# A BRIEF HISTORY OF BAT MANAGEMENT IN KENTUCKY

SUNNI CARR

# IN THE BEGINNING OF HUMAN INFLUENCES …..

Caves as dwellings

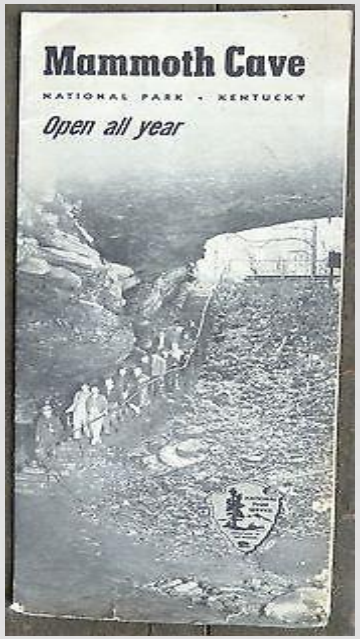
Early native people and fire

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
ENTRANCE

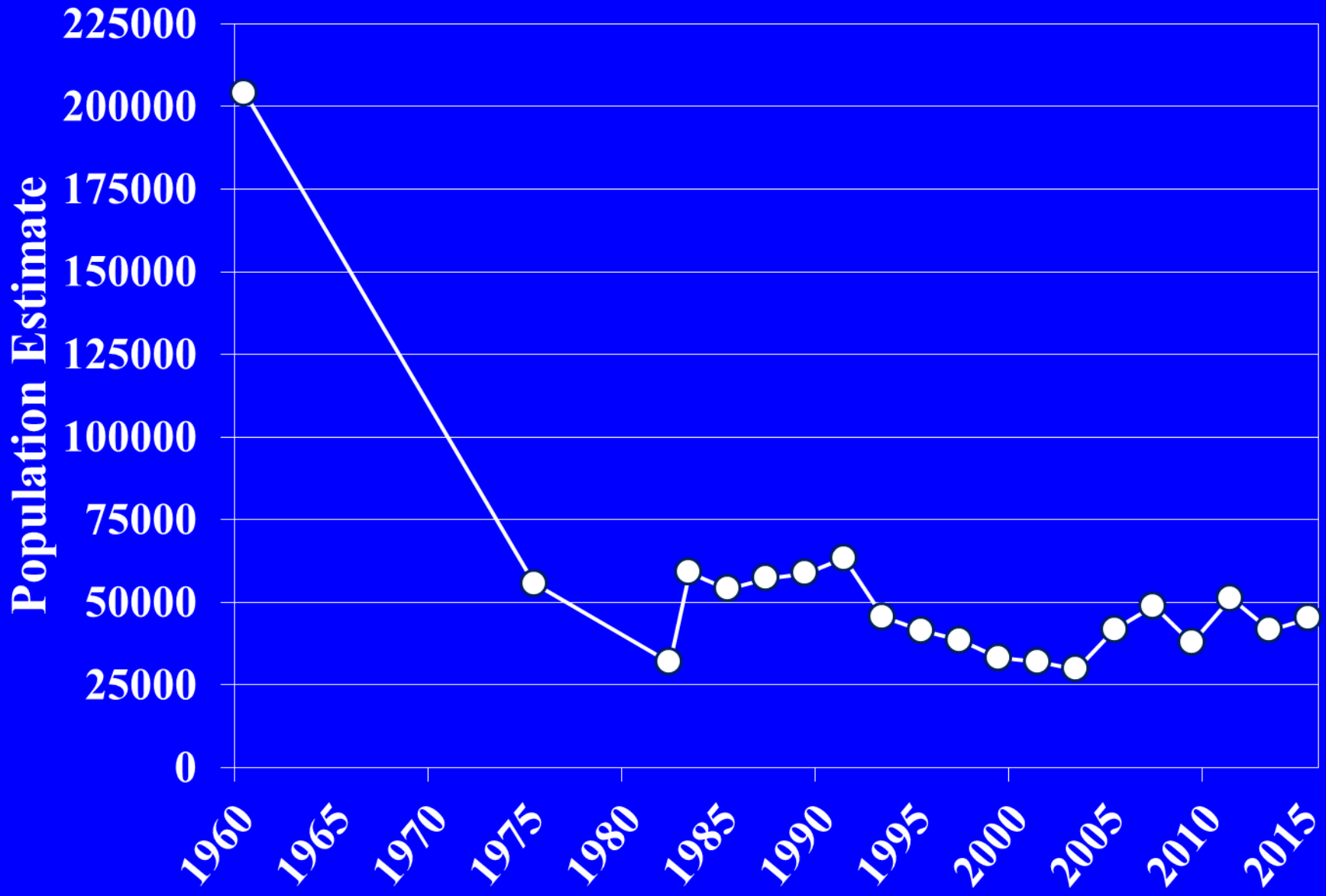
# JESSE JAMES CAVE

# COACH 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

# Indiana bat P1 hibernacula (n=6)



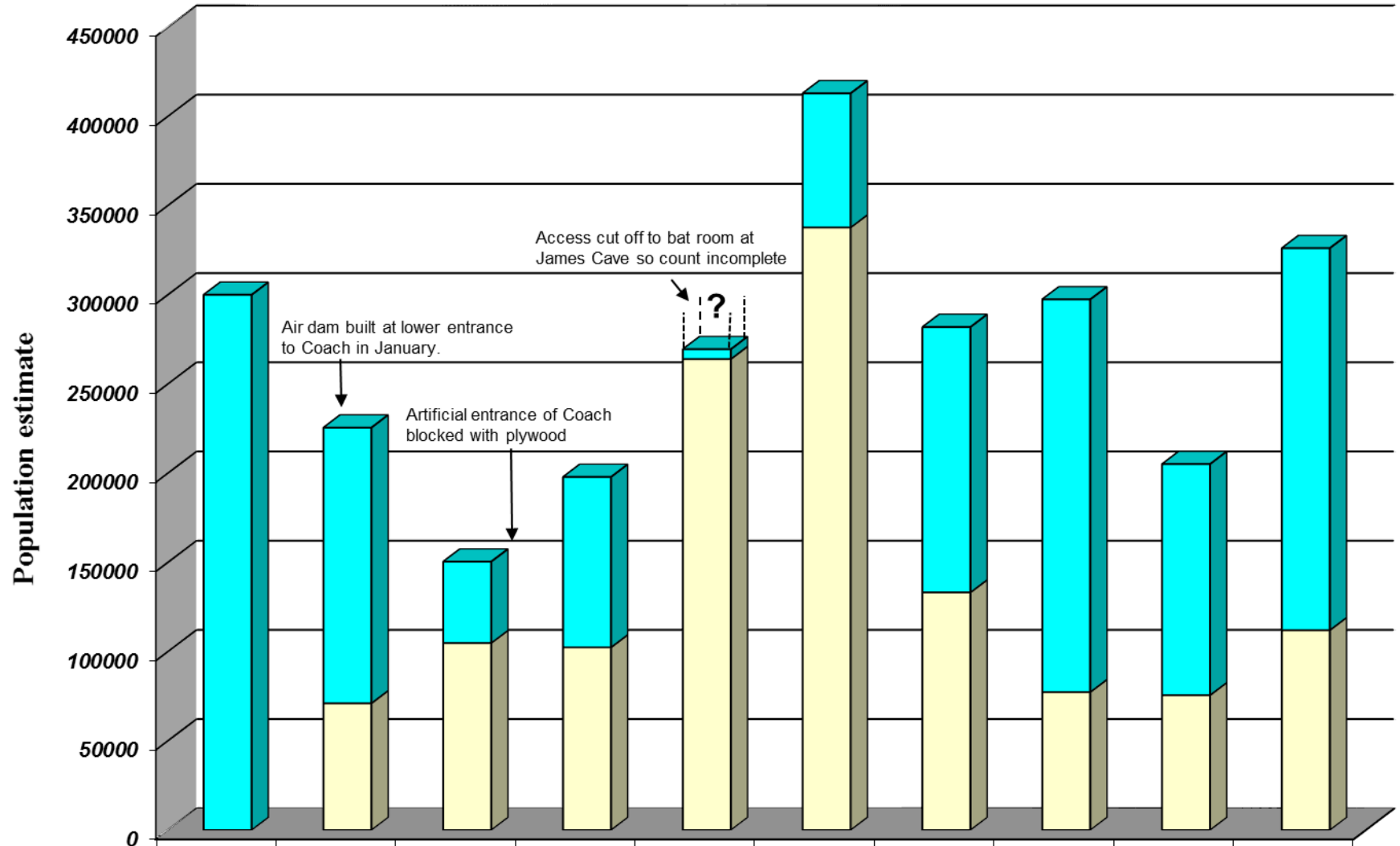
# 1980'S

- 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




| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Jesse James | 300000 | 154500 | 45600 | 95500 | 5500 | 75150 | 148750 | 220105 | 129533 | 214093 |
| Coach | 1 | 71060 | 104825 | 102400 | 264000 | 337750 | 133200 | 77324 | 75596 | 112039 |

# COACH CAVE GATE

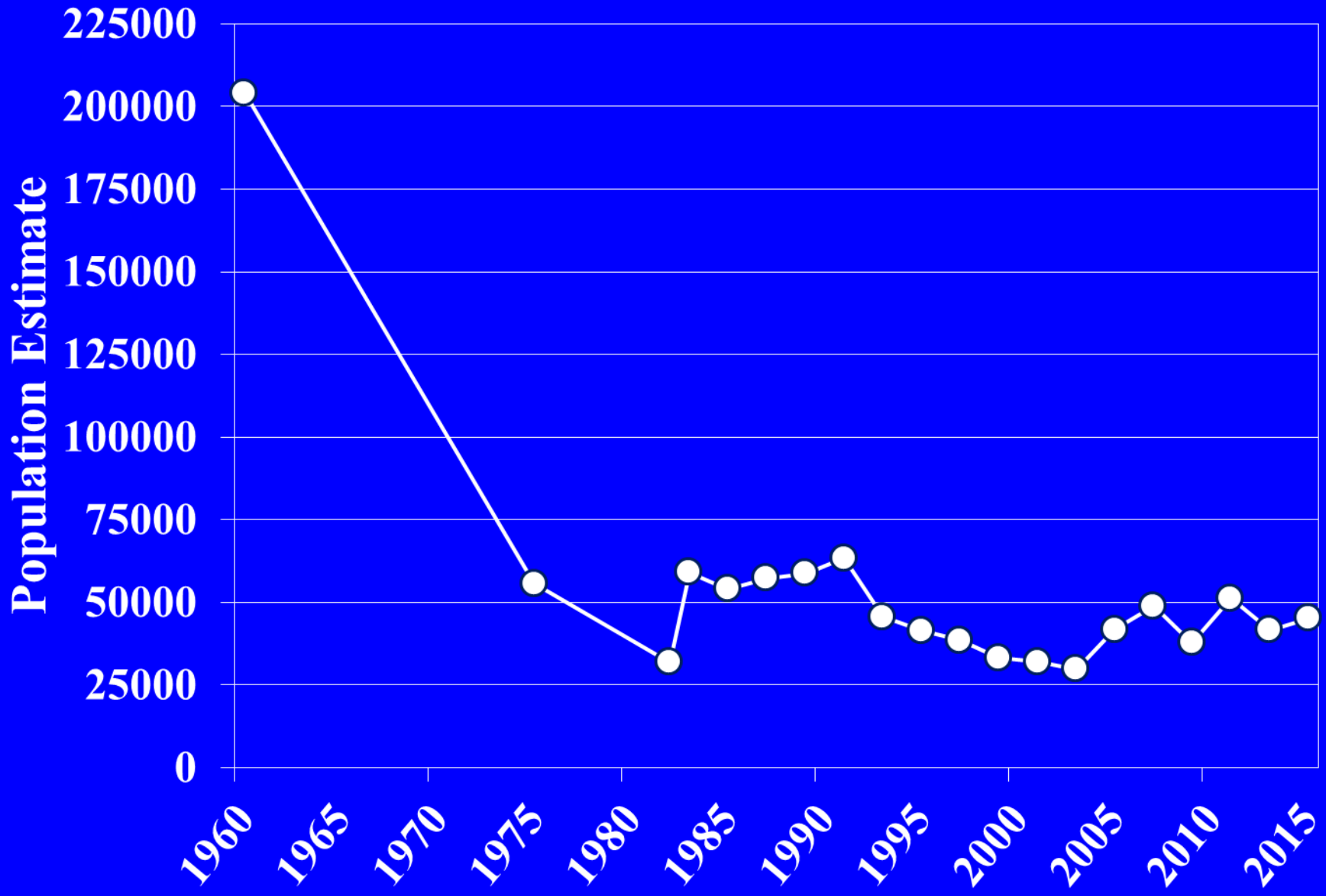
# COACH CAVE AIR DAM


NO
TRESPASSING

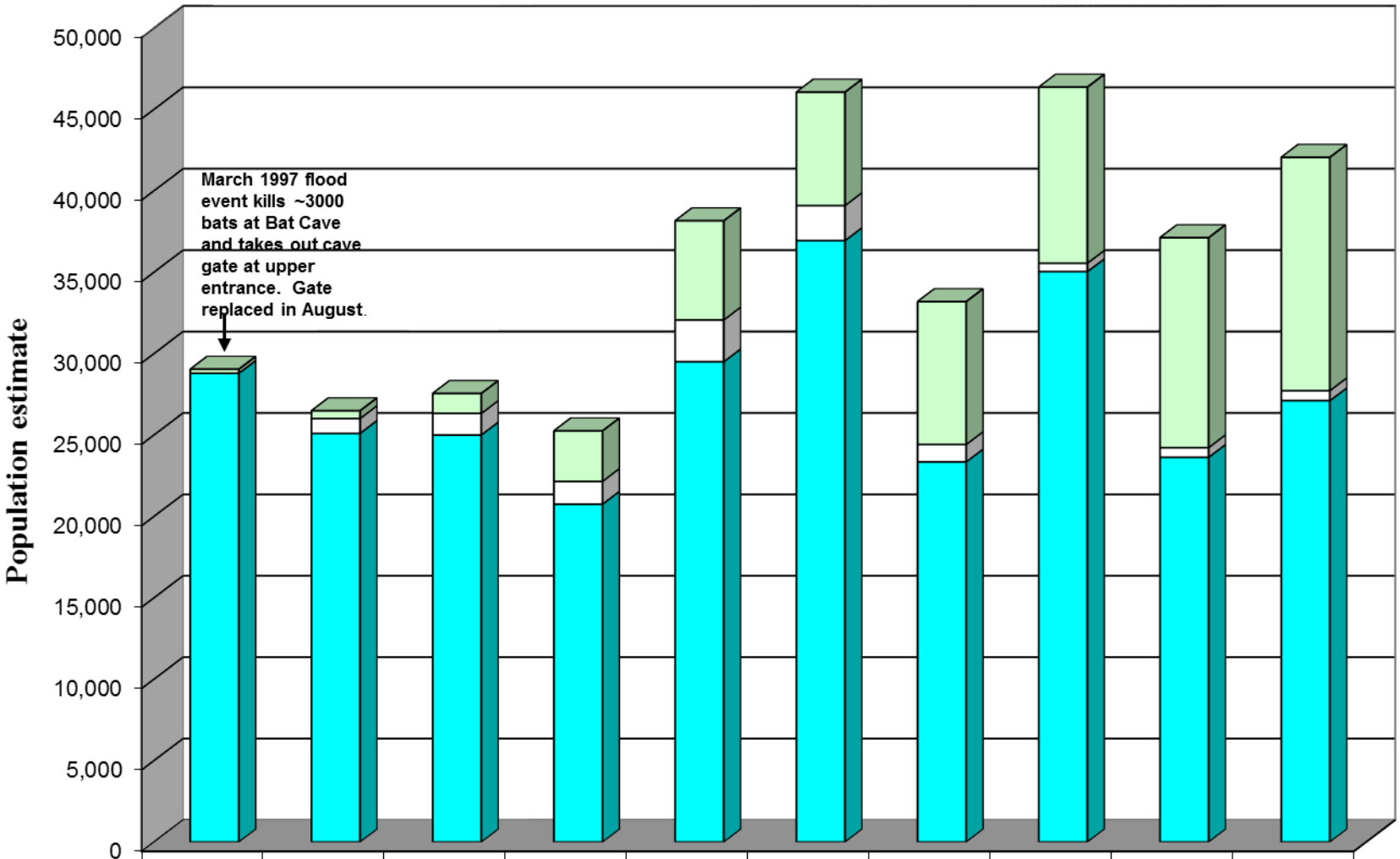
# 2000'S

- Hibernacula restoration continues
- June 2008 KFO releases the Final Biological Opinion based on the Indiana Bat Mitigation Guidance (2007)
- *Psuedogymnoascus destructans* (*Geomyces destructans*) first detected in New York
- Efforts to slow or stop the spread of WNS put into effect
  - WNS Response Plan

# Indiana bat P1 hibernacula (n=6)

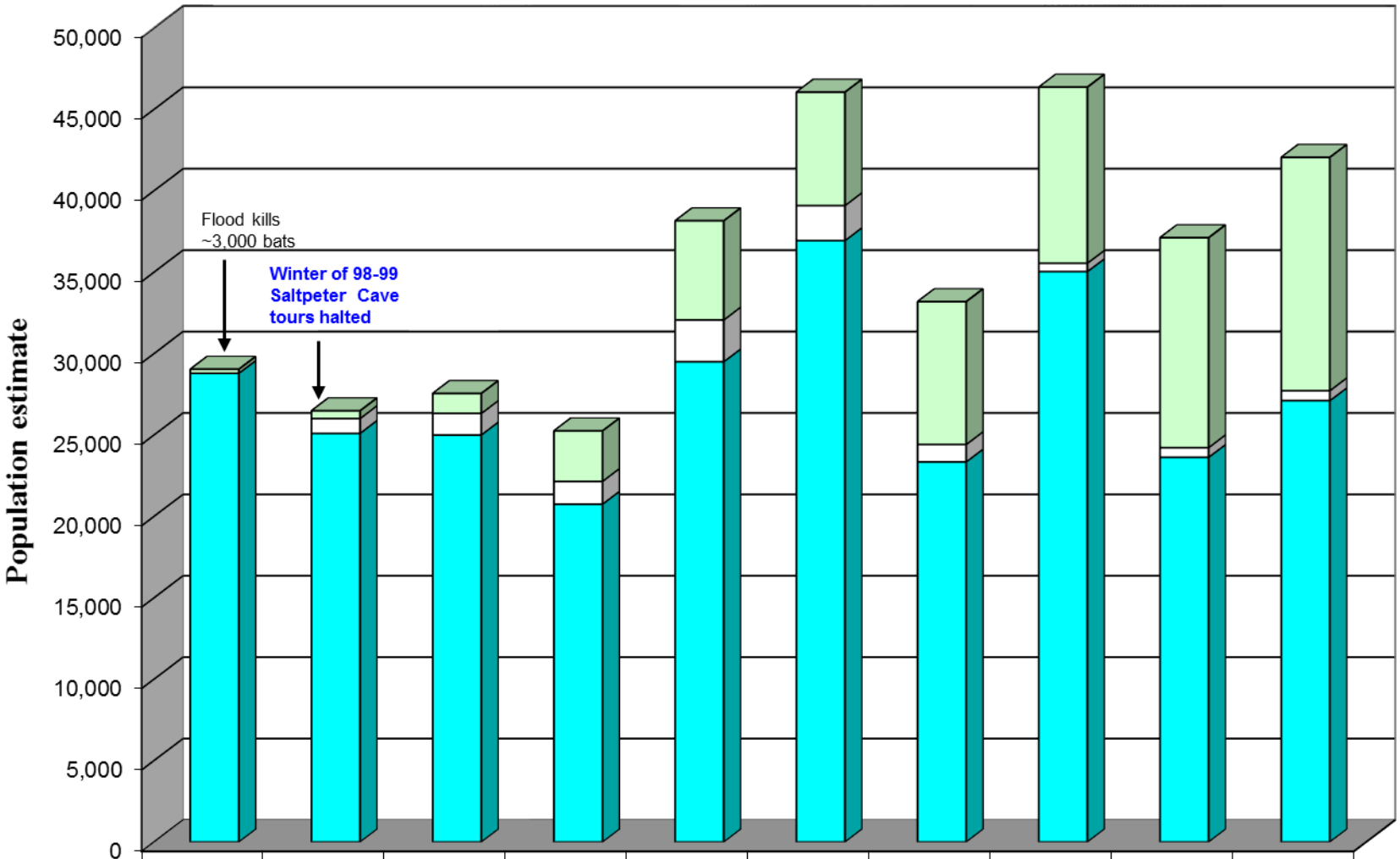


# BAT CAVE CCSRP



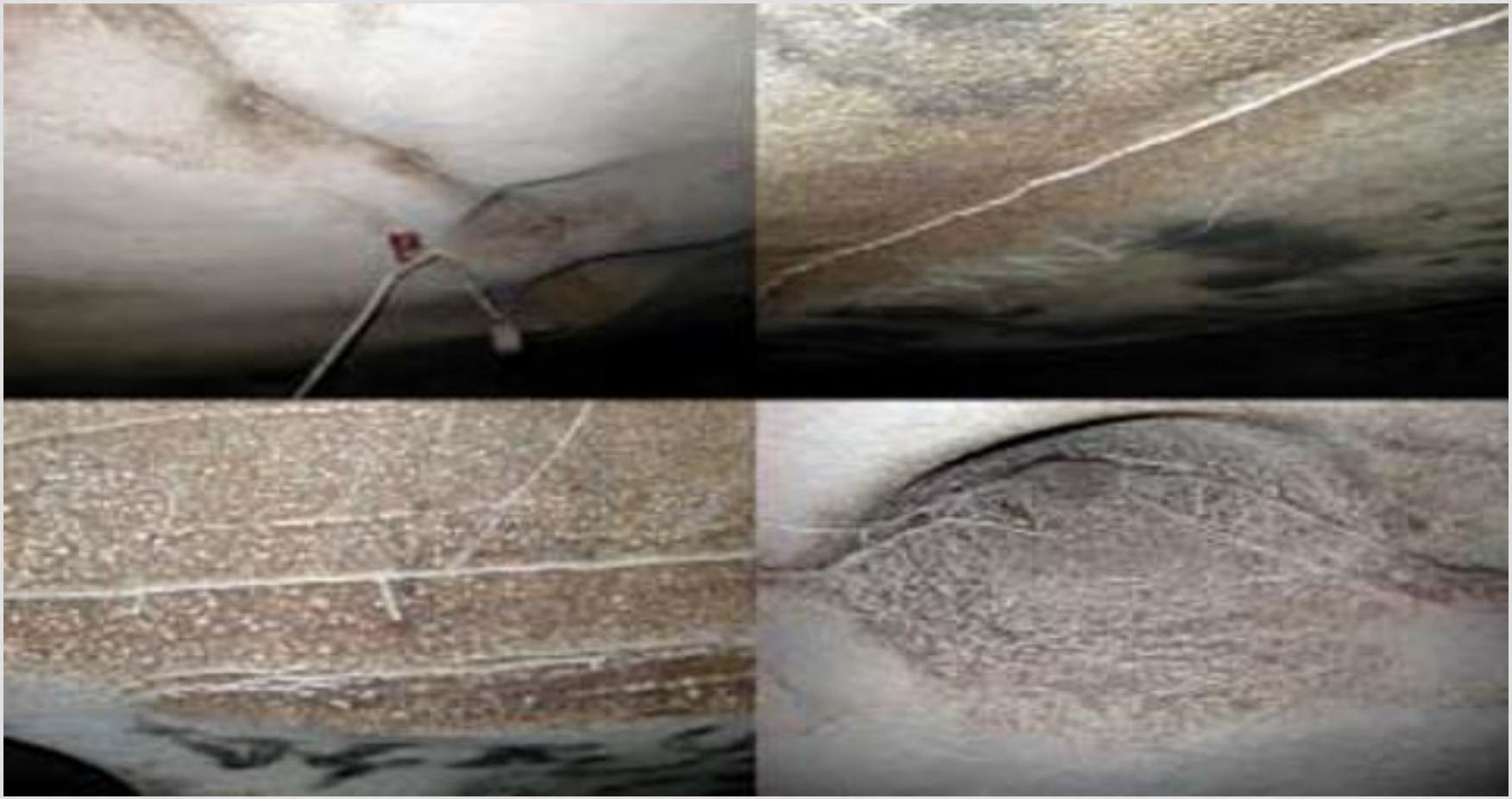

| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |

# 97’ FLOOD DAMAGE

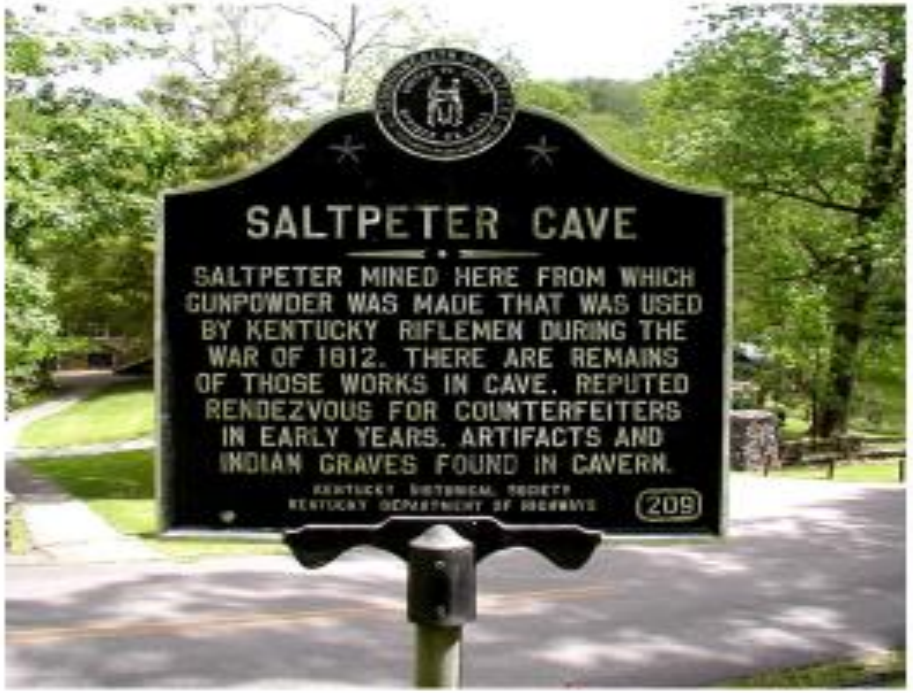


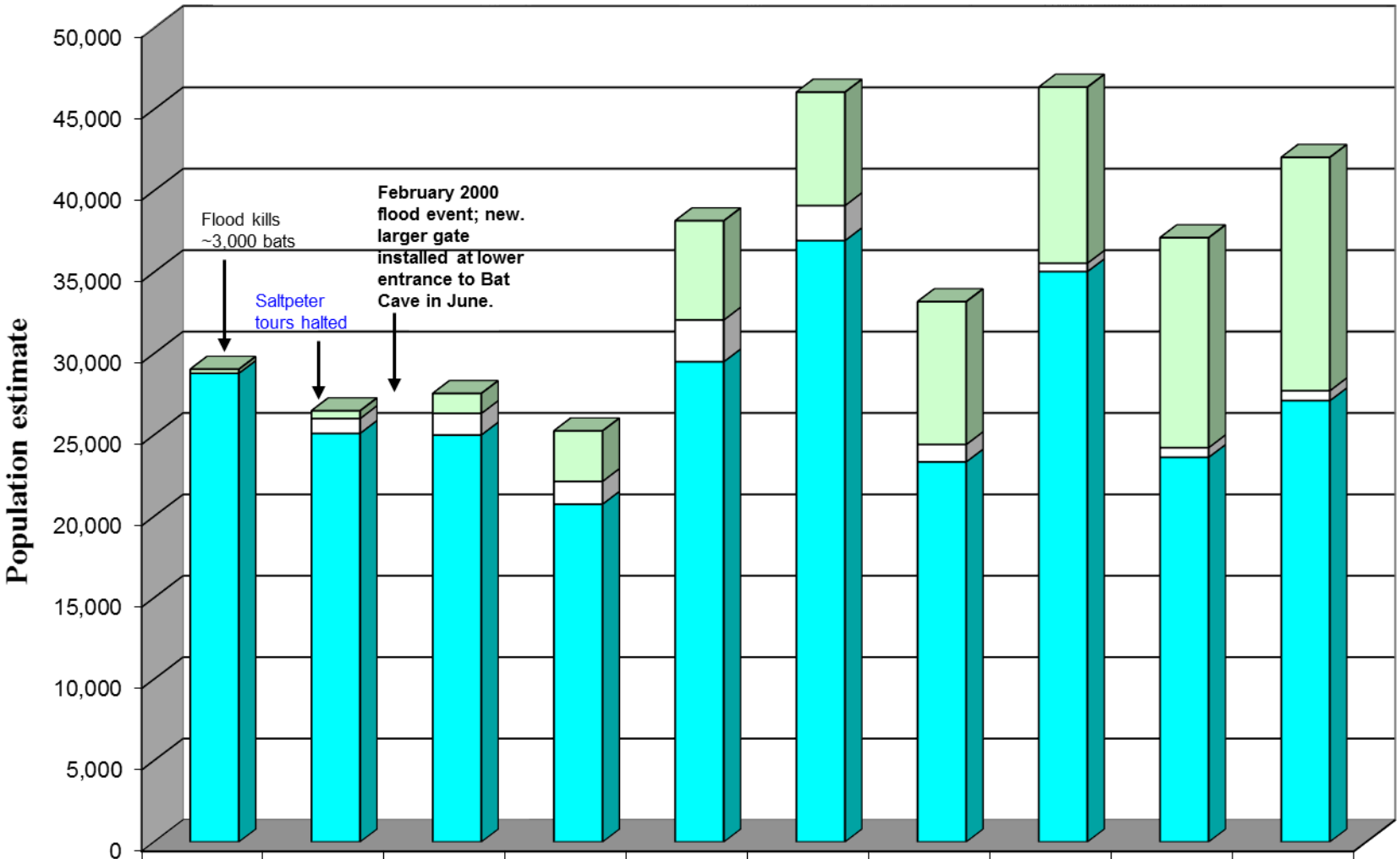

| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |

# EVIDENCE OF SIGNIFICANT USE



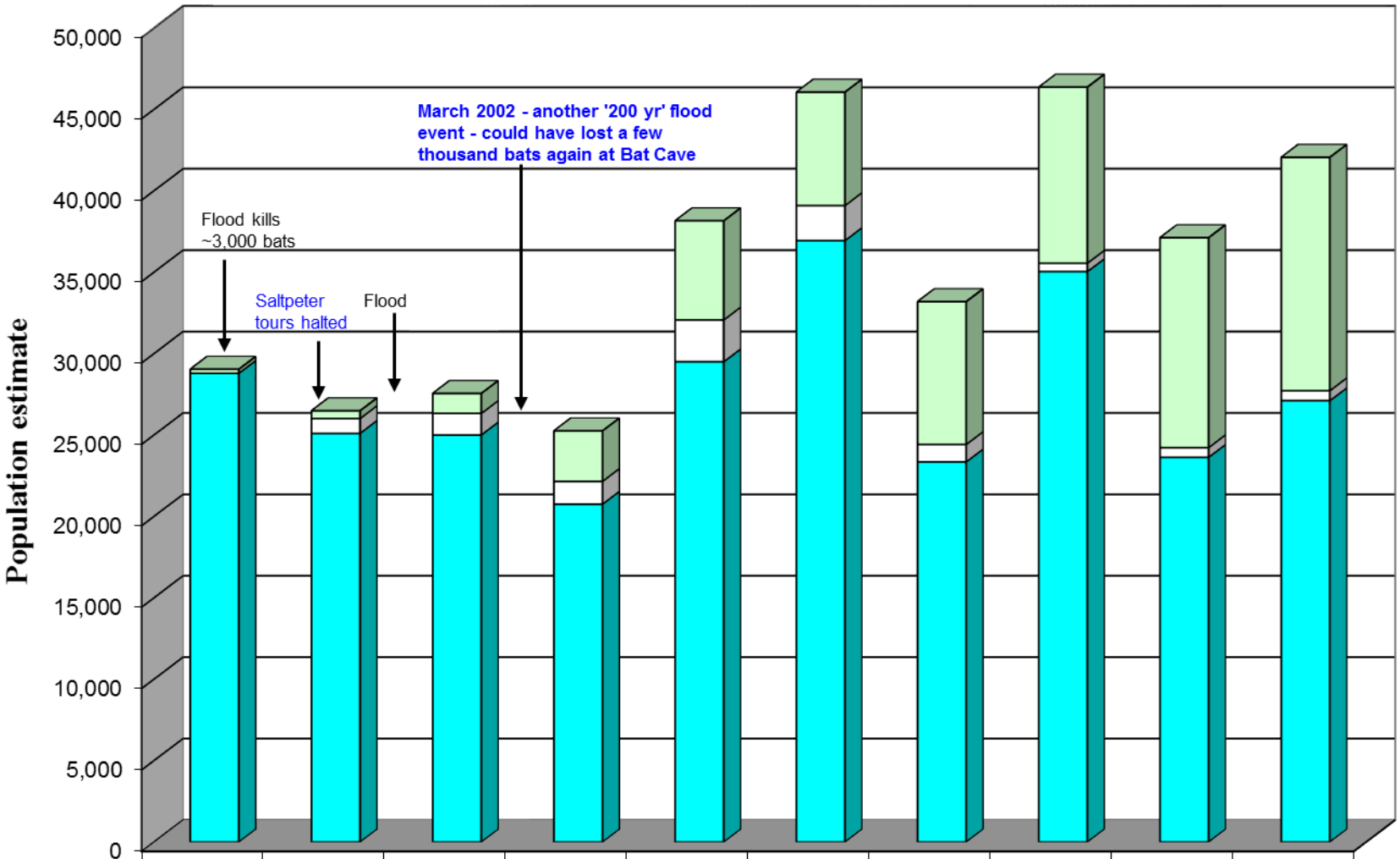
# DISTURBANCE AT SALTPETER

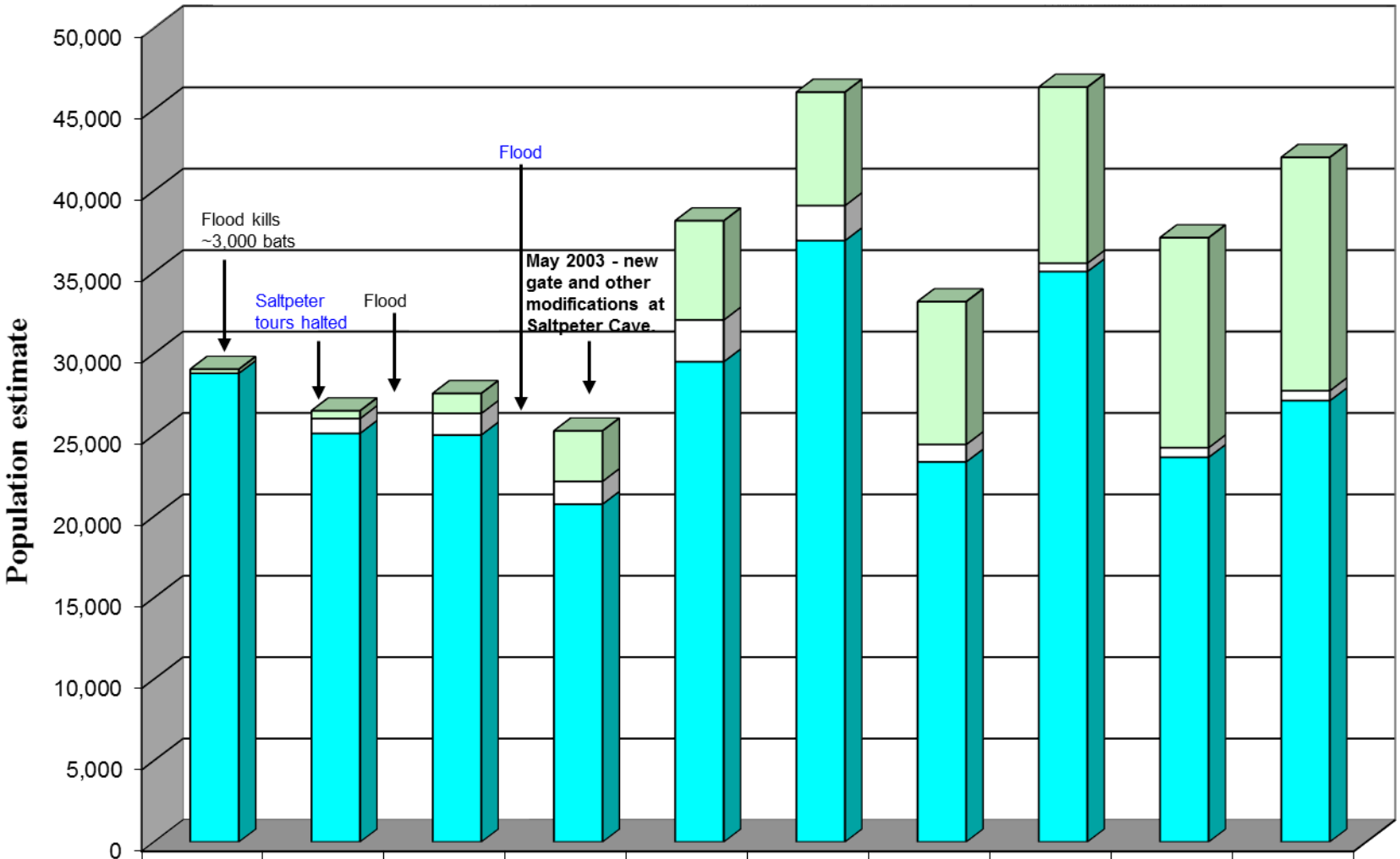



| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |

# WATER AND BATS??




| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |




| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |

# OLD SALTPETER ENTRANCE

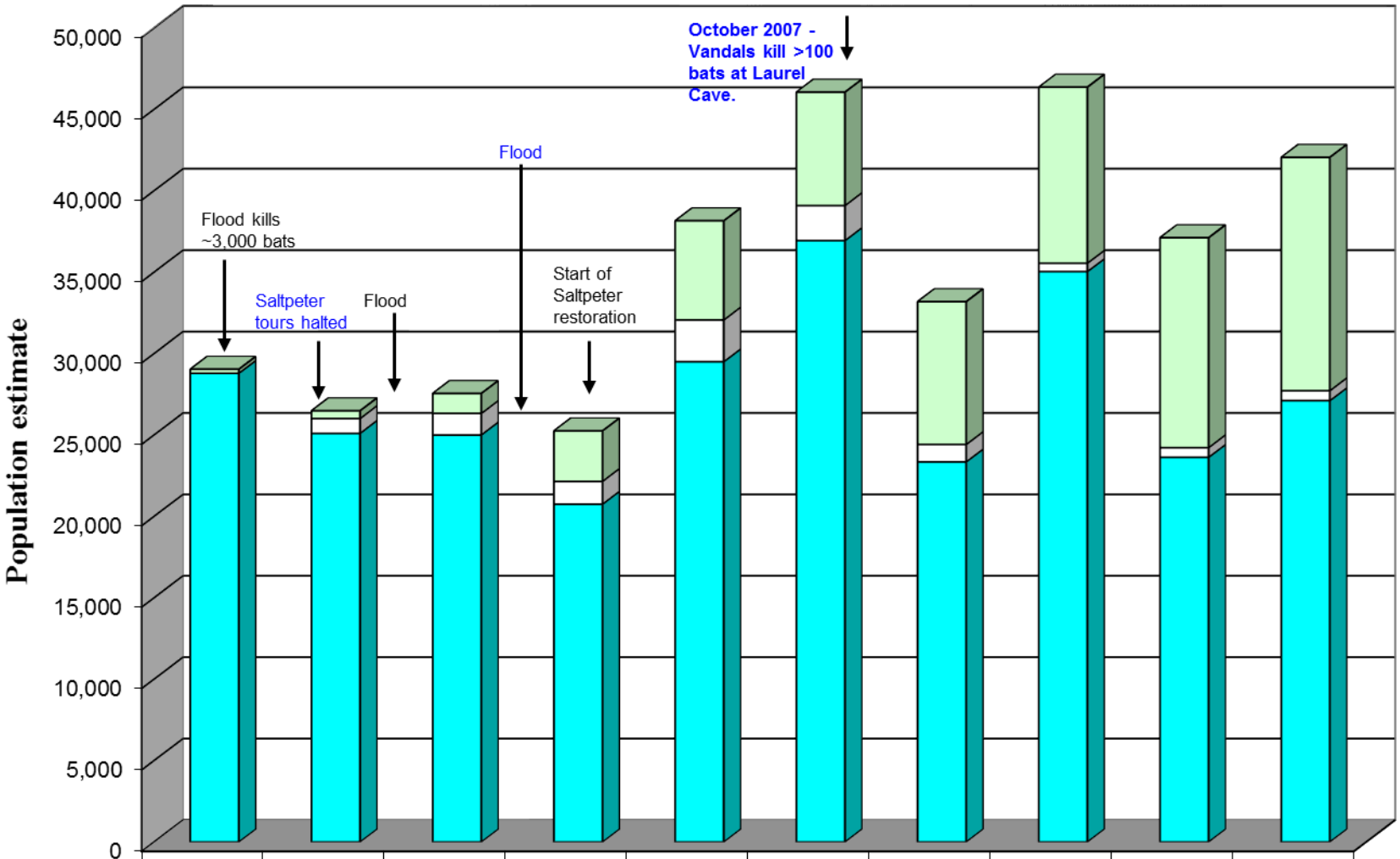
# NOT A BAT FRIENDLY DESIGN

# BAT FRIENDLY STRUCTURE

# ADDITIONAL AIR FLOW RESTORATION

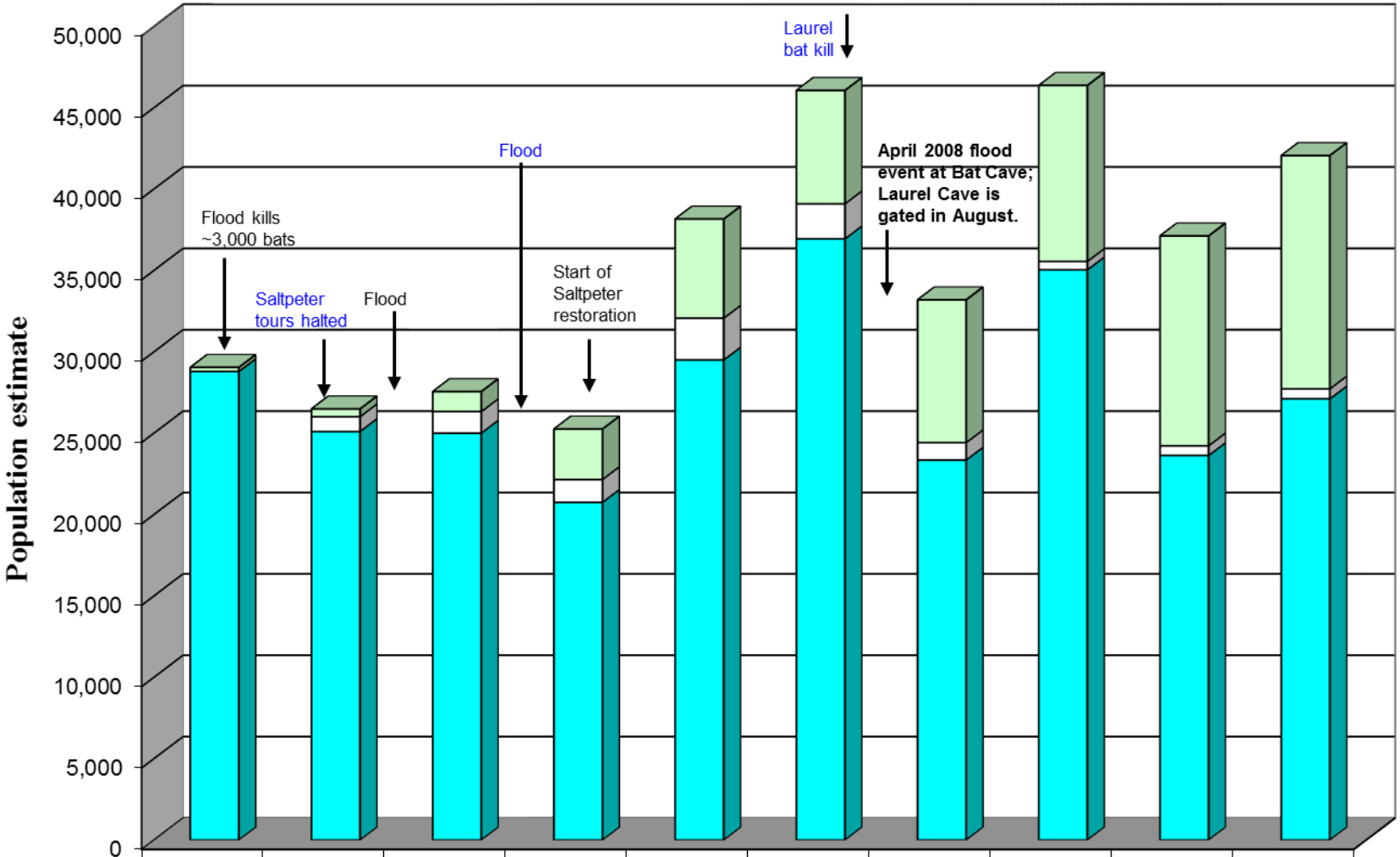
# IMPROVED AIR FLOW

# INTERNAL AIR DAM

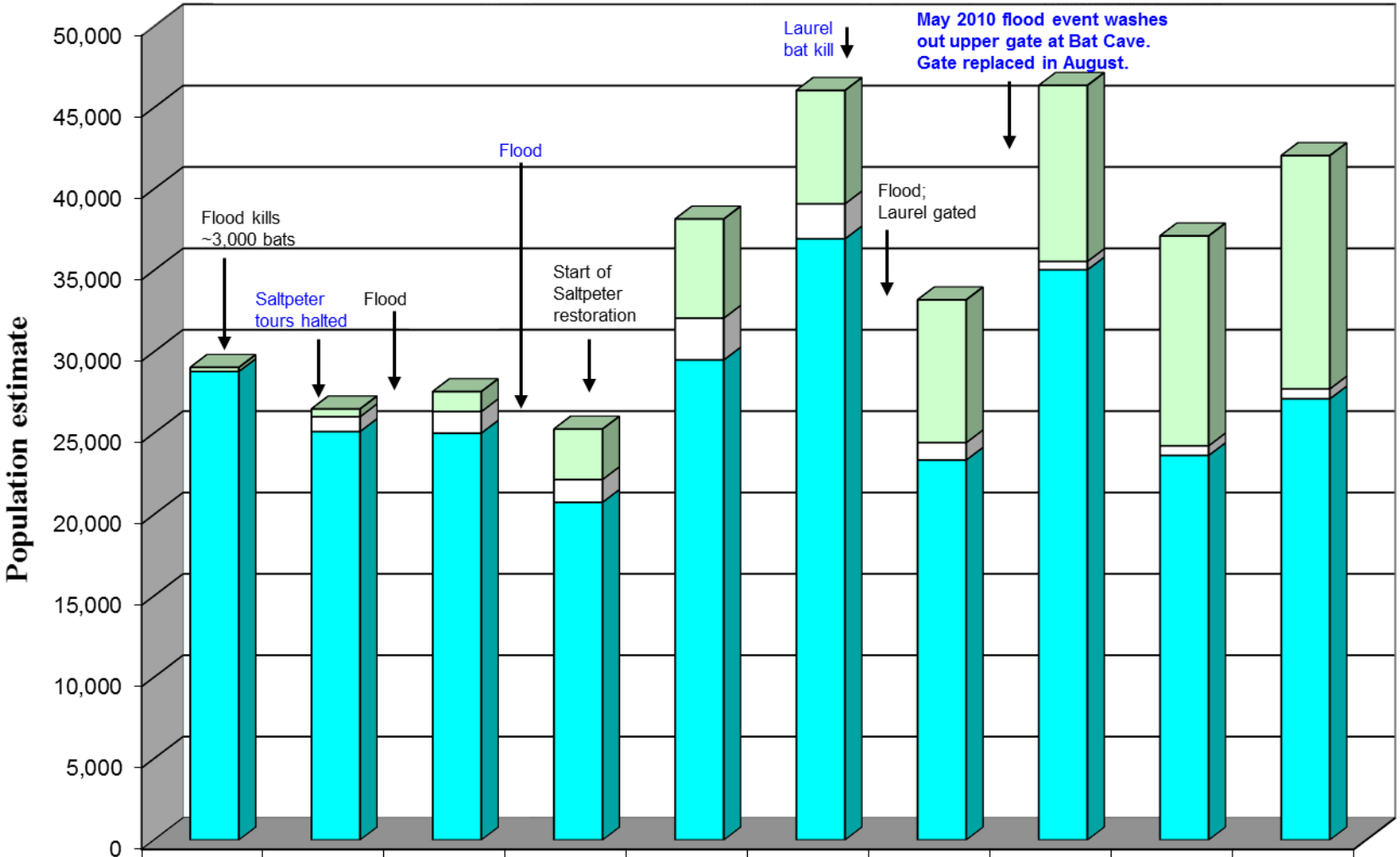



| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |

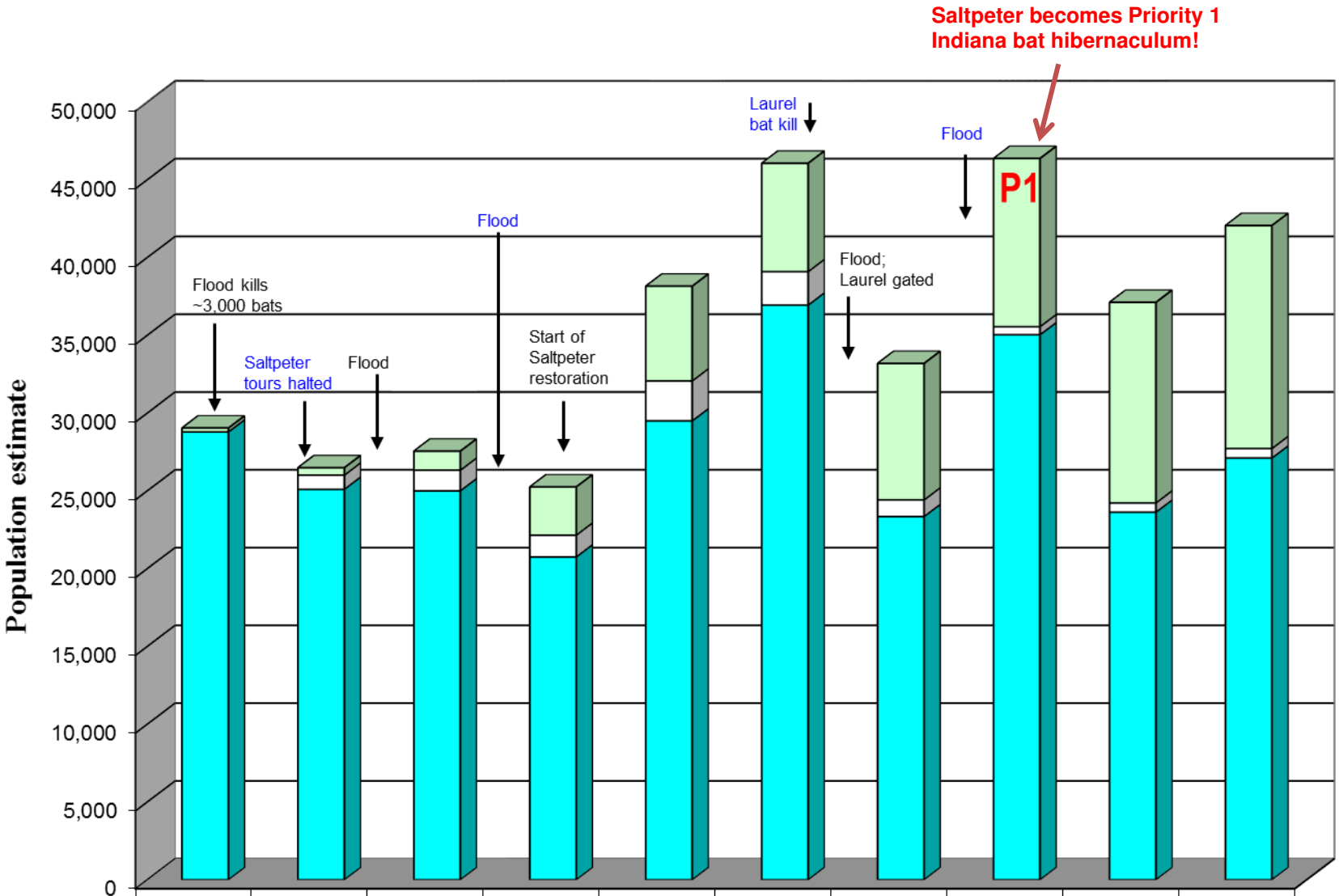
# VANDALISM



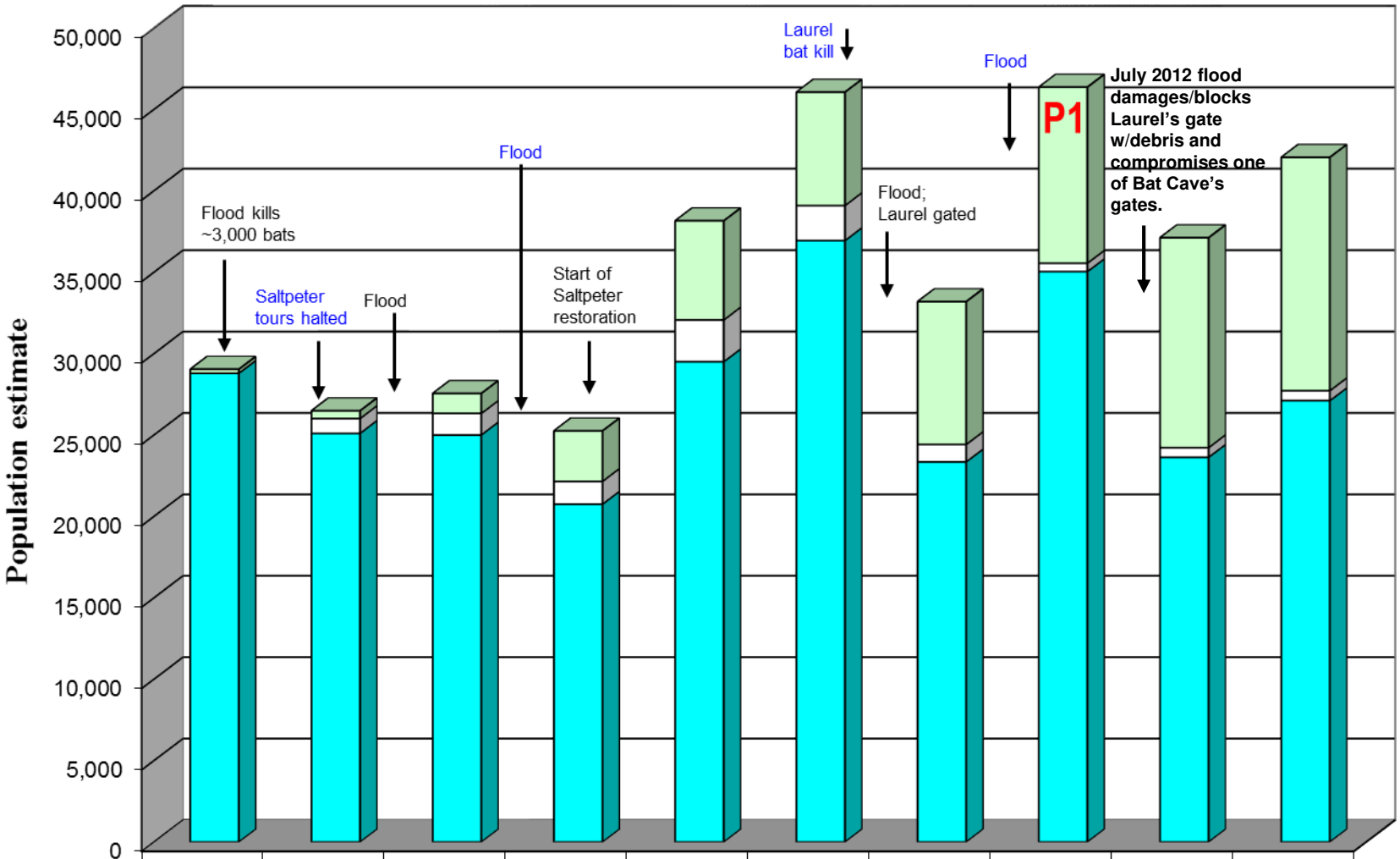

| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |




| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |

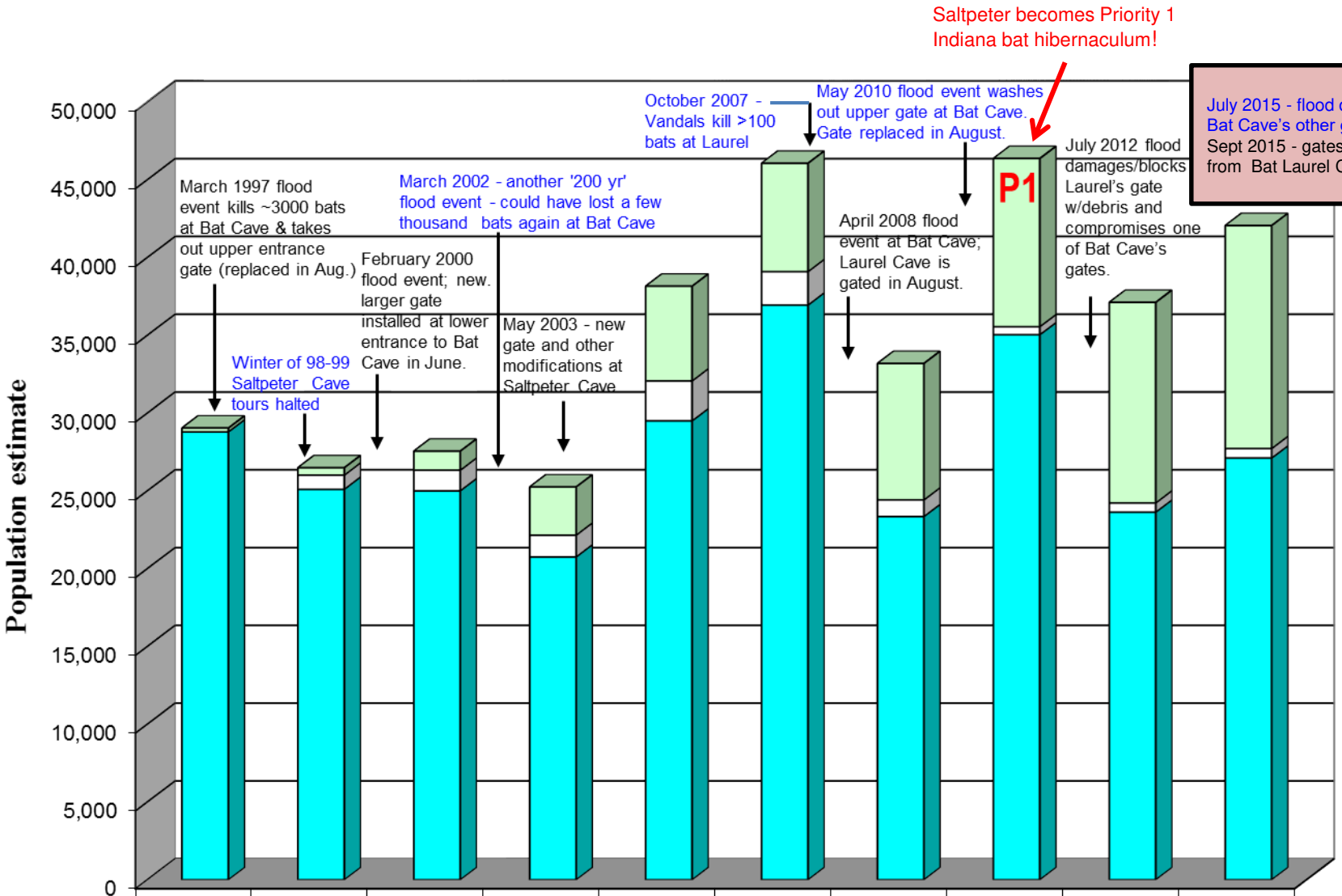



| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |



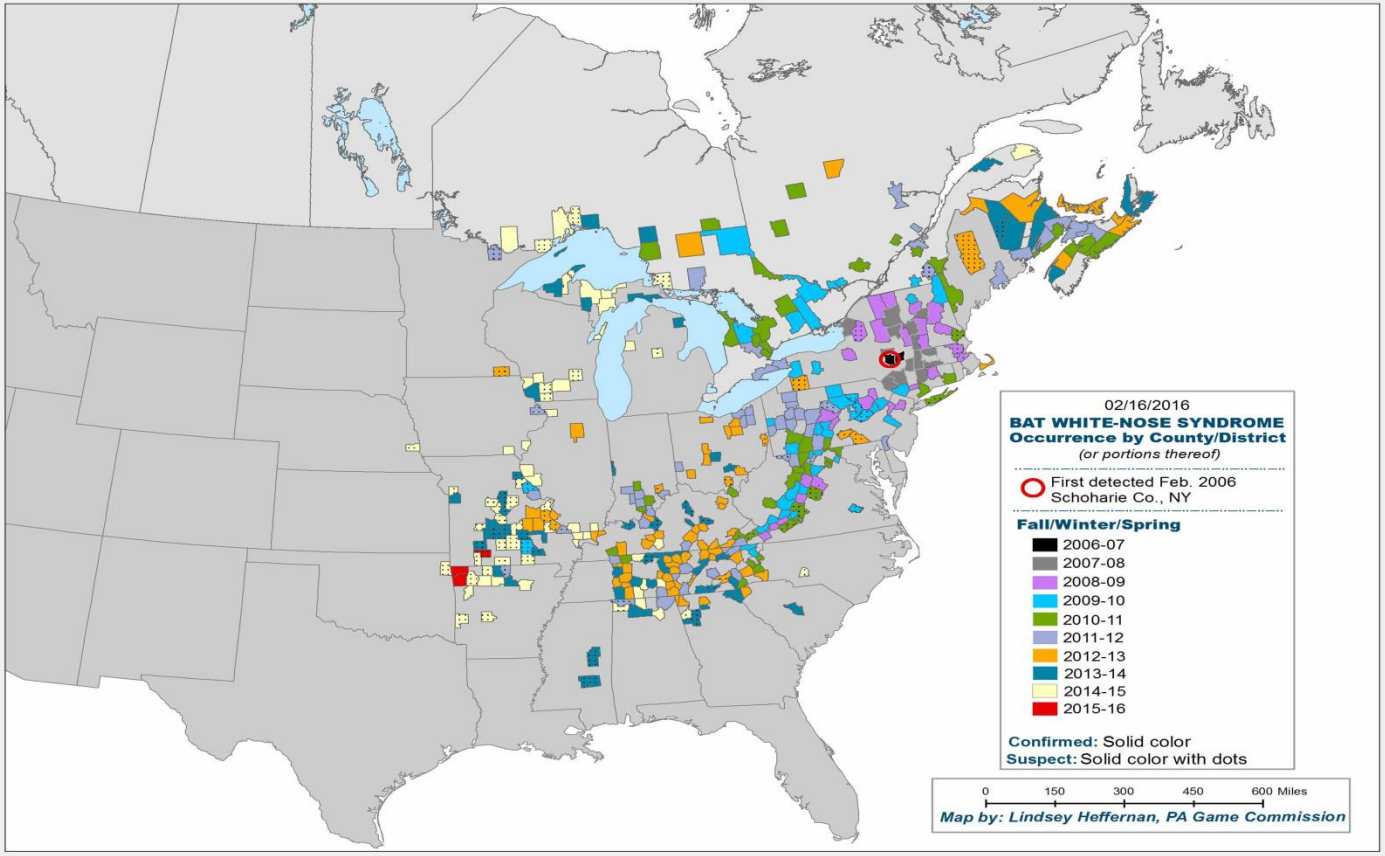

| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |


Supporting
"the Caves"




| | 1997 | 1999 | 2001 | 2003 | 2005 | 2007 | 2009 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Saltpeter | 250 (est.) | 475 | 1,225 | 3,100 | 6,088 | 6,964 | 8,773 | 10,812 | 12897 | 14337 |
| Laurel | | 912 | 1,325 | 1,400 | 2,566 | 2,150 | 1,072 | 515 | 590 | 608 |
| Bat Cave | 28,788 | 25,100 | 25,000 | 20,750 | 29,500 | 36,942 | 23,346 | 35,037 | 23631 | 27109 |

# WNS OCCURRENCE AS OF FEBRUARY 16,2016



# 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.)