

Birding for Beginners

Teach scientific inquiry skills using this citizen science field study unit on native songbird breeding behaviour



By **Renee Bachman** and **Ted Watt**

WE SAT QUIETLY IN THE FOREST, swatting mosquitoes and listening intently to the many species of birds singing in the trees around us. Sarah carefully pressed the button on the boom box, broadcasting the breeding call of the male black-throated blue warbler. Within seconds, Kevin focused his binoculars above us and whispered excitedly, “There he is!”

In response to our taped calls, a male black-throated blue warbler had zipped into the tree above us and was calling – bzzz-bzzz-bzzz-bzzzeeee. Denise carefully checked ‘singing male’ in the correct column on our data sheet and we grinned at each other across our little circle.

This was the culmination of weeks of focused study and discussion in our fifth grade classroom – about songbirds, their annual migration journeys, songs, calls, plumages, behaviors, and how they depend on specific habitats for breeding. Students investigated the ecosystems in the forest preserve across the street from our school, gathering and analyzing data about birds and their breeding habitats.

The program had been designed to build excitement for

both students and teachers about outdoor learning, and relies heavily on methodology from Birds in Forested Landscapes, a citizen science initiative from the Cornell Laboratory of Ornithology. As we learned more about the program’s methods and requirements, we became increasingly confident that we could use it to assist our fifth graders in developing the necessary knowledge and skills for gathering meaningful data. Students gather and submit data on what they discover about species identified by Cornell as of conservation interest. Student groups examine their data critically and ask scientific questions that could be answered by the class’ data. The study is fun and involving for the students and can lead to extensive discussion about birds and the forest and the process of doing science. The goals of the unit are to:

- identify four selected bird species in the field using visual and auditory cues
- describe and evaluate a variety of characteristics of forested habitats
- gather and record field data on bird song and behavior
- ask scientific questions that could be answered by our data
- analyze data and draw conclusions to determine breeding presence of selected bird species as well as determining answers to other questions



vegetation, slope, and proximity of each site to a variety of human and non-human habitat features including water availability. The Cornell protocol specifies how to gather and record these data.

Then gather the necessary equipment: quality binoculars, one pair each; photographs of target bird species; portable CD players, one per group (we found that iPods/mp3s weren't loud enough); CDs of target bird species' calls, clipboards, data sheets, pencils, compasses, and maps of the forest area where the study points were located.

Identify the skills that students will need to succeed in this endeavor and plan how to structure their classroom learning prior to the field data gathering. We carefully envisioned the outdoor field work and identified group members' roles:

- operating the audio player with the bird song CD;
- tracking time on the stopwatch and playing the repeated song broadcasts;
- recording sightings on the data sheet; and
- watching the trees intently for birds.

After careful planning, we realized we would need at least four parents or community volunteers to help us with this study. Our volunteers had to commit to one after school training and three mornings to conduct the research with the students. The volunteers also had to learn to identify the targeted species of birds.

Classroom Study

I stood at the door greeting my students as they entered the classroom that Monday morning late in March. I had covered the whiteboard at the front of our room with pictures of birds, which we had been watching and identifying at our window birdfeeder since September. Students began to enthusiastically identify the birds they saw.

Preparation

In preparation for the field study it is important to gather certain information before heading out into the field. Familiarize yourself with the general topography and habitat types in the forest preserve near your school, using an iPhone GPS app, or through field exploration. Analyze the available habitats and choose probable breeding birds from Cornell's list of species of concern. For our project, we identified veery, wood thrush, black-throated blue warbler, and eastern wood-pewee as birds we might encounter in the field.

Review the field methods described on the *Birds in Forested Landscapes* website and set up a grid of survey points in the preserve according to the protocol identified by the Cornell program. These points identify the locations of your bird song surveys and set the stage for fieldwork. Assess the

A Checklist for Teaching the Unit

Prior to Classroom Study

Locate a study area, choose the species you are going to target, review the field methods, set up a grid of survey points, assess the study site characteristics, gather equipment, identify skills students need to be successful, identified group members roles, and find and train volunteers.

Classroom Work Preceding Field Study

Conduct a pre-assessment, research bird species, breeding requirements and habitats, study bird calls, teach the protocol and make children aware of the implications of using recorded bird calls in research.

Classroom Review of the Scientific Process

Formulate scientific questions and teach how to write an "If... then...because hypothesis."

Field Study

Set up and conduct a practice run, conduct first survey count, and share data with one another.

Share What You Discovered

Share ongoing data collection with your community (make a bulletin board), finish research, analyze data, run correlations, make graphs, draw conclusions based on the data collected and celebrate the work!

Alex said, “Hey, that’s a black-capped chickadee.”
“And that’s a blue jay,” Denise responded.

Though I wasn’t planning on teaching science until later in the day, I couldn’t resist the opportunity to make this a teachable moment. The discussion we had in class provided an informal pre-assessment for this study. I now had a lot more information about what I needed to teach in preparation for our study.

There were a few bird photos the children couldn’t identify and four of them were our study species. Later that day, I introduced those four to the class and we went to the computer lab to do some research about these species using the Cornell website, *All About Birds*. We spent three forty-five minute sessions in the computer lab over the next two weeks researching these birds and their breeding habitat requirements, as well as learning their calls and songs. The students gained familiarity with the calls and sounds of other common birds they might encounter in our woods. We also dedicated a couple of days to studying and learning the Cornell field research protocol.

Since we would be following the Cornell protocol and broadcasting taped bird songs into active breeding territories we also discussed with students the effects this has on breeding bird behavior and stress levels and cautioned us all to minimize this way of using bird song playbacks.

Formulating Questions and Hypotheses

Following the Cornell protocol and participating in citizen science is an engaging and educational experience in itself, but you may want your students to participate in additional original, inquiry-based investigations. If students ask lots of questions and express interest in knowing more about study species, you have the opportunity to guide them into formulating their own questions that can be answered from the data you will be collecting. Most of our students’ inquiries dealt with what the birds needed in their environment to survive including food, water, and shelter, and in one instance, wondering about parasitic species.

Each of our six field groups formulated questions, such as; *Will there be a larger variety of bird species counted in the sites near water? Will the black-throated blue warbler be at all the count point sites? Will any groups see or hear the cowbird?* Use similar questions to teach the class how to develop formal hypotheses.

Field Study

If you will be incorporating parent and community volunteers into your site visit, it’s a good idea to organize a practice site visit with them before heading out to do the real thing. On our first visit, we hiked to our points in the forest, set up the audio player, and followed the protocol step-by-step. Each group needs a copy of the field data sheet to practice filling out, marking the birds that they hear and/or see. Get students to review the steps of the protocol and practice their bird identification skills.

On our first trip, the students were in awe and couldn’t believe there was such a diversity of birds living in the forest right behind their houses. When we returned to the classroom I allowed the enthusiasm to guide my teaching. We looked at the notes from our computer research on birds and discussed what we had seen in real life. We discussed

the behaviors of the individual birds and the differences in their body shapes and plumages. We marveled at their intelligence and their beauty.

Our first official field survey day finally arrived. Everyone was there and we had 6 functioning audio players. We donned our binoculars and hats and embarked for the forest to locate our survey points. Compass in hand, I led my group through mountain laurel thickets, pine scrub and oak forest following the compass bearings and pacing out required distances. I was looking for two huge tulip trees that we had seen when we set up the survey points. As we balanced along a fallen tree, I looked up and right in front of us stood the two trees with an orange flag tied to a nearby branch. At that moment, I felt quite capable as an orienteer. We settled into our area and began our survey.

When all the groups returned, students shared their findings, many with great stories. The protocol stated that the survey dates should be about a month apart. During the intervening month we continued to review the birds and their calls, readying ourselves for the next survey. Based on the data gathered that first, day we added a couple of new bird species and their songs to our ‘preserve list.’

Sharing our Learning and Authentic Assessment

You may find that rather than simply presenting a study, you want to involve the community as the project progresses. We designed a dynamic, evolving bulletin board on the wall outside our classroom and incrementally added each step in our study. We began with the study’s title, a Google Earth aerial photo of the forest preserve, and descriptions of our six survey points. As the study continued, each new dimension was added to the bulletin board, including students’ drawings and photos of our target study birds as well as student questions and hypotheses. After our two survey days, the groups analyzed their data, constructed graphs, ran correlations, and wrote conclusions about their investigations. All of this work was combined to finalize the bulletin board making it into one giant poster session. At our end-of-year celebration the students presented their findings to their parents and the school community.

Outdoor Safety First

By going out into the field, you risk wasp stings, tick bites, bramble scratches, poison ivy, countless mosquito bites, tumbling over loose rocks and tree trunks, and even getting lost in the large forested area. Make sure you send home detailed permission slips describing the potential hazards and how you plan to prepare and accommodate for them. Emphasize the importance of proper clothing and footwear, and offer families the choice of opting out of the field study. Hazards in outdoor learning are significant. In my experience, our school’s five-year engagement with outdoor learning had promoted a respect for these challenges while fostering student and faculty enthusiasm for exploring the natural world.

Conclusion

The excitement and motivation generated in our students through this study was evident to us, our fellow teachers, and the school community. The real world connections and sense of being able to contribute to bird conservation in authentic ways through their own observations resonated with our students.

Next Generation Science Standards (NGSS) (USA) Connections

By aligning classroom practice with the NGSS, it is possible to connect your unit to evolving best practices in science education. This unit combines a number of NGSS practices, ideas and concepts into an interdisciplinary experience for students. See the chart below for connections to the NGSS as well as cross-curricular integration opportunities with the Common Core.

	Unit Learning Activities	Science and Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts	Math, ELA and Technology Integration
Pre-teaching activities	Watching bird feeder	Obtaining, evaluating, and communicating information	LS4.D: Biodiversity and Humans	Patterns - Obtaining, Evaluating, and Communicating information	
Day 1-3	Researching birds and listening to calls	Obtaining, evaluating, and communicating information	LS2.A: Interdependent relationships in ecosystems	Patterns	
Day 4-5	Reviewed Cornell data-gathering protocol	Evaluating methods and tools for collecting data			RI.5.10 Read and comprehend informational texts
Day 6	Wrote inquiry questions and hypotheses	Asking questions that relate one variable to another	LS2.C: Ecosystem dynamics, functioning and resilience		
Day 7	First site visit	Collecting data on site conditions	LS4.C: Adaptations	Patterns	
Day 8	First survey day	Collecting data	LS2.A: Interdependent relationships in ecosystems		
Day 9	Analyzed the data	Interpreting data		Patterns	
Day 10	Second survey day	Collecting data	LS2.A: Interdependent relationships in ecosystems		
Day 11	Made posters with all data and information	Analyzing data Running correlations	LS2.A: Interdependent relationships in ecosystems	Patterns	Math-Make graphs W.5.2 Write conclusions
Day 12	Poster session reports	Reporting discoveries			MP.3 Construct viable arguments

This unit offered students the opportunity to engage in debates about the evidence they collected. We had many discussions around cause and effect vs. correlation and simple mathematical averaging. Conducting this field-based investigation enabled students to absorb the practices, ideas and concepts underlying the immediate research activities. It also engaged them in real field science at a level appropriate for their grasp of the scientific process. Students also showed appreciation for the diversity and beauty of our native forest bird species and connected to the world around them in ways that many do not fully appreciate.

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Resources

Arizona State University's Global Institute of Sustainability: Ecology Explorers <http://ecologyexplorers.asu.edu>

Cornell University's Laboratory of Ornithology: Birds in Forested Landscape www.birds.cornell.edu/bfl/

Cornell University's Laboratory of Ornithology: All About Birds www.allaboutbirds.org/guide/search

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