



MSCP System Wide Acoustic Monitoring Along The LCR

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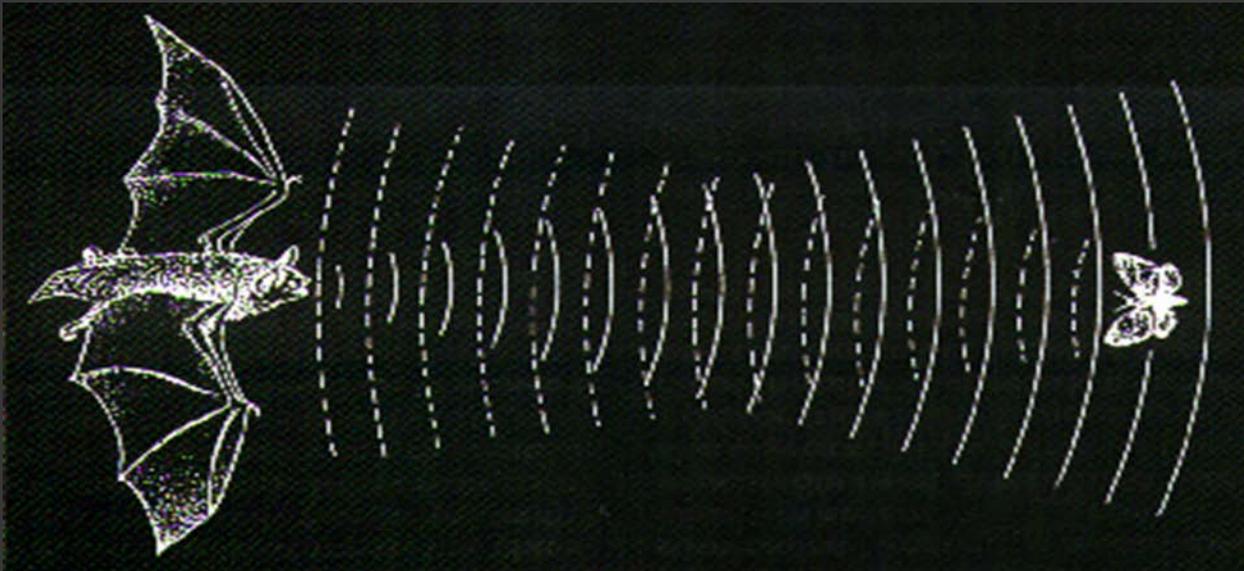
Arizona Game and Fish Department

Wildlife Contracts Branch



Benefits of Acoustic Monitoring

- Can Detect Greater Species Diversity and Activity Than Traditional Methods
- O'Farrell and Gannon 1999, 86.9% Acoustically vs. 63.5% Captures.
- Allows for Cost Efficient Long Term Monitoring
- Detect Occupancy and Activity Patterns
- Monitor Temporal and Spatial Activity



Project Objective

- Acoustically Assess Nightly Bat Activity Patterns and Proportion of Nights Occupied at Nine MSCP Conservation Areas and Five Non-Conservation Areas Along the LCR



MSCP Covered Bat Species

Western Red Bat



Western Yellow Bat



California Leaf-Nosed Bat



Townsend's Big-Eared Bat

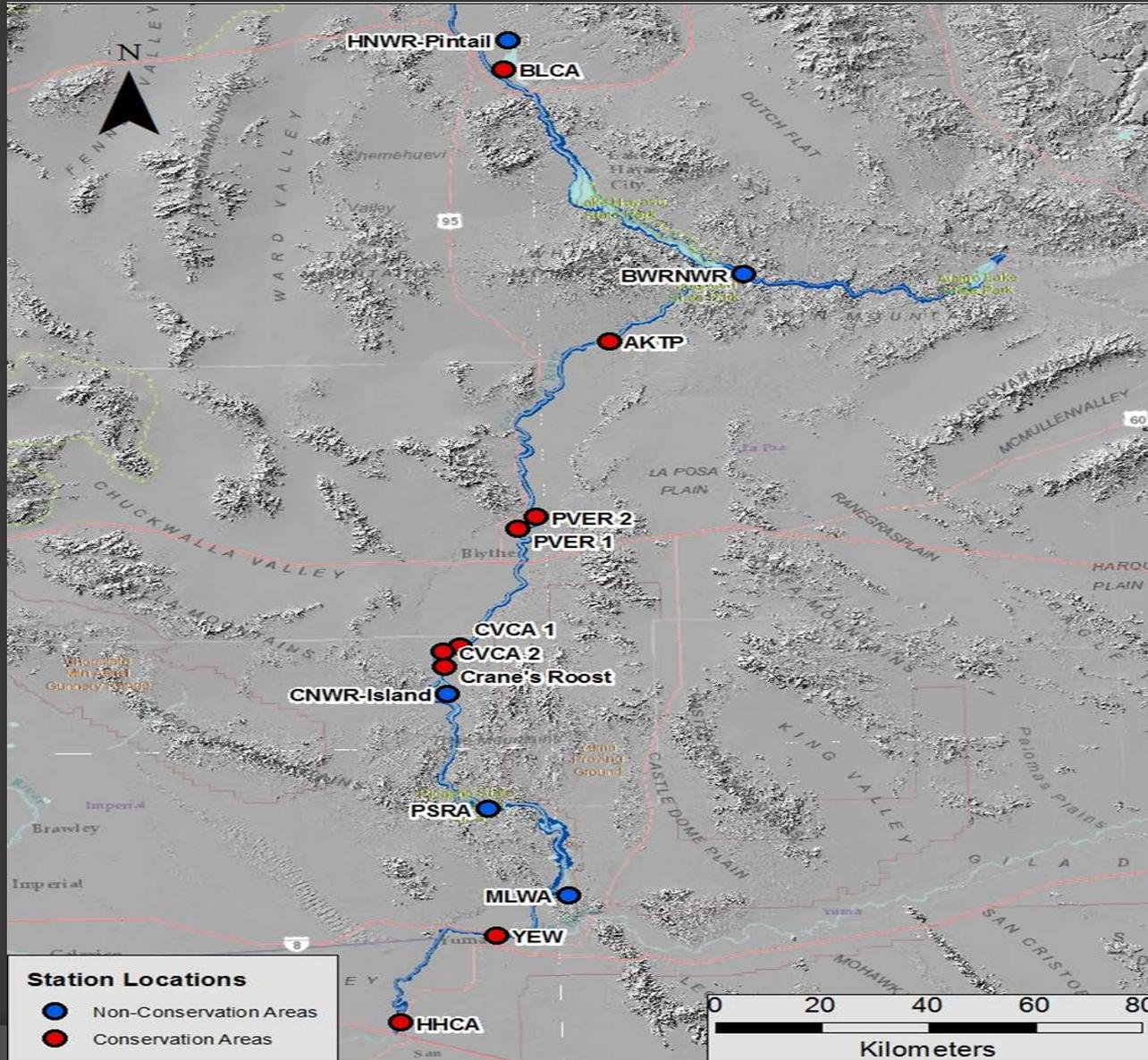


Additional Species

- ◉ Greater Mastiff bat
 - Crevice Roosting, High Altitude and Audible
- ◉ Hoary Bat
 - Tree Roosting, Migratory and carnivorous
- ◉ Cave Myotis
 - Cavern Roosting, Seasonally Migratory
- ◉ Arizona Myotis
 - Cavern/Palm Roosting, strong association with water sources, Migratory



Study Area



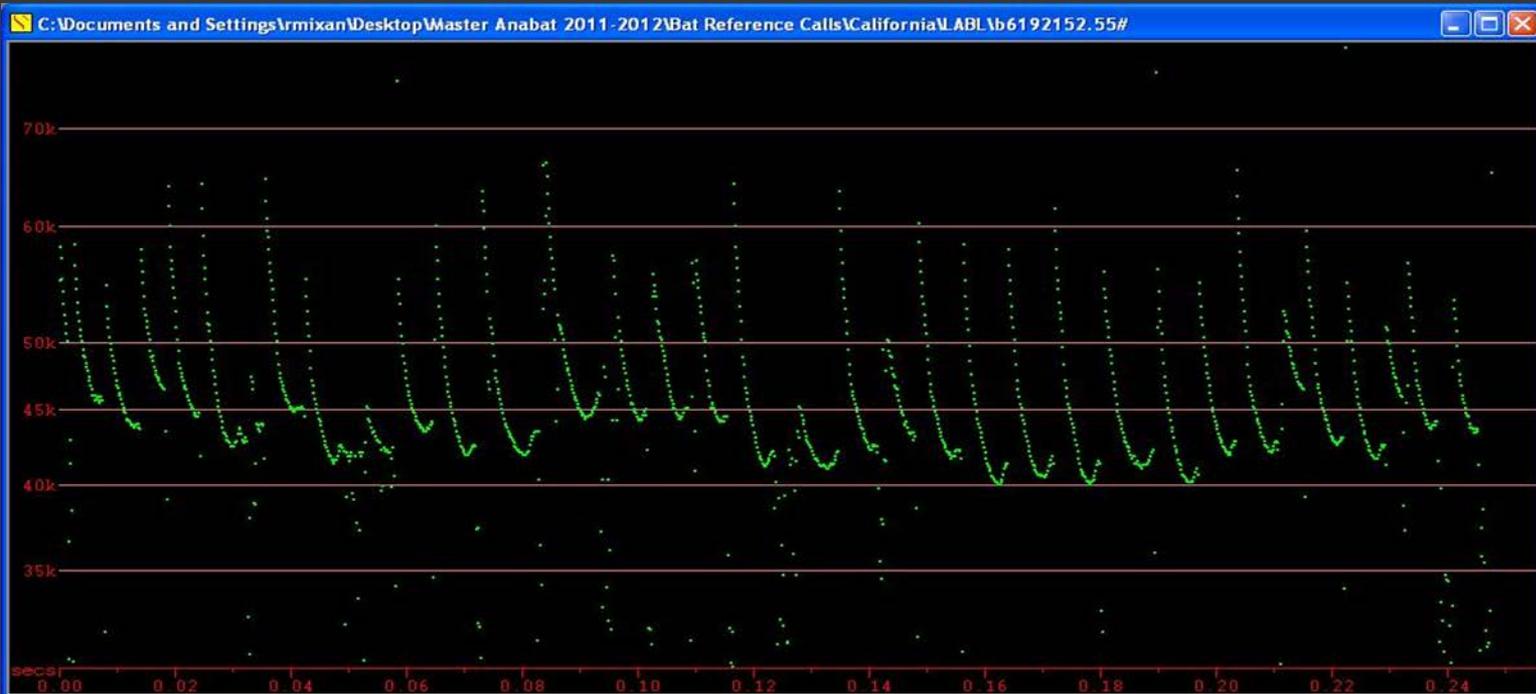
Methods

- We Record Calls Nightly From Sunset to Sunrise
- Apply Noise Filter
- Apply Species Specific Filters
- Manually Verify Calls (~430,000)



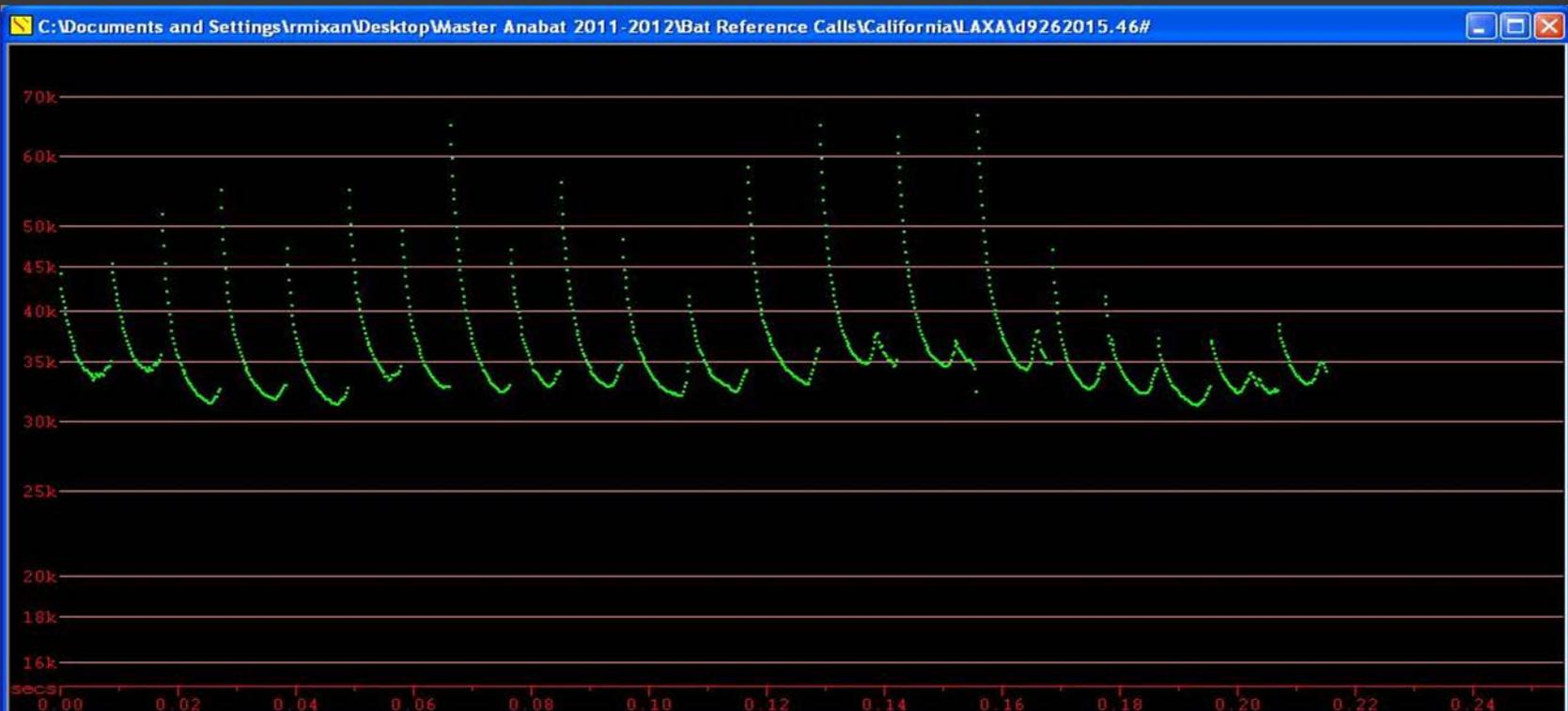
Acoustic Analysis

- Verified Calls Go Through a Call Minute Analysis
 - Measure of Relative Activity
 - Eliminates Bias of Over-Estimating or Under-Estimating Abundance



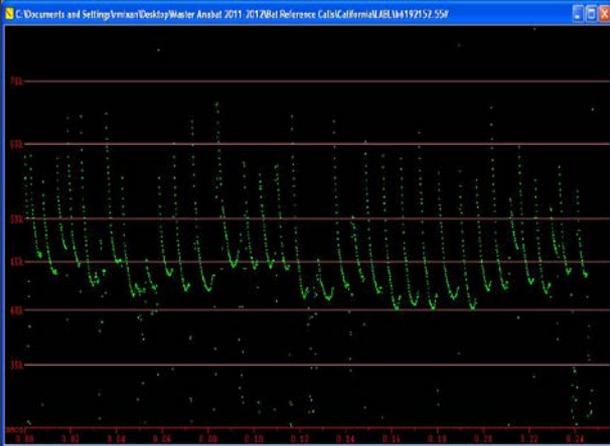
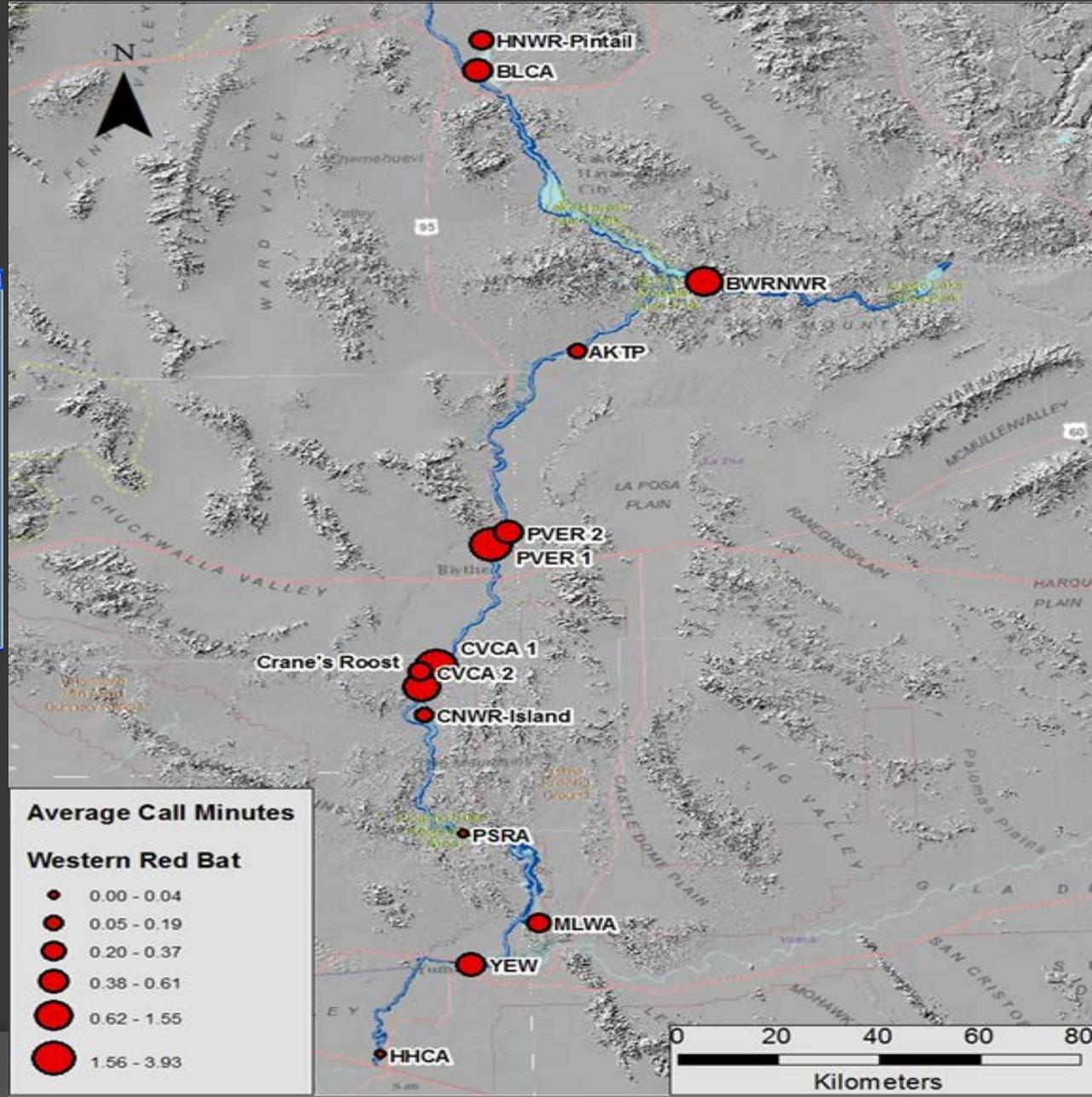
Acoustic Analysis

- Verified Calls Go Through an Occupancy Analysis
 - Presence/Absence Per Night Proportion of Nights Occupied
 - Determine Trends Between Stations and Across Months



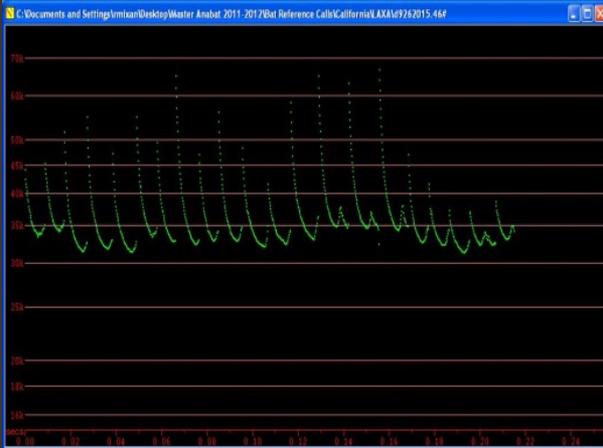
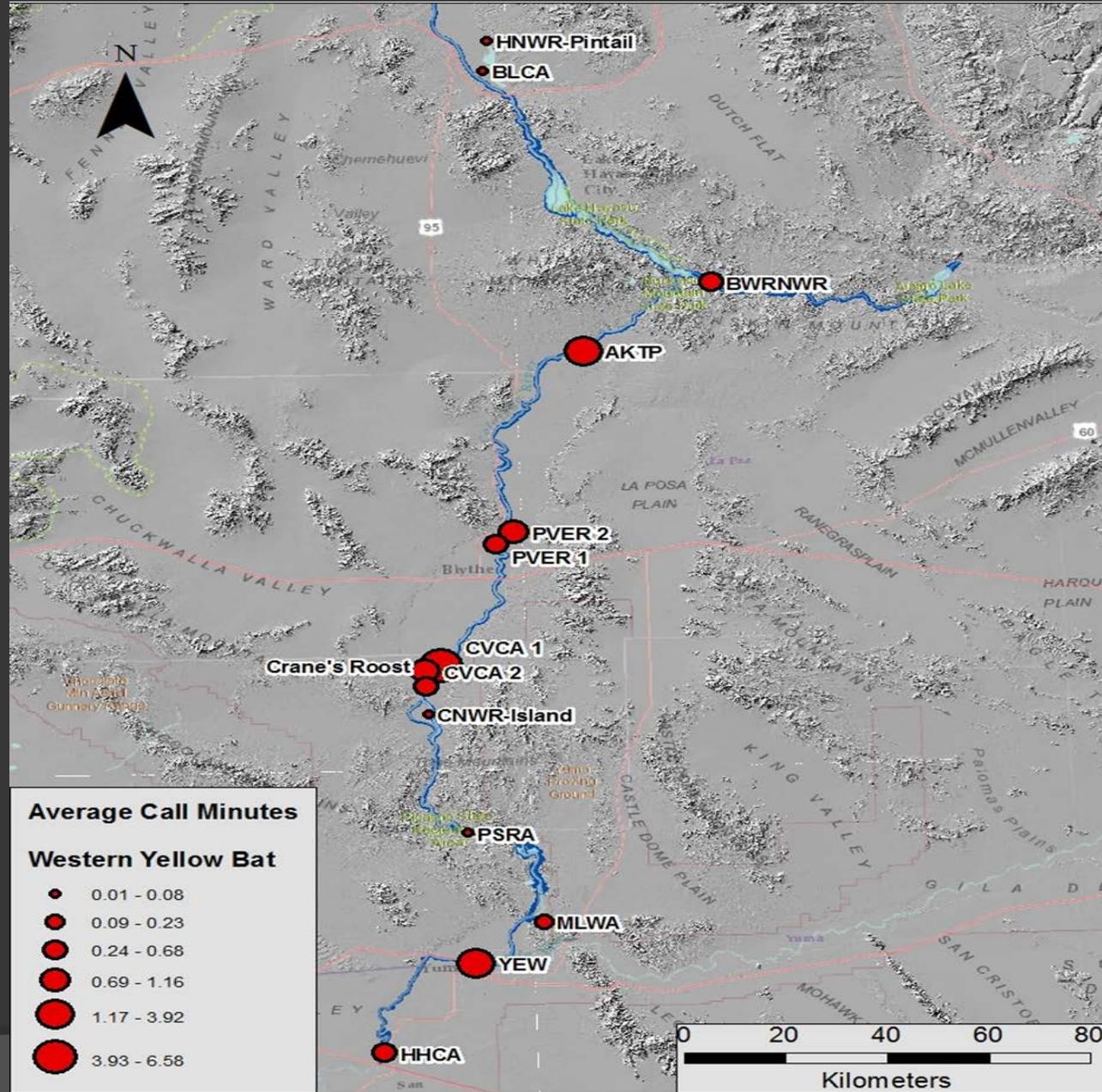
Western Red Bat Relative Activity

- CVCA 1
- PVER 1
- Crane's Roost
- BWRNWR



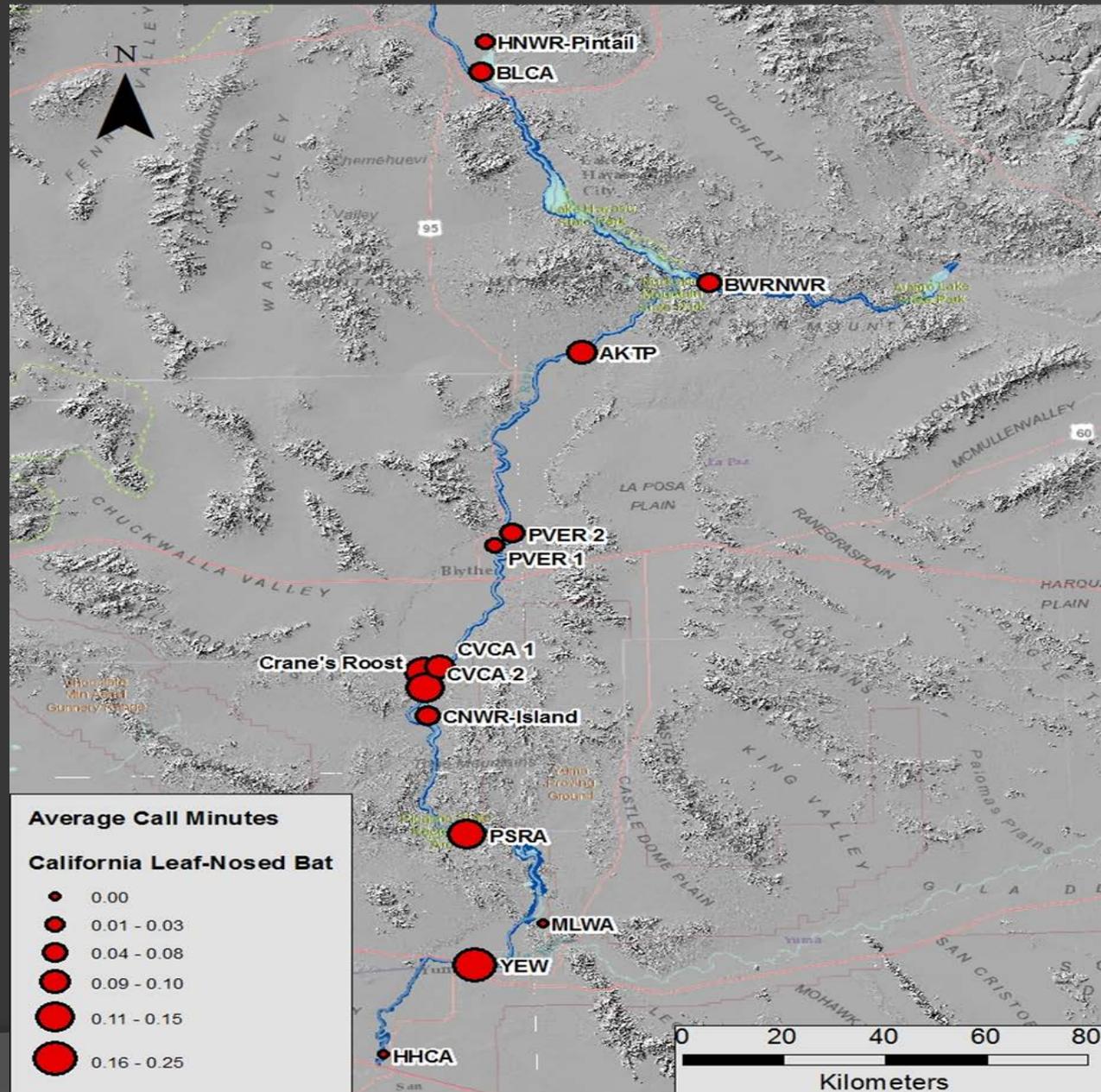
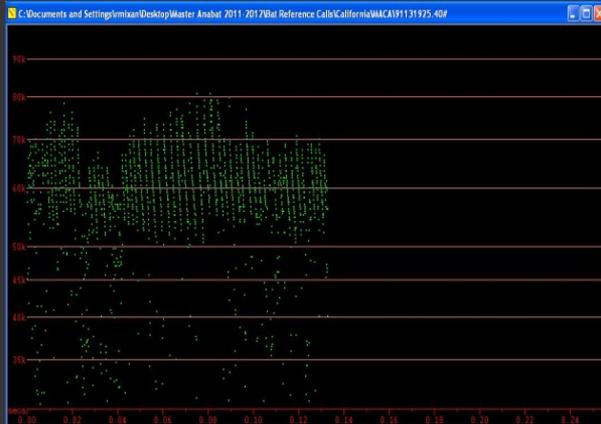
Western Yellow Bat Relative Activity

- CVCA 1
- YEW
- AKTP
- PVER 2



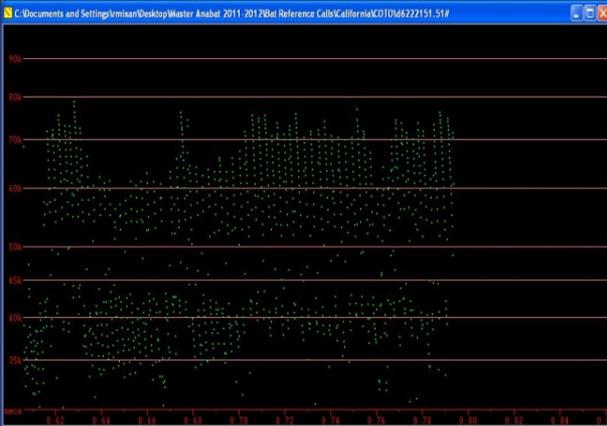
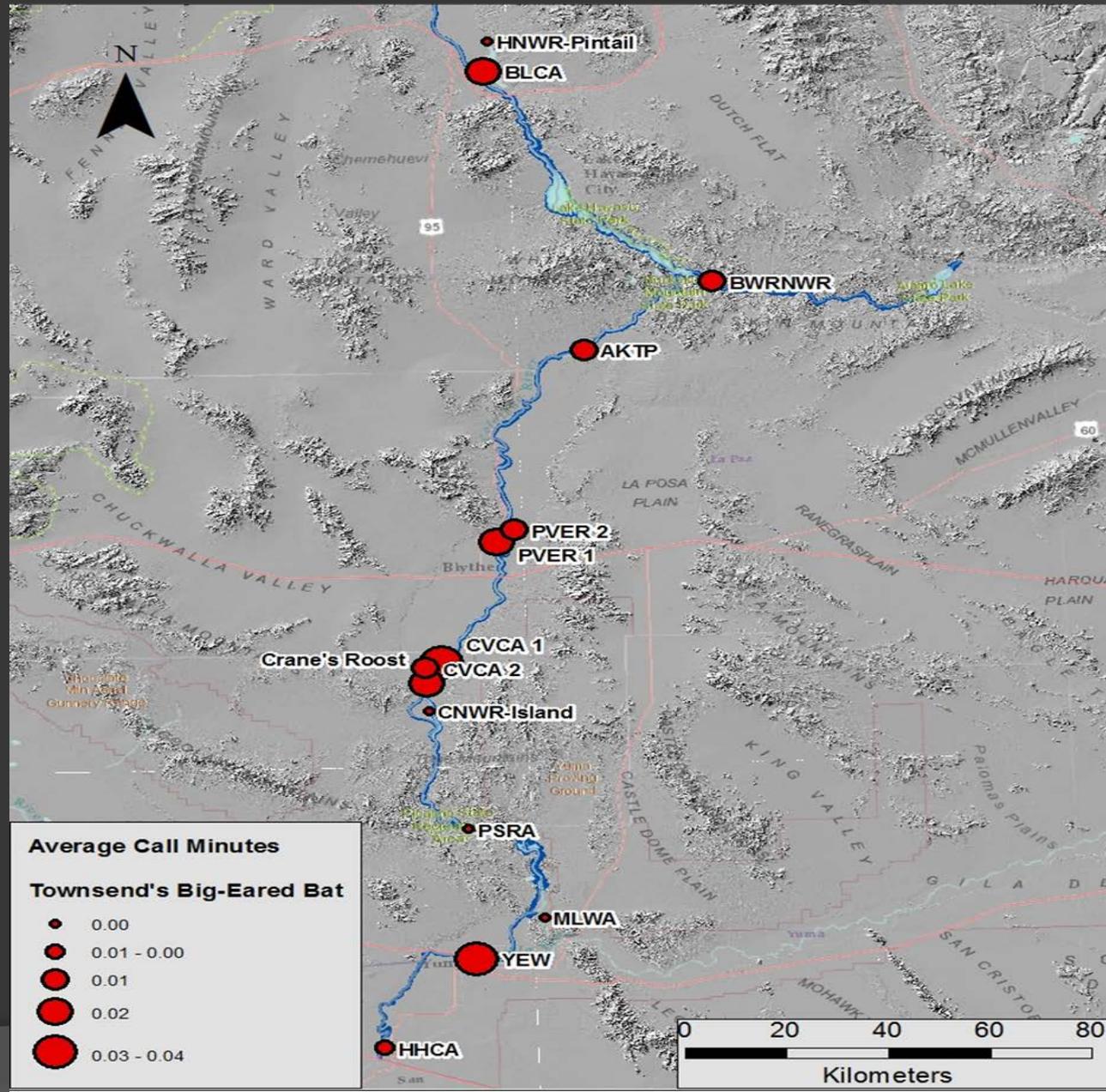
California Leaf-Nosed Bat Relative Activity

- YEW
- CVCA 2
- Crane's Roost
- PSRA



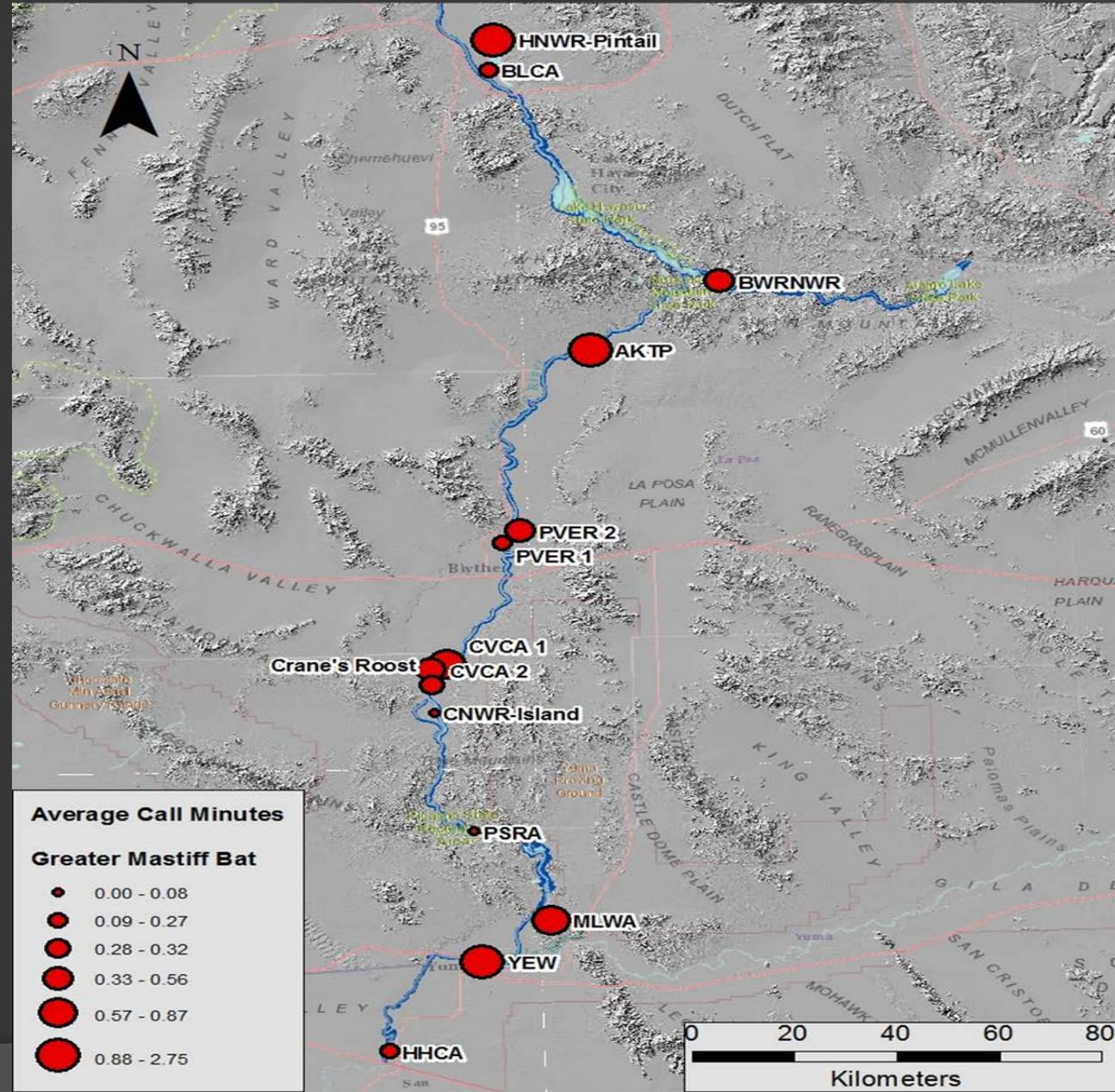
Townsend's Big-Eared Bat Relative Activity

- CVCA 1
- YEW
- Crane's Roost
- BLCA



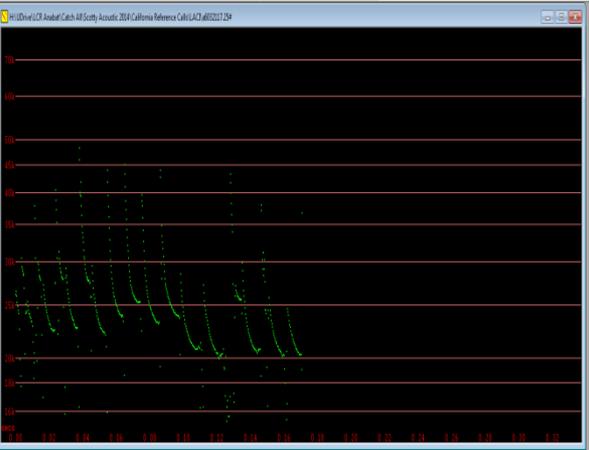
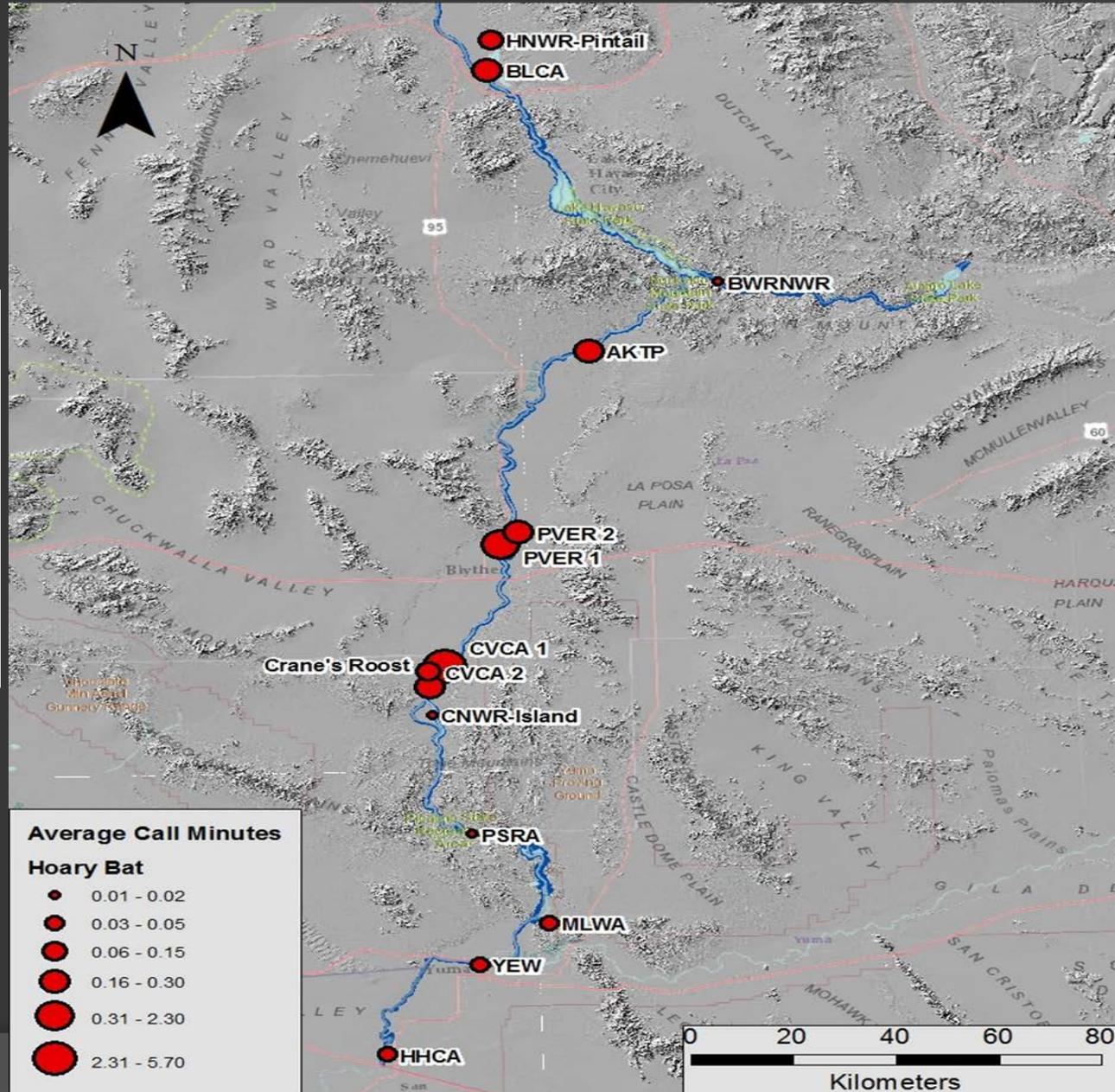
Greater Mastiff Bat Relative Activity

- YEW
- AKTP
- HNWR-Pintail
- CVCA 1



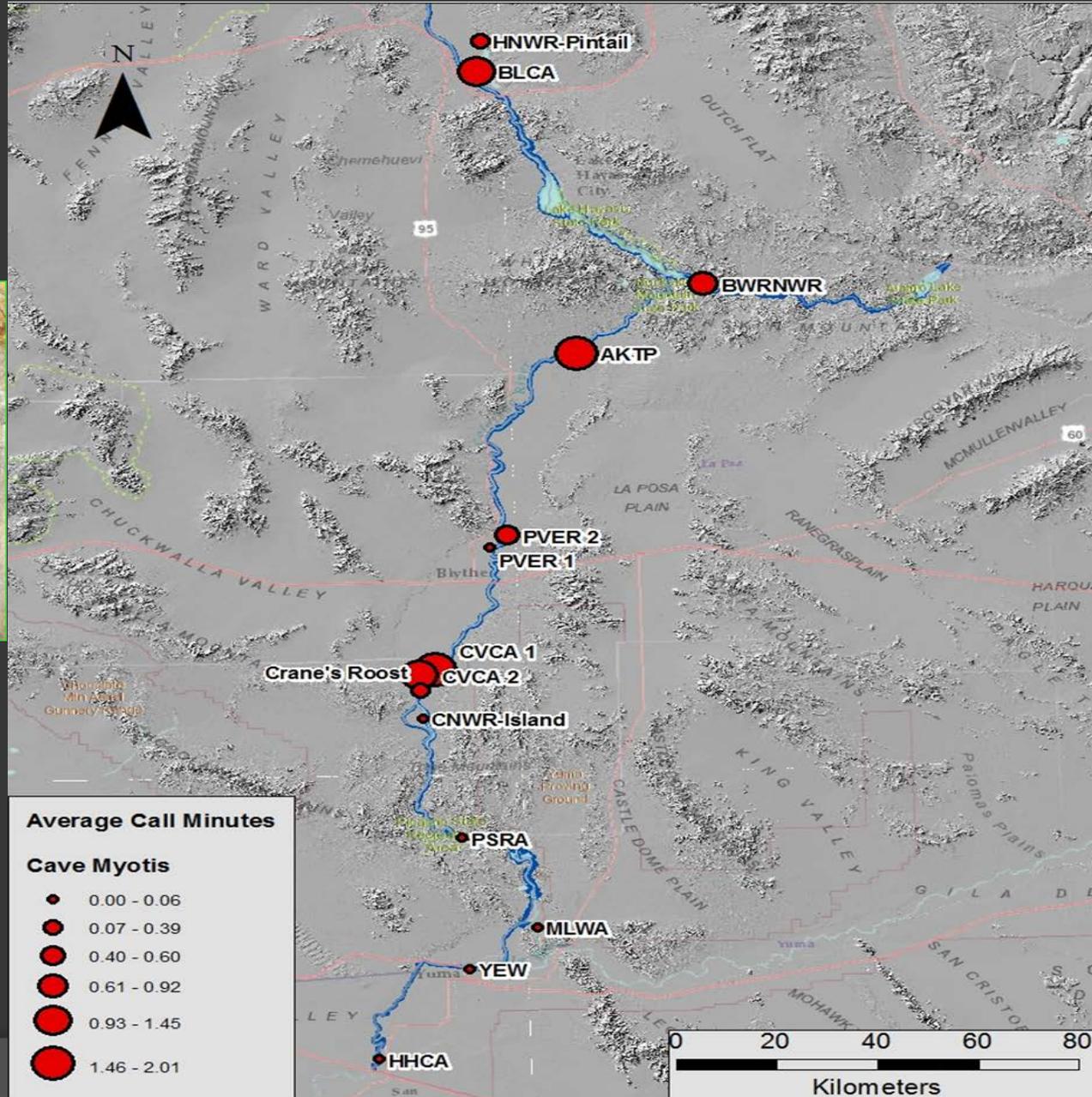
Hoary Bat Relative Activity

- CVCA 1
- PVER 1
- AKTP
- BLCA



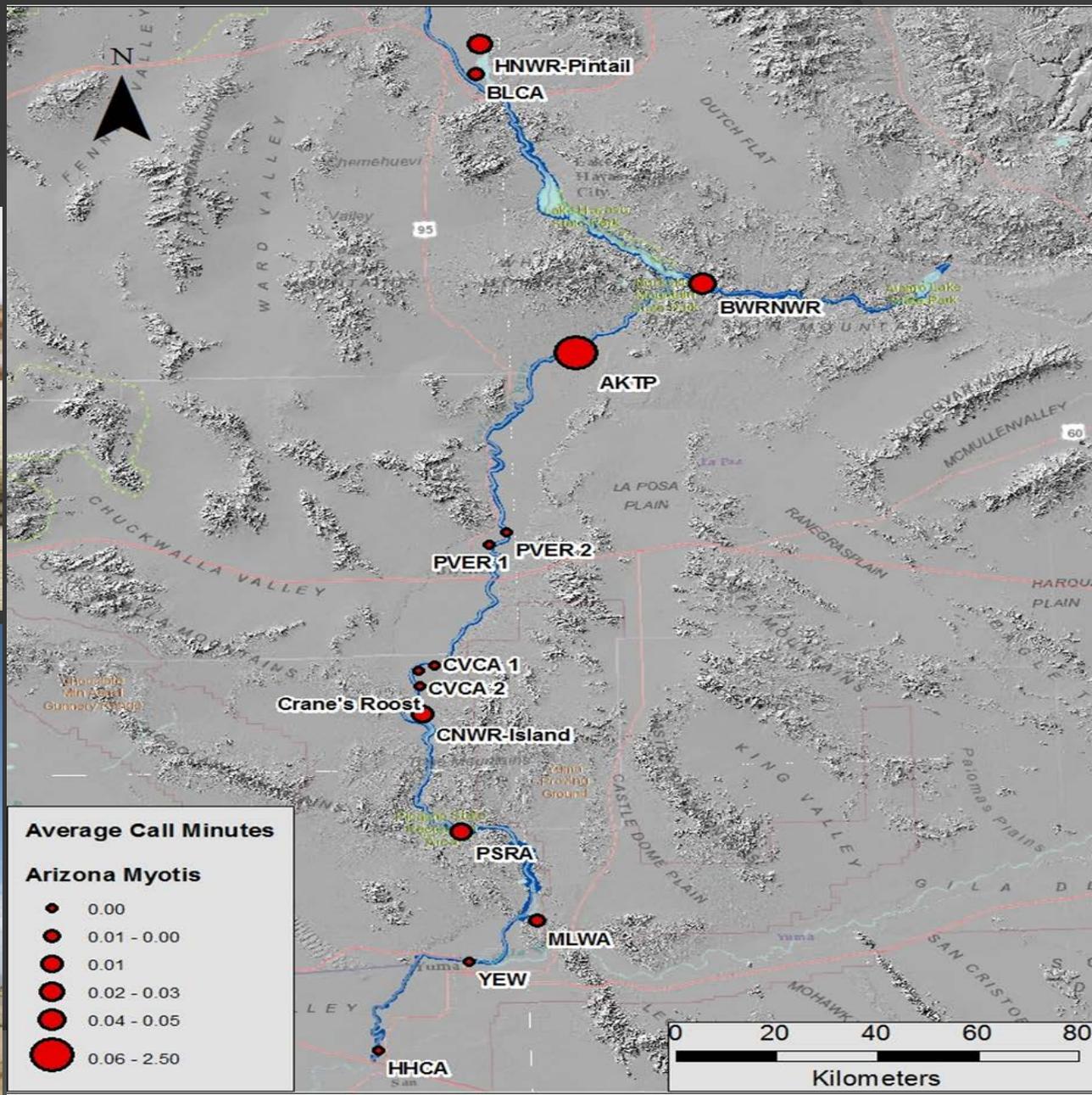
Cave Myotis Relative Activity

- CVCA 1
- AKTP
- BLCA
- CVCA 2



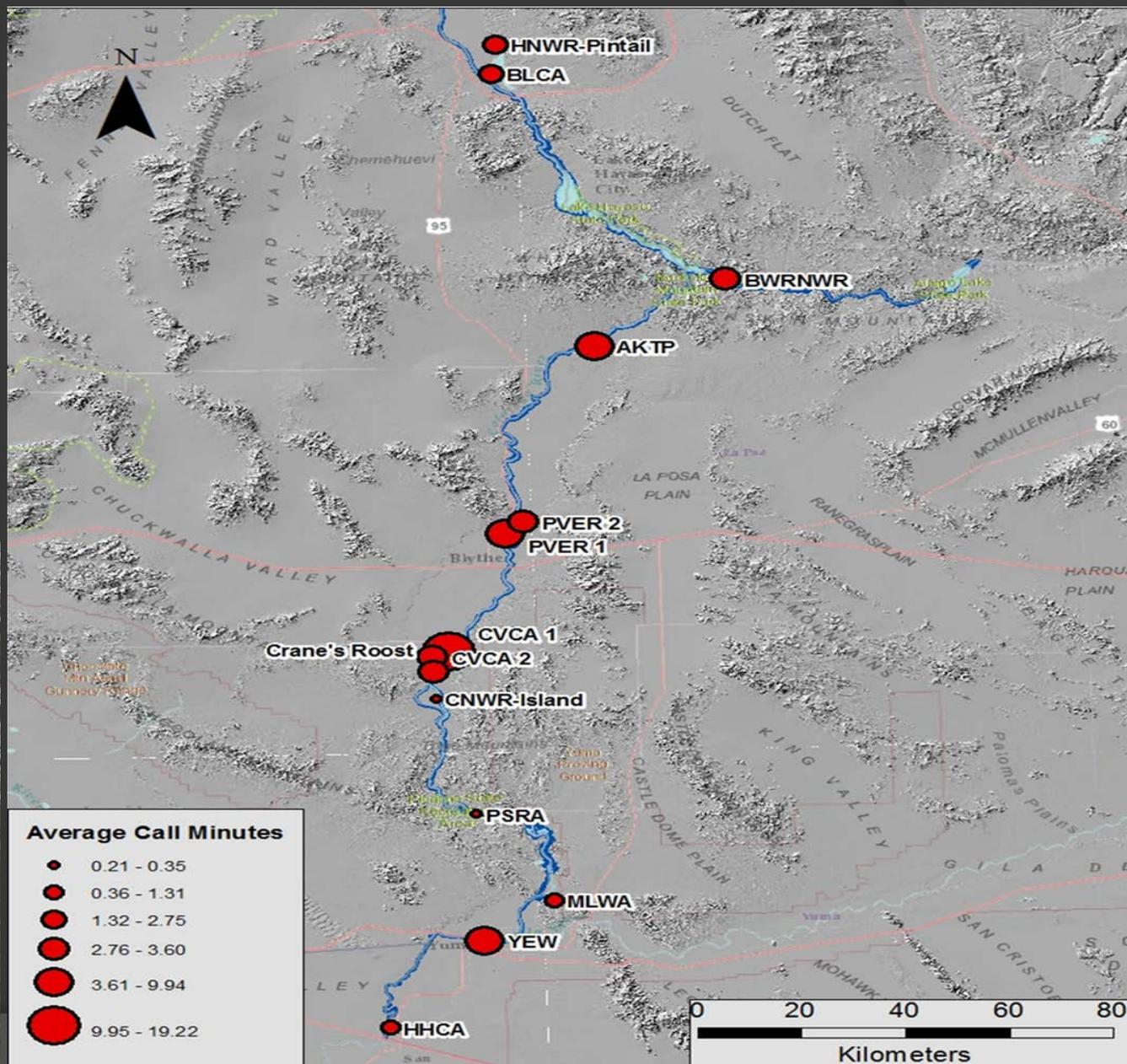
Arizona Myotis Relative Activity

- AKTP
- BWRNWR



Acoustic Stations Relative Activity and Proportion of Nights Occupied

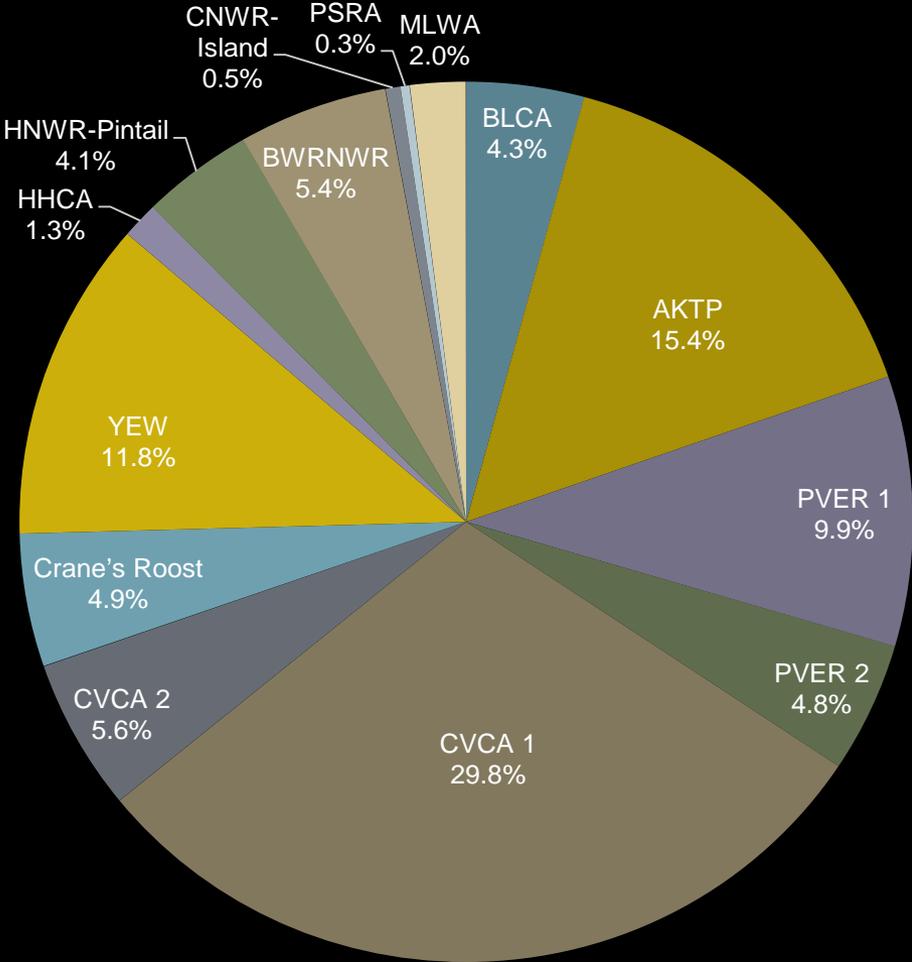
- CVCA 1
- AKTP
- YEW
- PVER 1
- Proportion
 - 72%
 - 44%



Station Results

- MSCP Conservation: 87%
- Non-Conservation: 13%

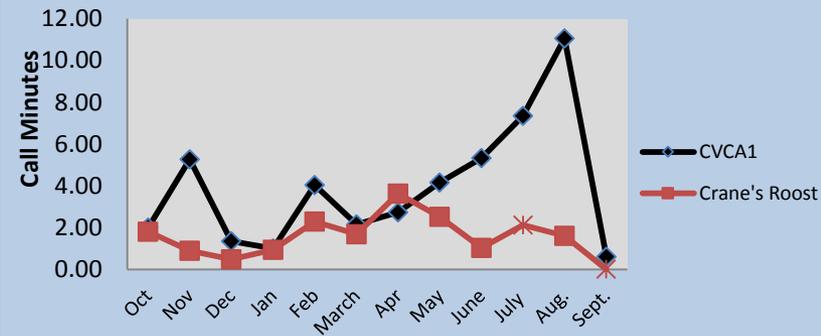
Percentage of Relative Activity



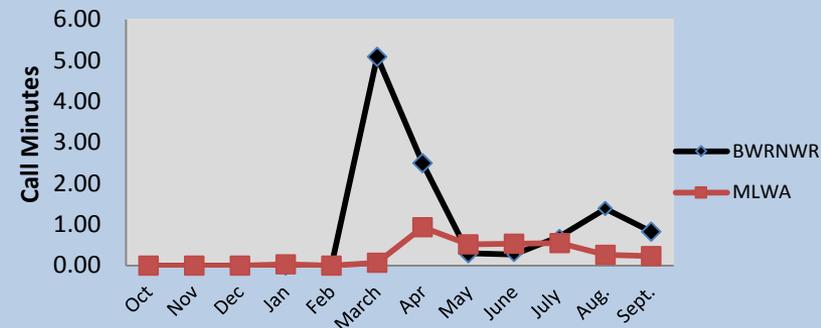
Temporal Activity MSCP Covered Species

- Western Red Bats
 - Year-Round Resident/Migrator
 - Conservation Areas vs. Non-Conservation Areas
- Western Yellow Bats
 - Summer Resident
- California Leaf-Nosed Bats
 - Resident
- Townsend's Big-Eared Bats
 - Resident

Western Red Bat Conservation Area
Relative Activity



Western Red Bat Non-Conservation Area
Relative Activity



Temporal Activity Additional Species

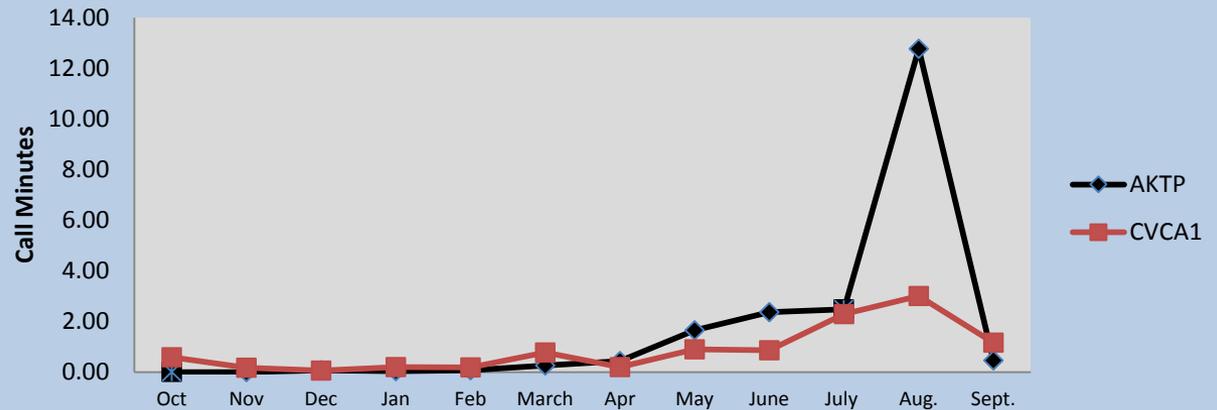
- ⦿ **Greater Mastiff Bat**
 - Mostly Summer Resident

- ⦿ **Hoary Bat**
 - Migratory Fall-Spring

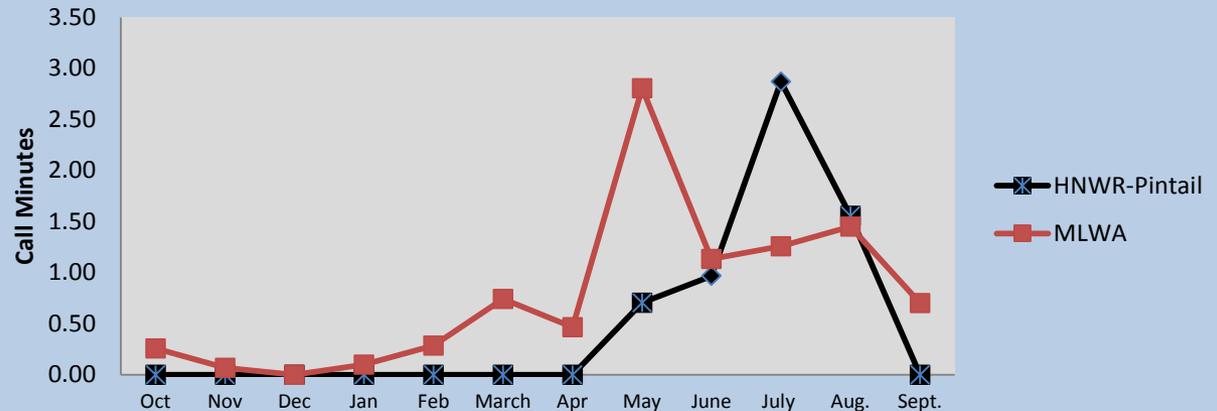
- ⦿ **Cave Myotis**
 - Summer Resident

- ⦿ **Arizona Myotis**
 - Summer Resident

Greater Mastiff Bat Conservation Area Relative Activity

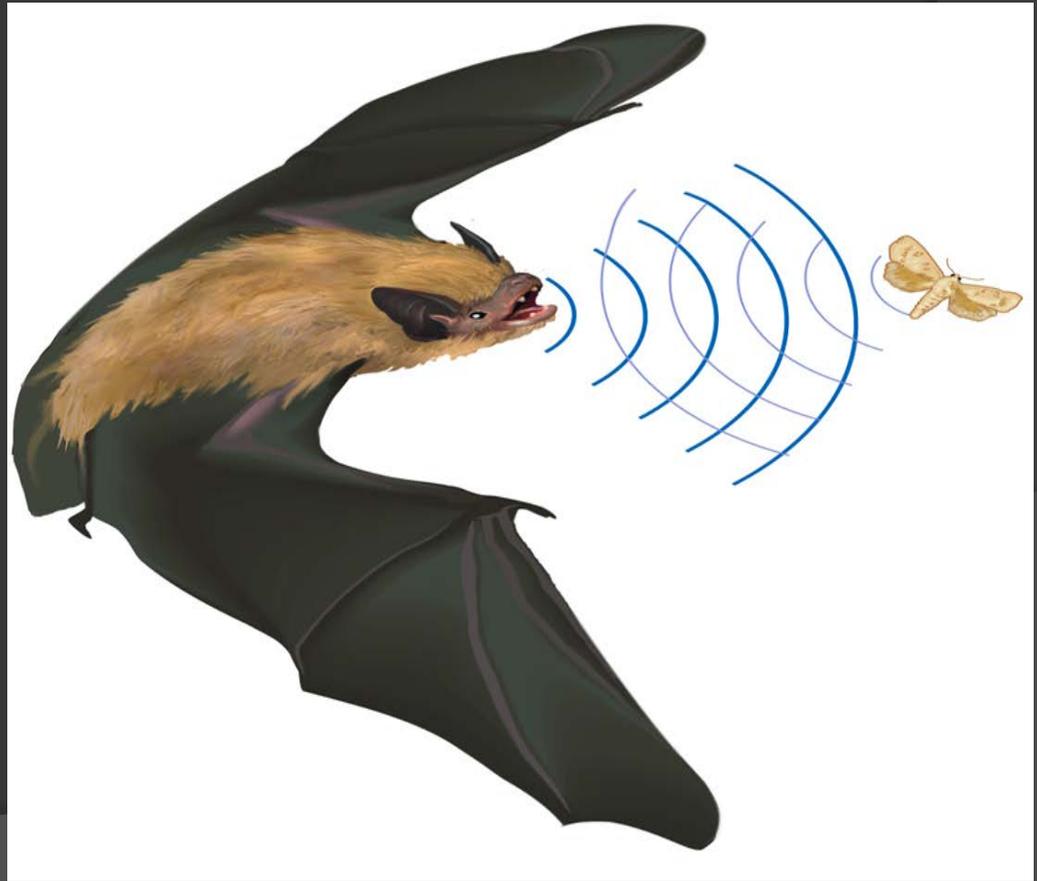


Greater Mastiff Bat Non-Conservation Area Relative Activity



Discussion

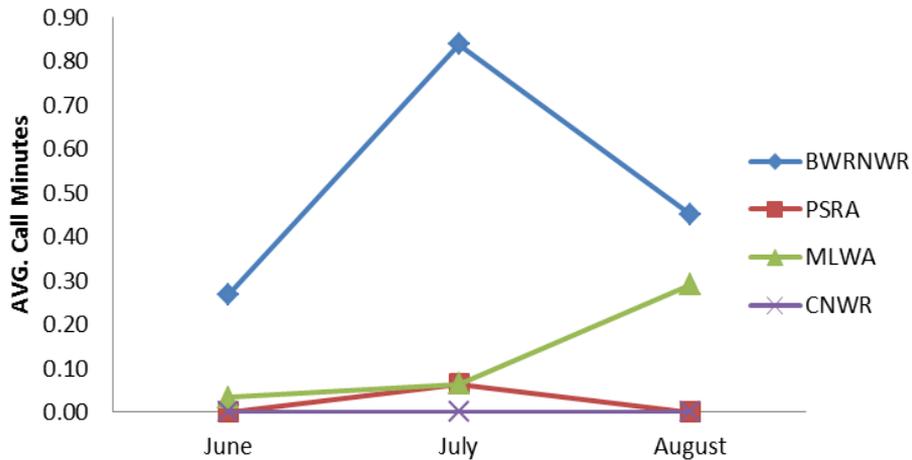
- Conservation vs. Non-Conservation Areas
 - Greatest Activity MSCP Conservation Areas
 - Vegetation Characteristics
 - Area
- Future Consideration
 - Age
 - Composition
 - Plant Spacing



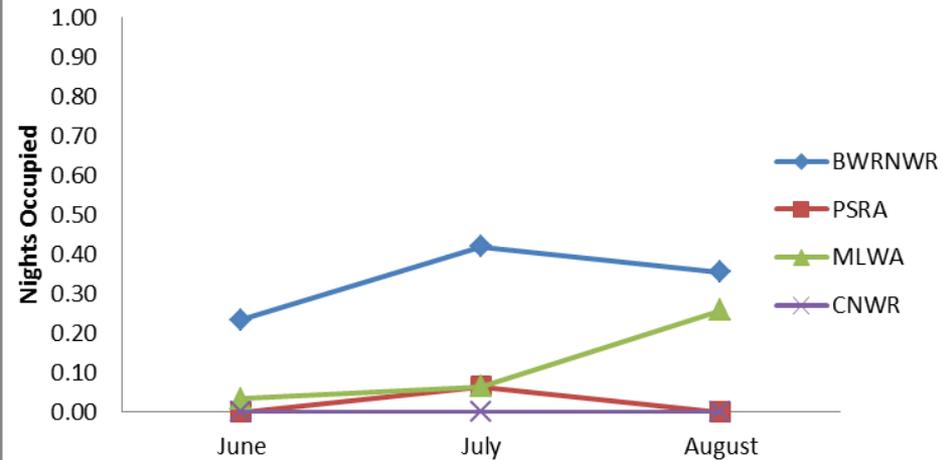
FY 2015 Monitoring

- Monitoring efforts scaled back in 2015
- Acoustic Monitoring June, July and August
- Monitoring Only MSCP Covered Species
- Non-Conservation Areas

LABL Average Nightly Call Minutes

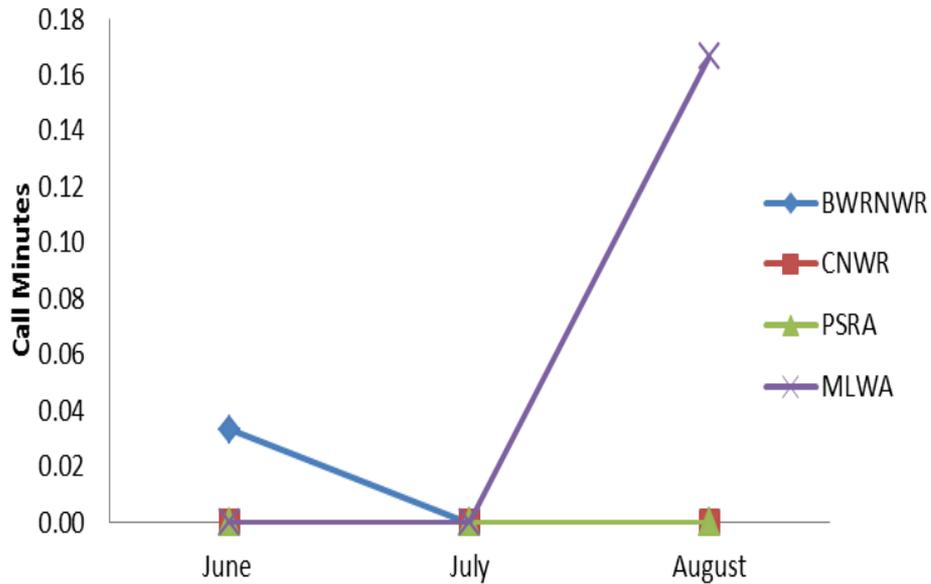


LABL Proportion Nights Occupied

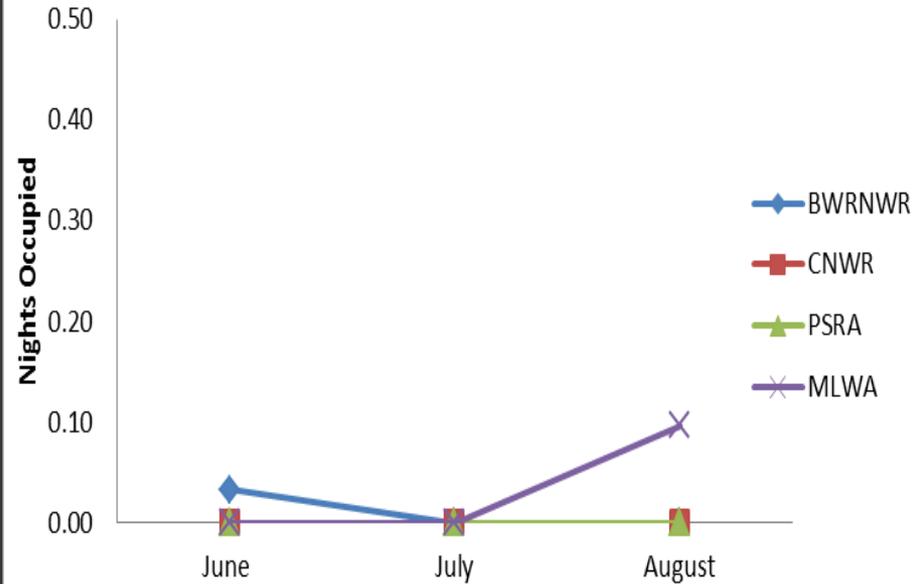


Western Yellow Bat

LAXA Average Nightly Call Minutes



LAXA Proportion Nights Occupied



Acknowledgements

- ◉ Allen Calvert: Bureau of Reclamation
- ◉ Susan Broderick: Bureau of Reclamation (Retired)

