

DISTURBANCES USING SOUND LOCALIZATION

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Background

Assessing the impact of anthropogenic habitat alteration on bird populations requires approaches at various spatial scales. Seismic lines are particularly vexing to study because they are individually very small and narrow, but cover a large collective area (Fig 1). Sound localization is a promising method for assessing impacts of seismic lines at small scales. Localization uses an array of microphones to pinpoint the location of a singing bird. In doing so, it allows birds to be continuously tracked without the potentially biasing effect of a human observer. We deployed sound localization arrays at 40 sites in northern Alberta to examine whether the seismic lines affect bird movements and habitat use, and to explore how habitat reclamation affects the tendency of birds to use or avoid seismic lines.



Fig 1: An estimated 1.5 million km of seismic lines exist throughout Alberta. Collectively, the amount of area disturbed by seismic lines is large (red square).

Goal 1: Use sound localization to examine behavioral responses of Red-eyed Vireos to disturbances.

Goal 2: Expand to the broader community of bird species.

Field methods



Fig 2: Arrays of fifteen recording units were placed at 40 seismic lines in northern Alberta. Recording units were spaced 35 meters apart.

Sound localization accuracy

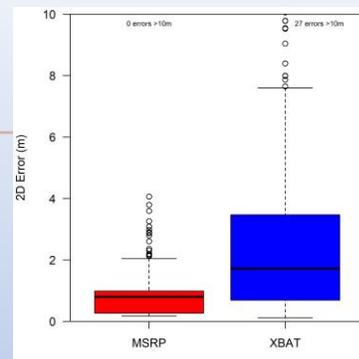


Fig 3: A comparison of two localization methods showed that our current preferred algorithm (MSRP) can localize birds within ~1m of their true position. N=1125 sounds.

Analysis of Red-eyed Vireo songs

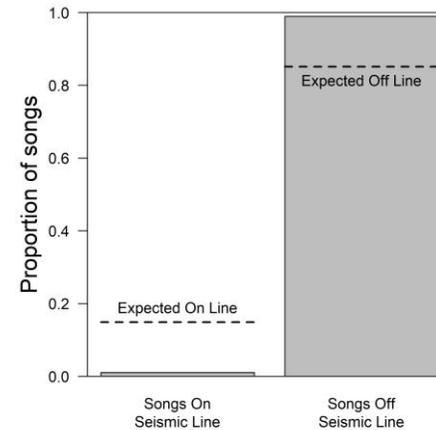


Fig 4: When individual songs were used as the unit of analysis, 13 songs originated from seismic lines, and 1249 from adjacent forest. Expected proportions shown; $p < 0.001$.

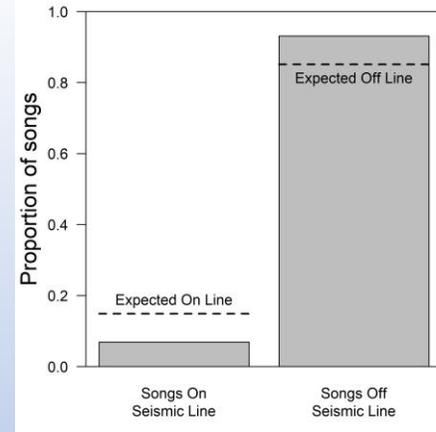


Fig 5: When distinct locations (>3m apart) were used as the unit of analysis, 4 locations were on seismic lines, and 58 in adjacent forest. Expected proportions shown; $p = 0.1$.

Conclusions & future directions

It appears as though seismic lines represent a form of habitat degradation for Red-eyed Vireos: they still inhabit areas with seismic lines, but seem to use the lines sparingly.

More involved analyses will convert singing locations into time budgets to resolve ambiguous results. Analyses will also examine the tendency for birds to cross seismic lines, and whether the edges of seismic lines are preferred or avoided.

How does this compare with other forest birds? Data processing is ongoing for this species and others.

