

Engaging Local Citizen Scientists to Record Avian Vocalizations to Improve Habitat Management on Land Trust Properties

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ABSTRACT

Many songbirds visit Connecticut on their migratory paths each year. Many of these species are threatened or endangered and rely on specialized habitats that can be found on Connecticut's Land Trust properties. However, without being able to identify their lands, Land Trusts are unable to maintain and properly manage the critical habitats these birds require. *Operation Bird Song* is a new and exciting way to involve local citizen scientists to help Land Trusts monitor bird populations and ultimately manage habitat for birds of conservation concern.

Using sound recording equipment and a variety of free software and computer applications, I surveyed bird populations on two different Land Trust properties in northwestern Connecticut during the summer of 2013. Despite having absolutely no knowledge of bird sounds or recording equipment, I captured the songs and calls of 29 different bird species in only a handful of experimental recording sessions. Using specialized computer programs, apps, and the help of experienced birders, I easily identified the vocalizations of these birds. To determine which species were relying on specific habitats, I recorded the location of these sounds using GPS technology. I discovered that 9 Species of Responsibility on The North American Bird Conservation Initiative list were using these Land Trust properties as a summer breeding ground (see Table 1). The ultimate goal of *Operation Bird Song* is to develop a manual and other resources to enable novice citizen scientists with an interest in birds to record and identify birds. This guide and its users can help Land Trusts identify and monitor breeding and migratory bird populations on their properties.

INTRODUCTION

While Land Trusts in Connecticut have done a wonderful job of preserving land in their communities, many are not doing enough to manage their property for the avian species that live and migrate there. There are several reasons for this oversight. First, few Land Trust properties have been properly surveyed for birds. The few Land Trusts that do have avian surveys often rely on outdated information. However, as habitat changes via the natural process of succession, so do bird populations. Surveys used by Land Trusts should successfully reflect these temporal and spatial changes in the habitat, but this may not always be the case. In order to acquire the most up-to-date information, Land Trusts must rely on skilled and experienced birders to survey their properties on an annual basis. Unfortunately, access to these skilled professionals and/or financial resources to hire professionals are limited for most Land Trusts, making it difficult for them to devote time and energy to these critical avian surveys. Research has demonstrated that different species of birds require a variety of different habitats in order to thrive. Without knowledge of what birds exist on the property, it is impossible for Land Trusts to manage the habitat for the benefit of inhabiting, as birds respond to variation in environmental factors resulting from habitat succession or climate change.

Studies by a variety of international, national and state conservation groups including Bird Life International, Partners in Flight (PIF), American Bird Conservancy, National Audubon Watchlist, the Connecticut Department of Energy and Environmental Protection (CTDEEP), and the Connecticut Audubon Society (CAS) have indicated that bird species are significantly affected by habitat change. Additionally, the CTDEEP has developed a Comprehensive Wildlife Conservation Strategy to help reverse population decline among several species of interest as well as to protect sensitive habitat areas within the state of Connecticut. A few examples of these threatened neotropical migratory birds on CAS's list of top 20 priority species for conservation action in Connecticut and/or whose populations are in decline due to habitat loss include:

Carulean Warbler - Requires large areas of closed-canopy mature deciduous forest, and often prefers to live along rivers and lakes.

Wood Thrush - Prefers mature deciduous forest with dense undergrowth and moist areas near streams or wetlands. Fragmentation and loss of mature forests in both its breeding and wintering grounds has reduced their population.

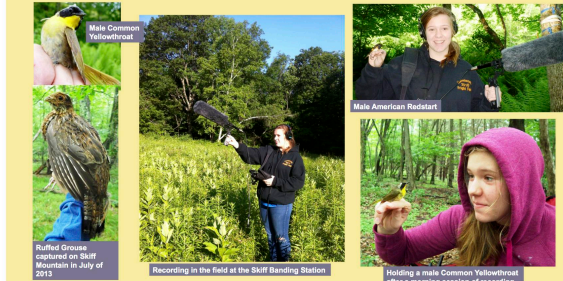
Least Flycatcher - Overall populations are stable, but beginning to show a decline in population numbers. Forest succession, human disturbance and increasing forest maturity and deer populations are believed to be causing the decline. This bird has largely disappeared from the state's maturing forests (archive.org; CAS SOB report 2011).

MATERIALS AND METHODS

Study Area - This study was conducted on the Kent Land Trust's Skiff Mountain South Property (41°46'42.29" N, 73°27'27.40" N, elevation 1280 ft.) and the Sharon Land Trust's Skiff Mountain North Property (41°47'14.33" N, 73°27'28.71" N, elevation 1369 ft.). The habitat of both properties is transitional oak-hickory forest. The lands are bordered by freshwater wetlands, streams, farm fields, and early successional habitat.

The Skiff Mountain South parcel has had an active bird banding station on the property since 2001, and the Skiff Mountain North parcel has had a bird banding station since 2003. These stations are part of a continent-wide network of mist-netting stations gathering data for the Monitoring Avian Productivity and Survivorship (MAPS) program. The data generated by the MAPS program provides critical information about "the ecology, conservation, and management of North American bird populations, and the factors responsible for changes in their populations" (www.birdpop.org). Data from the Skiff Mountain banding stations will function as a reference to any birds detected in the recordings and will help to confirm the validity and accuracy of Phase 1 of this project.

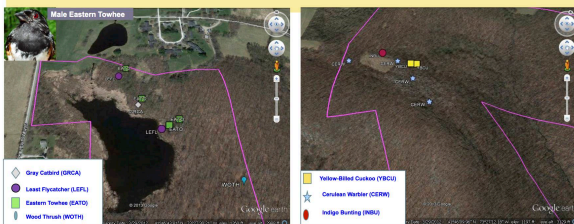
Recording Equipment - Field recordings were made using a Marantz Professional PMD661 digital recorder and a Sennheiser ME67 microphone. Recording settings were chosen (recorder format PCM-24, sample rate 96K, number of recordings on the left channel), a Rycote Softie wind shield was used to cover the microphone to reduce wind noise when recording. Sony MDR-7500 headphones were used to listen to the recordings, which were stored on an SDHC card and then transferred to a computer using a basic card reader.



Field Methods Phase 1 - The first phase of *Operation Bird Song* began with mapping the recording sites on existing hiking and/or net trails on the two Land Trust properties using a Garmin GPSmap 60CSx unit. These waypoints were eventually transferred to Google Earth using a software application called DNR Garmin, and maps of the study area and different transects were generated using Google Maps and Google Earth.

Between late June and September of 2013, approximately 25 hours were spent in the field, experimenting with recording techniques as well as learning how weather conditions (i.e., wind) and times of day might influence the recordings. The best recording method involved having the recorder to come to a complete stop, wait 15 seconds, state his/her location and time, then, standing perfectly still, aim the microphone straight ahead for 15 seconds before slowly rotating in cardinal directions (north, south, east and west) 90 degrees to record for another 15 seconds, until a total of 1 minute of recording at each point was completed.

Software, Analysis, Bird Song Apps and Mapping - A variety of computer software and online applications were used to record, visualize, transfer, and/or identify bird songs recorded during this study. Raven Lite (Cornell Lab of Ornithology) was used to visualize, listen to, and create audio and video records of the bird calls. Vocalizations were identified using the following apps: Chirp! Bird Song USA (Sispy), iAves (app), Sibley Digital Field Guide to Birds (app), and the Cornell All About Birds website. In addition to various software, my teacher, Laurie Doss, and birders Ann Orsillo and Joshua Fusaro also helped me learn the bird sounds and use the various forms of technology. Once bird songs were identified, song identification and other key information (location, time of day, weather conditions, etc.) was recorded into an Excel Data spreadsheet in the Marvelwood School science lab. Identified bird species were then plotted at each recording location on maps using Google Maps and Google Earth. This data was then compared to those species banded and/or heard during the operation of the MAPS banding stations to check for the validity of the results obtained from the field recordings.



RESULTS

Between June 24th, 2013 and July 31st, 2013, nine recording sessions occurred (of which five were useable). Each useable session was conducted in 1-2 hours long, totaling about 10 hours of recording time in the field.

Recordings were conducted in different wind conditions, as well as at different times throughout the morning. This gave us an idea of what times and weather conditions would be best suited for citizen scientists to conduct their own recordings.

Seventy-five percent of the 205 separate recordings between June 24th and July 31st were deemed acceptable for data analysis. I was able to detect the calls of 32 different species: 30 avian species, one amphibian (gray tree frog) and one mammal (chipmunk). 54 of the calls and songs heard were classified as "unknown" or marked as unacceptable due to wind or background interference. Ten of the species identified in these recordings are found on the North American Bird Conservation Initiative's Species of Responsibility list (see Table 1 and Appendix A).

Bird banding occurred concurrently with some of the recording sessions, so I was able to hold and release some of the species actually recorded in the field, including Red-Eyed Vireo, American Redstart, Veery and Wood Thrush. On one occasion, I was able to see a Ruffed Grouse, a species in decline due to the loss of early successional habitat, land in the net. Recordings of grouse drumming were not detected, as their breeding season begins in April. In the first recording session, due to lack of familiarity with the recording equipment, the singing of several Carulean Warblers were unable to be recorded, but I was able to count as these were recorded as confirmed by several experienced birders who had found these species previously on the property.

The avian species identified required a wide range of habitat types, such as early-successional forest, mid-successional forest, late-successional forest, forest edges, and open fields.

CONCLUSIONS

Phase 1 of *Operation Bird Song* proved that a citizen scientist with little to no experience identifying birds via their songs and calls can use these recordings and programs to successfully detect and identify bird species utilizing Land Trust property. Several species of birds recorded were even captured in the summer of 2013 and/or in the previous years, such as the Carulean Warbler, Eastern Wood Pewee, Wood Thrush, Eastern Towhee, and Least Flycatcher, giving further validity to our recordings. Online programs, software, and experienced birders aided in the identification of bird songs. Given that Phase 1 was so successful, Phase 2 can now commence. A trial run of the full protocol will be initiated in the spring of 2014 at two of Kent Land Trust's new preserves, the Tobin and the Camp Francis Preserves in Kent, CT. Recordings will follow a set protocol similar to the Breeding Birds Survey conducted by the Bird Population and MAPS program, and will follow a set recording schedule (see Table 2, protocol and data sheet samples associated with the exhibit).

ACKNOWLEDGMENTS

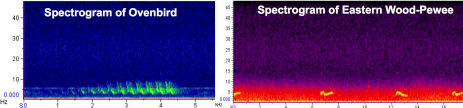
Operation Bird Song could not have grown into such a success without the help of a few talented people. I would like to thank the Kent and Sharon Land Trusts for giving us access to utilize their property for research purposes. Thanks to Benjamin VanDoren, from the Cornell Lab of Ornithology for suggesting the recording equipment utilized in this study, and to Chuck Bowers, who donated the equipment. I would like to thank the Marvelwood School for their support, as well as faculty member Tim Smith, who provided me with access to the tracks to Janet Allison and Ann Orsillo, two experienced birders who helped tremendously in the field, and to Joshua Fusaro and Connor Bachmann, two young aspiring field scientists, for helping me both in the field and in identifying the birds once data was collected. Lastly, I would like to thank Blythe Everett, my mother, for waking me up early in the morning and for helping me with my paper.



In the 1980's, field ornithologist Ted Parker "revolutionized the process of biological inventory by using sound to survey neotropical birds" (Cornell Lab of Ornithology). In recent years, the Cornell Lab of Ornithology's Maceaully Lab has created a number of audio recordings to help biologists learn bird calls and conduct inventories by sound.

The purpose of this study is the proposal of a new avian citizen scientist initiative called "*Operation Bird Song*," which will enable local citizens of all ages to capture auditory recordings of birds which are often difficult to identify through the foliage.

Operation Bird Song utilizes field recordings and online software and apps to help community citizen scientists (most with little to no initial knowledge of avian identification and/or vocalizations) identify bird sounds recorded in the field and analyzed in the comfort of one's home to generate annual avian baseline data needed to develop habitat management plans for their local land trusts. Phase 1 of *Operation Bird Song* involves determining whether this process would be able to be completed by the average person, with no prior recording experience or knowledge of bird songs.



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