

Bat and Cave Biology of El Malpais National Monument

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Grants, New Mexico



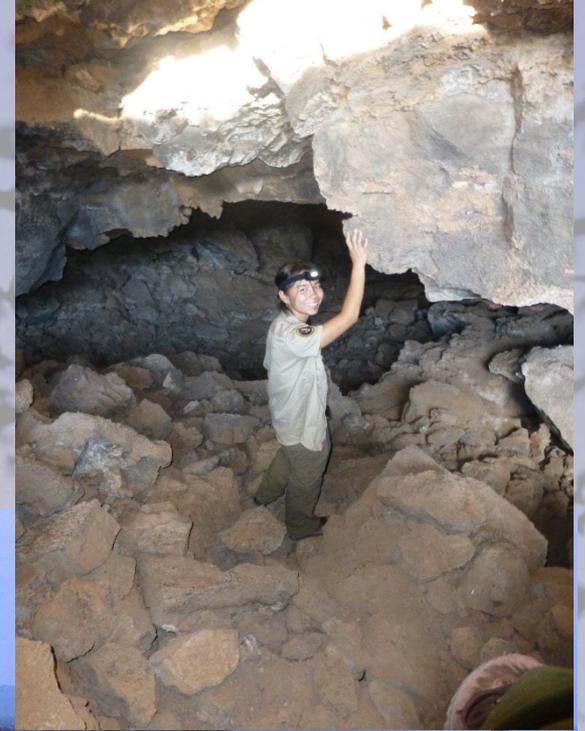
Location

- Headquarters located in Grants, New Mexico
- Volcanic terrain covered in basalt lava rock
- Formations in ELMA include:
 - Cinder cones
 - Shield volcanoes
 - Collapses
 - Trenches
 - Caves
- “One of the best continuous geologic records of volcanism on the planet.” – ELMA homepage

Project Objectives

- Monitor bat populations throughout the park
- Survey back country areas to detect presence/absence of different bat species
- Focus on surveying Brazilian free-tailed bat (*Tadarida brasiliensis*) outflights to estimate population trends

Out in the Field...



Surveying Caves for Bats

- Setting up AnaBat acoustic monitoring device
- Check for signs of bat use:
 - Staining
 - “Candy wrappers” (i.e. moth wings, beetle cases)
 - Bat guano



Surveying Bat Outflights

- Shortly after sunset
- Videotape outflight stream of *T. brasiliensis*
- Manual count using night vision goggles
- Video brought back to office for analysis



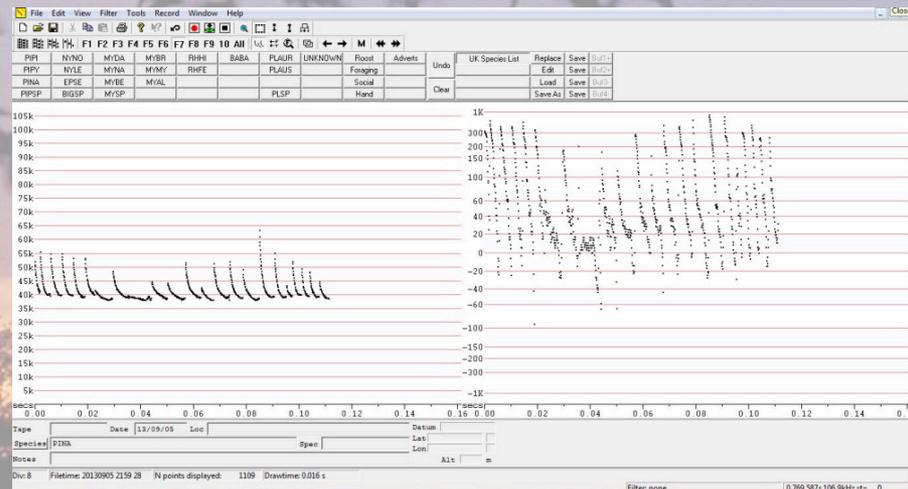
Out in the field prepping the camera and survey sheet for the outflight

...Back at the Office

- Surveying caves for bats:
 - Download AnaBat data and attempt bat ID
 - Download GPS tracks and waypoints
- Surveying bat outflights
 - Snapshots from video at regular intervals
 - Rate of bats flying between preset “goalposts”
 - Count bats in each snapshot
 - Input data into worksheet
 - Add manual count to get total estimate

Acoustic Data Analysis

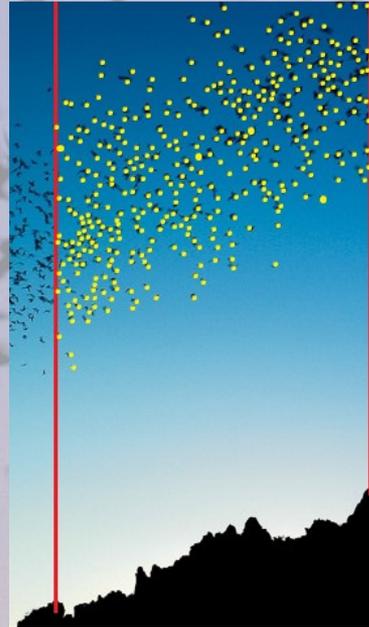
- Echolocation data collected through an AnaBat SD2
- AnaLook used to analyze acoustic data
 - Different bats echolocate at different frequencies
 - Can ID calls to groups of bats and sometimes to species



Population Estimate

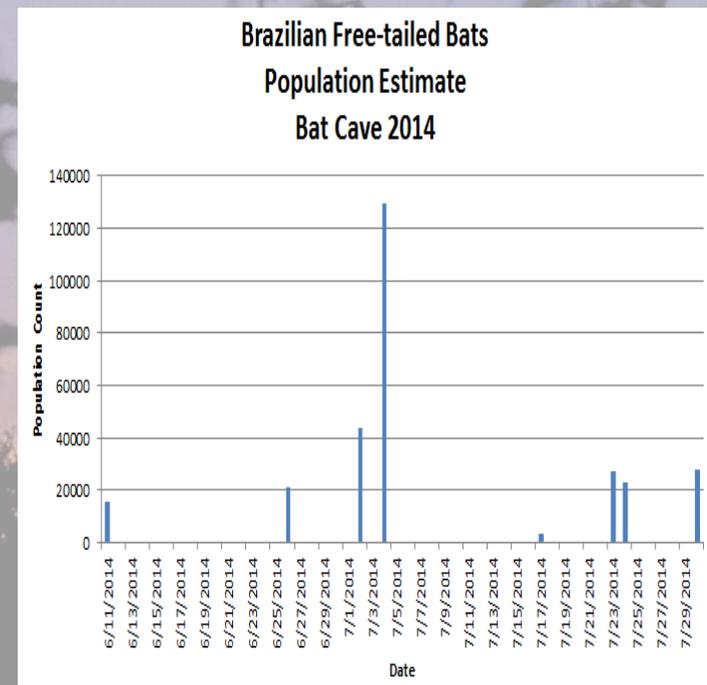
- For each snapshot (a):
 - Number of bats counted (x)
 - Average rate of speed calculated for time period (r)
 - Equation:

$$n_a = (t / r_a) * x_a$$
 - t = interval b/w snapshots
 - n_a = total for time interval around snapshot a
- Variation in numbers throughout season



July 24th, 2014				Rate(ave)			
Pic #	Time	#Bats	Rate(ave)	in seconds Estimate:			
00:00:00	20:31	45	1.94	232			
00:10:00	20:31	41	1.94	211		Time first bat seen:	20:29
00:20:00	20:31	18	1.94	93			
00:30:00	20:31	58	1.94	299			
00:40:00	20:31	101	2.01	502		Time steady stream starts:	20:31 2nd Start: 20:54
00:50:00	20:31	98	2.01	463		Time steady stream ends:	20:41 2nd End: 21:02
01:00:00	20:32	162	2.01	806		End of Count:	21:50
01:10:00	20:32	131	2.01	652			
01:20:00	20:32	60	2.01	299			
01:30:00	20:32	182	2.01	905		Wind Speed (mph):	3.6
01:40:00	20:32	252	2.01	1254		Wind Speed Average:	2.8
01:50:00	20:32	209	2.01	1040			
02:00:00	20:33	175	2.8767	608		Moon Phase:	
02:10:00	20:33	225	2.8767	782		Civil Sunset:	
02:20:00	20:33	267	2.8767	928		Actual Sunset:	20:21
03:30:00	20:33	157	2.8767	546			
02:40:00	20:33	233	2.8767	810		Start Temperature (°F):	72
02:50:00	20:33	229	2.8767	796		End Temperature:	69
03:00:00	20:34	231	2.8767	803			
03:10:00	20:34	194	2.8767	674		Notes on Weather:	28% humidity, calm
03:20:00	20:34	310	2.8767	1078			
03:30:00	20:34	207	2.8767	720			
03:40:00	20:34	257	2.8767	893			
03:50:00	20:34	187	2.8767	650			
04:00:00	20:35	97	2.4267	400			
04:10:00	20:35	143	2.4267	589			

Notes on Overall Count:
 30 Second pause before the first wave ended (20:40)
 Two Pulses seen this night



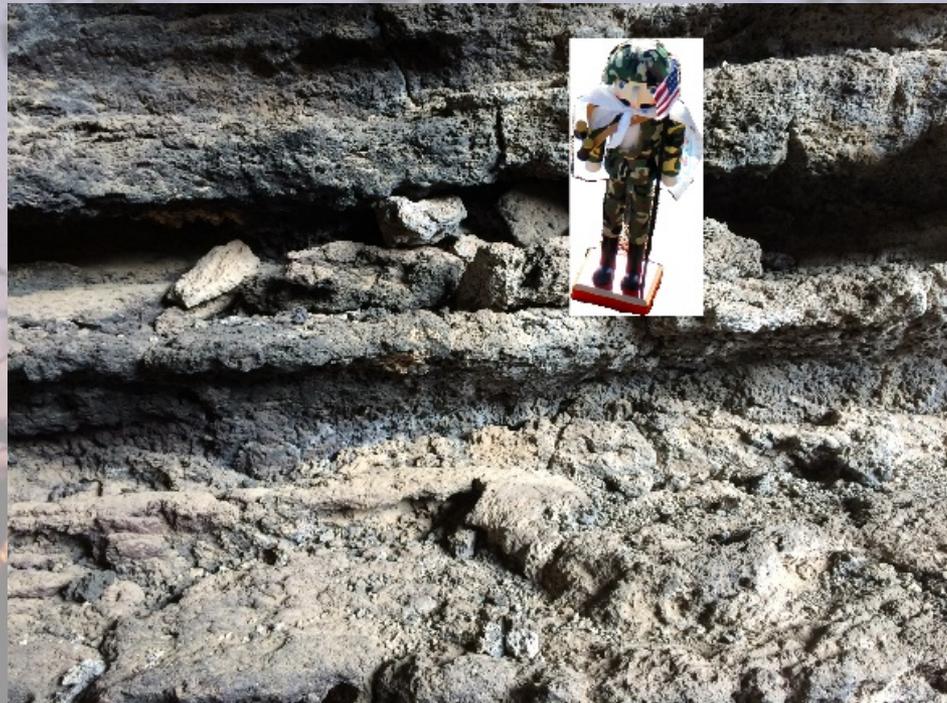
Other Work

- TrafX monitors
- Wildlife trail cameras
- Mist-netting bats
- Interpretation



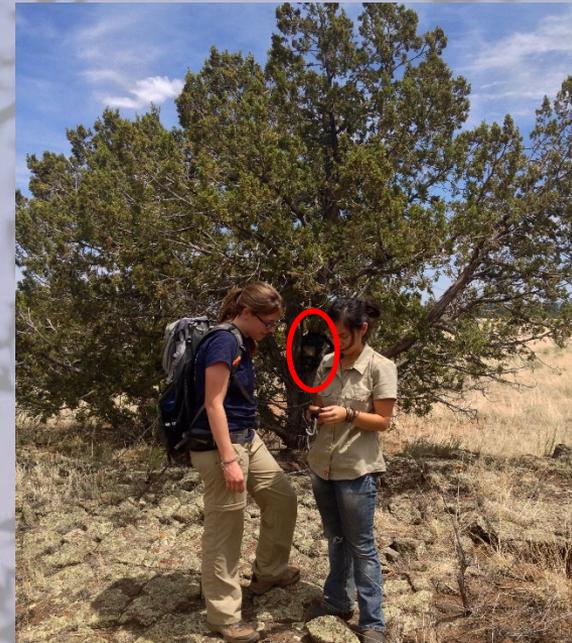
TrafX Monitors

- TrafX Monitors installed inconspicuously on trails and at cave entrances
- Used to monitor use of certain areas of ELMA



Wildlife Trail Cameras

- Trail cameras placed along game trails and areas with evidence of wildlife use
- Animals caught on cameras included in ELMA records



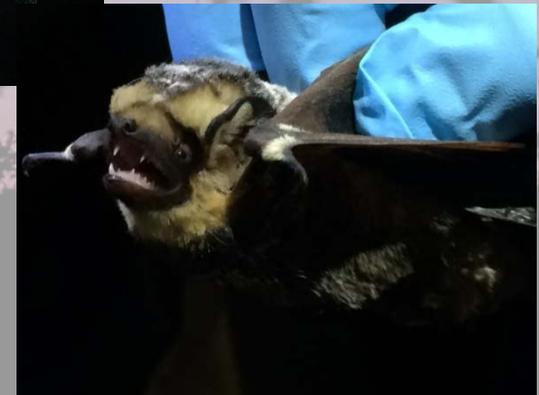
Stealth Cam 06/26/2014 18:14:04 86F



Stealth Cam 06/11/2014 22:17:40 66F

Mist-netting for Bats

- Assisted with mist-netting for Drs. Ernest Valdez and Diana Northup from UNM
 - Pulled bats out of nets
 - Helped with identification and recording physiological data
 - Inoculated for bacteria and DNA samples
- Need to be rabies vaccinated to handle bats



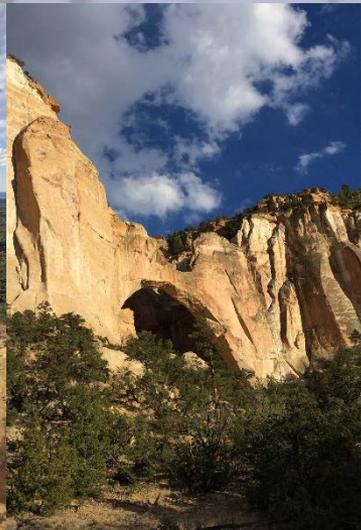
Interpretation

- An important aspect of work with NPS
- Provided information at outflights to observing visitors
- Wrote up information guide for Interpreter leading public outflights
- Same information used for bat section on ELMA webpage
- Wrote up guide for handling AnaBat and analyzing acoustic data

Awesome Critters!



Awesome Places!





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Acknowledgments

- Thanks to the Geological Society of America and Mosaics in Science programs for making this amazing summer possible!
- Thanks to the program partners and sponsors!

