

**Project Summary**  
**Rocky Mountains Cooperative Ecosystem Studies Unit**

Project Title: Field studies of the masking effects of anthropogenic noise on interactions between predators and prey

Discipline: Natural Resources  
Type of Project: Research  
Funding Agency: National Park Service  
Other Partners/Cooperators: Colorado State University  
Effective Dates: 8/15/2009 - 3/31/2012  
Funding Amount: \$107,514

Investigators and Agency Representative:

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Project Abstract: This project will address the effects of anthropogenic noise on animal auditory perception. One component will focus on the black-capped chickadee (*Poecile atricapilla*) and the red-breasted nuthatch (*Sitta canadensis*). We propose to directly measure the costs of acoustic masking created by noise via three-dimensionally reconstructing the animal's position and acoustic environment using a synchronized microphone and digital video camera array (Mennil et al. 2006, Thomas et al. 2002). Several classes of predation-related sounds (conspecific and heterospecific alarm calls, predator calls and predator movement sounds) will be played back to free-ranging birds. Each playback will repeat the potential threat signal in an increasing sequence of sound levels, from inaudible to clearly audible. The bird's behavioral reaction to one of the playback levels will indicate the threshold of response against the measured background sound level. These playbacks will be conducted under varying background sound levels to map out the increase in response level with increasing noise level.

The video and microphone arrays can be set up in advance of the experiments, and eliminate the need to capture and handle the birds. Small songbirds share common predators (Swift 1991). Recent playback work has shown that black-capped chickadees possess a referential alarm call system encoding predator size and predation risk (Templeton et al. 2005). Red-breasted nuthatches eavesdrop on these predator alarm calls (Templeton and Greene 2007).

A second component of this research will be studying the effects of noise on foraging behavior in owls. Many owl species have extraordinarily sensitive hearing, they exhibit morphological modifications that enhance their capacity to spatially resolve the sources of sounds, and hearing has been shown to play an integral role in prey detection and capture (Konishi 1973, Dyson et al. 1998). Laboratory and field studies of owl predatory behavior will be conducted under varying noise regimes.

A third component will involve collaboration with Dr. Kevin Crooks and his graduate students Amanda Hardy and Casey Brown of the Fish, Wildlife, and Conservation Biology department at Colorado State University on a project titled, 'Effects of pathway activities on behavior and distribution of ungulates in Grand Teton National Park' (GTNP). This NPS funded project, coordinated through the Rocky Mountains Cooperative Ecosystem Studies Unit, will assess the effects on ungulates (elk, pronghorn antelope, deer, moose bison) of the construction and use of a multiuse recreational pathway along a major transportation corridor in GTNP. We will collaborate with this group to implement, analyze and interpret acoustic monitoring along the pathway construction corridor. Our contribution to the work will focus on the capacity of anthropogenic noise to modify the distribution, behavior, and visitor viewing opportunities of ungulates in GTNP.

Outcomes with Completion Dates:

Investigator's annual report: 31 March, annually  
Due Date for Final Report and/or Other Products: 31 January 2012

Keywords: anthropogenic noise, predator-prey interactions, recreational pathway, Grand Teton NP, Colorado State University