Changes in Wind and Habitat Types and their Effects on Bird Call Identification

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Introduction

- The data collected by Autonomous Recording Units (ARUs) provide information regarding the amount of wildlife in an area
- Humans then listen to the recordings, compare them to reference recordings, and identify any species present.
- Many factors other than numbers, however, contribute to an ARU's collected results.
- Two such factors are the differences in wind and vegetation between open environments (grasslands) and closed environments (forests).
- These differences may result in variations in the number of birds correctly identified between habitat types, even if there is little difference in the population of wildlife.[1]

Purpose

Determine the extent to which habitat type and wind speed affect bird call detection.

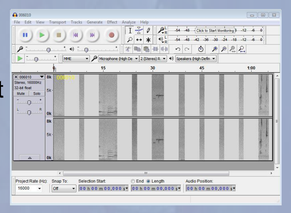


Figure 1: A sonogram of an ARU's recording. Included are the calls of the Great Grey Owl, White Throated Sparrow, and a Brown-headed Cowbird.

Methods

Recording Sound

- Along with the ARUs, a speaker was brought out into the field.
- Sounds were played at known distances from recorders.
- These controlled recordings, along with bird calls, were brought to people for identification.

Wind Speed Analysis

- **T-test**
- We compared wind speeds of the grassland and conifer forest

Bird Identification Analysis

- **Chi-squared test**
- We compared the number of times a bird was identified in each habitat.

Comparative Analysis

- **Logistic regression**
- We tested the effects of wind and habitat to observe their effects separately, while keeping the other variables constant.

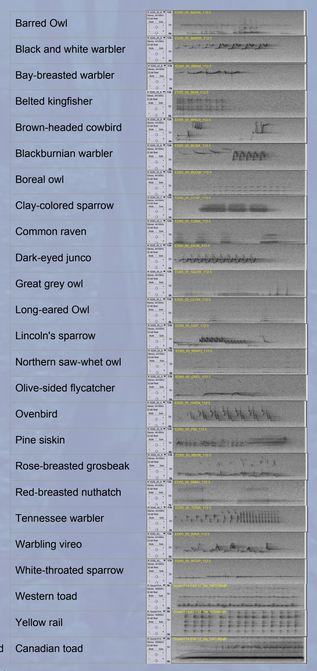


Table 1: All identified species and their respective sonograms.

Results

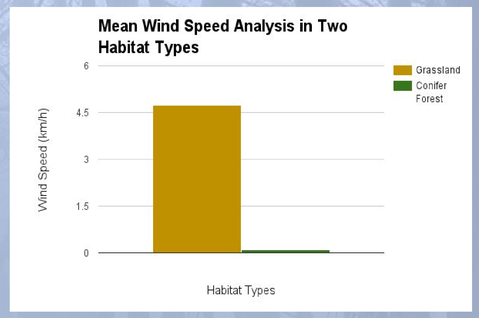
Wind Speeds

- Wind speed in the grassland was significantly higher than in the conifer forest
- **P-value<0.05**

Bird Identification

- Bird identifications occurred more frequently in the grassland than in the forest
- **P-value<0.05**

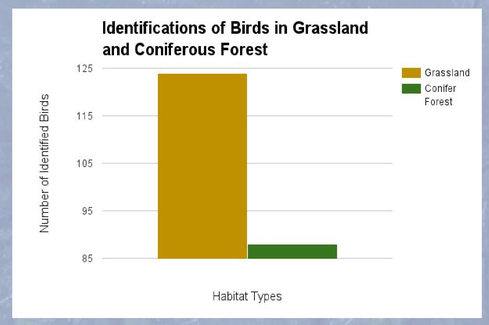
Figure 2: Mean wind speed analysis in two habitat types (T-test).



t-Test: Two-Sample Assuming Equal Variances		
	Grassland	*Conifer Forest*
Mean	4.730721649	0.105514705
Variance	13.71593859	0.059932575
Observations	970	272
Pooled Variance	10.7314405	
Hypothesized Mean Difference	0	
df	1240	
t Stat	20.57840353	
P(T<=t) one-tail	0	
t Critical one-tail	1.646083397	
P(T<=t) two-tail	3.49356806725419E-81	
t Critical two-tail	1.961878943	

Table 2: The statistical analysis for wind speed in both habitat types using a T-test.

Figure 3: Bird identification analysis in the grassland and conifer forest (Chi-squared test).



Category	Observed	Expected			
Grassland	124	106			124
Conifer Fc	88	106			88
					212
		p=	0.01341754107		

Table 3: Statistical analysis of the bird identification analysis (Chi-squared test).

Comparative Analysis

- Grassland has a significantly higher overall detection probability in comparison to the conifer forest while the overall effect of wind is negative.
- **P-values<0.05**

Figure 4: Probability of detection in grassland and conifer forest as distance from point count increases.

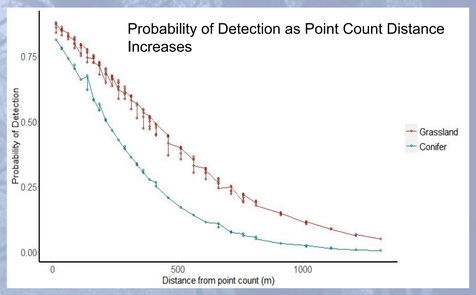


Table 4: Logistic regression analysis denoting the effects of wind and grassland habitat on detection when compared to the conifer forest.

Coefficients:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.78242	0.13235	-5.912	3.39e-09	***
HabitatGrass	**1.15425**	**0.16968**	**6.802**	**1.03e-11**	***
Wind	**-0.07909**	**0.01850**	**-4.276**	**1.91e-05**	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Conclusions

- Overall, the probabilities of detection was higher in the grassland than in the conifer forest.
- Wind speed was considerably higher in the grassland than in the conifer forest.
- The influence of wind on sound detection was lower than the influence of the habitat.
- The coverage of the conifer forest may block majority of sound from reaching the collectors.
- In the grassland, there is less coverage, so the effect is reduced.
- This should be taken into consideration when conducting point-count surveys of wildlife.
- The location of ARU placement should be taken into account when analyzing recordings.

Acknowledgements

Research Team

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Literature Cited

- [1]Daniel Alexander Yip, Erin M Bayne, Peter Solymos, James Campbell, Darren Proppe. In prep. Sound attenuation in forested and roadside environments: Implications for avian point count surveys. The Condor: Ornithological Applications.