IN THE BEGINNING OF HUMAN INFLUENCES ..... 

Caves as dwellings

Early native people and fire

Clearing of forests for settlement

Nitrate rich soils and guano to fuel war .....
1950’s

- Caving was becoming even more popular as automobile travel throughout the nation was vogue
- Recreational disturbance to summer and winter sites continue to increase
- Survey work was coarse scale and not standardized
1960’S

• Recognition that sites previously occupied were abandoned or population numbers had drastically decreased

• Jesse James and Coach Cave – entrances were modified to accommodate commercialization of tours

• Signing of the Endangered Species Protection Act (ESPA 1966)

• 1967 – Indiana bat listed as Endangered under the ESPA
JESSE JAMES CAVE
1970’S

• Population Census gains importance

• Drastic declines in Indiana bats are noted from 1960’s to mid 1970’s primarily due to cave entrance modification and disturbance

• Endangered Species Act signed December 28th, 1973

• ESA listings
  • 1976 Gray bat listed as Endangered under the ESA
  • 1979 Virginia Big-eared bat listed as Endangered under the ESA
1980’S

• 1983 First “Bat Friendly” gate installed at Bat Cave in Carter Caves State Resort Park

• Non-game program created at KDFWR and more formalized hibernacula counts were conducted

• 1989 was selected as the baseline year for summer Gray bat counts
CARTER CAVES 1983
1990’S

• Population Census work begins to show trends

• Sophisticated hibernacula restoration work begins

• Telemetry work gains in popularity, life history work of the Indiana bat makes strides

• Education of land managers on what bats need, and where they can be found
Access cut off to bat room at James Cave so count incomplete.

Air dam built at lower entrance to Coach in January.

Artificial entrance of Coach blocked with plywood.

<table>
<thead>
<tr>
<th>Year</th>
<th>Jesse James</th>
<th>Coach</th>
</tr>
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<tbody>
<tr>
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<td>1</td>
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<tr>
<td>1999</td>
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<td>71060</td>
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<td>2001</td>
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<td>2009</td>
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<tr>
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<td>2013</td>
<td>129533</td>
<td>75596</td>
</tr>
<tr>
<td>2015</td>
<td>214093</td>
<td>112039</td>
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</tbody>
</table>
COACH CAVE GATE
2000’s

- Hibernacula restoration continues

- June 2008 KFO releases the Final Biological Opinion based on the Indiana Bat Mitigation Guidance (2007)

- *Psuedogymnoascus destructans* (*Geomycetes destructans*) first detected in New York

- Efforts to slow or stop the spread of WNS put into effect
  - WNS Response Plan
BAT CAVE CCSRP
March 1997 flood event kills ~3000 bats at Bat Cave and takes out cave gate at upper entrance. Gate replaced in August.

<table>
<thead>
<tr>
<th>Year</th>
<th>Saltpeter (est.)</th>
<th>Laurel</th>
<th>Bat Cave</th>
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<tbody>
<tr>
<td>1997</td>
<td>250</td>
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<tr>
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<td>515</td>
<td>23,346</td>
</tr>
<tr>
<td>2011</td>
<td>10,812</td>
<td>590</td>
<td>35,037</td>
</tr>
<tr>
<td>2013</td>
<td>12897</td>
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<tr>
<td>2015</td>
<td>14337</td>
<td></td>
<td>27109</td>
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</table>

The graph shows the population estimate for the years 1997 to 2015 for different locations, with notable events and changes highlighted.
97’ FLOOD DAMAGE
EVIDENCE OF SIGNIFICANT USE
DISTURBANCE AT SALTPETER

SALTPETRE CAVE
PURCHASE TICKETS
AT WELCOME CENTER

SALTPETER CAVE
SALTPETER MINED HERE FROM WHICH
GUNPOWDER WAS MADE THAT WAS USED
BY KENTUCKY RIFLEMAN DURING THE
WAR OF 1812. THERE ARE REMAINS
OF THOSE WORKS IN CAVE, REPUTED
RENDEZVOUS FOR COUNTERFEITERS
IN EARLY YEARS. ARTIFACTS AND
INDIAN GRAVES FOUND IN CAVERN.

KENTUCKY HISTORICAL SOCIETY
KENTUCKY DEPARTMENT OF HIGHWAYS
209
WATER AND BATS??
March 2002 - another '200 yr' flood event - could have lost a few thousand bats again at Bat Cave.

Flood kills ~3,000 bats

Saltpeter tours halted

Flood

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<td>2015</td>
<td>14,337</td>
<td>608</td>
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OLD SALTPETER ENTRANCE
NOT A BAT FRIENDLY DESIGN
BAT FRIENDLY STRUCTURE
ADDITIONAL AIR FLOW RESTORATION
IMPROVED AIR FLOW
INTERNAL AIR DAM
VANDALISM
May 2010 flood event washes out upper gate at Bat Cave. Gate replaced in August.

- Flood kills ~3,000 bats
- Saltpeter tours halted
- Flood
- Start of Saltpeter restoration
- Laurel bat kill
- Flood; Laurel gated

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- Saltpeter
- Laurel
- Bat Cave
Saltpeter becomes Priority 1
Indiana bat hibernaculum!
July 2012 flood damages/blocks Laurel's gate w/debris and compromises one of Bat Cave's gates.
Saltpeter becomes Priority 1 Indiana bat hibernaculum!

- March 1997 flood event kills ~3000 bats at Bat Cave & takes out upper entrance gate (replaced in Aug.)
- Winter of 98-99 - Saltpeter Cave tours halted
- March 2002 - another '200 yr' flood event - could have lost a few thousand bats again at Bat Cave
- February 2000 flood event; new larger gate installed at lower entrance to Bat Cave in June.
- May 2003 - new gate and other modifications at Saltpeter Cave
- October 2007 - Vandals kill >100 bats at Laurel
- May 2010 flood event washes out upper gate at Bat Cave; gate replaced in August.
- April 2008 flood event at Bat Cave; Laurel Cave is gated in August.
- Saltpeter damges/losses Laurel's gate w/debris and compromises one of Bat Cave's gates.

July 2015 - flood destroys Bat Cave's other gate
Sept 2015 - gates removed from Bat Laurel Caves

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WNS OCCURRENCE AS OF FEBRUARY 16, 2016

WNS occurs in various states across the eastern United States, as indicated on the map. The map shows the occurrence of WNS from 2006 to 2016, with different colors representing the year of occurrence.

- **First detected in Feb. 2006 in Schoharie Co., NY.**

- **Fall/Winter/Spring Occurrence by County/District:**
  - 2006-07
  - 2007-08
  - 2008-09
  - 2009-10
  - 2010-11
  - 2011-12
  - 2012-13
  - 2013-14
  - 2014-15
  - 2015-16

- **Confirmed:** Solid color
- **Suspect:** Solid color with dots

Map by: Lindsey Heffernan, PA Game Commission
2010’S

• WNS confirmed 2011
  • Currently 22 Counties and 84 sites infected

• Monitoring and surveillance continued

• April 2015 KFO Conservation Strategy for Forest Dwelling Bats

• Northern long-eared bat listed as Threatened May 4 2015

• Final 4D rule relating to the Northern long-eared bat listing, issued January 2016
FOREST MANAGEMENT AND BATS

• Bats historically were not a regular consideration of Forest Management for agencies or other land managers

• Cliffline Policy of the USFS Daniel Boone National Forest

• Improvements in equipment (i.e. transmitters) allowed managers/researchers a more intimate look at bats on the landscape
FOREST MANAGEMENT AND BATS

• Studies to understand what the bats need and when (Life History....)
  • Maternity trees
  • Foraging
  • Roosting
  • Corridors
  • Overwintering
FOREST MANAGEMENT AND BATS

- Fire in forests
  - Bats use of leaf litter
  - Smoke management
  - Change in forest structure/composition

- Food availability/quality

- Contaminants

- Other stressors
WHERE ARE WE TODAY?

- Research Techniques are still relatively young (technology advancements)

- Opportunities to answer some questions may be become more difficult (bat numbers have drastically declined)

- Industry, state, federal, ngo, and researchers need to work closely together (funding, relevant questions to effective management, etc.)