Disentangling the effects of industrial disturbances and chronic noise in songbirds

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Aim

Occupancy estimation for songbirds at different levels of disturbances and noise.

Understand bird responses to chronic industrial noise.

Previous research

Anthropogenic noise can cause avoidance or tolerance in passerine birds[1].

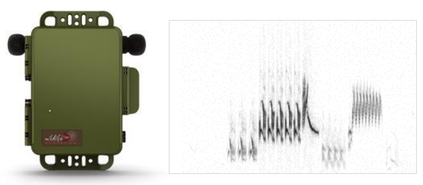
More evidence suggests that certain bird species can tolerate chronic industrial noise[2]. However, the noise has produced stress[3] and low breeding success[4].

Methods

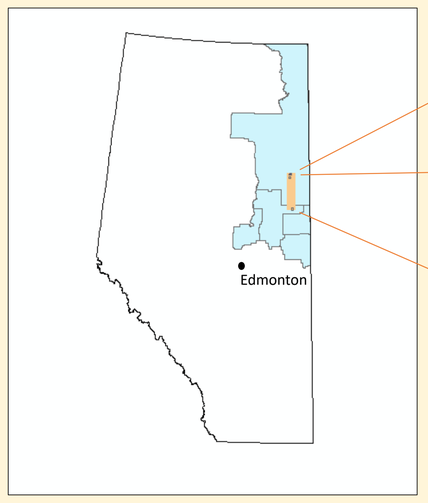
Study species

Lincoln's Sparrow (LISP)
White-throated Sparrow (WTSP)
Tennessee Warbler (TEWA)
Yellow-rumped Warbler (YRWA)

Listening data



Study area



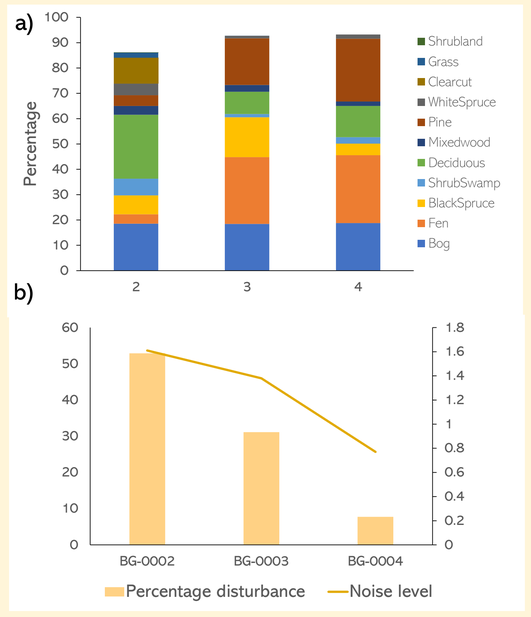


Figure 1. Big Grid a) vegetation type b) disturbance and noise levels.

Results

Lincoln's Sparrow

Psi (noise) p (noise)

White-throated Sparrow

Psi (propDisturbance) p (.)

Tennessee Warbler

Psi (noise) p (.)

Yellow-rumped Warbler

Psi (propDisturbance) p (.)

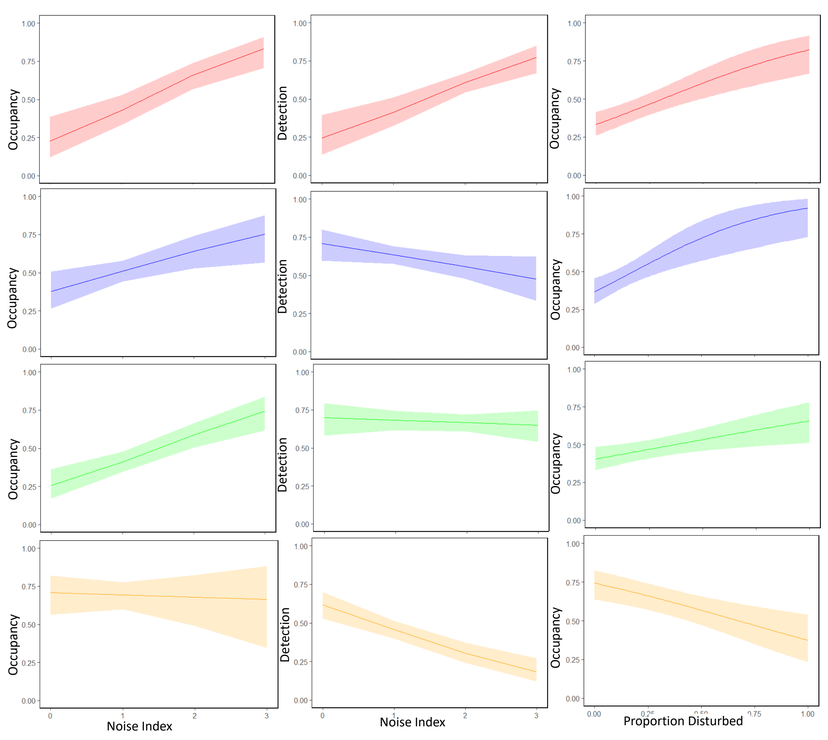


Figure 2. Best occupancy and detection models for the study species.

Table 1. Occupancy and detection probability models for LISP, WTSP, TEWA, and YRWA explained by noise and proportion of disturbances.

Model LISP	nPars	AIC	delta	AICwt	Rsq
psi(noise)p(noise)	4	800.68	0.00	1.00	0.23
psi(.)p(noise)	3	812.58	11.91	2.6E-03	0.18
psi(noise+propDisturbance)+(.)	4	816.66	13.98	9.2E-04	0.18
Null	2	866.45	67.77	5.2E-15	0.00
Model WTSP	nPars	AIC	delta	AICwt	Rsq
psi(propDisturbance)p(.)	4	886.83	0.00	1.00	0.12
psi(noise+propDisturbance)p(.)	4	888.82	1.99	2.70E-01	0.11
psi(noise)p(noise)	3	913.06	26.23	1.5E-06	0.03
Null	2	918.46	31.63	9.9E-08	0.00
Model TEWA	nPars	AIC	delta	AICwt	Rsq
psi(noise)p(.)	3	845.08	0.00	1.00	0.77
psi(noise)p(noise)	4	846.83	1.74	2.9E-01	0.76
psi(propDisturbance)p(.)	3	858.90	13.82	7.0E-04	0.28
Null	2	864.43	19.34	4.4E-0.5	0.00
Model YRWA	nPars	AIC	delta	AICwt	Rsq
psi(.)p(noise)	3	943.40	0.00	1.00	0.12
psi(noise)+(noise)	4	958.41	9.02	1.10E-01	0.09
psi(propDisturbance)p(.)	3	960.36	23.91	4.1E-03	0.09
Null	2	983.40	34.00	4.1E-08	0.00

Conclusions

Both WTSP and YRWA occupied more and less disturbed areas, respectively. We were expecting a higher number of **WTSP** in the low impact area. The low impact grid has more fen and less deciduous forest, which has more open areas (suitable habitat for the species). **YRWA** are occupying remnant forests patches.
At a larger scale, LISP and TEWA are occupying more noisy areas than quiet areas.
WTSP is detected at farther distances. Is the **LISP** singing more or adjusting its song?

Management Implications

Incorporate **noise assessments** as the forest recovers from disturbances.

Literature cited

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