
PREDICTING VISITATION FOR PROTECTED AREAS THROUGH GEOSPATIAL ANALYSIS

AN ANALYSIS OF THE HUFF MODEL

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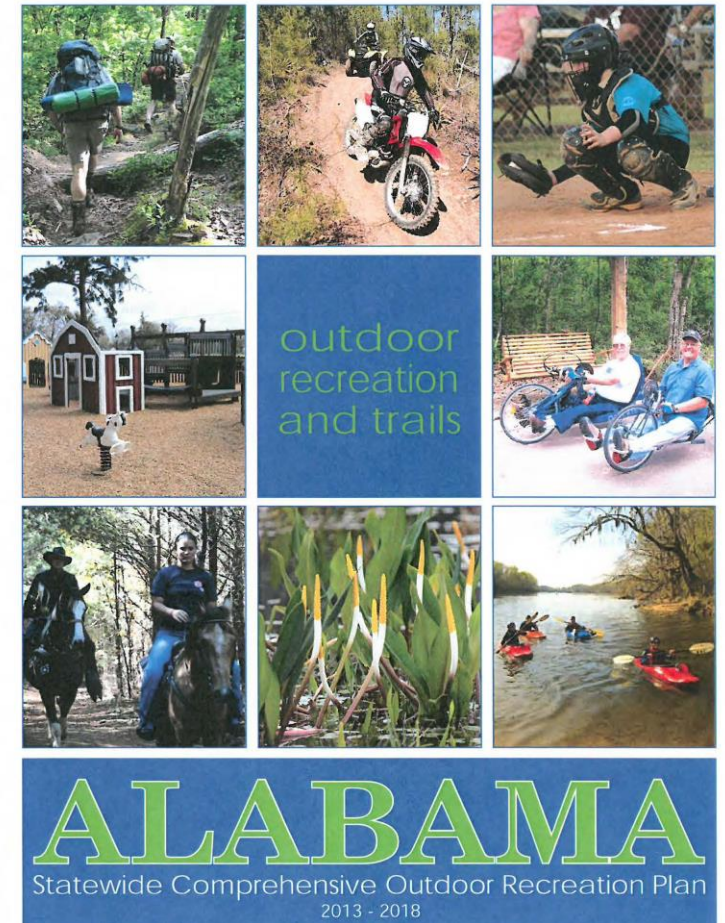
PREDICTING VISITATION RATES AND DEMAND

- Why?
- Provide information to land management agencies
 - To guide current management plans
 - To plan for future management
- Justify funding requests
- Defend decision making
- Understand demand for specific park attributes, amenities, or services



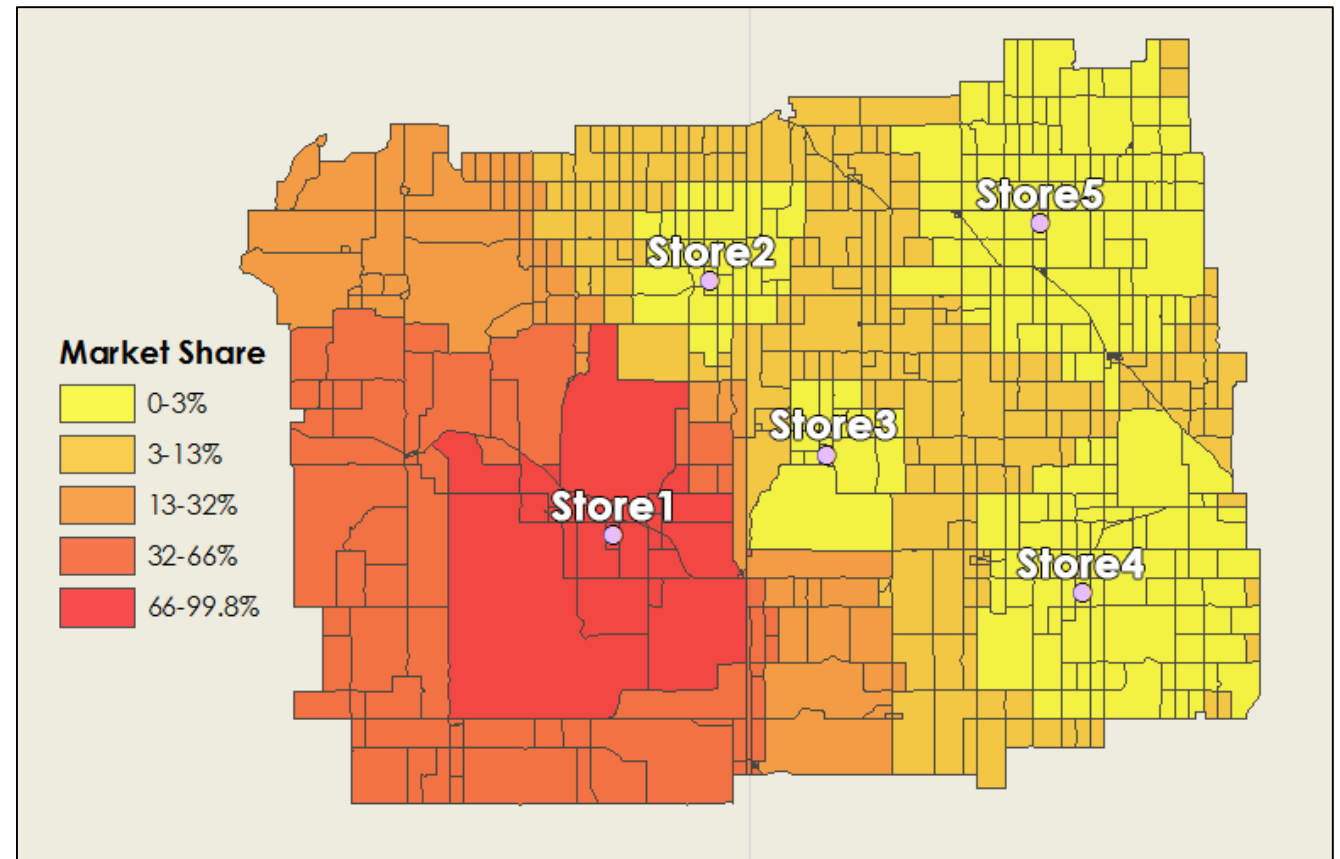
METHODS FOR ASSESSING DEMAND

- Surveys
 - National
 - National Survey on Recreation and the Environment (NSRE) is a comprehensive nationwide recreation survey dating back to 1960s; activity preference, demographics, environmental attitudes, constraints
 - National Visitor Use Monitoring Program (NVUM) estimates visitation to National Forests and Grasslands and produces descriptive information about visits; length of trip, expenditures, activity participation
 - State
 - Statewide Comprehensive Outdoor Recreation Plan (SCORP) measures statewide demand for public outdoor recreation resources
 - Local
 - Individual site studies on a particular park, lake, or other management area to produce descriptive information about visits
- What about methods that don't involve surveys?



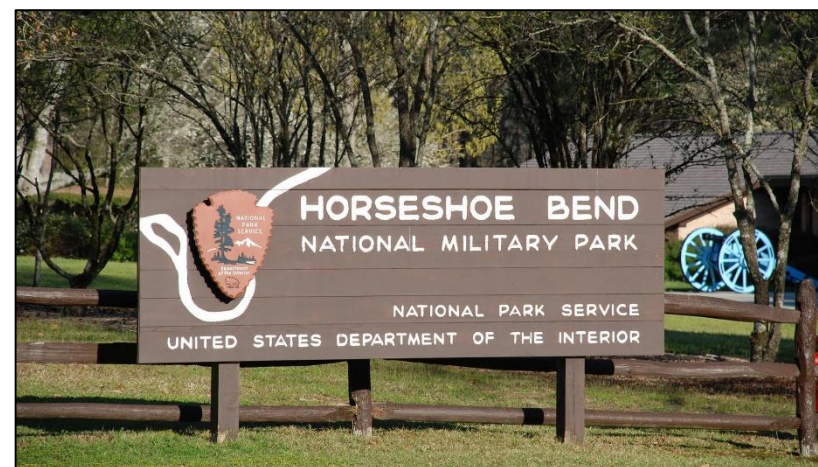
THE HUFF MODEL

- Developed in the 1960s
- Origins in consumer and retail market analysis
- Spatial model that calculates gravity-based probabilities of consumers in a given location patronizing a specific store
- Based on two variables:
 - 1.) Distance
 - 2.) Attractiveness
- Attractiveness is typically measured as the size of a location (square footage) or sales volume



THE HUFF MODEL IN OUTDOOR RECREATION

- Huff Model has been optimized to estimate demand for a variety of outdoor recreation interests
 - Ski industry in Washington state (Aiton and McLane, 2014)
 - National Battlefield and Military parks (Hanink and Stutts, 2002)
- Attractiveness measure must be altered: size alone is not representative
- Attractiveness can be the sum of standardized attributes or amenities that are important to consumers
- For the ski industry: # of lifts, # of runs, elevation change from peak to base, average snowfall, season length, night ski, dining options, and terrain park
- For battlefields: # of casualties, year of battle, and proximity to other battlefields



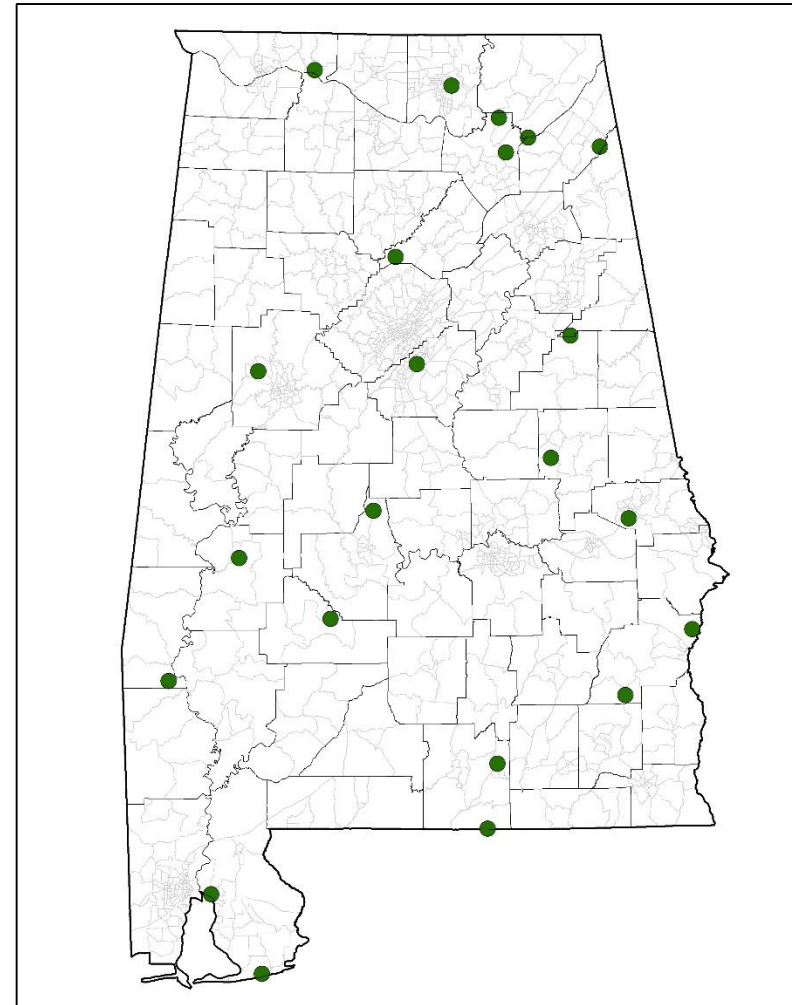
PREDICTING VISITATION FOR PUBLIC LANDS IN ALABAMA

- Using established Huff Model methods, we can estimate visitation patterns for outdoor recreation locations in Alabama
- Improves decision-making and planning for the Alabama Department of Conservation and Natural Resources (ADCNR)
 - State Parks*
 - Public Fishing Lakes
 - Wildlife Management Areas
 - Forever Wild tracts
 - Alabama Birding Trails



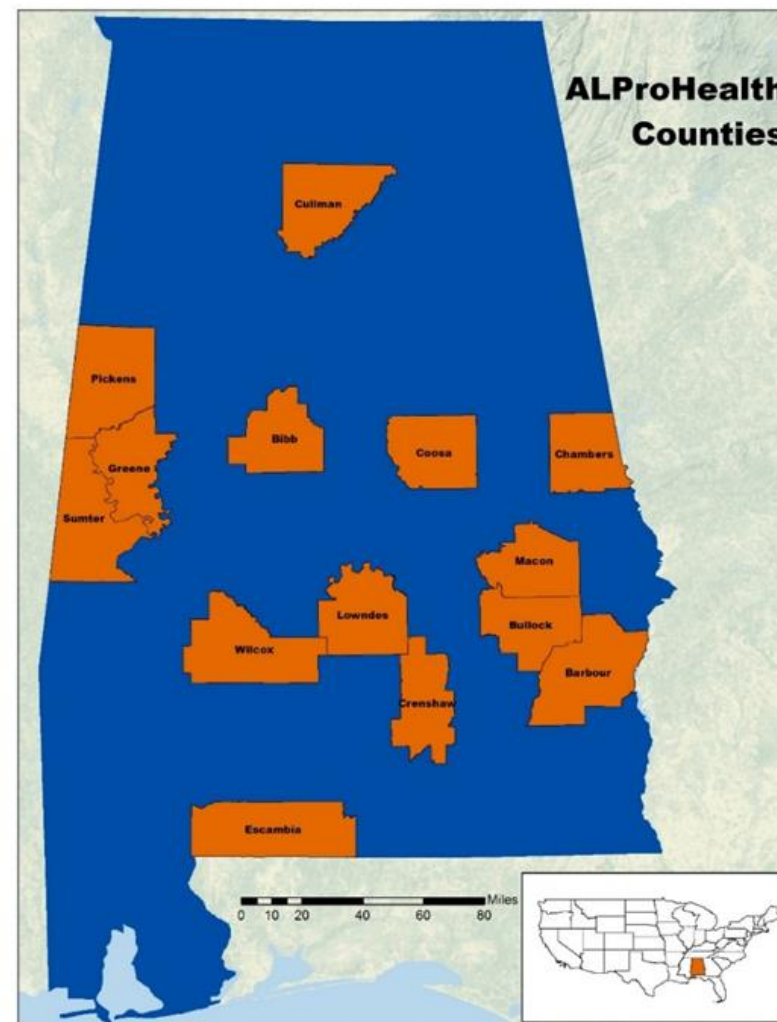
NECESSARY ITEMS FOR MODEL OPTIMIZATION

1. Designate study area (Alabama)
2. Divide study areas into subareas of analysis (census tracts)
3. Determine centroids of subareas
4. Identify all state park locations and geocode (22 state parks in Alabama)
5. Determine distances from centroids of all tracts to each state park (Euclidean distance, Manhattan distance, travel time)
6. Specify all attributes and amenities that could influence consumer preference
7. Conduct survey of households within subareas to determine frequency of visitation for parks*
 - *This step is intended to optimize the Huff Model based on real-world visitation data



SURVEY TO COLLECT VISITATION DATA

- **ALProHealth:** Alabama Preventing and Reducing Obesity – Helping to Engage Alabamians for Long-Term Health
- 4-year project funded by the Centers for Disease Control and Prevention
- Working with community coalitions in 14 counties with adult obesity rates greater than 40%
- Implementing research-based interventions proven to reduce obesity
- Needs assessment process included focus groups with community members and a mail survey to the general population



SURVEY TO COLLECT VISITATION DATA

- Mail survey to the general population
- Dillman's Tailored Design Method
- 8,000 total surveys: sent to 500 random households in each of the 14 ALProHealth counties plus an additional two urban counties
- 1,448 surveys returned (20% adjusted response rate)
- Survey was developed to elicit responses regarding access to outdoor recreation locations and healthy food sources
- Participation in outdoor recreation activities, needs for improving outdoor recreation, and constraints to participation
- *Visitation history for state parks and national forests in Alabama

2016 OUTDOOR RECREATION AND FOOD ACCESS SURVEY

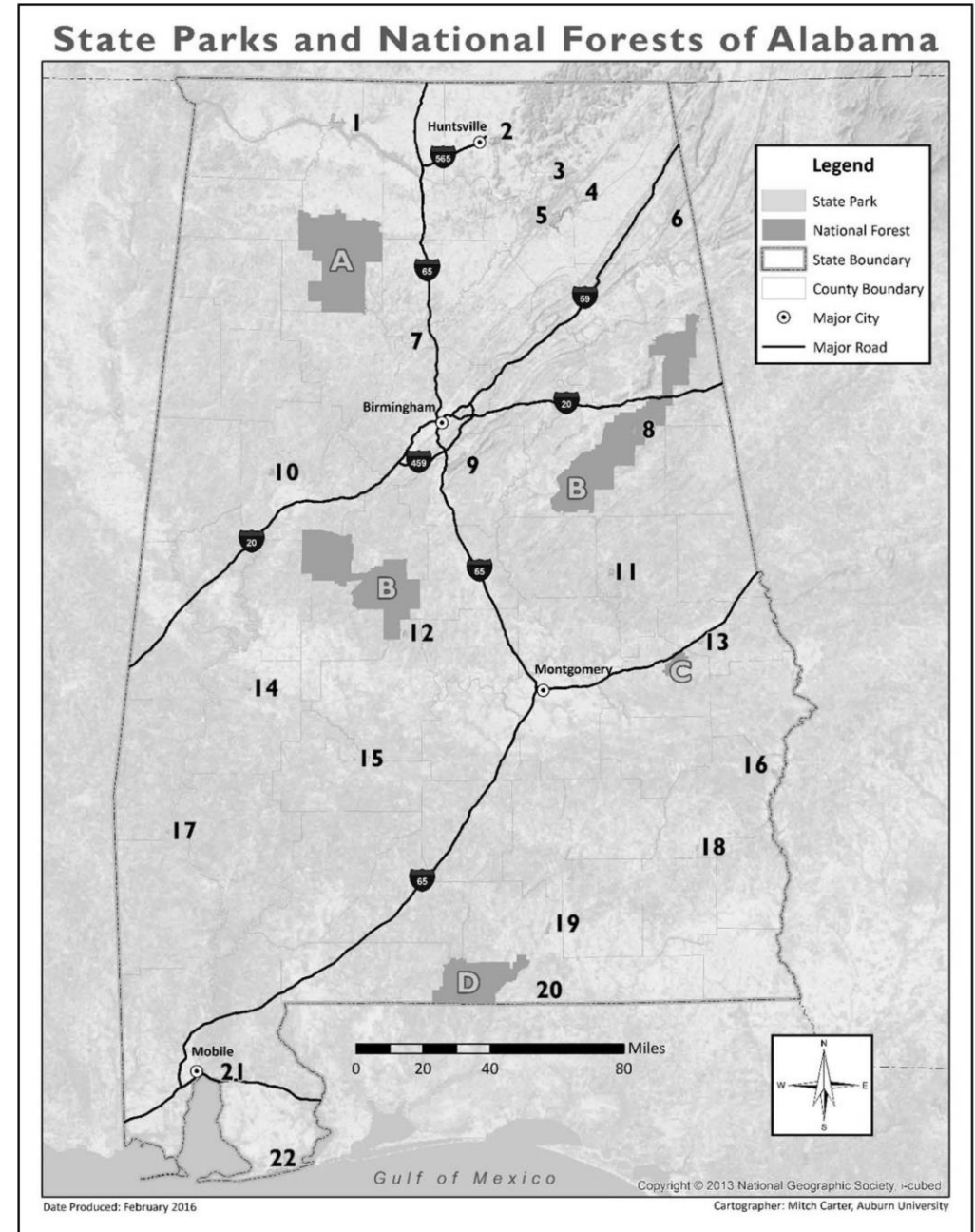
UNDERSTANDING YOUR PARTICIPATION IN OUTDOOR RECREATION ACTIVITIES
AND YOUR ACCESS TO FOOD



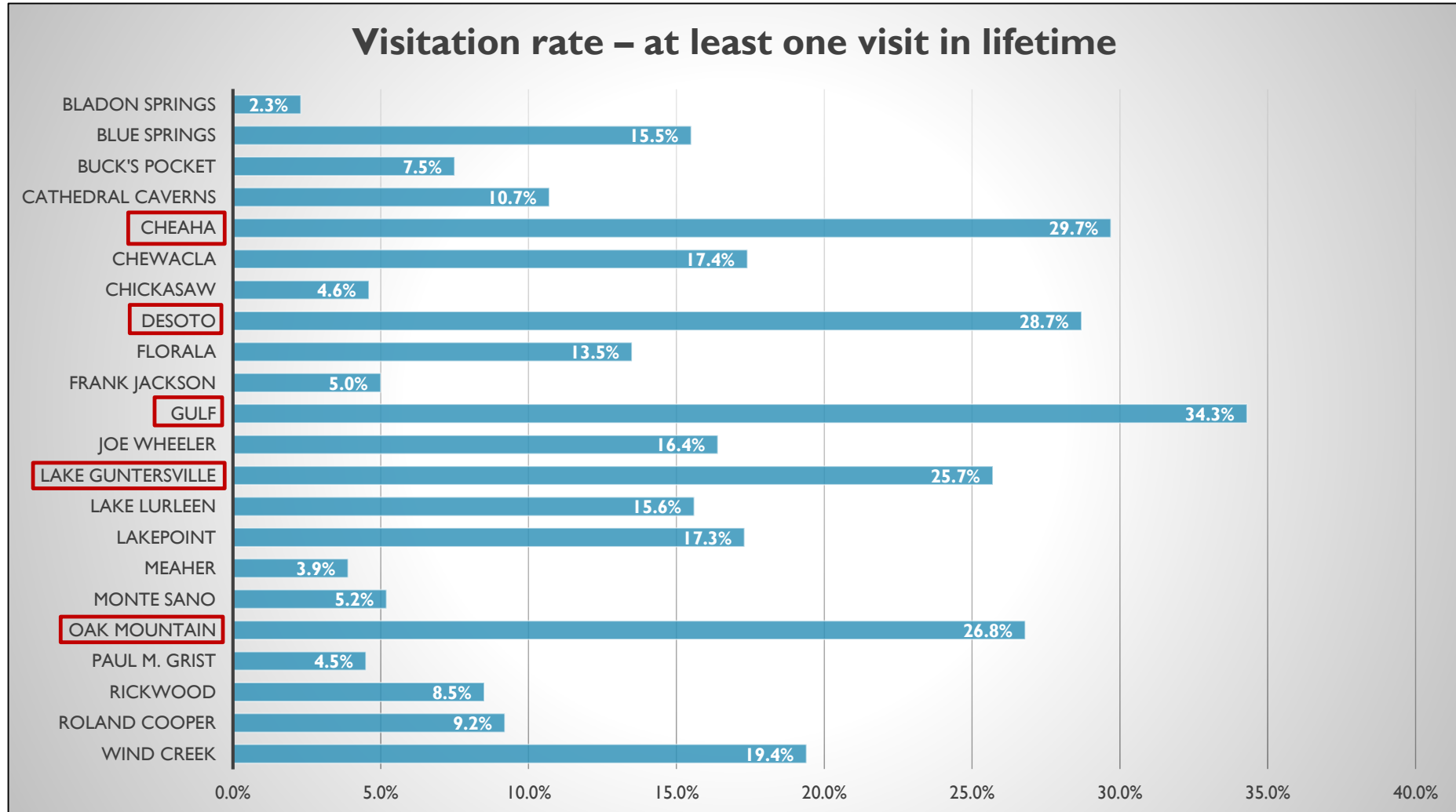
A STUDY BY:
ALABAMA COOPERATIVE EXTENSION SYSTEM
AND
THE SCHOOL OF FORESTRY AND WILDLIFE SCIENCES AT AUBURN UNIVERSITY

16. Have you or anyone in your household ever visited any of Alabama's state parks or national forests in your lifetime? What about in the past 12 months? A map on the following page will help you to identify locations of parks and forests. (Check all that apply)

State Parks (map #)	Visited at least once in lifetime	# of times visited in past 12 months
Bladon Springs State Park (#17)	<input type="checkbox"/>	#
Blue Springs State Park (#18)	<input type="checkbox"/>	#
Buck's Pocket State Park (#4)	<input type="checkbox"/>	#
Cathedral Caverns State Park (#3)	<input type="checkbox"/>	#
Cheaha State Park (#8)	<input type="checkbox"/>	#
Chewacla State Park (#13)	<input type="checkbox"/>	#
Chickasaw State Park (#14)	<input type="checkbox"/>	#
DeSoto State Park (#6)	<input type="checkbox"/>	#
Floral State Park (#20)	<input type="checkbox"/>	#
Frank Jackson State Park (#19)	<input type="checkbox"/>	#
Gulf State Park (#22)	<input type="checkbox"/>	#
Joe Wheeler State Park (#1)	<input type="checkbox"/>	#
Lake Guntersville State Park (#5)	<input type="checkbox"/>	#
Lake Lurleen State Park (#10)	<input type="checkbox"/>	#
Lakepoint State Park (#16)	<input type="checkbox"/>	#
Meaher State Park (#21)	<input type="checkbox"/>	#
Monte Sano State Park (#2)	<input type="checkbox"/>	#
Oak Mountain State Park (#9)	<input type="checkbox"/>	#
Paul M. Grist State Park (#12)	<input type="checkbox"/>	#
Rickwood Caverns State Park (#7)	<input type="checkbox"/>	#
Roland Cooper State Park (#15)	<input type="checkbox"/>	#
Wind Creek State Park (#11)	<input type="checkbox"/>	#
National Forests (map letter)		
Bankhead National Forest (A)	<input type="checkbox"/>	#
Conecuh National Forest (D)	<input type="checkbox"/>	#
Talladega National Forest (B)	<input type="checkbox"/>	#
Tuskegee National Forest (C)	<input type="checkbox"/>	#



VISITATION DATA RESULTS



HUFF MODEL DEVELOPMENT

- **Attributes and amenities used for attractiveness calculation:**

1. Size (acres)
2. RV/car camping spots (with hookups)
3. Primitive camping spots (no hookups)
4. Cabins
5. Resort/hotel rooms
6. Total miles of hiking trails
7. Total miles of bike trails
8. Sport facility availability (volleyball, tennis, basketball, or swimming pool)
9. Playground availability
10. Pavilion availability
11. Fishing area availability
12. Lake size

- Attributes are standardized and summed to create an overall attractiveness based on all 12 variables



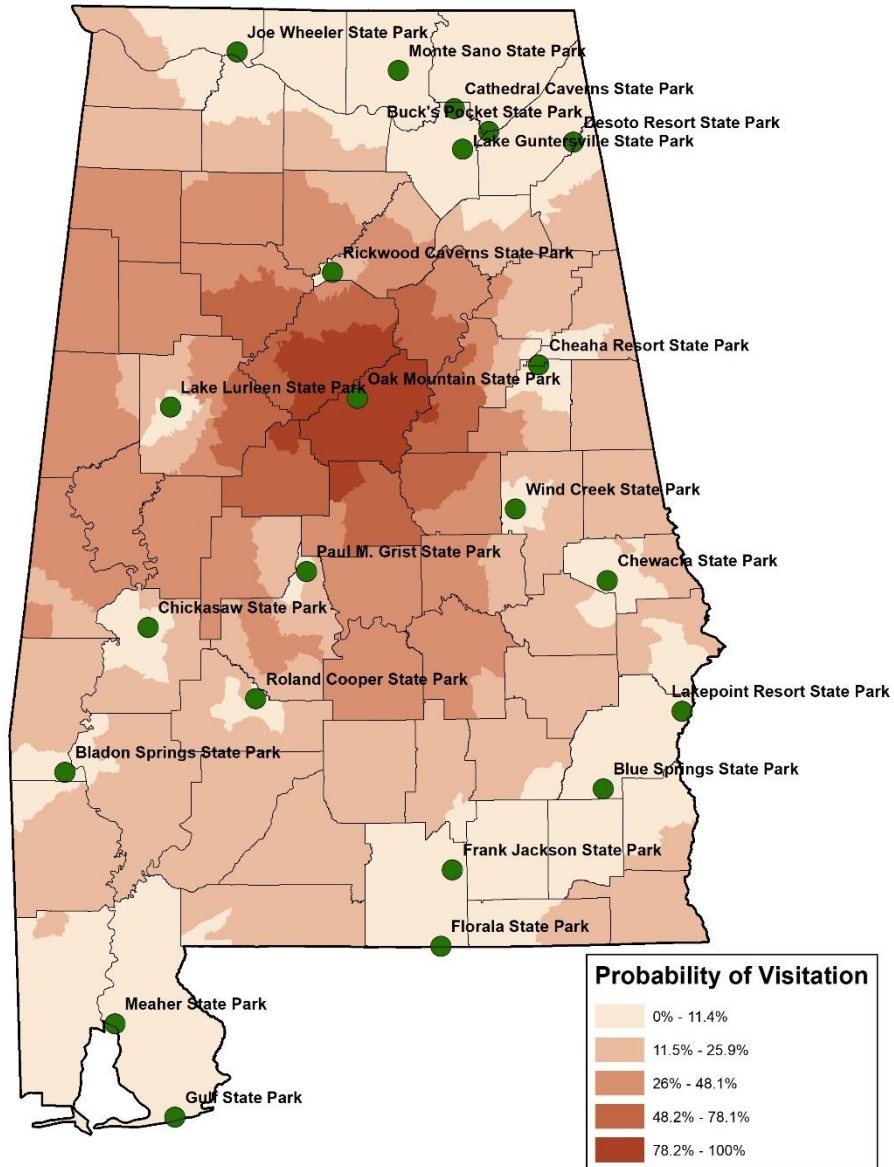
Cheaha State Park



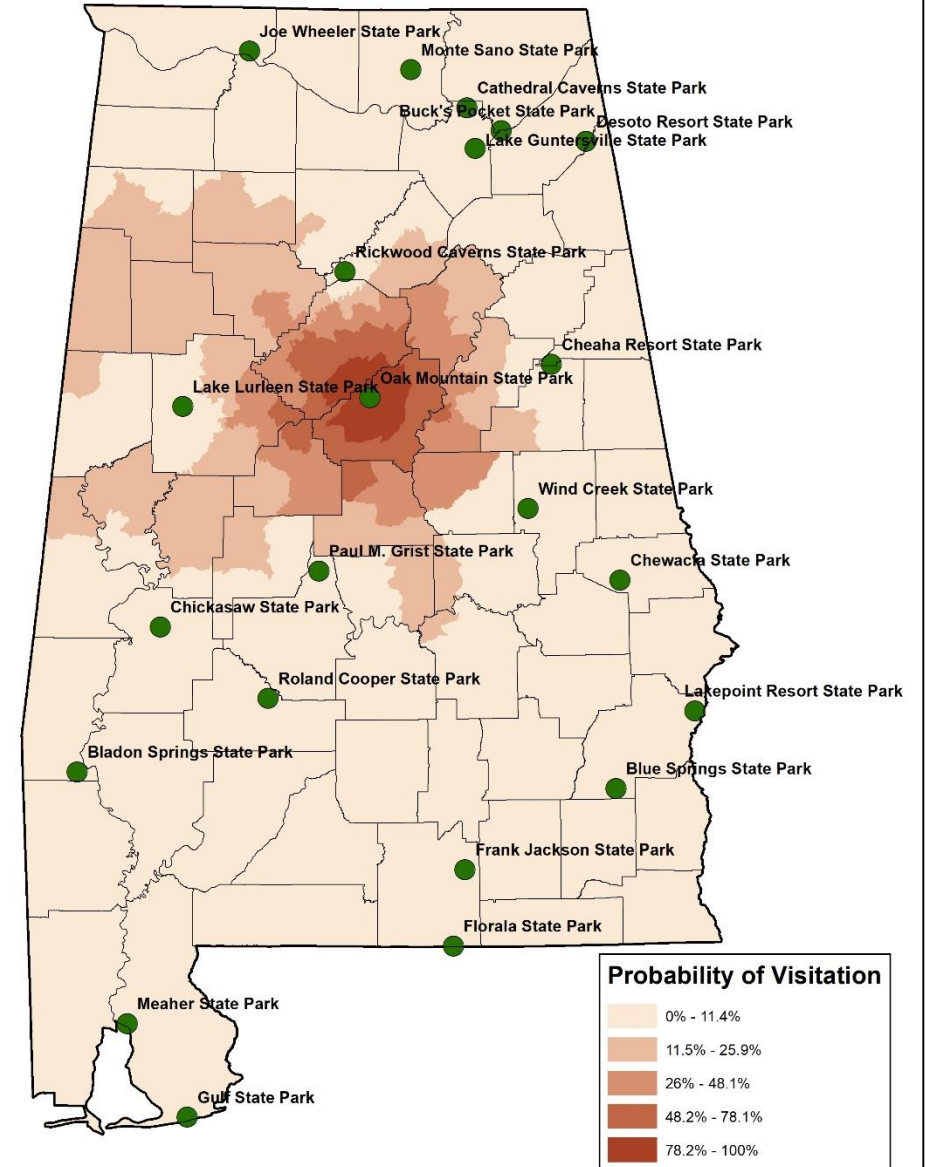
Lakepoint State Park

Oak Mountain State Park

Huff Model Probability: Acreage Only

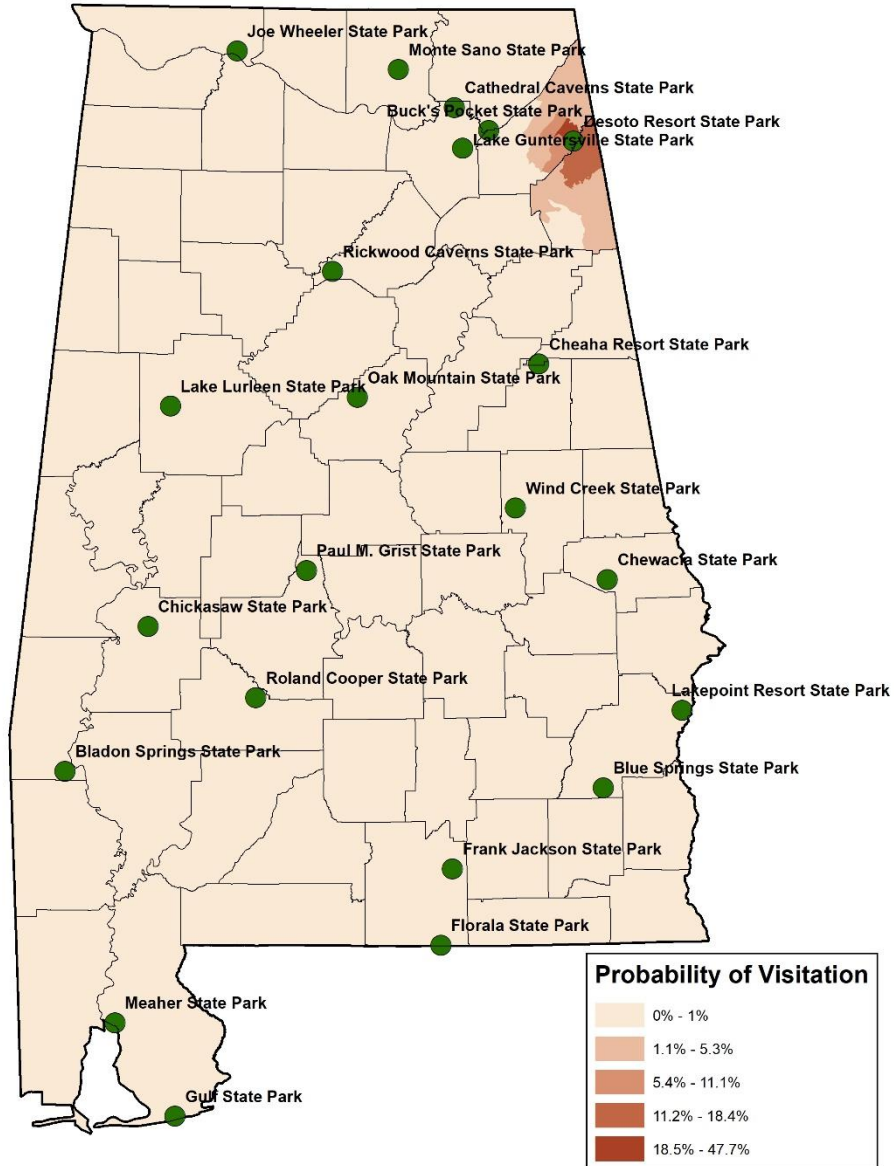


Huff Model Probability: Combined Attributes

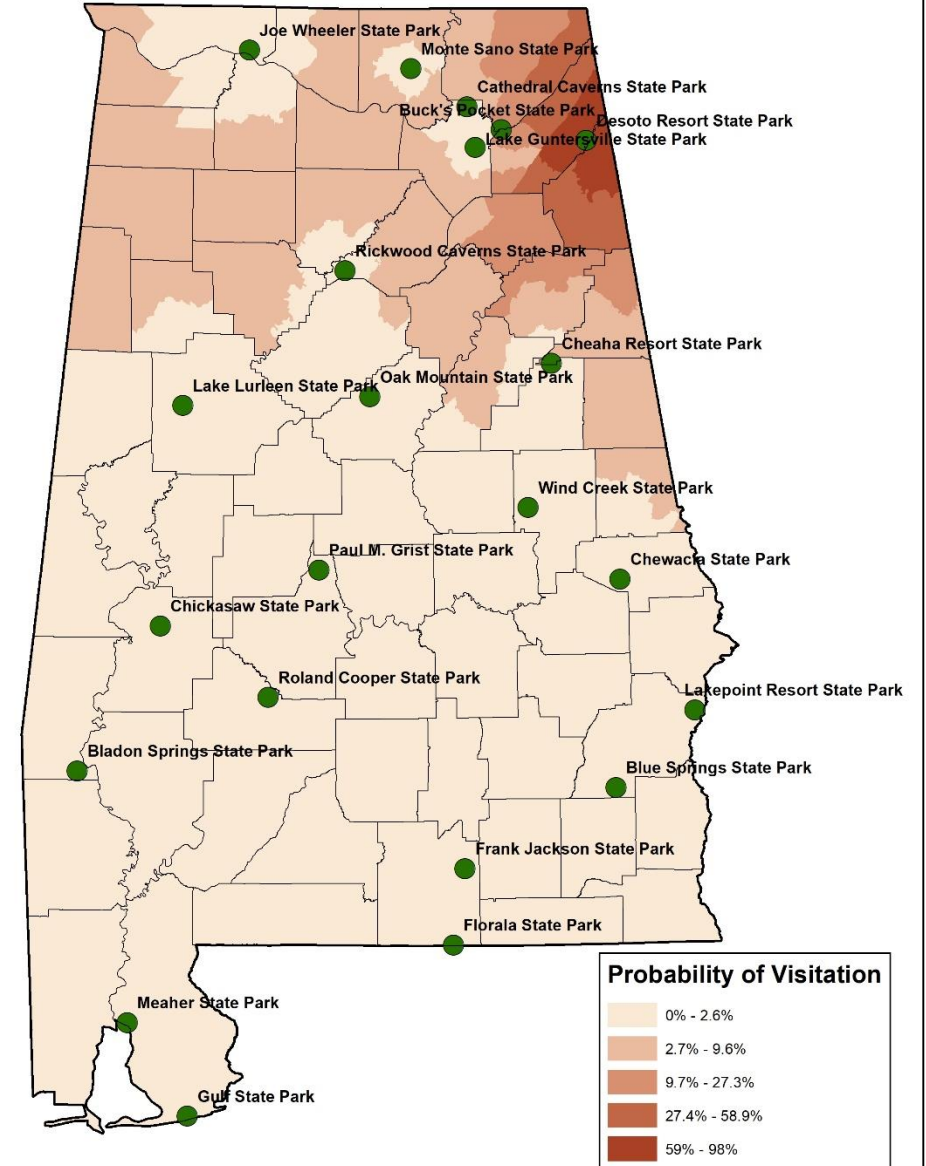


Desoto State Park

Huff Model Probability: Acreage Only

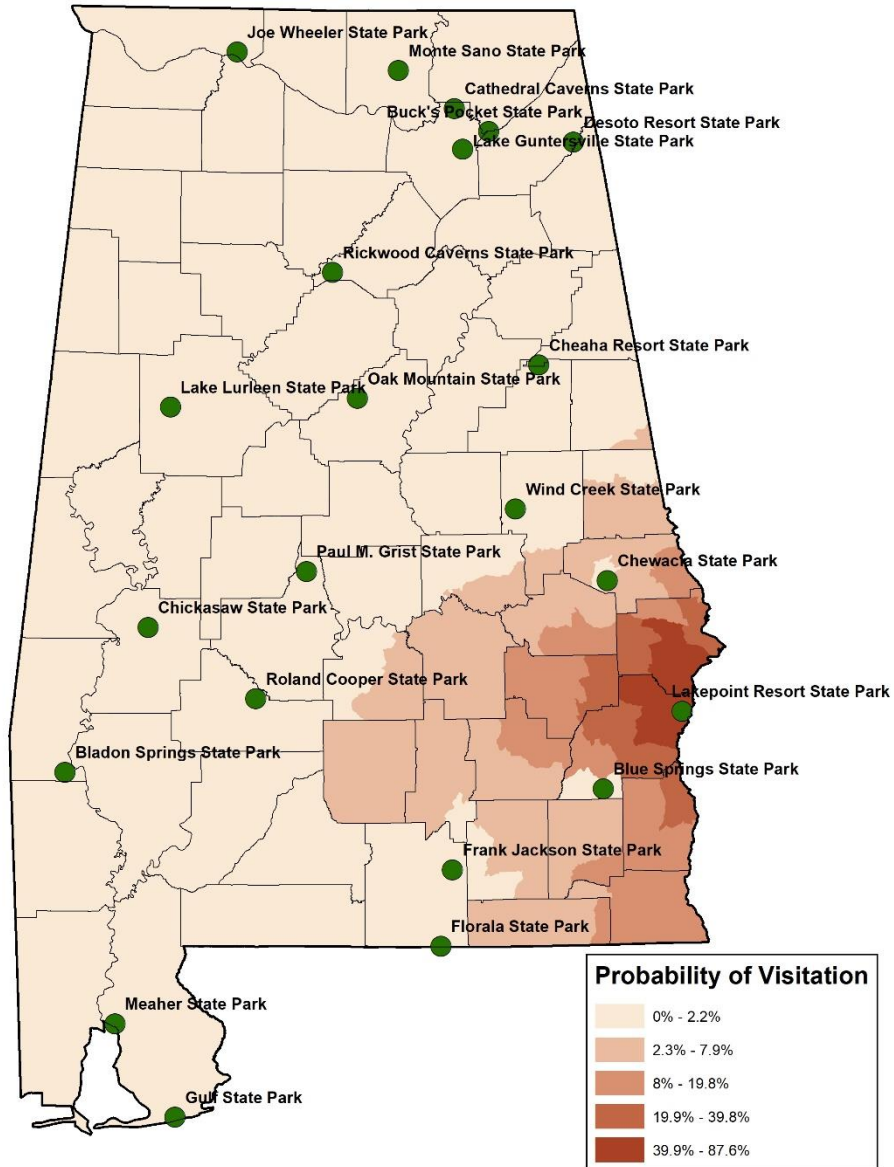


Huff Model Probability: Combined Attributes

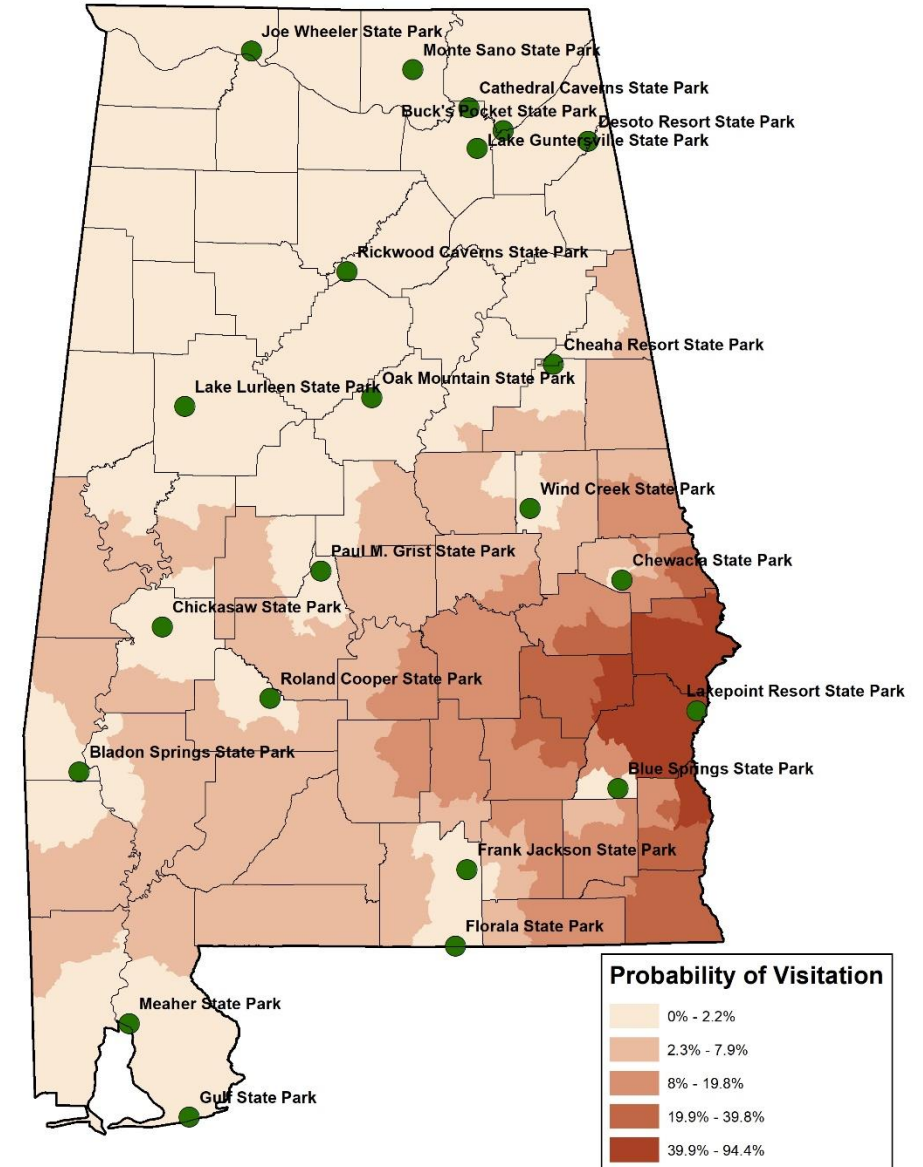


Lakepoint State Park

Huff Model Probability: Acreage Only



Huff Model Probability: Combined Attributes



LIMITATIONS AND FUTURE STEPS

■ Future steps:

- Create a model based on surveyed importance of amenities; identify attributes and amenities that play a larger role in influencing visitation (current model assumes equal importance of all 12 amenities)
- Accessibility measures to improve model:
 - Distance to nearest major road
 - Distance to nearest city
- Use model to predict visitation to other areas (Wildlife Management Areas, Public Fishing Lakes)
- Use census population data to predict visitation numbers

■ Limitations:

- Unable to accurately compare probability surfaces to surveyed responses at the census tract level
- Travel time instead of distance; requires addition of speed limits to road network dataset; can also be improved further by traffic data



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