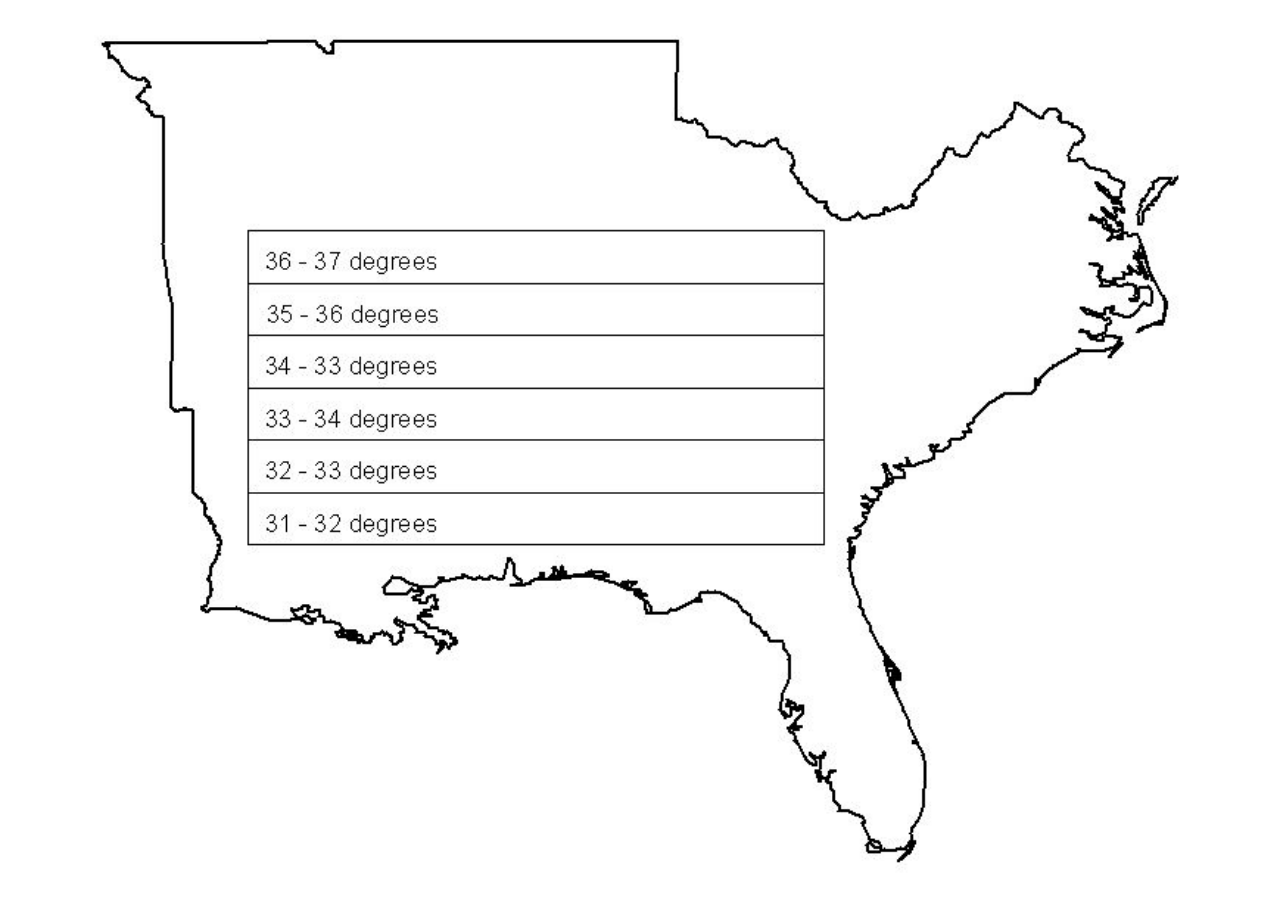


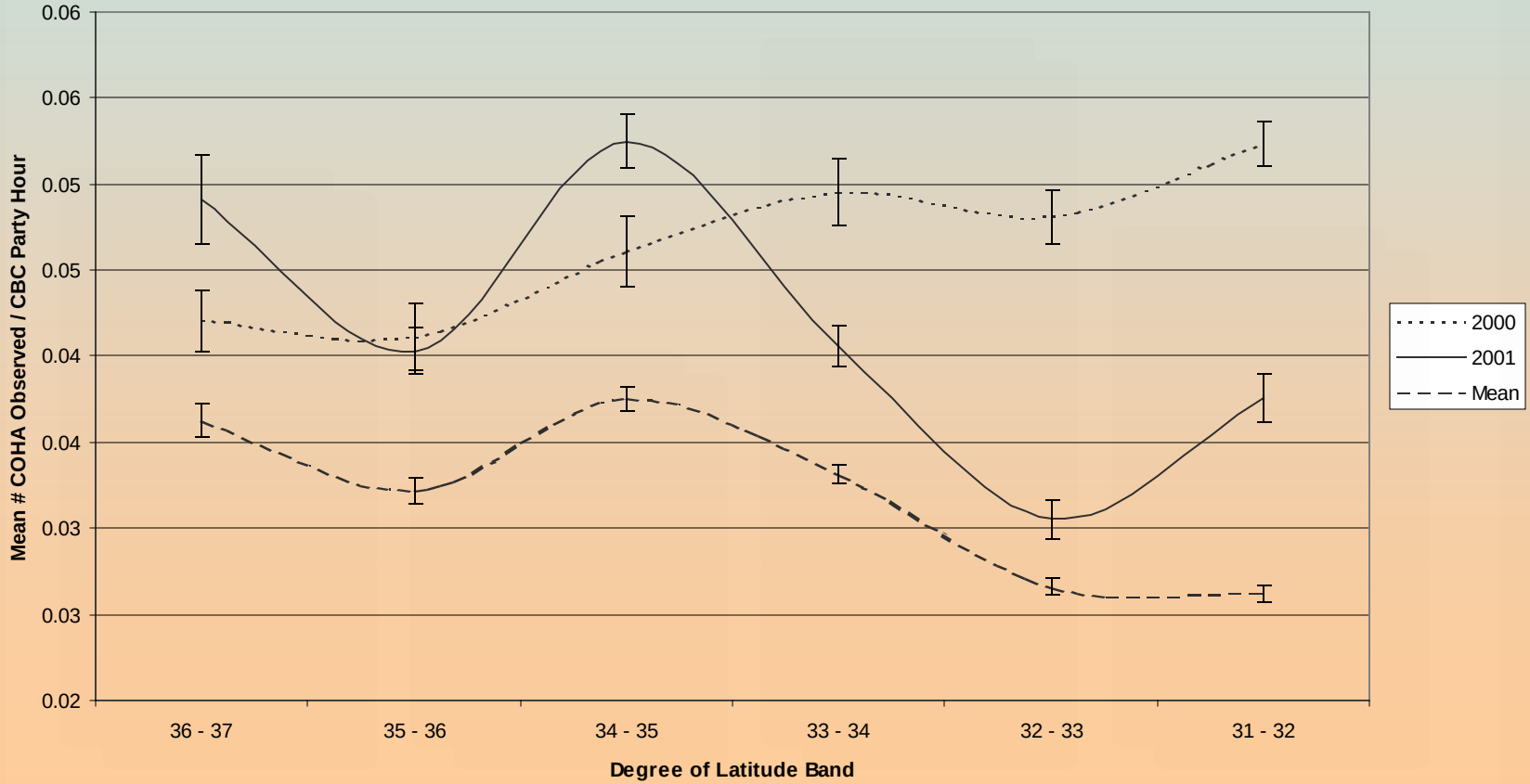
Raptor Migration Phenology

Year-specific spatial patterns of relative raptor abundance



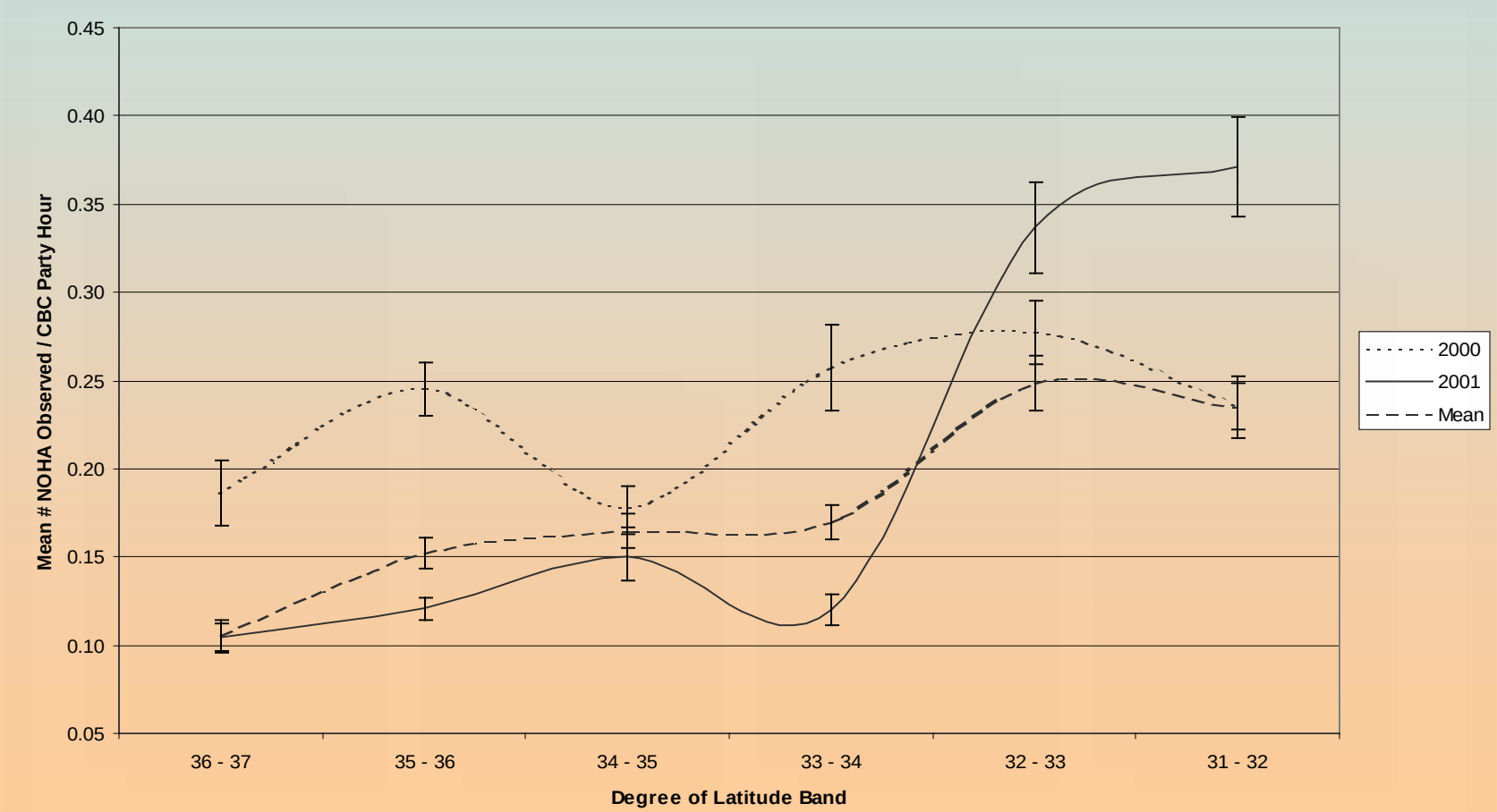
Raptor Migration Phenology

Mean relative abundance of Cooper's hawks



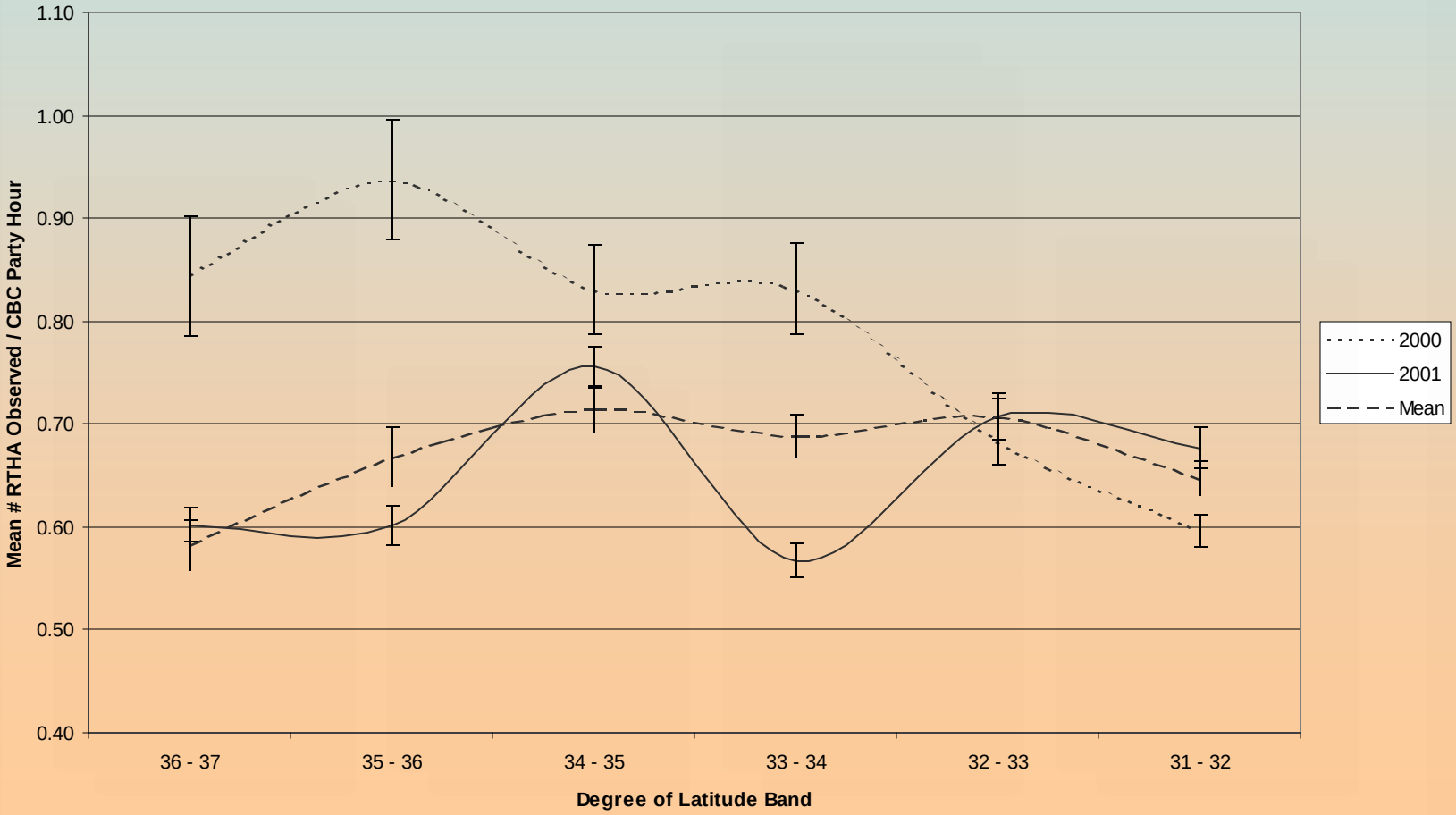
Raptor Migration Phenology

Mean relative abundance of northern harriers



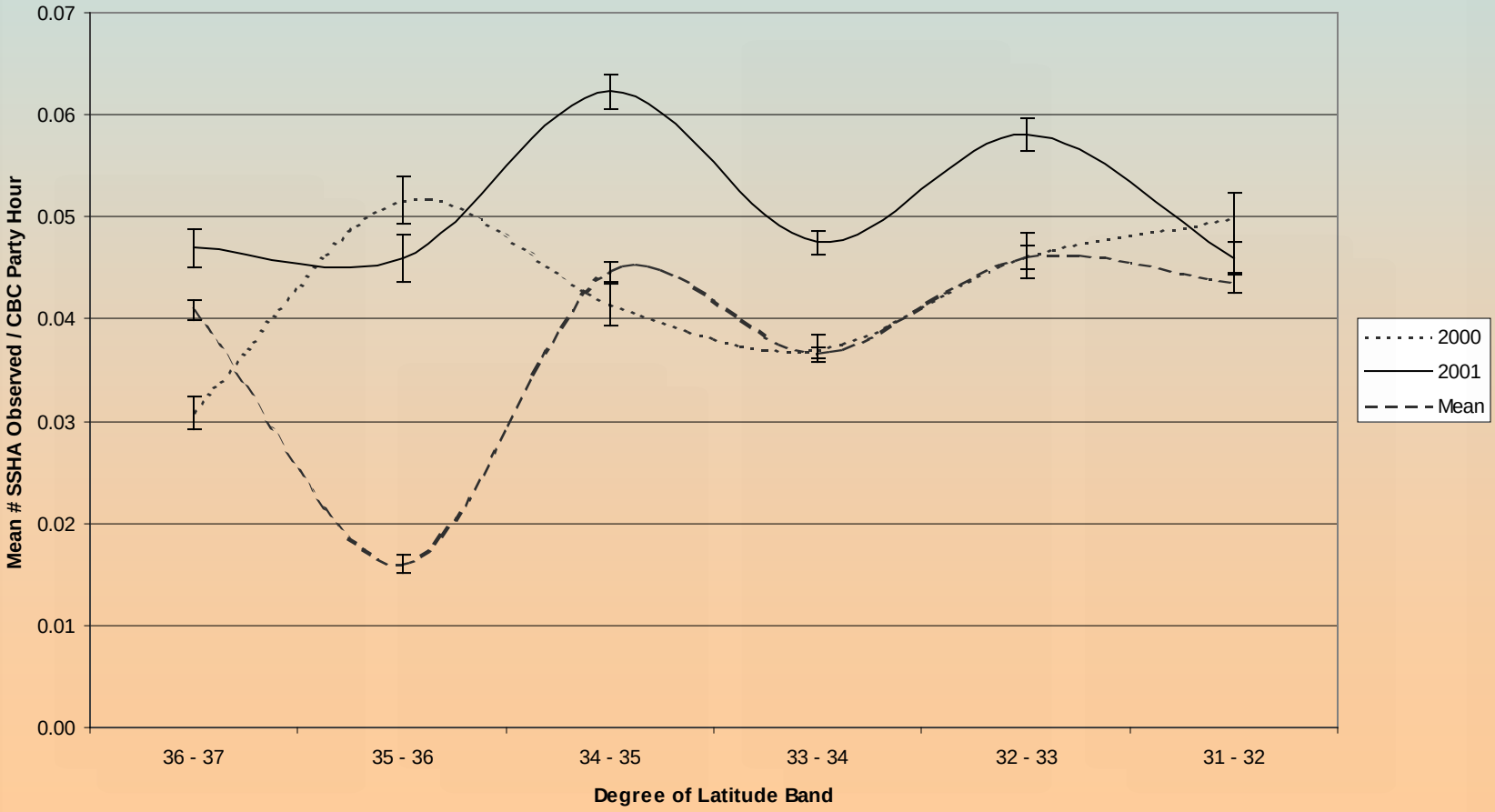
Raptor Migration Phenology

Mean relative abundance of red-tailed hawks



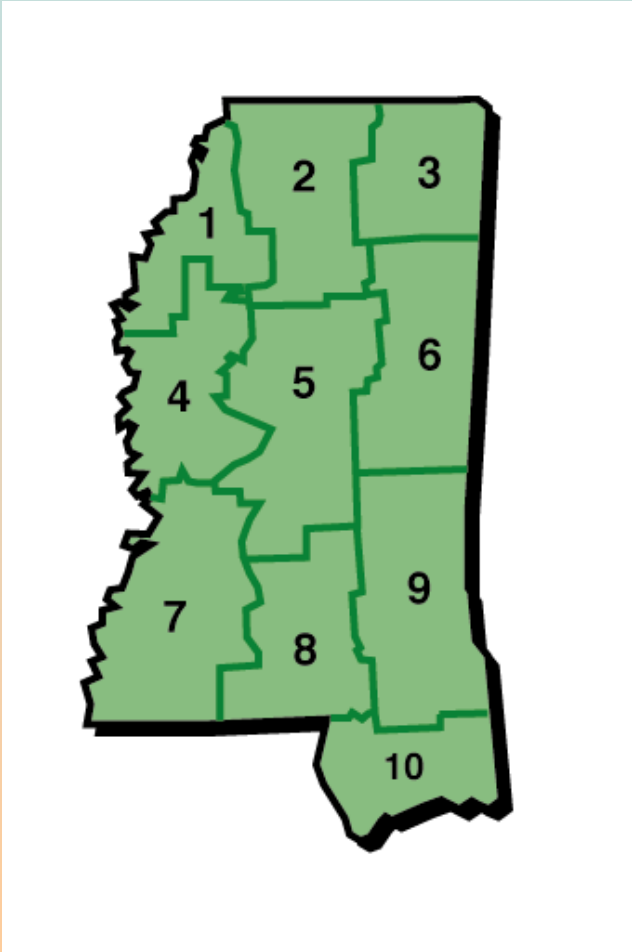
Raptor Migration Phenology

Mean relative abundance of sharp-shinned hawks



Growing Season Precipitation and Over-winter Temperature

- Long-term weather data for Mississippi Division 6
- Data from Jan. 1895 – May 2002
- Data collected for mean monthly precipitation, Modified Palmer Drought Severity Index, and mean monthly temperature



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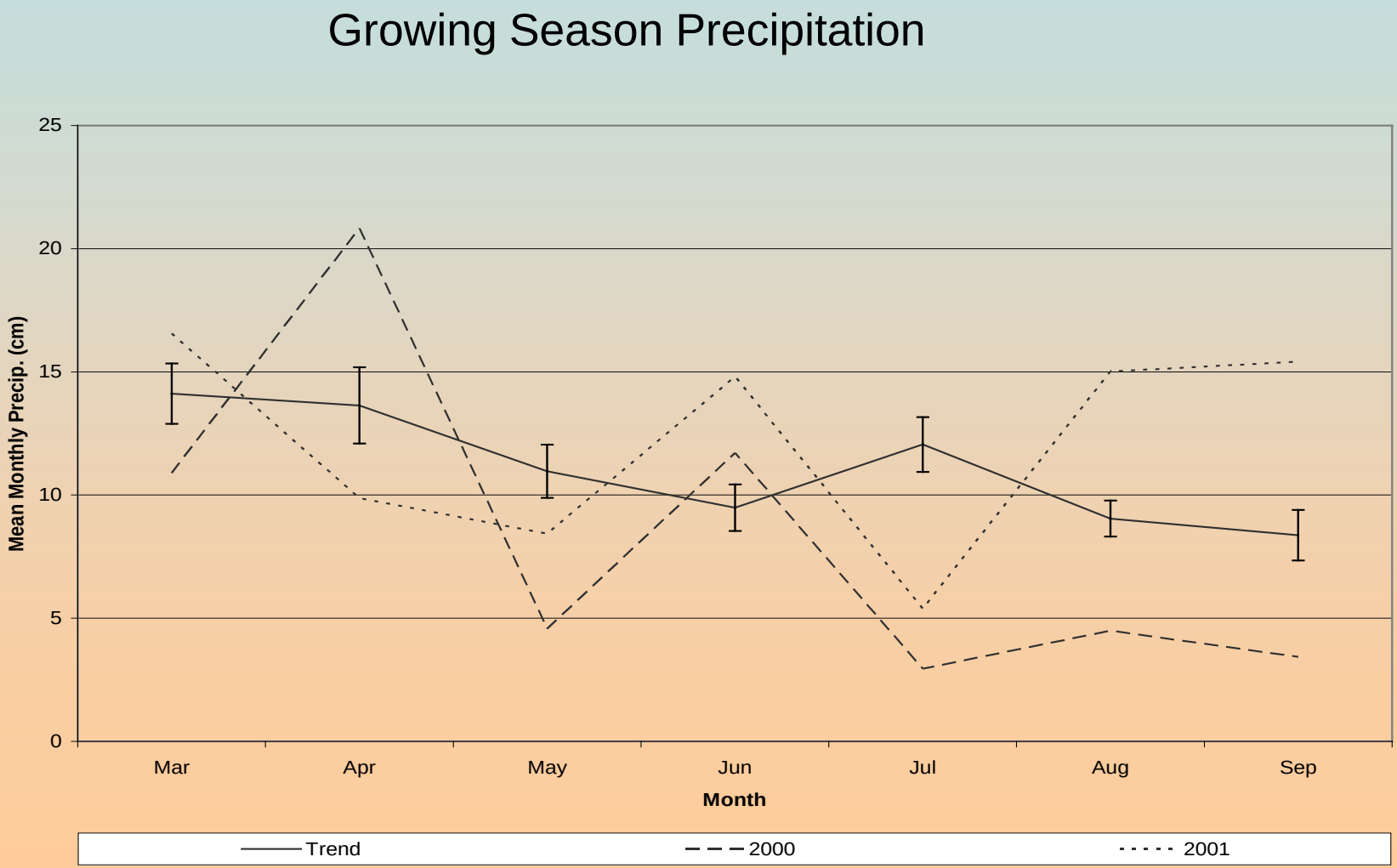


Growing Season Precipitation and Over Winter Temperature

Modified Palmer Drought Severity Index

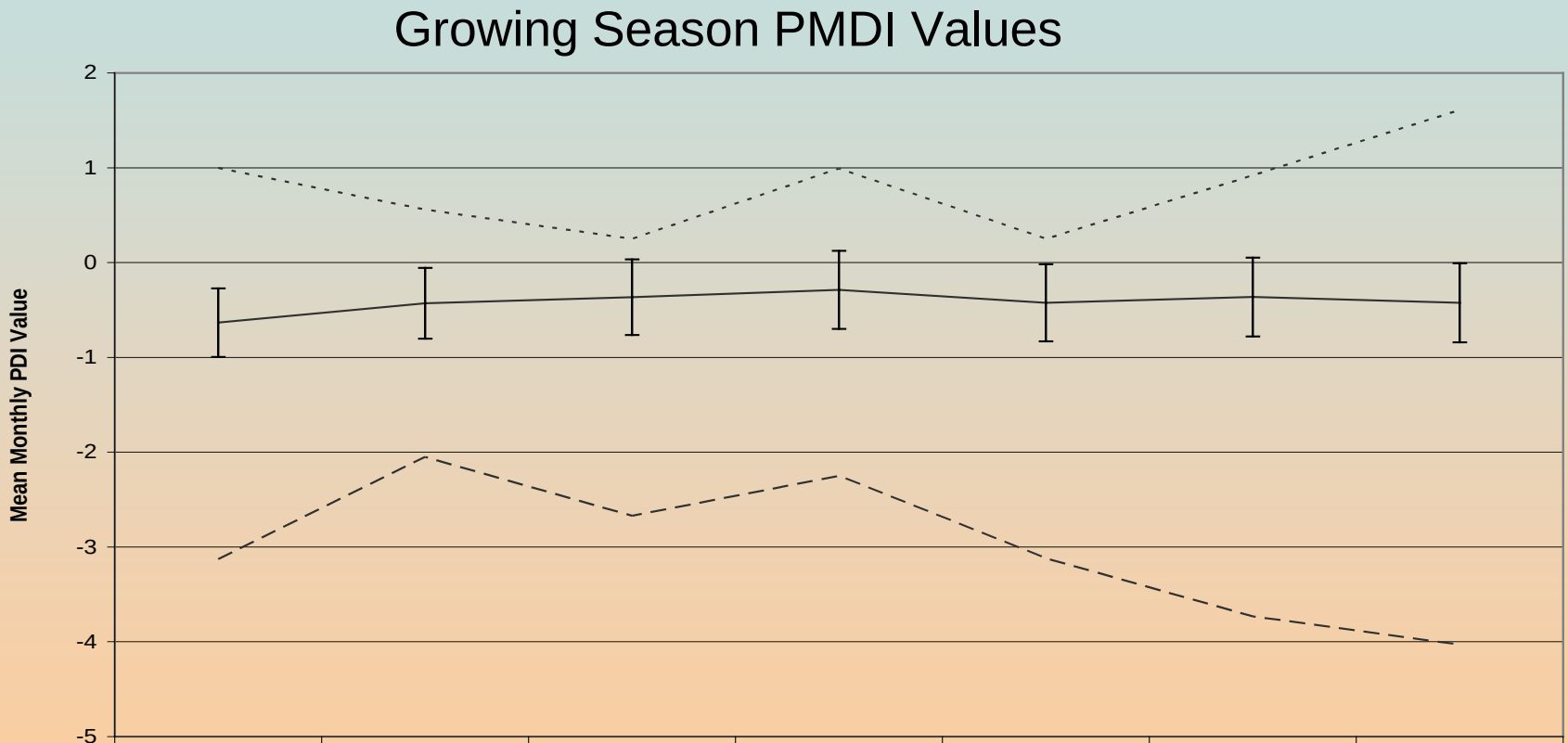
(PMDI)

- Calculated using precipitation, temperature, Thornwaite's evapotranspiration index, runoff, soil recharge, and average regional weather conditions

- Values range from > 4 (extreme moisture) to < -4 (extreme dryness)

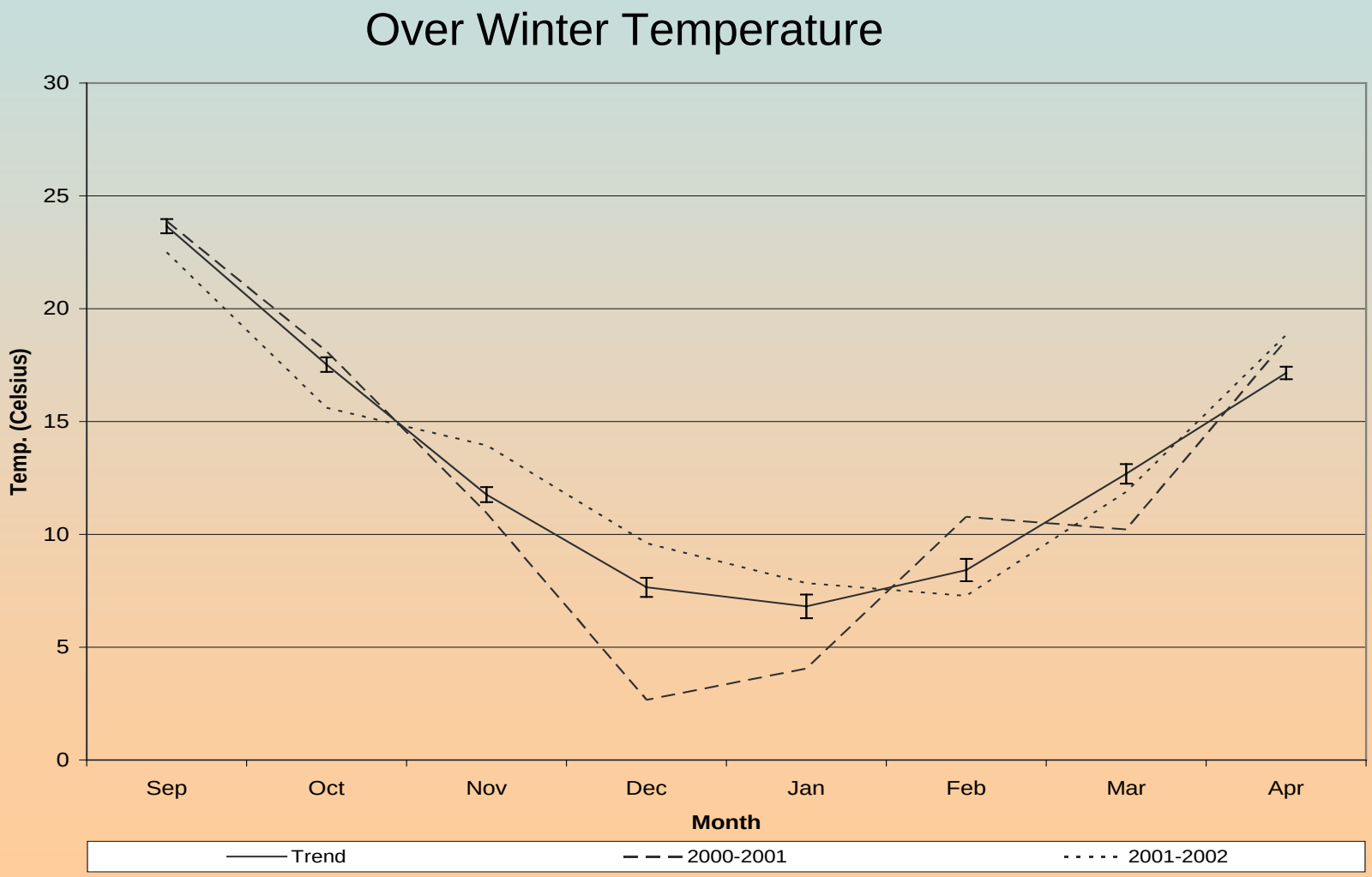
- Normal values range from 1.5 to -1.5

Growing Season Precipitation and Over Winter Temperature



	Mar	Apr	May	Jun	Jul	Aug	Sep
Trend	-0.6339	-0.4295	-0.3652	-0.2879	-0.4240	-0.3630	-0.4243
2000	-3.13	-2.05	-2.67	-2.25	-3.12	-3.73	-4.03
2001	1.00	0.56	0.25	0.99	0.25	0.92	1.61

Growing Season Precipitation and Over Winter Temperature



Growing Season Vegetation Structure

- Vegetative data collected at nest and brood locations during nesting seasons of 2000 and 2001
- Used to index vegetation conditions going into winter season
  - % grass canopy
  - % forb canopy
  - Visual obstruction index
- Compared using General Linear Models Procedure in SAS
  - Vegetation characteristics as dependent variables
  - Year and type (brood and nest) as fixed effects
- Grass structure was sparser at brood sites ($F_{1,245} = 6.00$, $P = 0.015$) in 2000 (13.09%) vs. 2001 (42.39%)

Conclusions

2000-2001 vs. 2001-2002

- Increased mortality
- Most attributed to avian predation
- Colder winter temperatures coupled with decreased growing season precipitation
- Sparser vegetative ground cover
- Higher relative abundance of wintering migratory raptors

Problems

- Low sample size
  - 1 site
  - 2 years

- Confounding effects of vegetative cover and relative raptor abundance
  - this study
    - “bad” growing season, high relative abundance of raptors
    - “good“ growing season, low relative abundance of raptors

What happens when we have “good” growing season with high relative abundance of raptors or “bad” growing season low relative abundance of raptors?

Problems

- No independent local raptor surveys to validate migration phenology

  Additional data is needed to validate estimates of raptor migration and to answer questions with respect to habitat vs. predation as driving factors of over-winter northern bobwhite survival.

Acknowledgements

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MISSISSIPPI STATE UNIVERSITY
College of Forest Resources

Questions ?