Birders’ Gift Guide

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How to Record and Analyze Nocturnal Bird Calls
JORY G. TELISER

On the cover:
Nature photography is famously easy on the Galápagos Islands, making them a great destination for trying out new camera gear. Shown here is a Hood Mockingbird performing its own evaluation on Española Island.

Photo © Kevin Loughlin / Wildside Nature Tours
We birders get more out of birding by sharing first-hand experiences. More enjoyment, more fulfillment, more meaning. That simple idea is the heart of the ABA’s culture.

Gear for birding—what to choose and how to use it—is a great topic for this birder-to-birder approach. What you read here is the distillation of many years of experience in the field, and it’s presented with an eye toward making gear a useful set of tools for your birding—not another distraction that gets in the way of it.

I hope that you’ll find the tips and techniques presented here useful and that you'll try some of them yourself. And I also hope you’ll let us know what works well for you, what does not, and what useful tricks and techniques you discover on your own or hear about from others. In this way, the great pool of knowledge that the ABA represents stays fresh and vital. It’s a resource that you can benefit from and contribute to and I invite you to do both.

If you find these Birder’s Guides helpful, please do two things. First, join the ABA, if you’re not already a member, at aba.org/join. Second, share Birder’s Guide with others who will benefit from it. All issues are available for free online, at aba.org/birdersguide.

Good birding,
Jeffrey A. Gordon
President, American Birding Association

The main goal of Birder’s Guide to Gear is to offer you expert advice on birding gear. We seek out the experts so you don’t have to.

Just in time for the holiday season, Jennie Duberstein offers gift suggestions for the birders in your life. No birding gear guide would be complete without advice on optics, so Kevin Loughlin reviews a new camera that’s quickly taking the birding world by storm. If you’ve ever wanted to record and analyze the flight calls of birds migrating over your house, Jory Teltser lays out some wonderful resources to help get you there. And on the topic of recording bird sounds, Ted Floyd extols the virtues of using your smartphone to do just that. Finally, Marcel Such offers advice on how to keep warm this winter with proper layering: it’s not as simple as you might think.

Birder’s Guide only exists because our talented pool of ABA members is willing to share its knowledge. You can join in by writing an article. By the same token, we depend on our members to give us feedback about what they want—and don’t want—to see in Birder’s Guide. Take just a moment to share your thoughts with us, either via the email address printed above or by leaving a comment at aba.org/birdersguide.

Good birding,
Michael L. P. Retter
Editor, Birder’s Guide
Birder’s Guide is published by the American Birding Association, Inc., a not-for-profit organization that inspires all people to enjoy and protect wild birds.

The American Birding Association, Inc., seeks to encourage and represent the North American birding community and to provide resources through publications, meetings, partnerships, and birder networks. The ABA’s education programs develop birding skills, an understanding of birds, and the will to conserve. The ABA’s conservation programs offer birders unique ways to protect birds and their habitats.

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About the Authors

**Jennie Duberstein** is a wildlife biologist and conservation social scientist who has spent her professional career working to build partnerships for conservation of birds and habitats across the U.S. and northwest Mexico. Jennie coordinates the Sonoran Joint Venture, a binational partnership with a mission to conserve the unique birds and habitats of the southwestern U.S. and northwestern Mexico. She has worked with young birders for many years by coordinating field courses, summer camps, and conferences, and by generally helping to connect young birders with opportunities and each other. She directs the ABA’s Camp Colorado, manages the ABA Young Birders Facebook page and the ABA’s young birder blog (“The Eyrte”), and co-leads VENT’s Camp Chiricahua.

**Ted Floyd** is the Editor of Birding magazine, the award-winning flagship publication of the American Birding Association. He has written five bird books, including the Smithsonian Field Guide to the Birds of North America (HarperCollins, 2008) and the forthcoming How to Know the Birds (National Geographic, 2019). Ted is also the author of more than 200 popular articles, technical papers, and book chapters on birds and nature. He is especially interested in analyzing bird vocalizations, in interpreting birds and nature for children and beginners, and in applying new media and emerging technologies toward the appreciation of nature. He and his family live in Lafayette, Colorado.

**Kevin Loughlin** was raised to appreciate nature while exploring the woodlands of Pennsylvania. At age six, during a family trip through the American West, Kevin became fascinated with seeing and photographing new and different birds throughout North America. He wanted to share his experiences with others and in 1993 created Wildside Nature Tours. Now celebrating 25 years of leading tours, Kevin has been on all but one continent (Australia). His photographs and articles have appeared in magazines such as Living Bird, WildBird, Nature Photographer, Audubon, and Philadelphia, as well as many natural history books, including the Peterson Reference Guide to Owls of North America.

An environmental biologist, wilderness junkie, and lifelong birder, **Marcel Such** is happiest when immersed fully into the natural world around him. He takes no greater pleasure than in using his own two feet to run, ski, and backpack though the mountains in pursuit of birds and adventure. Though a true child of the mountains, he recently “changed his chickens” from Gunnison Sage-Grouse to Sharp-tailed Grouse, having moved from the mountains of Colorado to the cornfields of the Nebraskan panhandle, where he is slowly learning to cope with and appreciate his new environment.

**Jory G. Teltser** is a high school senior who has been birding and photographing wildlife almost 10 years. He is the President of the Connecticut Young Birders Club. Jory is a member of the Land Management Committee of the Aspetuck Land Trust, and is spearheading avian research and study across the trust’s 100-plus preserves. He is passionate about birding, photography, and music. He plays the French horn, and when not listening to bird calls, listens to classical music and jazz. Jory is also a member of the Staples High School Orphenians, an elite choral group that recently toured Australia, with a performance at the Sydney Opera House. Jory hopes to continue birding and doing research throughout college and beyond.

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The Awesomeness of Smartphone Audio Recordings of Birdsong
In an idle moment the other day, I was perusing the eBird user profile of a well-known field ornithologist. We’re talking about somebody of considerable renown, justly admired for her or his birderly aptitude. The person in question has submitted more than 10,000 complete eBird checklists, invariably accompanied by all-important natural history notes in the “comments” field up top. And this individual has annotated her or his checklists with photos of hundreds of bird species. And a grand total of zero (0) audio recordings.

Why is that? Perhaps for the simple reason that she or he isn’t an aural birder? Nope, this person is a brilliant “earbirder”, able to ID warblers by their chip notes and ducks by their wing whistles. Rather, I think it’s because of the perception, very widespread in the birding community, that recording and uploading birdsong is, for want of a better word, hard.

Recording birdsong conjures images of some tech-savvy Cornell Lab technician, ca. 1950, schlepping around gear the size of a refrigerator. A large refrigerator. As to uploading a sound file to the internet, you might as well ask the user to prove the Riemann hypothesis while you’re at it.

Folks, it doesn’t have to be that way. It shouldn’t be that way. It isn’t that way. Making and sharing audio recordings is a piece of cake. It’s as easy, literally, as pressing a button on your smartphone.

The author is making a recording of a Lark Sparrow. He soon thereafter edited the recording on his laptop and uploaded the soundfile to the internet. In this article, we review the basics of creating sound recordings—with nothing more than a smartphone, free editing software, and popular websites like eBird and Xeno-Canto. Las Animas County, Colorado; May 24, 2014. Photo by © Chris Pague.
Earlier this year, I was a guest at the ABA’s Camp Colorado for teen birders. We’d wrapped up a morning of birding at a place called Rabbit Mountain, in the foothills of northern Boulder County, and were headed back to the 15-passenger vans. A Lark Sparrow was singing from the top of a juniper by the parking lot, so I walked toward the bird, pointed my smartphone (an iPhone 7) at it, pressed a button, and got a recording. Then I uploaded the recording to eBird (tinyurl.com/TF-LaSp-eBird) and to Xeno-Canto (tinyurl.com/TF-LaSp-XC).

Before going further, I want to quickly note that this is a good recording. The waveform function of the spectrogram (figure at right, top panel) shows effectively zero “noise” (the flatline stretches in places) and a strong “signal” (the pulses, or blobs, of blue throughout). The signal-to-noise ratio is high. Again, that’s good. The bottom panel shows a remarkably detailed “score” of the bird’s song, starting at 1.27 seconds and running till 4.99 seconds. This recording is the audio equivalent, I would say, of a digital photo showing details of individual feathers. One other thing: Those five-note pulses in the five-kilohertz band are the song of a field cricket in the genus *Gryllus*. My guess is *G. pennsylvanicus*, but I’m not sure.

Anyhow, the big question remains. How did I pull this off? What I want to do for the rest of this article is walk you through the entire process—from noticing the bird in the first place to successfully uploading the recording to the internet. I’ll assume that you have zero facility with making recordings. In other words, this primer is for somebody like the famous field ornithologist with 10,000+ richly annotated complete eBird checklists—but nary a sound recording to her or his credit. Let’s see what this is all about!

First things first. Get as close to the bird as possible. Same deal as with photography. Even the best camera can only do so much with an eclipse-plumage Mexican Duck a mile away. I got decently close to this Lark Sparrow—although never so close that it flushed.

As I prepared to make the recording, I pressed the Camera icon on my phone (again, an iPhone 7), then scrolled over one notch to Video mode, then pressed the big red circle. Perhaps one second’s worth of prep time? And, then, when I finished recording, I pressed the red circle again (to end the recording). That’s it! If you’ve ever made a smartphone video at a birthday party or bar mitzvah, you are fully capable of making an audio recording of *Chondestes grammacus*.

Now what?
The first thing to appreciate is that you’ve made an annoyingly large movie file (in .mov format, if you’re on an iPhone 7). If the recording is more than about 10 seconds long, it’s probably too large to send straight from your phone to your email account. Fortunately, your phone knows that, and it will prompt you to use a third-party client like Mail Drop. Tip: Shorten (press trim) the .mov file before you email it to yourself, so that it contains only the parts of the recording you actually want to upload to a file-sharing site like eBird or Xeno-Canto. Now scoot over to your email account—on your laptop, not on your phone.

The file will show up in your email account either as is (if it was small, and you didn’t have to use Mail Drop) or as a link to download the file from Mail Drop. Anyhow, download the soundfile and change the extension from .mov to .wav.
The Red-winged Blackbird is one of the greatest birds in the ABA Area—unless you’re trying to record a Mountain Bluebird or Cinnamon Teal in the same acoustic space as the blackbird. When making a sound recording, be aware of interference from clamorous blackbirds, clangorous geese, and especially road noise. Alamosa County, Colorado; March 18, 2017. Photo by © Ted Floyd.

.wav. At this point, the file is ready for upload to eBird—but not yet to Xeno-Canto. That’s because eBird accepts files in .wav format, whereas Xeno-Canto requires uploads in .mp3 format. Use an online converter like media.io to make the .mp3 file.

That’s all there is to it!

But you know me. Or if you don’t, let me tell you a little about myself. I’m the sort of person who likes to do a bit of file editing. I crop and resize, and sometimes sharpen and brighten, my photos. Also, I’m the sort of person who endeavors to get the right photo in the first place, by paying attention to the effects of lighting, motion, composition, and so forth. And I like to do analogous things with my sound recordings. So I’m going to spend some time now getting into the thickets. Now don’t worry!—We’re not going to wander in far at all. What follows is pretty basic: three general strategies for making great sound recordings. You could stop reading right now, but I hope you’ll come along for the rest of the ride.

**Strategy #1 • Get a good recording while you’re actually in the field**

I’ve already stated the most important thing of all: Get close to the bird. Next, while you’re recording, do everything possible to minimize anthropogenic noise. You would be amazed at how much noise you yourself make! Don’t whisper. Don’t even breathe. Don’t rustle your sleeves or jangle your earrings. And, whatever you do, don’t ever, ever, take a step. Even the quietest footsteps ruin a recording. Stand stock still, stretch your arm out toward the bird, and press the red circle.

What about other sounds? Bob Zilly, who mentored me in the art of using “cheap digital recorders”, advises bluntly not to record near road noise. Period.

The car always wins, even if you’re recording a Horned Scream or Hadeda Ibis. Water, in the form of creeks and rain, is nearly as bad. Wind isn’t great, but you can usually eliminate it with a high-pass filter, as discussed below. And then there is biotic interference. Canada Geese and Red-winged Blackbirds are the bane of my existence, almost as evil as cars and trucks. Crickets and katydids are either annoyances or ethereal descants, depending on your perspective. Anyhow, I’ve made my point. In the same way that photographers aim to avoid leaves, twigs, and branches, sound recordists strive to minimize interference from cars, crickets, and Canada Geese.

What about the orientation of the phone itself? This is interesting. Gearhead Diana Doyle has looked into the matter, and it turns out that these smartphones are, well, smart. They know, they just
know, what you’re trying to record. I mean, they know where you are right now, where you went shopping yesterday, and whom you voted for, so why wouldn’t they know? As Diana says, don’t try to outthink the phone. Siri is smarter than you are. Just point the phone straight at the bird, don’t whisper or otherwise fidget, and get your recording.

Because you’re making large .mov files, your recordings are—wait for it—large. Consider making multiple 30-second recordings, rather than a single two-minute recording. Then choose the best one and send it from your phone to your laptop as described earlier. Which raises a sort of obvious question: Is there a better way than making large videos on your phone? That takes us to Strategy #2…

**Strategy #2 • Consider an upgrade…but be careful**

I’ll be honest with you. Most of the recordings I upload to the internet are not smartphone-generated. I prefer to use a dedicated digital recorder, an aging but still functional Olympus LS-10. You can read all about this recorder in my three-part online tutorial at The ABA Blog (tinyurl.com/LS-10-tutorial). But I’m assuming you don’t want to make the investment. You just want to make a smartphone recording, and be done with it. And you can indeed get awesome smartphone recordings. For example, the double-knock of a Pale-billed Woodpecker immediately followed by the *decrescendo* of a Lineated Woodpecker: tinyurl.com/TF-PBWoLiWo. Or how about this recording, not only of the high-frequency flight call of the American Tree Sparrow, but also the frickin’ *echo* of said flight call off an outbuilding: tinyurl.com/TF-ATSp-echo. *That.* Is. Amazing.

True, I would have gotten a better recording with my Olympus LS-10. And the whiz kids at Cornell, with their Nagras and fuzzy sticks and parabolic dishes the size of a large satellite TV receiver, would have gotten better recordings yet. The most astonishing thing to me, though, is that you can whip out your phone, initiate the camera, scroll to Video, press the red button, and obtain a recording of a sparrow’s flight call and the echo thereof.

What about enhancing the smartphone itself? Yes, you can do that. Diana Doyle and Bill Schmoker have shown me external microphones that certainly boost amplitude somewhat. But that’s another bell and whistle. Ask yourself if you want to walk around with an external microphone. I’m not judging you! Just ask yourself whether you want it. Or what about apps for boosting amplitude or otherwise enhancing your smartphone’s performance? The free app Voice Memos has been recommended to me, but, to be honest, I haven’t found much use for it. It “thinks” (or maybe it really does think!) you want to record your own voice, not the CBC Marsh Wren or Virginia Rail—better have proof!—that won’t come out for a view but that’s vocalizing like crazy. And, yes, I’ve CBC-documented both Marsh Wrens and Virginia Rails with my no-frills, unenhanced, just-point-and-click iPhone 7.

Bottom line. Sure, you can invest in Voice Memos or the LS-10 or, heck, the full firepower of the Macaulay Library at the Cornell Lab. But you can also get great results by pressing the little red button on your smartphone.

**Strategy #3 • Down the rabbit hole of post-processing**

I said it earlier, and I’ll say it again. Once you’ve got that recording off your phone, onto your laptop, and converted to .wav format (eBird) or .mp3 format (XenoCanto), you’re set. But you’re a birder, mildly to hugely OCD about documenting things the right way, and you want to clean up your recording. You’re talking to the right guy. Practically every recording I’ve ever uploaded I’ve tweaked in one way or another. I’ll share a few tips with you, but not first without saying this: I always keep the original, just in case; and, for the doctored file, I try to remember to say something like “low-frequency wind filtered” or “footsteps of passerby clipped”.

Download Audacity. It’s free, it’s powerful, it does crash from time to time, and, if there’s a better free sound-editing package, I don’t know about it. Neither does anybody else. Audacity is simply the best. There are scores of editing options and literally millions of
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Smartphone Audio Recordings

Continued from page 12

permutations thereof, but just a handful will get you well on your way to making useful and beautiful recordings. That said, I just have to ask: What would happen if you applied the Wahwah and Paulstretch audio effects to the Nyquist Prompt? Yes, you can get pretty fancy with Audacity, and, yes, I am capable of every manner of digression. Getting back on track, here are some things to know about Audacity:

- The two interfaces you want are Waveform and Spectrogram. Don’t click on Waveform (dB), as it will give you an optical migraine.
- The high-pass filter, along with eBird animated range maps and blueberry ginger kombucha, is one of the true marvels of modern living.
- So is the Amplify effect, but go easy on it. If you have a lot of noise (of the technical, acoustic sort) in your recording, the law of diminishing returns quickly sets in.
- Resist the temptation to cut out too much ambient sound, don’t “crop” too tight (by trimming too close to the song itself), and play around with the strange interface of frequency (“pitch”) and the perception of loudness.
- Save the original soundfile!

Getting proficient with Audacity, like diving deep into PhotoShop, takes some time. So does learning flight calls, navigating molts and plumages, and mastering avian status and distribution (S&D). But with just a few basics under your belt (high-pass filter, amplify, don’t cut and crop too much), you’re in business.

A Final Thought

As I type this, after deadline and with other deadlines looming, I’ve got the office window wide open. I haven’t seen a bird all day. But I’ve heard a great many: collared-doves cooing and goldfinches twittering, the neighborhood Swainson’s Hawks squealing and a Blue Jay screeching, a troupe of Bushtits and a lone Say’s Phoebe, and more. Cool! A Solitary Sandpiper just flew over!

My just-turned-50 ears aren’t what they used to be (tinyurl.com/TF-hearing-loss), but, still, there are so many days like today. It’s been a good day, a great day. I mean, Swainson’s Hawks and a Say’s Phoebe and a flyover Solitary Sandpiper. And, pardon the interruption, but a western chorus frog, Pseudacris triseriata, just started calling in the yard. I can’t help myself. I want, I really need, to get up on the proverbial rooftop and shout aloud that this world of ours is a great symphony of birdsong.

And in the age of smartphones and Audacity, of eBird and Xeno-Canto and blueberry ginger kombucha, it’s eminently doable.

I’m going to reach out to my friend, the famous field ornithologist, about the imbalance in her or his eBird portfolio: 10,000+ checklists, 1,000+ photos, 0 audio recordings. It’s not that this person in some sense “owes” it to me or to the birding community. No, it’s something else—what Laura Erickson has called “The Evocative Power of Sound” (tinyurl.com/LE-evocative), the satisfaction and simple delight to be had from recording and sharing birdsong. ♪
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It's that time of year: the final countdown to the holidays. If you have put off buying gifts, don't worry—there's still time to find that perfect something for the birder on your list. Here are some ideas to get your holiday shopping mojo rolling. These are all things I have bought for myself and love or things that sound so nifty I'd love to own them.
FOR TECHNOLOGY LOVERS
For many years, the world has been working on an app to help people identify birds by song, a Shazam® for the avian world. Song Sleuth is the new app from Wildlife Acoustics, with text from David Sibley. It lets users record a bird in the field and then tries to match that recording to a known bird species in its database, giving an identification. I recently spent time in the field with bird ID expert Michael O’Brien and a group of young birders at Camp Chiricahua, and got to see Song Sleuth in action. I don’t think the app correctly identified a single bird we heard, but Michael used the spectrogram feature to show songs to our group, allowing the kids to visualize what they were hearing and compare different songs. It was an amazing teaching and field recording tool, and well worth the $9.99 price tag. • www.songsleuth.com

FOR PEOPLE WHO LIKE TO STAY HYDRATED
Over the past couple of years, I figured out that, for me, the difference between being miserable in the field in southeastern Arizona in the summer and being okay with the heat is access to cold water. I am only being slightly hyperbolic when I say that the HydroFlask water bottle has changed my life. I can fill it with ice cubes and water in the morning, be in triple-digit temperatures all morning (and afternoon), and still have ice cubes when I get home in the evening. The outside of the bottle can be hot to the touch and the inside is somehow still full of ice water. It’s magic. You can’t go wrong with this as a gift. • www.hydroflask.com

FOR NUMISMATISTS
2016 was the centennial of the Migratory Bird Treaty, the landmark agreement between the U.S. and Canada to conserve bird species that migrate between our two countries. In April 2016, I was in Ottawa to celebrate this milestone and found myself at the Royal Canadian Mint, where they had so many cool bird coins! I reined in my excitement and only bought two, but these gorgeous coins make great presents for both bird lovers and coin collectors. • www.mint.ca
FOR SUN LOVERS

When I was a kid, I didn’t really think about the sun too much, other than to wish for it to reappear on rainy days so my friends and I could play. These days, especially since moving to southeastern Arizona, I spend a lot of time trying to protect myself from the sun, and I know a lot of birders are in the same situation. Unless you want to switch to strictly nocturnal birding, it is important to have the right gear to protect your skin, and sunscreen only gets you so far. Why not get the birder on your list a hat or long-sleeved shirt with built-in sun protection? (I recently got myself this hat and am pretty happy with it: sundayafternoons.com/p/sunset-hat/).

An online search for “clothing for sun protection” gives you lots of options.

FOR HIKERS AND TRAVELERS

The search for the perfect backpack has consumed most of my adult life. I’ve had a series of bags that have been almost right, but nothing has hit the nail on the head. I now have two bags that come pretty close to meeting my needs.

My requirements:
• Large enough to carry a first-aid kit, rain shell, lunch, and extra snacks for those times when I or someone else gets hungry (30 liters at least).
• Easy to access. When I’m in the field, I often have to quickly get to my first-aid kit to fix a blister, treat a headache, or bandage a scrape. Or maybe I’d like to get to a stash of granola bars for an extra bit of energy. The last thing I want is to unpack everything in my backpack to get what I need.
• Pockets for organization. I carry a lot of stuff and I like everything to have its place. There is a fine line between enough and too many when it comes to pockets, though, so finding a bag with just the right amount of organizational storage is key.
• Water bottle storage. I want a bag with large-enough pockets on the side to hold a one-liter or larger water bottle. The pockets have to be deep and secure enough that the bottle won’t fall out when I bend over to look at a flower or insect on the ground.
• Multiple purposes. I travel a lot, so I appreciate a bag that can do double duty as carry-on luggage and to take on a multi-mile hike.

The Peak Design Everyday Backpack

I have owned the 30-liter version of this bag for about two years and overall have been thrilled with it.

THE GOOD: The accessibility and organization of this bag are great. I can quickly get at anything inside, whether it is at the top, middle, or bottom. The bag has two large pockets on the side that easily hold my water bottle, and with built-in extra straps I can even stick my tripod in one and strap it down with ease. It has a pocket for a laptop and/or tablet that is accessed separately from the main pocket, making it very easy to pull out my computer when going through a security line at the airport. The side panels have ample pockets and storage space, with a zipped cover to keep everything in the side panel instead of shuffling around loose in the main compartment.

SHORTCOMINGS: I’m hesitant to say “shortcomings” here, because I really love just about everything about this bag. The only real downsides for me have been the size (the 30-liter bag has lots of capacity, but the fit on my back is too large) and the lack of a padded hip belt. It does have a hip strap and a chest strap made of narrow webbing, but after a recent five-mile hike my lower back and shoulders were aching because of all the weight on my shoulders. Special note: Peak Design did just come out with a new Travel Series, which includes a 45-liter backpack with a padded hip belt. I haven’t tried this, but it looks like it addresses some of the issues I had with the Everyday Backpack. • peakdesign.com/all/everyday-backpack

REI Co-op Trail 40 Pack

THE GOOD: This bag is big, with plenty of space for everything I carry. It has a great zipper system that lets you get at the main compartment from pretty much any angle, deep pockets for water bottles, and a sturdy and comfortable hip strap with pockets large enough to hold two cell phones. I can fit my laptop in the sleeve in the back of the bag, and there is a separate compartment for a hydration bladder. Basically—this bag has enough space for just about any-
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SHORTCOMINGS: The deep side pockets, while wonderful for stuffing in water bottles and all kinds of other things, are so deep that it is impossible for me to get the bottle out without taking the backpack off—I physically can’t reach it. That said, this would become a non-issue if I used a hydration bladder. bit.ly/2LO6vCF

FOR PHOTOGRAPHERS

Every year, when I put together a list of gift ideas, I seem to recommend the Phone Skope adapter for digiscoping. I love mine so much, I can’t help recommending it again. Full disclosure: Phone Skope gave me my adapter, but I would 100% pay money for it. • phoneskope.com

Many birders carry tripods for their spotting scopes, but figuring out how to take a picture of you and your fellow birders isn’t always easy. Bill Schmoker, a science teacher and bird photographer, has a great solution: a mini tripod with flexible legs that he easily attaches to his spotting scope. Voilà—group shots with ease! • joby.com/gorillapod-tripods

FOR ARTISTS

I’m no artist, but this summer at Camp Colorado I had a bit of an epiphany. The point of field sketching isn’t to create good art—that’s nice and all, but by drawing and sketching, we observe things in a way that we otherwise would not. Sketching makes us better observers of the natural world. So why not get the birder in your life a nice set of pencils, a sketchbook, and maybe a travel watercolor set? • tinyurl.com/WN-field-box

FOR COMIC LOVERS

I love comics. And entertaining comics about biology and conservation? Yes, please! Rosemary Mosco is the talent
behind Bird and Moon science and nature cartoons (birdandmoon.com). She recently published a collection of some of her best comics, called *Birding is my Favorite Video Game*, which will not only make you laugh, but also teach you something.

**TRIED AND TRUE**

I would be remiss if I didn’t suggest purchasing a Migratory Bird Hunting and Conservation Stamp as a present.

The “Federal Duck Stamp”, as it is more commonly known, provides millions of dollars for habitat acquisition and restoration on national wildlife refuges. It also gives the owner free admission to all refuges. • aba.org/stamp

Along those same lines, how about an America the Beautiful National Parks and Federal Recreational Lands Pass?

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he first time Olympus offered to let me try their latest micro 4/3 mirrorless system cameras and lenses, I declined. I really could not imagine shooting with anything but my profession-
al, full-frame digital single-lens reflex (DSLR) gear, even for a short time. Then life happened: a health scare that caused some temporary limitations on how much weight I could carry. Suddenly the thought of carrying smaller, lighter-weight equipment was better than having no cameras at all!

I contacted Olympus and set up a meeting to go over what I had to do to replace my pro gear for several photo-based tours. The folks at Olympus came through with a nearly perfect kit that included exactly what I had requested from their lineup. Then it was time to put it to the test.

When I arrived at the Olympus headquarters, they handed me a backpack full of cameras and lenses that weighed a few ounces over 20 pounds. Revealed within was a kit that should be the envy of any nature photographer. Two OM-D E-M1 Mark II camera bodies (one with an HLD-9 Power Battery Grip), a 300mm f4.0 IS PRO telephoto lens, a 40-150mm f2.8 PRO zoom lens, a 12-100mm f4.0 IS PRO zoom lens, and an ultra-wide-angle 7-14mm f2.8 PRO zoom lens. They also included an FL-900R electronic flash, an MC-14 1.4x teleconverter, and four camera batteries with chargers. Yes, all of this weighed just over 20 pounds, including the backpack—one third the weight of the camera bags I currently take on a workshop!

At this point, I must note that, because of the sensor size of the micro 4/3 mirrorless system, the effective focal length of each lens is double the numeric length when compared to a full-frame system. In other words, the apparent magnification of that 300mm f4.0 IS PRO lens is equivalent to my full-frame 600mm f4.0 lens that weighs just over eight pounds all by itself. Add my full-frame pro body to that, and we now have, for comparison, 13 pounds of gear with just one body and one lens! The Olympus OM-D E-M1 Mark II body with the 300mm f4.0 IS PRO lens weighs about five pounds, a little more than one third of the full-frame equivalent. Yup... much easier to carry around.

As I played with the new toys, I was quite impressed with the solid feel of all the equipment. Everything seemed rugged; according to Olympus, this is also the most water-resistant of current cameras. (Yes, I put that to the test, too; just don’t tell Olympus!) The camera body felt very good in my hands. The grip, even with my larger hands, was comfortable. The controls were a bit small, but all were usable and well placed. The extent of control impressed me, too. Being able to change the operation or setting for each dial and button allows great customization. I chose to leave the controls at their default settings, as that is what most folks end up doing anyway.

I broke my “practice before travel” rule when I picked up this gear. I was leaving in just two days for a series of tours, and had no time to learn the controls beforehand. It would have been ideal to have time to go over some controls and settings I would like as a bird photographer, but mostly I had to play and learn on the fly.
The Hood (Española) Mockingbird, found only on the island of Española, seems quite curious as it peeps into the Olympus 12-100mm f4.0 IS PRO Zoom lens. Using the multi-position screen on the Olympus OM-D E-M1 Mark II made it easy to hold the camera down at the bird’s eye-level as it approached. Photo © Kevin Loughlin / Wildside Nature Tours
My first stop was the Teton Range in Wyoming, followed by the Galápagos Islands, the cloud forests of Ecuador, and then back to the Galápagos Islands with another group for my final tour of this month-long journey. These are all destinations I visit frequently, so it was easy to compare the results from the Olympus with my previous images.

Once in the field, I truly appreciated the smaller size and weight as I learned some of the more intriguing features. While in the Tetons, we did a lot of landscape and wildlife photography as well as night sky photography. For this article, I will stick to the features that make the Olympus setup shine for bird photography.

For birds in flight, the “low-speed” mechanical shutter still allows for 10 frames per second using continuous focus while following a subject. Switch to the silent, electronic shutter and you can get up to 18 frames per second and still track your subject’s focus. If you don’t need continuous focus tracking, you can obtain a blazing 60 frames per second. I did not need that and never tried it.
One incredibly useful Olympus feature not found on DSLR cameras is Pro-Capture. We’ve all waited as our subject prepared to fly… and waited… and then it took off and our reflexes were just not quite good enough, so we missed the best shot. With Pro-Capture, all you need to do is hold the shutter release button halfway down, in the “pre-focus” position, then react as usual, pressing the shutter release the rest of the way down to capture a burst of as many photos as you like. Pro-Capture then saves the 10-18 frames (depending on your frame rate choice) before your “first” shot taken by pressing the release all the way. No more, “I should have been quicker!”

Focus options are numerous, from a precise single point to 121 cross-type points covering the screen. I found that, for birds in flight, the 9-point option, along with the continuous focus setting, worked best. For perched birds, the single-point focusing on the eye was optimum. Making the switch was easy and quick to learn, by pressing a well-placed button on the back with my thumb before spinning the front dial with my index finger to scroll through the options.

My DSLR has optical viewfinders (which use mirrors to allow you to look directly through your lens), so the electronic viewfinder of the mirrorless system took some getting used to. I realized quickly that, especially for birds in flight, the automatic image review has to be turned off. I missed a lot of opportunities at first because, after shooting a burst of frames, the electronic viewfinder showed me the last image taken, which then caused me to lose sight of my subject. Turned off, I did much better.

However, I still struggled with the electronic viewfinder because it is slow to turn on when brought up to my face. Optical viewfinders are always “on”. At first, I had a much more difficult time getting on subjects in flight than I do with the optical viewfinder. Toward the end of my second Galápagos trip, I was getting much better, so practice is certainly important. One trick… practice touching the shutter release as you lift the camera.
Oilbirds roost in dark caves and rocky crags. Using a high ISO and a very slow shutter speed, without a tripod, I was amazed at the final image the Olympus helped me create!

Above: Using the FL-900R electronic flash brought out more color in the feathers of this Chestnut-breasted Coronet, a species found at higher elevations in the dark cloudforests of the Andes. Left: A lot of practice after figuring out the correct camera settings allowed me to capture this Galápagos endemic Lava Gull in flight.

I used the 300mm f4.0 IS PRO lens the most, often with the MC-14 1.4x teleconverter attached, giving me an effective 840mm f5.6 lens. Great for birds! In the Galápagos, many of the birds were often very close, so 840mm was too much at times. But in the sandy conditions I did not want to change lenses often. I missed my 100-400mm that I usually use here.

Olympus’s top competitor, Panasonic, has a Leica 100-400mm zoom (equalling a 200-800mm) that will also fit the Olympus bodies and function well, but the image stabilization in the Panasonic lens is not compatible with the Olympus and will not function. Fortunately, the Olympus body has a 5-axis stabilizer built in, so you still get great stabilization with the non-Olympus lens. I was told in a whisper that Olympus designers “know they need to build a 100-400mm zoom lens”, but that has not come to pass as yet.

Using the Olympus 300mm in low light, with the lens stabilization working in tandem with the camera’s stabilizer, I was able to hand-hold the setup at 1/25th of a second using an unbelievably high ISO of 12800 to get an image of an Oilbird in a dark gorge. Once Olympus builds a 100-400mm zoom lens, this system will be tough to beat for birds in the rainforest and in the Galápagos.

So the question I am sure is on everyone’s mind: Will the Olympus replace my current professional cameras and lenses? The answer: Not yet, but I may reconsider in a couple years, especially if Olympus introduces a 100-400mm lens. However, for most photographers I meet on a birding tour, the OM-D E-M1 Mark II with the 300mm f4.0 IS PRO lens could be their “nearly perfect” setup. For those who join me on my photo workshops, where we photograph more than birds, the array of lenses Olympus offers will surely fit the needs and desires of most, while giving fantastic high-quality images and more features and control than anyone requires—all in a lightweight and manageable size.
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I know the thoughts that are running through your head right now. 
What is the deal here? Why is some guy writing an article about fashion? We are birders; we take pride in our complete and utter lack of fashion! Yes, you are correct, birders do have a notoriously terrible sense of fashion, at least from a contemporary "hip" viewpoint; you know, the full uniform of khaki complimented by a bucket hat and tucked-in tube socks. Here is the thing about that stereotype: function before style. That image of your stereotypical birder contains a lot of important and valid takeaways. Almost everything about it exists to protect the birder from the reality of the environments in which we bird.

That functionality is what I aim to address with this article. So, no, this is not the Birder’s Guide to Hipster Fashion, though that might be an entertaining piece of work at a later time. Unless you bird exclusively
The strategies to keep yourself comfortable in the field are as varied as birders themselves.

Photo by © Marcel Such
from the climate-controlled environment of your car or living room, you undoubtedly have experienced some physical discomfort in your pursuit of birds. This article is about layering, or clothing oneself in such a way as to stay comfortable and safe throughout the varied and often temperamental climates in which we love (or dread) to bird.

**Layering 101**

Although rigorously touted by field trip leaders and informational trail signs, layering is a skill that I often see neglected in the field. In addition to regulating your body's homeostasis, what you wear plays a crucial role in protecting you from biting insects, scratching plants, and damaging ultraviolet radiation.

In theory, the concept of layering is simple and straightforward: merely wear or bring multiple “layers” of clothing to be prepared for the world around you. Wear too little, and you are unable to stay warm. Wear too much, and you overheat. If you only bring a heavy down jacket and a cotton T-shirt, you might be comfortable first thing in the morning and mid-afternoon, but the jacket will be too much for a good chunk of the day and your shirt will be too little.

Beyond this, things can get less obvious. How to dress for birding is a large, complex, and personal question. What keeps me happy on a brisk fall morning of birding may be totally different than what keeps you happy, as differences in sex, age, physical fitness, acclimatization, and personal preference all play large roles in this question. As a lean young male with a propensity for physically demanding birding, my needs may be quite different from yours. Even for the same person on the exact same day, there is no proper number or type of layers to pack. With that in mind, please take my suggestions not so much as a guide, but as a source of inspiration from which you can experiment and improve your own birding comfort.

**Maintaining Your Fire**

Layering most often and obviously becomes an issue when you need to stay warm. In some situations we birders get ourselves into, hypothermia can be a real concern. Even a slight chill can quickly turn a lifer White-tailed Ptarmigan into a miserable experience. Some people handle cold better than others, whether due to conditioning or high-functioning circulatory systems, but here are a few tips to help everyone avoid a chilly bite.

First, avoid cotton in all its forms. Cotton is cheap and the most common form of fabric in the world. You will be hard pressed to find a non-cotton birding festival T-shirt. The problem with cotton is that when it gets wet, it does not readily dry and thus becomes cold and uncomfortable. The chance of getting your cotton layers wet may be small on any particular day, but weigh that against serious risk of getting cold and not being able to warm back up. I recommend synthetic “quick-dry” fabrics, in addition to fleece jackets or even wool (keep reading to learn more about wool clothing).

Second, a more general note about insulation. From both physics and adaptive biology, we know the key to conserving heat and energy is to insulate your system. No matter how many down jackets you wear, the heat will suck right out of you if

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*Photo by © Marcel Such*
you leave your hands or head exposed. In the same way that a wetsuit keeps a diver warm, wearing thick insulating layers limits the exchange of body-warmed air and cold outside air. Also, be aware that if you struggle with poor circulation and get cold hands or feet easily, consider tying your shoes looser or sizing up your gloves to help ease that process. Little things can make a big difference.

To keep your core warm on a blisteringly cold Christmas Bird Count, natural down garments do the job best, using the static air captured in the feathers to provide an insulating barrier between you and your surroundings. Good down can be an expensive investment, though synthetic down apparel is rapidly gaining traction as a viable alternative for those who want to save money or avoid purchasing animal products.

There are major drawbacks to down layers, as they tend to be bulky, taking up a lot of space in your day pack when not in use, and often are too warm for most of our birding experiences. Good alternatives are thermal fabrics and apparel, which (in theory) hold and reflect your body heat. These can be excellent choices for staying warm without bulking out too much.

From a different perspective, losing heat to the environment can work to your advantage. Removing a layer can be a challenge in and of itself, especially with binocular and camera straps and having to rearrange the contents of your backpack. Instead, sometimes all that is needed is to remove an article of clothing from your extremities, giving your body a way to vent heat and thus cool off your core temperature without too much hassle.

Rainy Days

Staying dry is key when birding on rainy days. On pelagic days. On cold days. On windy days. Actually, staying dry is important regardless of where you are. Not only is wet clothing uncomfortable, but the evaporative process can also lead to a chill far worse than the ambient temperature. A trash bag can keep precipitation out, but it can also hold perspiration in, making you damp. Even if temperatures are below freezing, physical exertion makes you sweat, and that sweat can ruin your day if it does not wick out of your clothing—no matter how much you are wearing.

In rainy and windy situations, Gore-Tex shell layers are the items of choice. This fabric is designed to simultaneously resist water and breathe, excluding rain and allowing sweat to escape. It also does an amazing job of “cutting the wind”, as even the slightest breeze blowing through your shirt can turn a nice day into a frigid one. The downsides to this technology are that it is expensive and does not last forever. Even a good jacket has to be replaced every few years. If you want to make an investment, Gore-Tex Pro products maintain their integrity longer and endure harder use than consumer-level Gore-Tex, though with the caveat of a considerably steeper price tag.

Keep Your Cool!

The flip side of conserving your body heat is staying cool in a hot environment. This is one of the biggest areas where I struggle as a birder. The oppressive heat of the desert or the all-enveloping heat and humidity of tropical birding seems to suck all the energy straight out of me, and I know I am not alone with this feeling. In this situation, proper hydration plays the biggest role in a safe experience, though the importance of apparel can-
not be understated. In hot, dry climates, long, loose-fitting, and breathable clothing keeps you much happier throughout the course of the day than most other options. Tank tops and shorts might seem comfortable, but keeping your skin covered and not suffocated will play in your favor. Additionally, you can absorb less solar energy by avoiding dark clothes—even if the effect is minimal, I can feel the difference.

I know that I have cast cotton into a very poor light, but a thin, long-sleeved cotton shirt is one of my favorite heat-survival tools in arid climates. Hot, dry air wicks away perspiration, and the loose fit provides good sun protection without feeling stuffy. Synthetic long-sleeved shirts are also an option, especially as many are sold with SPF (sun protection factor) ratings, but they tend to have less breathability and hence feel a lot warmer.

In a humid climate, this same cotton shirt would be totally soaked within minutes of leaving an air-conditioned car, and would stay in that uncomfortable state until the return home. Quick-dry synthetic shirts can be good alternatives, but they have an unfortunate tendency to start smelling bad if not washed frequently, which is important on longer birding trips. The best solution that I have found for this quandary may surprise you…it is wool! Thin merino wool base layers, such as those made by Icebreaker, remain comfortable even when completely wet and naturally resist the build-up of the bacteria that cause bad odors. On a recent birding expedition to Panama, I got away with packing two shirts, both merino wool, and birded comfortably all day, every day for three weeks. I washed them in the sink every few days, leaving them out to dry for a couple of hours, and they were ready to go again. However, these shirts do have one major drawback, as their price tag makes them all but luxury items for many. Unless you make a habit of long and grueling expeditions, sticking to the much cheaper synthetic dry fabrics may be best.

The Final Thread

This entire article can really be boiled down to: “experiment and find your own comfort”. There are many facets of this problem. I encourage you to experiment with your normal birding gear and consider new options. Buy a different pair of socks, update your rain jacket, and leave behind your bucket hat every once in a while. Besides clothing, don’t neglect other aspects of your physical comfort. Drink enough water, eat enough food, and get enough rest, as all these play crucial roles in how well your body copes with the environment around it. No matter what you do, the birding experience may be uncomfortable sometimes. No amount of preparation or expensive wool T-shirts will fix that. Just remember that if birding were always easy, it wouldn’t be nearly as rewarding!

Dressing in light, loose clothing can make all the difference on a hot, sunny day of birding. Photo by © Marcel Such
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Listening to the Birds of the Night

How to Record and Analyze Nocturnal Bird Calls

You step out on your porch and look up to see the moon peeking out behind a low ceiling of clouds. It’s a crisp, late August night.

“Tzeep!”

“Northern Waterthrush,” you mumble to yourself.

A cool breeze whistles through the trees, quieting down the chorus of Spring Peepers in the Sycamores to your left. The cicadas on the oaks quiet down as well. Then, the floodgates open. The sharp rising call of Ovenbirds, the buzzed zeep of Yellow Warblers, and the bisyllabic call of American Redstarts. Musical fingerprints of nature, beautifully accenting the night.

“Wok.”

Your eyes light up. Black-crowned Night-Heron. New yard bird!

By now you may be wondering, “what the heck is this guy talking about?” Welcome to the world of the nocturnal flight call (NFC) enthusiast. We are a small but growing group of dedicated birders interested in the largely invisible but audible world of nocturnally migrating birds. NFCs opened up a whole new world for me, and contributed to my birding and general knowledge of the environment significantly. I have learned much about weather patterns, bird behavior, and other aspects of ornithology. Listening to and recording NFCs have far-reaching implications, from everyday bird identification to studies of bird morphology to researching climate change. Beyond birds, NFCs have shown me the nocturnal world, whether it’s taking pictures of shooting stars or listening to flying squirrels as they glide overhead.

Besides being a focus of study, recording flight calls has become a fairly popular niche. It can be a wonderful extension to a birding hobby. It offers the pleasure of listening to natural music as well as the added benefit of newfound knowledge about the birds, their calls, and the world around you. It can be very exciting to listen to the orchestra of different bird calls while staring at a starry night sky. By listening to NFCs, you gain a better understanding of weather-related migratory patterns, as well as bird behavior and identification. You also get to hear animals you wouldn’t normally hear, such as the squeaks of flying squirrels or the scream of a raccoon. Before I introduce you to the world of NFCs, let me first give you some history of the subject.

On September 14, 1896, on a small hill outside of Madison, Wisconsin, Orin Libby counted 3,600 calls from night-migrating birds during five hours of listening. This count is the first published record of an attempt to quantify the night flight call phenomenon of North America’s avifauna. Native people of what is now known as Wisconsin likely heard nocturnal bird migrations during the previous 10,000 years. In the 50 years after Libby’s report, only two other counts of nocturnal flight calls were reported, those by Paul Howes (1914) counting Swainson’s Thrushes in Connecticut and the extraordinary 15-year study by Stanley Ball (1952) counting migrating thrushes in eastern Quebec. The work of Ball was the first in the realm of nocturnal flight call monitoring for the purpose of producing data on the migration timing of species in a region.

Beginning in the 1950s, counts of NFCs were reported from areas throughout eastern North America, and were published in the Audubon Field Notes. In late 1957, the team of Richard Graber and Bill Cochran began their nocturnal flight call study in central Illinois. The work of Cochran and Graber put down the foundation for machine-based audio recording of NFCs. The concept of night flight call monitoring clearly existed in the 1960s, but the method needed some technological developments before it was ready to advance further.

Under the direction of Chris Clark, the Cornell Lab of Ornithology’s Bioacoustics Research Program (BRP) was pioneering the development of digital acoustic analysis software. BRP programmer Harold Mills wrote the first functional NFC detector in 1994. This development allowed the automatic clipping of birds’ flight calls in real time or from audiotapes directly.
Nocturnal Bird Calls

from an active microphone pointed at the sky. This tool opened the door to breaking the code of nocturnal flight call identification.

In 1990, Bill Evans released a cassette tape of the flight calls of nocturnally migrating New World thrushes as a reference guide. Ten years later, in 2002, he and Michael O’Brien released a CD-ROM guide to the flight calls of landbirds of the eastern U.S. This was an extensive audio library of NFCs encompassing 211 species of Eastern birds, paired with identifications of each call. This was not just any old CD. It revolutionized the birding community. It created a new guide to learning bird calls, allowing anyone to become an expert on the flight calls of birds.

Since then, some fabulous other resources have been published. In terms of databases, the two main resources I use are Cornell Lab of Ornithology’s Macaulay Library and Xeno-Canto. The former is an excellent database of photos, videos, and recordings of hundreds of species. Using the user-friendly interface, you can easily type in any species and find recordings of its flight calls. You can narrow down flight call recordings by quality, time of year, location, and even who recorded them. The latter database is similar to the Macaulay Library, but only has recordings of birds. This site is also a little harder to navigate and narrow down search options. Both sites are good resources for referencing bird calls and viewing spectrograms. A number of other websites can be extremely useful when learning NFCs. My favorite is Paul Driver’s blog (pjdeye.blogspot.com). He provides many examples of recordings and spectrograms of over 100 species of birds. I visit the site frequently. Another great reference is Nathan Pieplow’s and Andrew Spencer’s website (earbirding.com), which is great for birding by ear altogether.

After you familiarize yourself with the basics, you are ready to get a microphone and start recording! There are a couple different options for recording. The first, and most basic, is via your smartphone. If you have a phone that can record audio, this is the easiest and simplest way to record NFCs, and a great starting point. If you want something more intense and advanced, your best bet is to buy or build a microphone. I highly recommend purchasing one of Bill Evans’s microphones (oldbird.org). If you’re a do-it-yourselfer, you can make your own by following the instructions on Evans’s website. After you have a microphone, you need to set it up in a logical spot. Ideal locations are places where birds concentrate, such as along a river, on the coast, or along a mountain ridge. Even more important, the microphone should be placed as far away from trees as possible—so that insect, frog, or human noise isn’t a big problem—and in a spot with access to a power source. If none of that is possible, the roof of your home works just fine. Be aware that insects can create hundreds, if not thousands, of false recordings. You should be prepared to sift through all these recordings in order to find bird calls. Once you’ve set up your microphone, you are almost ready to start recording. The last step is to download the computer software and programs. Evans’s website lists the steps and needed software, and describes how to analyze bird recordings. Now you’re ready to record!

After a night of recording, as you listen to the audio clips, view the spectrograms...
for submitting your NFC observations. In addition to the scientific importance, NFCs can help you improve your bird-identification skills, increase your “yard list”, and learn more about bird behavior and migratory patterns.

The fascinating nocturnal world of migrants is out there just waiting for you to experience and record. What will your first recording be? When you throw on your headphones and hit the start button that first time, maybe it will be a Savannah Sparrow, identifiable by the unique double-banded downsweep of the spectrogram. And then you’ll realize: sparrow migration must be just starting up.

References

I TOP: American Redstart is one of the most common nocturnal migrants detected in the “Tribute in Light” in New York City. Photo © Douglas Gochfeld
I BOTTOM: This rooftop directional microphone used to record nocturnal flight calls was built and designed by Bill Evans. Photo © Bill Evans

created by the recording software, and sort through the calls, you may stumble on some calls that don’t really match any normal NFC. Have no fear, birders are here! There are two great places to post mystery recordings where helpful enthusiasts like yourself will respond with their thoughts: the Nocturnal Flight Call Facebook page and the listserv at northeastbirding.com. In both of these places, you can post your own thoughts or questions, participate or observe discussions of tricky IDs, and read comments about weather and its effect on migrating birds.

Once you have all those recordings, what do you do with them? I highly recommend adding them to your bird observations at eBird.org. When submitting an eBird checklist for your NFC counts, be sure to use the Nocturnal Flight Call Count option for observation type. Also, take care when estimating numbers for a night of recording. Many individual birds duplicate their calls; be careful not to count each call as one bird, but rather err on the safe side and indicate that two closely spaced calls of the same species represent one individual. Follow the eBird instructions
Online Resources

General Guidance

- eBird: A great reference for people who want to learn more about nocturnal migration and how to start listening for nocturnal flight calls in the field. tinyurl.com/eBird-NFC

- Nemesis Bird website: A great “how-to” guide for the basics of NFC and recording flight calls. nemesisbird.com/bird-science/night-flight-call-primer

- Bill Evans’s website: Explore Evans’s findings, purchase a hand-built microphone, or learn how to make one yourself. oldbird.org

- Cornell Lab of Ornithology All About Birds website: A great source for learning more about the science and research behind nocturnal migration. allaboutbirds.org/the-new-migration-science

- Cornell’s BirdCast website: View bird migration forecasts in real time. birdcast.info

Identifying Nocturnal Flight Calls

- Surfbirds: Learn how to use spectrograms. tinyurl.com/Surfbirds-spectrograms

- Matt Orsie’s website: A great resource for listening to flight calls and viewing spectrograms, though less comprehensive than the Evans/O’Brien guide. wwbirder.org/noc.htm

- Nightmigrants website: Similar to Matt Orsie’s website. nightmigrants.com/main/page_recorded_calls.html

- Paul Driver’s blog: A phenomenal resource for viewing spectrograms and listening to recordings that the Evans and O’Brien CD-ROM/online portal does not have, specifically waders and shorebirds. pjdeye.blogspot.com


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A great source for learning more about the science and research behind nocturnal migration. allaboutbirds.org/the-new-migration-science

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