



CONSERVE WILDLIFE  
FOUNDATION OF NEW JERSEY

## Build A Raptor

**NJ Core Curriculum Content Standards Addressed:** 5.1.D, 5.3.A, 5.3.B, 5.3.C, 5.3.D, 5.3.E

**Objectives:** At the conclusion of this activity, students will have a better understanding of:

- The huge number and diversity of birds throughout the world, with emphasis on raptors;
- Raptors and their unique place within the food web;
- Adaptations that raptors possess to help them survive and thrive.

**Materials:**

- Photographs of raptors. (A great resource for raptor photos is google images or Flickr. Make sure photos are not copyrighted or ask for permission to use the photos for educational purposes).
- “Build a Raptor” props:
  - big gag sunglasses or “eye ball” glasses;
  - a hooked raptor beak (you can find plastic raptor beaks online or at costume stores. Alternatively, you can make your own raptor beak out of cardboard or foam with a strap for holding it on the head – this would be fun classroom project);
  - children’s gloves (preferably yellow, tan, or orange) with the pinky and ring fingers sewn or taped together and the tip of the fingers painted black.

**Vocabulary:** bird, raptor, adaptation, predator, prey, talons, ...

**Procedure:**

1. Begin by showing some photos of birds. Discuss what makes a bird a bird. (Birds have feathers and wings that make most birds capable of flight, a beak and no teeth, and reproduce by eggs).
2. Ask the group to begin naming some birds that they see in their community. The list will grow quickly – mention that there are over 10,000 different kinds of birds in the world. New Jersey is home to over 300 birds that either live here year-round or can be found here at some point during the year (either in the summer, winter, or during their migration)
3. Show the group a photo of a raptor (you may choose to show a bald eagle) and ask the group if they know what kind of bird it is.
4. Explain that (eagles are raptors and) raptors are birds that eat other animals. There are over 500 species of raptors throughout the world, all sharing some common traits, or adaptations, that help them to survive.
5. A raptor, also known as a bird of prey, is a type of bird often characterized by a strong, curved (or hooked) beak, strong, sharp talons, and keen eyesight. Raptors are often referred to as Hunters of the Sky. Raptors have developed many unique adaptations that make them extremely proficient at finding and capturing prey.
6. Ask for a student volunteer. This student will then dress up as a raptor as the group discovers the many adaptations that a raptor possesses.
  - a. Raptors have **large eyes** – Have the student put on the big gag sunglasses.

Most raptors rely heavily on sight to locate their food so they have developed large, extremely sensitive eyes. In the entire bird world, birds of prey have extremely keen eyesight, enabling them to spot potential prey from a very long distance. In fact, an eagle can see a rabbit from almost a mile away!

Their eyes are fixed in their head, meaning they can't roll their eyes from side to side like we can. So in order to see what is going on around them they must constantly move their head to survey their surroundings. Just watch a bird for a couple of minutes and you will see it almost constantly moving its head, looking around.

To help in its ability to survey its surroundings, raptors (as well as most other birds) have more neck (or cervical) vertebrae than humans. Birds have a highly flexible neck, consisting of 13 to 25 vertebrae. In contrast, humans have 7 cervical vertebrae.

b. Raptors have a **strong, hooked beak** – Have the student wear the hooked beak.

Stout, thick, and sharply hooked, raptor beaks are a highly specialized tool. Each bird of prey's beak is slightly modified because of its specific dietary needs. For example, falcons have a tooth (called a tomial tooth) that is designed to lock onto and sever the neck bones of smaller birds. The soft, fleshy part of the bill (located at the top of the bill) is called the cere and this is where the nostrils are located. Beaks are made of keratin (just like human hair and fingernails). Bird beaks grow continuously (like our hair and nails) and it is constantly shedding and flaking off, maintaining a sharp edge capable of tearing flesh apart.

c. Raptors have **claws called talons** – Give the student the gloves to put on.

A talon is the claw of a bird of prey, its primary hunting tool. The talons of raptors are lethal weapons, perfectly designed for catching, holding, and carrying prey. Most birds of prey have 3 toes pointing forward and 1 pointing backward. These toes can exert an extremely powerful grip upon their catch and can literally crush it to death. Talons are the first line of defense for raptors and they are used to capture their prey. Raptors tend to capture with their talons, and kill prey with their beaks. Eagles have rough pads on the bottom of their feet to help them hold slippery fish.

d. Mention some **other adaptations** that are important such as:

- o Coloration of bodies – Males and females tend to have similar coloration. They are highly camouflaged tending to be shades of brown, black, and grey. Their backs are often darkly colored and their undersides tend to be lightly colored. This helps them to blend in with their surroundings.
- o Females are larger than males. This is called reverse sexual dimorphism. This size difference allows a mated pair of raptors to hunt a greater variety of prey.
- o Hearing - Raptors make a broad range of noises and use their voice and hearing as a means of communication. They also rely on their hearing heavily for locating their prey, combined with their sharp vision. Some raptors use their hearing more than others do. Owls use their hearing quite often to assist in finding prey at night.

7. Conclude the activity by asking the group to name some raptors that live in New Jersey. (New Jersey is home to over 20 different types of raptors, each having its own unique shape and size that can help to identify it.) Encourage students to keep their eyes open for raptors and to let you know when they see raptors in the community. You may decide to keep a list for a week, a month, or the entire schoolyear.

Adapted from *Raptors Capture Young Children*, Green Teacher magazine, Issue 76, Spring 2005.

**Appendix:**

A great additional activity to help students understand eagle eyesight:

- Make a cardboard cut-out of a 1" long fish.
- Place it upright on top of a post.
- Now start backing away from it until you can't see it anymore.

- Stop and move forward until you can see again and mark this spot. Now, measure the distance from the fish to where you marked your limit. Now multiply that distance by 8. The answer will be how far away a Bald Eagle could see the same fish.
- Now imagine that fish was the actual size an eagle would swoop down and catch. Let's say one foot. Since there are 12" in a foot, the distance you would be able to see that object is 12 times greater than the distance you saw the 1" fish cut out. So, to find out the distance at which an eagle could see a fish that is 1' long, multiply the number you computed earlier by 12! WOW! That's pretty far!

Field Trip Ideas: Visit a hawk migration site during the annual autumn hawk migration. These sites allow a perfect vantage to observe raptors as they migrate south for the winter. Some of these sites provide education staff to help make for a meaningful and educational experience. Places in and around New Jersey that offer educational staff and programs include: Hawk Mountain in Kempton, PA ([www.hawkmountain.org](http://www.hawkmountain.org)); New Jersey Audubon Society counts hawks at several locations throughout New Jersey including the Cape May Hawk Watch and Montclair Hawk Watch. Several of their education centers also offer field trips to area hawk watches during fall raptor migration. Visit their website at [www.njaudubon.org](http://www.njaudubon.org) for more information.

### **Background Info about Birds and Raptors:**

Birds are vertebrates with feathers, modified for flight and for active metabolism. There are a few kinds of birds that don't fly, but their ancestors did, and these birds have secondarily lost their ability to fly. Modern birds have developed the following traits:

- horny beak, no teeth
- large muscular stomach
- feathers
- large yolked, hard-shelled eggs. The parent bird provides extensive care of the young until it is grown, or gets some other bird to look after the young.
- Strong skeleton

There are over 10,000 species of birds in the world, ranging in size from the bee hummingbird, just 2 inches long, to the Ostrich, at over 9 feet tall. Birds evolved from a common ancestor, probably a dinosaur.

#### *What is a raptor?*

A raptor, also known as a bird of prey, is a type of bird often characterized by a strong, curved (or hooked) beak, strong, sharp talons, and keen eyesight.

The word "Raptor" is derived from the Latin word *raptor* meaning plunderer (from the verb *to snatch or seize*.) There are almost 500 species of raptors worldwide all sharing some common traits, or adaptations that help them to survive. Raptors are often known as hunters of the sky.

Male and female raptors are sexually dimorphic, females are larger than males. They also look alike, having similar coloration. (there are some exceptions to this rule).

Raptors come in many shapes and sizes. New Jersey is home to over 20 different types of raptors, each having its own unique shape and size that can help to identify it. When identifying a bird of prey in flight, look mainly at the body shape, size, and how it flies.

There are 3 general types of raptors: *buteos*, *accipiters*, and *falcons*.

**Buteos** are soaring hawks having long broad wings and wide fanned tails. They are built to glide on air currents, soaring for long stretches without flapping their wings. They will hunt from perches such as trees or utility poles and wait for unsuspecting prey to move below. Buteos that live or migrate to New Jersey include the red-tailed hawk, broad-winged hawk, red-shouldered hawk, and rough-legged hawk.

**Accipiters** have short, round wings, and long rudder-like tails. They typically live in the forest so their short wings and long tails enable them to maneuver quickly through the trees. They dart through trees chasing their favorite prey, other birds, on the wing. Although they sometimes soar like buteos, their typical flying style is several flaps followed by a glide. (Think “flap – flap – soar” when you see an accipiter flying over head.) Cooper’s hawks, goshawks, and sharp-shinned hawks are all accipiters living in New Jersey.

**Falcons** are the fastest birds of prey. They are built for speed with streamlined bodies and long, pointed wings. Falcons most often flap continuously in flight. Falcons living or migrating to New Jersey include the peregrine falcon, American kestrel, and merlin. The American kestrel, the smallest falcon, is able to hover in one place while hunting small rodents and insects. The peregrine falcon is the world’s fastest animal, capable of flying at speeds of over 200 miles an hour in pursuit of prey. This behavior is known as a stoop.

Other birds of prey living in or migrating through New Jersey include eagles, osprey, Northern harrier, vultures, and owls.

**Eagles** are the largest birds of prey found in North America. There are 2 species – the bald eagle and the golden eagle. The bald eagle is our national symbol. Their wingspans can reach 8 feet in length. Bald eagles are similar to buteos but they are much larger, with longer, narrower wings. The bald eagle is a fish eater (though it can eat other prey) so it is seldom far from water. The golden eagle is associated with wilderness and mountainous habitats, and they feed on a variety of mammals. Bald eagles are year-round residents in New Jersey (almost 70 pairs in 2009) while Golden eagles typically are found during their migration and occasionally in the winter months.

**Osprey** have very long narrow wings that are often bent at the wrist so that their wings form an “M” shape. From below, ospreys have contrasting dark and light plumage. They tend to glide extensively. Often called fish hawks, osprey hunt mainly fish and are seldom far from water. When hunting, osprey plunge feet first into the water to capture fish swimming near the surface. Osprey have rough pads on their feet with little spines on them to help them grab and hold onto slippery fish.

**Northern harriers** hold their wings above their body, resembling a “V” shape. The feathers on their face are stiff to help transit sound. These feathers create a pronounced “facial disk” similar to an owl face. Unlike other hawks, the Northern harrier relies on its hearing as well as its vision to capture prey. Northern harriers can be identified by a white rump patch at the base of their long narrow tails. Males and females look somewhat different. The male is white below with a light gray back and hood,(sometimes called “the grey ghost”); the female is mottled in browns.

**Vultures** also hold their wings in a “V” or a dihedral. They are easily identified by their rocking flight as they soar in circles. Unlike most birds of prey, vultures have a keen sense of smell, which helps them to find their favorite food, dead and rotting animals. In New Jersey, there are 2 types of vultures: turkey vultures and black vultures. Turkey vultures are large dark brown birds with silvery white along the length of its wings. Black vultures are smaller than turkey vultures with a shorter tail and

white patches just at the tip of its wings. Black vultures hold their wings flatter than a turkey vulture and flap its wings more frequently.

**Owls** are birds of prey that hunt and feed at night. They have extremely good eyesight and highly sensitive hearing. Some species of owl can hunt by hearing alone. Their huge eyes are fixed in their skulls (like most birds of prey); to look from side to side they must rotate their head. Some species of owls can rotate their head over 270 degrees! Owls also have silent flight – their flight feathers are serrated that act as a muffler reducing the sound of air moving over the feathers. There are 8 species of owls that visit New Jersey sometime during the year or live in New Jersey year-round. Owls that breed in New Jersey include the great-horned owl, screech owl, barn owl, barred owl, long-eared owl and sometimes the short-eared owl. Migrant species in New Jersey or species infrequently seen include the saw-whet owl and snowy owl.

### *Taxonomy of Raptors*

**Taxonomy** is the practice and science of classification. Carolus Linnaeus was a Swedish scientist who developed the classification system in use today. It categorizes organisms into a hierarchy of kingdoms, phylums, classes, orders, families, genera, and species based on shared physical characteristics. As you move down the ranks (from Kingdom down to Species), the organisms become more closely related. Groups at the top of the hierarchy (kingdom, phylum, class) contain a greater number of organisms than the more specific groups that are lower in the hierarchy (families, genera, species). By assigning each group of organisms to a kingdom, phylum, class, order, family, genus, and species, they can be uniquely characterized. Their membership in a group tells us about the traits they share with other members of the group.

Every known living organism on Earth is classified and named by a set of rules. Those rules are used by all scientists around the world. The names are called scientific names, not common names. Common names may vary from place to place. For example, a mountain lion may also be called a puma or a cougar depending on the geographic area that it is found. Scientific names follow a specific set of rules. Scientists use a two-name system called binomial nomenclature. Scientists name all organisms using the genus and species of the organism. The first word is the genus and the second word is the species. The first word is capitalized and the second word is not. So a mountain lion's scientific name is *Puma concolor* (the genus) *concolor* (the species).

Let us classify the bald eagle as an example:

Kingdom **Animalia** (bald eagles are animals)

Phylum **Chordata** (they have a spinal cord and are also vertebrates)

Class **Aves** (they are birds)

Order **Falconiformes** (they are diurnal, or daytime, birds of prey)

Family *Accipitridae* (they are hawks, eagles, and relatives)

Genus **Haliaeetus** (fish eagles)

Species **leucocephalus** (bald eagle)

Raptors belong to 2 scientific orders Strigiformes (OWLS) and Falconiformes (DIURNAL BIRDS OF PREY).

These 2 Orders are divided into 6 Families.

Order: FALCONIFORMES: approx. 285 species in 4 families

Family *Accipitridae* approximately 230 species:

Vultures (7 species)

Hawks and Eagles (226 species)

Family *Falconidae* approximately 64 species:  
Falcons

Family *Pandionidae* 1 species:  
Osprey

Family *Sagittariidae* 1 species in Africa:  
Secretary Bird

Order: STRIGIFORMES: approx. 148 species in 2 families

Family *Strigidae* approximately 129 species

Typical owls such as the great horned, screech and snowy owls.

Family *Tytonidae* approx. 19 species:

Barn owls

Masked owls and relatives

### *Adaptations of Raptors*

**Raptors are predators.** Like all predators, they hunt and kill other animals for food so their diet consists primarily of meat.

### **Raptors have keen eyesight.**

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To help in its ability to survey its surroundings, raptors (as well as most other birds) have more neck (or cervical) vertebrae than humans. Birds have a highly flexible neck, consisting of 13 to 25 vertebrae. In contrast, humans have 7 cervical vertebrae.

Owls have an added advantage over other raptors because of their sharp night vision. Their eyes are even larger than those of other raptors and their pupils can open very wide to let in a tremendous amount of light. The pupils can also close to a pinpoint, giving them excellent eyesight during the daytime as well. Owls can see in dim light at least 35x better than humans and perhaps 100x better.

### **Raptors have a keen sense of hearing.**

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### **Males vs. Female Raptors**

Most female birds of prey are larger and heavier than the males. This is called reverse sexual dimorphism. Also, male and female raptors have similar coloration making it difficult to distinguish between the genders.

### **Coloration**

Most birds of prey are light underneath so if you are looking up you are less likely to see them. They are dark above so if you are looking down on them they blend in with the ground. They tend to be mottled, making them harder to see when perched.

Of interest, fighter planes in WWII had similar coloration - dark above, light below, to make them harder to see by planes above and tanks and people below.