

# Bat Habitat Conservation and Management on Indiana State Forests



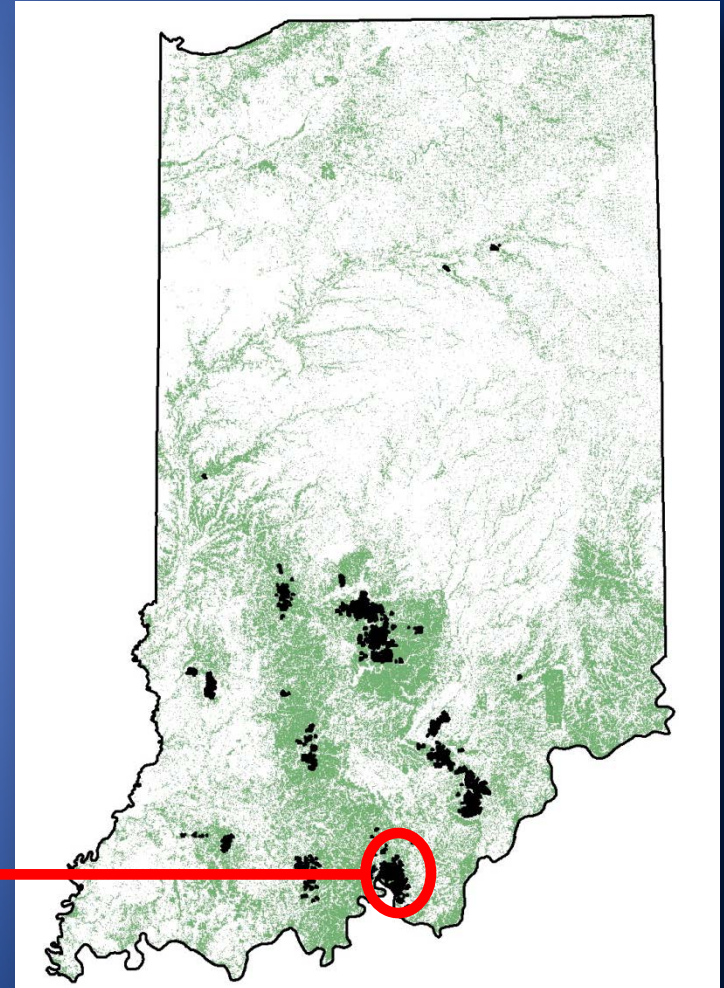
**Scott Haulton**  
**Forestry Wildlife Specialist**  
**Indiana DNR – Division of Forestry**





## Indiana's State Forests

- 156,000+ acres
- 13 state forests
- First property: Clark State Forest (1903)
- 80% acreage  $\geq 60$  y.o.;  
51% acreage  $\geq 80$  y.o.
- Dominant forest types: oak-hickory and "mixed oak"
- HCSF: several bat hibernacula; "critical habitat"





## **“You cut trees down on state forests?”**

- 3-4% SF acreage harvested annually;  
12-16 MMBF
- Primarily single-tree selection (>90%)
- Regeneration openings, 80+ year rotation
- Openings 4-7% of harvested acreage
- Average opening size: ~3 ac.;  
historically only 1% of openings >20 ac
- SFI & FSC certified since 2006





### The Early Years of IN State Forest Bat Guidance

- Prior to 2000: snag retention encouraged as a general habitat benefit, not specific to Indiana bats
- 2000: first “IN State Forest Indiana Bat Strategy”
  - Based on Ohio DNR Guidance (1999)
  - Guidance for both summer habitat and hibernacula
  - Snag retention, large live tree retention, riparian guidance, etc.
  - Applicable to all SF property
  - ...*but, no seasonal harvesting restrictions*

# State Forest Bat Habitat Conservation: The HCP Years



## The HCP Years...

- 2003: HCP & EA/EIS started
- 2004: USFWS-BFO guidance applied near P1&P2 Indiana bat hibernacula (Harrison-Crawford SF)
  - *Forest cover retention*
  - *Shagbark & snag retention*
  - *Large tree retention*
  - *Riparian areas*
  - *Seasonal harvest & Rx burning restrictions*



U.S. Fish & Wildlife Service

### BFO Forest Management Guidelines for Avoiding Incidental Take<sup>\*</sup> of Indiana Bats within the State of Indiana

These guidelines were developed by the Bloomington Field Office (BFO) of the U.S. Fish and Wildlife Service (FWS) to conserve the federally endangered Indiana bat (*Myotis sodalis*) and its summer/fall habitat within the State of Indiana. Adherence to these guidelines will avoid incidental take of Indiana bats and result in forest habitat that is suitable for the species' use, but may not represent optimal habitat. Maintaining or creating optimal Indiana bat maternal habitat typically would require more intensive management practices than provided here. This is a working document and periodically will be revised as new data warrant.

For forest parcels or stands managed in accordance with these guidelines, the BFO typically will provide concurrence letters to managers needing Section 7 clearance (i.e., an informal consultation will suffice) and an incidental take permit/Habitat Conservation Plan (HCP) will not be required on state-owned or privately owned lands with known Indiana bat occurrences because the risk of taking one or more Indiana bats will be discountable or insignificant. However, if any aspects of these management guidelines cannot be followed or conflict with other land management goals or directives, then forest managers are strongly encouraged to contact the BFO to discuss alternative processes available to federal and non-federal land managers under the Endangered Species Act of 1973 (ESA). [NOTE: Take of federally listed species is prohibited by Section 9 of the ESA regardless of whether the taking occurs on federal, state, or privately owned lands].

#### FOREST MANAGEMENT GUIDELINES

1. At least 60% canopy cover (on a stand-by-stand basis, depending on size of stands) shall be maintained after any timber harvest activities.
2. Shagbark hickory (*Carya ovata*) or shellbark hickory (*C. laciniosa*) trees shall not be harvested or manipulated during timber stand improvement (TSI) activities, unless the combined density of these species exceeds 16 trees/acre. If present, at least 16 live shagbark and shellbark hickory (combined) >11" dbh must be maintained per acre.
3. Standing snags shall not be felled/removed, except where they pose a serious human safety hazard (a tree with <10% live canopy should be considered a snag). Snags that have no remaining bark and no visible cracks, splits, or hollows may be felled as well as any snags leaning more than 45° from vertical.

<sup>\*</sup> **Incidental take** – Take that results from, but is not the purpose of, carrying out an otherwise lawful activity.  
**"Take"** – To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct; may include significant habitat modification or degradation if it kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering.  
**"Harass"** – To intentionally or negligently, through act or omission, create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns such as breeding, feeding, and sheltering (defined by FWS regulation; NOAA Fisheries has not defined harass by regulation).  
**"Harm"** – To perform an act that kills or injures wildlife; may include significant habitat modification or degradation when it kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering.



### **The HCP Years...**

- 2007-08: First draft of HCP/EIS submitted/reviewed
- 2010 to present:
  - HCP (version 2) and separate EIS started
  - USFWS-BFO forest management guidance adopted in areas affected by known Indiana bat maternity colonies (~47% in 2012)
  - Current state forest “Interim” guidance: hybrid of original state forest guidelines and BFO guidance...seasonal harvest/burning restrictions retained



## **Current “Interim” Bat Guidance (since 2012)**

- Canopy cover – 60% at landscape-level
- Snag retention – excludes salvage
- Loosebark hickory – “monitor & maintain” at landscape-scale
- Future large snags (a.k.a. large live tree retention) – “monitor & maintain” at landscape-scale
- Riparian areas – follow BMPs, limited harvest
- Seasonal harvest restrictions - only in areas affected by hibernacula or maternity colonies (~40% of SF)
- NLEB – 4(d) rule...known roosts and hibernacula



### **So, Why Pursue an HCP for State Forests?**

- In 2003, no maternity records, but recognized state forests had potential summer habitat for Indiana bat
- Winter-only harvesting would increase soil & water impacts & mitigation costs

### **Two Choices:**

1. Follow USFWS-BFO Guidelines to avoid take
2. Complete HCP, apply for Incidental Take Permit





### **Why are seasonal harvest restrictions such a big deal?**

- Harvesting impacts to soil and water are reduced during summer and early autumn
- Winter-only harvesting significantly increases management costs (**~\$38K per MMBF harvested**)
- Additional costs for pre- and post-harvest mitigation activities, reduced sale bids, road construction, rock reinforcement, etc.
- Current estimated annual costs with ~40% of SF under seasonal harvest restriction: **\$223K** (~8% of all harvesting contracts)



## **Integrating Research with HCP Development**

### **HCP (v.2) Needs...**

- **Habitat Effects Analysis (long & short term)**
- **Alternative Analysis**
- **Take Analysis**



### **Research to Address Needs...**

- **Roost & foraging habitat use on managed State Forests**
- **Habitat suitability & forest succession/development modeling**





## **Bat Research Partners (since 2006)**

### **Indiana State University**

- Joy O'Keefe (HEE PI, 2011-present); Scott Bergeson (PhD), Tim Divoll (PhD)
- John Whitaker (HEE PI, 2006-2011); Jeremy Sheets (MS), Megan Caylor (MS)

### **Ball State University**

- Tim Carter (HEE PI); Holly Badin (MS), Katherine Caldwell (MS), Jocelyn Karsk (MS)

### **Indiana University of Pennsylvania**

- Joseph Duchamp (HEE PI); Amber Nolder (MS)

### **Purdue University**

- Pat Zollner (PI); Benjamin Pauli (PhD)

## **HEE Bat Research – Foraging Activity**

- **Acoustic surveys**
- **Pre-harvest: 2007-2008**
- **Post-harvest: 2009-2014+**
- **Objective: foraging activity in opening interiors and along edges; unharvested sites**
- **Detectors placed within interiors and along edges of openings**



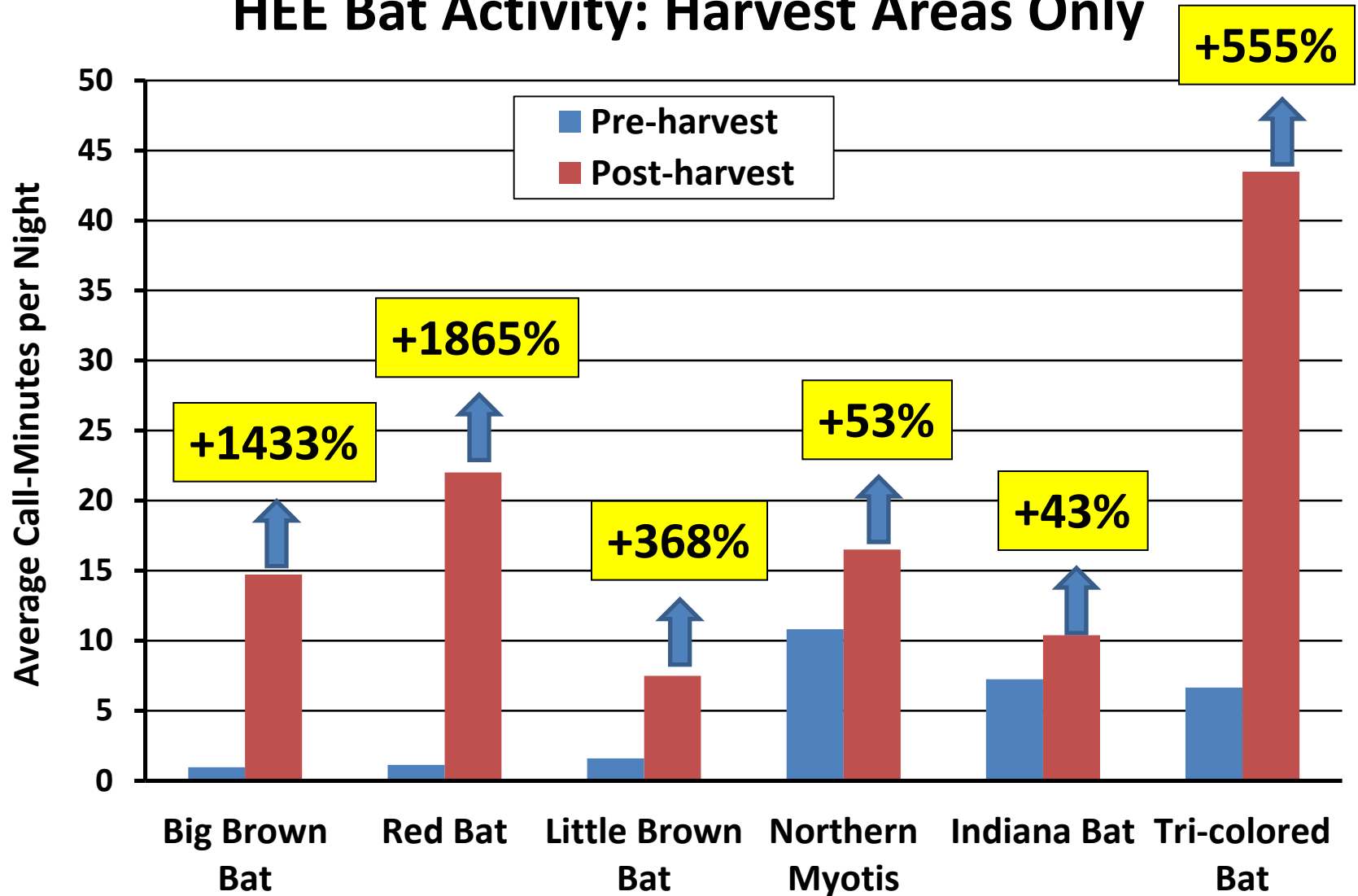
# HEE Bat Research – Foraging Activity

## *General Harvest Response...*

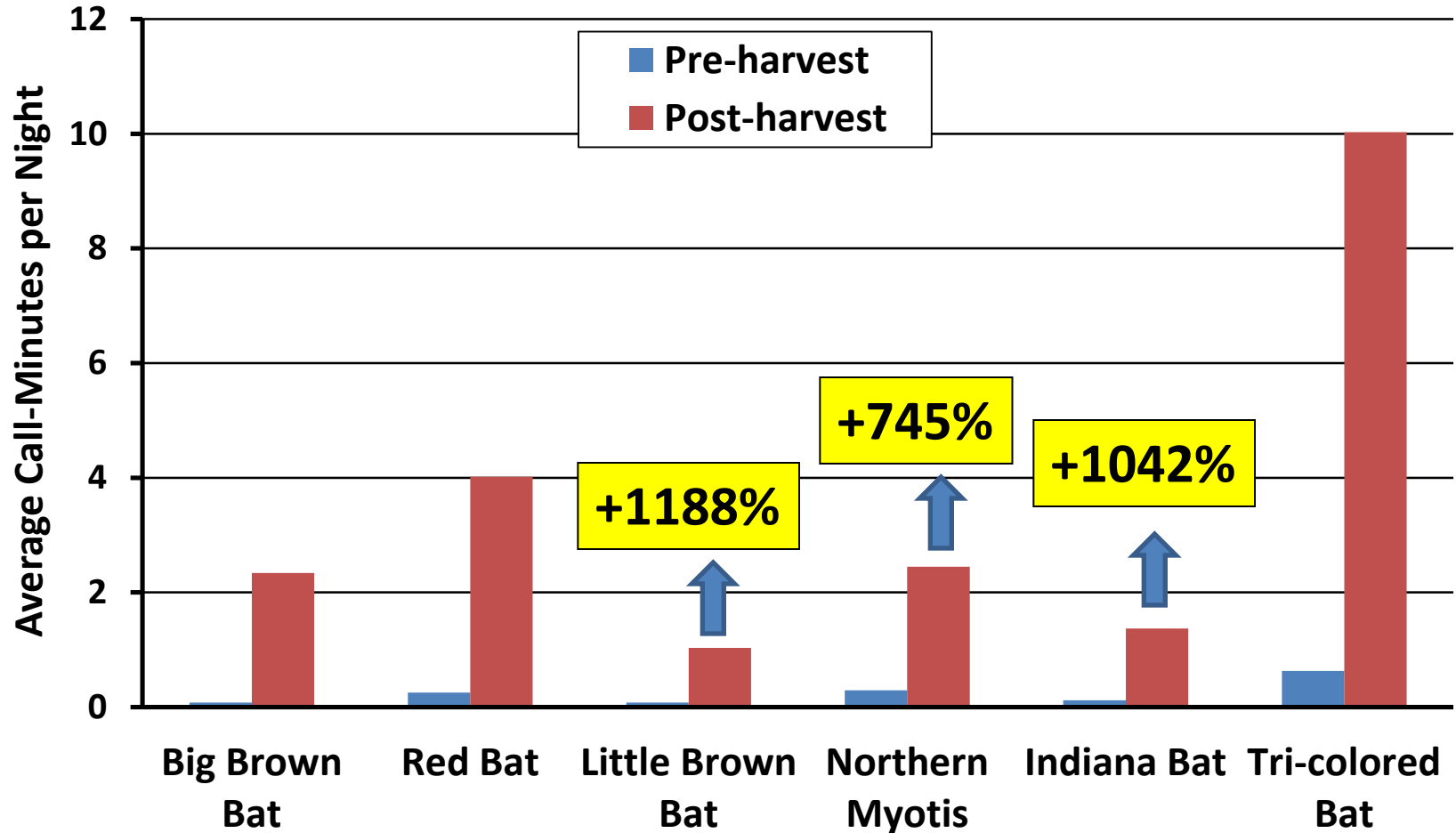
- No species experienced decline in activity following harvests
- Generalists used harvest areas more than intact forest
- Less increase in post-harvest use among *Myotis*



# HEE Bat Activity: Harvest Areas Only

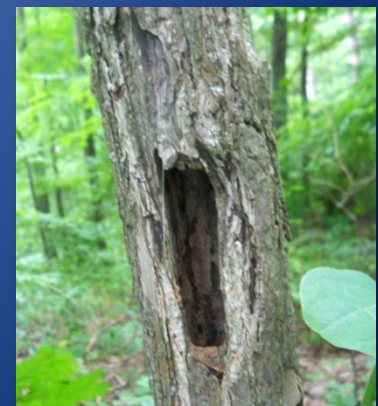
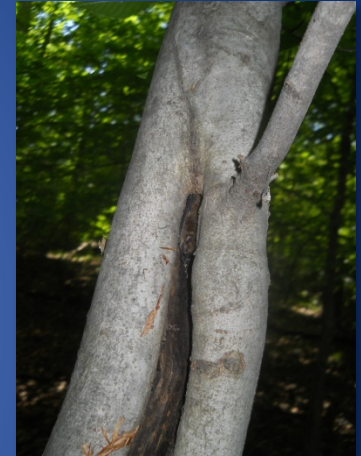


# Shelterwood Prep - Understory Removal



### HEE Bat Research – Roosting Ecology

- 2012-2014+
- Indiana bats and Northern long-eared bats
- Most roosts (54%) were in recently harvested areas
  - *Indiana bat*: 67%
  - *No. long-eared*: 51%
- Indiana bats roosting more consistently within or near openings



# 2014 Indiana Bat Maternity Roosting Sites

*6 year old 5-acre regeneration opening – Yellowwood SF*



# 2014 Indiana Bat Maternity Roosting Sites

*oak shelterwood one year after establishment cut*





### **How will Alternate Management Programs Affect Habitat Suitability?**

- Indiana bat & northern long-eared bat modeled
- Used HEE and other State Forest habitat use data to develop current habitat suitability and occupancy models for all State Forests
- MaxLike analysis to determine best habitat/environmental predictors for suitability
- LANDIS II to predict forest development under each management scenario and resulting habitat suitability



### **State Forest Habitat Suitability Models**

- No one management scenario was “perfect” fit for both species
- Ibat suitability lowest among “no harvest” scenario; highest with moderate amount of selection harvesting
- NLEB results supported “forest generalist” characterization
- Study described in open-access publication (“Ecosphere”):  
<http://www.esajournals.org/doi/10.1890/ES14-00336.1>



## IN State Forest HCP - Current/completed Major Tasks:

- Avoidance & minimization measures (✓)
- Alternative analysis (✓)
- Habitat effects analysis (✓)
- “Take” estimation (✓)
- Mitigation & monitoring commitments (✓)



# Questions?

Scott Haulton  
shaulton@dnr.IN.gov

Pauli et. al. 2015. *The simulated effects of timber harvest on suitable habitat for Indiana and northern long-eared bats*. Ecosphere 6(4):58.

<http://www.esajournals.org/doi/10.1890/ES14-00336.1>