Prescribed Fire and Bat Conservation

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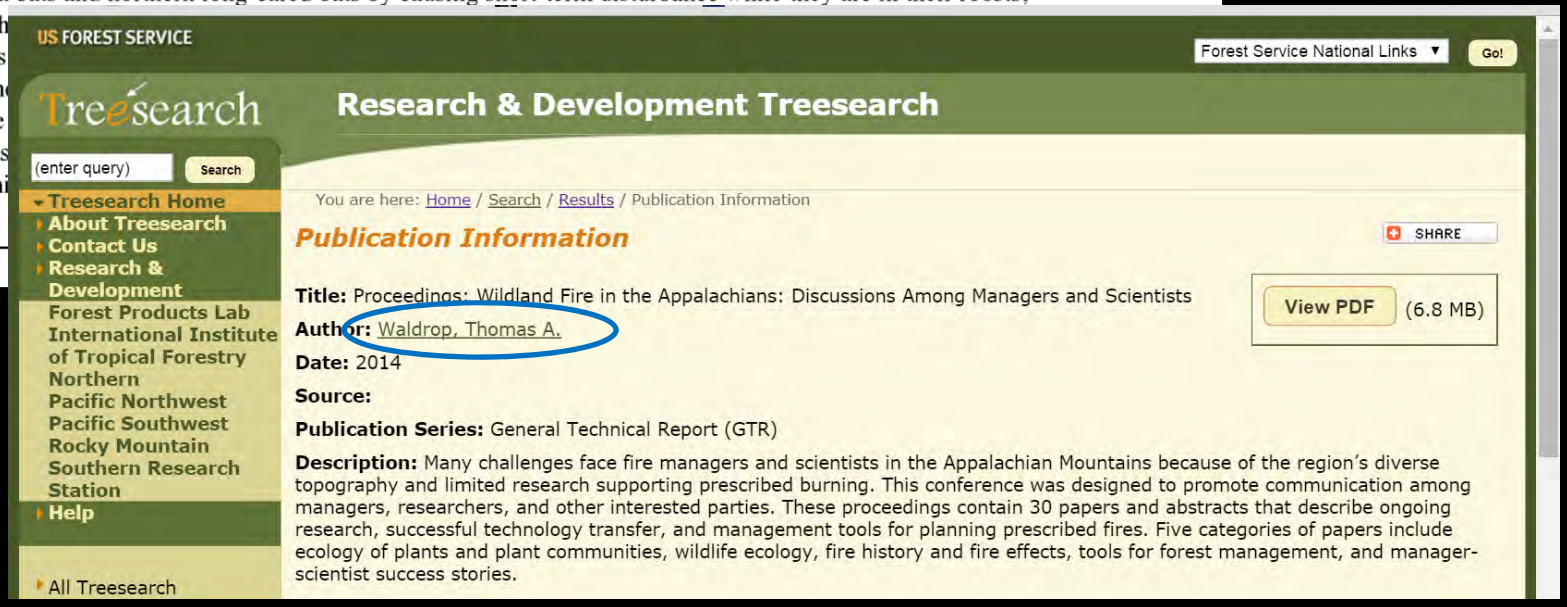
Manager bat by S. Bergeson

Refer to Loeb and O'Keefe 2014

INDIANA BATS, NORTHERN LONG-EARED BATS, AND PRESCRIBED FIRE IN THE APPALACHIANS: CHALLENGES AND CONSIDERATIONS

Susan C. Loeb and Joy M. O'Keefe[1]

Abstract—The Indiana bat (*Myotis sodalis*) is an endangered species and the northern long-eared bat (*M. septentrionalis*) has been proposed for listing as endangered. Both species are found throughout the Appalachians, and they commonly inhabit fire-dependent ecosystems such as pine and pine-oak forests. Due to their legal status, prescribed burns in areas where these species occur must be conducted to avoid harming or harassing the animals, and managers must consider the effects of their prescribed burning programs on these species. We review what is known about the potential positive and negative impacts of prescribed fire on Indiana and northern long-eared bats throughout their life cycles. Prescribed fire may affect Indiana bats and northern long-eared bats by causing short-term disturbance while they are in their roosts, and this may impact th
phase. Prescribed fires
Indiana bats and north
prescribed fire may be
their preferred habitats
of prescribed fire withi



Six Grams of Grief?

Indiana bat (*Myotis sodalis*)

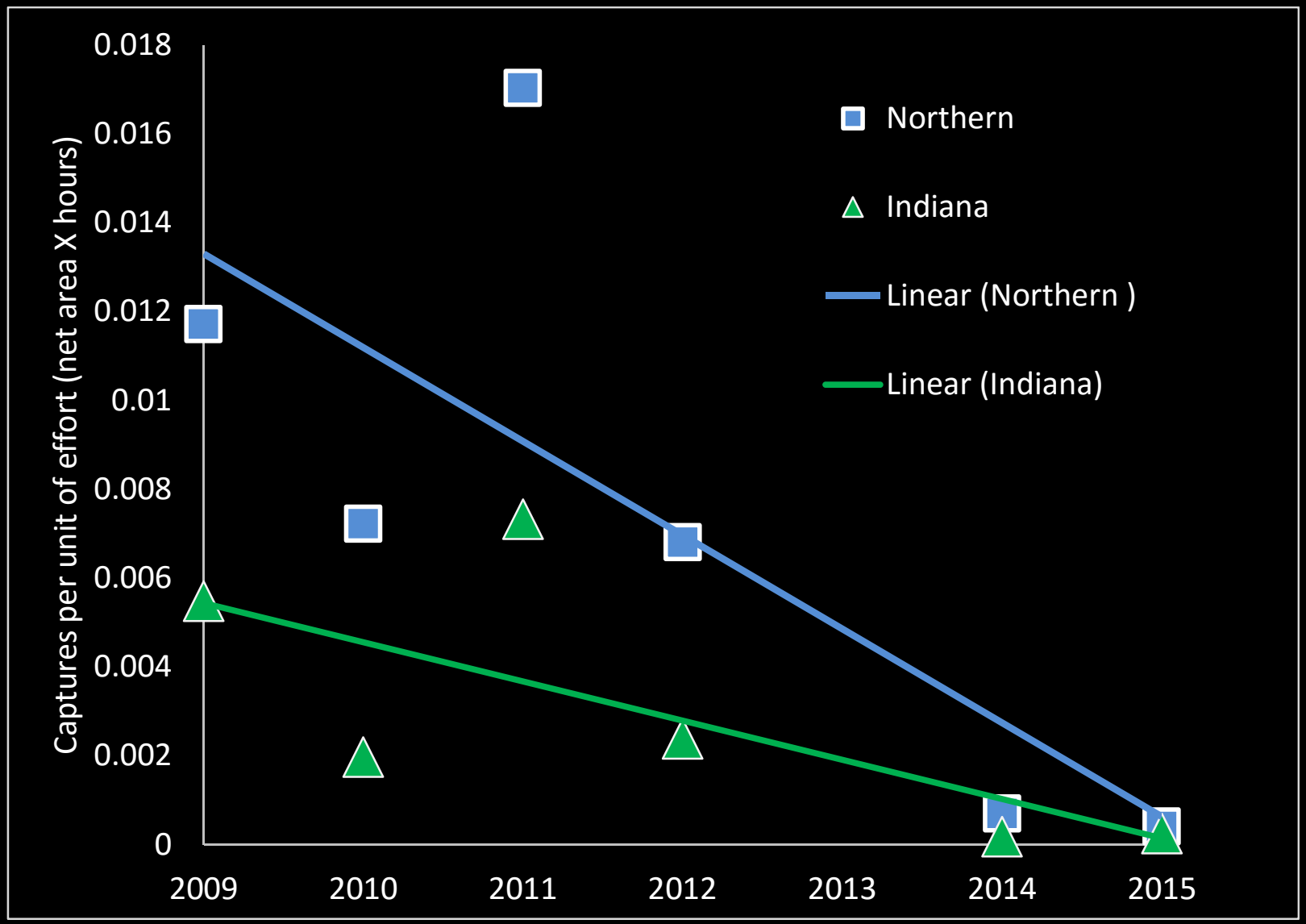
Northern long-eared bat
(*Myotis septentrionalis*)

Bat Populations are Declining!

- Catastrophic declines (>90% for Indiana bat and northern long-eared bat in some areas)

O'Keefe et al., in progress

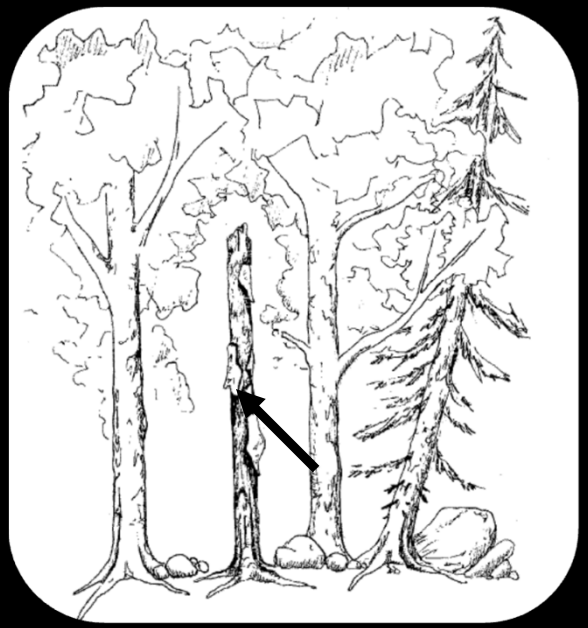
Myotis Declines in Smoky Mtns



Bat Populations are Declining!

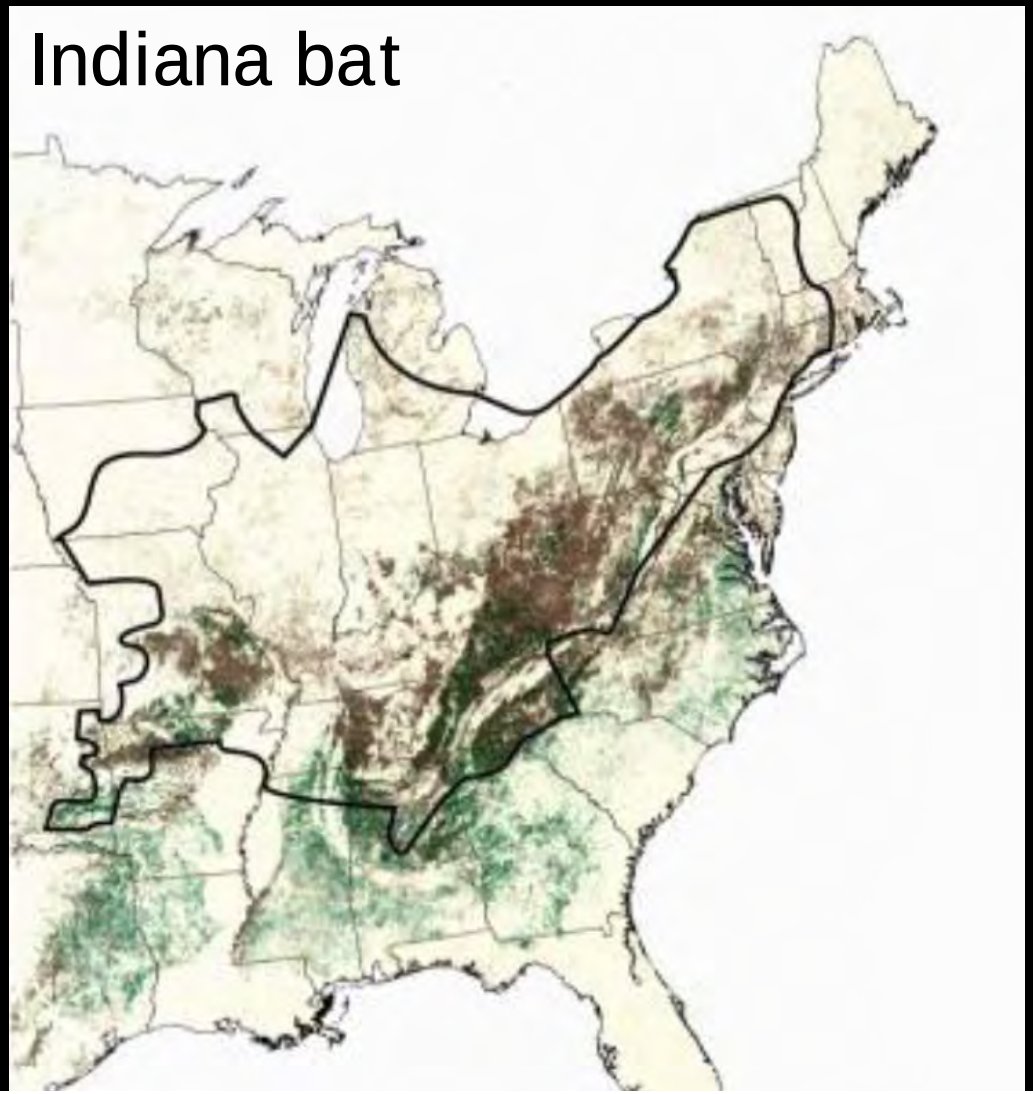
- Catastrophic declines in the Smokies (>90% for Indiana bat and northern long-eared bat)

- Smaller "colony" sizes will translate to differences in roosting habits
  - Smaller roosts & different thermoregulatory strategies?



O'Keefe et al., in progress

Endangered *Myotis* Overlap with Fire-Adapted Ecosystems

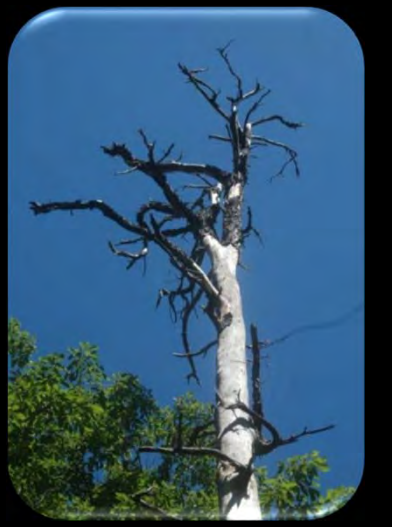


Endangered *Myotis* Overlap with Fire-Adapted Ecosystems

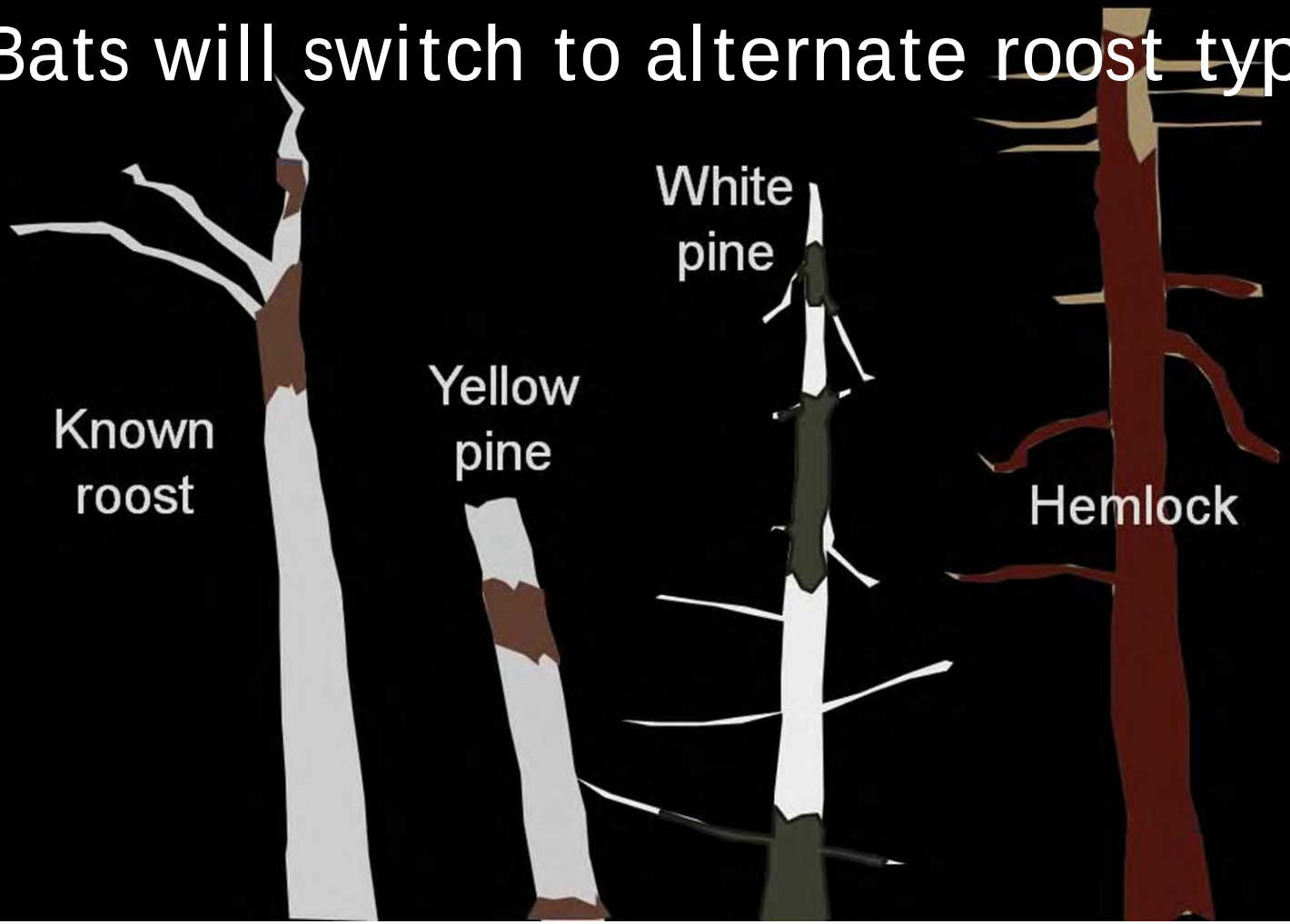
Pines are Important…

- In east TN/western NC, 64% of Indiana bat roosts are in dead yellow pines (mainly shortleaf)
- In Arkansas:
  - 71% of Northern roosts are dead shortleaf pines
  - 29% of male Indiana bat roosts are shortleaf pine (in fall)

Perry and Thill 2007
Perry, in review
O'Keefe and Loeb, in prep



- Suitable yellow pine snags less common
- May take 200-300 years to grow large yellow pines
- Bats will switch to alternate roost types



Concern about potential for "take" affects fire policy

"Take" = any action that may result in the harassment, harm, pursuit, wounding, or collection of an endangered species, where harm can include habitat modification

Potentially harmful management actions include timber harvest and fire

Potential direct and indirect effects of fire on Indiana bats

Direct (short-term)

- Kill bats at roost in caves or trees
- Immediate loss of critical roosting habitat
- Ear burns during intense fires
- Waste energy reserves in response to fire
- Predation risk from daytime flight to escape fire

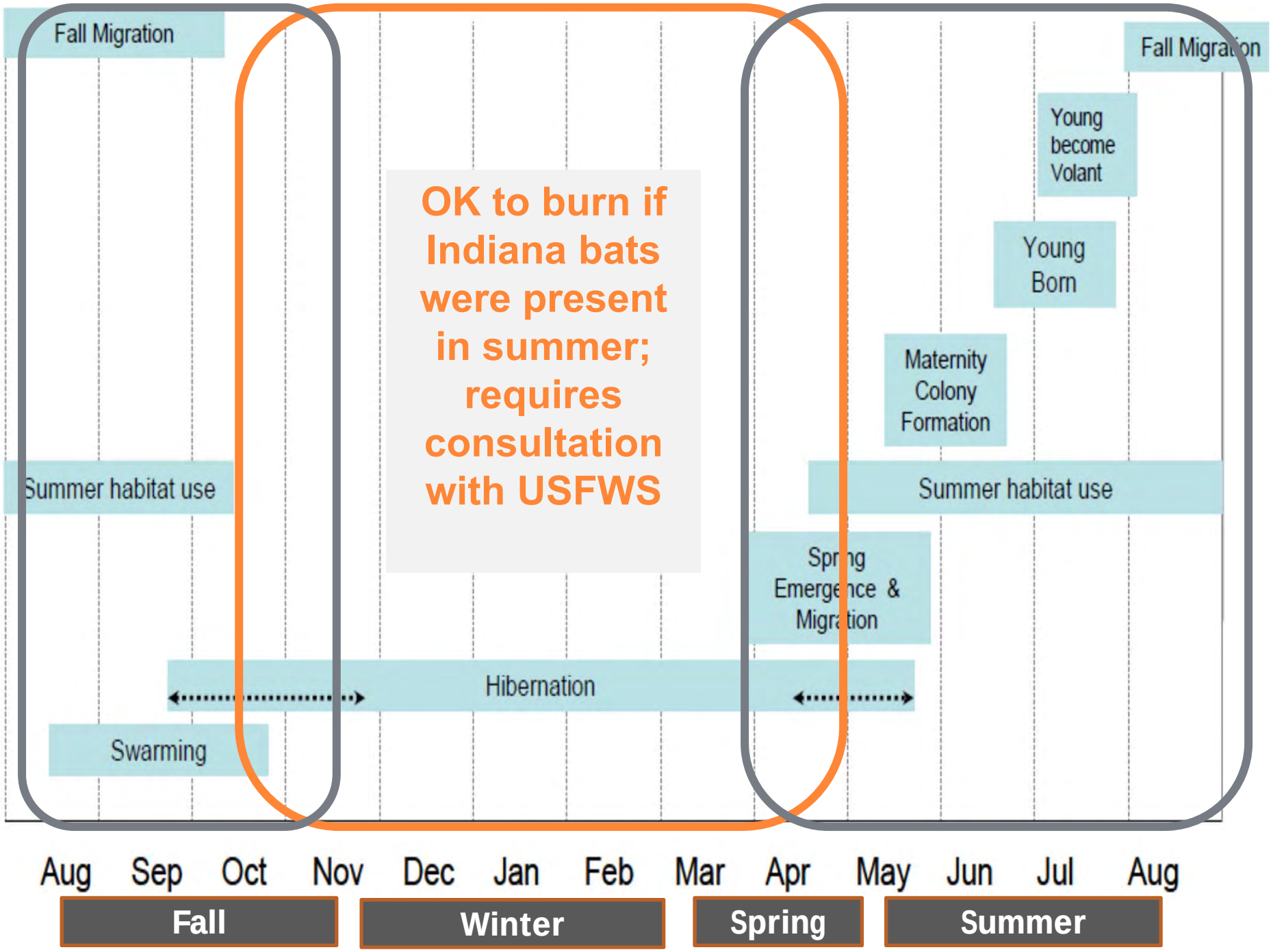
Potential direct and indirect effects of fire on Indiana bats

Direct (short-term)

- Kill bats at roost in caves or trees
- Immediate loss of critical roosting habitat
- Ear burns during intense fires
- Waste energy reserves in response to fire
- Predation risk from daytime flight to escape fire

Indirect (long-term)

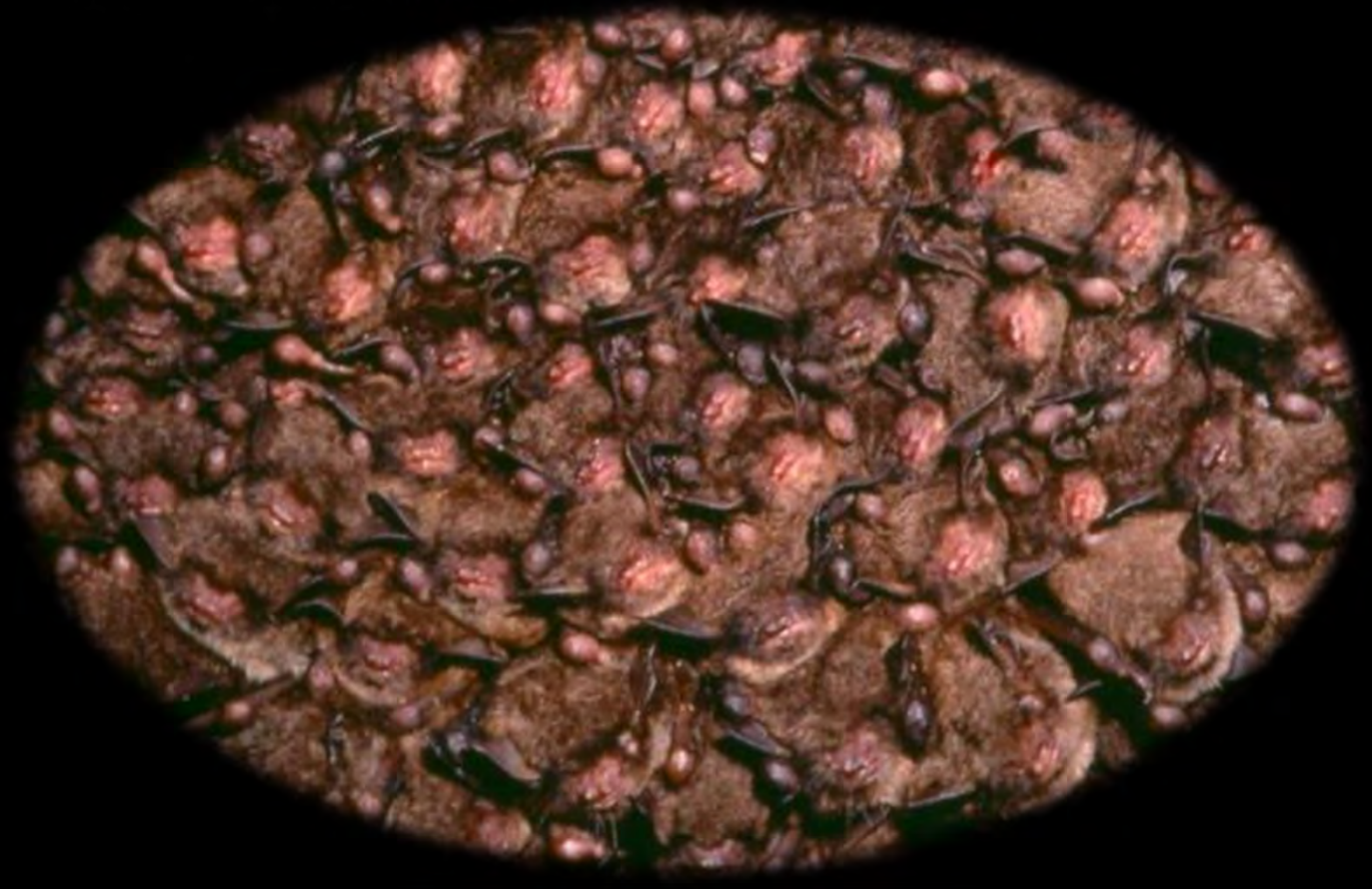
- Destroy roosting habitat, which is typically snags
- Destroy foraging habitat, if fire is severe
- \+ Create roosting habitat
  - \+ Pines & oaks
  - \+ Large & small snags
  - \+ Open conditons
- \+ Create foraging habitat
  - \+ Open conditions
  - \+ Insect pulses
- \+ Reduce wildfire risk


Fall Migration
Fall Migration
Young become Volant
Young Born
Maternity Colony Formation
Summer habitat use
Summer habitat use
Spring Emergence & Migration
Hibernation
Swarming
OK to burn if Indiana bats were present in summer; requires consultation with USFWS
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Fall
Winter
Spring
Summer

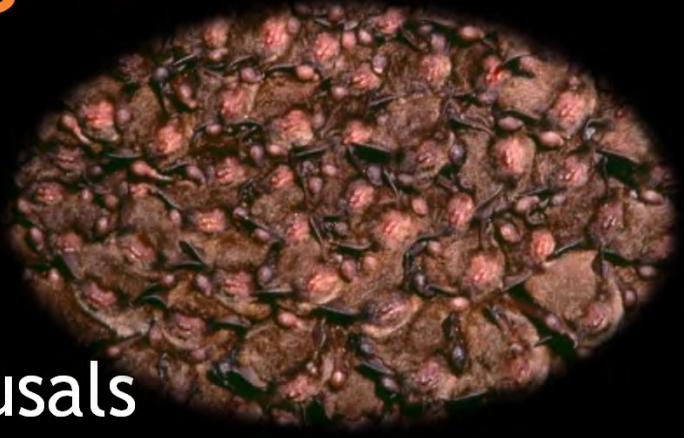
Annual Life Cycle of *Myotis* Bats

Four important phases:

1. Winter hibernation



Fire Effects During Winter



- Smoke effects
  - May be noxious
  - Or may cause additional arousals
- Avoid burning when atmospheric conditions might draw smoke into caves
  - Mammoth Cave NP has successfully burned very near Indiana bat hibernacula

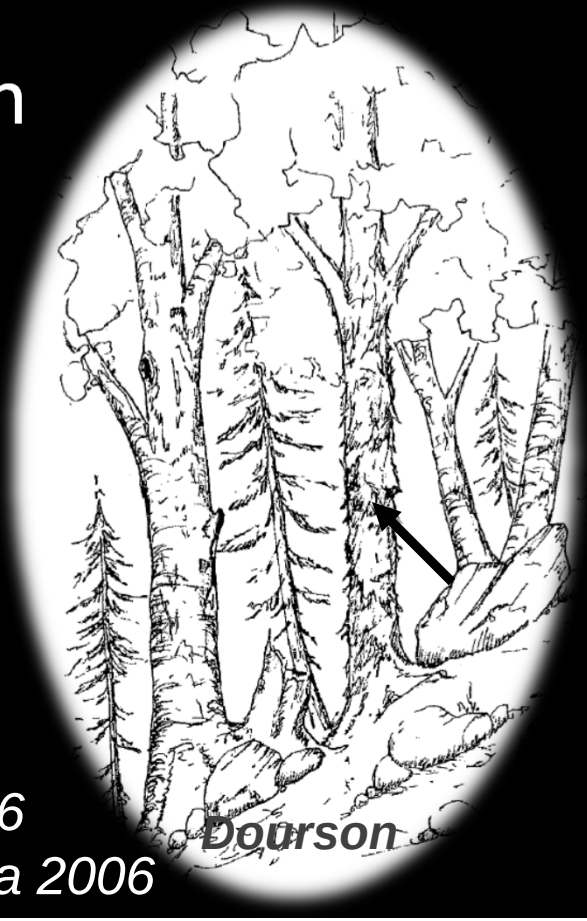
Dickinson et al. 2009
Caviness 2003

Annual Life Cycle of *Myotis* Bats

Four important phases:

1. Winter hibernation
2. Spring emergence & migration

(northern long-eared bat)

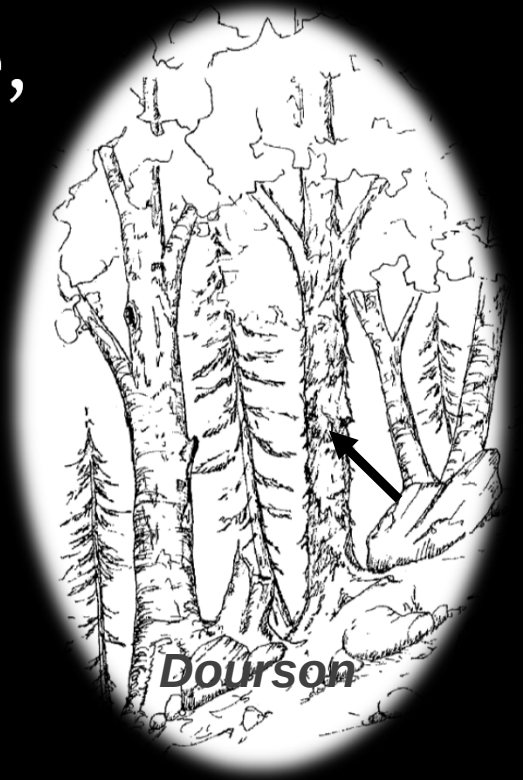


Dourson

Britzke et al. 2006
Gumbert 2001
Willis et al. 2006
Winhold & Kurta 2006

Fire Effects in Spring

- May harass, harm, or wound bats at roost
- May affect roosting or foraging habitat
  - Effects could be positive, negative, or neutral
- Burning on warm days or in late afternoon may enable quick response by bats
  - Northern bats left roost in 10 min when fire lit at ~16:45 in KY

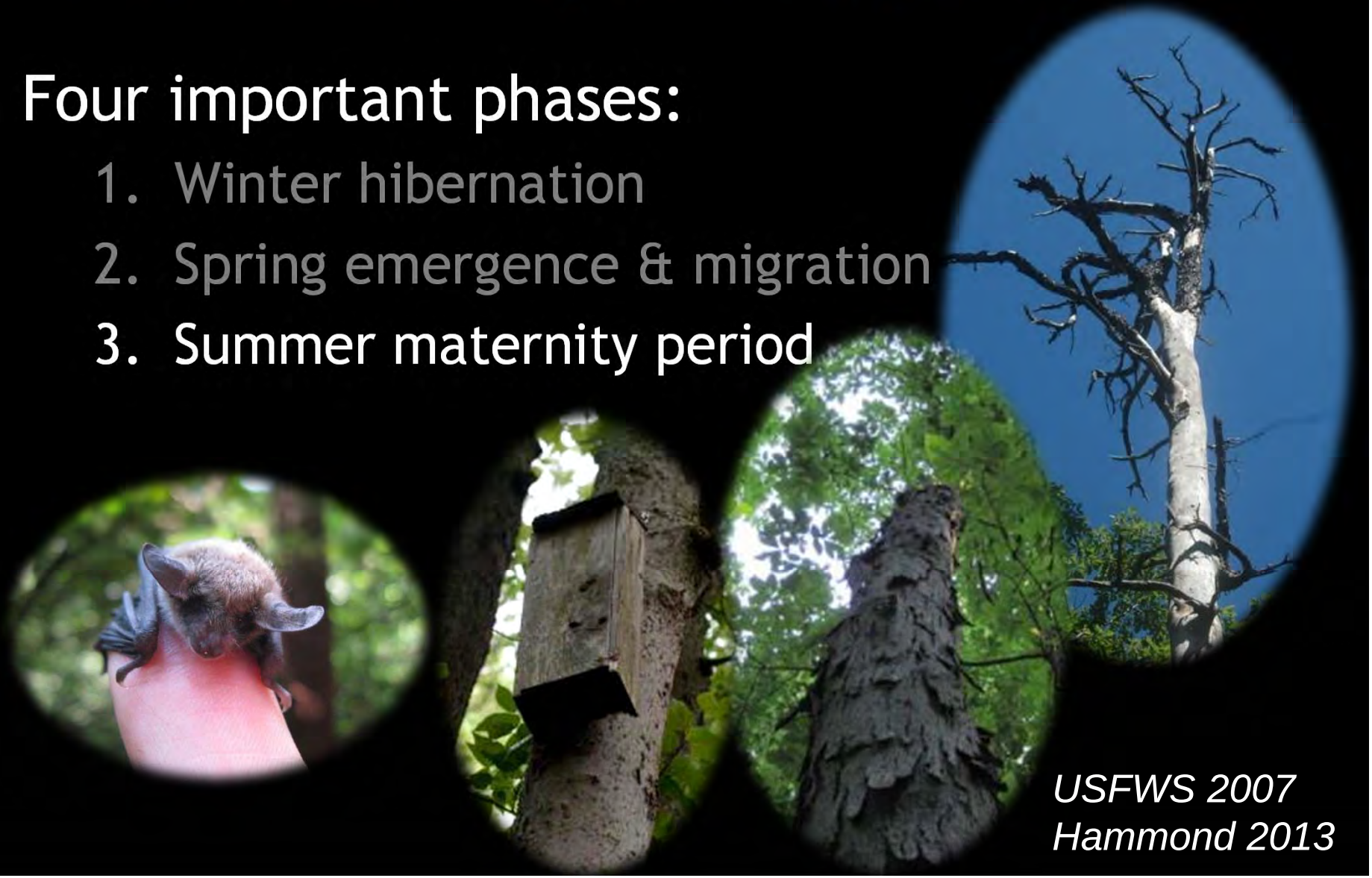


Dickinson et al. 2009
Layne 2009

Annual Life Cycle of *Myotis* Bats

Four important phases:

1. Winter hibernation
2. Spring emergence & migration
3. Summer maternity period



USFWS 2007
Hammond 2013

Fire Effects in Summer

- Growing season burns often prohibited
- Indirect effects from burns outside growing season
  - Loss of large snags in some burns
  - May create new snags over longer term
  - Could promote optimal forest types
    - Oak and pine woodlands
  - Could create open conditions good for roosting & foraging
    - Oak and pine savannahs?

Bagne et al. 2008
Gumbert 2001
Johnson et al. 2010
O'Keefe, in prep.

Annual Life Cycle of *Myotis* Bats

Four important phases:

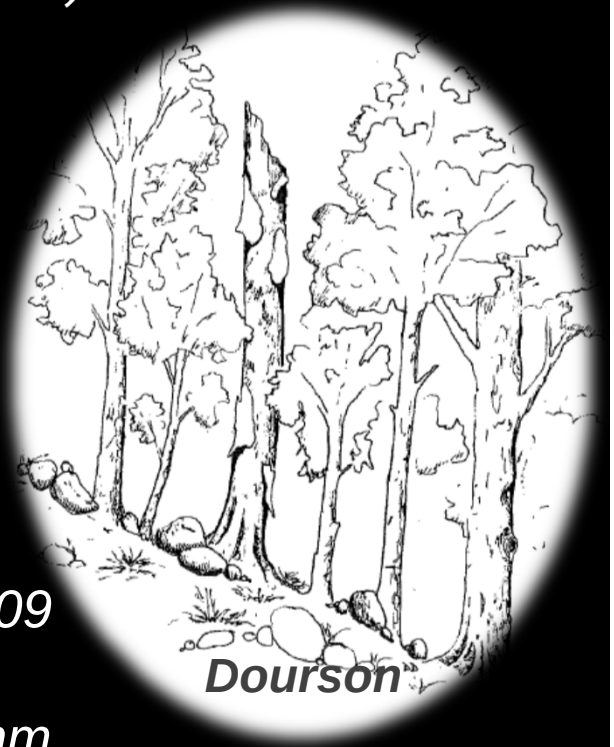
1. Winter hibernation
2. Spring emergence & migration
3. Summer maternity period
4. Fall migration & swarming

Brack 2006
Gumbert 2001
O'Keefe, unpubl. data

Fire Effects in Fall

- May harass, harm, or wound bats at roost
- May affect roosting or foraging habitat
  - Effects could be positive, negative, or neutral
- Burning during warm periods may enable quick response by bats
  - But fire behavior may vary in fall vs. spring

Dickinson et al. 2009
Layne 2009
R. Klein, pers. comm.



Potential Effects of NOT Burning

- Increased wildfire risk
- Loss of pine and oak woodlands
- More cluttered forests

Cohen et al. 2007
Armitage & Ober 2012
Lafon et al. 2007

Thanks to funding sources and research assistants!

Indiana State University
More. From day one.

JOINT FIRE SCIENCE PROGRAM

NATIONAL PARK SERVICE

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE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