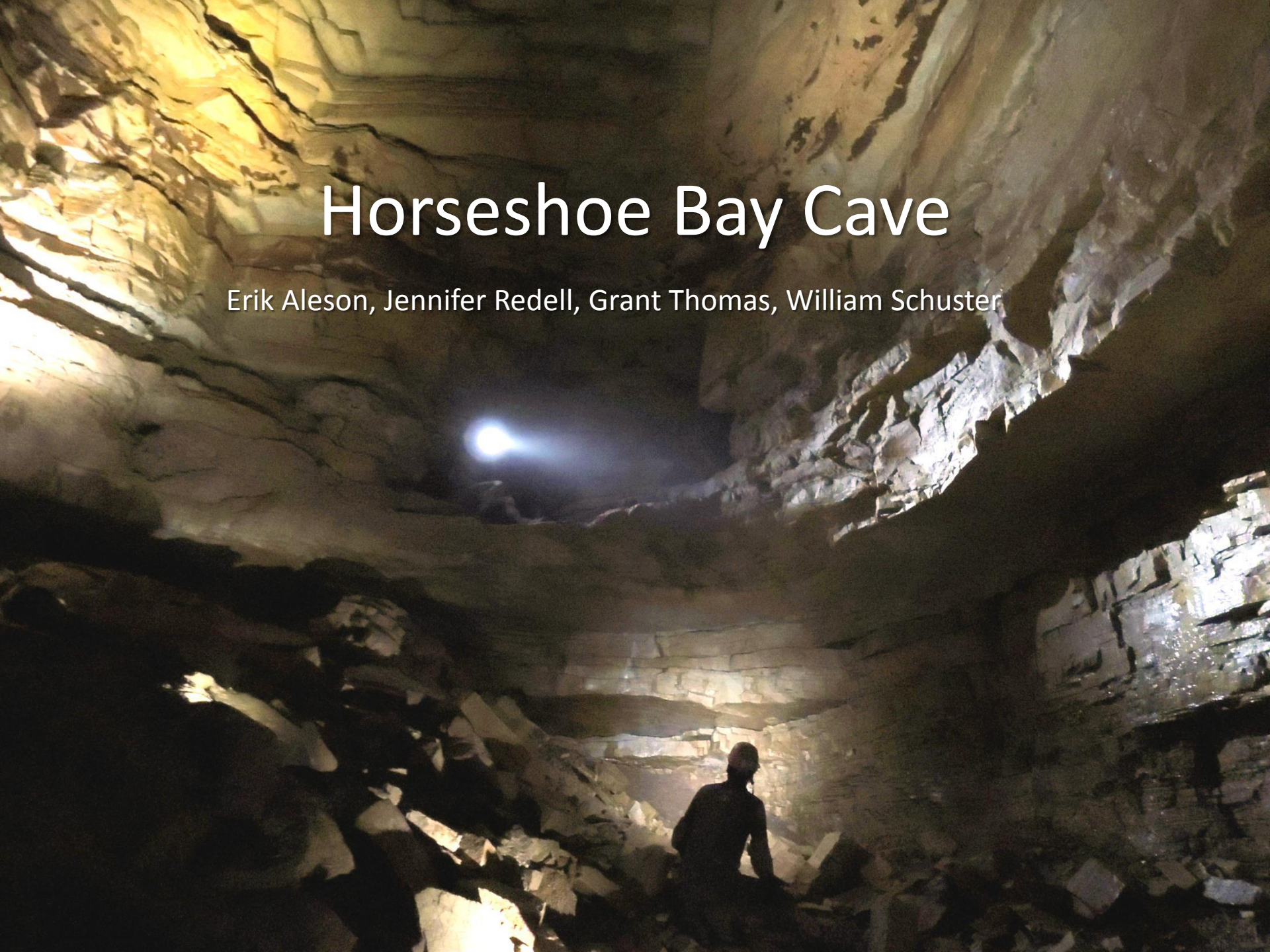

Horseshoe Bay Cave

Erik Aleson, Jennifer Redell, Grant Thomas, William Schuster

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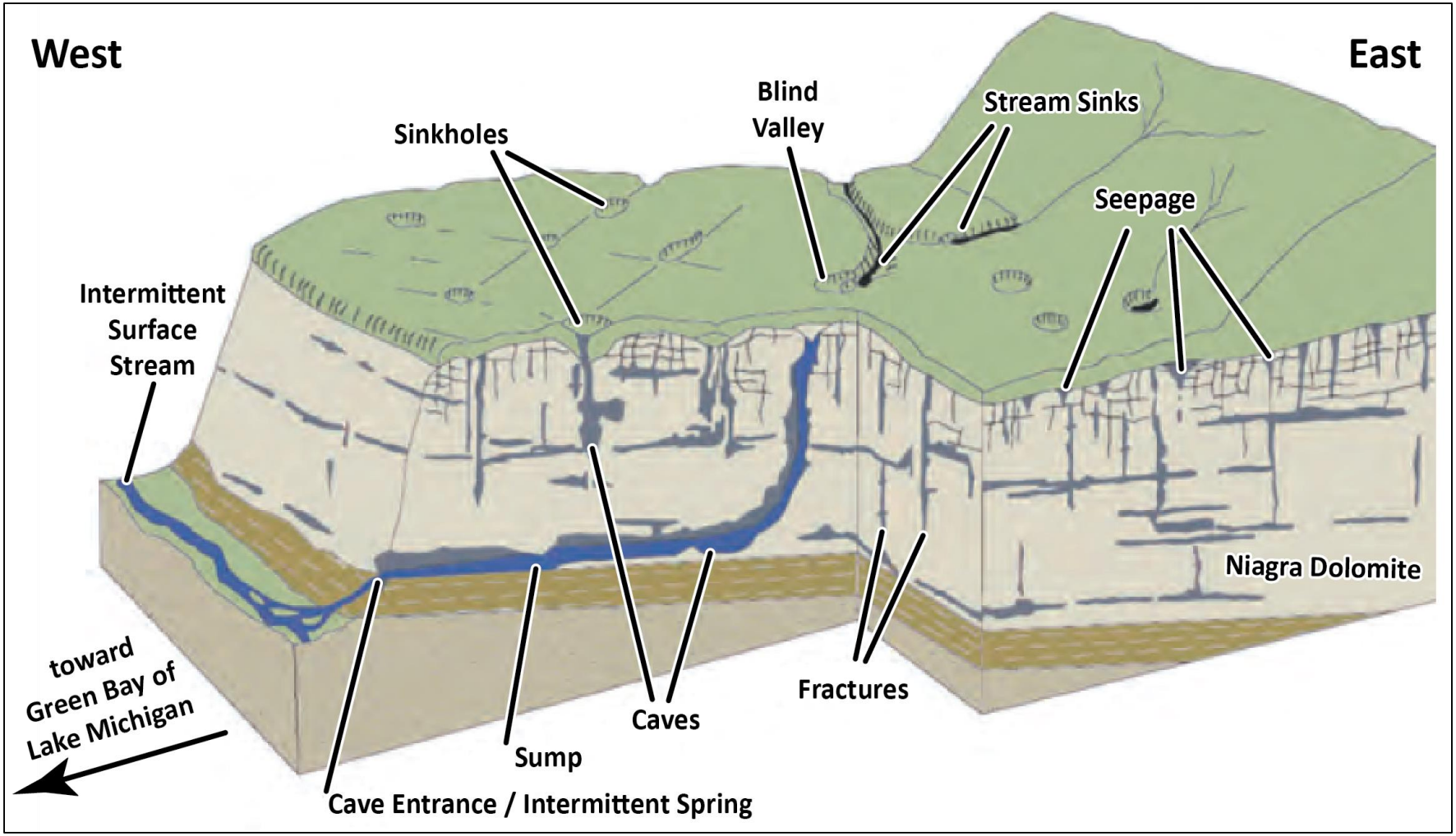
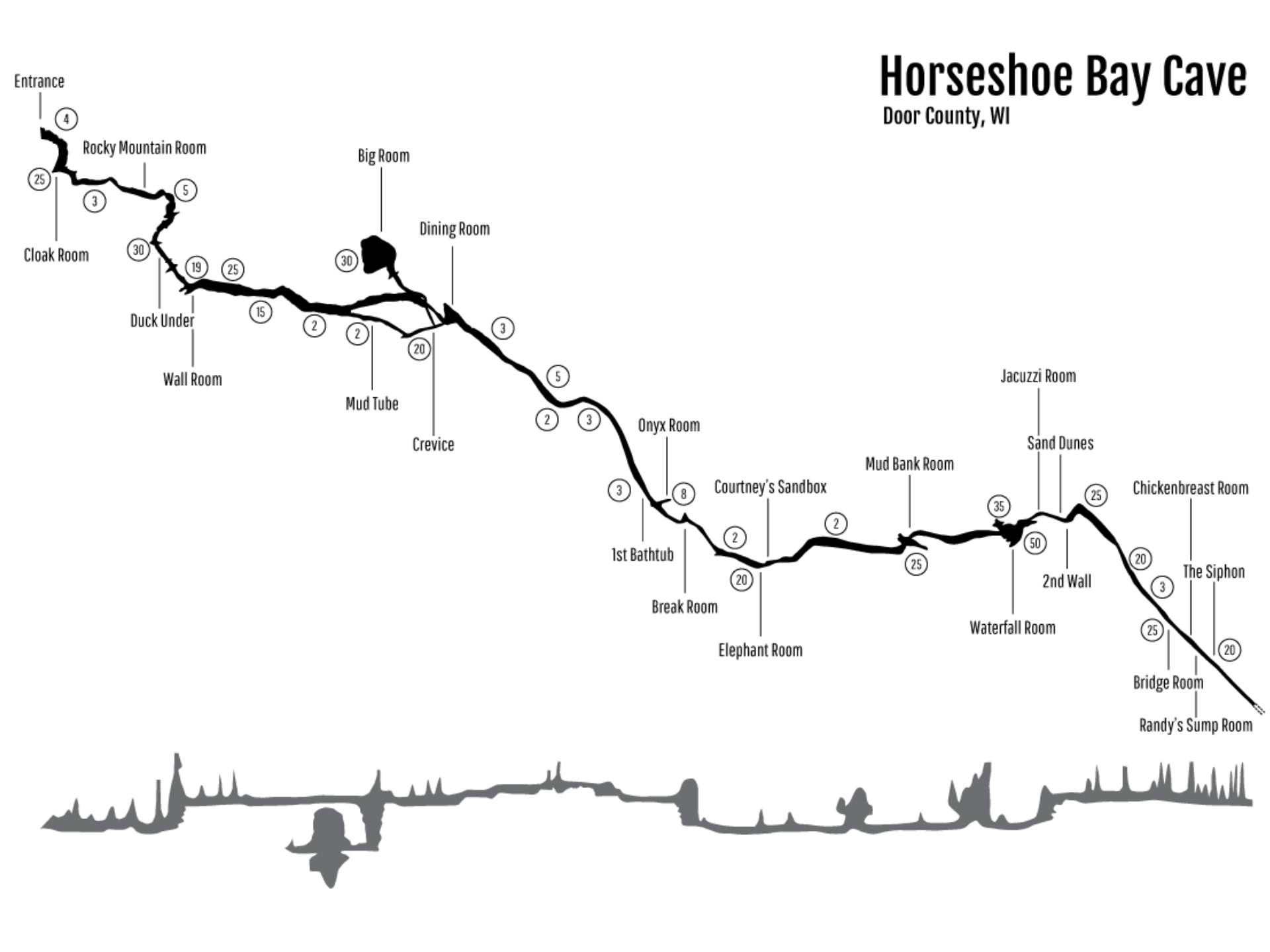

West
East
Blind Valley
Stream Sinks
Sinkholes
Seepage
Intermittent Surface Stream
Niagra Dolomite
toward Green Bay of Lake Michigan
Fractures
Caves
Sump
Cave Entrance / Intermittent Spring


Horseshoe Bay Golf Club
Horseshoe Bay Cave
Door County, WI
Entrance
Rocky Mountain Room
Big Room
Dining Room
Cloak Room
Horseshoe Bay Rd
Duck Under
Wall Room
Mud Tube
Crevice
Onyx Room
Jacuzzi Room
Sand Dunes
Mud Bank Room
Courtney's Sandbox
Chickenbreast Room
1st Bathtub
Break Room
Elephant Room
2nd Wall
Waterfall Room
The Siphon
Bridge Room
Randy's Sump Room
Cobblestone Cir
G
G

Horseshoe Bay Cave

Door County, WI

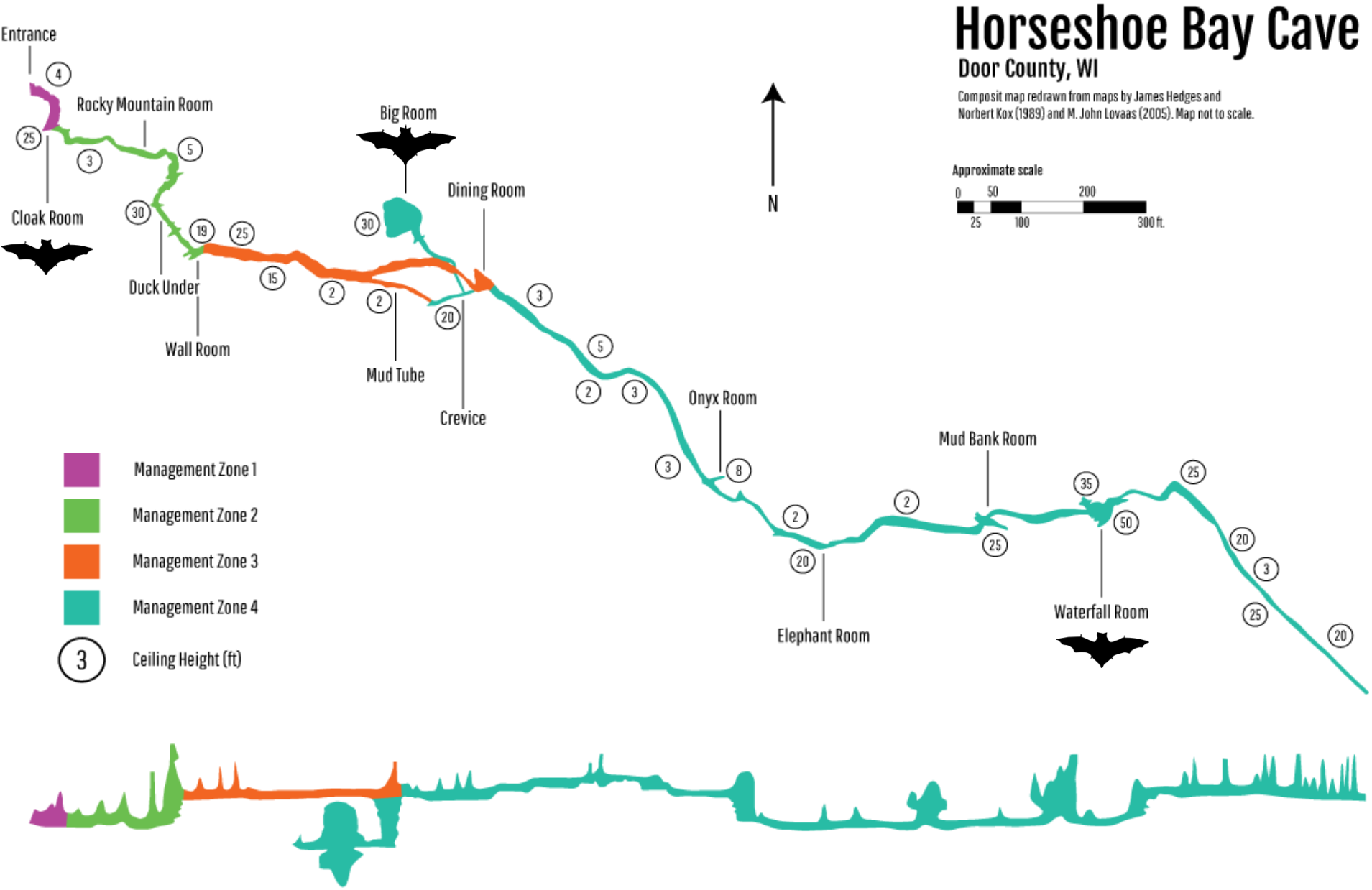


Escarpment at Horseshoe Bay--cave entrance

Horseshoe Bay Cave

Door County, WI

Composit map redrawn from maps by James Hedges and Norbert Kox (1989) and M. John Lovaas (2005). Map not to scale.



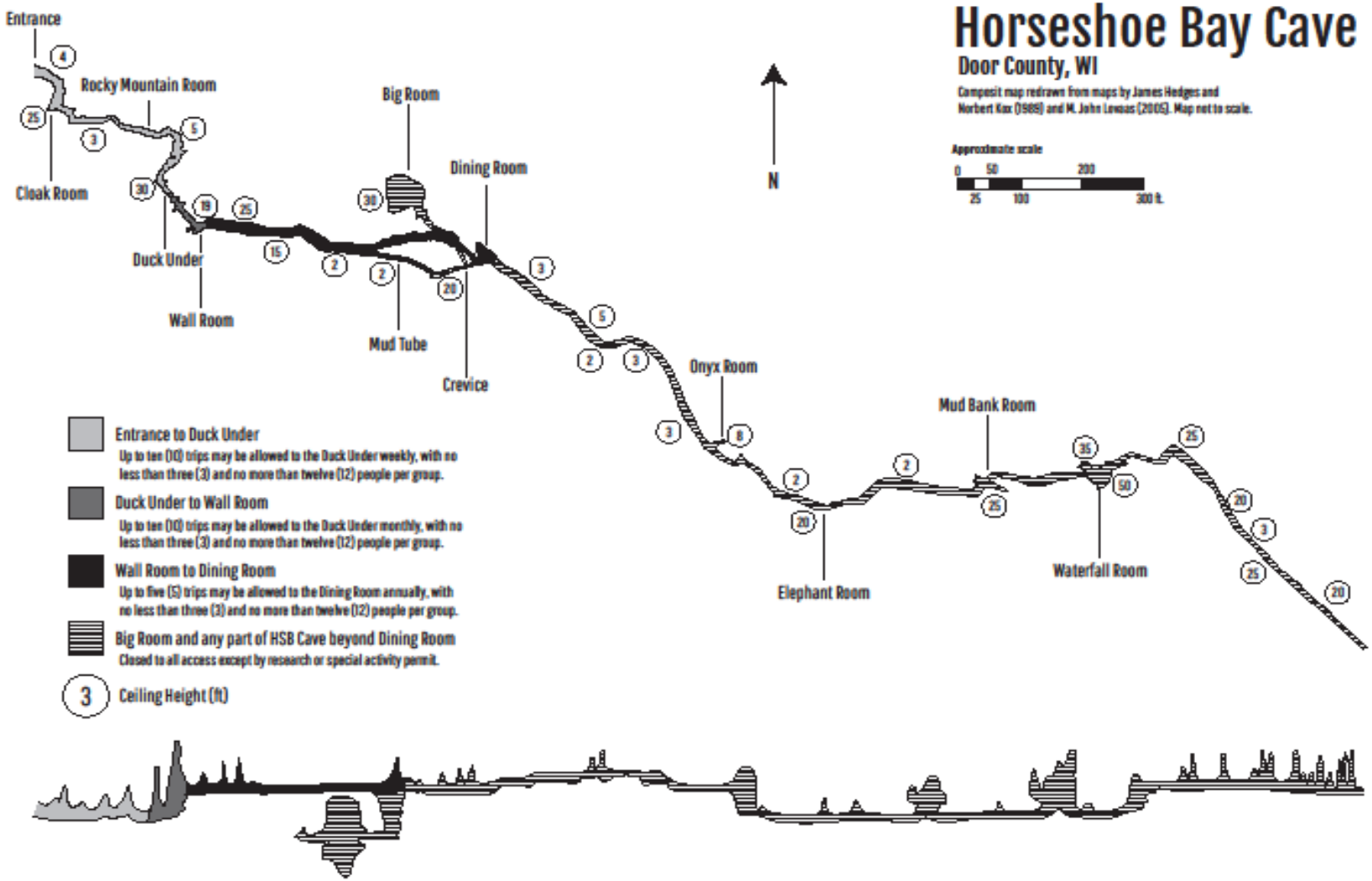
Access Restrictions
Horseshoe Bay Cave
Door County, WI

Composit map redrawn from maps by James Hedges and Norbert Kax (1969) and M. John Lewaus (2005). Map not to scale.

Approximate scale

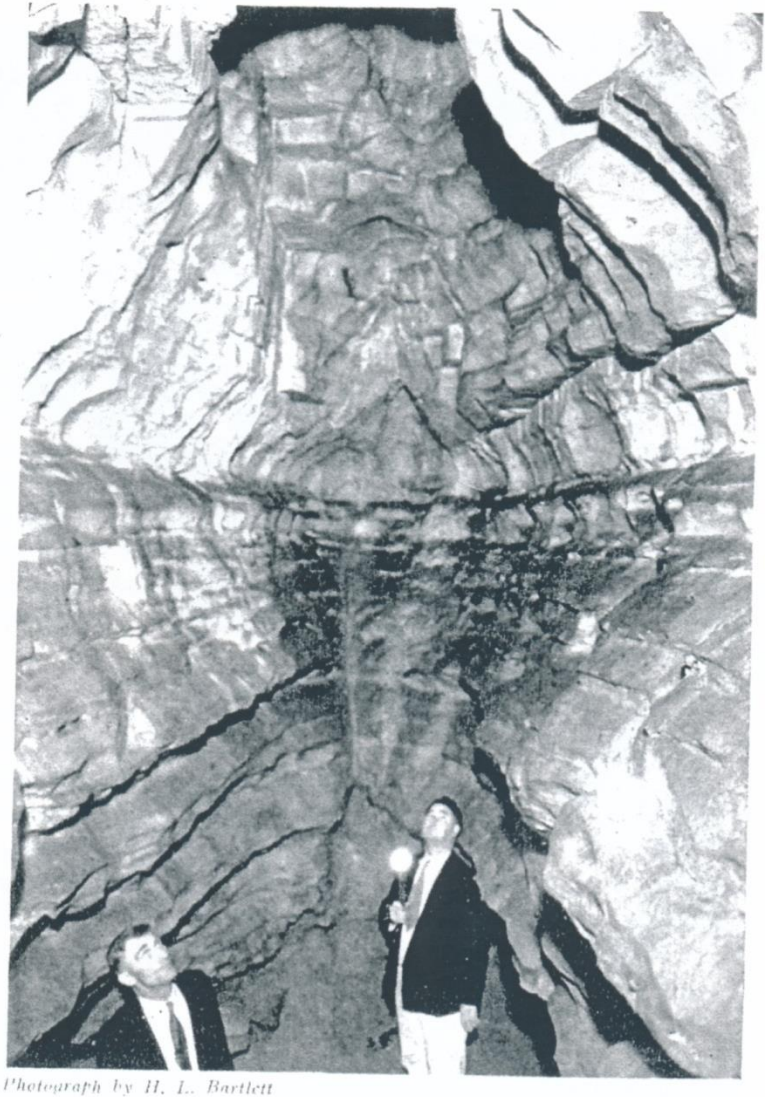
0 50 200

25 100 300 ft.



Visiting HSB Cave

1933– unknown visitors



Photograph by H. L. Bartlett

29. Tecumseh's Cave

1971– Sturgeon Bay teachers

2014– WDNR WNS surveillance

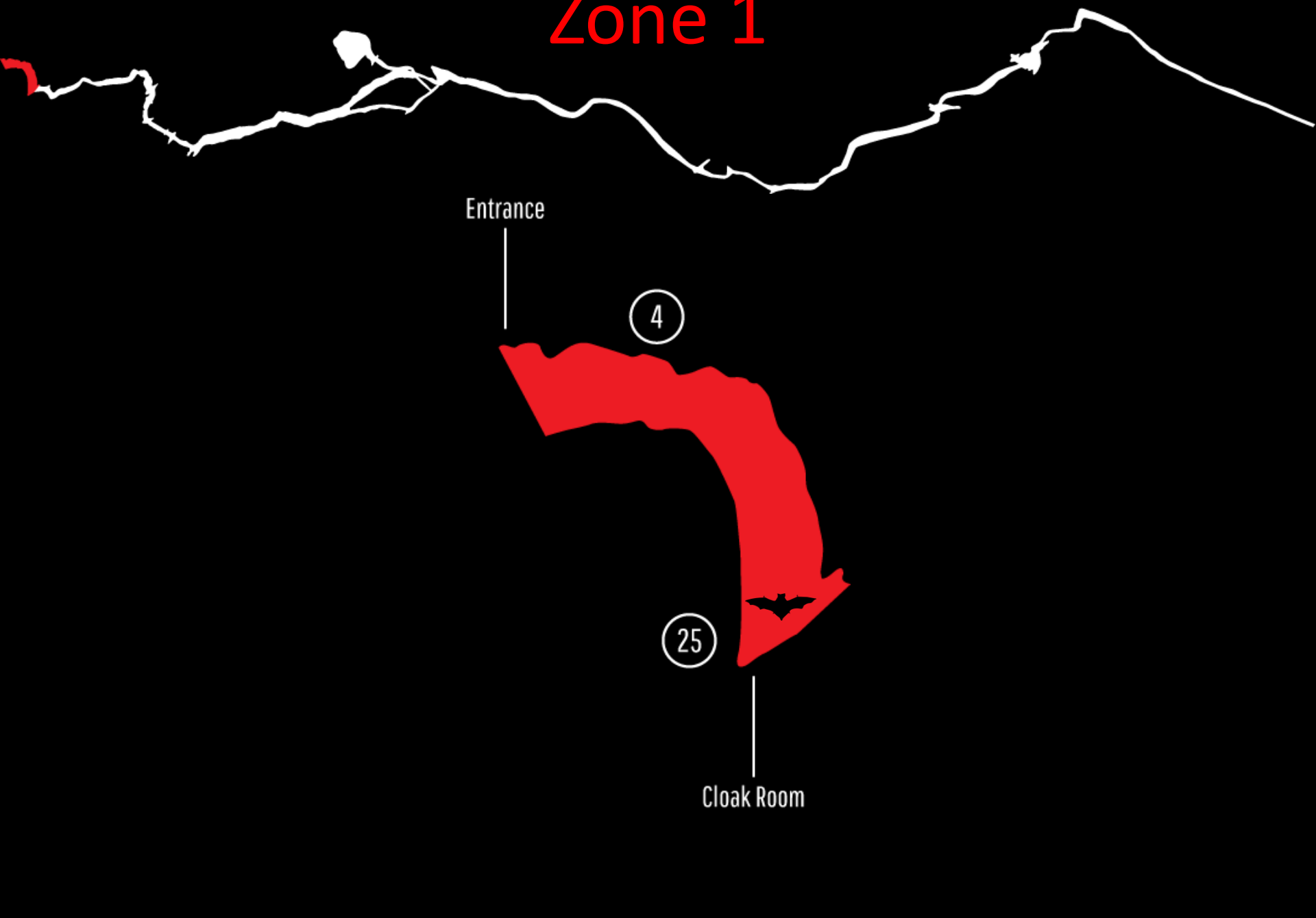
Wet and Muddy

Before

After

Virtual Cave Tour

Zone 1



Existing gate & updated gate

1986

- narrow gaps slow flight, predator vulnerability
- I-beams block air flow
- solid cumbersome door
- hanging signs in flight path

2012

- wider bars in accordance with BCI & ACCA standards
- angle-iron facilitates bat movement & airflow
- removable locking bars allow access

Old WSS Gary Soule Pics

Water flowing out the entrance to Horseshoe Bay Cave!

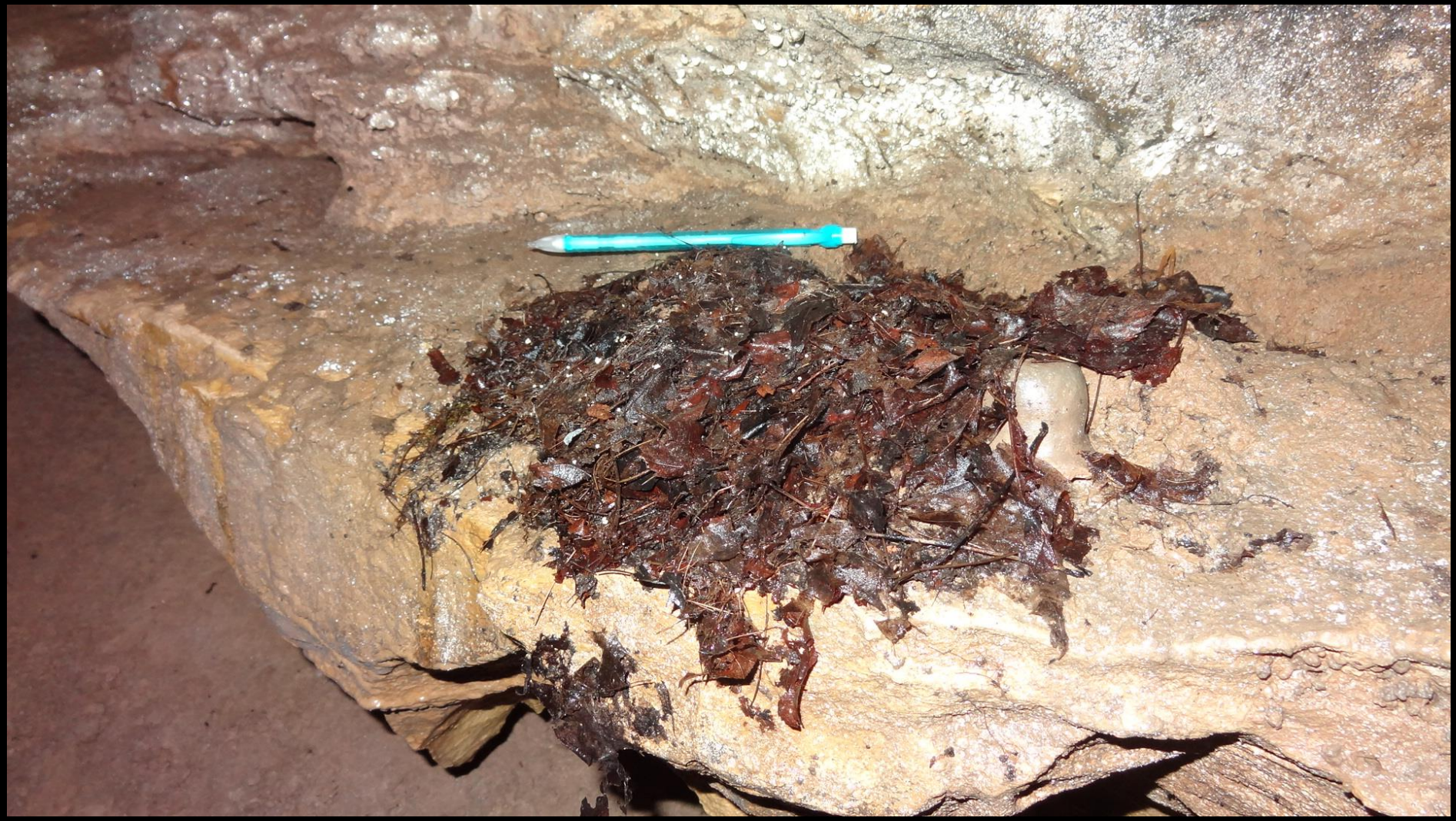
©WSS


© A.B. Sheldon


© A.B. Sheldon

Zone 2


Rocky Mountain Room
5
3
Delineation of Zone 2a/2b as determined by water level
Wall Room
30
Duck Under
19




PETZL

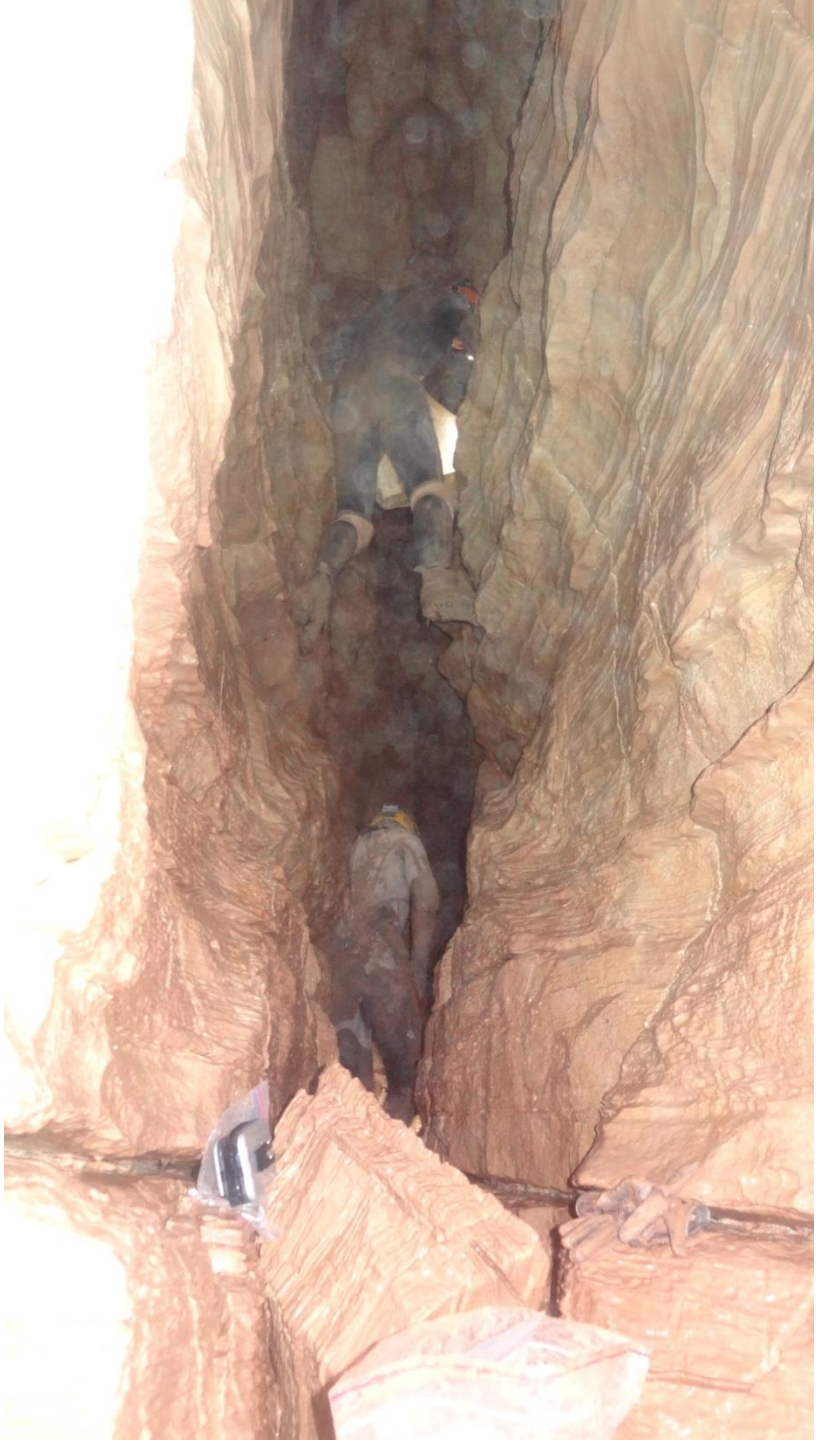
Ichneumonid wasp

Pygmarrhopalites sapo from an Illinois cave as a representative member of the genus- thought to be narrowly endemic trogliobites.

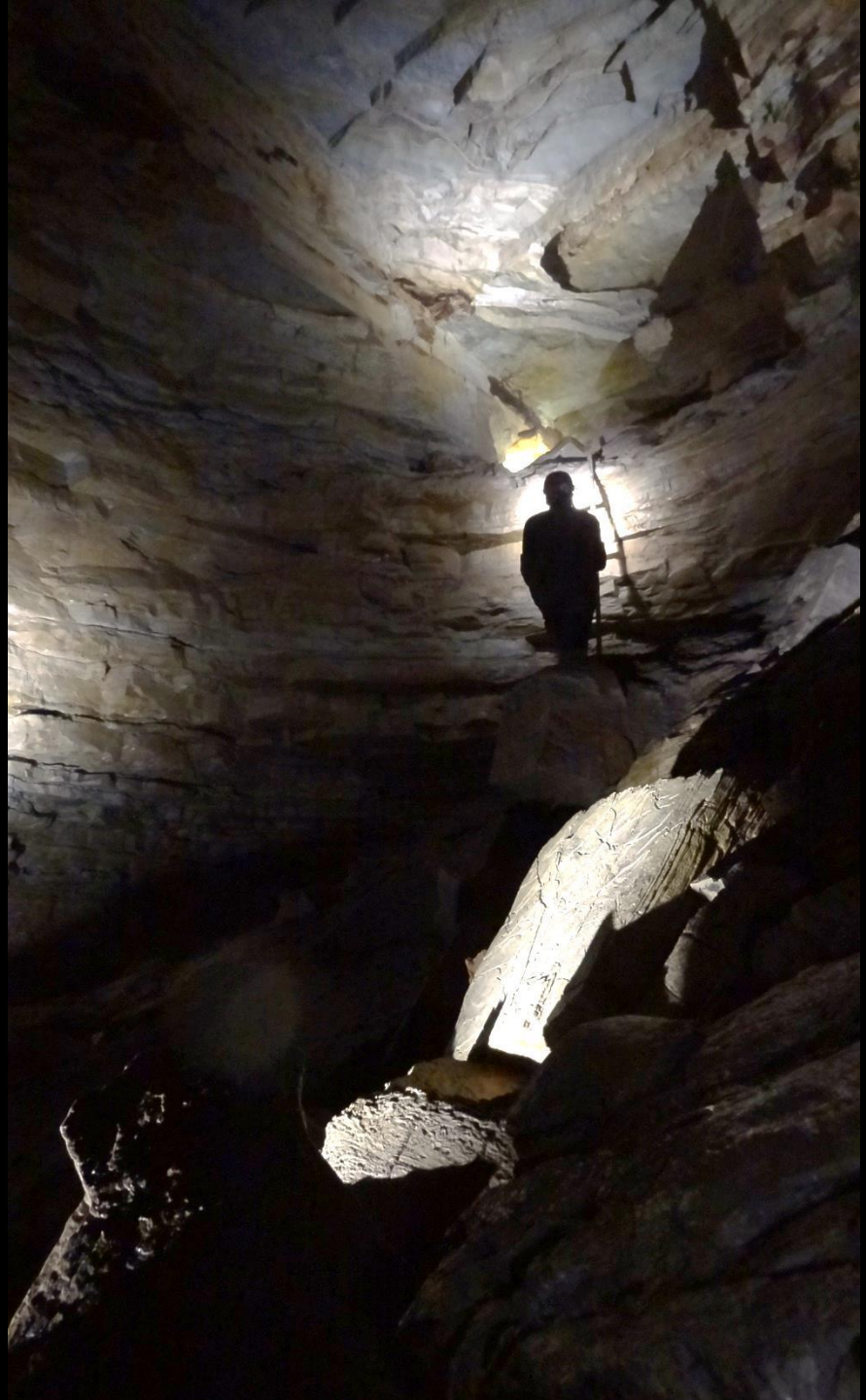
Aquatic isopod, *Caecidotea* sp. (Asellidae)
Scale bar 1 mm. Steven J. Taylor.

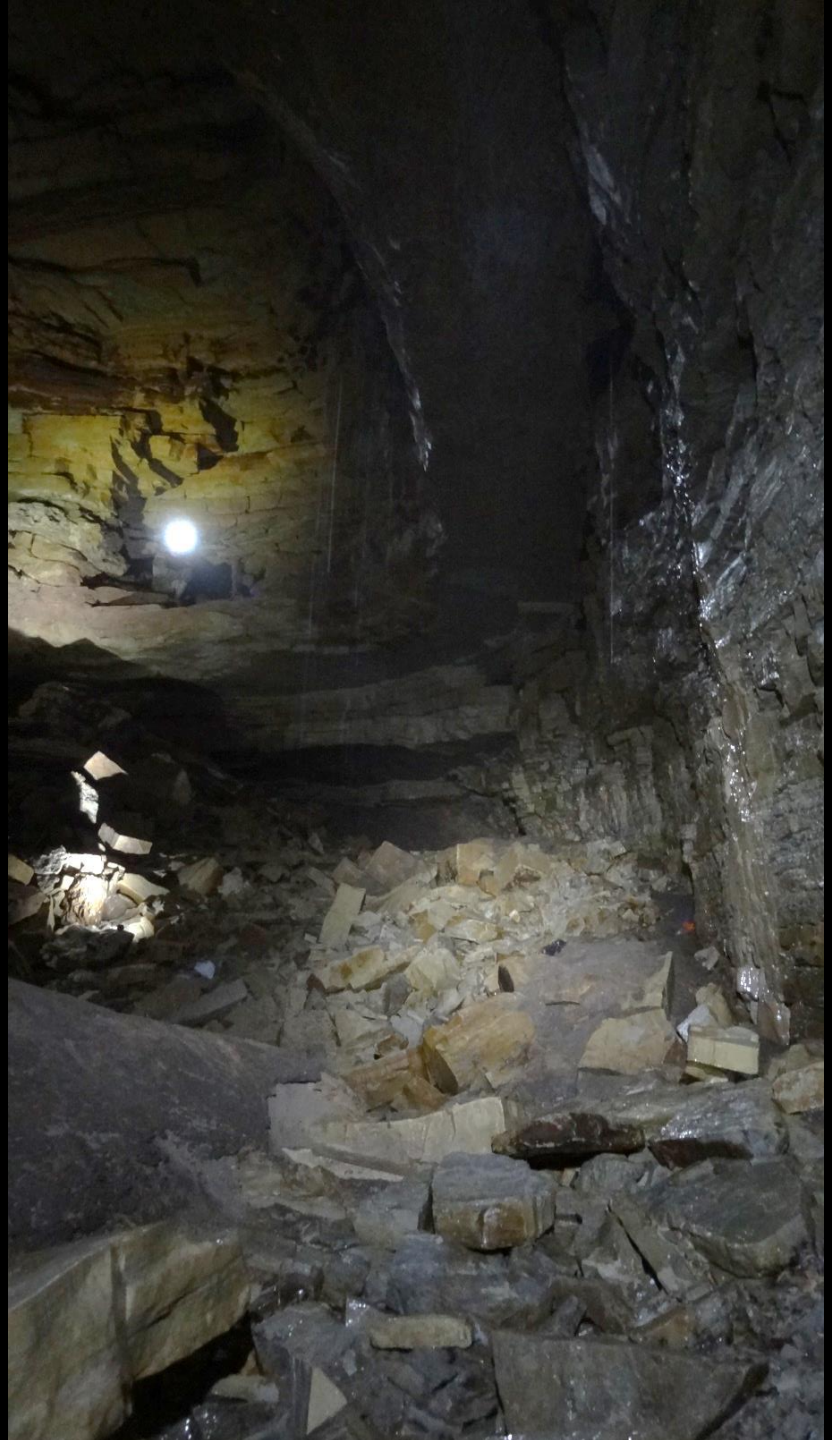
Zone 3

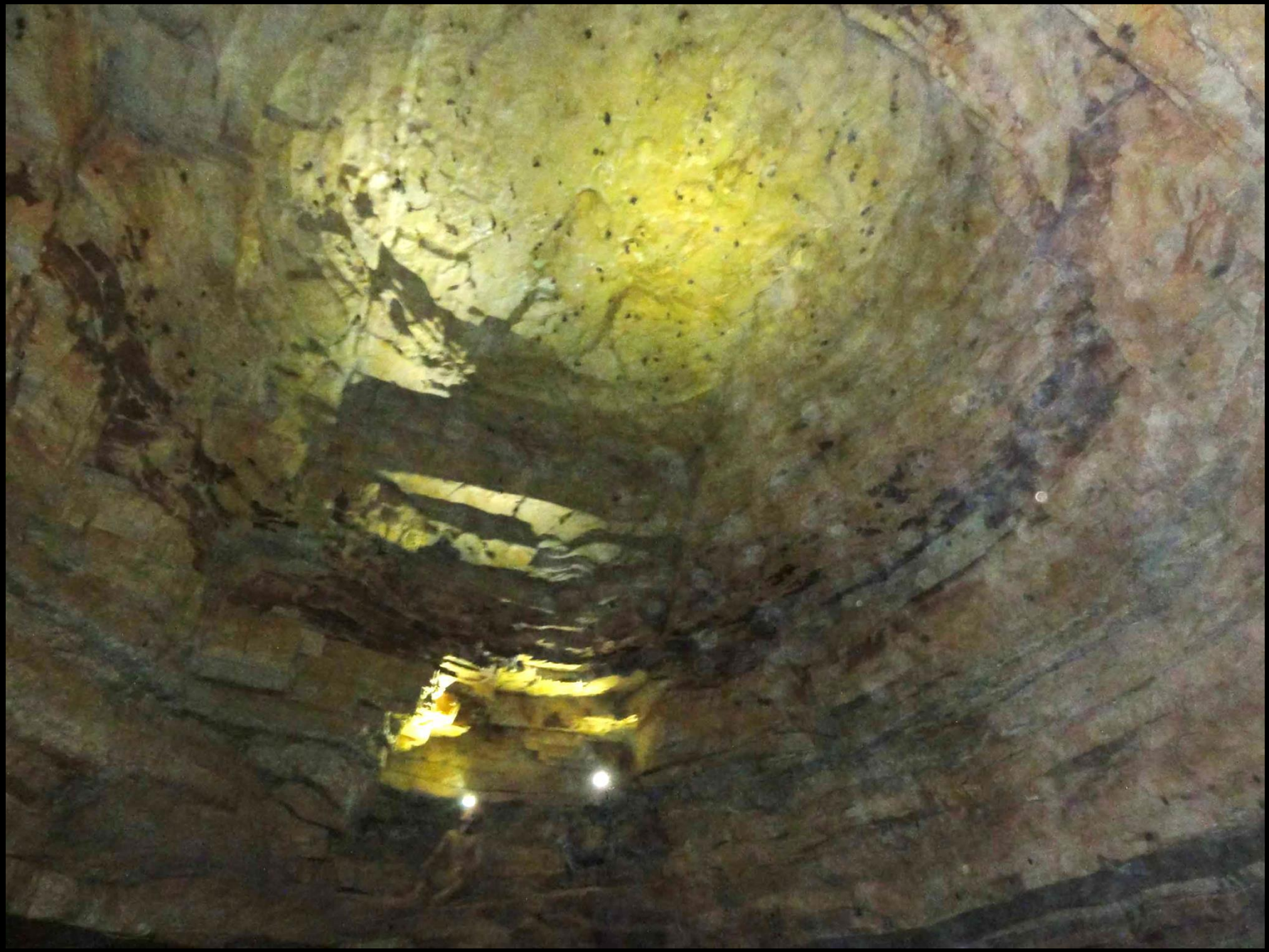

Zone 4a
Big Room
30
3
20
3
Onyx Room
Crevice
8
30
Elephant Room



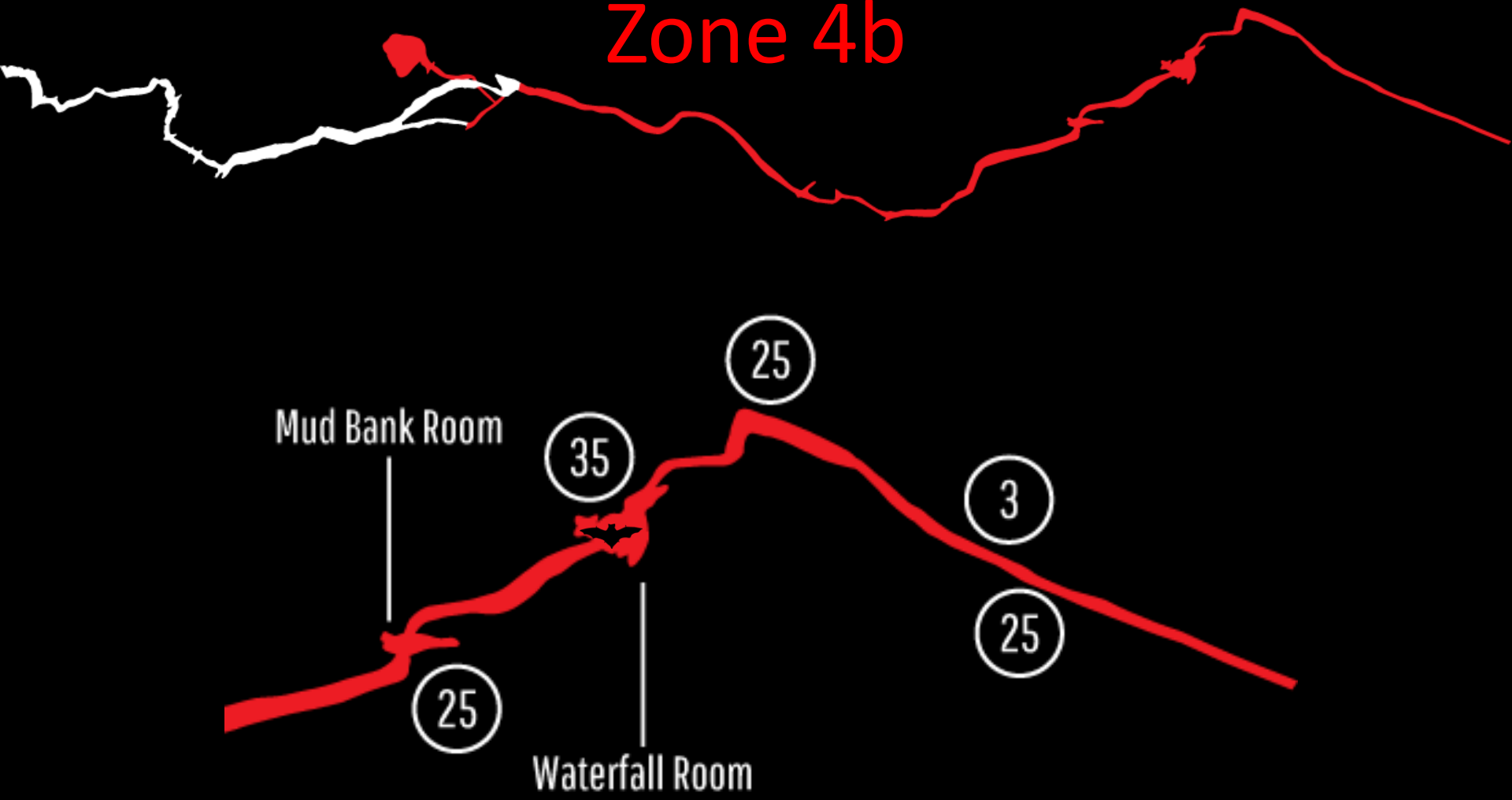
Groundwater amphipod,
Crangonyx sp. Steven J. Taylor.







Zone 4b



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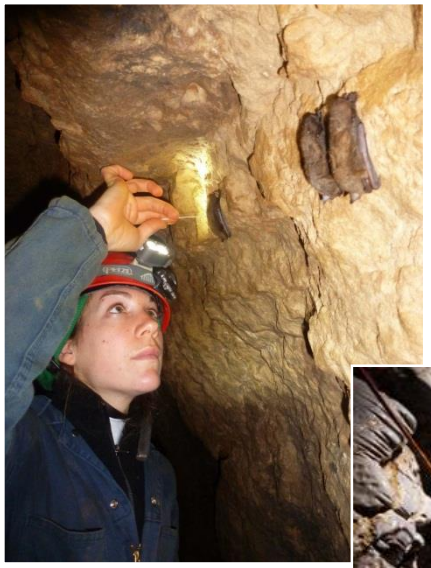
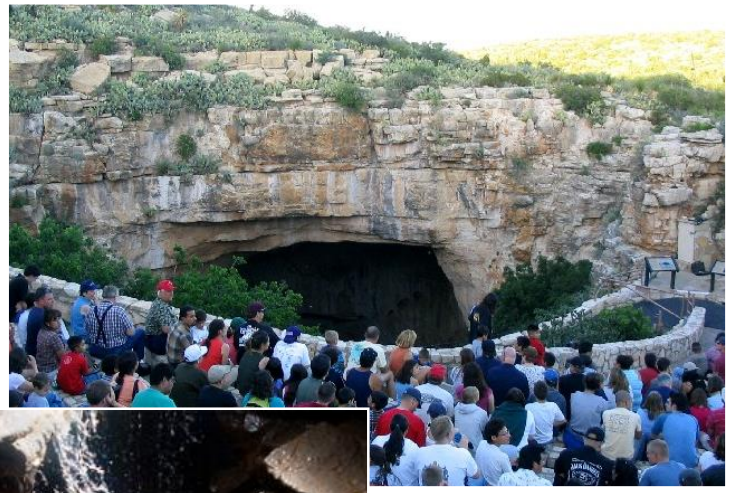
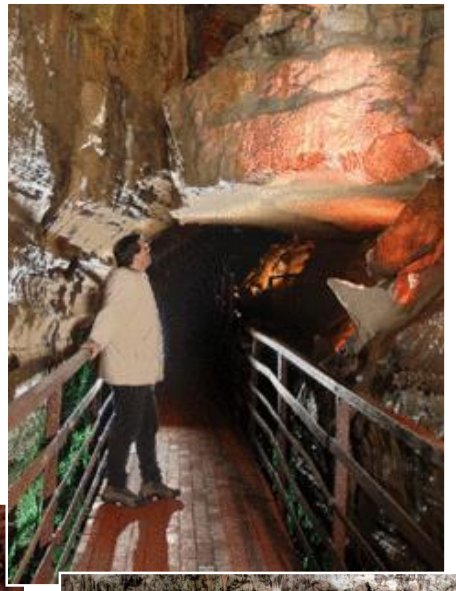
Broad range of management options







Primary Concerns of Cave Management

- Resource identification/inventory
- Resource protection
- Research
- Education
- Access
- Administration
- Publicity
- Safety & rescue
- Future

Science advisory group input

Composed of experts and/or professionals highly qualified in terms of knowledge, training, and experience in the subject area, and possessing an intellectual interest in the scientific and technical questions to be addressed.

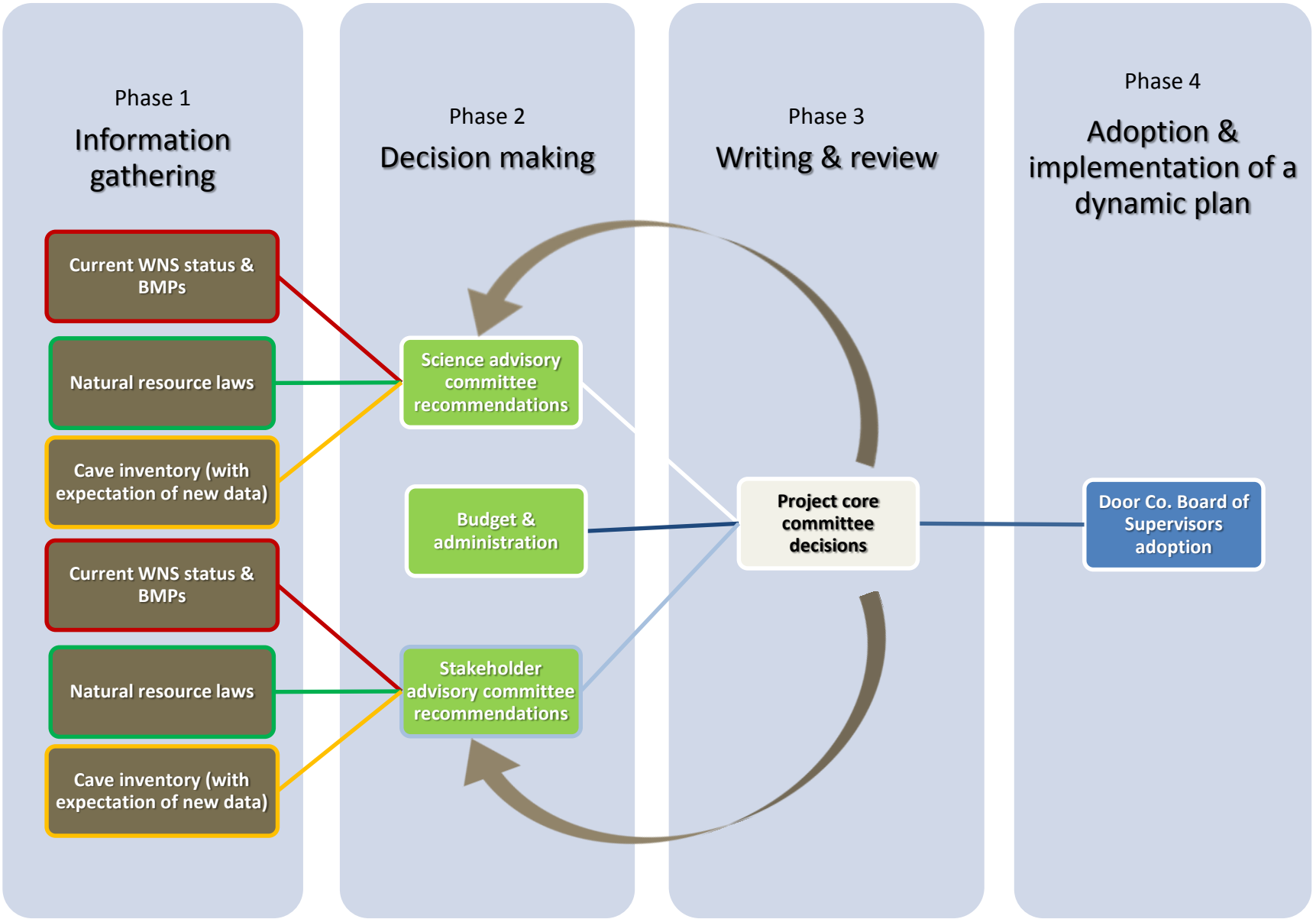
- Biological
  - bats, invertebrates, fungi & other microbes
- Geological
  - rock & sediment
- Hydrological
  - groundwater & water quality
- Meteorological
  - cave microclimate- temp/humidity/airflow
- Historical/Pre-historical
  - human cultural use & activity

Stakeholder group input

Composed of individuals (representing organizations, agencies, local units of government, etc.) with an interest in the issue and/or who may affect or be affected by the issue. May include industry, other management or regulatory agencies, local units of government, conservation groups, affected landowners, and the interested public.

- Cave & land managers
  - HSB Golf Club, Nature Conservancy, Friends of DC Parks, Southern Door School
- Educators
  - Nature Conservancy, Friends of DC Parks, Southern Door School
- Recreational cavers/commercialization of caves
  - WI Speleological Society
- Economic development & tourism
  - DC Economic Dev. Corp., DC Visitor Bureau
- Local representatives
  - Town of Egg Harbor

HSB Cave Management Plan Development



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Wisconsin Bats

- Mammals (Order: Chiroptera)
  - 2 groups (mega & micro)
  - 1200 species worldwide (~50 in USA)

- Susceptible to decline
  - long-lived
  - slow to reproduce
  - large aggregations at critical times

Bats are Valuable

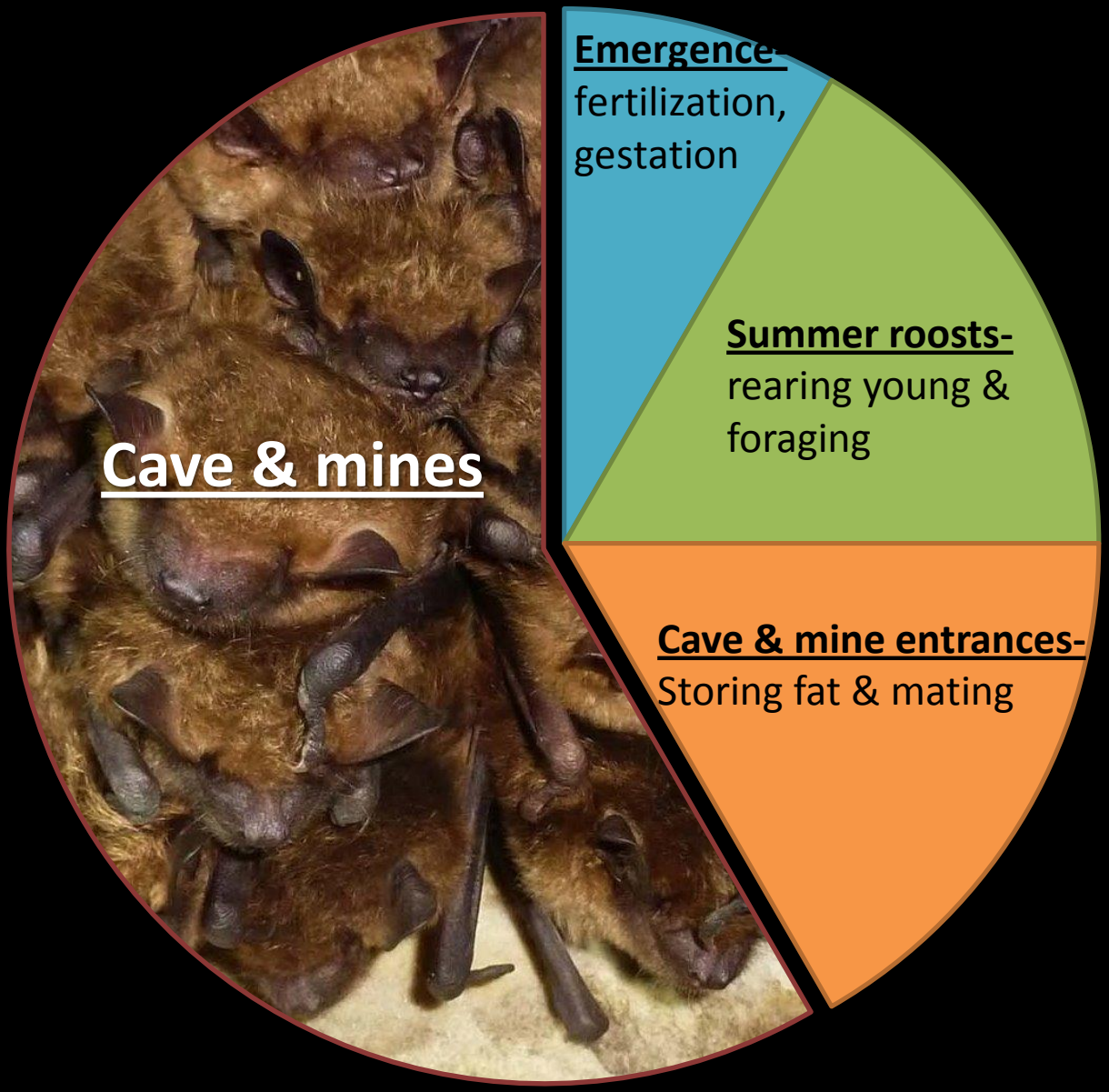
- Human health
- Forestry
- Agriculture:

  (increased pesticide/application costs without bats)

  – USA, **$3.7 billion -- $53 billion**

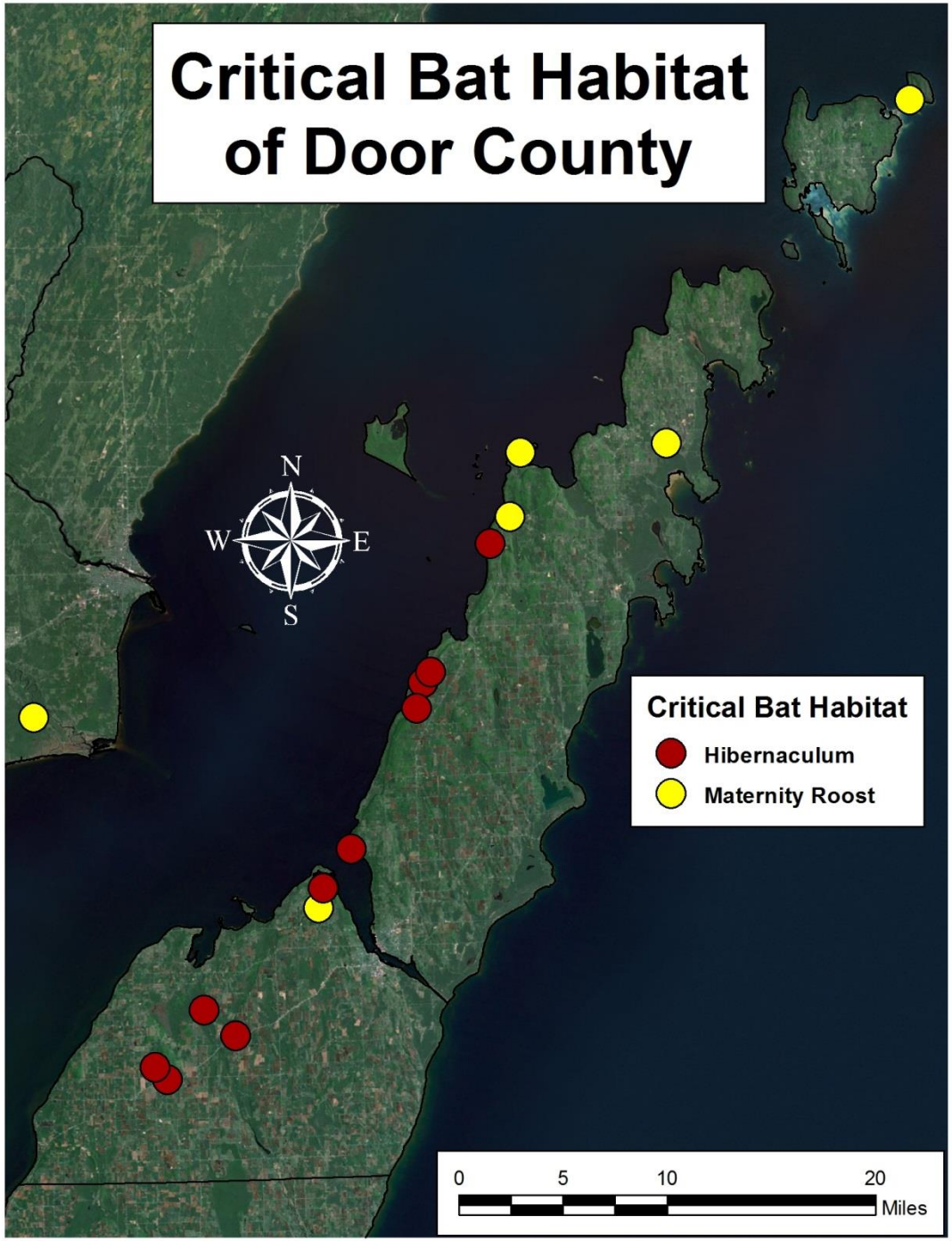
  – Wisconsin, **$658 million -- $1.5 billion**

(Boyles et al. 2011)



Annual Cycle

- Emergence (April- May)
- Summer resident (June-July)
- Fall swarm (Aug- Sept)
- Hibernation(Oct- May)


Critical Bat Habitat
of Door County
N
W
E
S
Critical Bat Habitat
Hibernaculum
Maternity Roost
0
5
10
20
Miles

HSB Cave: Priority 1 Bat Hibernaculum

- Critical site for bats– NHI Database
- Regionally important
- Located on migration corridors (escarpment & shoreline)
- Avg. 1250 individuals, 4 threatened species
- 2 rooms with high bat density
- Possibility of bat presence beyond Sandbox?
- Occasional flooding results in bat deaths?

White nose syndrome

The most precipitous decline in North American wildlife in history

http://whitenosesyndrome.org/

White nose syndrome (WNS)

Cause

Cold-loving fungus first detected in NY state in 2006

~~*Geomyces*~~ *Psuedogymnoascus destructans*

Presence

25 states

5 Canadian provinces

Affected

7 species of hibernating bats (+4 other species)

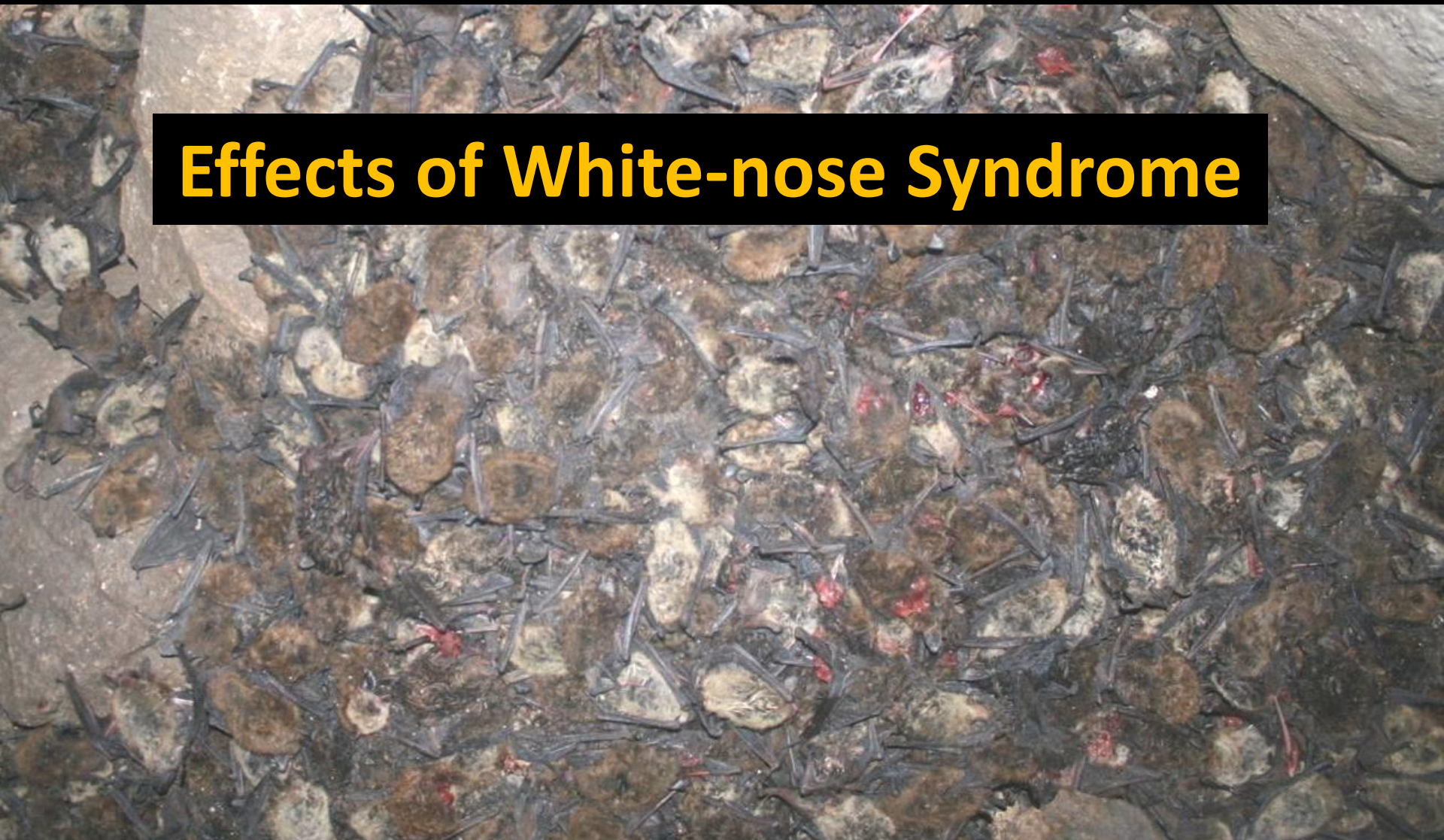
Nearly half of the 50 species in N. America rely on hibernation for winter survival

Dead

6 million+ bats (2012)

Mortality: 75-100%

95% Overall Decline



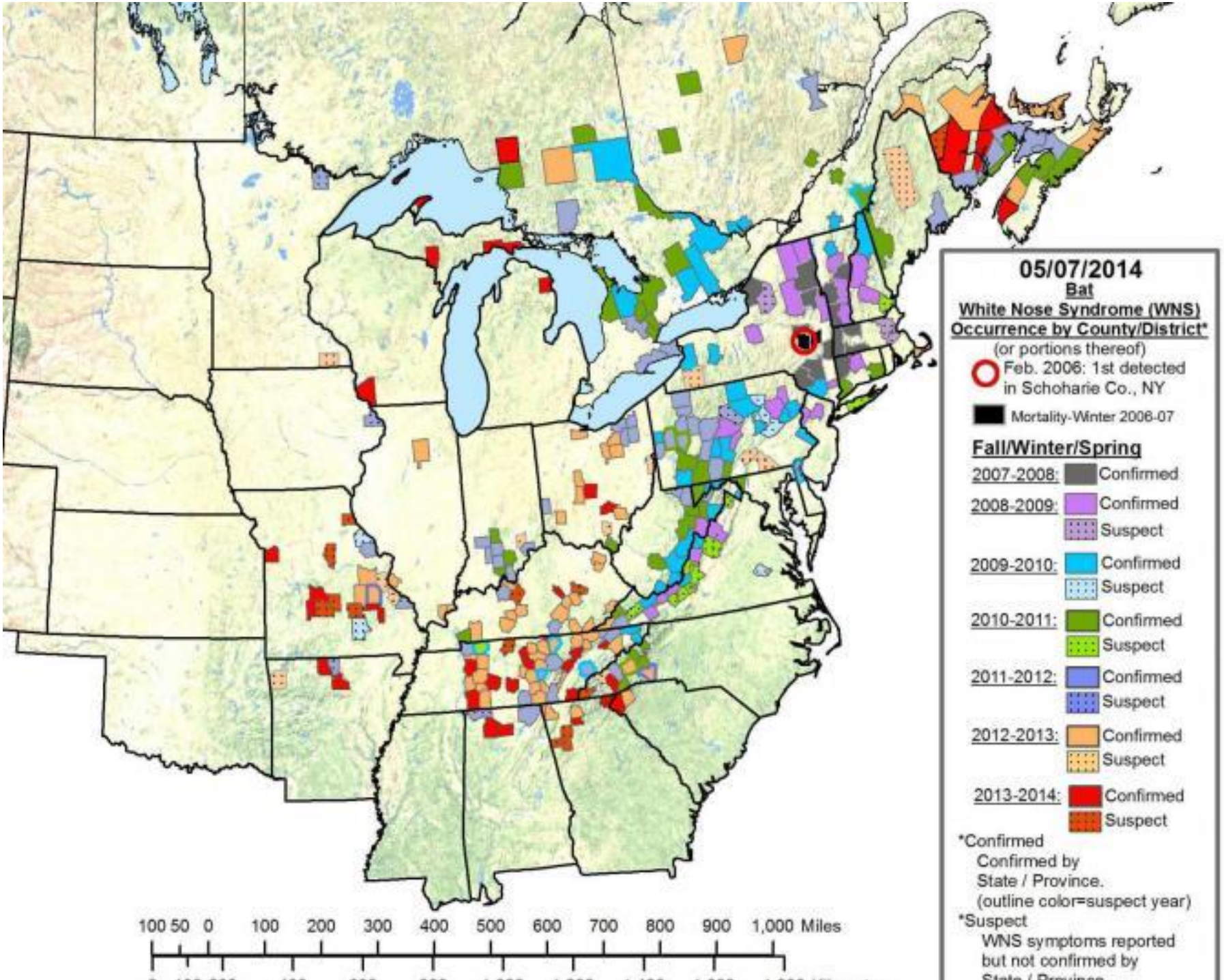
Species expected to be extirpated from the Northeast in the next few years

Little brown bat
(*Myotis lucifugus*)

Northern long-eared bat
(*Myotis septentrionalis*)

Eastern Pipistrelle
(*Perimyotis subflavus*)

All WI Cave Bats are WNS Susceptible


05/07/2014
Bat
White Nose Syndrome (WNS)
Occurrence by County/District*
(or portions thereof)
Feb. 2006: 1st detected in Schoharie Co., NY
Mortality-Winter 2006-07
Fall/Winter/Spring
2007-2008: Confirmed
2008-2009: Confirmed
Suspect
2009-2010: Confirmed
Suspect
2010-2011: Confirmed
Suspect
2011-2012: Confirmed
Suspect
2012-2013: Confirmed
Suspect
2013-2014: Confirmed
Suspect
*Confirmed
Confirmed by State / Province.
(outline color=suspect year)
*Suspect
WNS symptoms reported but not confirmed by
100 50 0 100 200 300 400 500 600 700 800 900 1,000 Miles

How is it spread?

Bat → bat

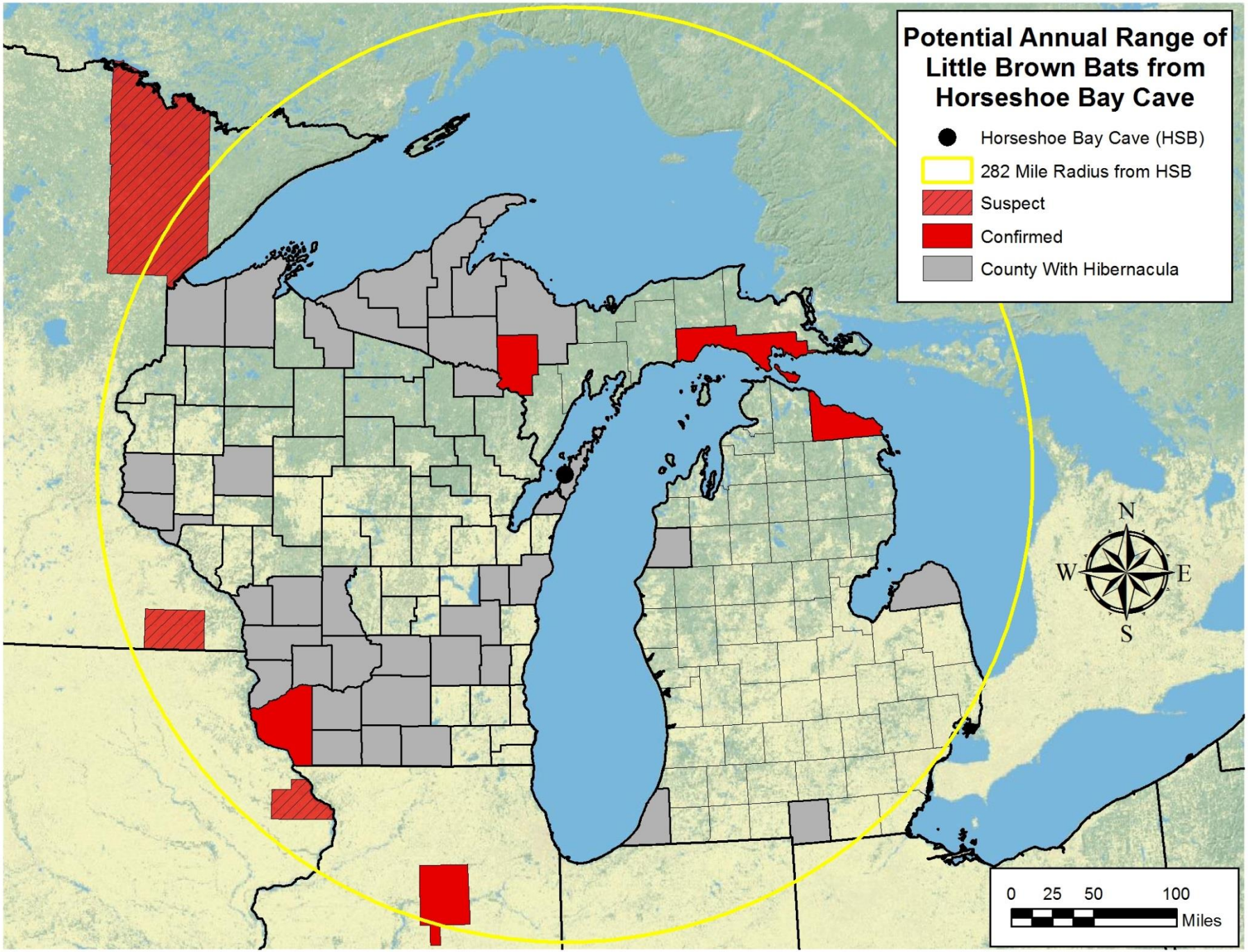
fall swarm, hibernation

Cave → bat

fungal spores present on walls and in sediment

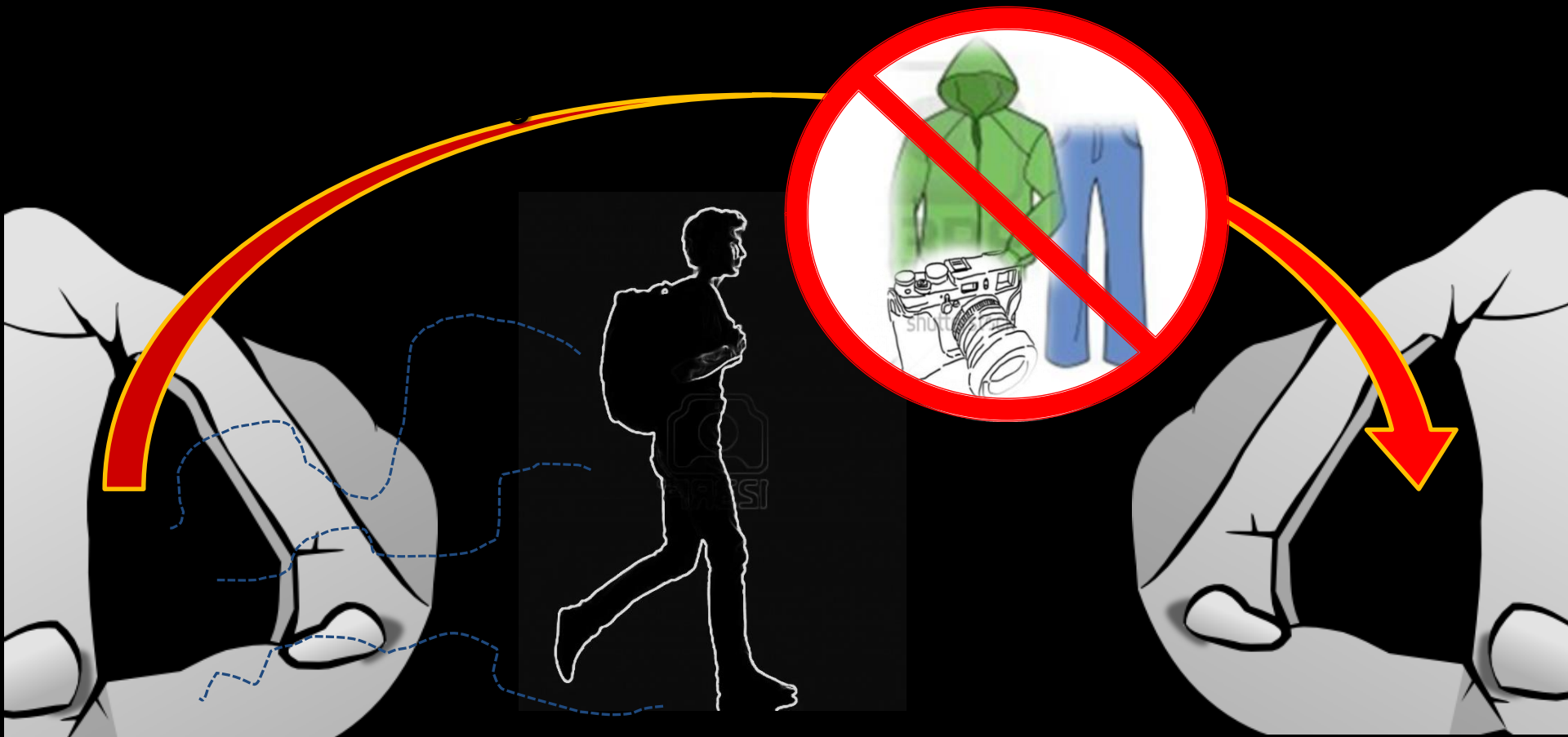
Cave → human → bat

mud picked up by individuals during cave visitation may contain fungal spores


Potential Annual Range of Little Brown Bats from Horseshoe Bay Cave
Horseshoe Bay Cave (HSB)
282 Mile Radius from HSB
Suspect
Confirmed
County With Hibernacula
N
W
E
S
0 25 50 100
Miles

Visiting Caves?

Never transfer clothes or gear.



Wisconsin's response to WNS

- Baseline data collection
  - Acoustic, roost, cave monitoring
- Early detection
  - Disease surveillance &
- Partnerships with cave owners
  - Site access & WNS Prevention Plans
- State / Regional / National response planning
  - Research participation & planning
- Applied & adaptive management tools in WI
  - All WI cave bats listed as threatened species (NR-27)
  - WI laws related to bats and WNS (under NR-40

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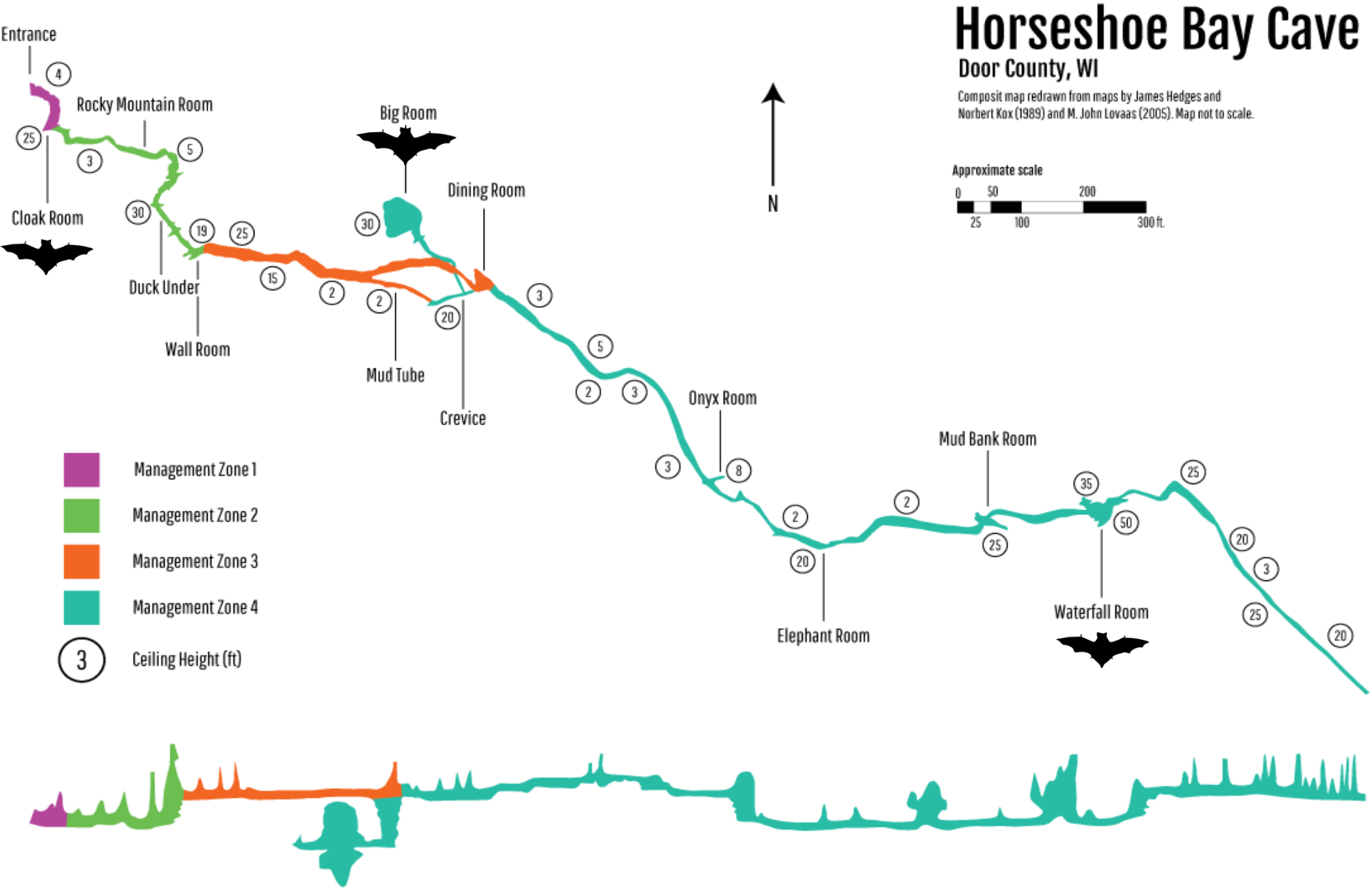
Door County, WI

Composit map redrawn from maps by James Hedges and Norbert Kox (1989) and M. John Lovaas (2005). Map not to scale.



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Access agreement & Phased implementation of Plan

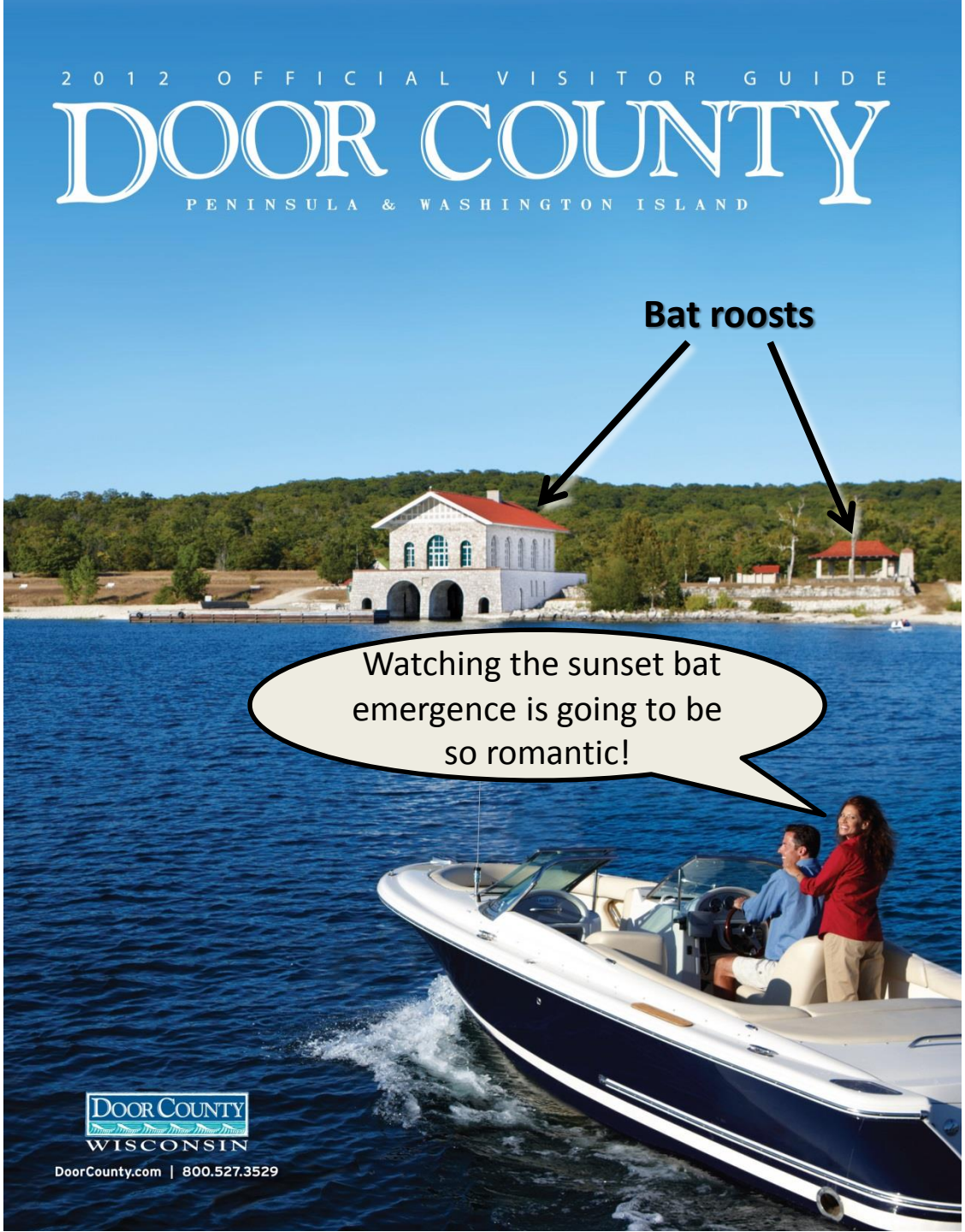
- Phase 2: Access agreement
- Phase 3:
  - Trustee training
  - Dedicated gear acquisition
  - Safety strategy development
  - Cave monitoring program

Acknowledgements

- Horseshoe Bay Golf Club
- Science advisory group: Steven Taylor, Ron Stieglitz, John Luczaj, Robert Bozshardt, Maureen Muldoon, Jeff Huebschman, Jeff Lorch, Jill Utrop
- Stakeholder advisory group: Glen Timmerman, Gary K. Soule, Paul Peterson, Bob Ryan, Bill Chaudoir, Mike Grimm, George Zachariason, Jack Moneypenny, Mike Toneys
- Heather Kaarakka, Bob Bultman, Meredith Coulson, Tyler Brandt, Owen Boyle
- David Redell (1970-2012)

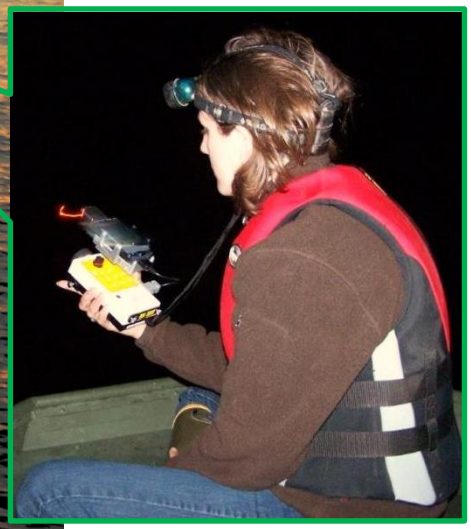
Questions?

Wisconsin Bat Program


2012 OFFICIAL VISITOR GUIDE
DOOR COUNTY
PENINSULA & WASHINGTON ISLAND
Bat roosts
Watching the sunset bat emergence is going to be so romantic!
DOOR COUNTY
WISCONSIN
DoorCounty.com | 800.527.3529

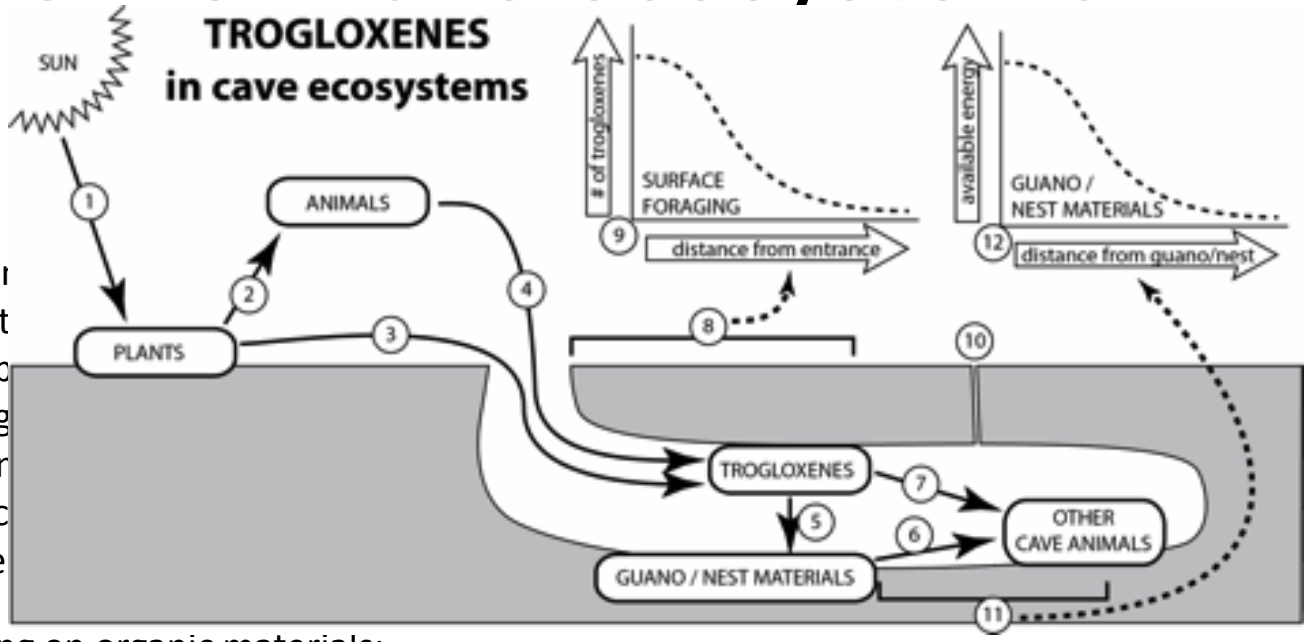
DOOR COUNTY

WISCONSIN

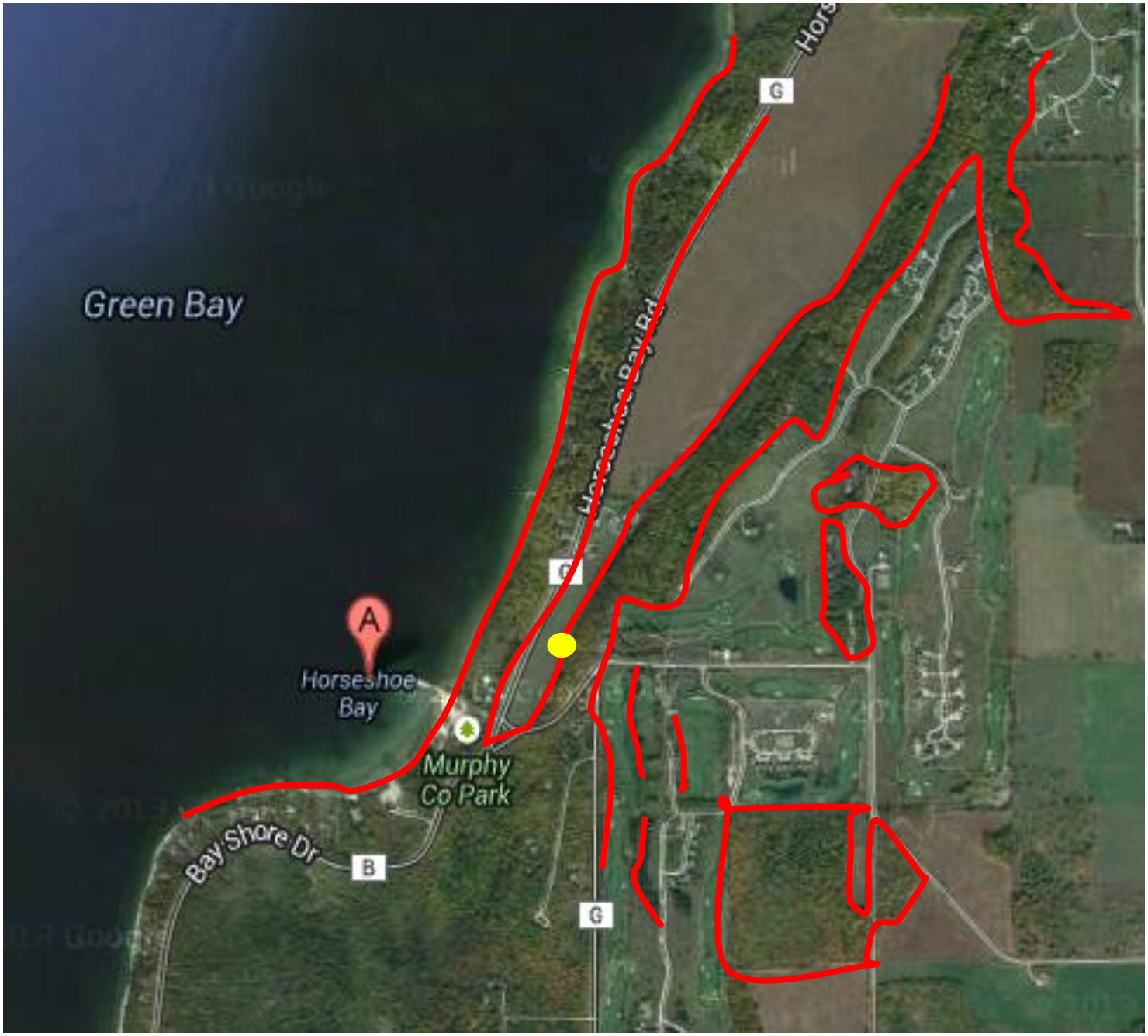


2014 OFFICIAL VISITOR GUIDE

Overview of Cave ecosystems



- Figure 2. Energy enteri
- 1. Energy from sunlight
- 2. Energy transfer to ab
- 3. Surface foraging trog
- 4. Surface foraging anir
- 5. Nesting material, fec
- 6. Other animals in the
  on the
- fungi & bacteria growing on organic materials;
- 7. Bodies, eggs, & young of trogloxenes serve as energy for other cave animals;
- 8. Foraging range is how far trogloxenes travel from cave to feed;
- 9. We expect higher numbers of trogloxenes closer to cave entrances;
- 10. Sometimes cave entrances are too small for humans to notice, but these can be used by some
- trogloxenes (mice, crickets, etc.);
- 11. Abundance and diversity of cave animals drops with increasing distance from guano &/or nest
- materials;
- 12. High concentrations of guano, such as at bat roosts, provide lots of energy, but the available energy
- decreases with increasing distance from the source.


Green Bay
G
G
A
Horseshoe Bay
Murphy Co Park
Bay Shore Dr
B
G