Acoustic Monitoring at Non-Restoration Sites Along The LCR

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Echolocation

- Bats (Function) Vs. Birds (Unique ID)
- Identify Calls by Several Parameters (Freq, Dur, Slope, etc).
- Search Phase
- Approach Phase
- Feeding Buzz
Mostly Pros but Some Cons of Acoustic Monitoring

- Can Detect Greater Species Diversity and Activity Than Traditional Methods
- Insects, Whispering Bats, Station Maintenance
- Allows for Long Term Monitoring
- Detect Population and Activity Fluctuations
- Monitor Temporal and Spatial Activity and Occupancy
Project Objective

- Acoustically Assess Seasonal and Nightly Bat Activity Patterns at Five Non-Restoration Areas Along the LCR
MSCP Covered Bat Species

- Western Red Bat
- Western Yellow Bat
- California Leaf-Nosed Bat
- Townsend's Big-Eared Bat
Study Area

1) Pintail Slough HNWR
2) BWRNWR
3) CNWR
4) PSRA
5) MLWA
Methods

- We Record Calls Nightly From Sunset to Sunrise
- Download Data and Perform Station Maintenance 4-6 Weeks
- Apply Noise Filter
- Apply Species Specific Filters
- Manually Verify Calls (~430,000)
- Collect Weather Data (Temperature, Wind, Humidity, etc).
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
  - Determine Significant Differences Between Stations and Years
Results

Western Red Bat 2014

Call Minutes/Occupancy

Western Red Bat 2014

Call Minutes/Occupancy

Call Minutes

Occupancy

BWRNWR  CNWR  MLWA  PSRA  PTSL

October  November  December  January  February  March  April  May  June  July  August  September
Results

Western Yellow Bat 2014

[Bar chart showing call minutes and occupancy for different months and locations]

Western Yellow Bat 2014

[Line chart showing call minutes and occupancy trend over months]
Results

California Leaf-Nosed Bat 2014

Call Minutes/Occupancy

- BWRNWR
- CNWR
- MLWA
- PSRA
- PTSL

California Leaf-Nosed Bat 2014

Call Minutes/Occupancy
Results

Western Mastiff Bat 2014

Call Minutes/Occupancy

- BWR: 50
- CNWR: 10
- MLWA: 250
- PSRA: 100
- PTSL: 50

Western Mastiff Bat 2014

Call Minutes/Occupancy

- October: 10
- November: 10
- December: 10
- January: 10
- February: 10
- March: 200
- April: 150
- May: 100
- June: 50
- July: 200
- August: 150
- September: 10
Results

Arizona Myotis 2014

Call Minutes/Occupancy

0 1 2 3 4 5 6 7 8 9

BWRNWR  CNWR  MLWA  PSRA  PTSL

Call Minutes
 apologized

Arizona Myotis 2014

Call Minutes/Occupancy

0 2 4 6 8 10 12

October  November  December  January  February  March  April  May  June  July  August  September

Call Minutes/Occupancy
Results

Cave Myotis 2014

Call Minutes/Occupancy

BWR NWR | CNWR | MLWA | PSRA | PTSL

Call Minutes
Occupancy

Cave Myotis 2014

Call Minutes/Occupancy

October | November | December | January | February | March | April | May | June | July | August | September

Call Minutes
Occupancy
Results

Townsend's Big-Eared Bat 2011-2014

Call Minutes/Occupancy

BWR/NWR
CNWR
MLWA
PSRA
PTSL

Call Minutes
Occupancy
California Leaf-Nosed Bat Occupancy 2011-2014

Occupancy

BWRNWR
CNWR
MLWA
PSRA
Discussion

- Consistent Activity and Occupancy
- Merge Restoration and Non-Restoration Data Sets (System Wide Analysis)
- Determine Significant Temporal and Spatial Changes (Stations/Species)
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Questions