

Acoustic Monitoring to Assess Ecosystem Restoration

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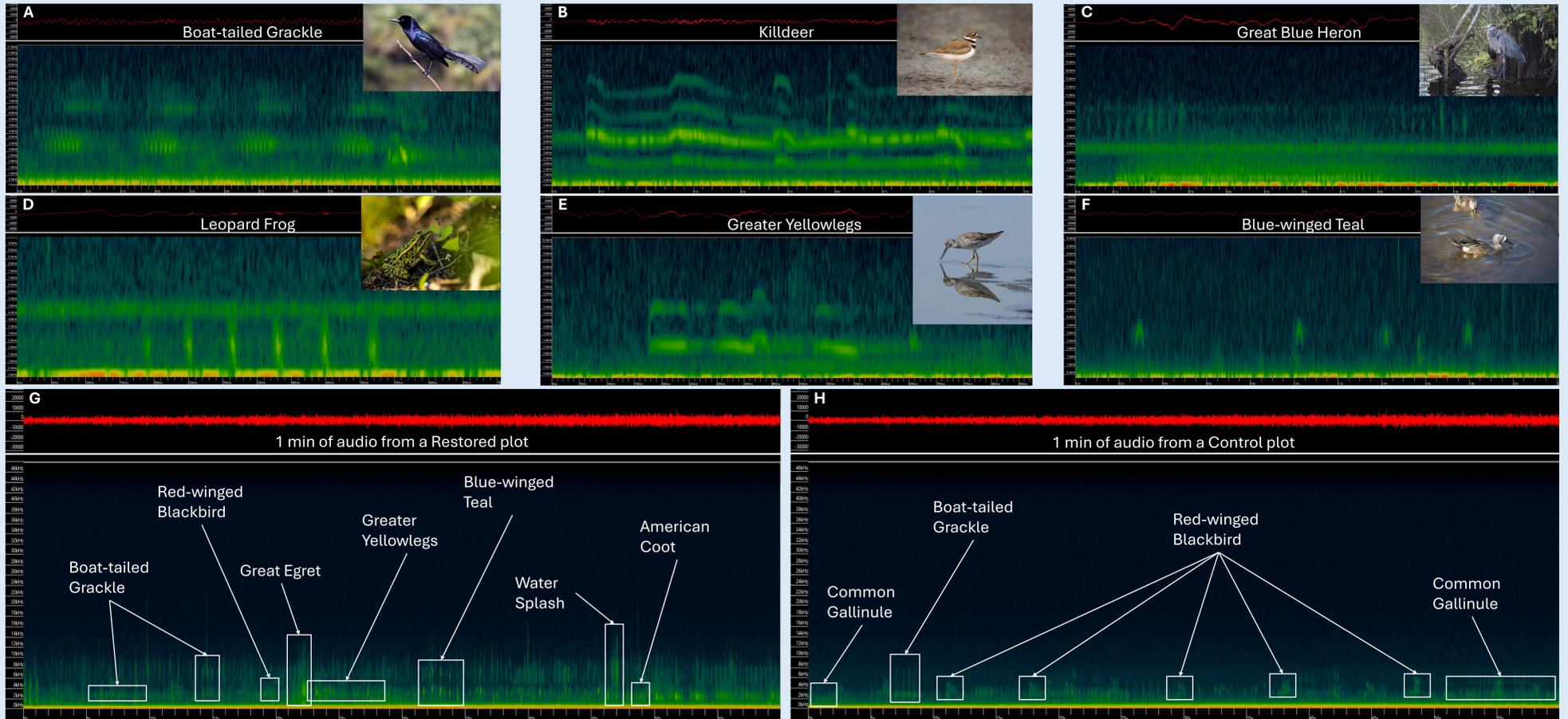


Can we use acoustics to monitor ecosystem restoration?

- Wildlife call in a variety of patterns, frequencies, and amplitudes
- Segments of sound can be given scores based on changes in frequency and amplitude using acoustic indices.
- We used acoustic surveys to see if we could hear the differences between restored, control, and reference plots in Water Conservation Area 2A (WCA 2A)

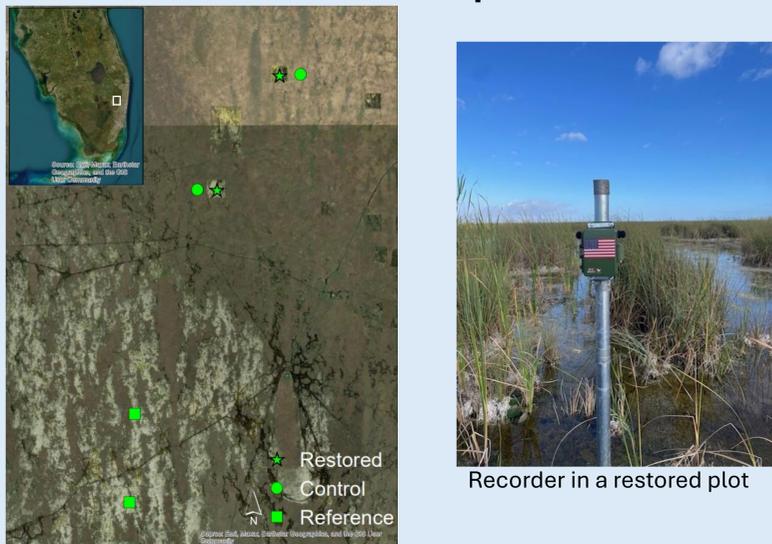
What did we hear?

- Boat-tailed Grackles (*Quiscalus major*)
- Common Gallinules (*Gallinula galeata*)
- American Coots (*Fulica americana*)
- Southern Leopard frogs (*Lithobates sphenoccephalus*)
- Killdeer (*Charadrius vociferus*)
- Greater Yellow Legs (*Tringa melanoleuca*)
- Blue Winged Teals (*Spatula discors*)
- Great Blue Herons (*Ardea Herodias*)
- Other wildlife and associated sounds
- Anthropogenic noises including gunshots, airboats, and airplanes



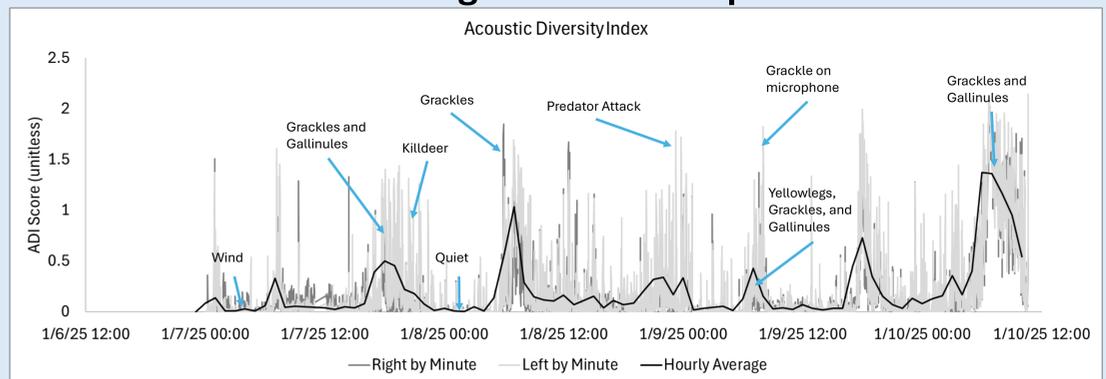
Visualization of sounds recorded in WCA 2A from A) Boat-tailed Grackle, B) Killdeer, C) Great Blue Heron, D) Southern Leopard Frog, E) Greater Yellowlegs, and F) Blue-winged Teal. G and H are one minute audio clips from a restored plot (G) and the adjacent control plot (H) from 1/10/2025 at 7:24 am. Upper red portion of each figure is amplitude (dB) over time, and the lower portion of each figure is frequency (kHz) over time. Color intensity in the lower portion increases with increased amplitude (i.e., volume).

The Set Up



- Six Wildlife Acoustics Inc. Song Meter SM4 recorders were deployed.
- 2 in restored habitats (Stars)
 - 2 in adjacent non-restored cattail (control) habitats (Circles)
 - 2 in reference ridge-and-slough habitats (Squares)

Scoring the Soundscape

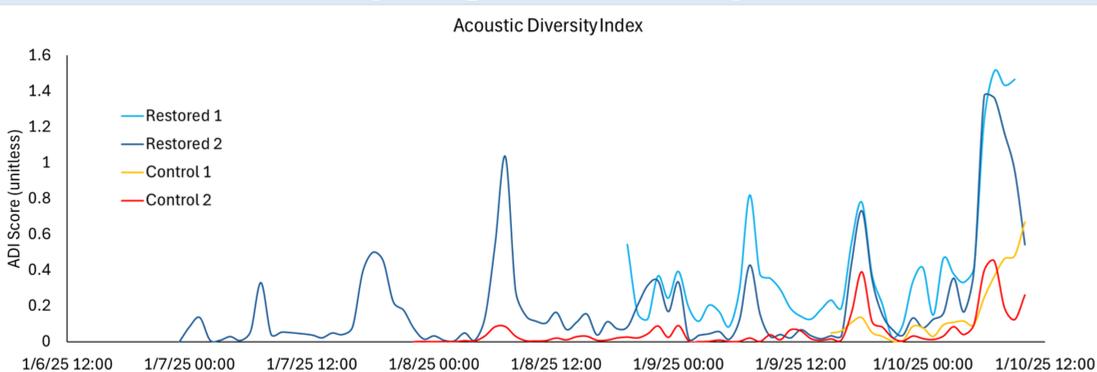


Acoustic Diversity Index scores, calculated from changes in frequency and amplitude, were greater with more vocalizations. Each minute of recording from the right microphone (dark grey line) and left microphone (light grey line) were given a score. The hourly average of the left microphone is shown in black. Some drivers of scores are included in the graph.

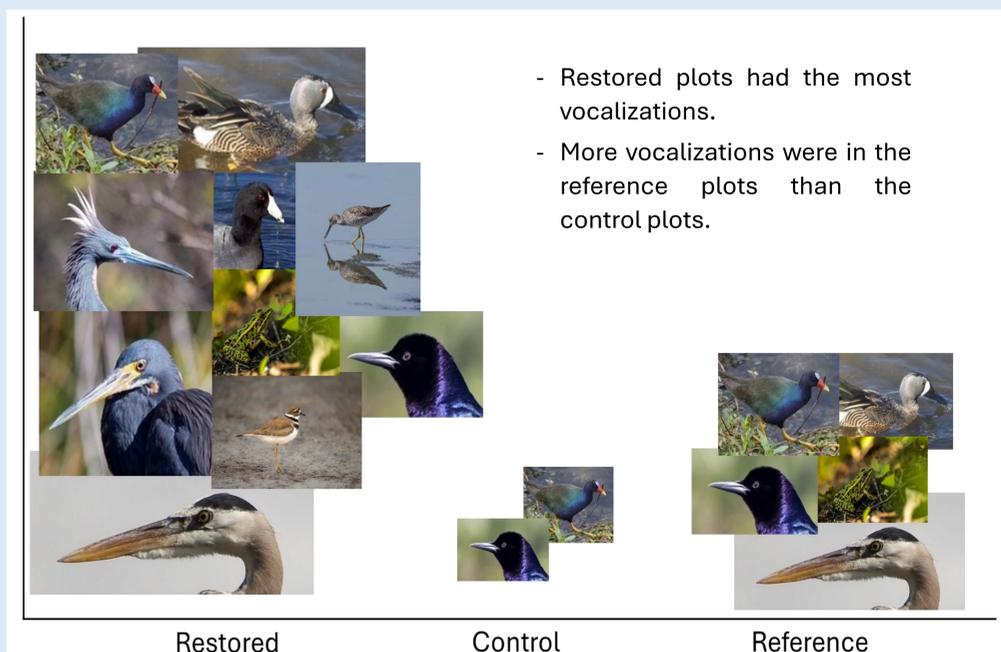
What did we find?

- Restored plots had the most vocalizations.
- More vocalizations were in the reference plots than the control plots.

Comparing the Soundscapes



Hourly average Acoustic Diversity Index scores (unitless) for restored plots (Light Blue and Dark Blue lines) and control plots (Orange and Red lines).



Benefits of Acoustic Monitoring

- Successfully showed differences between restored, control, and reference plots in WCA 2A
- Allows managers to assess impacts of restoration on wildlife communities over large spatial and temporal scales.
- Allows for the study of cryptic, crepuscular, nocturnal and other understudied species
- Anthropogenic recordings indicate amount and type of recreational use of restored habitat.

