Migratory Bird Monitoring Using Automated Acoustic and Internet Technologies

07-245

Background:

Cornell Laboratory of Ornithology (CLO) developed digital autonomous recording units (ARUs) that record for periods of up to 10 weeks in duration (improved from 7 weeks). Acoustical methods are important for avian monitoring because many birds can be heard more reliably and at much greater ranges than they can be seen; however several limiting factors may reduce the effectiveness of acoustic techniques. We addressed the limiting factors of observers monitoring birds acoustically and of protocols monitoring birds that may be missed by traditional observation methods and provide solutions and sample data that enhance DoD's capacity to monitor avian resources on and around DoD lands and analysis and summary of these data.

Objective:

We accomplished the following tasks: 1) tested and evaluated protocols for using digital autonomous recording units (ARUs) to a) enable ground-based acoustic censusing of species that vocalize infrequently, b) provide critical data to improve the accuracy of any acoustic census, and c) produce acoustic datasets for observer training; 2) implemented a network of acoustic detectors to monitor flight-calls (FCs) of migrating species, to predict species-specific stopover use on and around DoD installations; and 3) customized the Internet-based eBird application to allow DoD to collect, store, and manage sighting data on all bird species throughout the year. The first two components address directly the limiting factors of observers monitoring birds acoustically and monitoring birds that may otherwise be missed by traditional observation methods and provide solutions that will enhance DoD's capacity to monitor avian resources on and around DoD lands. The third component facilitates the analysis and summary of these data as well as their presentation in a convenient and accessible format.

Summary of Approach:

We deployed ARUs to record nocturnal migrants' flight-calls and to evaluate recording methods for monitoring target species of concerns (such as Whip-poor-will). Each ARU consists of a sensitive, pre-amplified dynamic microphone feeding a recording unit that stored sounds digitally on a 120 GB hard drive as binary files (BIN), uncompressed sound files. Each ARU recorded on a pre-programmed schedule from civil twilight to civil twilight, 7 days/wk for approximately 70 days, generating approximately 120 GB of sound data when units functioned at full capacity without failure. The installations were Mt. Pleasant, Ithaca, NY, Picatinny Arsenal, Lakehurst Naval Air Station, Naval Air Station at Patuxent River, West Point Military Academy, Dover Air Force Base, Fort Drum Military Reservation, Whidbey Island Naval Air Station, Yakima Training Center, Fallon Naval Air Station, Vandenberg Air Force Base, Camp Pendelton Marine Corps Base, Yuma, AZ, Crex Meadows and Cheq National Forest, Wisconsin, and locations in NY to monitor Whip-poor-wills.

Benefit:

This project has direct benefits to the military missions and conservation objectives by 1) improving DoD capacity to monitor avian resources on and around DoD lands and 2) identifying patterns of migration and migratory usage on and around DoD facilities that may impact DoD activities.

Accomplishments:

We collected over 50,000 hours of data between 2005-2008, and we successfully stored, processed, and initiated analysis of this information. Our preliminary results indicate that this method is an invaluable source of information about species passing and stopping over on DoD lands and that this method is widely applicable to monitoring target species of concern. We recorded over 200 species automatically using these acoustic methods. We also proved that the concept of target species monitoring using automated acoustic devices is robust and cost-effective. We have outlined problems and constraints that we encountered in developing and applying hardware and software technologies, including the needs for data storage and the need for equity in the resources required for collection and analysis processes. We suggest several future areas to improve our data collection and analysis, to expand our research, and to form partnership that will further bolster the use of this technology - these include refining criteria for local attributes at deployment sites to minimize noise contamination, adjusting software parameters for detection of signals of interest, expanding the range of studies that apply acoustic monitoring, and transferring information among interested DoD users.

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