





are endangered, threatened, or rare in the state for a whole host of reasons. Habitat loss, forest fragmentation, pesticide use, land use change, and human disturbance have taken their toll on so many vulnerable wildlife populations, including our owls.

Climate change is a clear and present threat that scientists are only just beginning to fully understand. Wild swings in weather patterns, severe storms with extreme winds that blow down nest trees and cause both juvenile and adult mortality, extended periods of drought that dry up water sources, kill trees, and deplete prey are just some examples of the unfolding climate crisis. Fires, floods, and famine are the harsh realities facing owls and all wildlife in the world today.

Although owls are protected by state and federal laws, their future status is uncertain. Let's get to know our New Jersey native owls while they are still here to enrich our lives.



### **Great Horned Owl**

Say the word owl and this predator of Halloween fame invariably comes to mind. *Bubo virginianus* is our most common large owl (about 25 inches tall) with a wingspan up to 5 feet from tip to tip. This magnificent bird is easily identified by its long "horns" (feather tufts), piercing glassy eyes, and deep hooting voice. They are equally at home in forests, fields, deserts, backyards, city parks, and almost any other semi-open habitat between the arctic and the tropics.

This powerful predator is predominantly nocturnal but can be seen hunting at dawn and dusk. They are perch hunters, meaning they wait in a tree lookout, spot or hear their prey, they swoop in. Great horned owls are as opportunistic as a bird can be when it comes to food resources. They will feed on almost any creature they can catch and carry, but their diet is made up mostly of rabbits, squirrels, ground hogs, rats, mice, moles, voles, and muskrats. But they can take down large prey, including raptors such as ospreys, peregrine falcons, and even other owls!

"Hoo-h'hoo-hoo-hoo", the haunting hoots of the great horned owl is the language of love. The male will make his [call](#) to establish territory, but a male and female breeding pair will often perform a duet with alternating calls. The male's voice is noticeably deeper in pitch than the females. Most great horned owls mate for life, but late September and October is when the happy couple begin their annual courtship vocalizations. The best time to listen for their [duet](#) is at dusk and just before sunrise.

Great horned owls do not build their own nest. They scope out nests made by hawks, crows, ospreys, eagles, and herons. They will also nest in a jumble of evergreen branches, hollowed out portions of dead trees, rock crevices, or even man-made platforms. The wildest thing about their nesting behavior is that these owls nest at the height of winter. In January or February, the female lays one to four eggs, usually two days apart. The number of eggs depends on availability of food and it is mostly up to the male to do the hunting and bring food to the female while she sits on the eggs.





It seems crazy to [nest](#) in the middle of winter, *so why do they do it?* Owls are very large birds and it takes the juveniles a long time to grow and mature. Although they have incredible vision, hearing, and other adaptations, learning to hunt on their own takes many months of trial and error. The eggs hatch in February or March and the babies stay in the nest for about 6 weeks. This means they begin to practice their flying and hunting skills by the end of spring when prey becomes abundant. The parents will continue to feed and protect the young ones through the summer. First year mortality is often high for the inexperienced birds, but if they make it, they can begin to breed at about one year of age. Watch a great horned owl nestcam [here](#).

At Duke Farms, we have great horned owls that nest and hunt on the property. One of the best places to look for them in the mature woodlands behind the Hay Barn, around the bike tent, and up around the reservoir. Although they are not usually active during the day, they do like to hang out in conifers and dead trees. One big clue to their presence is if you hear a flock of noisy American crows having a conniption about an intruder in their midst. It's very possible the gang is [mobbing](#) a great horned owl. Crows will follow and harass the owl incessantly as they want their fiercest predator to be gone. So, if you want to find an owl, follow the crows!

### Eastern Screech Owl

Screech owls look a lot like mini versions of great horned owls with rounded heads and prominent feather tufts. There are eastern and western versions and two color phases called morphs, red and gray. This condition is called dichromatism and the red is more common in the east.

The screech [owl](#) is New Jersey's most common breeding owl, and one of its smallest. They are only seven to ten inches tall with a maximum wing span of two feet. Like the great horned, the screech owl is a year-round resident. They prefer woodland habitats with open understories and dead trees with hollow cavities. Eastern screech owl populations are stable because they can live and breed successfully on farmland, wetlands, suburban landscapes, and city parks so as long as they have some trees.



Eastern screech owls mostly hunt at dusk or just before dawn and are mostly nocturnal. Like great horned owls, they perch in trees and swoop down on their prey. They tend to hang out on lower branches than their cousins, only six to ten feet off the ground. When moving from perch to perch, these owls often drop down, fly straight, then rise again, in a distinctive u-shaped pattern. Eastern screech owls eat most kinds of small mammals, including rats, mice, squirrels, chipmunks, moles, and even rabbits. They also eat earthworms, insects, crayfish, tadpoles, frogs, lizards, and woodland birds of every kind. This owl is acrobatic enough that they even catch bats! When food is plentiful, screech owls store extra food in tree cavities. Like other owls, they regurgitate the parts they cannot digest in pellets once or twice a day.



Eastern screech owls form pair bonds that usually last for life. Despite their small size, there's nothing small about their territorial and mating [songs](#). Oddly enough, screech owls rarely screech. Their ghostly trills can strike terror in the hearts of unsuspecting humans, especially when experienced for the first time, in the woods, at night, alone... But don't be afraid; these nocturnal birds have no interest in you at all. Both the males and females sing their eerie songs to find each other and to communicate. They have two kinds of trills; a "bounce song" or tremelo and a whinny, not unlike a horse's whinny. Mated pairs will sing to each other at night and sometimes during the day as well.

Screech owls nest in late winter and early spring in cavities in dead trees, often hollowed trunks created by woodpeckers or squirrels. They will also readily [nest](#) in human made nest boxes. If you have habitat that supports screech owls, consider building a [nest box](#) for them. Males defend territories with several cavity roost spots that include nest boxes.



The female usually lays one to six eggs in the cavity and will stay in the nest except for brief breaks at dawn and dusk. Males do the hunting and continue to do so after the eggs are hatched, bringing food to the female. The babies stay in the nest for about a month. When they fledge, it takes months for them to master their flight and hunting skills. They depend on both their parents for food for eight to ten weeks after fledging. The adults, especially the females, stay close together with the young in tree roosts. Eventually the juveniles begin to roost and hunt on their own without their parents and siblings. At Duke Farms, screech owls do nest in nest boxes and dead snags.

Screech owls have a variety of enemies like other owls, raccoons, crows, and jays. On the flipside, screech owls are predators of blue jays, chickadees, titmice, and other small birds. One of the easiest ways to pinpoint the location of a screech owl is to watch and listen for marauding mobs of agitated birds. Sometimes this [mobbing](#) makes the owl fly away, but it also alerts other birds about the danger in their midst. The commotion may also help you find a screech owl on a daytime walk at Duke Farms.

### **Activity: Learn More About Owl Eyes**

Let's explore how your eyes function differently than an owl's eyes.

Materials: Pencil and toilet paper tube

1. Hold a pencil about a foot in front of your face, then cover one eye with your free hand.
2. Keep looking straight ahead while you slowly move the pencil to the side. Your eye is looking directly forward, but you should still be able to see the pencil out of the corner of your eye. Stop moving the pencil when you can't see it anymore. How far did it get to the side before it disappeared?
3. Now hold the tube up to one eye and look through it at the pencil in front of your face. Start moving the pencil to the side. Now how far did it get before it disappeared?
4. Now do it again but this time turn your head to follow the pencil as it moves so you can keep it in sight through the tube. Stop when you get to the point where the pencil disappeared earlier. How much did you have to turn your head to see the pencil at that point?





- Owls have two eyes, just like us, but they can see way better in the dark than we can. However, an owl can only see straight ahead. This is why they need flexible necks so they can turn their head in every direction to see their prey. Pretend to move your head like an owl. How far can you turn your head? Certainly not 270 degrees like an owl! Look up at the ceiling only moving your eyes. If you were an owl you would have to lift your whole head to see the ceiling.

Our eyes are in front of our heads, on our face. So are owl's eyes, but we can see to the side without moving our heads! This is called peripheral vision. What we see with both eyes open is called our field of view. We have a much wider field of view than owls do.

When you hold up the tube up to one eye, it narrows the field of view and you can no longer see out of the corner of your eye. This is similar to how an owl sees the world all the time. Do you think you'd like to be able to turn your head almost all the way around to see things?

While we're on the subject of turning heads....the way owls turn their heads to see is amazing. But why don't they cut off their blood supply to their heads when they turn them? Watch how owls can turn their heads without cutting off their blood supply [here](#)

*\* This experiment is adapted from Home School Science Tools.*

### **Activity: Owl Food Web**

Use this online food web [resource](#) to think about and connect owls to the food they eat and what the other organisms in the web also eat. Everything is connected! This is another reason to consider the impact of chemicals used in insecticides and pesticides in various elements of the food web. Additionally, if climate change negatively impacts one aspect of the food web, how might this relate to owls?

### **Additional Resources for All Things Owls**

- [17 Owl Facts](#)
- [All About Birds: Great Horned Owl](#)
- [All About Birds: Eastern Screech Owl](#)
- [The Owl Pages: Everything You Want to Know About Owls](#)
- [The Hooting Season: Enjoying Great Horned Owls Outdoors](#)
- [Video: Baby Screech Owls](#)
- [Climate Change and Impact on Spotted Owls](#)
- [Snowy Owls and Climate Change](#)
- [More Science Activities About Owls](#)
- [Tips for Teaching About Owl Pellets](#)
- [Owl Pellets: Science Explosion](#)

**Learning about the owls at Duke Farms and of New Jersey aligns with numerous learning standards including those newly adopted for NJ K-12 public schools focused on climate change.**





## Adopted 2020 New Jersey Student Learning Standards (NJSLS)

### Climate Change

New Jersey is the first state in the country to require climate change curriculum across all content areas and at a K-12 level. As stated by the NJDOE:

On June 3, 2020, the State Board of Education adopted the 2020 NJSLS in the following content areas:

- Career Readiness, Life Literacies, and Key Skills;
- Comprehensive Health and Physical Education;
- Computer Science & Design Thinking;
- Science;
- Social Studies;
- Visual and Performing Arts;
- and World Languages.

These standards truly represent a foundation from which districts will build coherent curriculum and instruction that prepares each New Jersey student with the knowledge and skills to succeed in our rapidly changing world. They will put New Jersey again at the forefront of national education by including the following:

- Climate Change across all content areas, leveraging the passion students have shown for this critical issue and providing them opportunities to develop a deep understanding of the science behind the changes and to explore the solutions our world desperately needs.

**If using the Next Generation Science Standards - Independent Relationships in Ecosystems, consider these life science, engineering and ecology connections:**

**2-LS2-1.** Structure and Function: The shape and stability of structures of natural and designed objects are related to their function(s).

**2-LS4-1.** Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence: Scientists look for patterns and order when making observations about the world.

**2-LS4-1.** Engineering Design K-2 – ETS1-2 Crosscutting Concepts Structure and Function: The shape and stability of structures of natural and designed objects are related to their function(s).

**4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

### Mathematics – NJ Student Learning Standards

The Learn More About Owl Eyes activity above can be used as a real world example with the teaching of mathematics for angles and degrees – 360 degrees vs the 270 degrees of the owl's ability to turn its head. "Owls have two eyes, just like us, but they can see way better in the dark than we can. However an owl can only see straight ahead. This is why they need flexible necks so they can turn their head in every direction to see their prey. Pretend to move your head like an owl. How far can you turn your head? Certainly not 270 degrees like an owl! Look up at the ceiling only moving your eyes. If you were an owl you would have to lift your whole head to see the ceiling."



Students can draw 360 degrees and then 270 degrees. Questions to consider: What is the difference between 360 degrees and 270 degrees? How would this relate to what an owl can see? Would this be an issue regarding how an owl may protect itself? How does this relate to another animal such as a herbivore or another carnivore?

#### **Grade 4 example SLS**

##### **C. Geometric measurement: understand concepts of angle and measure angles.**

5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through  $\frac{1}{360}$  of a circle is called a “one degree angle,” and can be used to measure angles. b. An angle that turns through  $n$  one-degree angles is said to have an angle measure of  $n$  degrees. 6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. 7. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems.

**For more information about how to use any aspect of this lesson in a multi-disciplinary manner contact Kate Reilly, Manager of Education, Duke Farms at [kreilly@dukefarms.org](mailto:kreilly@dukefarms.org)**

*All photos courtesy of Cornell Laboratory of Ornithology; Macaulay Library, Ithaca New York.*