

BAT ACOUSTIC SURVEYS: 2024

HAMPTON CREEK COVE STATE NATURAL AREA

Presented to: Friends of RMSP & Park Rangers



RMSP Website

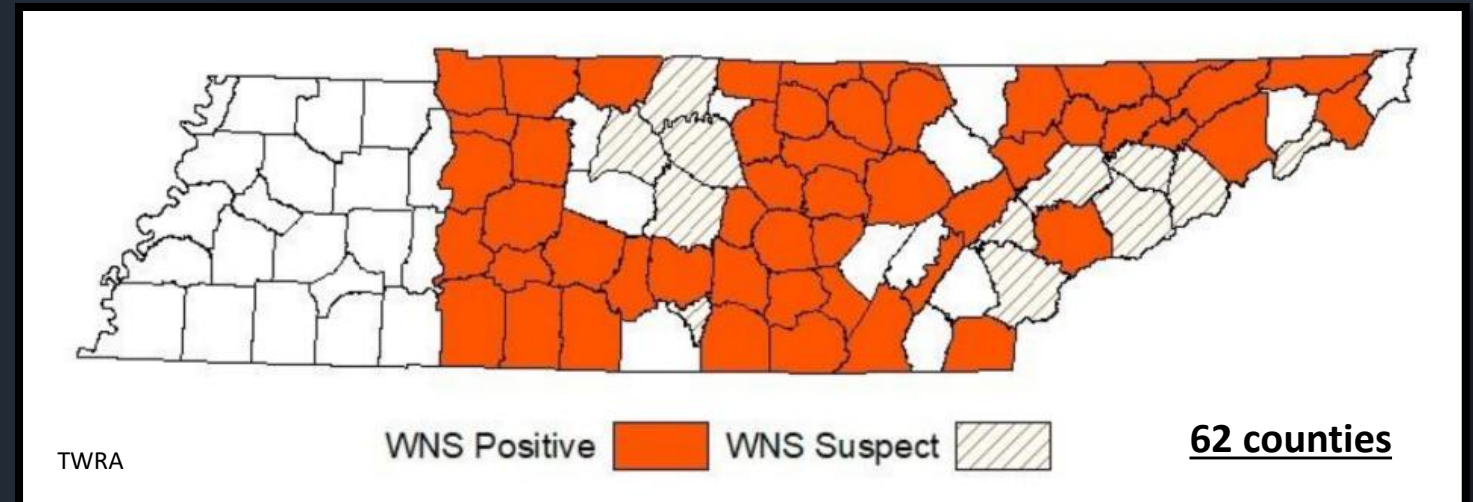
*Prepared by:
Gerry Middleton, MS
TDEC Biologist (retired)
&
Carole Middleton
Field Tech & Data Mgr.
Oak Ridge, TN
Feb. 15, 2025*

HAMPTON CREEK COVE BAT ACOUSTICS STUDY



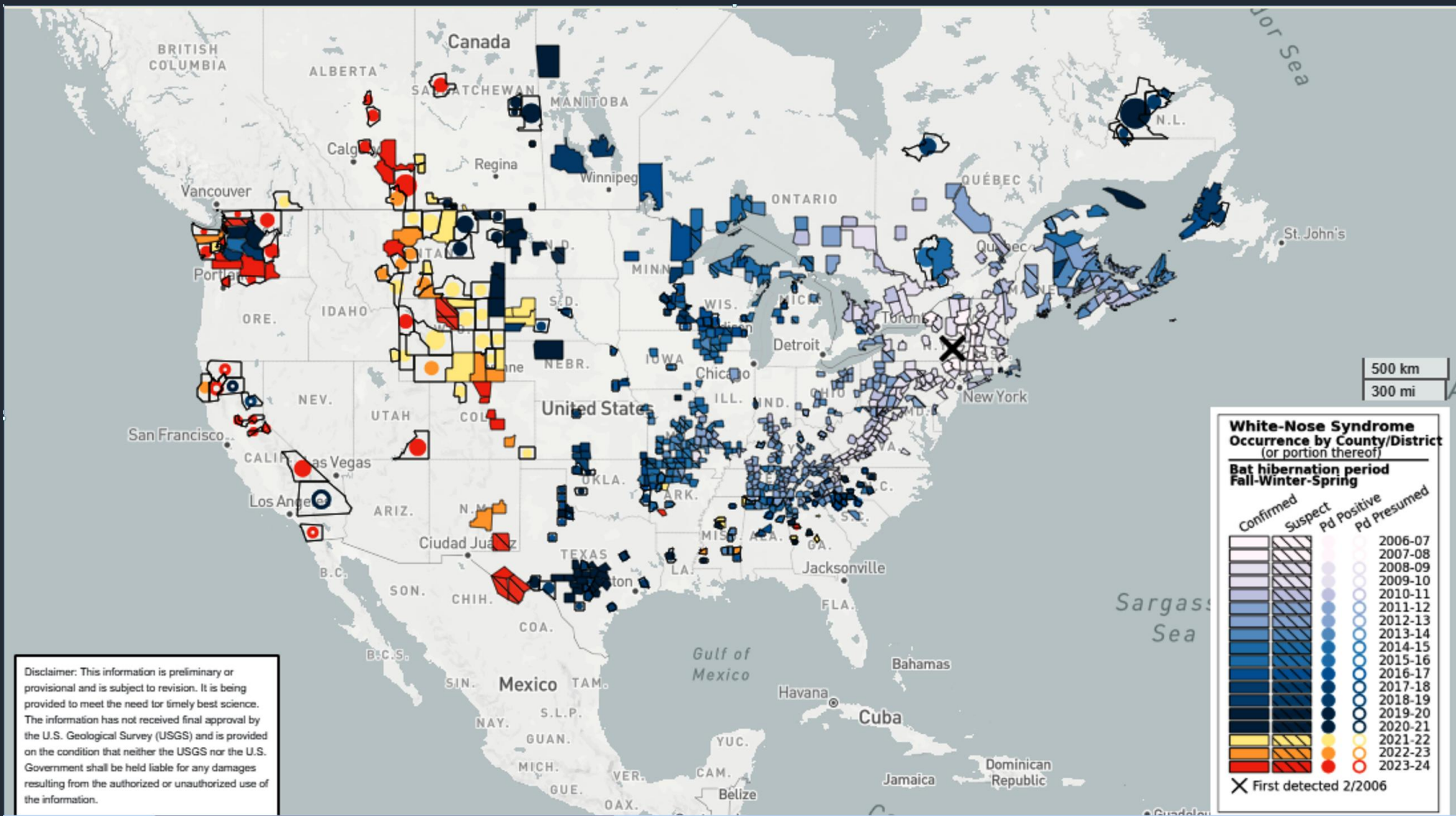
CRASH COURSE ON BATS

- Tennessee is home to over 80 Mammal species
- Bats in Tenn = 16 species
- 4 endangered bat species
- Bats are Hugely beneficial
- Bats are at risk to disease: Cave Bats
- White Nose Syndrome: 62 Tenn Counties
- Bat species susceptible to WNS:
 - Big brown bat
 - Eastern small-footed bat
 - Gray bat (End.)
 - Indiana bat (End.)
 - Little brown bat
 - Northern long-eared bat (End.)
 - Southeastern bat
 - Tri-colored bat-Proposed for Endangered

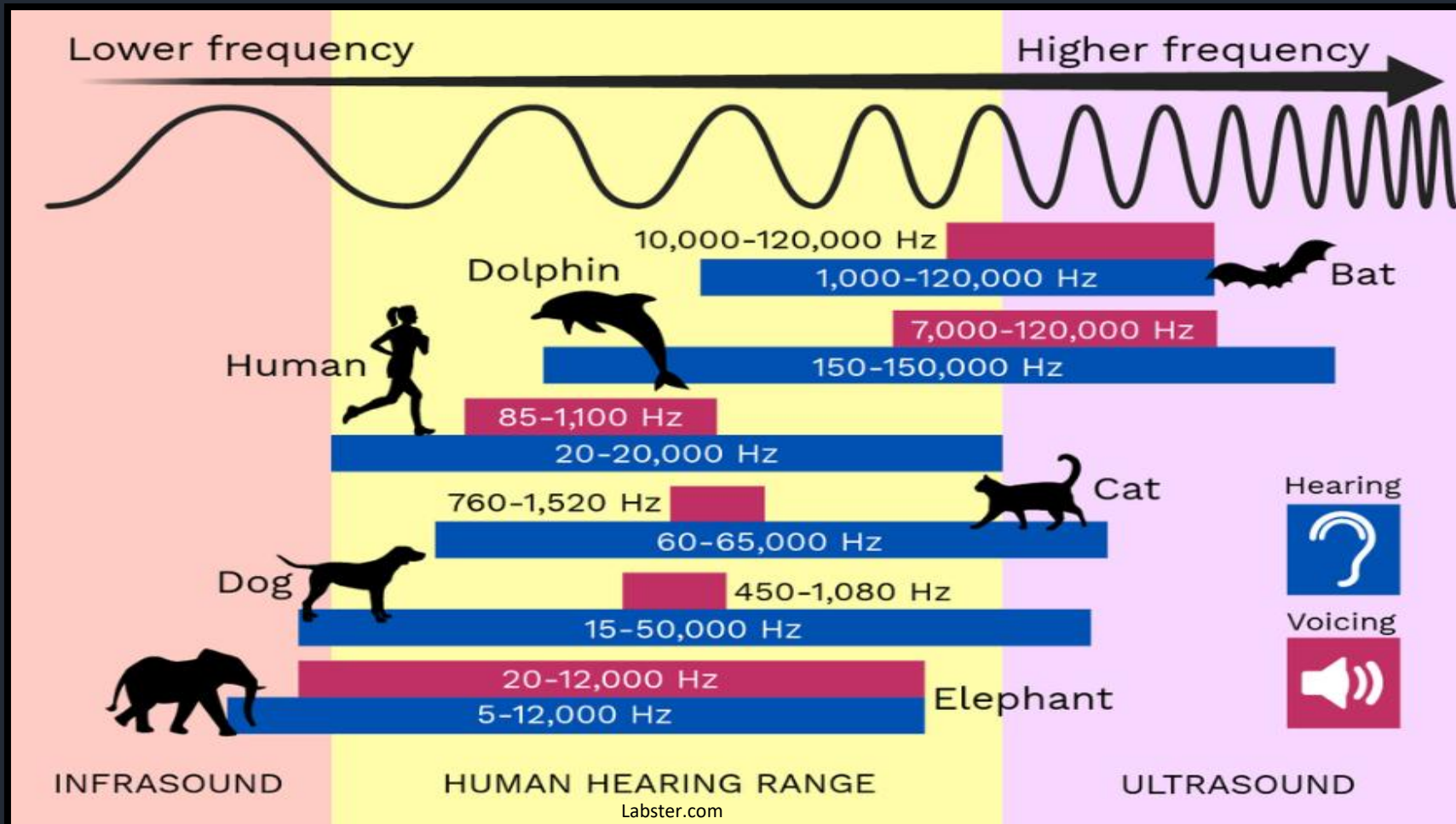


White Nose Syndrome Extent as of 2024

- 40 US States
- 9 Canadian Provinces

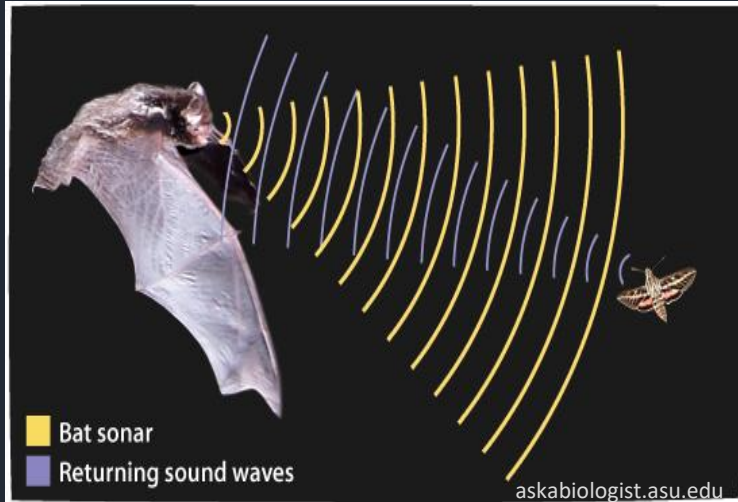


TENN BATS HAVE A SPECIAL TALENT: SOUND

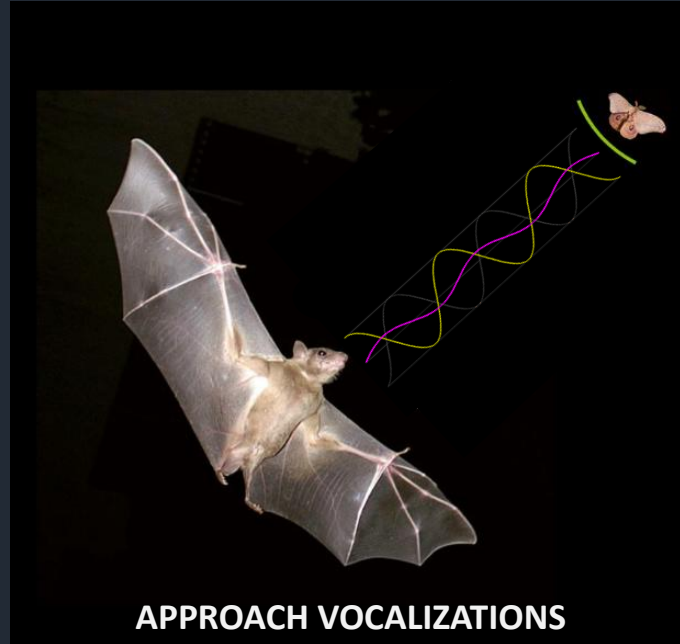


ECHOLOCATION SONAR

**ANABAT DETECTORS
RECORD THE BAT
SONAR
VOCALIZATIONS**



SEARCH VOCALIZATIONS



APPROACH VOCALIZATIONS



Great horseshoe bat catching a moth/Credit: Alamy

FEEDING BUZZ

- **Bats Emit High Frequency Clicks**
- **Listen for Return Echoes**
- **Navigation**
- **Hunting**

TENN BATS** ROOSTING HABITS

1. TREE SPECIALISTS

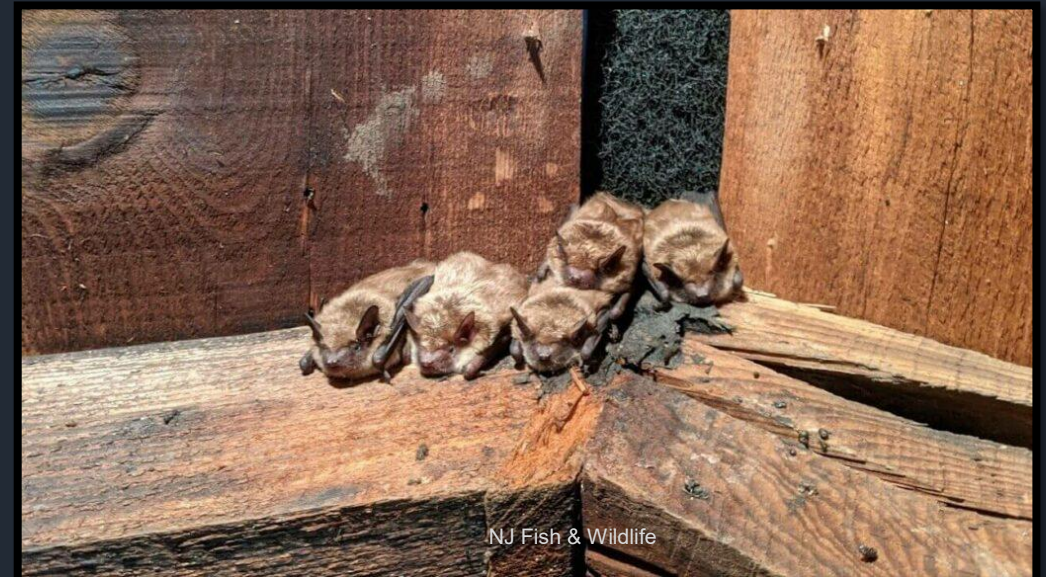


**ALL TENN BATS
ARE INSECTIVORES

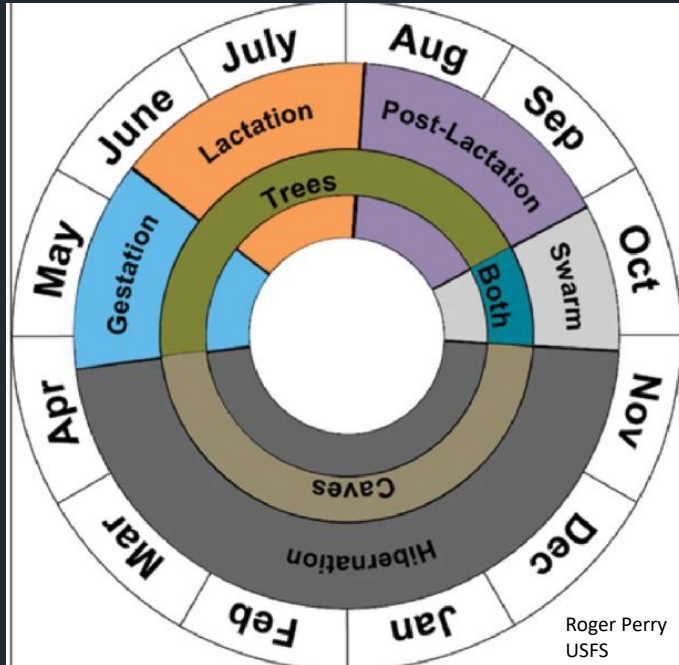
2. CAVE (& MINE) SPECIALISTS



3. OPPORTUNISTIC SPECIALISTS



Bat Reproduction



← Generalized life cycle diagram of roosting for most North American cave bats, such as the Endangered Indiana bat.

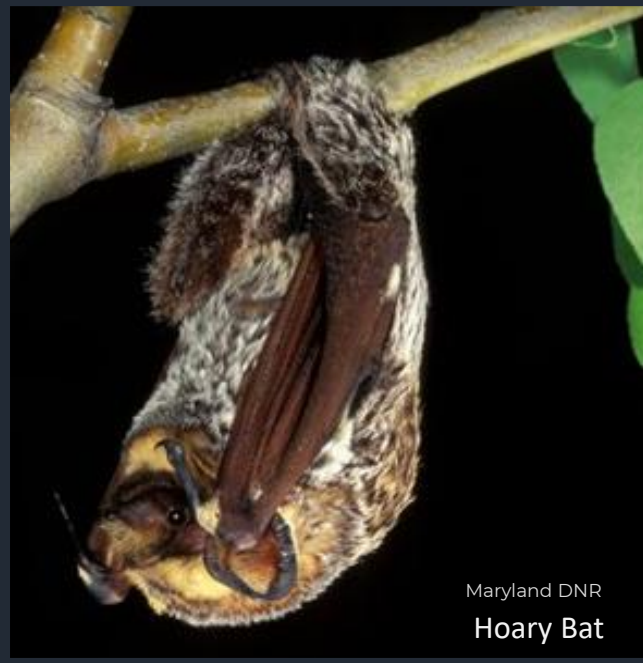


Female Red Bat Nursing at least 2 “Pups”

- The reproduction cycle of the Indiana bat (*Myotis sodalis*) is characterized by **delayed fertilization**, a unique biological strategy where mating occurs in the fall, but pregnancy does not begin until the following spring.
- Baby bats (“pups”) weigh 25-30% of their mother’s weight at birth.
- Bat litters typically are 1-2 pups, but Hoary Bat females can have as many as 4 pups.

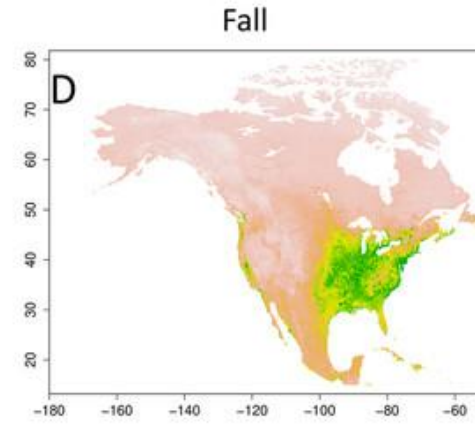
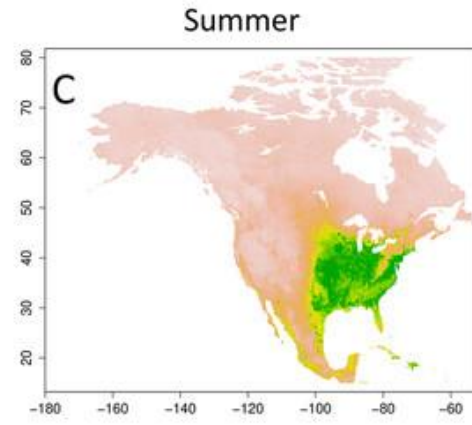
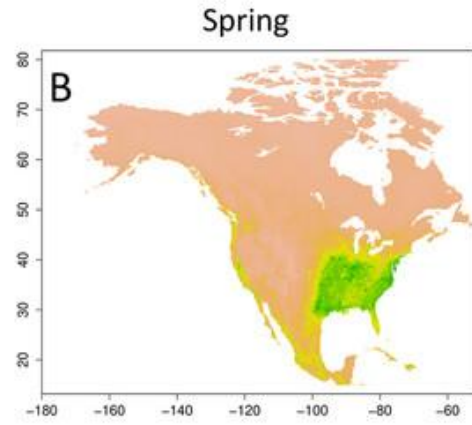
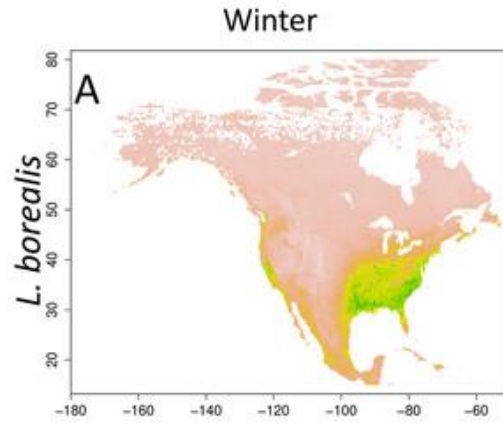
Easiest Tenn bats to recognize by sight:

- Eastern Red Bat roosting in tree
- Brazilian Free-Tailed Bat
- Rafinesque's Big-Eared Bat
- Hoary Bat
- Silver-Haired Bat

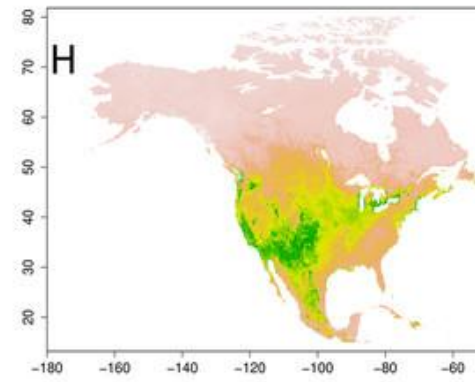
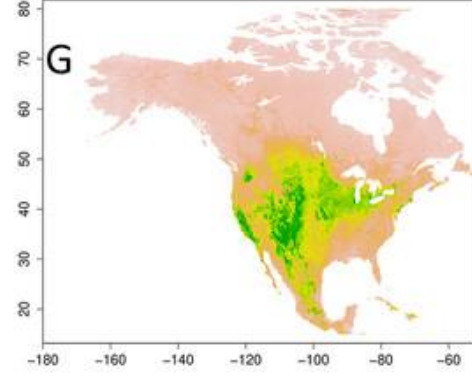
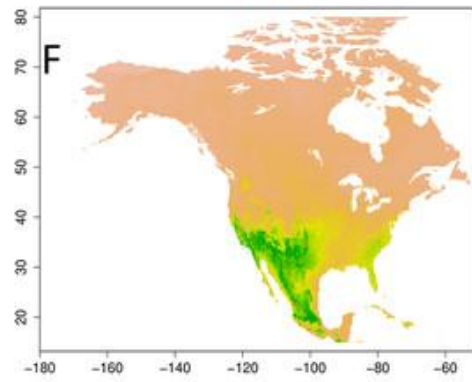
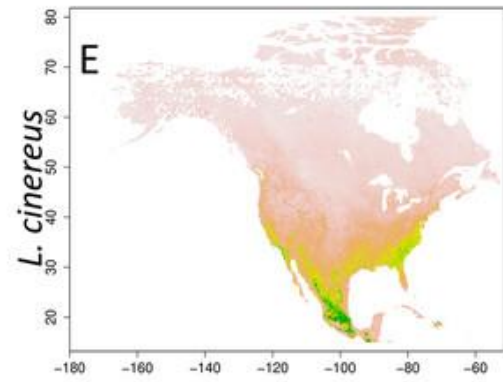


DO BATS MIGRATE?

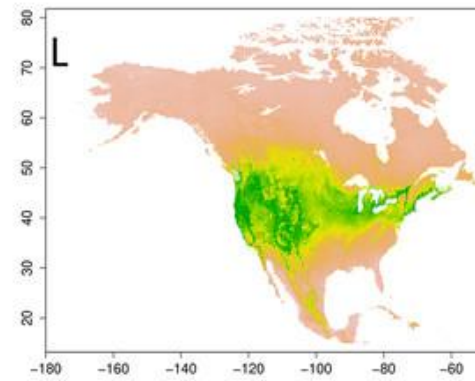
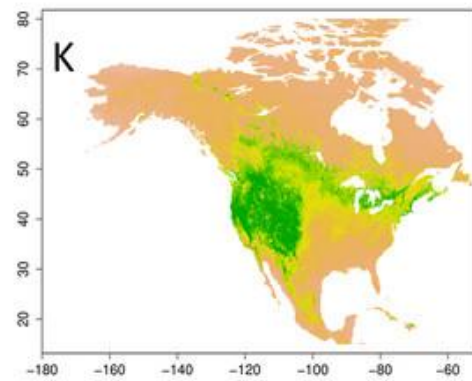
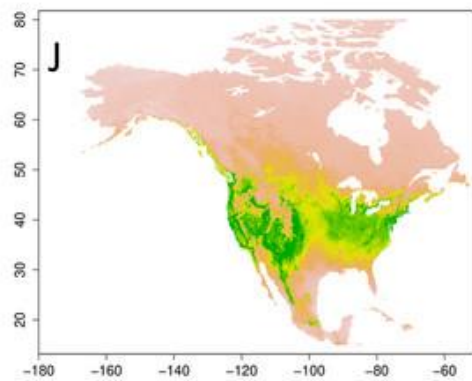
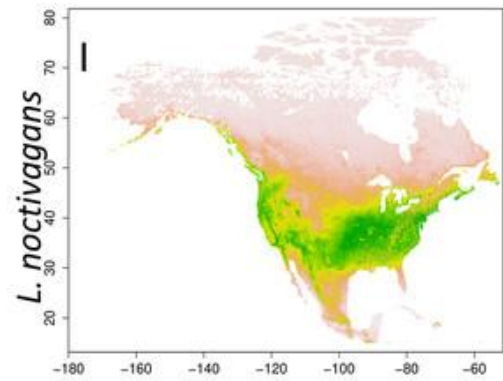
Red Bat



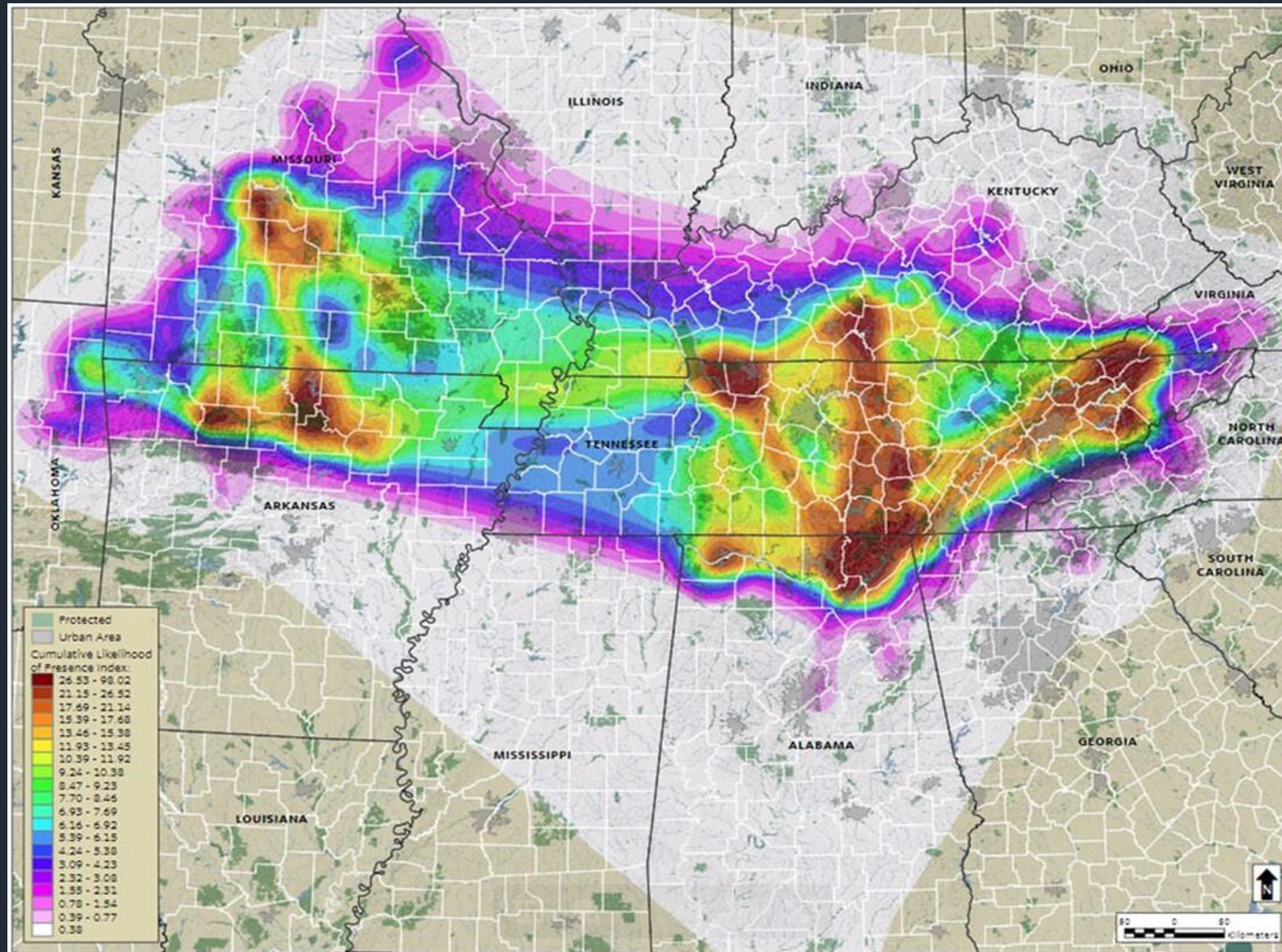
Hoary Bat



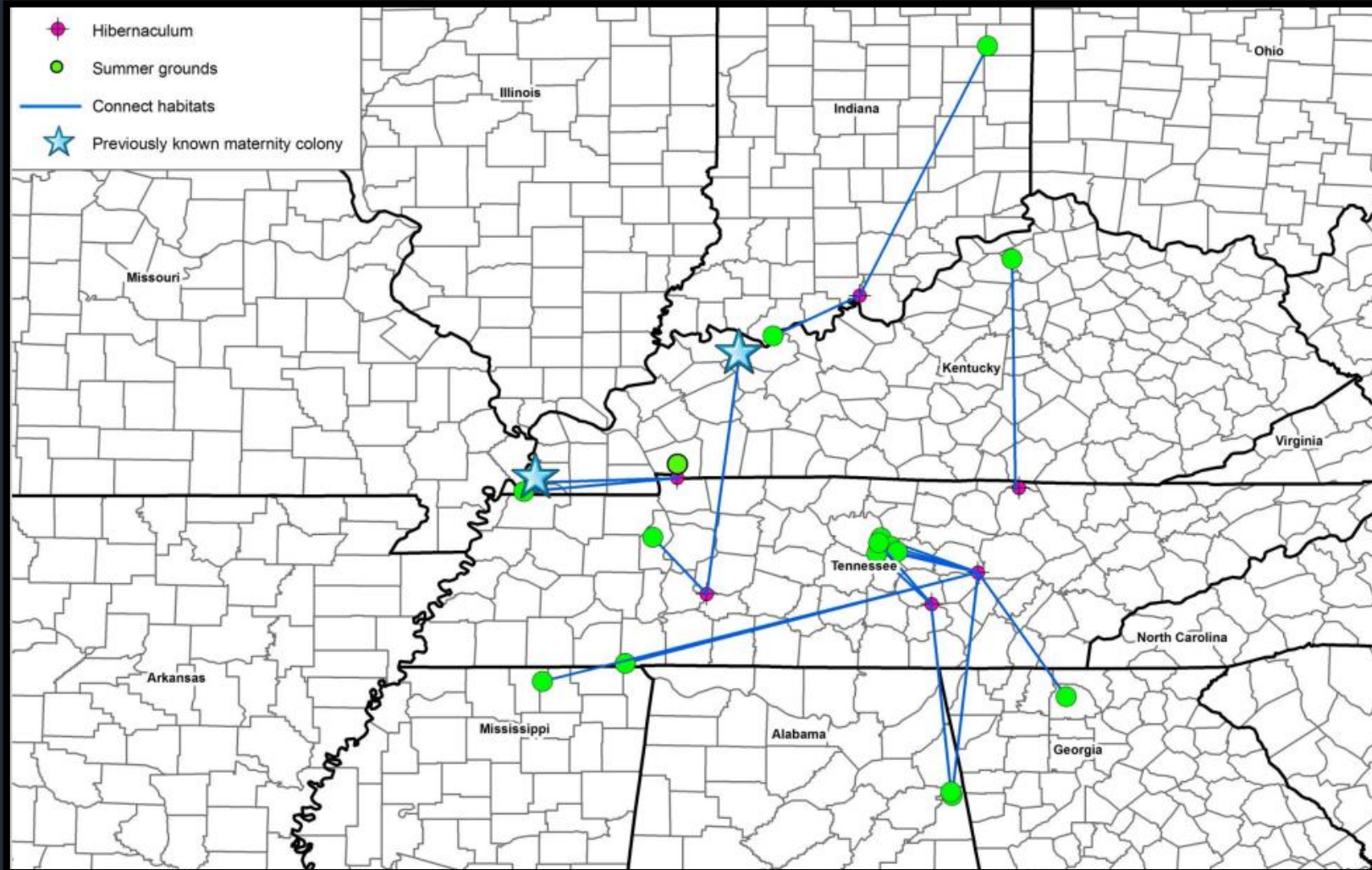
Silver-Haired Bat



Gray Bat Distribution Model: Year-Round Species Range, Southeast U.S.



Migration of Indiana Bats in the Southeast US: Tracking Study



Debbie Buecher (2003).

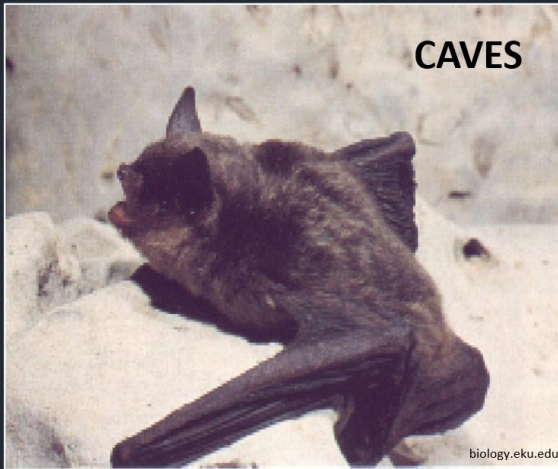


VHF Tracking Device

Roby, P.L., M.W. Gumbert & M.J. Lacki. 2019.
Journal of Mammalogy 100(5):1501-1511.

Endangered Bat Species - Tennessee

Gray Bat
Myotis grisescens



Indiana Bat
Myotis sodalis



Virginia Big-eared Bat
Corynorhinus townsendii
virginianus



CANDIDATES FOR FEDERAL-LISTING AS ENDANGERED SPECIES



THE US FISH & WILDLIFE SERVICE HAS PROPOSED TO LIST (AS OF 9-13-2022) THE TRICOLORED BAT AS AN ENDANGERED SPECIES UNDER THE ENDANGERED SPECIES ACT

Ongoing spread of white-nose syndrome is primary threat, increasing risk of extinction.



LITTLE BROWN BAT LISTING STATUS: UNDER REVIEW BY THE US FISH & WILDLIFE SERVICE

Bat Maternity Roost Trees

Indiana Bat / No. Long-Eared Bat

- White Oak



- Shagbark Hickory



****One failure of our 2024 HCC bat project was lack of survey sites in the upland forests that flank the main natural area fields & pastures.**

TREE CRACKS AND HOLES



Tree Cracks/Breaks



Linda Roth



© BCT/Aubrey Furner



© BCT/Aubrey Furner

Flaking bark

Hole in decay



naturebftb.co.uk



cdn.bats.org.uk



© BCT/Gail Armstrong



© BCT/Stephen Davison

Knot hole

Woodpecker hole

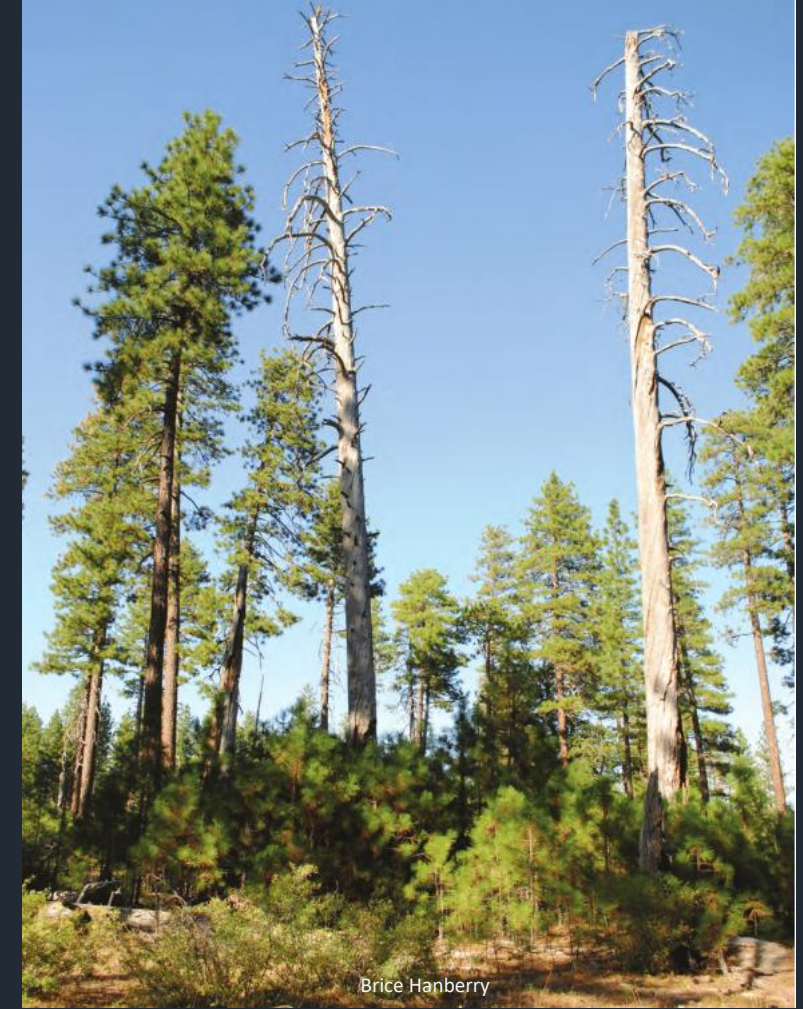
- Indiana bats
- Evening bats
- Northern Long-eared bats
- Rafinesque's Big-eared bats

Bat Habitat: Loose & Flaking Bark

- Indiana bats
- Northern Long-eared bats



Dead Tree Snags—Important Bat Maternity Roosts



Bat Habitat: Field & Forest Edge

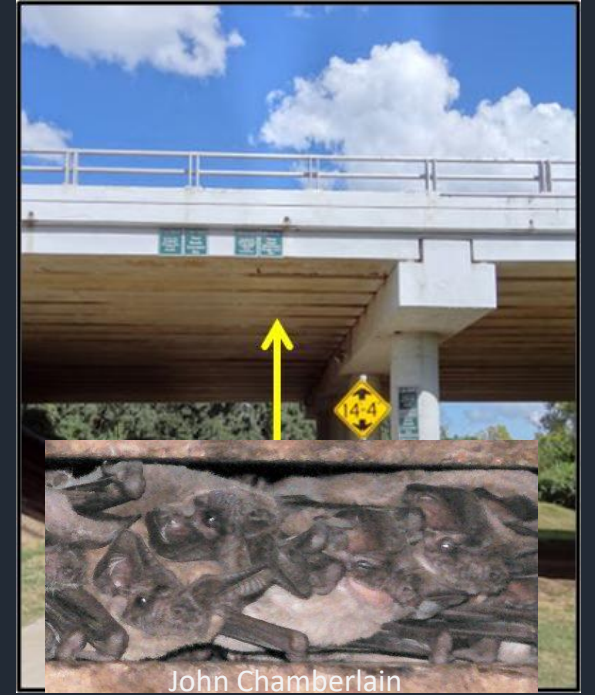
Bat Roost & Foraging Areas



Bat Habitat: Man-Made Structures



Bats in bridge expansion joints



Bat Habitat: Ponds, Wetlands, Springs, Streams & Riparian Zones



Bat Habitat: Rock Bluffs, Talus Slopes, Cracks, Fissures & Caves



Bat Flyways: Trails, Access Roads & Forest Clearings



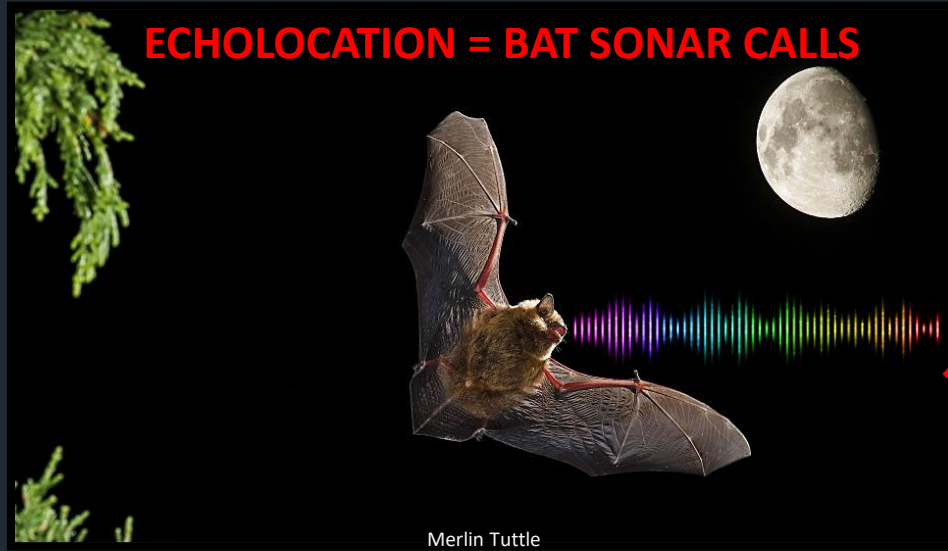
METHODS

- **Anabat Express** detectors record ultrasonic bat vocalizations – Sonar Clicks
- Bat sonar calls are recorded as the bat(s) fly near the Anabat



- Anabat Express units are lightweight & portable.
- Affixed to a tree with a metal lock box & Master Lock cable.

METHODS: SOFTWARE & ANALYSIS



Bat calls recorded ↓



EXAMPLE OF KALEIDOSCOPE PRO ANALYSIS OUTPUT (EXCEL)

KALEIDOSCOPE 5.3.0		<i>Values shown in the table represent number of bat calls, NOT the number of bats. ↓</i>															
Bats of North Am	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA	NOID	NOISE
5/29-6/13/24	185	750	322		2		167		208	469	1	642		338	156	10	98
		<i>Maximum Likelihood of Occurrence Estimator ↓</i>															
Presence	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA		
P-values	0.00144	0	0.0004	1	0.99564	1	0.03172	1	0.02382	0	1	0	1	0	0.02859		

The current standard for occupancy is a returned MLE* P-value < 0.05

* MLE = "Maximum Likelihood Estimator"

Kaleidoscope PRO
Mfg. by: Wildlife Acoustics
Maynard, MA

BAT RESULTS



← *Bat in Flight
Above the Deer*



59 F

TRAILCAM01

04/15/2024 10:44PM

Bat Species Results From Kaleidoscope PRO Analysis*

Survey Site ↓	BAT SPECIES DETECTED BY KALEIDOSCOPE PRO															ADDITIONAL DATA			
	CORTOW*	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI*	MYOLEI	MYOLUC	MYOSEP*	MYOSOD*	NYCHUM	PERSUB	TADBRA	NOID	Bat Calls Site Totals	Noise	Survey Nights
HC-01	717	9076	370	587	907	348	86	301	239	294	356	126	513	570	767	1309	16566	212881	150
HC-02	393	2575	106	78	347	292	33	47	52	69	35	34	255	94	202	220	4832	22485	143
HC-03	52	221	4	61	158	24	154	14	727	19	283	32	·	17	197	102	2065	27843	152
HC-04	31	469	23	55	104	9	13	10	44	56	76	46	14	27	126	1143	2246	304658	150
HC-05	608	5419	75	2	99	24	15	75	15	27	15	13	79	59	100	250	6875	979	103
HC-06	217	539	2	141	79	2	3	·	4	4	6	5	·	·	49	338	1389	17192	136
HC-07	373	4662	75	191	355	33	70	141	59	103	85	52	48	79	500	830	7656	43289	136
HC-08	252	175	4	1	3	·	32	3	42	1	55	10	·	1	·	21	600	1005	129
HC-09	·	·	2	6	19	22	·	1	·	·	124	·	2	2	32	21	231	209	16
HC-10	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	118
Totals by Species	2643	23136	661	1122	2071	754	406	592	1182	573	1035	318	911	849	1973	4234	42460	630541	1233

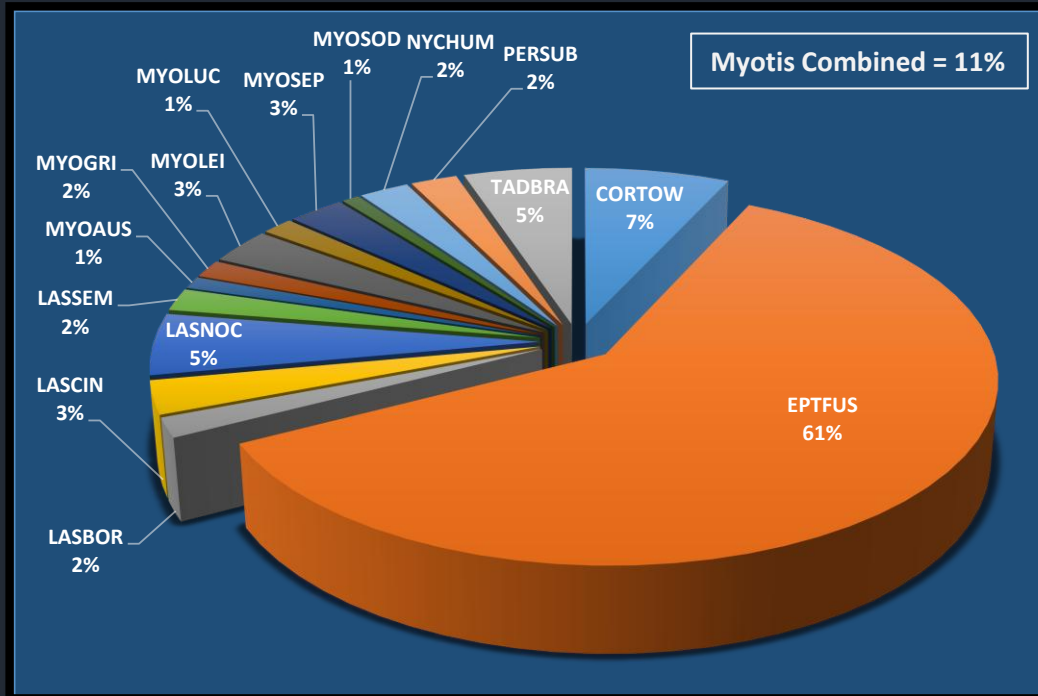
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Bat Code	Bat Species	Bat Code	Bat Species	Bat Code	Bat Species	Bat Code	Bat Species
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CORTOW	Virginia Big-Eared Bat (End.)	LASNOC	Silver-Haired Bat	MYOLEI	Eastern Small-Footed Bat	NYCHUM	Evening Bat
EPTFUS	Big Brown Bat	LASSEM	Seminole Bat	MYOLUC	Little Brown Bat	PERSUB	Tri-Colored Bat
LASBOR	Eastern Red Bat	MYOAUS	Southeastern Bat	MYOSEP	Northern Long-Eared Bat (End.)	TADBRA	Brazilian Free-Tailed Bat

Big Picture – 2024 HCC Bat Data Combined*

	SUMMARY OF BAT SPECIES DETECTED BY KALEIDOSCOPE PRO												ADDITIONAL DATA						
	CORTOW*	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI*	MYOLEI	MYOLUC	MYOSEP*	MYOSOD*	NYCHUM	PERSUB	TADBRA	NOID	Bat Calls Site Totals	Noise	Survey Nights
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LASBOR	Eastern Red Bat	MYOAUS	Southeastern Bat	MYOSEP	Northern Long-Eared Bat (End.)	TADBRA	Brazilian Free-Tailed Bat



CORTOW =
Corynorhinus townsendii
virginianus
Virginia Big-Eared Bat (End.)

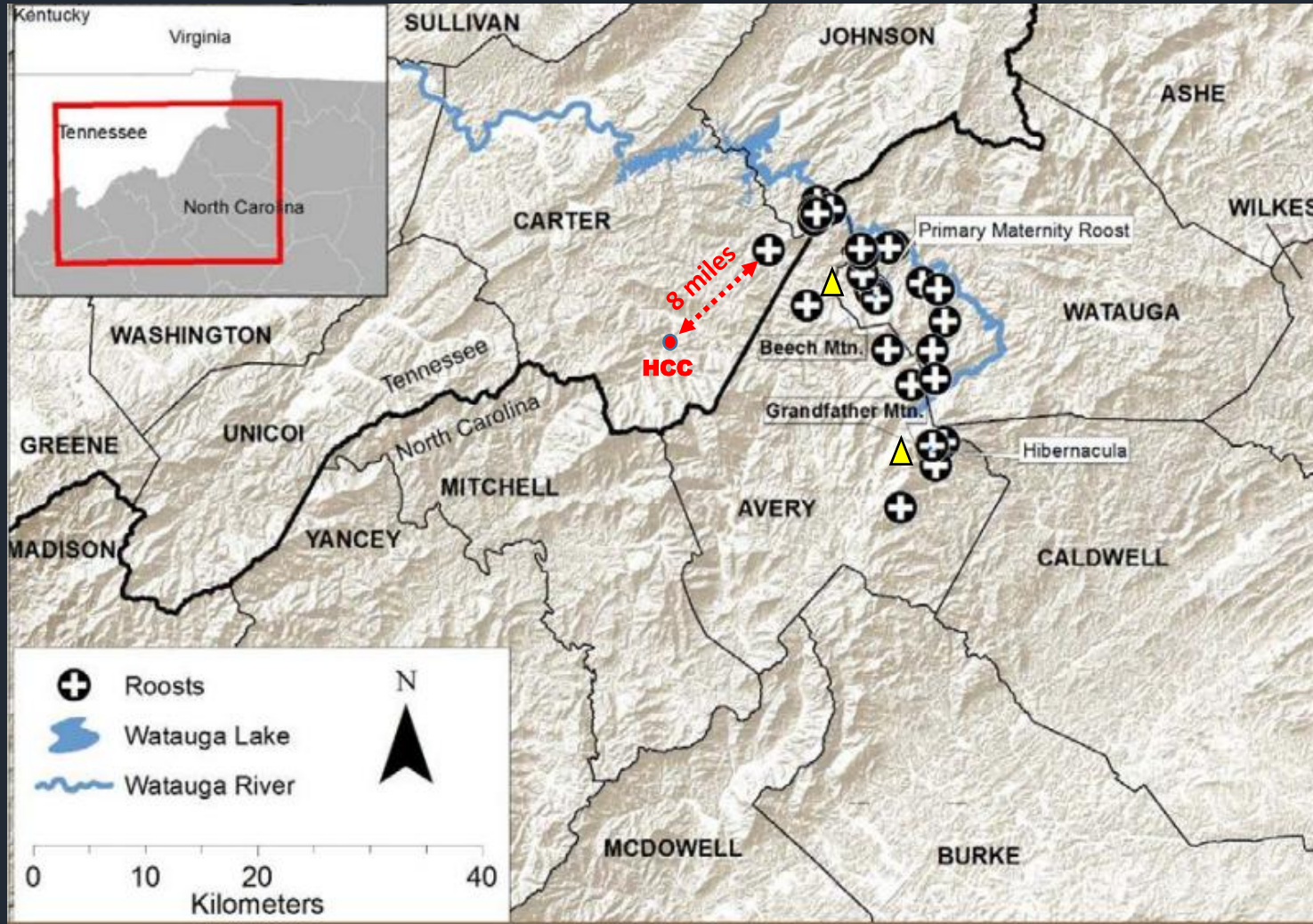


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Documented Virginia Big-eared Bat Roost Locations North Carolina & Tennessee

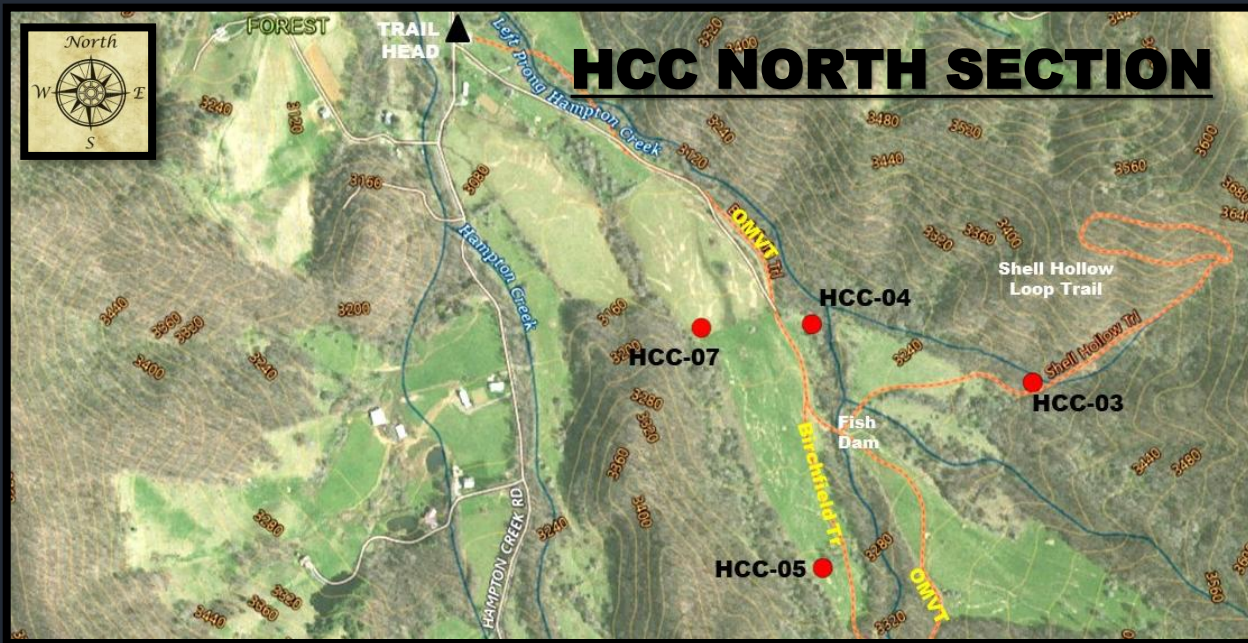


- Pogo Cave in Carter Co. (near NC border) is about 8 mi straight-line distance NE of Hampton Creek Cove.
- VA Big-Eared Bat foraging Range is about 20 mile radius. (Virginia Big-eared Bat / VA DWR)



Joey A. Weber, Joy M. O'Keefe, Brianne L. Walters, and Robert J. Arndt. 2016. Center for Bat Research, Outreach, and Conservation Indiana State University Terre Haute, IN

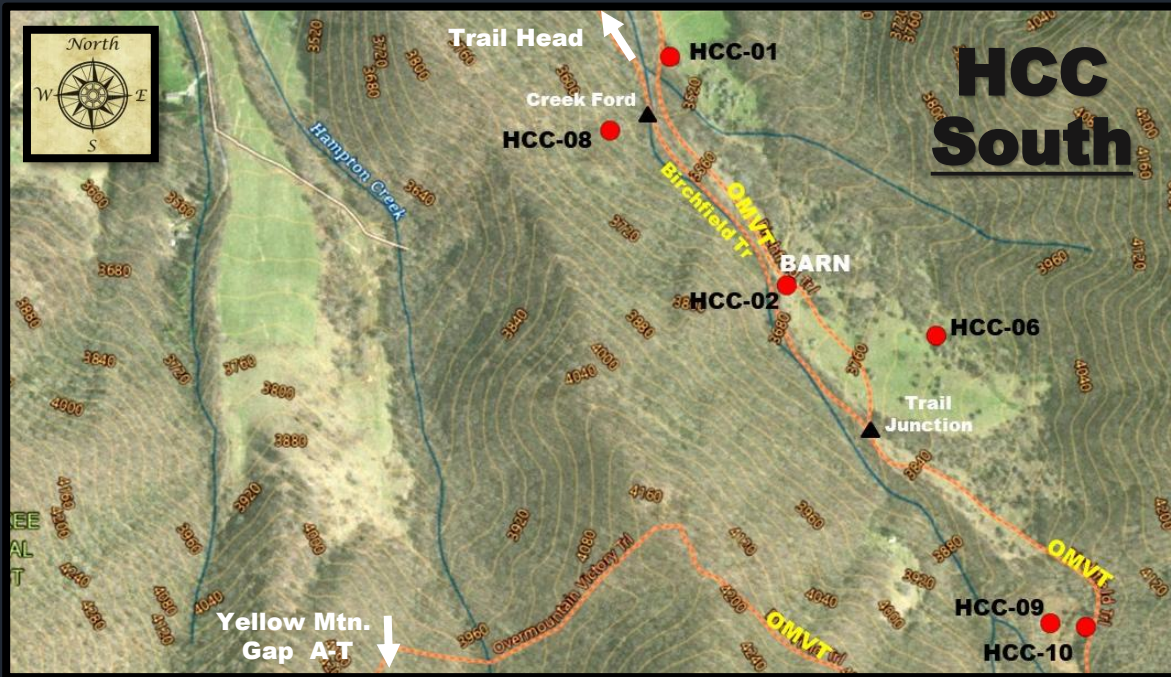
TWRA (2023) reported the first Virginia big-eared bat (VBEB) ever documented hibernating in Tennessee was confirmed in 2023 at Poga Cave in Carter County.



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LASBOR	Eastern Red Bat	MYOAUS	Southeastern Bat	MYOSEP	Northern Long-Eared Bat (End.)	TADBRA	Brazilian Free-Tailed Bat



* Values shown in the table represent number of bat calls, NOT the number of bats.

Bat Calls by Myotis Species:
 Southeastern Bat = 154
 Gray Bat (End.) = 506
 E. Small-Footed Bat = 337
 Little Brown Bat = 368
 No. Long-Eared Bat (End.) = 576
 Indiana Bat (End.) = 175

**Combined Myotis Group
2,116 Calls**

Survey Site ↓	BAT SPECIES DETECTED BY KALEIDOSCOPE PRO															ADDITIONAL DATA			
	CORTOW*	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYO AUS	MYOGRI*	MYOLEI	MYOLUC	MYOSEP*	MYOSOD*	NYCHUM	PERSUB	TADBRA	NOID	Bat Calls Site Totals	Noise	Survey Nights
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Hampton Creek Cove Bat Summary

- Surveyed 10 HCC field sites between 3/30/24 & 9/02/24
- Anabats deployed for a site-wide 1,233 survey nights (all 10 sites)
- Anabats recorded bat calls from dusk-dawn, 24/7
- Recorded bat data analyzed with Kaleidoscope PRO
- 42,460 combined bat calls recorded (site-wide for 10 sites)
- Survey Sites with highest volume of recorded bat calls:
 - HC-01: Field/Forest fence boundary along OMVT & small creek
 - HC-02: Old barn along the OMVT
 - HC-05: Open pasture with clump of Trees / Birchfield Trail
 - HC-07: Pasture at fence line corner / west of Birchfield Trail
- One Anabat at site HC-10 malfunctioned several times, NO data
- The most active bat sites were at or near the open pasture fields
- In hindsight, Anabats should have been deployed deeper into the ridgeside forests flanking the HCC Natural Area

Hampton Creek Cove Bat Summary-Continued

- Yes! We got some bat hits at HCC... plus Endangered bat hits
- VA Big-Eared Bat (?) – Pogo Cave 8 miles straight-line distance NE of HCC
- VA Big-Eared Bat foraging range is about 20 miles from roost site
- Recommend Mist Net Surveys to confirm species presence
- Myotis Group ($n=6$ species): Includes 3 of our Endangered Bats
- Combined Myotis site-wide bat call volume = 4,106 recorded calls

Most frequently recorded bat species:

- Big Brown Bat
- VA Big-Eared Bat (End.) ?
- Silver-Haired Bat
- Brazilian Free-Tailed Bat
- No. Long-Eared Bat (End.)
- Eastern Small-Footed Bat

Other bat species detected:

- Gray Bat (End.)
- Indiana Bat (End.)
- Tri-colored Bat
- Seminole Bat
- Southeastern Bat
- Evening Bat
- Hoary Bat
- Red Bat

*WE APPRECIATE THE FRIENDS OF ROAN MOUNTAIN
STATE PARK AND THE RMSP RANGERS FOR THEIR
GENEROUS SUPPORT*

THANK YOU !!!

