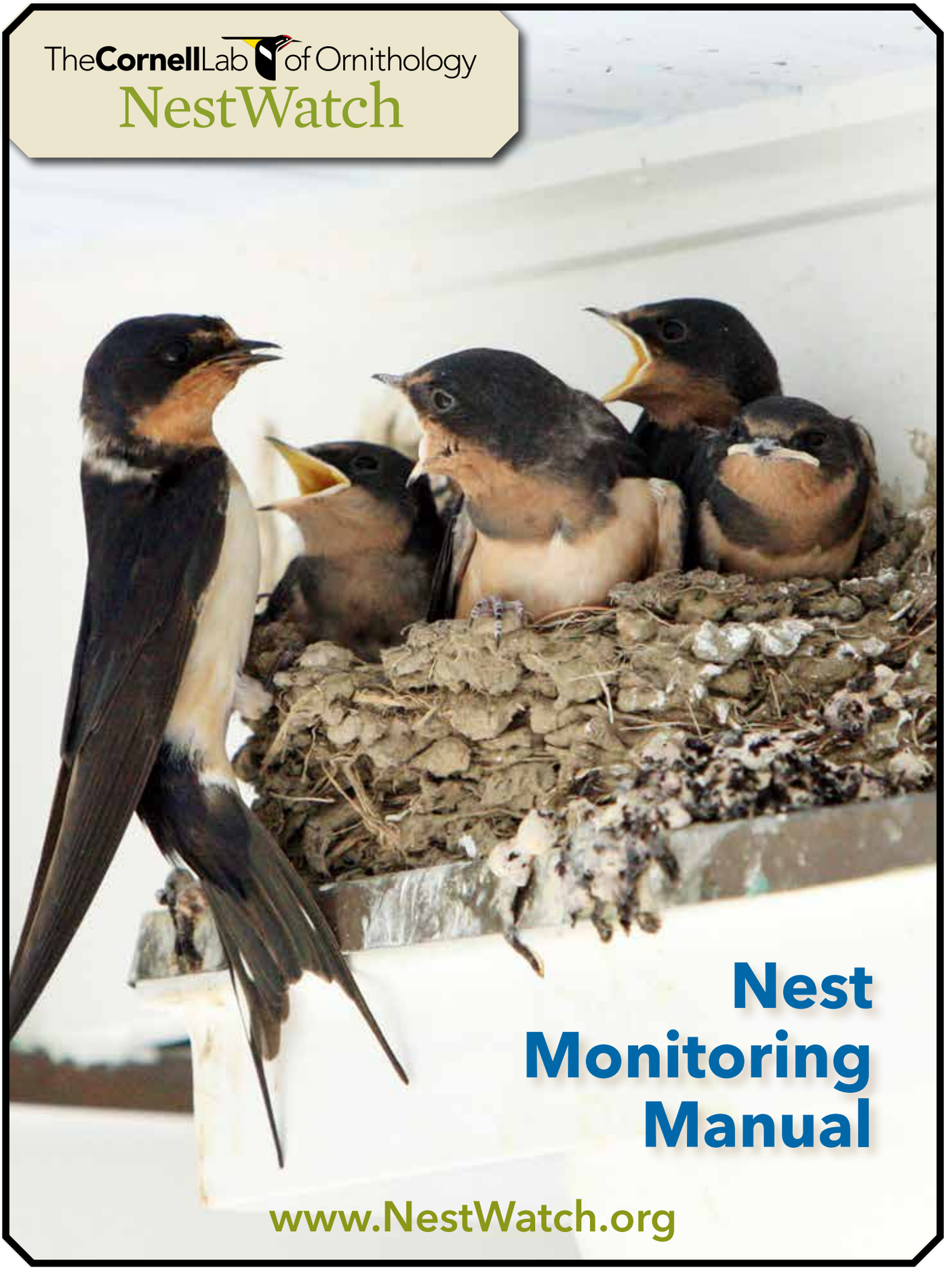
The Cornell Lab of Ornithology

NestWatch



Nest Monitoring Manual

www.NestWatch.org

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NestWatch

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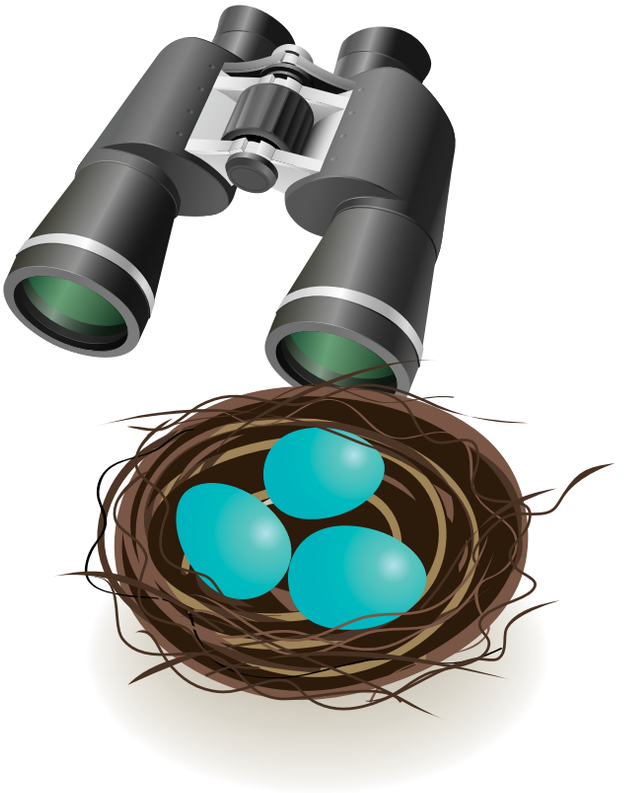

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The Cornell Lab of Ornithology is a nonprofit membership institution whose mission is to interpret and conserve the earth's biological diversity through research, education, and citizen science focused on birds.

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Some material in the NestWatch Nest Monitoring Manual has been adapted from the Ontario Nest Record Scheme Handbook and the British Trust for Ornithology Nest Record Scheme Handbook.

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Introduction

NestWatch is a nationwide monitoring program designed to track status and trends in the reproductive biology of birds, including when nesting occurs, number of eggs laid, how many eggs hatch, and how many hatchlings survive. Our database is intended to be used to study the current condition of breeding bird populations and how they may be changing over time as a result of climate change, habitat degradation and loss, expansion of urban areas, and the introduction of non-native plants and animals.

NestWatch teaches people about bird breeding biology and engages them in collecting and submitting nest records. "Citizen scientists" submit their nest records to our online database where their observations are compiled with those of other participants in a nationwide effort to better understand and manage the impacts of environmental change on bird populations.

For decades, citizen scientists have enjoyed monitoring and recording nests via the Cornell Lab of Ornithology's Nest Record Card Program, but until now, most nest data have been stored on paper forms that are not widely accessible. These historic data, as well as data from The Birdhouse Network, will be entered into the NestWatch database. Once fully populated, the database will house nearly 400,000 nest records spanning more than 50 years and 500 species. This long-term data set becomes more valuable each year and is vital to scientists studying and predicting the effects of climate and land-use changes on birds. Because these impacts may vary with latitude, weather conditions, and habitat, it is important to study them on a national or even global scale.

R. Smith

Eastern Bluebird nestling.

Participating in NestWatch is easy and just about anyone can do it, although children should always be accompanied by an adult when observing bird nests. Simply follow the directions on our website to become a certified NestWatcher, find a bird nest using our helpful tips, visit the nest every 3-4 days and record what you see, and then report this information on our website. Your observations will be added to those of thousands of other NestWatchers in a continually growing database used by researchers to understand and study birds. Simply put, your participation takes this effort far beyond what teams of professional researchers can achieve on their own. And while you are contributing extremely valuable information to science, you will learn firsthand about birds and create a lifelong bond with the natural world.

How to Participate in NestWatch

1 Create a NestWatch Account

Go to www.NestWatch.org and create an account. If you already have an account for NestWatch, eBird, Project FeederWatch, YardMap or any other Lab of Ornithology project, please use your existing account.

2 Get Certified to Monitor Nests

Review the NestWatch Code of Conduct (see page 6) to learn how to monitor nests without causing harm to birds. After registering for an account you will be prompted to take the nest monitor's certification quiz, which is based on the NestWatch Code of Conduct.

3 Look For an Active Nest

Prior to searching for a nest, we recommend familiarizing yourself with the nesting cycle of birds (see page 30). You can also learn about our Focal Species online. These species were selected because you are very likely to encounter them in your backyards and neighborhoods. Other helpful information is found here:

- Tips for Finding Nests (see page 9)
- Behavior Cues for Finding Nests (see page 10)
- You also can find additional Nest Monitoring "How Tos" online.

4 Monitor Nests and Collect Data

This is the really fun part! Once you are a certified nest monitor and have found an active nest (a nest under construction or containing at least one egg) you can begin collecting breeding data. Each time you visit a nest, write down your observations on a NestWatch data sheet (see sample page 15) and use a new data sheet for each new nest.

Your nest visit schedule should closely follow the NestWatch Protocol for monitoring nests (see page 12).

5 Enter Your Data

Log in to your account and begin by registering the locations of your nest sites and their descriptions. Next, you can enter your breeding data for each nest. You will find it easiest to enter your data as you go rather than waiting until the end of the nesting season.

It is important to include data on failed nest attempts as well as successful ones.

6 See Your Data

As one of thousands of citizen scientists across North America, you are now a member of the world's largest research team. Take a look at the data you entered on a map and compare them with other participants' data. You can also download the data you enter for your own records.

For more information and resources, visit
www.NestWatch.org

Frequently Asked Questions

Q: Who can participate in NestWatch?

A: Anyone! Our participants are people of all ages throughout North America who care about the natural world. They range from families with children to retired adults and professional biologists who monitor nesting birds in backyards, parks, green spaces, and public lands. There is no charge to participate in the program, but a suggested annual donation of $10 will help sustain NestWatch into the future.

Q: How do I join NestWatch?

A: Go to **www.NestWatch.org.** If you are not already registered, please click on the "Sign In" link and click on the option "I need an account." You will need to create a username and password. Shortly after you register, you will receive an email confirming your registration and containing your username and introductory information.

Q: What do I need to participate?

A: The most important requirements are a bit of time, an interest in birds, an eye for detail, a pen, a clipboard, and data sheets. In addition, binoculars and a field guide to birds and/or bird nests may be helpful. To report data, you will need Internet access.

Q: How do I participate?

A: There are two easy ways to monitor bird nests for NestWatch.

- Work individually or in groups to monitor nests during the breeding season and collect information on the location, habitat, species, number of eggs, and number of young in each of the nests you monitor. You'll submit your nest records online.
- Get involved with one of our chapter sites and, with the guidance of a chapter coordinator, collect information on the location, habitat, species, number of eggs, and number of young in each nest. Nest records are submitted online. See page 33 for links to our partner sites.

Q: Can I be a NestWatcher as part of a community or group?

A: Absolutely! In fact, many people work with friends, family, and neighbors to monitor large nestbox trails or conduct surveys for state-sponsored Breeding Bird Atlases. We encourage individuals new to nest monitoring to get involved with one of our partner sites. These sites are located throughout North America and occasionally hold workshops to get people started in the rewarding activity of nest monitoring.

Q: What species do you want data for?

A: We will accept data on ALL North American breeding birds. However, we have a list of Focal Species which were chosen based on many factors including migratory status, nest type, and range. The Focal Species are commonly found in rural, suburban, and even urban neighborhoods, making them easily accessible for nest monitoring. For more information about our focal species' nesting biology, visit: **www.NestWatch.org/learn/focal-species**.

Focal Species

American Goldfinch
American Kestrel
American Robin
Ash-throated Flycatcher
Barn Swallow
Bewick's Wren
Black-capped Chickadee
Black-headed Grosbeak
Blue Grosbeak
Carolina Chickadee
Chestnut-backed Chickadee
Dark-eyed Junco
Eastern Bluebird
Eastern Phoebe
Eastern Towhee
Gray Catbird
Great-crested Flycatcher
House Finch
House Wren
Indigo Bunting
Juniper Titmouse
Killdeer
Lazuli Bunting
Lesser Goldfinch
Mountain Bluebird
Mountain Chickadee
Mourning Dove
Northern Cardinal
Northern Mockingbird
Oak Titmouse
Purple Martin
Red-winged Blackbird
Rose-breasted Grosbeak
Say's Phoebe
Song Sparrow
Spotted Towhee
Tree Swallow
Tufted Titmouse
Violet-green Swallow
Western Bluebird
Western Scrub-Jay

Q: Is there a certain form I should use to collect nesting data?

A: YES! At our website you will find the **Multiple Nest Visits data sheet**. This form allows you to enter information about the location, nest substrate, habitat characteristics, and observations of nesting progress during each visit. The Multiple Nest Visits data sheet is intended for use in the field. It mirrors the web-based form, making it easy for you to transfer your data online. See pages 14–15 for complete instructions on filling out this form.

Q: How often should I visit a nest?

A: There is no set standard for how often to visit a nest; however, too many nest visits can lead to nest abandonment by the parents and too few visits can result in data that are difficult to analyze and interpret. As a general rule, we recommend 8–10 visits to a nest (during a typical songbird nesting cycle). If you check nests every 3–4 days, this will add up to roughly 8–10 visits. We strongly encourage a minimum of three visits (one visit in the beginning, middle, and end) so we can meaningfully interpret your observations. Please review the protocol on page 12 for more information.

Q: Can I monitor nest boxes?

A: YES! The effects of providing nest boxes for cavity-nesting birds are not well understood, and more data are needed to address this issue. Additionally, nest boxes are a great way for beginners to get started with nest monitoring.

Q: Should I report nest failures?

A: YES! In addition to knowing when nests succeed (at least one young fledges from the nest), we also need to know when they fail (no young fledge from the nest). If you can't report all your active nests, please report a random sample of your nests, where successful and failed nest attempts have the same potential to be reported.

J. Dobson

Carolina Chickadees in the nest.

Q: How do I enter my nesting observations online?

A: First, go to **www.NestWatch.org** and create your NestWatch account, then click on the "Your Data" tab along the top of the screen to enter the data management page. See page 24 for guidelines on submitting data or open the "Instructions" section online for help.

Q: How do I see my data?

A: Several online tools are available to make it easy to manage and organize your nesting records. In addition, data visualization features will allow users to view, download, and explore nest data submitted from anywhere in North America. Visit the "Explore Data" tab online to get started!

C. Griffis

A Pileated Woodpecker feeds its fledgling.

Q: What questions are researchers hoping to answer?

A: With the data gathered and reported by citizen scientists, researchers around the world will have access to an incredibly powerful data set that will grow each year, including nearly 400,000 nest records from most of North America's breeding birds. Below are some of the critical questions that citizen-science data can answer. More details about each of these scientific goals are available online.

- How do breeding parameters such as clutch size, nesting success, and daily nest survival vary across time and space?
- Does nest monitoring impact nesting success?
- Can conservationists use nesting data to detect changes in the environment?
- What factors limit breeding success in areas from rural to urban?
- Can people modify backyard habitat to affect breeding birds?

Q: What can participants hope to learn by participating in NestWatch?

A: NestWatch was developed in part to increase public understanding of science and to teach people about the breeding biology of birds. We hope participation will result in greater understanding of how science is conducted and contribute to knowledge about the breeding behaviors of birds. We further hope that participants will develop their nest-monitoring skills and learn how human impacts on the landscape can greatly affect nesting birds.

B. Zimmerman

A House Wren nest and eggs.

Q: Why is nest monitoring important?

A: As a NestWatch collaborator, your nest observations become part of a continentwide database that will allow us to better understand and manage the impacts of environmental change on bird populations. In addition:

- Studies of nesting birds can increase our understanding of population ecology, conservation biology, and behavioral ecology.
- Because nesting birds often compete intensely for a limited number of suitable breeding sites, many species are decreasing in number.
- The biological effects on bird populations of providing and monitoring nest boxes are not well known.
- Nest monitoring increases our connection to and appreciation for birds and the natural world.

For more information and resources, visit
www.NestWatch.org

Nest Monitor's Code of Conduct

Observations of nests should never jeopardize the well-being of birds. Please exercise extreme caution and responsibility when monitoring nests to ensure the safety of birds, nests, and nest contents. The NestWatch Code of Conduct will help you minimize the three potential risks that all nest monitors must be careful to avoid:

- Accidental harm to a nest
- Parental desertion of a nest
- Attracting predators to a nest

1. Learn about the nesting cycle of birds

Birds are diverse and fascinating creatures! Make the most of your NestWatch experience by understanding a bit about their nesting behaviors. Appendix D provides a brief and general overview about avian nesting cycles. More information about breeding birds can be found at our website.

2. Plan and prepare for nest visits

Make a plan to conduct observations of nests every 3-4 days following the NestWatch protocol. Most successful songbird nests last about 30 days, so you may need to visit each nest 8-10 times. The first time you encounter an active nest, accurately record its location in your field notes and draw a picture of its location to avoid long searches on subsequent visits. Prepare materials, such as data sheets, notebooks, GPS units, etc., before your nest visits to minimize time spent in the immediate vicinity of the nest. Nest visits should last no longer than one minute. Clipboards are an excellent way to keep your data sheets organized.

3. Choose appropriate times to visit nests

Generally, you should AVOID visiting nests under the following conditions:

- **Do not check in the early morning.** Most birds lay their eggs in the morning, so plan on visiting nests in the afternoon. Also, most adults will temporarily leave the nest when you are near, and eggs and young nestlings can become cold quickly if left alone in the morning.
- **Avoid nests during the first few days of incubation.** If necessary, observe nests from a distance and approach only when the female leaves the nest.
- **Do not approach nests when young are close to fledging.** When the young are disturbed during this stage, they may leave the nest prematurely. Young that fledge prematurely usually do not stay in the nest despite attempts to return

Quick Guide to Code of Conduct

- Learn about the nesting cycle of birds
- Plan and prepare for nest visits
- Choose appropriate times to visit nests
- Search carefully
- Approach nests with care
- Minimize disturbance at the nest
- Do not handle birds or eggs*
- Don't leave a dead-end trail
- Respect private land
- Understand the Migratory Bird Treaty Act

**It is illegal under the Migratory Bird Treaty Act to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued by federal and, in some cases, state agencies.*

Premature Fledging

Before they are fully feathered and ready to fledge, the young of many species instinctively scatter from the nest when a potential predator approaches. If this happens during a nest check, gather the birds quickly and replace them gently but firmly in the nest cup, the smallest on top, and covered with a hand or tissue. Withdraw the cover smoothly after giving time for the nestlings to settle. This is most successful if you can keep yourself out of sight. If they leave the nest again, it's best to let them be and allow the parents to round up the young themselves. The adult birds will continue to care for young that fledge prematurely.

them, and their survival rates away from or outside the nest are low. When young birds are fully feathered and very alert, only observe the nest from a distance.

- **Avoid nests during bad weather.** If it is cold, damp, or rainy, postpone checking nests until another day. Checking nests during this time can be very stressful for birds.
- **Do not check nests at or after dusk,** when females may be returning to the nest for the night. The exception to this would be owls, which typically leave the nest at dusk.

4. Search carefully

It is critically important that monitors avoid damaging nest sites. Nests that have yet to be discovered are particularly vulnerable. When searching for nests, move slowly through dense foliage, being careful not to dislodge any nests. The nests of ground-nesting birds, such as Killdeer, Ovenbirds, Bobolinks, and many waterbirds, are difficult to see, so tread lightly and be cautious around potential ground nest sites.

5. Approach nests with care

Avoid leaving tracks that can direct predators to nests. Nest predators are everywhere—on the ground, in vegetation, and in the air—and many are smart enough to watch you! Be careful that predators such as cats, crows, and jays are not following you. Minimize damaging or trampling vegetation that could expose nests.

6. Minimize disturbance at the nest

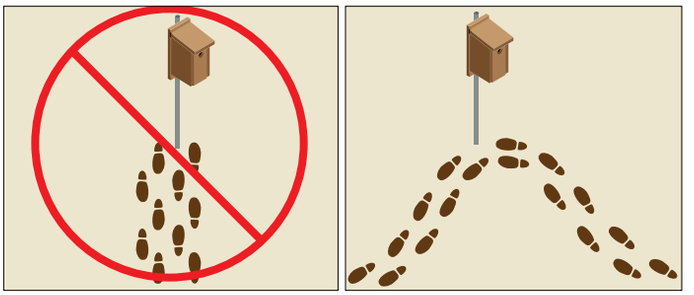
It is important not to startle a bird as you approach the nest; this may cause it to accidentally knock out eggs or young when it flies off. Before approaching the nest, try to see if a parent is sitting on it. Whenever possible, wait a few minutes to see if the bird leaves on its own. If it does, this is the ideal time to check the nest. If the bird is to be flushed, give it ample time to slip off quietly by rustling branches or making noise during your approach. Nest boxes should be tapped first, then tapped again when open to allow the parent to slip away before you stare directly into the box. If a sitting bird does not leave on its own, do not force it off the nest. In this case, you will need to come back later. Remember to keep each visit brief, and wait until you are well away from the nest before recording your field notes.

7. Do not handle birds or eggs

Do not handle young birds or eggs. Eggs can be easily cracked or small nestlings injured. Small nestlings are remarkably helpless and may not be able to crawl back into the nest cup if displaced, even inside of a nest box. Children monitoring nests should always be under the supervision of an adult. If you wish to band birds or handle nest contents, you need to possess the proper federal and/or state or provincial permits.

8. Don't leave a dead-end trail

Whenever possible, take a different route away from the nest site than the route you took to reach it. Walking to the nest and back along the same path leaves a dead-end trail that can lead predators directly to the nest.



To avoid leaving a dead-end trail that may lead predators directly to a nest, approach a nest by one path and leave it by another.

9. Respect private land

If you wish to search privately owned land for nests, first gain permission from the landowner. Remember that you are asking for a favor. Explain your purpose; many landowners will probably be interested in learning more about what you are doing and what birds are nesting on their property. Treat landowners and their property with the utmost respect, and follow any special requests that they make.

10. Understand the Migratory Bird Treaty Act

Under the Migratory Bird Treaty Act, it is illegal to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued by federal and, in some cases, state agencies. Additionally, many species are protected by other state and local laws. Therefore, in most instances, it is illegal for you to touch or otherwise physically disturb an active nest or its contents.

Nest-Monitoring Risks

Abandonment

If you find a nest with eggs and no parents, verify whether the nest is indeed abandoned. Prior to incubation, birds may leave their eggs unattended for most of the day. During incubation, adults may leave the nest for periods of up to 15 minutes to feed. Although many songbirds begin incubating on the day the last egg is laid or the day before, there are exceptions.

B. Zimmerman

A Tufted Titmouse nest and eggs.

For example, Tree Swallows may wait up to a week to start incubating a clutch of eggs. A nest such as this may only appear to be abandoned.

Remember that it is illegal to remove any materials from an active nest.

Threats of predation, harsh weather, or infestations of insects can cause the parents to leave. Frequent or aggressive disturbances from humans also can cause nest desertion, and care should be taken to eliminate this possibility. Certain species are more prone to deserting nests than others. Also, young breeders are typically more sensitive than experienced pairs, though individual birds vary greatly in the degree to which they will tolerate nest inspection.

Please remember:

- Do not assume a nest is abandoned just because you don't see or hear an adult bird in the vicinity, even for long periods of time.
- Do not try to hand-raise eggs or young that appear abandoned. Raising wild birds is very difficult and illegal without appropriate permits.
- Contact a local wildlife rehabilitator if you find injured birds.

One-Month Rule

The eggs of most birds will remain viable for up to two weeks after being laid even before they are incubated, so as a rule of thumb, you should wait at least one month after the expected hatch date before concluding that a nest is abandoned.

Predation

Nest predation by crows, jays, chipmunks, weasels, squirrels, skunks, raccoons, snakes, small rodents, cats, and birds of prey is a common cause of nest failure. Observers often fear that increased predation may result from the observer leaving a track or scent-trail to nests. However, a two-year investigation by the British Trust for Ornithology showed that nests visited frequently had similar success rates as nests left undisturbed between laying and fledging. Predation in the absence of human involvement has also been demonstrated by searches of completely undisturbed areas late in the season. Such findings are consistent with the normal high annual mortality of songbirds. However, you should still do your best to minimize unwanted attention to the nest.

If you are monitoring nest boxes in predator-prone areas, we recommend outfitting them with predator guards. Common predators of nest boxes include raccoons, snakes, cats, and squirrels. Please see page 19 for more information on dealing with predators.

P. Savoie

Hooded Merganser eggs in a nest box are vulnerable to any predator that can get through the entrance hole.

Tips for Finding and Monitoring Nests

Patience and good observation skills will go a long way toward finding nests. Once you find one, minimize disturbance to the nest site and surrounding area.

Before searching for nests

- Please read and understand the Code of Conduct for Nest Monitoring (page 6).
- Read the NestWatch Protocol for Monitoring Nests (page 12), which specifies when to collect information needed to determine daily nest survival.
- Get certified to monitor nests.
- Print out the Multiple Nest Visits data sheet from our website to determine what to record in the field.
- Recognize behavioral cues of breeding birds (see page 10).

Practice First

If you are going to monitor an open-cup nest, you should hone your ability to check nest contents with a "walking by" glance. To practice, first create a fake nest (e.g., a pile of grass, a cupcake holder, etc.) and fake eggs (e.g., marbles, rocks, clay balls). Ask a friend to put the nest with fake eggs in a nearby tree or bush, when you are not looking. Then walk the area slowly and, without stopping, try to find the nest and its contents. With practice, you can learn to see all the necessary details during a few seconds as you walk by. Keep your eyes open for details such as recently cracked eggs or the presence of nest parasites.

When to look for nests

Generally in North America, birds nest between March and August. In warmer climates, the nesting season may begin as early as February; in cooler climates, nesting may not begin until late May or June. Because most songbirds feed their young insects, nesting is closely tied to insect abundance. Resident birds, or those that do not migrate in the winter, usually begin nesting earlier than non-resident or migratory birds, which may have traveled great distances to reach their breeding grounds.

L. Goherty

An American Robin chick begs for food.

If possible, during fall and winter, look for old nests in trees that have yet to regain their leaves. Many birds will come back to the same nest site year after year.

Where to look

You can find nests in nearly all habitats across the continent. However, NestWatch has created a list of Focal Species that were chosen for their tendency to nest in areas where people also live. The Focal Species (see page 3) include common birds such as American Robin, Eastern Phoebe, Mourning Dove, Tree Swallow, and Eastern, Western, and Mountain bluebirds. For those species that don't nest in cavities or nest boxes, look for clumps of nest material in shrubs and trees, being careful to gently part vegetation and not to dislodge nesting material.

After you locate a nest

The first time you find a nest, note its location carefully so that you can easily find it again later. If you find a nest in a spot that may be difficult to relocate, look around and try to memorize some visual landmarks. We do NOT recommend placing any type of flagging within 20 meters of a nest. Instead, draw a picture in a field notebook, recording compass bearings and distances from landmarks. Record additional information about nest contents on the field data sheet. To keep each visit brief, prepare equipment beforehand (e.g. data sheets, notebook, camera, and GPS unit).

A sturdy stick is worth carrying, and is useful for:

- parting foliage to view a nest;
- leaning on to inspect a nest without disturbing the immediate surroundings;
- rustling foliage to warn a nesting bird of your approach, enabling it to leave the nest.

Use mirrors or binoculars to monitor nests from a distance

If the nest is too high, you might have to use a mirror to see into it. Attach a small mirror (e.g., a bicycle or mechanic's mirror) to the end of a pole and position the contents in the reflection.

If a nest is so out of reach that you can't monitor it safely, you can still collect valuable information by observing activity through binoculars. You may not be able to get an exact count of eggs or young, but you can determine if the nest is active and whether the parents have eggs or nestlings by observing their behavior.

Be efficient and thorough

Check the nest quickly. On average, nest visits should take less than one minute. Count the eggs/nestlings and then leave the immediate area to record your data. Remember, if you miss a day or can't get an exact count, it's okay. Safety of the birds should be your first priority!

Northern Cardinal eggs by T. Greenwood

Using a mirror to see a nest that is more than 5 feet off the ground.

Behavioral Cues for Finding Nests

If we listen and observe carefully, we can witness a variety of behavioral cues that birds use to communicate with one another during each phase of the breeding season.

Courtship phase

- Singing males are often trying to attract a mate or defend a breeding territory. This is usually a good indication of nearby nesting.
- Food offering, also known as allofeeding, occurs when a bird (usually the male) feeds or appears to feed another adult bird.
- If you see copulation, females are probably building a nest or laying eggs.

Singing

Food offering

Copulating

- Nudging and preening of one bird by another often accompany courtship and help maintain the pair bond.

Nudging and preening

Nest-building phase

- Not all birds build nests, but for those that do, the nest-building stage can be very obvious because adults make frequent flights to the nest site carrying nest material. Female songbirds typically build the nests, so follow females when possible.

Nest building

- If you observe a bird carrying nest material, try to follow it from a distance to avoid interrupting its flight. This is an ideal time to find a nest because the adult will be making frequent visits to the nest site.
- During nest building, males may follow their mate closely. Called "mate guarding," this tactic deters the female from mating with other males.

Mate guarding

Egg-laying phase

- This is the most difficult stage for finding nests because the female may visit the nest only once per day, usually in the early morning. However, if you see only the male and you have previously observed nest building, keep watching him. He will probably lead you to the female and, in some cases, will join her as she comes off the nest.

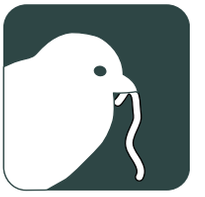
Incubation phase

Incubating

- Look for birds that suddenly vanish during quick bouts off the nest to forage, followed by long flights back to the nest.
- Listen for birds giving call or chip notes that may alert their mate that they are off the nest. If she chips frantically, you are probably close to the nest. Search quickly and thoroughly, but leave the area if the bird is visibly agitated.
- Look and listen for males that may be either guarding a nest while a female forages or feeding an incubating female.

Nestling phase

- This is the easiest time to find an active nest because both parents make frequent trips to the nest with food, and young birds can often be heard begging. If you spot an adult bird with food in its beak, it is probably on its way to a nest with young. Follow the bird at a safe distance of about 20–30 feet to locate the nest.
- In an effort to keep nests clean, parent birds are often seen removing fecal sacs from the nests. Fecal sacs are small white deposits of excrement produced by young birds.



Feeding

Young begging

Removing fecal sac

J. Pawesi

Bewick's Wrens hatching.

NestWatch Protocol for Monitoring Nests

There is always some risk of disturbing birds when monitoring their nests. By following the NestWatch protocol, which is based on the nationally recognized Breeding Biology Research and Monitoring Database (BBIRD) Field Protocol, and input from professional biologists, you will minimize this risk and ensure that your data achieves a high quality standard and will be comparable with data collected by other NestWatchers. The protocol described below is intended to gather the most meaningful data without causing unnecessary disturbance to the birds. Although it may be tempting to visit nests more often than suggested, please try to keep disturbances at the nesting area to a minimum.

1. Find a nest. Putting up a nest box is an easy way to start, but please consider monitoring open cup nests as well. You can find more information on how to locate nests on the NestWatch Focal Species pages (www.NestWatch.org/learn/focal-species).

2. Remember where the nest is located. It may be helpful to write a short description or draw a picture of the nest site in a field notebook. Do not use flagging unless absolutely necessary because this can attract predators. If you must use flagging to relocate a nest, use a small strip, place it at least 30 feet away, and take accurate notes on how to locate the nest from the flag.

3. Create a new NestWatch nest site by going to "Your Data" section of the NestWatch website and clicking the "Add New Nest Site" button. If the nest site has already been recorded during a previous nesting attempt, make sure that its description is up-to-date.

Sondra Fox

Eastern Screech-Owl chicks, still in their down, peek out of their nest box.

Get Certified to Monitor Nests

Please take our online certification quiz (www.NestWatch.org/nw/certification) to learn how to monitor nests safely. We recommend that you review the quiz every three years to stay up-to-date on the protocol.

4. Check the nest every three to four days. Record the number of eggs and young observed during each visit, as well as other relevant observations such as the behavior of adult birds. Longer intervals between checks make it harder to determine the outcome of the nest, while shorter intervals increase risk of disturbance. Whenever possible, wait for the female to leave the nest on her own rather than scaring her off. Use a mirror attached to the end of a pole to see into nests that are higher than your head.

5. Visit the nest one last time after you are certain that it is empty to determine if any unhatched eggs or dead young remain.

6. Record your observations at NestWatch.org either after each nest visit or after the nesting attempt is complete by going to "Your Data" and clicking on the "Add/Edit Attempt" icon for that nest. If you prefer to enter your data at the end of the nesting attempt, please carefully record your observations in a notebook after each visit. Each nesting attempt should be recorded separately, even if a bird has a second nest in the same location as a previous attempt.

7. Enter nest summary information at NestWatch.org by going to "Your Data", clicking on the "Add/Edit Attempt" icon for that nest, and going to the "Summary" tab.

Estimating first egg, hatch, and fledge dates

We define these dates as:

First Egg Date—Estimated date when first egg was laid for each nesting attempt.

Hatch Date—Estimated date that first egg hatched for each nesting attempt.

Fledge Date—Estimated date that the first nestling

left the nest, for each nesting attempt.

Since it can be difficult to record a complete nesting chronology, we ask participants to provide estimates on first egg, hatch, and fledge dates for their nests. For most songbirds, you can calculate a first egg date by backdating using the assumption that one egg is laid per day. For example, suppose you encountered 2 eggs in the nest on May 10 and you visit the same nest again on May 13 and discover 4 eggs. Counting backward one egg per day, we know the first egg was laid on May 9, the second egg was laid on May 10, the third on May 11, and the fourth and last egg on May 12.

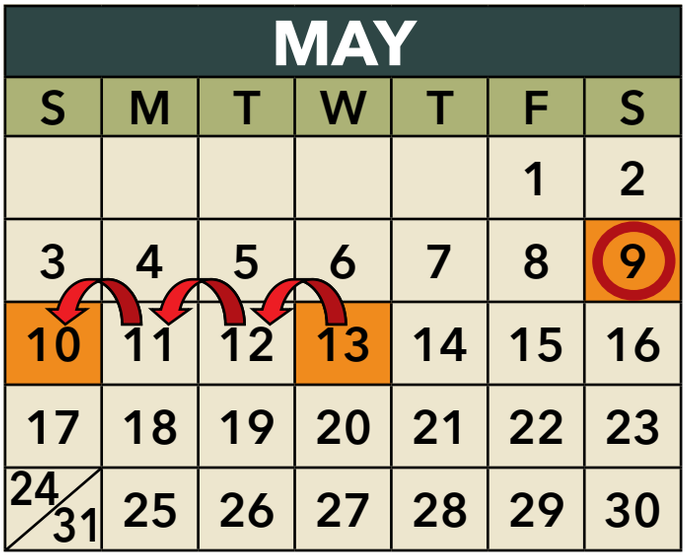
Once the clutch is complete, the female will start incubating after the ultimate (last) or penultimate (second to last) egg is laid. Most songbirds will typically incubate eggs for 11 to 14 days, but see our Focal Species pages for species-specific incubation periods (nestwatch.org/learn/focal-species). The eggs of most songbirds usually hatch within 24–48 hours of each other, and songbird nestlings typically spend approximately two to three weeks in the nest before fledging. Once you've entered a few nest visit observations and identified the species being monitored, we will provide these estimates for you in the "Overview" tab of the Nest Attempt. You can use these ranges of predicted dates to help you anticipate important events, or determine when a nest should have fledged or failed.

Data Quality and the NestWatch Protocol

We are often asked why we use such a rigorous protocol for collecting data when it would be easier to simply report the final numbers of eggs, nestlings, and fledglings for each nest. While it is possible to just report the final tallies of eggs, nestlings, and fledglings for each nesting attempt, this does not allow for the most insightful analyses of your data. When participants use the "Multiple Visits" method of data entry (i.e., reporting their nest checks every 3 to 4 days as outlined above), scientists can estimate a very important demographic rate called **daily nest survival**, which is defined as the likelihood that any nest in a population will survive from one day to the next.

Accurately estimating **nesting success** (the fraction of nests in a population of birds that fledge at least one young) is a critical goal of most nest monitoring programs. True nesting success of a bird population is almost never equal to the proportion of nests that fledge offspring within a sampling of nests monitored by an observer, particularly for species that do not nest in nest boxes. This is because nests that are destroyed by predators or weather early during the nesting cycle have a very low likelihood of ever being found, whereas nests that survive until fledging are much more likely to be noticed and monitored because they are around longer and because nests become more conspicuous as the parents begin feeding and defending their brood. For these reasons, nests that survive the longest are most likely to be found and nests that fail are often missed by nest monitors entirely. Since this **detection bias** means that you are likely to find more successful nests than unsuccessful ones, it is important to correct for the fact that your data will tend to overestimate actual nesting success.

To eliminate this bias, our nest monitoring protocol is designed to collect nesting data that can be used in statistical methods that utilize daily nest survival statistics, such as the **Mayfield Method** (Mayfield 1961, 1975) and the **Logistic-Exposure Method** (Shaffer 2004). In order for researchers to use these statistical methods to estimate nest survival, it is critical that you collect a chronological record of observations from each nest visit. This will also enable researchers to conduct more sophisticated analyses, such as examining how factors such as habitat, seasonal effects, or daily changes in climatic variables affect the probability of nesting success.



If you monitor nests during egg-laying, you can determine first egg dates for songbirds by counting backward one egg per day.

Collecting NestWatch Data in the Field

Collecting data using the nest check data sheet involves reporting exactly what you see each time you monitor a nest. If you check a nest five times in one season, then you report five visits for that nest. Your nest check data provide a chronological record of observations, making it possible to calculate estimates of daily nest survival. These estimates can help identify critical time periods of high or low nest survival.

We need to know the location of the nest, the species, and the contents of the nest when you visit. The more details you can provide, the better we can understand the threats facing breeding birds.

B. Parfitt

Checking nest boxes.

Contact us at nestwatch@cornell.edu if...

- you find a rare bird nesting.
- you find a nest and can't identify the species. Before contacting us, please use a field guide to nests and eggs to determine the host species. If you still can't identify the species, email the NestWatch staff with the following information: the precise location, habitat, description of the nest, and nest contents.
- you can photograph the nest without disturbing it. Please include a photo attachment. You may want to hold a quarter next to the nest for scale.

Data Collection Guidelines

- Record location, habitat, and nest observations on the nest check data sheet.
- If you need more space on the data sheet to record nest visits, begin another data sheet and include the nest site name.
- If the same species uses exactly the same location more than once in the same season, use a separate data sheet but specify that the location is identical to a previous attempt.
- Report all active nests (i.e., with at least one egg or those actively under construction) that you visit, even if they fail to fledge young. We need your help in learning about why nesting attempts fail as much as why they are successful.
- If eggs or young are present, but you can't get an exact count, record "U" to indicate at least one egg or young is present, but exact number is unknown.
- If you can't tell if there are eggs or young present, you should not submit any data for that visit.
- For meaningful reporting, a minimum of three visits is encouraged.
- Report each visit to the online database as the season progresses or at the end of the season, whichever you prefer.

The Cornell Lab of Ornithology
NestWatch

Nest check data sheet

Use this form to describe your nest site and to record data from each visit. Use a separate sheet for each nest monitored and each new nesting attempt. See back side for explanations of codes and fields. When finished, please enter completed sheets online at: www.NestWatch.org.

Year 2013 **Species** Tree Swallow

1. NEST SITE LOCATION

Nest Site Name
Box 1A

Nearest address
123 Hickory Street
Ithaca, NY 14850

- OR -

Latitude (decimal degrees; ex. 47.67932)
N

Longitude (decimal degrees; ex. -76.45448)
W -

2. SITE DESCRIPTION (see key on back)

Nest is located (circle one): (IN) ON UNDER
Nesting substrate Nest box
Cavity orientation (N,E,S,W) NE
Cavity opening width (in. or cm.) 1.5 in.
Habitat within 1 arm length Human modified
Human modified description Yard
Habitat within 1 football field length Human modified
Human modified description Residential area
Elevation (ft. or m.) 550 ft.
Height above ground (ft. or m.) 4.8 ft.

3. BREEDING DATA If eggs or young are present but not countable, enter "u" for unknown.

Visit #	DATE & TIME		HOST SPECIES			STATUS & ACTIVITY CODES				COWBIRD ACTIVITY			MORE INFO	
	Month / Day (1–12) /(1–31)	Time (am/pm)	Eggs	Live Young	Dead Young	Nest Status	Adult Status	Young Status	Mgmt. Activity	Eggs	Live Young	Dead Young	Obs. Initials	Notes Below
Ex.	5 / 6	2pm	1	0	0	cn	aa	no	no	0	0	0	BB	X
1	5 / 8	2 pm	2	0	0	CN	VA	—	No	0	0	0	MS	
2	5 / 12	3 pm	5	0	0	CN	AA	—	No	0	0	0	MS	
3	5 / 17	4 pm	5	0	0	CN	VA	—	No	0	0	0	MS	
4	5 / 22	1 pm	u	u	0	CN	RA	—	No	0	0	0	MS	x
5	5 / 26	4 pm	1	4	0	CN	VA	HY	No	0	0	0	MS	
6	6 / 1	5 pm	1	4	0	CN	VA	DY	No	0	0	0	MS	
7	6 / 8	4 pm	u	u	0	CN	FA	FY	No	0	0	0	MS	x
8	6 / 6	2 pm	1	0	0	CN	VA	YY	No	0	0	0	MS	
9	6 / 20	6 pm	1	0	0	CN	NO	NO	EM	0	0	0	MS	
10	/													

4. NESTING ATTEMPT SUMMARY *Fill in information for HOST SPECIES below after the nesting attempt is complete.

IMPORTANT DATES:

First Egg Date	5/7/13
Hatch Date	5/25/13
Fledge Date	unknown

HOST SPECIES TOTALS:

Visits to nest	Clutch Size	Unhatched Eggs	Live Young	Fledglings
9	5	1	4	4

NEST FATE: May 22- I could not see because the female remained on the nest during my nest check.
COMMENTS: JUNE 8 - Checked box from a distance, but could tell young still in the nest.

Explanation of Codes for Multiple Nest Visit Data Sheet

1. Nest Site Location

Each time you visit the nest, record the date and time and any pertinent information about the nest contents and progress of the nesting attempt.

Year—Indicate the four-digit year in which this nest attempt occurred. If the nest attempt spans December and January, indicate the year that the attempt began.

Species—Please take care to identify the host species correctly. Consult a field guide or contact the NestWatch staff if necessary.

Nest Site Name—Use a unique name or number for each nest site you monitor. This will help you manage your nest sites online.

Nest Location—Enter information about the nest location either by providing the closest street address, city, and state *or* by entering latitude and longitude (decimal degrees) which can be found via our new online Google maps tool.

ZIP Code—Provide a ZIP or postal code where the nest is located.

2. Nest Site Description

Please provide as much information about each nest's site description and habitat as possible. You only need to do this once for each nest, but you can edit this information online if the description changes.

Nest Substrate—This describes the position of the nest (in, on, or under) relative to the surface on which the nest is built. For example, it can be in a nest box, on a tree branch, under a bridge, etc. Note: this is a required field in the online database. See page 25 for images of nest substrate types.

Immediate Habitat Within One Meter—This refers to the immediate habitat within one meter of where the nest resides. Draw an imaginary circle (1 meter in diameter) around the nest and determine the habitat type. See page 25 for habitat descriptions and images.

Dominant Habitat Within 100 meters—This is the dominant landscape type within 100 meters of the nest, and the likely area where the bird is foraging. Scan the area surrounding the nest (an area about the size of a football field) and determine which habitat type is most dominant. See page 25 for habitat descriptions and images.

Habitat Modifier—If you selected "human modified" for the immediate or dominant habitat type, please describe the type of modification (e.g., yard, airport, campground, power line, etc.). See page 25 for habitat descriptions and images.

Elevation—This is the measure of altitude above sea level. Elevation should be rounded to nearest whole meter or foot.

Height Above Ground—Measure the height of the bottom of the nest from the ground. For nests on the ground, please record zero. For nest boxes, record the height to the bottom of the entrance hole. Your measurements can be rounded to the nearest 100th (2 decimal places). This facilitates recording inches e.g., 10 ft. 1 inch = 10.08 ft. In this case, 1/12th of a foot can be calculated as follows: 1 divided by 12 = 0.08.

Cavity Orientation—For a natural cavity or nest box, record the direction (N, S, E, W, NE, NW, SE, SW) that a nest hole entrance faces, if known.

Cavity Width—For a natural cavity or nest box, record the diameter of the entrance to the nest. Your measurements can be rounded to the nearest 1,000th (3 decimal places). This facilitates recording 1/8ths of inches, e.g., 2 1/8 in = 2.125 in. In this case, 1/8th of an inch can be calculated as follows: 1 divided by 8 = 0.125.

You can print out the data sheet from www.NestWatch.org. Use a separate data sheet for each nest attempt.

Exact Counts of Eggs or Young

If you are certain that eggs or young are present, but you can't get an exact count, record "U" to indicate that at least one egg or young is present, but that the exact number is unknown. If nest contents are not visible, you should not submit that visit.

3. Breeding Data

The letters below correspond to the column codes on the Multiple Nest Visits data sheet.

A. Date—Enter the month and day each time the nest was monitored.

B. Time—Record the approximate time that a nest was monitored; round the time to the nearest hour.

Host Species

Provide information about the number of eggs and young for the species that built the nest.

C. # of Eggs—The highest number of host eggs counted (not parasitic eggs) for each nest visit.

D. # of Live Young—The highest number of host live young counted for each nest visit.

E. # of Dead Young—The highest number of dead young (not including young of cowbirds) for each nest visit.

Report All Nests

Be sure to report all active nests you visit, even if they fail to fledge young. We need your help in learning about why nesting attempts fail as much as why they are successful.

Steven J. Marsh

A Bald Eagle on its nest.

Status/Activity Codes

Describe the status of the nests, adult activity, and stage of development of the young birds. Additional information can be included in the comments section.

F. Nest Status—Choose a code (see page 28) to describe the condition of the nest every time you visit.

G. Adult Status—Choose a code (see page 28) to describe the activity of adults seen or heard near the nest.

H. Young Status—Choose a code (see page 29) to describe the developmental stage of the young birds each time you visit the nest.

I. Management Activity—Choose a code (see page 29) to describe any action taken at the nest (such as banding young or cleaning a nest box) during the visit.

Details, Optional

Additional information regarding cowbird parasitism and observers can be included here.

J. Cowbird Evidence—Cowbirds lay their eggs in the nests of other birds (see next page). Please provide information about the number of cowbird eggs and number of live and dead cowbird young (if any).

© Matthew Sim

A Tree Swallow in its nest.

K. Observer Initials—Optional, but helpful if you are tracking who did the monitoring.

L. Comments—Provide additional information about a nest visit or the outcome of a nest attempt.

The Last Nest Visit

It is critically important that you try to monitor each nest attempt through to the end. Even if you can't monitor as often as the protocol suggests, you should try to visit at the end of each nesting attempt so that we may know the outcome for each nest.

Brood Parasites: Brown-Headed Cowbirds

M. Whitman

Brown-headed Cowbird egg in a Veery nest.

Brown-headed Cowbirds are brood parasites, that is, they do not build nests, incubate eggs, and care for young. Instead, the female deposits as many as 40 eggs per year in nests that belong to other bird species. More than 100 other species have provided host nests for cowbird eggs. The female cowbird finds these nests by watching patiently from an observation post. She typically chooses a nest with eggs smaller than her own and lays a single egg quickly at dawn once the host has also started laying eggs. Brown-headed Cowbird young do not evict their nest-mates, although the female cowbird may remove and sometimes eat eggs from the host nest. However, cowbird nestlings typically out-compete their smaller nest-mates for food.

Judy Howle

A female Brown-headed Cowbird.

4. Summarizing a Nest Attempt

In addition to reporting Multiple Nest Visits, participants should summarize each nest attempt. A Nest Summary provides a snapshot of the timing of key events (e.g., first egg dates, hatch date, fledge date) and numbers of eggs, young, and fledglings for each nest attempt.

Nest Summaries

Nest Summaries are required to complete a nesting attempt. You cannot add a new nesting attempt at a given location until the attempt in progress is summarized. However, you can submit just the summary without the individual nest visit data.

Totals

Total Visits to this Nest Attempt—Record the total number of times you actively checked this nest. Estimates are okay.

Clutch Size—Record the maximum number of host eggs counted in the nest.

Number of Unhatched Eggs—Record the maximum number of eggs that failed to hatch for this nest attempt.

Total Number of Young—Record the number of live young of host species in the nest.

Number of Fledged Young—Record total number of young that fledged (left the nest) for this nest attempt.

Important Dates

Egg Laying Start Date—Estimate the month and day that the female laid the first egg.

Hatch Date—Estimate the month and day that the first egg hatched.

Fledging Start Date—Estimate the month and day that the first young fledged from this nest.

Tom Muir

Male Cooper's Hawk prepares to incubate five eggs while the female takes a break away from the nest.

Dealing with Predators

Although nest boxes provide nesting opportunities for many native birds, they also can make easy targets for predators. Common predators of nests in nest boxes include raccoons, cats, snakes, and squirrels. Here are some tips to help you thwart these common nest box predators.

The most passive way to prevent predation is to avoid placing nest boxes in areas where predators are prevalent. But, because some predators are prevalent everywhere, you should always protect your nest boxes with predator guards.

Raccoons and Domestic Cats

Raccoons and cats are abundant in both rural and suburban areas. Raccoons are especially difficult to deter because they are very intelligent. Once they learn that nest boxes are good sources of food, these nocturnal creatures have been known to destroy nests in entire groups of boxes. Similarly, cats can quickly learn that nest boxes can be the source of an easy meal. When raiding nest boxes, both raccoons and cats will leap to the top of a box, sit on the roof, and "dip" into the entrance hole with their front paws to grab the eggs or young birds inside.

Ways to prevent raccoons and cats from raiding your boxes:

- Installing a roof that extends 5 inches beyond the front of the box will prevent these animals from easily reaching into the entrance hole from above.
- Mount your box high enough and away from trees so cats cannot spring to the top of the box in a single leap.
- Attach predator guards to your boxes to prevent these animals from climbing up from below. Three commonly used guards are shown.
- Keep domestic cats indoors.

Ms. Pixie via Flickr

A King Snake gains access to a nest box.

Snakes

Snakes are a common predator of eggs and nestlings, especially in southern states. A conical metal collar mounted below the box will prevent most snakes from climbing up from below, but very large snakes can occasionally circumvent these barriers. In this case, it is helpful to have a Noel predator guard installed as a backup. Also, nest boxes should be placed away from trees to prevent snakes from accessing them from overhead branches.

Squirrels

In some regions, squirrels do great damage to nest boxes. By chewing at entrance holes to enlarge them, they make it easier for themselves and other predators to enter. If squirrels are common in your area, simply cut a hole the same size as the nest box entrance hole in a rectangular piece of sheet metal and attach it to the front of the nest box so that both holes line up.

Predator Guard Examples

Stovepipe baffle

This device is made from a piece of stovepipe or PVC pipe that encircles the nest-box pole. It is held in place by hardware cloth and straps.

Bill Griffith

Stovepipe Baffle

Noel predator guard

The Noel guard is a rectangular tube of hardware cloth stapled to the front of the nest box. This will make it difficult for predators to reach into the box entrance hole; however, the nest-box occupants can easily come and go.

"Ash" via Flickr

Noel Guard

Conical metal predator guard or collar

This guard works well for boxes that are attached to free-standing poles. The collar is a made from a circular piece of galvanized sheet metal that is placed around the pole underneath the nest box.

Beverly Vealatch

Predator guard on an Osprey nesting platform.

Managing Nest Box Competitors

Sometimes nest boxes are used by species for which they were not intended. Wasps, mice, squirrels, and other wildlife can compete with native cavity-nesting birds for nest sites. Here are some tips for discouraging nest box usurpers.

House Wrens

House Wrens are sometimes considered problematic. These sprightly birds are very territorial and may use similar tactics as House Sparrows to evict nesting pairs from their nests. Unlike the House Sparrow and European Starling, House Wrens are protected by the Migratory Bird Treaty Act. You may not legally remove nesting material, eggs, nestlings, or adult House Wrens from a nest box. If House Wrens are not wanted, wait until after the breeding season is over to move your nest boxes away from shrubby areas, which are prime House Wren habitat. Another solution is to place a box or two in good wren habitat. This will give them a place to nest and decreases the chance that they will usurp boxes meant for other species.

Darin Ziegler

House Wren building a nest.

Bees

Bees are important pollinators of the wild foods that birds need to survive. However, they do sometimes take over nest boxes. To minimize the likelihood of bees colonizing your boxes, keep them plugged until just before the breeding season of the target species. If bees have already moved into your box, it is best to contact a professional pest management company or beekeeper to remove the insects because bees will vigorously defend their colonies. Africanized bees, which are becoming much more common in the United States, look very similar to native bees but are much more aggressive. You should not attempt to remove a bee colony without professional help. Once they have been safely removed, clean out any combs or wax in the box with soapy water.

Texas Bluebird Society

Nest box colonized by bees.

Paper wasps

Paper wasps sometimes construct hanging colonies from the interior roof of nest boxes in the early spring. The European paper wasp, introduced to North America in 1980, is quickly increasing its range in the eastern United States. The European paper wasp is black and yellow, similar to the yellow jacket, and is slightly smaller than our native brown and tan common paper wasp. The European wasp prefers to nest in cavities, and it becomes aggressive with much less provocation than the native paper wasp. Unlike the common paper wasp, the European paper wasp often uses the same nest year after year, resulting in early nesting and larger nests.

Seldom do wasps usurp boxes from nesting birds. They are mostly found in empty boxes. If these insects are found in a box, it is best to leave them alone

Jim Webber

Native paper wasp

and not take any active measures to exterminate them. Instead, wait to evict them until the fall when the weather is cooler and their activity has halted. You can prevent wasps and bees from establishing themselves by applying a thin layer of bar soap on the inside surface of the roof. This will create a slippery surface between the insects and the roof of the box. To prevent them from establishing colonies, keep nest boxes plugged until just before the breeding season of the target species begins. Do not spray any pesticides into the nest box under any circumstances. The residue may remain even after cleaning and harm future nestlings.

Lynette Schimming

European paper wasp

Mice

Mice usually don't become problematic in nest boxes until they begin to build their nests for the winter. Because this happens after birds have finished breeding, most nest box monitors do not evict mice, and instead allow them to nest in their boxes throughout the winter. These boxes need to be cleaned out in early spring, however, or birds will not use them. Wear gloves and a dust mask when cleaning out old mouse nests.

Jonathan Morgan

A mouse's nest.

Squirrels

Squirrels occasionally compete with birds for nest boxes, and the timing of their litters does overlap with the breeding season of nesting birds. If a squirrel nest with young is found while checking nest boxes, it is best to wait until the nesting attempt is finished to clean out the box. State laws protecting native mammals vary and typically do not allow for the removal of active nests without a permit, unless they are inside buildings. Some squirrel species will produce two litters per year (spring and fall) and may use the same box for both attempts. It takes about 60 days for a litter to become independent and stop visiting the nest. If squirrels become more than just an occasional guest, prevent them from reaching the box by installing proper predator guards and by locating the nest box away from any tall trees.

Jonathan Morgan

Flying squirrel in a nest box.

Managing House Sparrows and European Starlings

Please note that the methods described below are only for controlling House Sparrows (Passer domesticus) *and European Starlings* (Sturnus vulgaris)*, which are not protected by the Migratory Bird Treaty Act, and that it is illegal to harm or harass any native species, including their nests and eggs.*

Invasive exotic species are those introduced species which benefit from their new environment and increase their population range significantly over time. Invasive species are currently recognized as one of the main threats to global biodiversity. House Sparrows and European Starlings were both introduced to North America in the 19th century. They are now permanent residents found across the United States and Canada, almost always near areas of human habitation and disturbance (e.g., cities and suburbs) or areas with a reliable food source, such as barns or granaries. Both species nest in structures ranging from gutters and downspouts to thick shrubs and bushes, but readily use nest boxes when available. They out-compete native cavity-nesting birds, and are known to destroy nests and eggs, and kill nestlings and adults while taking over an occupied nest site.

Deterring House Sparrows and European Starlings

As a nest box monitor, your goal is to provide a safe environment for local cavity-nesting species to breed. For the reasons outlined above, we strongly encourage you not to allow House Sparrows or European Starlings to breed in your nest boxes. We recommend that you take measures to prevent them from breeding in your boxes. Unfortunately, a completely sparrow-proof nest box does not exist. There are several styles that seem to deter the sparrows for a while, but ultimately if these birds are desperate, they will eventually use the box.

Because European Starlings are a larger bird, they are less of a problem when it comes to competition with bluebirds and other smaller cavity-nesting species. Simply restricting the size of the entrance hole of a nest box should be enough to give the smaller birds access while keep starlings out. If your target species are larger cavity-nesting birds, like American Kestrels, you may have to actively deter starlings from your area.

The Nature Nook

European Starling (sexes alike)

Passive Control Methods

Placement

The most successful method for preventing exotic species from breeding in your nest boxes is simply to move your boxes. Only place your boxes in areas that do not have these birds. House Sparrows and starlings prefer to be near human habitations, and starlings also frequently inhabit agricultural areas with abundant grain. Therefore, placing your nest boxes in natural areas away from densely-populated locations will prevent many non-target birds from ever finding them.

Avoid Feeding

Another simple way to reduce the number of House Sparrows and European Starlings around your property is to avoid feeding them. House Sparrows prefer smaller seeds like millet, cracked corn, and milo, which are plentiful in inexpensive bird seed mixes. European Starlings, on the other hand, like premium black-oil sunflower seeds. If you do feed wild birds, offer foods that these species do not appreciate, such as safflower for Northern Cardinals, nyjer or "thistle" seeds for finches, and nectar for hummingbirds. Avoid putting out mealworms and suet, and scattering seed on the ground. Feeders with short perches and small ports are also less attractive to these two species.

Timing

Because House Sparrows and European Starlings do not migrate, they have a competitive advantage when it comes to having first pick of suitable nest boxes. By waiting to open your nest boxes until migratory birds return, you can ensure that they have a better chance of finding an unoccupied site. Simply plug the entrance hole of your boxes until nesting season begins. Note that this means that your resident chickadees, titmice, and nuthatches may also have to wait for the migrants to return.

Exclusion

Starlings cannot squeeze through a hole smaller than 1 1/2 inches, so an entrance hole of this size or smaller will exclude starlings from boxes intended for smaller birds. House Sparrows can fit through entrance holes as small as 1 1/8 inches, therefore, most cavity-nesting songbirds using nest boxes are vulnerable to House Sparrow competition. There is currently no scientifically documented way to exclude House Sparrows that works permanently. Your best bet may be to use a more active method of managing House Sparrows.

Robert Scott Photography

Female (left) and male (right) House Sparrows

Active Control Methods

Because House Sparrows and European Starlings are exotic species, they are not protected by the Migratory Bird Treaty Act. Therefore nest box monitors are legally allowed to remove or harass them. Below we list some humane, legal actions for controlling or deterring these two species.

Nest Removal

Once House Sparrows have started nesting, remove their nesting materials every few days to discourage them. You may have to continue doing this for at least a week before the birds will tire of continually building a nest that is never completed and move elsewhere. While it is true that the birds will eventually seek a new nesting site, a second problem arises if they find a new site in another nest box that contains an active bluebird or swallow nest. House Sparrows can usurp the nest, often killing the inhabitants of the nest box. Therefore, this method works best with a single backyard nest box.

Incubation Fake-Out

Another method involves tricking the birds into incubating eggs that will never hatch. The logic behind this method is that the adults will remain occupied with their nest and leave the native birds in your area alone. Addling (vigorously shaking the eggs), freezing, poking a pin-hole, or boiling the eggs renders them nonviable, and the female will continue to incubate for longer than the usual incubation period. The drawback to this method is the same as if nesting material was removed: the birds will eventually lay another clutch, often in a new nesting site that may contain an active nest. Many experienced nest monitors concede that nest removal and prolonged incubation are temporary stop-gaps and not long-term solutions; they work best once nesting is already initiated by the unwanted species and the monitor is unable to effectively trap the exotics.

Trapping

Where populations of exotic species are high, trapping may be the only effective means of managing invasive species. Once you have a bird trapped, it is best to humanely euthanize it as soon as possible to avoid unnecessary stress to the bird. Sparrow traps must be checked hourly to ensure that no native birds become trapped, and trap operators should have the necessary identification skills to ensure that only House Sparrows are detained. There are several humane methods for trapping exotic birds, such as:

- In-box Trap
- Funnel Trap
- Trio Trap
- Repeating (Elevator) Trap

While no wildlife manager takes pleasure in euthanizing a pest species, it is upsetting and discouraging to find the injured or dead victims of preventable attacks in your nest box. Many raptor rehabilitation facilities will accept sparrows that have been euthanized humanely and without the use of chemicals. The North American Bluebird Society (http://www.nabluebirdsociety.org) provides additional details on House Sparrow control and may have state or provincial affiliate members who can advise you on effective deterrents for your region, state regulations on wildlife relocation, and local organizations that accept harvested sparrows and/or starlings.

D. Kay Strickland

A House Sparrow prepares to claim a nest box.

Submitting Data Online at www.NestWatch.org

- If you have previously created a username for The Birdhouse Network, NestWatch, eBird, or for any other online project with the Cornell Lab of Ornithology, please enter your existing username and password. You can request a username/password reminder email by clicking on "Forgot your username or password?" on our website at www.NestWatch.org. If you haven't participated in an online Lab project before, you should create a new account.
- After logging in to your NestWatch account, click the "Your Data" tab. Complete instructions are provided online for entering your data.
- You can edit or delete information for up to one year after it is entered. Once the data are in our system for more than one year, you will need to contact us to change any historic data.
- You can begin entering data online any time after you begin monitoring. There is no need to wait until the end of the nesting season.
- Be sure to check the online "Learn" section called "How to NestWatch" for Frequently Asked Questions about data entry.

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Appendices

APPENDIX A: Nest Substrate Types

Images below represent the types of surfaces that nests may be **in**, **on**, or **under.**


Snag or dead tree cavity


Live tree cavity

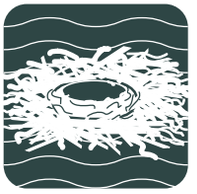

Nest box or birdhouse


Building or dwelling


Cliff or rock


Post, pole, or platform


Ground


Floating vegetation


Live tree branch


Dead tree branch


Bush, shrub, or cattails


Vine/tangle

APPENDIX B: Habitat Description Codes

When describing your nest site, enter descriptions for immediate habitat type within 1 meter of the nest and for the dominant habitat type within 100 meters of the nest. If habitat type is human modified, describe the type of modification from the list below.

Human Modified Habitats Include:

Yards and residential areas
Public park/green space
Roadside
Golf course
Landfill/gravel pit/strip mine
Cemetery
Industrial/commercial center area
Utility corridor
School/campus/church/hospital
Airport
Campground
Christmas-tree farm
Orchard/vineyard
Recently clear-cut area
Recently burned area


S. Wright

Yards and residential areas


Michael Bradford

Golf course

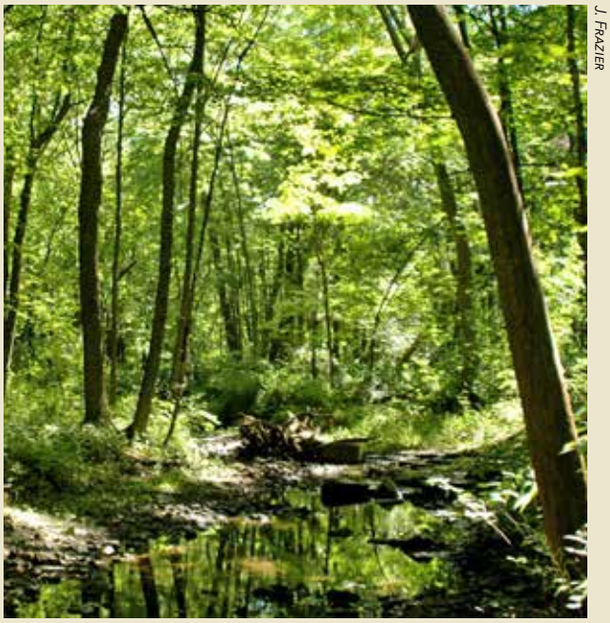
Agricultural Area

Includes cropland, pasture, and tree plantations–vegetative cover dedicated to the systematic production of food, feed, fiber, livestock, and other goods.

V. Pillar

Woodland Forest

Dominated by deciduous and/or coniferous trees, generally with a distinct canopy, though it can have some open areas.



J. Frazier

Natural Grassland/Prairie

Grassland and savanna including all native prairies, aspen parklands, and other natural grasslands. Precipitation is highly variable but usually very seasonal. Areas are dominated by grasses and forbs (herbs), but may include scattered shrubs or trees.

T. Lindenbaum

Chaparral/Shrubland

Chaparral and shrubland are characterized by long, hot, dry summers and cool, wet winters. Although the habitat is globally rare, it features an extraordinary biodiversity of animal and plant species uniquely adapted to the stressful conditions of long, hot summers with little rain. Most plants are dependent on fire disturbance for their survival.

D. Baron

Desert Scrub

Deserts and xeric (dry) shrubland vary greatly in the amount of annual rainfall they receive (usually less than 250 cm or 10 inches) and in temperature (some become quite cold in winter), but evaporation typically exceeds rainfall in these regions. A rich array of woody-stemmed shrub and plant communities can occur under these extreme conditions, many of which are transitory, reflecting the seasonality of available water.

L. Dugger

Tundra

Alpine tundra can occur at high altitude (above subalpine forest treeline) at any latitude. Alpine tundra lacks trees, but does not usually have permafrost, and alpine soils are generally better drained than arctic permafrost soils.

Arctic tundra occurs in the far Northern Hemisphere and usually refers only to the areas where the subsoil is permanently frozen for much of the year, making it impossible for trees to grow. Bare and sometimes rocky land can only support low-growing plants such as mosses, heaths, and lichen. Rising summer temperatures melt the top permafrost layer, but because the ground below remains frozen, seasonal lakes, bogs, and marshes form. Precipitation (falling mostly as snow) is desert-like, with only about 15–25 cm (6–10 inches) annually.

W. Selman

Freshwater

Freshwater habitats include lakes, rivers, creeks, streams and some marshes, swamps, and ponds.

P. Boury

Saltwater

Saltwater habitats have significant amounts of dissolved salts including oceans, tidal flats, and some bays, marshes, swamps, and ponds.

S. Mollerus

Beach

Sand, gravel, pebbles, and shells along the shoreline of a body of water.

E. Masoner

APPENDIX C: Status/Activity Codes

Nest Status Codes

The codes below correspond to nest status codes on the Multiple Nest Visits data sheet.

NO = No nest. Cavity, nest box, or platform with no nest present or for species that do not build any nest.

AN = New avian nest found. If you see a new bird nest built on top of an old one from the current season, treat this as a new nest attempt and begin a new form. Describe additional details in the comments section.

CN = Completed nest. Nest appears structurally complete, with an obvious nest cup.

T. Phillips (4)

Complete nest

DN = Damaged nest. Nest appears disheveled and/or torn apart.

Damaged nest

FN = Flattened nest with fecal matter. This is evidence that nestlings were present—their weight flattened the nest and they left fecal droppings behind.

Flattened nest

IN = Incomplete nest. Evidence of nesting material; nest building appears to be in process, but not quite finished.

Incomplete nest

NN = Non-avian nest. Evidence of a nest that was not built by a bird (e.g., wasp, mouse, or squirrel) in nest boxes or cavities. Describe details in the comments section.

RN = Nest removed, remover unknown. An active nest disappears for an unknown reason. Do not use this code if you know the reason for the removal of the nest (i.e., monitor, predator, blown out of tree, etc.).

Adult Activity Codes

The codes below correspond to adult activity status on the Multiple Nest Visits data sheet.

NO = No adults seen or heard. During your nest check, you did not see or hear any adults near the nest.

AA = At/on, then flushed from nest. During a nest check, an adult flies out from the vicinity of the nest or nest box.

BA = Building nest or carrying nest material. An adult carries nest material to the nest site or sits on the nest while building it.

DA = Dead adult(s). Dead adult bird found at or near the nest site.

FA = Feeding young at nest. A parent carries food to the nest or drops food into the open mouths of nestlings.

RA = Remained on the nest. During a nest check, the adult remained on the nest or in the nest box.

VA = Remained in vicinity. During a nest check, parents are seen or heard in the vicinity of the nest or nest box.

Young Status Codes

The codes below correspond to young status codes on the Multiple Nest Visits data sheet.

NO = No young present.

FY = Fully feathered young. The tail feathers are short and most body feathers are visible, little or no skin visible. Nestlings are well feathered and look ready to leave the nest (whether or not they can fly).

Eastern Bluebird by Dick Peterson

Fully feathered young

HY = Hatching young. A chick is emerging or has just emerged from an egg.

Eastern Bluebird by M. Thompson

Hatching young

NY = Naked young. Altricial nestlings with little or no down or feathers.

Chestnut-backed Chickadee by Richard Pitschka

Naked young

PY = Partially feathered. Outermost flight feathers on the wing are emerging, encased within a pointed sheath, OR feathers have broken through the sheath and have a stubby brush-like appearance, OR the flight feathers appear fully grown but tail feathers and body feathers are not yet complete. Some skin is visible.

Eastern Bluebird by Dick Peterson

Partially feathered

VY = Vocal young, heard only. Young in the nest were heard but not seen.

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Management Codes

The codes below correspond to management status codes on the Multiple Nest Visits data sheet.

NO = No management activity. No human management activities were conducted for this visit.

AM = Avian competitor nest/eggs/young removed. Indicates that you are discouraging the nesting attempts of House Sparrows or European Starlings, two nonnative species that are not federally protected under the Migratory Bird Treaty Act.

BM = Banded adults or young at nest. Indicates that you banded adults or young at this nest. Note: banding birds requires a special permit.

EM = Unhatched host eggs removed. Indicates that you removed host eggs that never hatched.

NM = Nest box management. Activities include cleaning out nest boxes, plugging or unplugging nest boxes, or removing inactive nest of the host species from a next box.

PM = Pest management (e.g., wasps, ants, mice, etc.). Non-avian competitors such as wasp nests or other pests were removed. Please remember to use nontoxic pest control methods.

Altricial vs. Precocial Young

Most songbirds are altricial, i.e., nestlings are generally helpless, immobile, naked, and blind with eyes closed after hatching. The young of precocial species such as geese, are covered in down, can move around, and have their eyes open after hatching.

Altricial young at hatching

Precocial young at hatching

APPENDIX D: Overview of the Nesting Cycle

More than 700 bird species breed in North America, and the variations in their behaviors are fascinating and complex. Different species find mates, build nests, lay eggs, and raise their young in incredibly different ways. This overview is a generalization of avian nesting cycles. For more information about nesting cycles of individual birds, please visit our online resource center at www.nestinginfo.org.

Finding a place to breed

Tony de Goutiere

A male Song Sparrow sings to establish his territory.

Throughout the year, day length is the cue that tells most birds what season it is, triggering physiological changes such as the readiness to migrate or to breed. Most birds, especially those in temperate regions, must time their breeding activities so they will be feeding their nestlings when food is most abundant.

Well before nestlings arrive, however, birds need to select a breeding territory. Resident species may keep a territory throughout the winter or look for a new one in spring. Migratory birds begin looking for and defending a territory or nest site as soon as they arrive in spring. Good territories provide nest sites, reliable food sources, and protection from predators.

Choosing a mate

While territories are being claimed, males and females also try to attract mates. Males often try to advertise their ability and their vigor by exhibiting bright breeding plumage and by singing, drumming, or calling.

Most bird species form a pair bond with the male and female staying together throughout the breeding season. It was once thought that nearly 90 percent of all birds were monogamous, but new evidence using DNA profiling has revealed that strict monogamy is not so common. Many birds may have a single social mate who helps raise the young, but they may actually have mated with additional partners. DNA analysis shows that even birds that presumably "mate for life," such as bluebirds and Bald Eagles, may not always be faithful. The nestlings in one nest actually may have been fathered by different males!

Ted Schroeder

A male Greater Sage Grouse during a courtship display.

Some birds are polygamous, forming social bonds with more than one bird of the opposite sex. Sometimes males have more than one mate at the same time (polygyny). Less commonly, females may have social bonds with more than one male (polyandry).

In most bird species, the female chooses her mate. This is one reason why males are often the "showier" or more colorful sex. Besides physical appearance, females also may assess factors such as nest site quality, vocal behavior, age, courtship displays, and the male's ability to provide food resources.

Nest building

Nests provide a safe place for the eggs and young. Bird nests are extremely diverse, although each species typically has a characteristic nest style. Some birds do not make a nest and simply lay eggs in a scrape in the ground or other substrate. Other birds may make nests from natural

Rene Wilbur

An Eastern Bluebird brings nest materials to its chosen nest box.

materials such as grasses, leaves, mud, lichen, fur, and dung, or man-made materials such as paper, plastic, trash, yarn, and even barbed wire! Nests can be found almost anywhere—on the ground, in trees, in burrows, on the sides of cliffs, in or on man-made structures, etc. Females typically build the nest, but sometimes both parents or just the male will build it.

Copulation and egg formation


Rose Albano Risso

American Kestrels mating.

During the breeding season, hormonal changes cause the internal testes of males to swell to more than 1,000 times their normal size, and the ovaries and oviduct of females to increase in size in preparation for egg fertilization and egg development. During copulation, the male's cloaca contacts and ejects sperm into the cloaca of the female. The sperm travel to the oviduct where they can be stored for long periods in sperm storage tubules. If all goes well, the sperm penetrate through the wall of the ovum (egg) and fertilization takes place. During the first stage of embryonic development, known as the blastocyst stage, the egg shell develops. Ovulation and laying take about 24 hours, so females produce at most a single egg per day.


A. Knudson

Tree Swallow eggs and nest.

Egg laying

The number of eggs a female lays in one nesting attempt (also known as clutch size) varies widely depending on the species. For example, many tropical birds have clutches of only two or three eggs. Waterfowl such as Wood Ducks can lay up to 15 eggs in one nesting attempt. Clutch size can also vary widely within a species depending on food and calcium availability, latitude, age of female, seasonal timing, weather, and time of year. The size, shape, color, and texture of bird eggs are also extremely variable.

Incubation


Jan Martin

A female hummingbird incubates her eggs.

Birds incubate their eggs to keep them at the proper temperature to ensure normal development. Female songbirds usually begin incubation after they have finished laying all the eggs so that they will hatch at approximately the same time. Other birds, such as herons, cranes, cormorants, and raptors (eagles, hawks, and owls) begin incubating as soon as the first egg is laid, and the eggs may hatch on different days. In some species, both the male and female incubate eggs. Incubation time varies depending on the species, but typically, the larger the bird, the longer the incubation period.

Hatching


Lindell Dillon

Bluebird chick and eggs.

Songbirds and most seabirds have altricial young—the newly hatched birds are blind, naked, and helpless. They remain in the nest where the parent can feed them and brood them, sitting on them to keep them warm. Immediately after hatching, altricial birds can do little more than open their mouths to beg for food. Their mouths are often very bright and patterned. For a long time, scientists thought this helped guide parents to place food; it may also provide information on chick identity, health, and quality.

Unlike altricial birds, precocial birds such as ducks and many shorebirds hatch fully feathered, mobile, and with eyes open. Incubation periods are longer for precocial birds than altricial birds, allowing for increased embryonic development in the egg, and therefore they have enhanced motor and sensory functions at hatching.

Feeding the young

For the first week of life, most altricial birds cannot control their own body temperature—similar to reptiles and other cold-blooded animals—and must be constantly brooded (kept warm) by the parents. Usually, by the end of the first week, their eyes are open and their feathers are beginning to emerge. During these first 10 days, nestlings experience remarkable growth—some are able to double their body weight several times!

To keep up with demand, parents must supply food for themselves and their young. This is an extremely dangerous time for the parents who are constantly foraging for food, and for the young, whose noisy cries for food may attract predators. After two to three weeks, most songbirds are usually ready to leave the nest. Other birds, such as birds of prey, may stay in the nest for as long as 8 to 10 weeks.

In contrast, precocial birds such as ducks and many shorebirds spend hardly any time in the nest and are often seen wandering in search of food alongside their parents hours after hatching. Most precocial birds gain the ability to fly within a few weeks to a few months after hatching.

J. Jacobson

A female Yellow Warbler delivers a meal to her nestlings.

K. A. Smith

A Clark's Grebe carries its precocial chick safely on its back only minutes after hatching.

Leaving the nest

C. Griffis

A pair of Tree Swallow nestlings prepare to fledge.

After leaving the nest, or fledging, the young birds typically remain close to parents for a short period of time. During this time, young birds must learn to survive on their own and are very vulnerable to predators and starvation. Most birds nest only once per year, but some species can nest up to four or even five times in one breeding season.

Surviving on Their Own

After fledging the nest, young birds (juveniles) are faced with surviving on their own. The first year is the toughest, as evidenced by the fact that in nearly all birds species, more than half of first year birds die. For birds that do make it to adulthood however, the odds of surviving another year improve greatly.

Tony de Goutiere

A juvenile Bald Eagle learns to survive on its own.

APPENDIX E: Additional Resources

NestWatch
www.NestWatch.org

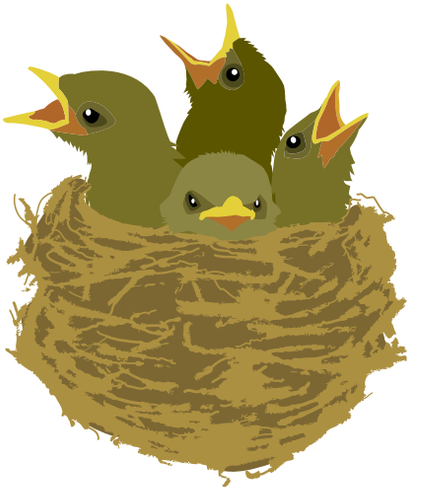
Cornell Lab of Ornithology
www.birds.cornell.edu

All About Birds
www.AllAboutBirds.org

Birds of North America Online
www.bna.birds.cornell.edu

Cornell Citizen Science
www.birds.cornell.edu/LabPrograms/CitSci

BirdCams
www.AllAboutBirds.org/cams



NestWatch Chapters

NestWatch Chapters are based at nature centers, parks, wildlife refuges, zoos, and other nature-minded organizations across the United States. These organizations help us grow by teaching others about the NestWatch program and training participants in their local communities. In return, Chapters are able to use the NestWatch infrastructure to monitor *their* nesting birds on *their* properties. For information on how to become a Chapter, please email **nestwatch@cornell.edu**. To locate a NestWatch Chapter near you, visit **http://NestWatch.org/community/NestWatch-chapters**.

NestWatch

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