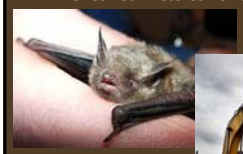
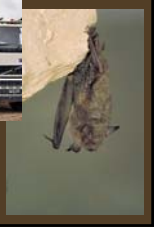
The Effects of Timber as a Biofuel on the Occupancy and Habitat Suitability of the Indiana Bat and the Gray Bat in Tennessee





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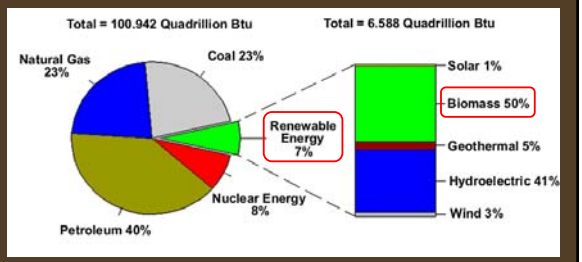
Introduction

- Biofuel:
  - National Security
  - Stimulate Local Economies
  - Reduce Carbon Emissions
- Tennessee described as "Saudi Arabia of cellulose"

Introduction

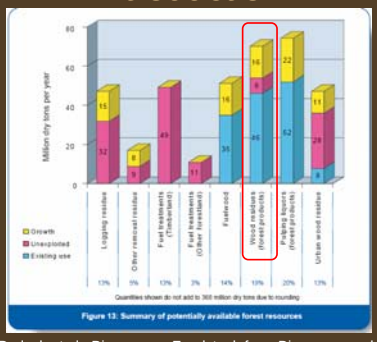


*EIA, Renewable Energy Trends, 2008

Introduction

- Biomass Includes
  - Food Crops & Residues
  - Perennials
  - Other Residues
  - Timber Residues

Introduction



*Perlack et al., Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Supply, 2005

Introduction

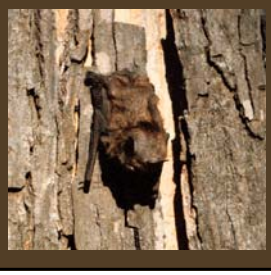
- Potential Negative Impacts of Biofuel Production
  - Decreased Site Productivity/Decreased Soil Conservation
  - Increased Carbon Emissions
  - Decreased Biodiversity
  - Reduced Quality of Wildlife Habitat

Introduction

- Species of Concern In Tennessee
  - 20 Endangered Mammal Species
  - 4 of These Species Federally Listed as Endangered Under the ESA
    - Carolina Northern Flying Squirrel
    - Virginia Big-Eared Bat (not confirmed in TN)
    - Indiana Bat
    - Gray Bat

Purpose

- The goal of my research is to determine how utilizing timber as biofuel will affect the quality of Indiana Bat and Gray Bat habitat in Tennessee.



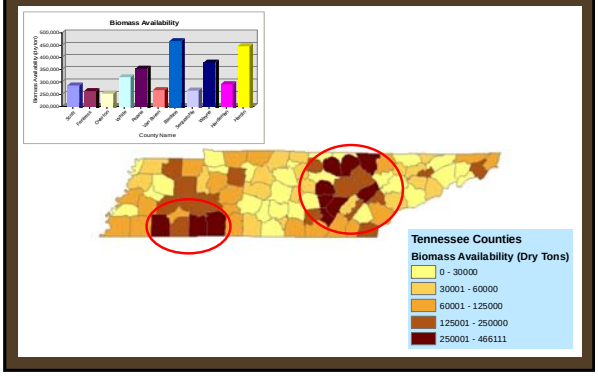
Objectives

1. Determine both current and potential logging residue availability in TN
2. Determine suitable habitat for both the Indiana Bat and the Gray Bat
3. Determine areas occupied by the Indiana Bat and Gray Bat
4. Determine areas of concern by comparing biofuel productivity with key bat habitat

Methods
1. Logging Residue Availability

- Utilize FIA data to determine annual logging residue availability and removals in Tennessee, by county
- Multiply annual removals by 65% to determine annual logging residue availability for biofuels (Perlack et al., 2005)
- Locate areas within the state with the highest removals

Methods
1. Logging Residue Availability

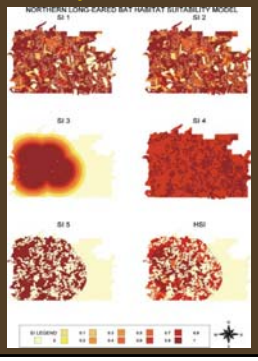


Methods
2. Habitat Suitability

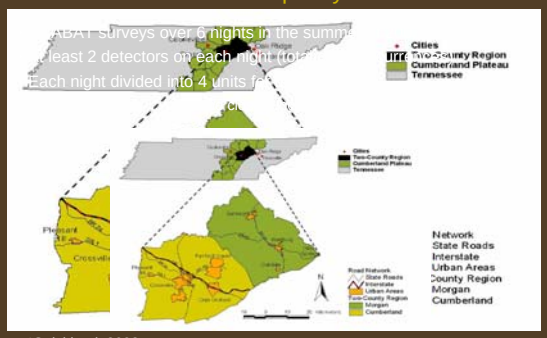
- Determine most important habitat characteristics for Indiana Bat and Gray Bat
  - Distance from Caves (5 miles max)
  - Distance from Water (2 miles max)
  - Elevation
  - Percent Tree Cover (>30%)
- Determine suitability, on a scale of 0 to 1, for each of these characteristics and create layer in GIS
- Model Habitat Suitability in Tennessee to determine ideal habitat for Indiana Bat and Gray Bat, using GIS

Methods
2. Habitat Suitability

- Existing Habitat Suitability Model for Northern Long-Eared Bats in Missouri:
  - Mature forests for roosting/foraging (SI_1)
  - Density of large snags for roosting (SI_2)
  - Forest gaps (SI_4)
  - Interspersion of roost sites and foraging (SI_5)
  - Distance from water (SI_3)



Methods
3. Occupancy



*Strickland, 2003

Methods
3. Occupancy

- Conduct Occupancy Model in Program MARK with 25 occurrences, 4 repeats, and the following covariates:
  - Time of night
  - Average temperature
  - Average precipitation

  } Detection Probability (p)

  - Each Habitat Suitability characteristic (from my model and existing models)
  - The overall Habitat Suitability Index

  } Probability of Occurrence (psi)

Methods
3. Occupancy

- Determine Occupancy Model with best fit
  - Lowest AIC model
- Create new habitat suitability model, utilizing the most significant covariates from the occupancy model

Methods
4. Areas of Concern

- Compare new Habitat Suitability Model with current model of biofuel production
- Create forecast model of biofuel production and determine how this could affect the habitat suitability of the two species in the future

Acknowledgements

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Questions