Deploying a sensing network at the Barton Creek Habitat Preserve: a preliminary proposal for field testing – PROJECT REPORT 06/06/2023

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Project Summary

Last year, we proposed to deploy acoustic recorders at Barton Creek Habitat Preserve during summer 2022. We completed the first part of the project and focused on testing BirdNET, a bird call classifier developed by the Cornell Lab of Ornithology. Ultimately, our goal is to use fine-scale acoustic, meteorological, and environmental data to understand avian ecology in Texas. Here, we provide a summary of the acoustic data that we collected and analyzed within the preserve to support informed resource management in the area.



Figure 1. Photos of the 3 acoustic recorders deployed at Barton Creek Habitat Preserve (BCHP) in May 2022. From left to right: Site #1, Site #2, and Site #3. Deployment latitude and longitude coordinates for each recorder along with other details are reported in Table 1.

sensor_Type	sensor_Model	sensor_ID	Site	site ID	day	month	year	latitude	longitude	SD_size
microphone	Wildlife Acoustics	WLA0301	BCHP	site_1	30	May	2022	30.30676	-97.9237	400GB
microphone	Wildlife Acoustics	WLA0303	BCHP	site_2	30	May	2022	30.3052	-97.9171	400GB
microphone	Wildlife Acoustics	WLA0302	BCHP	site_3	30	May	2022	30.303644	-97.9163	400GB

Table 1. Details of the 3 acoustic recorders deployed at Barton Creek Habitat Preserve (BCHP) in May 2022. Deployment latitude and longitude coordinates for each recorder is reported along with deployment date, sensor type and model.

Preliminary Acoustic Results

In total, we analyzed 210 acoustic files collected during the time frame starting on May 30 (2022) and ending on July 23 (2022). Acoustic recorders on Site #2 and Site #3 collected data between 6:00AM and 8:00AM in the morning and between 6:00pm and 8:00pm in the evening. The acoustic recorder on Site #1 collected data from 6:00AM to 8:00PM. Overall, we collected over 180 GB of acoustic data. The preliminary results of BirdNET data analysis are summarized in the two tables. In Table 2, we report the top 10 avian species occurring at Barton Creek Habitat Preserve during June and July 2022 and estimated with a conservative determination threshold = 0.7. The vocalizations of the following species were detected more than 1000 times during our recording period: White-eyed Vireo, Carolina Wren, Carolina Chickadee and Summer Tanager.

RankNET	Species	Freq	CTOFF
1	White-eyed Vireo	3782	0.7
2	Carolina Wren	1860	0.7
3	Carolina Chickadee	1145	0.7
4	Summer Tanager	1091	0.7
5	Northern Cardinal	509	0.7
6	Painted Bunting	347	0.7
7	Blue-gray Gnatcatcher	117	0.7
8	Red-shouldered Hawk	94	0.7
9	Red-eyed Vireo	89	0.7
10	Common Nighthawk	88	0.7

Table 2. Summary of BirdNET data analysis. We report the top 10 avian species presumably occurring at Barton Creek Habitat Preserve during June and July 2022 and estimated with a specificity determination threshold = 0.7. Please note, these results need to be further evaluated for definitive proof of occurrence and detection frequency.

In Table 3, we report other 18 avian species that were detected at BCHP via BirdNET analysis during the same recording period but less frequently. We used the same conservative determination threshold value of 0.7, but for many of these species the occurrence frequency dropped to single digit and results must be carefully evaluated. In general, BirdNET performed well with common species, but provided several false positives (detection confirmed in theory but the species is not present in the recording) across the recording period. For example, the BirdNET classification algorithm detected the Olive Sparrow (*Arremonops rufivirgatus*) a species that is not present at BCHP. Moving forward, we will begin a thorough validation of BirdNET data analysis and workflow.

RankNET	Species	Freq	CTOFF
11	Barn Swallow	61	0.7
12	Chimney Swift	56	0.7
13	Yellow-billed Cuckoo	44	0.7
14	Purple Martin	30	0.7
15	Ruby-throated Hummingbird	24	0.7
16	Blue Grosbeak	12	0.7
17	Black-crested Titmouse	10	0.7
18	Green Heron	8	0.7
19	Eastern Phoebe	3	0.7
20	Indigo Bunting	3	0.7
21	Black-bellied Whistling-Duck	2	0.7
22	Brown-headed Cowbird	1	0.7
23	Field Sparrow	1	0.7
24	Great Blue Heron	1	0.7
25	Great Crested Flycatcher	1	0.7
26	Northern Bobwhite	1	0.7
27	White-winged Dove	1	0.7
28	Yellow-breasted Chat	1	0.7

Table 3. Summary of BirdNET data analysis. We report additional 18 avian species presumably occurring at Barton Creek Habitat Preserve during June and July 2022. Please note that for many of these species the occurrence frequency is very low (< 30). Therefore, these results must be further evaluated for definitive proof of occurrence.