



Raptors of the Caribbean

Education & Conservation Resource Guide



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Why focus on birds of prey?

Birds of prey, also known as raptors, are found across the globe and on every continent of the world except Antarctica. Raptors play an important role in the ecosystems in which they live, acting as top predators, bio-indicators, and umbrella species. They provide important ecosystem services for humans, and many are keystone species. In general, their role in an ecosystem is large in comparison to their numbers, and their removal from that system would cause a cascade of negative effects on numerous other organisms.



Raptors are impressive creatures. Their keen eyesight, powerful hunting skills, acrobatic and graceful flight, and unique adaptations, coupled with their penetrating stare, have been a source of fascination for humans probably since the first time someone locked eyes with one of these spectacular birds. Today, they still serve as muses for artists and writers, and as inspiration for engineers (pay close attention to a plane's design and you will see how similarly shaped some are to raptors). They make terrific topics of study in the classroom. They have inspired generations of conservationists, and they will surely inspire some of your students, too!

Sadly, raptors are one of the most threatened bird groups in the world. Daily, they face many human-related threats such as direct persecution, destruction of nests, direct and indirect poisoning, capture for the wildlife trade, electrocution on power lines, destruction of habitat, and collisions with vehicles, buildings, cars, and wind turbines, among other threats. Raptors in the Caribbean are also suffering a decline in numbers, and a few endemic species are categorized as Critically Endangered. Despite the important roles they play in our ecosystems, and the many threats they face, raptors are often excluded from environmental education guides and programs. Overall, there is a basic lack of knowledge about raptors, as well as a lot of misinformation about predators in general. We hope this guide

will clear up some common misconceptions about raptors and provide its readers with a true understanding of and appreciation for birds of prey.

Although approximately 71 species of birds of prey have been recorded in the Caribbean, this guide will focus on just a few of the species that you are most likely to encounter in the wild.

How to use this guide

This guide is divided into four chapters. Each contains important information on birds of prey and the roles they play in their environments. At the end of each chapter are two lesson plans designed to reinforce the material, as well as one evaluation activity, so educators can measure the impact of each learning experience on their students. Chapters are intended to be read and presented in order, as each chapter builds on the information provided in previous ones.

The activities are designed specifically to require only a few easily obtained materials, such that very few resources are necessary to carry out the lesson plans. Some lesson plans include activity sheets that are designed to be photocopied. However, if the option does not exist to make photocopies, students can recreate the activity sheets on recycled paper, carton, or cardboard as part of their learning experience! The use of natural materials and recyclable objects is encouraged.

Each activity incorporates subjects such as language, math, science, and physical education, while encouraging teamwork, imagination, and exploration. Activities are also adaptable for different age, grade, and knowledge levels. We encourage educators to be creative and to inspire that creativity in their students!

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An Introduction to the Caribbean



The Caribbean covers an area of approximately 2,754,000 km² and encompasses a myriad of islands, cays, and islets. Twenty-six island nations are found in the region, as well as coastlines along the southeastern United States, Mexico, Central America, and parts of Colombia and Venezuela. The Caribbean Islands are divided into three main groups: The Bahamas Archipelago, the Greater Antilles, and the Lesser Antilles. There is substantial variation in the size, precipitation, soil type, and temperature across the region and within individual islands.

This variety makes the Caribbean an important **biodiversity hotspot** - one of only 36 in the world. Additionally, this region has a high level of endemism - meaning many of its plants and animals are found there and nowhere else on

Earth. For example, there are around 11,000 different plants found throughout the region. Of these, more than 70% are endemic. When we look at the reptiles, the amount of endemism is even greater. While there are only around 200 different amphibians found in the Caribbean, more than 95% of them are endemic, and of the roughly 600 reptile species, over 80% are found only in the region. Over a quarter of the 560 bird species, and close to 50% of the roughly 100 mammal species found here are endemic. The region's marine ecosystem is highly biodiverse as well and is home to the world's second largest barrier reef.

The rate of habitat loss across the region varies considerably from island to island. As a whole, around 25% of forest cover remains for the Caribbean Islands region. Sadly, it has one of the highest numbers of globally threatened species of any biodiversity hotspot in the world!



Major Caribbean Ecosystems

Ecosystems found throughout the Caribbean region are extremely diverse, and raptors can be found in most of them. Some major ecosystem types include:

Mangroves

Mangroves are densely packed, swampy forests made up of Mangrove trees. These trees are relatively small and grow along shorelines in saline (salty) or brackish (a mix of fresh and salt) waters. Mangrove swamps can be found throughout coastal areas within the Neotropics and are abundant on Caribbean islands. Salt-tolerant plants (especially mangrove trees), and animals dominate these ecosystems. Mangrove swamps help to protect coastlines from erosion and have relatively high levels of nutrients which provide habitat for worms, oysters, snails, and a host of other invertebrates. Fish, shrimp, crabs, and shellfish often use these swamps as breeding grounds. Wading birds, such as herons and egrets, are attracted to this incredible buffet and, of course, raptors are part of



Photo: Lisa Sorenson

this ecosystem too. Birds of prey that can be found in mangroves of the Caribbean include **Osprey** (*Pandion haliaetus*), **Snail Kite** (*Rostrhamus sociabilis*), and **Cuban Black Hawk** (*Buteogallus gundlachii*), which is endemic to Cuba.

Coniferous forests

Coniferous forests are composed of trees that produce cones and needles. **Caribbean Pine** (*Pinus caribaea*) is native to several countries in Central America, as well as Florida, U.S.A., Cuba, and The Bahamas. In fact, it is one of the most dominant trees in The Bahamas. On Hispaniola, the Hispaniolan pine forest extends between the Dominican Republic and Haiti and grows at elevations greater than 800 meters above sea level (m.a.s.l.). Coniferous forests are the only kind of Caribbean forest that grows between 2,100 and 3,175 m.a.s.l. which are the highest elevations in the Caribbean. The highest point in the region is known as Duarte



Photo: Frank Rivera

Peak and is found in the Dominican Republic. Raptors such as the **Red-tailed Hawk** (*Buteo jamaicensis*), **Broad-winged Hawk** (*Buteo platypterus*), and **Sharp-shinned Hawk** (*Accipiter striatus*) can be found in these forests.

Subtropical and tropical broad-leaf forests

Both moist and dry subtropical and tropical broad-leaf forests generally occur in more mountainous regions across the Caribbean. These forests are lush and host a variety of tree and shrub species. On the dark forest floor ferns and mosses grow, and epiphytes tend to be abundant on tree trunks and branches. In Puerto Rico, these forests are nesting habitat for the **Puerto Rican Sharp-shinned Hawk** (*Accipiter striatus venator*), as well as the **Puerto Rican Screech Owl** (*Gymnasio nudipes*). On Hispaniola, deciduous forests are home to the **Ridgway's Hawk** (*Buteo ridgwayi*), and **Ashy-faced Owl** (*Tyto glaucops*). The **Red-tailed Hawk**, resident in much of the Caribbean, also uses subtropical and tropical deciduous forests.



Photo: Dax Roman

Grasslands and Savannas

Though not as common as other types of ecosystems in the region, we can find grasslands and wet savannas on a few islands, such as Cuba and Hispaniola. Some grasslands may have been formed by natural forces, while others are the result of human activities.

These grasslands are normally dominated by dense grasses and host some scattered trees and shrubs. They can host a variety of different flora and fauna. Some raptors that may be found in or near these grasslands include **Short-eared Owl** (*Asio flammeus*) and **American Kestrel** (*Falco sparverius*).



Photo: Dax Roman

Deserts and Xeric Shrublands

Xeric landscapes are dry regions characterized by thorn scrub, cacti, and succulents. Found along the Caribbean coastline in Venezuela and Colombia, as well as on many Caribbean islands including Aruba, Cayman Islands, Barbados, Guadeloupe, and Martinique, these habitats include dry limestone forests, thickets, and deserts. Many of the plants that grow in this type of landscape have fleshy leaves with a waxy surface to conserve water and are covered in spines to protect themselves from herbivores. The ground is often hard and rocky. Trees are sparse but some do grow here. Many lose their leaves in the driest times of the year. These arid habitats can attract **American Kestrels** and hawks that are in search of small rodents and reptiles to feed on.



Photo: Steve Latta

Coastal areas

Of course, every Caribbean nation, by definition, has an extensive coastline. Several types of forests, xeric landscapes, and even major cities can be found along the coastlines in the Caribbean. Warm waters, sandy beaches, and brackish wetlands provide a home for several different plant and animal species. Sandy beaches are important nesting sites for marine turtles, and coastlands, estuaries, and coral reefs serve as important nursery and feeding areas.

Beaches, of course, are an important source of food, recreation, and travel for humans as well. The raptor most commonly found along the Caribbean's coastal areas is the **Osprey**, which can be seen perched over water, or diving into the ocean after fish.



Photo: Ted Eubanks

Agricultural fields

Agricultural fields are areas where humans have modified the landscape for grazing cattle or other livestock, or for growing food plants or other commodities. They are often dominated by monoculture - meaning only one type of plant is grown over a large area, reducing biodiversity in the area. This type of habitat is found on every inhabited island in the Caribbean and while these areas have been developed by humans, they can still provide a rich habitat for some birds, reptiles, and small mammals.

The presence of prey animals, of course, serves to attract a few species of birds of prey, including the **Red-tailed Hawk**, **Barn Owl** (*Tyto alba*), **Burrowing Owl** (*Athene cunicularia*) and **American Kestrel**.



Photo: Dax Roman

BIRDS OF PREY

Chapter 1

Learning Objectives for Chapter 1

Participants will be able to:

1. Identify at least 3 raptor characteristics
2. Name at least 3 different types of raptors
3. Differentiate between raptors and other birds

Words to Know

carnivore	nocturnal
diurnal	raptor
facial disc	talons
invertebrate	tomial tooth
	vertebrate

Birds are found everywhere in the world, across all continents and in nearly all landscapes. There are roughly 11,000 species of birds world-wide, and though they differ in size, coloration, feeding strategies, nesting habits, and behavior, all avian species have several characteristics in common. Birds are the only known living descendants of dinosaurs. They are warm-blooded **vertebrates** that lay eggs with hard shells. They are the only living animals that have feathers, which help to insulate and protect their bodies. Feathers also aid in flight, though not all birds can fly.

Birds have toothless beaks, and lightweight skeletons composed, at least

in part, of hollow bones. This helps to keep their weight down. If you were to compare the weight of a bird with a mammal of equal size, the bird would weigh much less!

Birds have air sacs throughout their bodies that act as part of their respiratory system, along with their lungs. They have four-chambered hearts, and they tend to have a high metabolic rate. There are several different groups of birds, including songbirds, cormorants, parrots, and many more. Over the following pages and chapters, we will focus on just one of the many fascinating groups of birds we share our planet with - the raptors! Birds of prey, or **raptors**, are found on every

continent of the world except Antarctica. They are divided into 5 orders and 8 families. Worldwide, there are 559 raptor species. They can be found at almost every elevation and in almost every habitat including arid deserts, deciduous and coniferous forests, wetlands, open tundras, savannas, and even major cities!

Raptors are primarily **carnivores**, or meat eaters, and, as a group, prey upon insects and other **invertebrates**, fish, reptiles, amphibians, mammals, and even other birds, including other raptors! Raptors tend to have sharp, down-curved beaks and strong feet armed with sharp **talons**, which they often use to capture and kill their prey. However, there are some exceptions.

For example, a few raptors, such as the seriemas, use their beaks instead of their feet, to kill their prey. Addition-

ally, some raptors rarely hunt at all, if ever! The **Palm-nut Vulture** (*Gypohierax angolensis*), found in sub-Saharan Africa, feeds primarily on palm fruits and vegetable matter, though it does eat animals, too. In fact, most vultures are scavengers, and don't kill prey at all.

Finally, even though many birds eat meat, not all are considered raptors. Pelicans, shrikes, ravens, herons, storks, sparrows, flycatchers, and fowl are just a few examples of birds that hunt to eat but aren't classified as raptors.

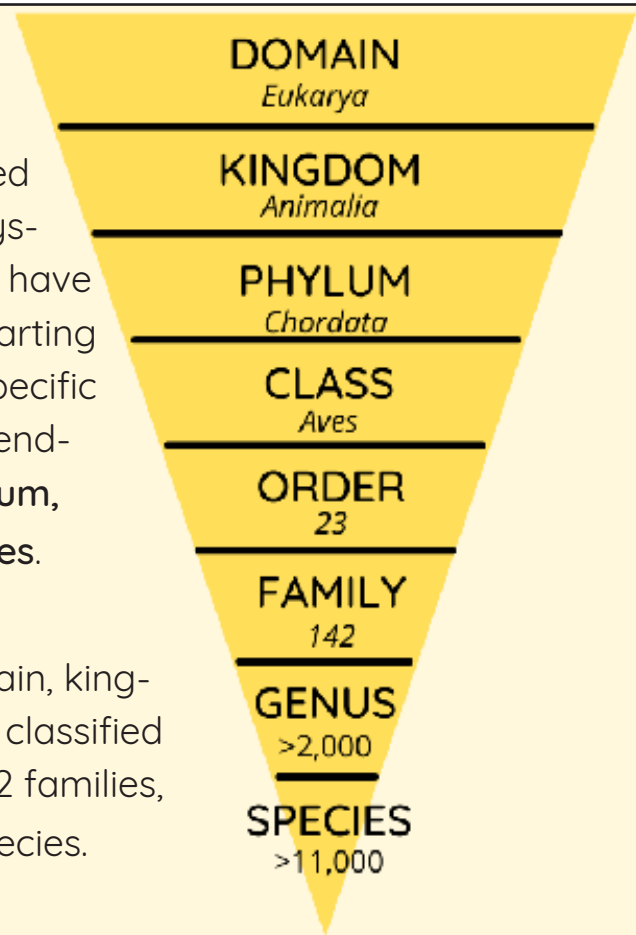
So, what exactly makes a raptor a raptor? The truth is, scientists are still working to define exactly what a raptor is. However, we can learn about a few important characteristics that will help us to identify a bird of prey when we see one.



The Classification of Birds

Scientists classify all living things based on their shared characteristics. This system is known as **taxonomy**. Scientists have grouped organisms into categories starting at a very broad level and ending at specific species. The seven categories in descending order are: **domain**, **kingdom**, **phylum**, **class**, **order**, **family**, **genus**, and **species**.

The chart on the right shows the domain, kingdom, phylum, and class that birds are classified under. There are 23 orders of birds, 142 families, over 2,000 genera, and over 11,000 species.



Photos: Marta Curti

Main Characteristics of Raptors

Raptors are the hunters of the sky and are adapted to consume meat. Though there are many birds that hunt and eat meat, not all of them are raptors. Over the years, scientists have looked at different ways to define birds of prey. Until recently, the most common definition of a raptor was “a bird that hunts other animals for food and that has three important characteristics: hooked beaks with sharp edges, powerful feet with sharp talons which they use to grasp and kill their prey, and keen binocular vision.”

However, considering that some birds of prey, such as vultures, are mostly scavengers, and other birds of prey, such as the **Secretarybird** (*Sagittarius serpentarius*), use their feet to kick their prey to death rather than to grab them, researchers began looking for a better way to determine which birds should be considered raptors and which ones shouldn't.

To find the answer, scientists turned to evolution. After thorough research and study, they came up with a new

definition for raptors: “Land birds... that evolved from vertebrate-eaters in which most species of the group maintained that vertebrate-eating lifestyle.” This definition has led to the inclusion of a new group of birds into the raptor family - the seriemas! These long-legged terrestrial birds found in South America are the last known living descendants of the **Terror Birds**, and are now classified as birds of prey.

Some raptors are **diurnal**, others are strictly **nocturnal**. Some are **crepuscular** - meaning they are active in the half-light of dawn and dusk. Still others are active both day and night! Generally, diurnal raptors include the hawks, eagles, kites, seriemas, secretarybirds, falcons, osprey, and vultures. Nocturnal raptors include the owls.



Vision

A raptor's vision is one of its most important senses. Raptors depend on their eyesight to find food, to recognize other members of their species, and to detect danger. They, like other predators, have forward-facing eyes. This allows them to see an object with both their eyes at the same time, which helps with depth perception. This is called **binocular vision**.

To learn about how and what a bird sees, scientists look at different things including eye size, eye shape, and the number of **cones** and **rods** in the eye. Generally speaking, the larger the eye and the more cones present, the higher the **visual acuity**.

Though there is a large variation in the visual capabilities of different raptor species, in general birds of prey have superior vision to many animals, including humans. In fact, biologists estimate that many raptors can see 2 to 8 times better than we can.

A raptor's eyes are very large in comparison with the size of their heads. Our eyes, for example, make up only

1% of the weight of our heads, while a raptor's eyes make up around 15%. If we had eyes that were proportionately the same size as a raptor's, our eyes would be the size of tennis balls!

Because raptor eyes are so large, they are protected and held in place by a special bone called a **sclerotic ring**. As a result, their eyes are fixed inside their skulls, which means raptors cannot move their eyes up and down, or to the right or left like we can. In order to look in any direction, a raptor must move its entire head.

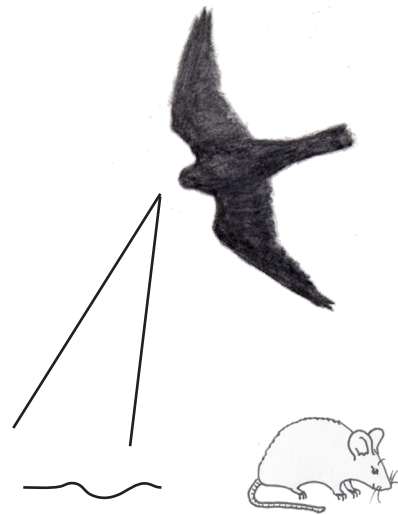
While it might seem like a disadvantage to have eyes fixed in one's skull, raptors have a special adaptation to make it work! Birds of prey, and owls in particular, have extra vertebrae in their necks, which make their necks very flexible. As a result, raptors can turn their heads almost 270° around from a forward-facing position. They can look in almost any direction without moving their bodies.

Another important characteristic that makes a raptor's vision so good are the cones and rods it has in its eyes.

Cones and rods are photoreceptors that contribute to an organism's ability to see. Cones are what allow us to see in color, and rods help us to see in low light. Diurnal birds of prey can have as many as 12 times the number of cones in their eyes as we do! While owls have a very high number of rods, giving them excellent night vision.

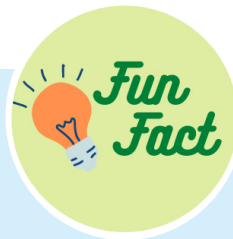
Some raptors, such as the **Common Kestrel** (*Falco tinnunculus*), which is found in parts of Europe, Asia, and Africa, can see **ultraviolet** (UV) light. This ability allows the kestrels to detect urine trails left by rodents - one of their favorite prey!

This is possible because some rodents' urine reflects UV light, acting like a neon sign. Once the kestrels find these urine trails, they know it is only a matter of time before a mouse will appear!



A Third Eyelid

Raptors have three eyelids! Like us, they have an upper and lower eyelid that move up and down. Their third eyelid, called a **nictitating membrane**, moves from side to side. It is semi-transparent, helping to protect their eyes and keep them clean and moist.



Beaks

All birds have beaks. Beaks can be long or short, thick or thin, straight, up-curved or downcurved. Raptors' beaks tend to be strong and hooked, and have sharp edges. However, there is quite a bit of variation in beak size and shape among raptors. After all, what a raptor eats helps determine the size and shape of its beak! This makes sense. We too use different utensils to eat different things. We wouldn't eat a steak with a spoon, or soup with a fork. So how does this apply to birds of prey?

The **Snail Kite**, which is found in the Americas, feeds primarily on apple snails. This kite has a thin, extremely down-curved beak, which is perfect for plucking the snails from their

shells. But this type of beak wouldn't work well for a **Philippine Eagle** (*Pithecophaga jefferyi*), which is endemic to the Philippines. This large bird naturally feeds on larger prey. It, of course, needs a powerful, heavy beak for tearing into its dinner. The **Southern Boobook** (*Ninox boobook*), one of Australia's smallest owls, feeds on insects and small vertebrates. It has a shorter, smaller beak, which suits it just fine.

Apart from using their beaks to eat, raptors also use them to preen (clean) their feathers, to transport and arrange nesting materials, and to feed their young. Though rare, scientists have observed some raptor species using their beaks to pick up rocks and drop them onto eggs to break them to get to the yolk inside.

A Bird with a Tooth?

Birds do not have teeth. However, falcons have a small triangular-shaped notch on their beaks. This notch is called a **tomial tooth**, even though it isn't really a tooth at all. Falcons use this "tooth" to snap the neck of their prey, killing them quickly.



The Right Tool for the Job

Study the three pictures below. Compare the beaks of each bird.

How are they similar? How are they different? Can you guess which raptor eats snails, which raptor eats medium to large mammals, and which raptor feeds mostly on insects? Explain in your own words how you came to your conclusions.



Snail Kite



Philippine Eagle

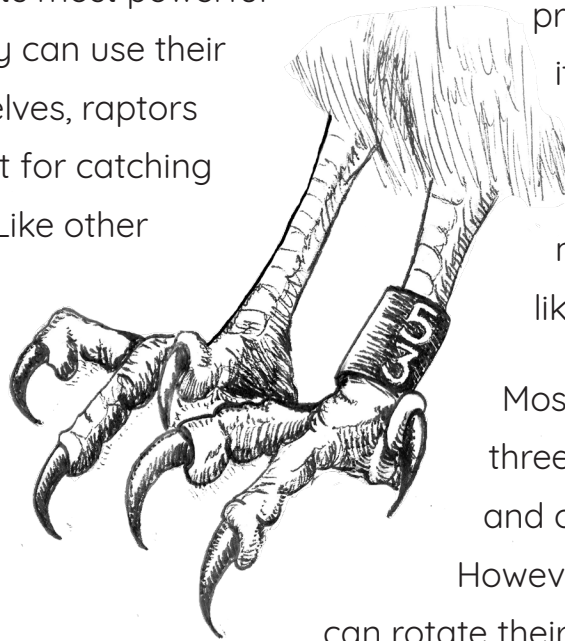


Southern Boobook

Legs and Feet

A raptor's strong legs, muscular toes, and sharp talons are its most powerful weapons. Though they can use their feet to defend themselves, raptors primarily use their feet for catching and killing their prey. Like other birds, they also use their legs and feet to perch, to walk, to run, to transport nesting materials, and even to scratch.

Just as raptor beaks vary in size and shape, so too do their legs and feet. The size of their prey determines the size of their feet and vice versa. For example, mammal-eating raptors usually have short and powerful toes. This allows them to grab and kill their prey quickly. This is very important when catching prey that are themselves armed with strong claws and sharp teeth! Bird-eaters, such as falcons and many accipiters, have long, thin toes, while snake-eating raptors often have shorter toes and thick scales on their legs to protect them from snake bites.



The **Osprey**, which is found around the globe, feeds mainly on fish. To help it catch and hold on to its slippery

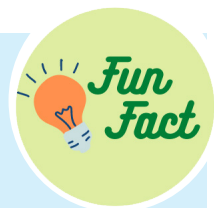
prey, the bottoms of its feet are equipped with grippy barbs. Its talons are sharp and more down-curved, just like a fishhook.

Most birds of prey have three toes facing forward and one facing backward.

However, owls and **Osprey** can rotate their outer toe from the front to the back, so that two toes point forward and two toes point back. This ability to move their toes may help them grip prey more easily.

I.D. Cards for Birds?

Scientists place bands - each with a unique combination of colors, numbers and letters - on birds' legs (like in the image above) to help them identify individual birds. No two birds have the same combination!



Let's Review!

By now you should be familiar with the main features of a raptor and be able to describe what a raptor is. Look at the images below. Can you identify which birds are raptors and which aren't, based on what you have learned so far?

GROUP A: All three birds have feet for gripping and strong beaks. Only two are raptors. Which ones?



Photo: Dax Roman



Photo: Jim Shane



Photo: Matt Giovanni

GROUP B: All three birds live near water and feed on fish. Only one is a raptor. Which one?



Photo: Andrew Morffew



Photo: Gary McHale



Photo: Paul Chung

GROUP C: All three birds eat insects. Only two are raptors. Which ones?



Photo: Jim Shane



Photo: Marta Curti



Photo: Russell Thorstrom

Answer Key: Group A: Photos 2 and 3 are of raptors (Western Screech-owl, Red-tailed Hawk)
Group B: Photo 3 is of a raptor (Osprey)
Group C: Photos 1 and 3 are of raptors (American Kestrel, Cuban Pygmy-owl)

More Raptor Characteristics

Hearing

As a general rule, raptors have excellent hearing. Their calls and songs would not be important if they did not hear well. A raptor's ears are located on the sides of its head, just like ours, with a few important differences.

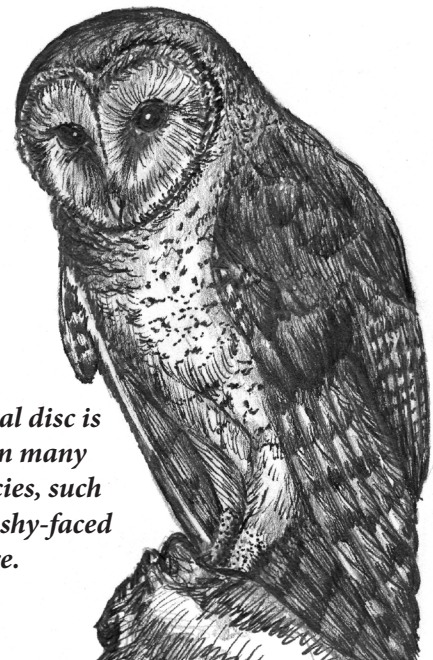
First, raptors don't have earlobes like humans do. They have ear canals that are hidden beneath their feathers. Some raptors, like owls, have asymmetrically positioned ears. This means the ear on one side of the head is higher up than the ear on the other side! This helps the bird triangulate sounds in order to better hone in on the location of its prey.

Species that hunt in semi-darkness or total darkness have especially acute hearing. In fact, some species of owls, such as the **Barn Owl**, can locate and capture their prey in complete darkness using only their hearing.

A few diurnal raptors, such as harriers that hunt over grasslands, or some eagles that hunt in dense forests, also rely heavily on their hearing to locate prey. Like owls, these birds have disc-shaped feathers surrounding their faces. This **facial disc** helps to direct the sound waves to their ears, just like a parabolic dish.

What's that sound?

To better understand how a facial disc works, cup your hands behind your ears, pushing your earlobes slightly forward. Do the sounds seem louder and clearer to you? Now try listening to something far off in the distance. Does cupping your hands behind your ears help pinpoint the direction the sound is coming from?



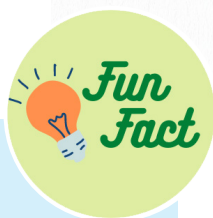
The facial disc is visible in many owl species, such as the Ashy-faced Owl here.

Vocalizations

Most birds of prey have a wide variety of calls and songs which they use to communicate many different things. They have vocalizations to defend their territory, to warn of danger, to help them bond with their mate, to alert their partner or parents when they are hungry, and so much more!

It would be logical to expect that powerful, majestic birds like raptors would have equally majestic and powerful voices. However, most diurnal raptors have rather high-pitched, frilly calls that don't quite fit with their outer appearance. Owls have a wide variety of calls including hoots, screeches, barks, and whistles!

Vultures, on the other hand, can only make hissing and grunting sounds. This is because they lack a syrinx, or voice box.



In the Movies

The piercing call of the Red-tailed Hawk is often used in movies and T.V. shows instead of the real call of the raptor being shown. Next time you hear a raptor calling in a movie, pay attention to the sound! Listen to a Red-tailed Hawk calling by scanning the QR Code.



Sense of Smell

For a long time, researchers believed that birds could not smell anything at all. However, every day scientists are learning more and more about the olfactory ability of birds. They are discovering that many - if not all birds - do indeed have some ability to detect odors, although the intensity of this ability varies from species to species.

Today, it is still generally accepted that most raptors have a very limited sense of smell, with one very important exception.

The **Turkey Vulture** (*Cathartes aura*) has one of the most highly developed senses of smell in all the bird world. They use this sense to locate their food - **carrion** - and may be able to detect a small piece of rotting meat from more than 2 km away!

Perhaps with more research, biologists will discover that raptors have a much more developed sense of olfaction than we ever suspected.

Look at the photo of the Turkey Vulture on the right. The bony structure above its beak helps to protect its nasal passages and keep them clean.

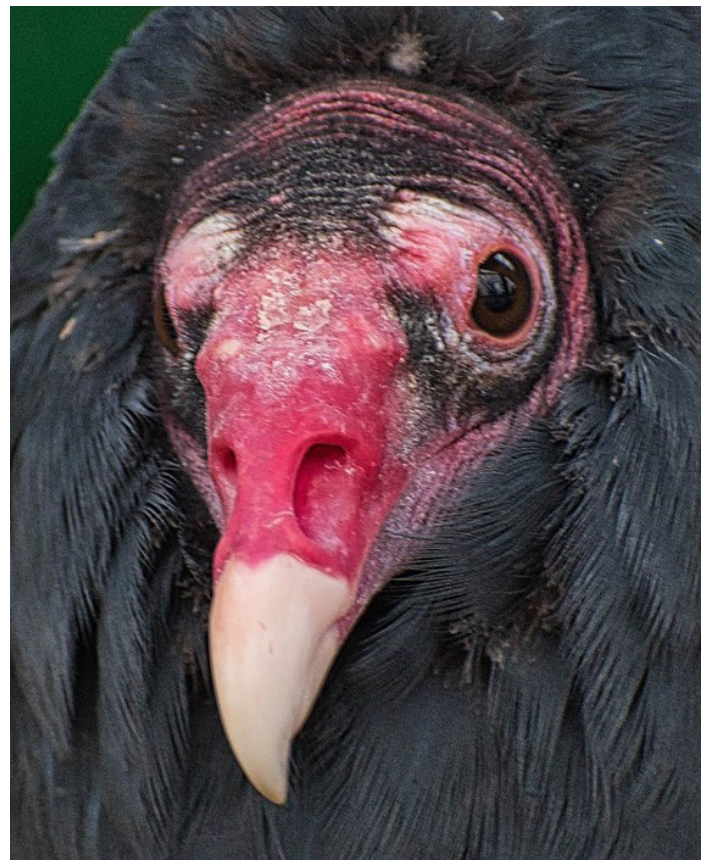


Photo: Michael Breuer

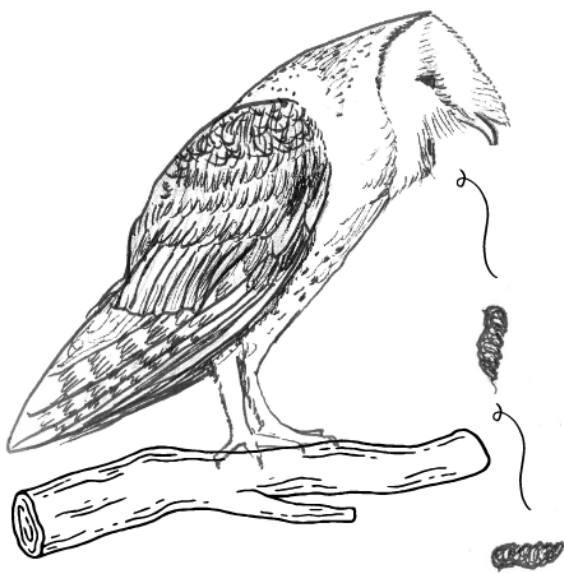
Diet and Digestion

A raptor's diet varies depending on its size, habitat, and many other factors. Some raptors eat primarily insects. Others prefer to consume small, medium or large mammals, reptiles, or amphibians, while others specialize in eating fish. A few raptors also consume fruits. One species, the **Bearded Vulture** (*Gypaetus barbatus*), feeds almost entirely on bones. Others eat carrion, eggs, larvae, and even feces.

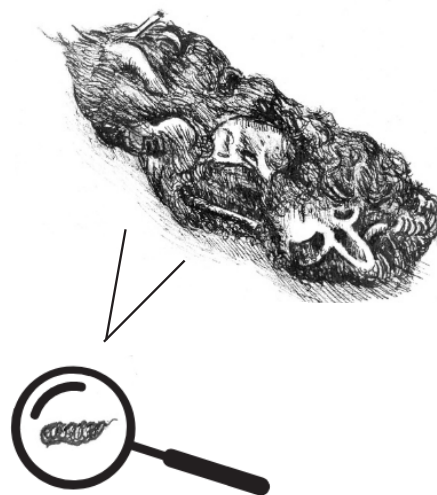
Most raptors, except for owls, have what is known as a **crop**, an organ where extra food is stored before it is digested. When a raptor has eaten a large meal, its crop expands to accommodate all the food!

Though raptors are adapted to eating meat, they are unable to digest some parts of their prey such as fur, feathers, claws, and exoskeletons. All these indigestible parts form a dense pellet. Later this pellet is regurgitated out of the raptor's mouth. By dissecting raptor pellets, we can find clues as to what the bird has been eating. Since many owls often swallow their prey whole, it is possible to find the entire skeleton of their prey inside a pellet.

1. A raptor coughs up a pellet



2. A closer look reveals fur, bones, claws, and other indigestible parts

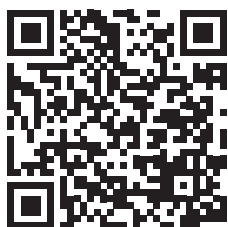
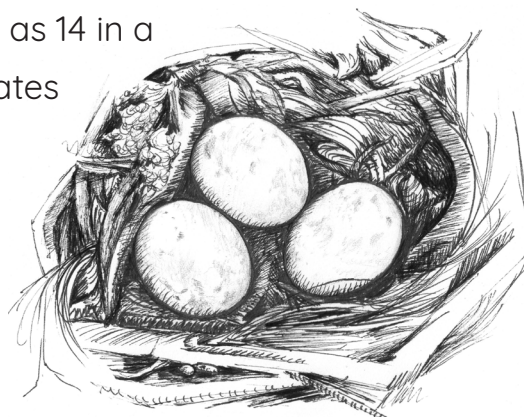


Nests and Eggs

The nesting habitats of raptors are varied. Many falcons and owls do not build their own nests, but instead use nests that were built by other bird species. Some raptors build nests of branches and sticks; others lay their eggs in tree cavities. A few raptor species even nest right on the ground, while others nest on cliff ledges or in treetops. Sometimes only the male or the female is responsible for constructing the nest. At other times both adults share this duty. Some raptors build a new nest each year, while others reuse old nests or alternate between multiple nests.

Many eagle species use the same nests over many generations. There are **California Condors** (*Gymnogyps californianus*) in the Grand Canyon in Arizona, U.S.A. that are nesting in the same caves today where condors nested more than 10,000 years ago! Some raptors, such as **Osprey**, continue to add material to their nests every year, using both natural and human-made materials (cloth, plastic, etc.). Their nests can grow to be very big and heavy. They have been known to measure 3–4 meters deep, and grow to over 1 meter in diameter!

Raptor eggs are relatively large. They are usually round or oval. Large birds of prey tend to lay fewer eggs than smaller birds of prey. Eagles may lay one or two eggs, while small kestrels lay two to six eggs. As a rule, owls lay two to four eggs, but some may lay as many as 14 in a single clutch. Species that live in tropical climates usually lay fewer eggs than individuals of the same species living in temperate zones.



Size Difference Between Sexes

Many people are surprised when they learn that female raptors are larger than males. In some species the females are slightly bigger, while in others they can be more than 30% larger than the males! This difference between sexes is called **sexual size dimorphism**. Scientists have many theories about the reasons for this difference in size. One theory is that females are larger because they are the ones who spend the most time at their nests, protecting the eggs and young. Being big is an advantage when it comes to defending offspring from other animals that can attack the nest. Another theory as to why males are smaller than females is because, at least during nesting season, it is often the males that do most of the hunting. Small, agile, and fast males are usually better hunters. Still another theory suggests that having a small male and a large female allows raptors to hunt different sized animals. This might prevent them from directly competing with one another for food and allow them to capture a wider variety of prey.

Apart from this size difference, most males and females of the same species look identical. However, there are a few exceptions. What differences can you see between the two American Kestrels pictured below?



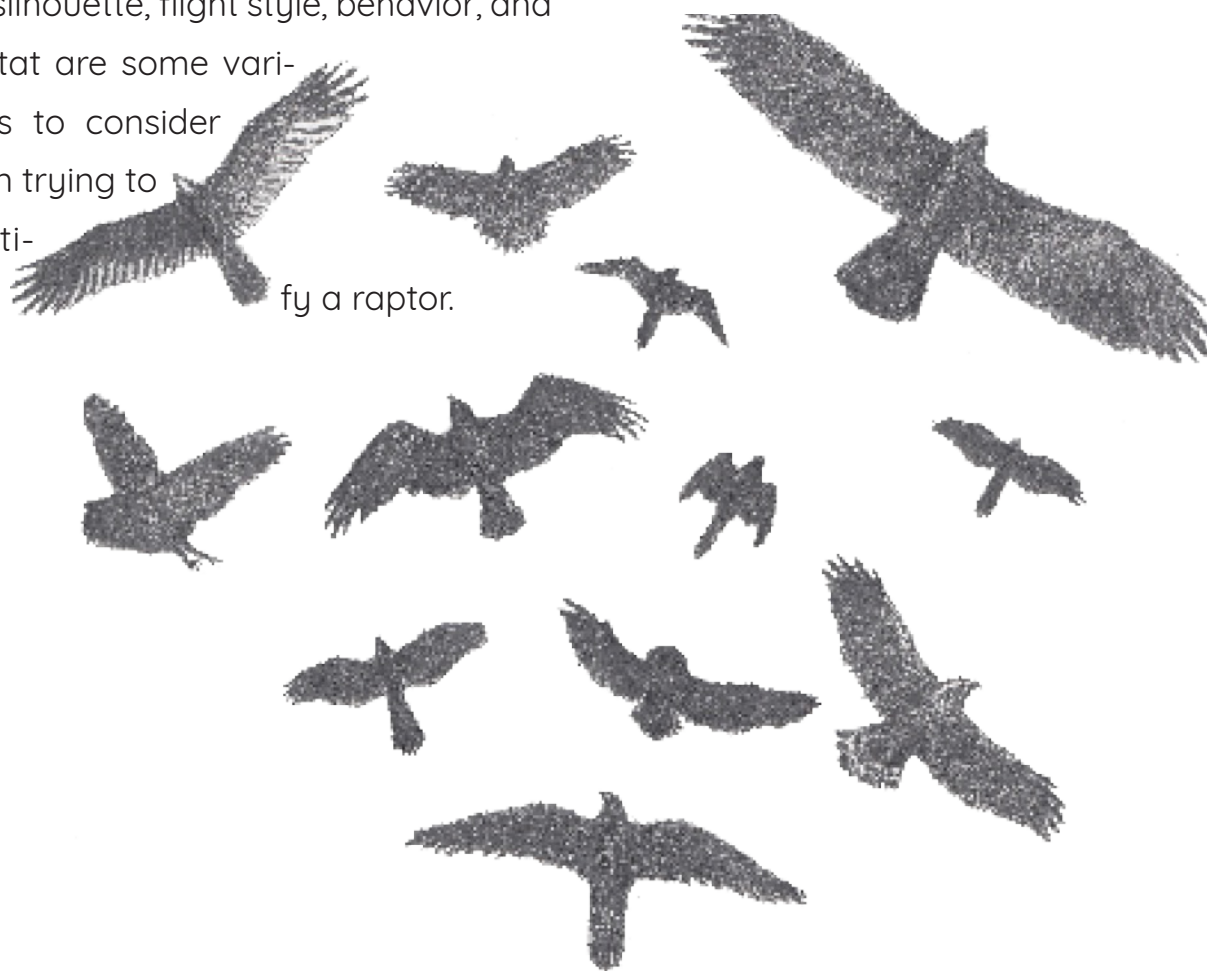
Female (left) and male (right) American Kestrels. Photo: Jim Shane

What Does a Raptor Look Like?

If you have ever been out on a hike, or driving in a car, and spotted a raptor soaring in the sky, or sitting on an exposed perch, you know that it can sometimes be difficult to tell raptor species apart.

Although identifying birds of prey can sometimes be a challenge, learning what to look for will help simplify the process. The color, size of the wings and tail, silhouette, flight style, behavior, and habitat are some variables to consider when trying to identify

One of the best places to start is by focusing on the silhouette, or the shape, of the bird. On the next four pages, we are going to look at the main features of the major raptor groups. These groups are eagles, hawks, kites, falcons, osprey, harriers, seriemas, secretary-bird, and owls.



Eagles

Eagles are large birds with broad wings and tails shaped like a fan. Generally, they nest in treetops or on large cliffs. Among the different species of eagles, there is great variation in their diet. Some eat fish and waterfowl, others eat large mammals like monkeys, and still others are specialized in hunting snakes. Outside of Trinidad and Tobago, eagles aren't found in the Caribbean.



Hawks (Accipiters)



True hawks, or *Accipiters*, have short, rounded wings and long tails. These characteristics are useful for speed and maneuverability in their forest habitats. These small to medium-sized

hawks prey mostly on birds and sometimes small mammals. They have a



distinctive flight pattern of rapid wingbeats alternated with elongated glides. Some *Accipiters* found in the Caribbean include the **Sharp-shinned Hawk** (*Accipiter striatus*), the **Puerto Rican Sharp-shinned Hawk**, and **Gundlach's Hawk** (*Accipiter gundlachi*) which is endemic to Cuba.

Hawks (Buteos)

Buteo hawks are medium-sized birds with heavy bodies, long, broad wings, and short, fan-shaped tails. Hawks soar in wide circles and spend time perched on large branches, fences, power poles or power lines. They live in a variety of habitats, including open savannas, rain forests, and gallery forests. Some hawks found in the Caribbean include the **Ridgway's Hawk**, the **Red-tailed Hawk**, the **Broad-winged Hawk**, and the **Cuban Black Hawk** which is endemic to Cuba.



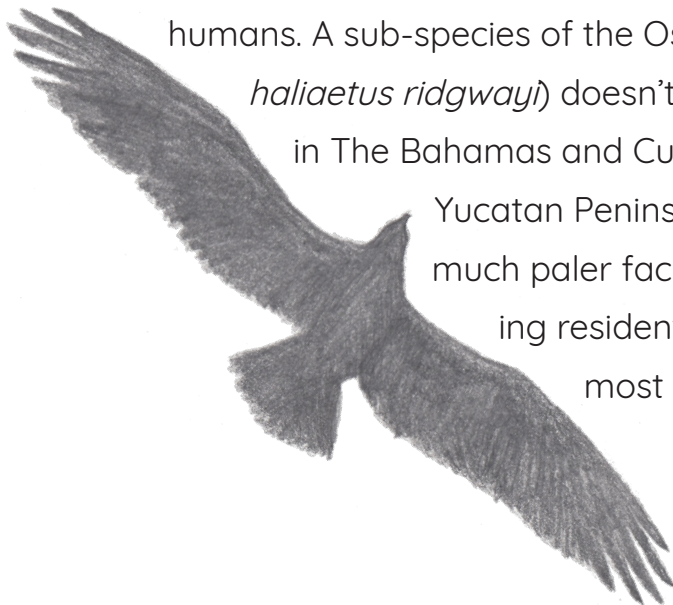
Falcons

Falcons are small to medium-sized raptors with long, narrow, pointed wings. They are powerful fliers and mainly feed on other birds that they catch in flight. Their short and powerful beaks have a characteristic **tomial tooth** on the upper bill, which together with the hooked tip and divot in the lower mandible, acts like a pair of shears to sever the vertebrae of their prey. Females are appreciably larger than males. Some falcons that live or migrate to the Caribbean include **Peregrine Falcon** (*Falco peregrinus*), **Merlin** (*Falco columbarius*), and **American Kestrel**. There are three subspecies of **American Kestrel** found in the Caribbean.



Osprey

The **Osprey**, which is the only bird in the genus *Pandion*, has long, tapered wings. When flying, the wings appear narrow and angled. It has a dark back and a white breast, and a distinctive dark stripe across the eyes. Ospreys dive in pursuit of fish, plunging feet first to snatch their prey with their sharp talons. Ospreys live near water, and nest in treetops, or on top of poles with platforms built by humans. A sub-species of the Osprey, the **Caribbean Osprey** (*Pandion haliaetus ridgwayi*) doesn't migrate and can be found year-round in The Bahamas and Cuba, as well as in parts of Belize and the Yucatan Peninsula. The Caribbean subspecies has a much paler face and breast. Migrant and non-breeding resident Ospreys are common throughout most of the Caribbean islands.



Kites

Kites are medium-sized raptors that, in flight, look somewhat like hawks, but with distinctively different tails. The **Swallow-tailed Kite** (*Elanoides forficatus*), which migrates through the Caribbean, has long wings, a tail that diverges into two points, and an elegant floating flight. In Cuba and Grenada, we can find a sub-species of the **Hook-billed Kite** (*Chondrohierax wilsonii*), and a subspecies of the **Snail Kite** occurs in Cuba.



Owls

Owls are mostly nocturnal. They have large heads framed by a feathered facial disc. Barn owls, in particular, have a divided, heart-shaped facial disc which helps distinguish them from other owls. Owls have elongated curved beaks and keen night vision. Their soft-ended flight feathers allow them to fly almost silently. The in-flight profile of an owl shows wide wings almost twice the length of the tail, and a rounded head. Owls use the nests of other birds or nest in cavities in cliffs or trees. Most owls are inconspicuous in color, with striped or mottled feathers that help them remain camouflaged during daylight hours. Among the owls found throughout the Caribbean are the **Short-eared Owl**, the **Barn Owl**, and the **Stygian Owl** (*Asio stygius*). Many Caribbean Islands have their own endemic owls.



The **Ashy-faced Owl** is found only on Hispaniola, the **Puerto Rican Screech-owl** is found only in Puerto Rico. Cuba has two endemic owl species - the **Bare-legged Owl** (*Margarobyas lawrencii*) and the **Cuban Pygmy-owl** (*Glaucidium siju*), while Jamaica has one - the **Jamaican Owl** (*Pseudoscops grammicus*). There are several subspecies of **Burrowing Owl** found in the Caribbean.



Vultures

Vultures have wide wings and relatively small heads. They feed mainly on carrion and are regularly seen soaring in small groups high in the sky.

They often perch in trees or exposed branches, and on sunny

days they can be seen “sunning” - - spreading their wings with the sun at their backs. Vultures nest on the ground, in tree stumps or caves, on cliff ledges and sometimes in trees. In the Caribbean, the most common vulture is the **Turkey Vulture**. It spends a lot of time soaring and is easily recognizable by its large size, and its two-toned gray and black underwings which it holds in a characteristic “V” shape when in flight.

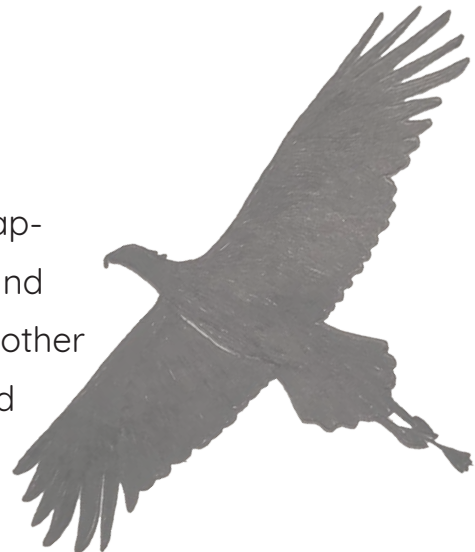


Seriemas

Seriemas are long-legged birds that spend most of their time walking on the ground. They fly only when it is necessary - such as to escape danger. They feed mainly on snakes which they hunt in grasslands. There are only two species of seriemas and both are found only in South America.

Secretarybirds

The **Secretarybird** has the longest legs of any raptor. It is found throughout Sub-Saharan Africa, and like the seriemas, it feeds mainly on snakes and other ground-dwelling animals. It uses its long legs and strong feet to kick and stomp its prey.



BUILD A RAPTOR

Learning Activity 1

Materials:

- ruler
- tape measure
- pen
- paper
- colored pencils
- recyclable materials*
- measurement fact sheets**

Subjects:

- mathematics
- art

Grade Levels:

- K-12th

Objectives:

Participants will:

- 1) practice math and measurement skills,
- 2) use these skills to build a life-sized raptor that displays the three main raptor characteristics.

Ecological Message:

Birds of prey, like all living things, have certain adaptations that help them survive in their particular habitats.

**cardboard, carton, plastic bottles or whatever is available that is fun and easy to use.*

***These are found on pages 42 and 43. It is important to note that among raptors, there are size differences between the sexes and between individuals of the same sex of the same species. The measurements provided are approximations only.*

Process:

1. On the blackboard, list the measurements of the different birds of prey as shown on page 43. Tell students that they are going to use their imagination and math skills to build their own bird of prey.
2. Organize students into groups of 3-4. Distribute 1 or 2 rulers or measuring tapes to each group. Tell the students that, using recyclable objects or natural items they find outside (ensuring students don't cut living plants) they need to build a life-sized bird of prey of their choice. This must include the key

characteristics of a bird of prey and be as close as possible to the real-life measurements of the bird (as indicated in the fact sheets).

3. Allow students at least an hour to work on this project.

4. At the end of the allotted time, allow students to present their raptor sculpture to the classroom, and include information about the main characteristics of the bird of prey they chose to build.

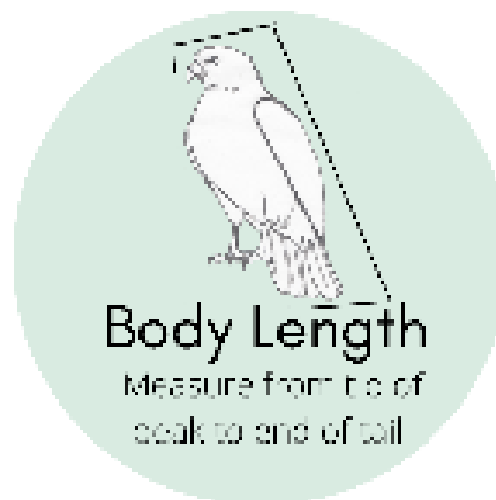
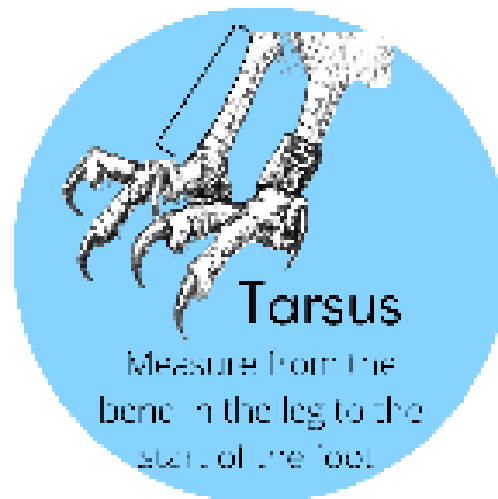
Variations:

To challenge students with more advanced math, reduce or increase the proportions of each feature by $\frac{3}{4}$, $\frac{1}{2}$, 75%, etc.

Extensions:

- a) Organize an art exhibit at your school and display the raptor sculptures.
- b) Using whatever materials are available, build a replica of the hawk's habitat in one corner of the room including trees, rivers, prey, and so on.
- c) Have students write a short story about their raptor - giving the bird a name, a history, etc.

MEASUREMENT DEFINITIONS



SOME RAPTOR MEASUREMENTS

	Wingspan	Beak	Talon	Body Length	Tail	Tarsus
Osprey	1.5 m	34 mm	30 mm	55 cm	228 mm	6 cm
Sharp-shinned Hawk	58 cm	11 mm	8 mm	25 cm	145 mm	42 mm
Barn Owl	116 cm	21.5 mm	32 mm	41 cm	141 mm	72 mm
Hedgehog's Hawk	65 cm	19 mm	16 mm	38 cm	155 mm	65 mm
American Osprey	59 cm	13 mm	10 mm	27 cm	135 mm	35 mm
Snail Kite	112 cm	31 mm	24 mm	38 cm	186 mm	52 mm
Turkey Vulture	180 cm	3.25 cm	22 mm	80 cm	284 mm	76 mm

RAPTOR OLYMPICS

Learning Activity 2

Materials:

- scorecard*
- pencil
- 3 scented items**
- 1 piece of paper
- marker
- clipboard
- whistle (optional)
- stopwatch (optional)

Subjects:

- physical education
- math

Grade Levels:

- 3rd-12th

Objectives:

Participants will:

- 1) be able to name at least two different raptor species
- 2) identify some of the physical abilities they must have in order to survive.

Ecological Message:

Life for raptors can be hard and they must be in excellent physical condition to survive.

**Provide one Raptor Olympics Scorecard (available on page 48) and pencil for every 3-4 students.*

***Scented items can include coffee, cinnamon, mint or any other strong-smelling item that students know well - making sure to keep student allergies in mind.*

Preparation:

1. Locate an open area where participants have space to engage in all the activities. The distances marked for the races should be based on the abilities and ages of the students.
2. In the classroom, on the blackboard, list the following statistics:
 - a. Peregrine Falcons can dive at 250 kms per hour
 - b. The Broad-winged Hawk can travel over 8,500 km round trip during its migration.
 - c. The Turkey Vulture can smell old meat from about 2 km away.
 - d. Diurnal raptors have the sharpest vision of

- all birds - seeing 2 to 8 times better than humans do.
- e. The Red-tailed Hawk is a powerful bird with an estimated grip strength of around 90 kgs per square inch, double that of even the strongest human.

Process:

1. Divide the students into small teams of 2-5 students each. Each group should name their team after a bird of prey or something related to raptors. Each team chooses a member to keep and record scores (scorekeeper).

Note: If some students are not able to participate in the more physical activities, they can help with scoring, timing, as referees, etc.

2. Hand out a Raptor Olympics Scorecard, pencil, and clipboard to each scorer (1 per team).

How to Play:

Long Distance Race - (Broad-winged Hawk) Mark a distance of 200 m using rope, cones, stones, etc. In teams, or individually, students run to the 200 m point and back while continuously flapping their arms. Under "long distance race" on the scorecard*, team scorekeeper will indicate which student on their team came in first, second, third, etc.

Short Distance Race - (Peregrine Falcon) Mark a distance of 50 m. In teams, or individually, students run to the 50 m point keeping their arms at their sides, to represent a falcon in a dive. Under "short distance race" on the scorecard, team scorekeeper will indicate which student on their team came in first, second, third, etc.

Push-ups - (Red-tailed Hawk) Each player has 30 seconds. He or she should do as many pushups as they can. Each should keep their own count. The team scorekeeper will write the number of pushups each student did beneath their name in the "push-ups" category.

The Nose Knows (Sense of Smell) - (Turkey Vulture) Place three aromatic items in different covered containers with holes poked into the lid. On a piece of paper, teacher writes what each item is and places the paper beneath each cup (out of sight of the students). With their eyes closed, students must smell each item and guess what it is, writing their guesses on a scrap piece of paper. When everyone on the team has had a chance to guess, they can look at the answers. The scorekeeper indicates the number of correct answers for each student on the scorecard.

The Eyes Have It (Vision) - (Diurnal raptors) On a large sheet of paper, write a word or phrase in medium-sized letters. Tape the paper to the wall and cover it with another paper. From where the paper is placed, mark distances of 30 cm, 1 m, 1.50 m, and 3 m. Ask students to form one line on the 3 m mark. Remove the paper covering the word and ask the students to try to read the word.** If no one can read it, they walk as a group to the 1.5 m. mark. They try to read the word again. If no one can, walk as a group to the next distance marked, and so on until the first student reads it correctly. Enter the name and distance at which each reads the word on the Scorecard.

**See page 49 for a sample scorecard to see the best way to fill it out.*

***Make sure students whisper the answer to the scorekeeper or teacher so the other students don't hear the answer.*

Follow-up:

Discuss the following:

- a. Who read the secret word from the longest distance? If a raptor sees 5 times better than us, and if it could read, from how far away could it read the secret word?

b. Who ran the fastest short distance and in what time? A Peregrine Falcon can dive at a speed of around 250 kms per hour. How many kilometers per hour did the fastest student run the short-distance race? How does that compare to a Peregrine Falcon?

c. Broad-winged Hawks can fly approximately 8,500 km. round trip or more during their migration. How far and in what time did the fastest student run in the long-distance race? How long would it take this student to run 8,500 km?

d. Ask students if they feel tired after participating in these activities. How would they feel if they had to use so much energy all the time just to eat and survive? Share ideas and feelings.

Extensions:

a) Host a Raptor Olympics event at your school. What other challenges can students come up with, based on the different abilities of raptors?

b) Challenge students to investigate other amazing bird facts and write a story, blog article, or report about them.

c) Allow students to create a “Raptor Olympics” magazine and write articles, comics, etc. about the incredible life of raptors. They can take turns “being” raptors and interviewing each other about their lives as raptors.

WORKSHEET

RAPTOR OLYMPICS SCORECARD

Photocopy & Distribute

Team Name: _____ Score Keeper: _____

Student Names	1.	2.	3.	4.	5.
ACTIVITY: LONG DISTANCE RACE					
Who came in first, second, third, etc. place.?	_____ place	_____ place	_____ place	_____ place	_____ place
ACTIVITY: SHORT DISTANCE RACE					
Who came in first, second, third, etc. place.?	_____ place	_____ place	_____ place	_____ place	_____ place
ACTIVITY: PUSHUPS					
How many push-ups did each student do?	How many? # _____	How many? # _____	How many? # _____	How many? # _____	How many? # _____
ACTIVITY: THE NOSE KNOWS					
How many items did each student correctly identify?	How many? # _____	How many? # _____	How many? # _____	How many? # _____	How many? # _____
ACTIVITY: THE EYES HAVE IT					
At what distance could each student read the mystery word?	Distance _____	Distance _____	Distance _____	Distance _____	Distance _____

* Each challenge represents a different raptor species and its amazing strength and endurance. Which raptor(s) is/are your team/s most like?

Long Distance Race = Broad-winged Hawk

Short Distance Race = Peregrine Falcon

Push Ups = Red-tailed Hawk

The Nose Knows = Turkey Vulture

The Eyes Have It = Diurnal raptors

SAMPLE

SAMPLE SCORECARD

SAMPLE DO NOT PRINT

SAMPLE SCORECARD

Team Name: Super Stygian Owls

Score Keeper: Welinton

Student Names	1. MARIA	2. JOSE	3. KIRA	4.	5.
ACTIVITY: LONG DISTANCE RACE					
Who came in first, second, third, etc. place.?	2nd place	3rd place	1st place	_____ place	_____ place
ACTIVITY: SHORT DISTANCE RACE					
Who came in first, second, third, etc. place.?	1st place	2nd place	3rd place	_____ place	_____ place
ACTIVITY: PUSHUPS					
How many push-ups did each student do?	How many? 20	How many? 22	How many? 15	How many? # _____	How many? # _____
ACTIVITY: THE NOSE KNOWS					
How many items did each student correctly identify?	How many? 3	How many? 2	How many? 3	How many? # _____	How many? # _____
ACTIVITY: THE EYES HAVE IT					
At what distance could each student read the mystery word?	Distance 1.5 m	Distance 3 m	Distance 2.5 m	Distance _____	Distance _____

BIRDS IN MY BACKYARD

Evaluation Activity 1

Materials:

- Birding Activity Sheet*
- pencil
- colored pencils
- binoculars (if available)

Subjects:

- language arts
- science
- art

Grade Levels:

- 3rd-12th

Objectives:

Participants will:

- 1) make observations about bird behavior and use behavioral and physical clues to aid in bird identification,
- 2) differentiate between raptors and other birds,
- 3) practice taking field notes.

Ecological Message:

Birdwatching is an enjoyable, educational activity that helps one relax and have fun!

**Birding Activity Sheet A (page 52) for younger students, and Birding Activity Sheet B (page 53) for older students*

Process:

1. Ask students if they have noticed birds or other wildlife around their school or their homes. Give them a few minutes to describe what they have seen. Explain that they will go outside the classroom to look for birds and will collect information about the ones they see. Then pass out the Activity sheets, pencils, and clipboard (optional) to each student.
2. Once outside, ask students to write down the date, the temperature, and what the weather is like (this could affect the number of birds you see). Then give students a few minutes to watch birds and answer the questions on the Activity Sheet. This can be done in a group or individually. Make an effort to find raptors - but these can be harder to locate.

3. Make sure to allow students time to simply enjoy watching birds and observing their behavior.

4. After the observation time is complete (30-60 mins) speak with students about their experience. What did the students learn and what did they see? If students cannot identify the birds, ask them to brainstorm where they can find the different species' names (books, the Internet, a local elder, etc.). Be sure to follow up on this.

Extensions:

a) Visit a local park, or a botanical garden. Have students compare the number of birds in these areas with those found near the school. Is there a difference? Why?

b) As a class, make a (write your school's name here) Bird Field Guide including illustrations and facts about each bird.

c) Make a mural or sign choosing a bird of prey and another bird. Describe the characteristics of each one, explaining why one is a raptor and the other is not. How is each one important?

d) Research the different native plants that will attract insects and birds to your school yard. Hold a fundraiser (bake sale, car wash, art sale) and purchase these plants and plant them around the school yard. Conduct a long-term experiment, to determine if the number of insects or birds has increased over time.



BIRDING ACTIVITY SHEET - A

Photocopy & Distribute

Name: _____ Date: _____ Weather: _____

Look around. How many different species of birds can you find? _____

Pick a bird to look at. What color(s) are its wings? What color(s) is its head?
Its eyes? Its belly? _____

Describe its beak: _____

Describe its legs: _____

Draw the bird here



Answer the following questions:

1) Is the bird you are looking at a bird of prey? Yes or no? _____

2) Why or why not? _____

WORKSHEET

BIRDING ACTIVITY SHEET - B

Photocopy & Distribute

Observer name: _____ Start Time: _____ End Time: _____

Weather: _____ % Cloud cover: _____

Habitat Type: tropical forest, farm, desert, grassland, prairie, marine, lake, river, rural, urban, other: _____

Number of birds observed in the area: _____

Pick a bird (or group of birds) to observe. Is the bird alone or in a group? _____

Describe the bird's beak: long, short, wide, thin, curved, straight, other: _____

What color is the beak? _____

Describe the bird's legs, including color: _____

What is the color of the bird's head? _____ wings? _____ tail? _____

Describe the bird's behavior: perching, eating, flying, collecting material for a nest, etc.

Draw a picture of the bird here



Answer the following questions:

1) Is the bird you are looking at a bird of prey? Yes or no? _____

2) Why or why not? _____

CARIBBEAN RAPTORS

Chapter 2

Words to Know

anthropogenic endemic
endangered
resident migratory

Learning Objectives for Chapter 2

Participants will be able to:

1. Explain the difference between migratory, resident, and endemic species
2. Name up to three species of raptors
3. Describe the general diet, habitat, and nesting habits of at least one raptor

More than 40 different raptor species can be found in the Caribbean. Some species are **resident** - meaning they are in the region year-round and breed here. Some examples of resident Caribbean species include the **Red-tailed Hawk** and the **Burrowing Owl**. Some resident species are also **endemic**. This means they are found in only one small area in the world, and nowhere else on Earth.

In the case of the Caribbean, endemic species might be found only in the region, or even on just one island! Some examples of endemic species include **Ridgway's Hawk**, which is found only on Hispaniola, the **Jamaican Owl** which is endemic to Jamaica, and the

Cuban Black Hawk which is found only in Cuba. Still other raptor species are **migratory**. During October through December, migratory raptors travel from North America to Central and South America. Some of these birds use the Caribbean islands as a quick stop-over point on their journey further south. Others spend the entire winter in the Caribbean before returning back north in the spring. Some migratory birds of prey include the **Swallow-tailed Kite** and the **Swainson's Hawk**.

In this chapter, we are going to learn about some of the amazing raptors we can find in the Caribbean, including endemic species, residents and migrants.

RIDGWAY'S HAWK

Scientific Name:

Buteo ridgwayi

Status:

Critically Endangered

Endemic to:

Hispaniola



Photo: David Anderson

Did you know...?

In the year 2000,
there were only 200-300
Ridgway's Hawks left
in the world!

Diet	Active During	Silhouette
		
Habitat	Nests in	# of eggs < or =
		

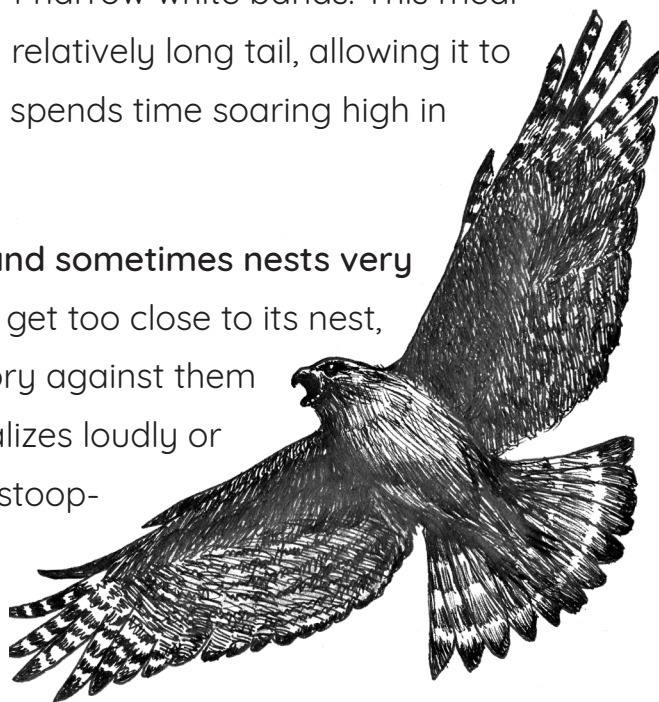
Where It Lives

The Ridgway's Hawk is the only **diurnal** bird of prey **endemic** to Hispaniola. It makes its home in undisturbed lowland forests, and a wide variety of other habitats, including tropical forests, subtropical dry and wet forests, pine forests, karst limestone forests, and even in secondary forests and agricultural areas. It is found from sea level to 2,000 meters above sea level. Researchers have found that these birds often nest in forest fragments and altered human habitat, at forest edges, secondary forests, active and abandoned farms, plantations, residential areas, golf courses, and grazing lands. **The fact that this hawk can live and nest in many different habitats is good news! That means it is very adaptable and can survive even in disturbed habitats, as long as a suitable prey can be found.**

Identification & Behavior

Both males and females look very similar. They have slate-gray backs and their bellies are streaked with gray and white barring. Their thighs are reddish, and they have a gray tail marked with 3 to 4 narrow white bands. This medium-sized hawk has broad wings and a relatively long tail, allowing it to maneuver deftly through forest. It also spends time soaring high in the sky.

This hawk is not shy around people and sometimes nests very close to human settlements. If people get too close to its nest, however, it is quick to defend its territory against them or any other potential predator. It vocalizes loudly or flies swiftly after the perceived threat, stooping and chasing it to a safe distance away from the nest and young. Often, both the male and female work together to chase off intruders.



Diet

Ridgway's Hawks eat just about anything small enough to catch, including rodents, snakes, lizards, skinks, frogs, toads, insects, bats, and birds. They are patient hunters. They spend a lot of time perched in relatively low snags or branches. When prey is spotted, they dive after it, often snatching it up from a log or directly from the ground. During nesting season, and perhaps all year-round, these hawks sometimes **cache** (store) food to be eaten later. This saves them time and energy and allows them to take advantage of an easy catch, instead of letting it escape because they aren't hungry at the moment. It is like buying enough groceries for several meals, rather than going to the store every time you are hungry.

Nesting

Ridgway's Hawk pairs are **monogamous**, meaning they stay together for life. They work together to build stick nests high up in hardwood or palm trees. They often place their nests right on top of active **Palmchat** (*Dulus dominicus*) nests, so that the nests resemble a two-story apartment. The Palmchats, which are the national bird of Dominican Republic, nest on the "first story", with the hawks nesting above. The female lays one to three eggs (usually two) which she and the male incubate for about 35 days until the young hatch. The nestlings grow fast and in 40-50 days they are ready to fly for the first time. The young hawks remain in their parents' territory for about three months before flying off and looking for a territory of their own.

Threats & Conservation

While habitat loss, electrocution on power lines, collisions with motor vehicles, and rodenticides are all threats to this species, the greatest human-caused threat it faces is human persecution. People shoot these hawks because they fear the hawks will kill their chickens. They also sometimes kill and eat the hawks. Sometimes, people capture the hawks to keep them in cages.

The biggest natural threat these birds face is from a fly! A parasitic nest fly (*Philonis ssp*) lays its eggs in the nest. When the larvae hatch, they burrow into the skin of young nestlings, feeding on their muscle tissue, flesh, and blood. If a baby bird becomes infested with a lot of fly larvae, it will usually die.

The Peregrine Fund, with local partners, has been studying the Ridgway's Hawk since 2000. Biologists spend long days in the field, hiking for many hours to visit all the known nest sites and to find new ones. At each nest, biologists observe the birds to learn more about their behavior, what they are eating, and all sorts of other interesting things! Biologists also climb into the nests to check on the nestlings, treat them for parasitic fly infestations, or place bands on their legs. Banding birds is a way for biologists to learn how many young survive each breeding season and to gather information on how far they travel after leaving their parents' territory.

In 2008, The Peregrine Fund and local organizations worked together to release young Ridgway's Hawks in protected areas in the Dominican Republic, so that these young birds would grow up, find a mate, and begin to raise young of their own. By doing this, conservationists are helping to create new populations of Ridgway's Hawks. So, if a hurricane or disease does hit, the chances are greater that some individuals or even whole populations will survive. And these efforts are paying off! Today, the population of hawks is continuing to grow!

Another important component of conservation is environmental education and community development. The team of local organizations in Dominican Republic and Haiti have been working with local community members to teach them about the importance of this hawk. The more people there are who know about it, the more people there are who will be willing to protect it. In conservation work, gaining the support of the people who share the environment with wildlife can be just as important as the field work carried out to study the species.



ASHY-FACED OWL

Scientific Name:
Tyto glaucops

Status:
Least Concern

Endemic to:
Hispaniola



Photo: Dax Roman

Did you know...?

The Ashy-faced Owl is the only nocturnal raptor endemic to Hispaniola.

Diet	Active During	Silhouette
		
Habitat	Nests in	# of eggs < or =
		

Where It Lives

The Ashy-faced Owl is fairly common on Hispaniola. It lives in a wide array of habitats from 0 to 2,000 meters above sea level. In general, it prefers to hunt in open areas, such as pasturelands and grasslands, but roosts in more forested habitat. It can even be found in areas that are also occupied by humans.

Identification & Behavior

The Ashy-faced Owl is a nocturnal bird of prey. It resembles the Barn Owl, except it is much darker overall. Its facial disc is gray, and its back and wings are more tawny. This species doesn't migrate, and is known for having a raspy, screeching call.

Diet

Ashy-faced Owls are quite skilled at catching rodents. This makes them a good friend to farmers. By feeding on rodents, these medium-sized owls are highly effective at controlling mice and rat populations that can damage crops and spread disease to domestic animals and humans.

But apart from eating rodents, they also eat many other things. One researcher documented these owls eating at least 9 species of amphibians, 23 species of reptiles, 13 species of bats, and almost 80 species of birds including egrets and even other raptors, like American Kestrels.

Ashy-faced Owls are silent hunters that use their keen eyesight and hearing to locate and capture prey. Like other owls, and some other raptors, they are equipped with a facial disc, a group of feathers around their heads that helps direct



sound to their ears. This characteristic allows them to hear the rustle of a mouse in the grass, the flapping of feathers in the night, or the slithering of a snake on a tree branch. These sounds give away the location of prey animals, making it easy for these owls to deftly swoop in to catch a meal.

Nesting

There is a lot we don't know about Ashy-faced Owl nesting habits. Scientists have documented Ashy-faced Owls nesting in holes in trees, on ledges and in crevices, and even in man-made structures. Recently, Peregrine Fund staff discovered an Ashy-faced Owl nesting inside an active Palmchat stick nest. The Palmchat is a small songbird and the National Bird of Dominican Republic. Though Ridgway's Hawks most often build their nests atop active Palmchat nests, this was the first time anyone had ever documented an Ashy-faced Owl nesting within the active nest of another bird species.

Ashy-faced Owls can lay between two and seven bright white eggs. When the chicks hatch, they are covered in fluffy down.

Threats & Conservation

The Ashy-faced Owl, like many birds of prey, is often misunderstood by people. There is a myth that these owls try to mate with chickens and infect the hens with a disease that makes them unable to lay eggs. Though there is no scientific evidence to prove this is happening, many people still blame owls when their hens fall ill. This can lead people to shoot owls.

The use of rodenticides can be another major threat to these birds. Many people use poison baits to kill rodents. These poisons are anticoagulants, which means they prevent the body from forming clots to stop bleeding. When this poison is consumed, it causes internal bleeding and death. However, it often takes a poisoned rodent several days to die from this poison. In the meantime, it continues its regular activities. This sick rodent is an easy target for a hungry owl. Each time an owl eats a poi-

soned rodent, some of that poison builds up in its system. If an owl eats many poisoned rats, it, too, will become poisoned and die.

By inadvertently poisoning owls, snakes, hawks, and other animals that are rodents' natural predators, humans are making it easier for rats and mice populations to grow!

Currently, environmental education programs are underway in Dominican Republic that teach people about the importance of birds of prey, including the Ashy-faced Owl.

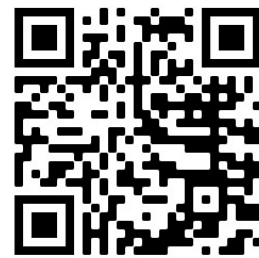


Photo: Carlos Suarez

PUERTO RICAN SHARP-SHINNED HAWK

Scientific Name:
Accipiter striatus venator

Status:
Critically Endangered

Endemic to:
Puerto Rico



Photo: Julio C. Gallardo

Did you know...?

The Puerto Rican Sharp-shinned Hawk population was greatly reduced by Hurricane Maria, which hit the Caribbean in 2017.

Diet	Active During	Silhouette
		
Habitat	Nests in	# of eggs < or =
		

Where It Lives

The Puerto Rican Sharp-shinned Hawk is an endangered species endemic to the island of Puerto Rico. It lives in mature and secondary forests and shade coffee plantations. Unlike the Sharp-shinned Hawk (*Accipiter striatus velox*) found in North America, the Puerto Rican Sharp-shinned Hawk does not migrate and remains on the island all year round.

Identification & Behavior

Adult Puerto Rican Sharp-shinned Hawks have dark gray backs and reddish-orange bars that run horizontally on their breasts. They have long legs and long tails; the latter is marked by wide bands. They have dark eyes, and a yellow cere and legs. These birds spend time perching on branches and soaring in the sky. During breeding season, they can be quite vocal.

Diet

The Puerto Rican Sharp-Shinned Hawk is equipped with long thin legs, ideal for trapping small, aerial prey. It feeds mostly on smaller birds and insects but it has also been known to capture small lizards from tree branches.



Nesting

The adult male and female work together to build a stick nest which they line with bark and greenery. The nest is placed in a dense stand of trees. After the nest is ready, the female will lay her eggs. She will incubate them for 30-32 days. The nestlings fledge in three to four weeks. When these young hawks reach one year old, they will be able to find a mate and raise their own nestlings.

Threats & Conservation

The cause of this species' population decline is still unknown; however, it may have been the result of several factors. These include habitat loss, forest fragmentation, high nestling mortality rate caused by a parasitic nest fly (*Philornis* sp.), nest predation by the **Pearly-eyed Thrasher** (*Margarops fuscatus*), and changes in the forest composition and structure due to natural disturbances such as hurricanes. The Puerto Rican Sharp-shinned Hawk has been on the U.S. Endangered Species List since 1994.

In 2017, Hurricane Maria decimated the forests of Puerto Rico. The majority of mature trees were blown down, uprooted, or had their leaves stripped off. Without foliage, nestlings don't have shelter from heat, rain, or predators. Even adult birds are subject to starvation because their main prey—small birds like tanagers, warblers, and vireos—also depend on adequate forest habitat. With such difficult conditions, conservationists began to provide supplemental food so the remaining Sharp-shinned Hawks could become healthy enough to breed.

As pairs began to lay eggs, conservationists carefully moved some of these eggs into incubators to hatch in a secure, climate-controlled breeding facility on the island. Since these hawks normally produce a second set of eggs if the first set is lost, they were able to raise chicks in the safety of a facility without compromising the wild parents' success. In the first year of captive-rearing, conservationists raised and released six young, while the wild pairs raised only two.

The future looks bright for the Sharp-Shinned Hawk. Through an ever-growing range of knowledge and expanded collaborative efforts, The Peregrine Fund, along with the help of countless entities and individuals, will continue to help save this species.

PUERTO RICAN SCREECH-OWL

Scientific Name:
Gymnasio nudipes

Status:
Least Concern

Endemic to:
Puerto Rico



Photo: Andre Nunez

Did you know...?

The Puerto Rican Screech-Owl is known locally in Spanish as “Múcaro” a word that comes from the Taíno word “Múcuru.”

Diet	Active During	Silhouette
		
Habitat	Nests in	# of eggs < or =
		

Where It Lives

The Puerto Rican Screech-Owl is the only arboreal owl and nocturnal raptor endemic to Puerto Rico. The species is common and widespread throughout the island. It can be found in forests, coasts, and urban areas throughout Puerto Rico. It prefers forests with a developed understory, hardwood trees for nest cavities, and dense vegetation to roost in during the day.

Identification & Behavior

This owl is small with a round head, bare legs (the Latin name for the species “nudipes” refers to its unfeathered legs), and a facial pattern of white “eye-brows” that form an “X” over the bill. Its plumage ranges from grayish brown to reddish-brown, it is white below and marked with brown streaks, and it has reddish-brown eyes. When alarmed, it raises its short feather tufts that look like “ears.” Females are slightly larger than males.

Although vocal throughout the year, the screech-owl can be hard to spot since it is nocturnal. It often calls while hidden deep within thick foliage during the evening and early in the morning. Its vocalizations have been described as a low-pitched trill and have also been compared to the sound of monkeys. Females and males often perform duets, singing together.

Nesting

Breeding season is believed to be from April to June. They generally nest in tree or other cavities and produce a clutch of one to three white eggs.

Diet

Puerto Rican Screech-Owls feed mostly on insects and small vertebrates, such as anole lizards, coqui frogs, small birds, and rodents. Like other owls, they swallow their prey whole and then regurgitate the parts that can’t be digested in a hard pellet.

Threats & Conservation

The population in Puerto Rico is believed to be stable, and this owl is considered a species of Least Concern. However, another bird found in Puerto Rico, the Pearly-eyed Thrasher, is known for eating the eggs of other birds, including those of the Puerto Rican Sharp-shinned Hawk. It is possible this thrasher could be causing some decline in the owl's population by causing some nest failures.

The subspecies *Gymnasio nudipes newtoni* inhabited Puerto Rico's offshore islands (Vieques and Culebra), the Virgin Islands (St. Thomas, St. John, and St. Croix), and the British Virgin Islands (Guana, Virgin Gorda, and Tortola). However, there have been no recent confirmed records of this subspecies since the 1900s. It is considered extremely rare or perhaps extinct.

Teaching people about the importance of owls is a good way to help protect them.

JAMAICAN OWL

Scientific Name:
Pseudoscops grammicus

Status:
Least Concern

Endemic to:
Jamaica



Photo: Matt Grube

Did you know...?

The Jamaican Owl is the only bird of prey endemic to Jamaica.

Diet	Active During	Silhouette
		
Habitat	Nests in	# of eggs < or =
		

Where It Lives

The Jamaican Owl is **endemic** to Jamaica. It is found in lowland habitats (usually below 600 meters above sea level) and can be seen hunting, perching or roosting in open wooded areas, along the edges of forests, and even in urban gardens, parks or agricultural fields.

Identification & Behavior

This owl has dark eyes, and a bright rufous colored body marked with fine, black streaks along its breast. Its **facial disc** is edged with white and black feathers, and it has very prominent ear tufts. It is important to remember that these ear tufts aren't ears at all. Though they do resemble the ears of some mammals, ear tufts are actually feathers that stick up on each side of the bird's head. They are thought to help birds communicate with and identify other members of their species. They also help in camouflage, breaking up the owl's silhouette.

Diet

Jamaican Owls feed on a wide variety of prey including insects, such as beetles, and small rodents, spiders, snakes and frogs. There is even one record of a Jamaican Owl feeding on a grackle - a type of bird!

Nesting

Like most owls, Jamaican Owls don't build their own nests. Rather, they nest in tree cavities or in tree forks. They lay up to two eggs.

Threats & Conservation

Two of the main threats to the Jamaican Owl include loss of habitat and human persecution. Sadly, some people fear owls, because they mistakenly believe that they are associated with death. When they see an owl, they might kill it because of this fear. Even though this owl is categorized as Least Concern, its population is in decline. Teaching people about the importance of owls is a good way to help protect them.

CUBAN BLACK HAWK

Scientific Name:
Buteogallus gundlachii

Status:
Threatened

Endemic to:
Cuba



Photo: Russell Thorstrom

Did you know...?

Scientists estimate that the Cuban Black Hawk has already lost around 50% of its habitat.

Diet	Active During	Silhouette
		
Habitat	Nests in	# of eggs < or =
		

Where It Lives

The Cuban Black Hawk is endemic to the island of Cuba and Isla de la Juventud. It is often found near beaches, coastal swamps, and mangroves, as well as palm savanna and along roadsides.

Identification & Behavior

This hawk is mostly all black with some mottling of browns and greys. Its tail has one large white band. The Cuban Black Hawk is diurnal, meaning it is active during the day. It is non-migratory and likely remains on its territory all year.

Diet

The Cuban Black Hawk feeds on several different species. A high portion of its diet includes crabs, but it also feeds on centipedes, lizards, birds, and rats. One researcher observed this hawk drowning a **Common Moorhen** (*Gallinula chloropus*), which is an unusual prey item. This could be an unusual behavior for this species too.

Nesting

Cuban Black Hawks breed from January through June. They build large nests that are cup-shaped and made of mangrove twigs, which they place 3.5-8 m high in the canopy. The females can lay one to two eggs, which are dull grayish-white. There is still so much to learn about the breeding habitats of this amazing hawk. It could be an excellent species for any biologist to study!

Threats & Conservation

The main threat to the Cuban Black Hawk is habitat loss and degradation. Its population has been declining over the past few decades. Programs to support conservation of wetlands and mangroves would be a good way to help protect this species.



BARE-LEGGED OWL

Scientific Name:
Margarobyas lawrencii

Status:
Least Concern

Endemic to:
Cuba



Photo: Russell Thorstrom

Did you know...?

During the day, the Bare-legged Owl roosts in well-concealed places, such as in dense foliage, tree cavities, or caves.

Diet	Active During	Silhouette
		
Habitat	Nests in	# of eggs < or =
		

Where It Lives

The Bare-legged Owl is found only on two islands in the entire world - Cuba and Isla de la Juventud, an island off Cuba. It lives in a variety of habitats including wooded areas, forest, shrub areas, and even human-altered habitats.

Identification & Behavior

The Bare-legged Owl's name comes from the fact that it has no feathers on its legs at all. It has dark eyes, an off-white facial disc, and dark rectal bristles, which are hair-like feathers that grow around the bird's beak. The Bare-legged Owl lacks ear tufts. Like many owl species, this small owl is nocturnal.

Diet

Like all owls, the Bare-legged Owl is a carnivore. It feeds on insects, arthropods, and small reptiles and amphibians, which it often captures from the ground.

Nesting

This small owl is reliant on other birds, such as woodpeckers, to help it find a place to nest. These owls nest in natural cavities found in trees, crevices and caves, but they will also lay their eggs in tree holes created by other species, such as woodpeckers!

The female usually lays one to two eggs, but at least on one occasion researchers documented three owlets in a nest.

Threats & Conservation

The Bare-legged Owl population is considered stable. It has a wide distribution across the island and it seems to be adaptable to living in many human-altered habitats. Teaching people about the importance of owls is a good way to help protect them.

AMERICAN KESTREL

Scientific Name:
Falco sparverius

Status:
Least Concern

Resident & Migratory:
The Americas



Photo: Rob Palmer, falconphotos.com

Did you know...?

The American Kestrel is the smallest falcon in the Caribbean and in North America.

Diet	Active During	Silhouette
		
Habitat	Nests in	# of eggs < or =
		

Where It Lives

American Kestrels are found throughout most of North America, Central America, South America, and the Caribbean. They can be found in a variety of habitats, including grasslands, deserts, urban areas, and agricultural fields. If there are sufficient perches, such as power lines and trees, good nesting cavities, and abundant prey, chances are kestrels will be there too. In the northern part of their range, much of their prey hibernates or leaves during the cold winter months, so they must migrate further south, to where more food is available.

Identification & Behavior

The American Kestrel is one of the most beautiful falcons in North America. Its feather patterns of blues, reds, grays, browns, and blacks make this small bird of prey a real eye-catcher! Apart from their good looks, American Kestrels are also swift fliers with astounding aerobatic abilities.

Kestrels, like only a few other birds of prey, are very good at hovering. With the help of a good headwind, kestrels can flap their wings vigorously and maneuver their tail so they can stay in one spot, like a helicopter in mid-air, while searching the ground for prey. Though it is a small bird, the kestrel needs strength, agility, and stamina to maintain this static flight. When you see kestrels in flight, notice how their wings, tail feathers, heads, bodies, and even feet all change shape and direction to help this amazing bird achieve such aerial feats.

Diet

American Kestrels feed mainly on insects, mice, voles, lizards, and snakes, making this bird a very good friend to farmers! Like the Barn Owl and many other birds of prey, American Kestrels help keep agricultural fields free of animals that might damage crops.

When hunting, American Kestrels search for prey from a perch overlooking an open area or by hovering in the air. When a kestrel spots its prey, it plunges

down, in what's called a stoop, to catch it. Kestrels usually capture their prey on the ground, though they can also take prey in the air. After catching their prey, kestrels will carry it up to a perch (such as a power line or fence post) from which they can comfortably eat. Being up high keeps them away from ground predators, though they still have to watch out for other birds that might attack them or steal their catch.

Nesting

Like other falcons, kestrels don't build their own nests. Instead, they lay their eggs in cavities in trees, cacti, and cliffs. They also nest in nesting boxes made by people or in crevices in buildings. It is important to note that even though kestrels nest in tree cavities, they are unable to make these cavities themselves. They rely on the work of other birds, such as woodpeckers, to provide them with good nest sites. In fact, an American Kestrel won't nest unless it has an adequate hole available in a tree, building, or nesting box. A lack of good nesting cavities limits this species' reproduction and population.

American Kestrels, like many birds of prey, are solitary, meaning they spend most of their time alone. The exception to this is during breeding season. The male and female spend a lot of time together during courtship and breeding and while raising young.

Females usually lay four to six eggs that are white with brown spots. Both the male and female help incubate the eggs. After about 29 days, the young kestrels hatch.

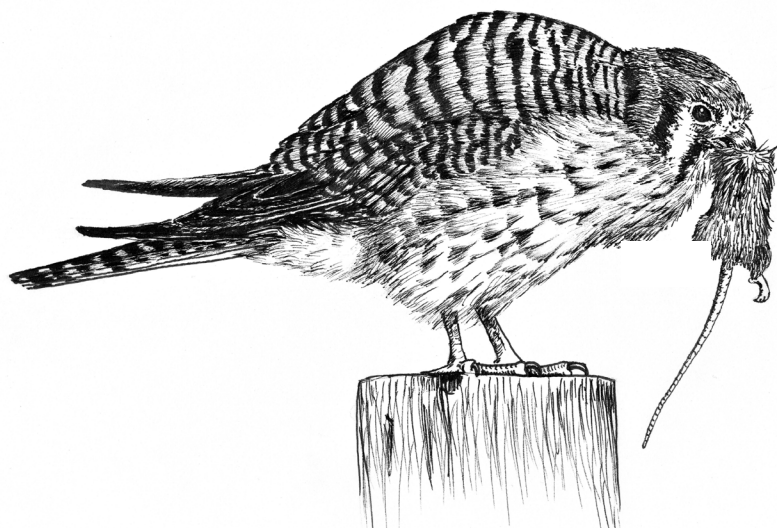
While they are growing, kestrel nestlings eat about twice as much as the adults do – consuming two or three mice a day! About 28-31 days after hatching, the chicks are grown and ready to take their first flight. For any bird, the first flights are the most precarious. They leave the nest and, though their parents are still around to protect them, young inexperienced birds can get into a lot of trouble.

They have to learn to recognize and evade predators, and they can be injured or killed - facing such dangers as flying into windows, being hit by cars, or becoming tangled up in barbed wire fences. Placing a nest box away from roads and fences can help provide the young kestrels with a safe environment in which to practice hunting and evade danger. American Kestrels are able to reproduce as early as one year of age.

Threats & Conservation

The American Kestrel was once one of the most common raptors in North America. Lately, however, scientists have noticed that this species' numbers are beginning to decline - and no one really knows why. Causes may include loss of habitat, increased predation by other raptors, and pollution. There also may be more competition for nesting sites from species like the **European Starling** (*Sturnus vulgaris*) that were not historically found in North America but were introduced there by humans.

The first step in helping the American Kestrel is understanding why they are declining in the first place. For more information and to learn how you can help, please visit <https://kestrel.peri.com>



TURKEY VULTURE

Scientific Name:

Cathartes aura

Status:

Least Concern

Resident:

The Americas



Photo: Ron Dudley

Did you know...?

Turkey Vultures spend a lot of time soaring and can travel great distances in relatively short periods of time.

		
Habitat	Nests in	# of eggs < or =
		

Where It Lives

Turkey Vultures are the most widespread of all the New World Vultures. They are found from southern Canada, throughout most of the continental United States, Mexico, Central and South America, and the Caribbean islands. Northern populations of Turkey Vultures are migratory; during the coldest months, they will travel south in large groups, called “kettles,” composed of tens of thousands of individuals. They live in a wide range of habitats from deserts and grasslands to forested areas, marshes, coastlines, agricultural fields, and even near human settlements, especially around garbage dumps and landfills.

Identification & Behavior

Turkey Vultures have dark brown, nearly black, bodies, bright red heads, and pale beaks. In flight, they teeter gently from side to side with their wings held open in a slight “V” shape. They are most recognizable by their featherless heads. While some people think this makes vultures look ugly, it actually makes them quite beautiful. And it serves an important purpose. When feeding, vultures sometimes need to stick their heads deep into the cavities of dead animals. Having a bald head is very useful – otherwise bits of flesh, blood, or other fluids might get stuck on their feathers, creating quite a mess. Though vultures spend a lot of time cleaning their feathers, it would be impossible for them to clean their own heads. Bald heads might also help them stay cool in hot weather, or soak up the sun’s rays on chillier days.

In addition to their bald heads, Turkey Vultures have other unique adaptations to keep cool. They will sometimes pee on their own legs! This is called “urohidrosis” and they do it for two reasons. First, because Turkey Vultures don’t sweat like we do, they need a way to cool off in hot weather. When the urine evaporates from their legs, it has a cooling effect. But there is another benefit! Their urine contains properties that might help kill any bacteria on their legs and feet that they may have picked up. Though it might seem gross to us, it actually helps keep the vultures clean.

Diet

Turkey Vultures feed almost entirely on animals that are already dead. Though they have been documented killing very weak or very sick animals, this is rare. They consume animals as big as deer or sheep, and as small as squirrels and lizards. When searching for a meal, they often fly low over an area, using their sight and their amazing sense of smell to find food. Vultures are social feeders, which means many birds might join together to feed on a large carcass.

Nesting

Turkey Vultures don't build nests. They lay their eggs in natural substrate in small caves, on the ground, in hollow logs, and even in abandoned buildings. The female usually lays up to three eggs and will incubate them for 38-41 days. After the nestlings hatch, the adults must feed their young often. However, they don't bring prey back to the nest in their talons like many other birds of prey do. Instead, they regurgitate food they have eaten themselves, and feed this to their young. When the young hatch, they have dark grey heads and their bodies are covered in light down. Little by little, their dark feathers will start to grow in. The young vultures fledge about 10-11 weeks after hatching.

Threats & Conservation

Turkey Vultures were negatively affected by the use of the pesticide DDT in the 1950s and 1960s in North America. Today, the population is stable and even increasing. They are common and widespread in the Americas, and evidence suggests they are expanding their range northward. This could be because of climate change, or because they are able to survive in human-altered landscapes, which may provide them with more food sources than were present historically. Turkey Vultures play an important role in the health of our ecosystems. As Nature's clean-up crews, they help control the spread of certain diseases by quickly consuming carcasses that may otherwise take a long time to decompose.



OSPREY

Scientific Name:

Pandion haliaetus

Status:

Least Concern

Resident & Migrant:

Worldwide



Photo: Tom Sheley

Did you know...?

Ospreys are one of the most widespread raptors in the world, found on every continent except Antarctica!

Diet	Active During	Silhouette
		
Habitat	Nests in	# of eggs < or =
		

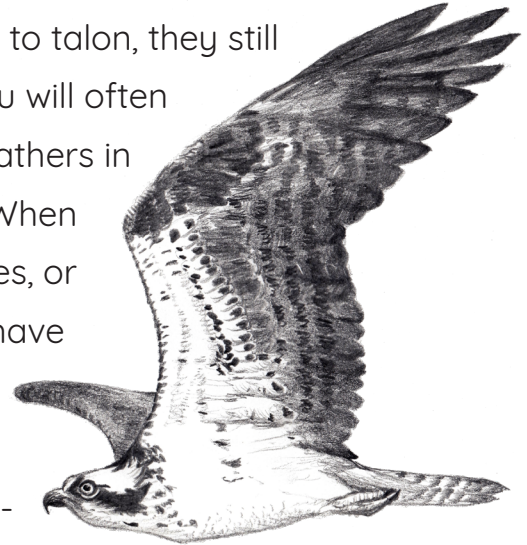
Where It Lives

Ospreys live in both temperate and tropical climates. Because they are principally fish eaters, they like to remain close to still or slow-moving bodies of water, such as oceans, rivers, lakes, mangroves, coastal wetlands, lagoons, reefs, estuaries, marshes, and even fish farms. When the weather turns cold enough for some rivers and lakes to freeze over, Ospreys must migrate to areas where food is still available.

Identification and Behavior

In the Caribbean, it is hard to confuse the Osprey with any other bird. It is a large raptor with a white breast, belly, legs, and head. It has a dark brown back and wings, and a distinctive black line across its face. It has bright yellow eyes, and a dark beak. In flight, it holds its wings in a distinctive pointed shape.

Osprey have many unique adaptations to make them very good at catching fish. Most other fish-eating birds of prey only catch fish from near the surface of the water. Osprey, however, dive feet-first and sometimes fully submerge themselves under water. Though they get soaked from head to talon, they still fly away with their meal. If you watch closely, you will often see them shaking the excess water from their feathers in mid-air, just like a wet dog does on the ground. When Osprey are underwater, they can close their nares, or nostrils, to prevent water from flowing in. If you have ever had water up your nose, you know how uncomfortable that can be. This is an important adaptation for a species that makes its living diving underwater.



If you look at an Osprey's foot, you will see a few other interesting and important adaptations that help this fish-eating raptor catch and hold on to its prey. The bottom of the bird's foot is covered in backward-facing barbs. These barbs make

the Osprey's feet extra rough, helping them keep their grip on slippery fish.

Another thing to notice is that two of the Osprey's toes face forward, while two face backward. They can change the position of their toes from this configuration to having three forward and one back. This, too, helps these birds get a better grip on prey. Anyone who has tried to hold a slippery fish knows how easy it would be to drop one!

Diet

Though Ospreys mainly eat live fish of a wide variety of species, they also feed on snakes, birds, frogs, reptiles, mammals, crustaceans, and other invertebrates.

Ospreys usually fly low and slowly over the water, or even hover briefly over a spot that looks promising, while scanning for movement just beneath the surface of the water. If they don't spot a fish that way, they may resort to more clever tactics. Ospreys have been seen flying right above the surface of the water with their legs hanging down and their feet occasionally dragging in the water, in an attempt to startle any fish. When a fish is spotted, Ospreys make graceful dives from heights of 30-120 feet and plunge feet first into the water. Once they have caught a fish, they normally fly to a tall perch to feed.

Nesting

Though Ospreys generally nest in high places, such as trees, power poles, or cliffs, they have been known to nest on rocky promontories, offshore stacks of rocks, or even on the ground. Ospreys build some of the largest nests and use some of the most interesting materials. Though they start off with the basics – large sticks piled together to create a strong foundation – they line the nests with seaweed, bark, leaves, grass, or any other materials they can find, from fishing nets to plastic bottles. Osprey re-use the same nest from year to year. Every season, both the adult male and female add new material to the nest. As you can imagine, over time, some nest structures get to be quite big! Once the

nest is ready, the female will lay two to four eggs, which are white with bold red-dish-brown and dark brown spots and blotches. Both the male and female work hard to care for their young. The female incubates the eggs and then feeds the chicks after they hatch, while the male's job is to bring fish to feed his family when the nestlings are small. After the young fledge, they stay with their parents for two or three more months while they learn to survive on their own.

Threats & Conservation

Like so many other species of wildlife

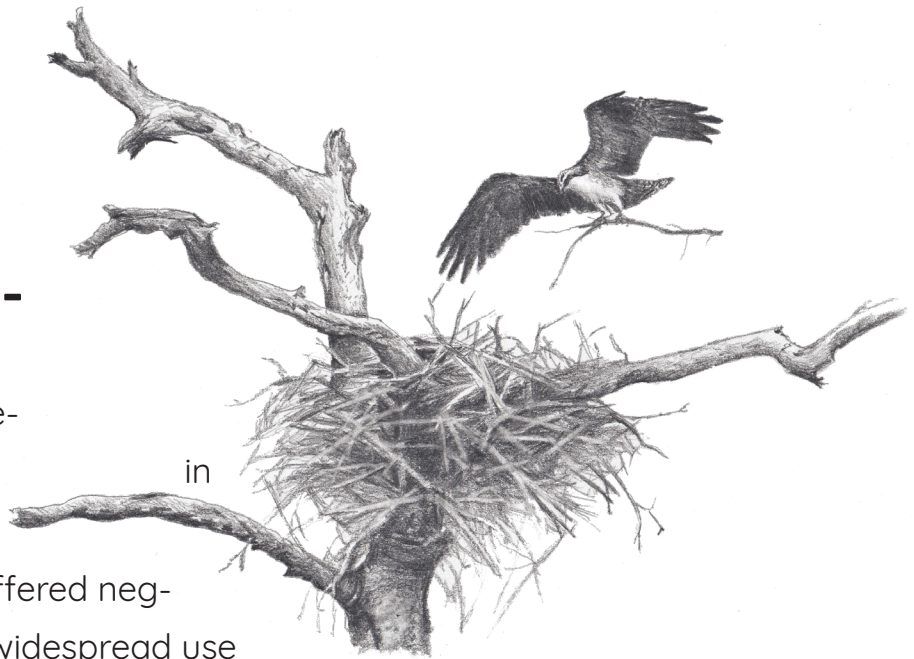
the 1950s and 1960s,

Osprey populations suffered negative

effects from the widespread use

of the pesticide DDT. Today, their popula-

tions are doing much better and Osprey seem to be holding their own. However, there are still many risks these beautiful birds of prey must face in their daily lives. In some parts of the world, people shoot Osprey because they see them as competitors for the same food source. Contamination in rivers and lakes, loss of habitat, and even electrocution are some of the challenges facing Osprey in our modern world.



BURROWING OWL

Scientific Name:
Athene cunicularia

Status:
Least Concern

Resident & Migratory:
The Americas



Photo: Yolanda Luna

Did you know...?

While many owls nest on the ground or in holes, the Burrowing Owl is the only owl that nests in holes underground.

Diet	Active During	Silhouette
		
Habitat	Nests in	# of eggs < or =
		

Where It Lives

The Burrowing Owl is found from southwestern Canada, across the western United States and into Florida, throughout Central America, and in most of South America. Several subspecies of Burrowing Owls are found in the Caribbean.

This species makes its home in drier, more open areas such as prairies, grasslands, and savannas. It can also be found in deserts, farmlands, and even golf courses and other urban areas, such as city parks. Burrowing Owls that live in the northern part of their range are migratory, moving to warmer climates when colder weather sets in.

Identification & Behavior

It is very difficult to misidentify a Burrowing Owl. It is a small owl that spends its time mostly on the ground or low perches, such as a dirt mound, rock, or fence post. It has bright yellow eyes and a distinctive cream-colored edging around its face.

As their name suggests, Burrowing Owls roost and nest in holes or burrows usually dug by small mammals, such as ground squirrels. They are active at night and during the day. They can often be seen walking around, preening, or simply standing in small groups in front of a burrow entrance at just about any time of the day. However, they do reserve most of their hunting activities for dusk and dawn.

While most owls tend to be solitary creatures, the Burrowing Owl is quite social. This small raptor lives among others of its own species in loose groups of up to several hundred individuals.

When young Burrowing Owls get scared, they emit an alarm call that sounds something like a rattlesnake! This is an interesting adaptation for survival, as certainly any predator hearing what they think is a rattlesnake will think twice before getting too close.

Diet

Burrowing Owls feed on invertebrates such as spiders, termites, beetles, crickets, and other insects, as well as frogs, lizards, rodents, and small birds. According to some sources, they even feed occasionally on cactus fruit and seeds.

Nesting

Burrowing Owls nest in loose colonies. They usually lay their eggs inside burrows dug by other animals. They improve these nest sites by placing different materials, including animal dung, in the nest or at its entrance. Though it might seem strange to place animal dung near a nest, this might be quite ingenious in fact. Dung attracts insects, giving the owls easy access to a quick meal.

Female Burrowing Owls lay up to a dozen eggs in a clutch, which are incubated for about 30 days. After the owlets hatch, both parents bring them food and help raise them. After four to six weeks, they are ready to fly for the first time. When they are about a year old, Burrowing Owls will be able to mate and produce young of their own.

Threats & Conservation

When forests are cut down, Burrowing Owls sometimes expand into these newly cleared areas. However, this species is also losing much of its native habitat, which is being developed for human use. This leaves these owls little room in which to live. Sadly, they are disappearing in some parts of their native range.

Since Burrowing Owls often nest or roost in burrows dug by other animals, programs to eliminate burrowing mammals are affecting owl populations, too. Protecting Burrowing Owls means protecting them, their habitat, and all the other wildlife that lives alongside them. In Aruba, conservation efforts are underway to conserve the subspecies found there, known locally as “Shoco.” It is Aruba’s National Symbol.



Other Caribbean Raptors

Here are a few more resident and migratory raptors found in the Caribbean.

RED-TAILED HAWK (*Buteo jamaicensis*)



BROAD-WINGED HAWK (*Buteo platypterus*)



Photo: Paul Spurling

Status: Threatened

Movement: Non-migratory; resident

Habitat: Open country including deserts, grasslands, roadsides, pastures, and farmlands. In some parts of its range, it can be found in tropical forests.

Diet: Primarily small to medium sized mammals, such as voles, rats, and rabbits, and occasionally birds.

Nest: Builds large stick nest, high in trees, cliffs, or even on man-made structures.

Eggs: Between 1-5 eggs

Fun Fact: These hawks sometimes hunt in pairs.



Photo: Angel Muela

Status: Least Concern

Movement: Migratory and resident

Habitat: Forests and forest edges, including deciduous and tropical forests.

Diet: It has a varied diet and feeds on mammals, amphibians, reptiles, and insects, spiders, crabs, and more.

Nest: Builds stick nest in trees, and often builds a new nest each breeding season.

Eggs: Between 1-5 eggs

Fun Fact: During migration, hundreds or even thousands of these hawks will travel together, along with other migratory raptors, in large groups called “kettles.”

PEREGRINE FALCON (*Falco peregrinus*)



MERLIN (*Falco columbarius*)



Photo: Jim Shane

Status: Threatened

Movement: Migratory

Habitat: Open spaces, including coastlines, and has adapted to nesting in some cities where it feeds on pigeons.

Diet: Primarily other birds

Nest: Doesn't build its own nest, but lays eggs on natural substrate on cliff ledges and sometimes on man-made structures

Eggs: Between 2-5 eggs

Fun Fact: It is the most widespread raptor and the fastest animal in the world. It is capable of diving at speeds of over 250km per hour.



Photo: Carlos Suarez

Status: Least Concern

Movements: Migratory

Habitat: Open or semi-open areas such as shrubland, grassland, forest clearings, wooded lots near rivers or lakes, and even city parks.

Diet: Other birds, as well as insects, bats, and other small mammals.

Nest: It doesn't build its own nest, but uses abandoned nests built by other birds, such as hawks.

Eggs: Between 4-5 eggs

Fun Fact: Its North American population is expanding. Merlins have adapted very well to living in cities, so much so that some have stopped migrating and remain in the same area year-round.

SWALLOW-TAILED KITE (*Elanoides forficatus*)



SNAIL KITE (*Rostrhamus sociabilis*)



Photo: José María Loaiza BIOTRANSECTO

Status: Least Concern

Movement: Migratory

Habitat: Very diverse from open country, bottomland forests, pine forests, swamps, wet savannas, to fragmented patches of forest.

Diet: Primarily insects, though it will also feed on other things, particularly during breeding season. It preys on lizards, frogs, snakes, and even nestling birds.

Nest: The male and female build stick nests lined with soft materials, such as lichens and moss. The nest is placed high up in a tree. They usually build a new nest every breeding season.

Eggs: Between 1-3 eggs

Fun Fact: These kites feed on several stinging insects, including wasps!



Photo: Angel Muela

Status: Least Concern

Movement: Resident

Habitat: Inhabits areas around freshwater lakes, canals, ponds, and marshes.

Diet: Feeds almost exclusively on apple snails. Will occasionally prey on crabs, turtles, fish, and snakes.

Nest: Males do most of the nest building. The stick nest is placed in a relatively low tree, often near or in shallow water.

Eggs: Between 1-5 eggs

Fun Fact: These kites often roost, hunt, and sometimes nest in close proximity to other Snail Kites or even other bird species, such as vultures, storks, or ibises.

BARN OWL (*Tyto alba*)



SHORT-EARED OWL (*Asio flammeus*)



Photo: Timoteo Estévez

Status: Least Concern

Movement: Non-migratory; resident

Habitat: Open habitats that include deserts, grasslands, agricultural fields, wooded lots, and even urban areas.

Diet: Feeds primarily on rodents including rats, voles, and mice.

Nest: It doesn't build its own nest, but lays its eggs inside natural tree cavities, caves, cliff ledges, and even man-made structures such as barns or church steeples.

Eggs: 2-18 eggs

Fun Fact: This owl is found around the world, and scientists have identified 46 different races of this species. The smallest race is found on the Galapagos Islands of Ecuador.



Photo: Martin Murray, Walkingrocks Photography

Status: Least Concern

Movements: Non-migratory; resident

Habitat: Open areas such as shrubland, prairie, and grasslands.

Diet: Primarily small mammals such as mice, rats, and voles.

Nest: It scrapes out a bowl-shaped depression in the ground in a concealed spot, and lines it with soft grasses.

Eggs: 1-11 eggs

Fun Fact: The only native owl to Hawai'i is a subspecies of the Short-eared Owl (*Asio flammeus sandwichensis*). This owl is found on nearly every continent of the world, except for Australia and Antarctica.

Let's Review

A. Complete the names of each raptor by matching the words in each column.

Peregrine	Hawk	
Ridgway's	Owl	
Bare-legged	Falcon	
Turkey	Kite	
Snail	Vulture	

Answer Key: Peregrine Falcon, Ridgway's Hawk, Bare-legged Owl, Turkey Vulture, Snail Kite.

Pictured: Ridgway's Hawk (photo: David Anderson)

B. Complete each sentence using the words below, and your own words.



1. The Swallow-tailed Kite is _____, meaning _____.
2. The Ashy-faced Owl is _____, meaning _____.
3. The Red-tailed Hawk is _____, meaning _____.

Answer Key:

1. The Swallow-tailed Kite is migratory, meaning (example) it travels to different areas of the world, based on changes in season and food availability.

2. The Ashy-faced Owl is endemic, meaning (example) it is only found in one small part of the world, Hispaniola Island.

3. The Red-tailed Hawk is resident, meaning (example) it doesn't migrate and has a wide range.

RAPTOR ALPHABET

Learning Activity 3

Materials:

- old magazines
- eraser
- scissors
- paper
- pencils
- crayons

Subjects:

- language arts
- creative writing

Grade Levels:

- K-12th

Objectives:

Participants will

- 1) demonstrate knowledge about birds of prey,
- 2) improve language skills and vocabulary,
- 3) combine these skills to write a poem.

Ecological Message:

Raptors and nature can inspire art and poetry.

Process:

1. Find poems about wild animals or nature, whether online or in books or magazines. Read the selected poems to the students. Then show students pictures of raptors. Ask students to describe the birds using one or two adjectives, describe what the bird is doing using one or two verbs, and describe the background (habitat). Then ask students to describe how looking at the photos (or imagining seeing these birds in the wild) and hearing the poems makes them feel. Make a list of these words on the board.

2. Give each student a sheet of paper. Provide enough erasers, scissors, colored pencils, and magazines for students to share. As a class, choose a raptor and write the letters of its name vertically on the board. For example, if you choose Barn Owl, you would write “B-A-R-N-O-W-L” on the board, and ask students to write a poem describing this raptor. Each line must start with the corresponding letter in the bird’s name. Use some of the words from the class

list if possible
 Example: **B**eautiful and free, it soars on
A-gile wings. By day, it
R-oosts among the trees. At
N-ight it is the hunter of the skies

O-pening its wide, pale
W-ings, looking, always
L-ooking for prey

3. With younger children, you may choose to write the poem together as a class and allow students to copy the poem on their own paper. For older students, each of them may choose a raptor and write their own poem, following the example.

4. Once the poem is complete, ask students to make a collage around their poems, using colored pencils, photos, and magazine clippings, etc., or their own original drawings. Allow students time to share their work.

5. Explain and discuss with students the importance of art and poetry in our lives and how nature can inspire us to be creative.

Variants:

Option 1: For older students, practice writing more advanced poetry or even short stories.

Option 2: For younger students who are beginning to read, ask them to cut out pictures from magazines or draw things that begin with each letter of the poem. Example: B - book, boat, barn, A - apple, anaconda, artichoke, etc.

Extensions:

a) Investigate other types of poems or forms of writing. Students write a short story, haiku, sonnet or other genre, based on a raptor or nature.

b) Collect all the students' poems and put them together in a poetry book that the whole class (or school) can enjoy.

c) Organize a school poetry contest with the theme of nature or raptors

Remember: Poetry does not have to be serious and somber. It can contain humor and be fanciful. Encourage your students to be as creative as possible, to have

RAPTOR TALES

Learning Activity 4

Materials:

- Raptor Tales Worksheet (page 98)
- pencil
- paper
- crayons
- recyclables*
- natural materials**

Subjects:

- language arts
- art
- drama

Grade Levels:

- 4th-12th

Objectives:

Participants will:

- 1) read and understand a short story about hawks,
- 2) be able to describe the nesting and dietary habits of hawks,
- 3) use this knowledge to write and perform an original play.

Ecological Message:

Birds of prey, like human beings, depend on natural resources to survive.

**cardboard, tetrapaks, plastic bottles or whatever is available that is fun and easy to use to build the hawk.*

**It is very important to explain to students that they should not cut leaves or flowers from living plants. They must use materials found on the ground. Natural materials may include leaves, flower petals, twigs, anything else that comes from nature.*

Process:

1. Read the “Raptor Tales Story” aloud to students. With older students, divide them into groups and allow them to read the story aloud to each other, or they can read it silently individually.

Hint: *You may ask students to read only the section (part) they are assigned, or read the entire thing, depending on how much time you have. As they read, ask them to pay attention to the details of the story such as where the hawks live, how they fly, and what they eat. These details will be important when they begin writing their play, and designing the costumes and set.*

2. Discuss the highlights of the story in class. Who were the main characters? (Freedom, Hope, The Peregrine Fund biologists) What was the setting of the story? (The forest) Where did it take place? Describe the forest in the story.

3. As a class, or in small groups, list the events of the story in order on the blackboard.

4. Divide the class into small groups. Assign one major event from the story to each group. Each group will work together to write a play that retells the event in their own words.

5. Using natural and recyclable materials, students will create costumes and scenery, and will select actors to play each role.

6. Each group will perform their play with the class. Make sure each group performs their part in sequential order.

Extensions:

a) Ask students to write original short stories, based on the bird of prey of their choice.

b) Present the play to the entire school (maybe during World Bird Day, or on May 25th - Ridgway's Hawk Day).

RAPTOR TALES STORY

Photocopy & Distribute

PART I

Deep inside a beautiful forest, two hawks are perched on top of a large tree. This tree is where this pair of raptors has built their nest and are raising their young. Inside the nest, one fluffy white nestling stands on unstable legs. It is around 10 days old and isn't as strong as it will be in just a few more weeks. Suddenly, the adult male notices movement in a nearby tree. With his keen vision, he spots a lizard scurrying up a tree. The male leaves his perch without hesitation. He flaps his strong wings as he maneuvers through the vegetation. With legs outstretched, he quickly and easily pulls the lizard from the branch with his strong, curved talons. He lands on a nearby branch and quickly begins to devour his catch. The female, who has been watching from her place at the edge of the nest, begins to vocalize with high pitches that alert the male that she too is hungry. The male reluctantly leaves most of the lizard for the female. He flies to her with the lizard in his beak. She takes the prey gently from the male. Inside the nest, the female carefully rips off a small piece of the lizard, which she delicately feeds her young. The young nestling, named Freedom, gluttonously swallows his food.

Not too far from this wild nest, in a laboratory run by The Peregrine Fund, biologists are raising a young nestling named Hope. This nestling hatched in captivity as part of a captive breeding and release program. She is being cared for by biologists who make sure that the young hawk is getting enough food and that she is safe, just as a mother hawk would.

PART II

It has been a little over a month. The wild nestling named Freedom has grown considerably in this short time. His parents have fed him well. His flight feathers have grown in, and he has begun to discover the world around him. The early morning sun now warms his feathers. He is full from the first meal of the day and is content to explore his home. He gets up and does a morning stretch, pushing his wings forward and lifting his head slightly. Then he stands firm and

quickly jumps to one of the large branches that extend out from the nest. Today, Freedom will attempt his first flight. The morning is calm and only a gentle breeze brushes his feathers. Freedom stretches his wings, and starts to flap them vigorously. Slowly he lifts just a few inches off the branch before landing down again. Suddenly, a stronger wind blows. Freedom spreads his wings and leaps. His strong flapping and steadfast determination guide him towards a branch several meters above and away from where he took off. He clumsily lands on a branch of a nearby tree. As he takes a look around, he hears his mother calling from a short distance away. Now that he has left his nest tree, a new world opens before his eyes. Excited to explore his newfound freedom, he spreads his wings once more and leaps.

Meanwhile, Hope slowly begins to wake. She stretches her long wings and looks around her. It is early in the morning and the sun is beginning to rise. A week earlier, the biologists had moved Hope from her laboratory home to an enclosed artificial nest in the forest. This nest is made of wood on three sides, and a barred window on the fourth. There is a small, closed door on one side. She has spent the past ten days in this nest, with other young hawks. She has grown comfortable with her new home and all the sights and sounds around her. But today, she notices something is different. The door to the artificial nest is open for the first time. With curiosity she walks to the ledge. She sticks her head out and looks around at the surrounding trees. She sees a lizard scampering in the litter below. Without much hesitation, she jumps and is free! In a few hours, she will make her first flight. In a few weeks she will begin to move through the forest, exploring and discovering a whole new world.

PART III

At least a year has passed. Freedom has been away from his parents for many months. Recently, he found a perfect area in which to set up his own territory. He is perched there now, resting on a high branch. Soon, dark clouds begin to form in the sky. As Freedom looks at the horizon, small drops of rain begin to fall. In a matter of minutes, it seems as if the sky has opened and buckets of water are raining down. This is the first rain of the season, and it is welcome here in the forest. As the rain falls, Freedom spreads his wings

and lifts his tail. He flaps his wings. Water droplets fall from his feathers to the ground. The water keeps Freedom clean and fresh, gives life to the trees he needs for nesting and roosting, and supports the different animals he needs to eat. Water is life for Freedom, and for all living things on Earth.

Hope, meanwhile, has started moving longer distances through the forest where she was first released. The muscles in her wings and chest have developed well, and she has become a powerful flyer and a skilled hunter. It has been several hours since she last ate, and she feels the first pangs of hunger. She waits patiently for her chance. Very soon she sees a mouse walking at the edge of the forest. One of its legs is swollen and she notices that it is limping. After a few minutes of waiting, she flies quickly towards the mouse, with her talons outstretched. She is successful! After a moment she flies to her original perch and begins to eat. Hair and small bits of meat fall back to the forest floor. Insects and other decomposers will soon be drawn to this feast. Nothing goes to waste in the forest.

PART IV

Two years have passed. Hope is perched in a tree in the immense forest. She is watching and waiting. Finally, in the distance, she notices another hawk flying towards her. In its talons, it holds a rat. Freedom gently lands next to Hope and gives her the remains of his capture. She takes it quickly and swallows small pieces. Then, she breaks a tiny piece of meat in her beak and walks towards the center of the nest. She hunches over and delicately feeds her three-day-old nestlings. In a short time, these nestlings will be big enough to fly. In a few months, they will be ready to leave their parents' territory. In the meantime, this forest will give Hope and Freedom everything they need to ensure that their young nestlings grow up strong and healthy so that they too will one day have their own territory and family.

***** THE END *****

Think about what you just read and answer the following questions to help you begin to write your own play:

1. Who are the main characters in this story?

2. Are there other characters as well? If so, list them:

3. What is the setting of the story? Where does it take place? Describe it in detail here:

4. List the 4 most important events in this story:

5. Brainstorm some ideas: what natural or recyclable objects can you use to create costumes and scenery?

RAPTOR SILHOUETTE

Evaluation Activity 2

Materials:

- Raptor Silhouette Worksheet (page 104)
- colored pencils
- scissors
- natural items*

Subjects:

- creative writing
- art

Grade Levels:

- K-12th

Objectives:

Participants will use natural materials and art supplies to demonstrate

- 1) what they have learned about raptors in general (or a specific species) including diet, needs, and importance
- 2) how birds of prey help humans and nature.

Ecological Message:

Raptors, other wildlife, and nature can inspire art and poetry.

**It is very important to explain to students that they should not cut leaves or flowers from living plants. They must use materials found on the ground. Natural materials may include leaves, flower petals, twigs, or anything else that comes from nature.*

Process:

1. Find a place outside the classroom, such as a garden, a nearby park, or the schoolyard. Give students 15 minutes to collect leaves, stones, feathers, or other natural materials found on the ground.**

**If materials are scarce around the school, the teacher can collect these materials beforehand.

2. Distribute colored pencils, eraser, and the Raptor Silhouette Worksheet. Using all the available materials, students will fill in the silhouette of the bird of prey, showing what they have learned about raptors. They should include things like the hawk's diet, its habitat, its importance, its threats, nest type, etc.

3. Allow them to use their creativity and share their work at the end.
4. The teacher can evaluate the students' knowledge and learning by focusing on the items students chose to include, which they excluded, the amount of detail, etc.

Extensions:

a) Students choose a raptor species to focus on. On a large piece of paper, they draw the outline of the bird in its habitat (include prey, nest type, etc.) Then use natural materials to "color" the silhouettes. Display these works around the school.

b) Make a list of all the natural materials that the students found (pebbles, leaves, feathers, etc.) on the board. Make a column for each item: one that says "raptors" and another that says "humans." For each item, students should think of how humans and raptors these use items.

For example: leaves - raptors use branches with leaves to build their nests, for shade and to cover themselves from the rain; humans use leafy plants to decorate their surroundings, for shade, to make drinks (tea), and for food. Raptors and humans need green plants to produce the oxygen we need to breathe.

Example:

Item	Leaves	Flowers	Sticks
Raptor Use			
Human Use			
Both raptors & humans			

WORKSHEET

RAPTOR SILHOUETTE

Photocopy & Distribute



WHY RAPTORS MATTER

Chapter 3

Learning Objectives for Chapter 3

Participants will be able to:

1. Name three levels of a food chain
2. Describe two ecosystem services raptors provide
3. Explain the difference between a predator and a top predator

Words to Know

bioindicator food chain

ecosystem service

decomposer

bioaccumulation producer

top predator

All organisms play an important role in the ecosystems in which they live. Raptors help maintain a balance in nature, help keep prey populations healthy, and perform very important **ecosystem services**, which help support human safety and health!

Think of **Turkey Vultures** swiftly cleaning up the carcass of a dead animal, such as a cow. In doing so, they help stop the spread of disease-causing bacteria that could make people and domestic animals sick. Or think of a **Barn Owl** family that can consume around 1,000 mice and rats a year!

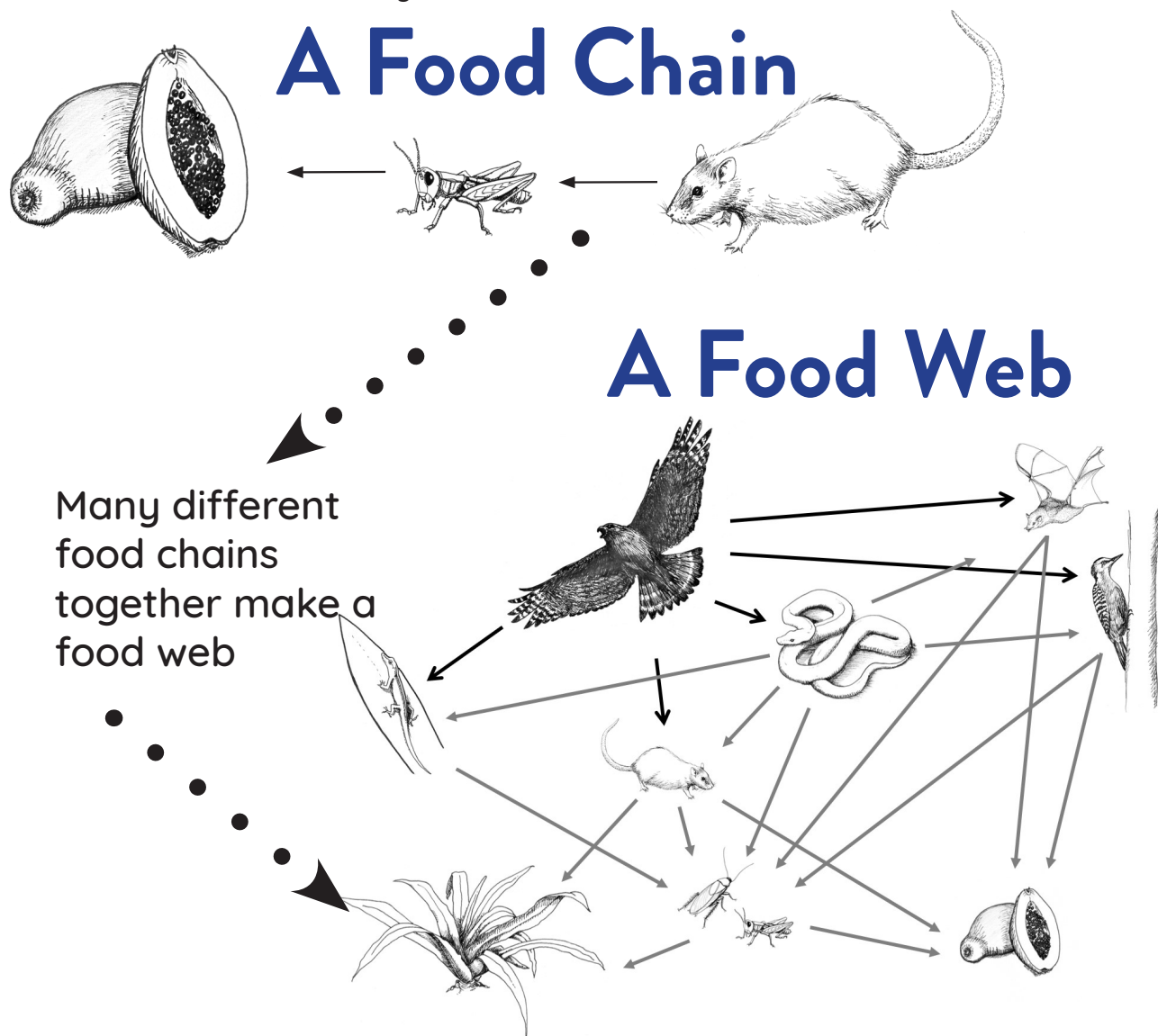
These nocturnal hunters help control rodent populations that, in large numbers, can be damaging to crops and households, and may even spread disease.

Raptors, as **top predators**, also act as keystone and umbrella species, and **bioindicators**.



An Introduction to the Food Web

To understand why raptors play such an important role in the environment, we first must understand their place within the food web. But what exactly is a food web? Think about what you had for breakfast today. Did you have eggs from a chicken? Bread, which is often made from wheat? Maybe you had cereal or oats? Just like humans, every living thing needs energy to survive. And, as a general rule, organisms get their energy from the food they eat, which means they are part of the food chain. And so are we! A **food chain** is the transfer of energy from one organism to another, through food. A **food web** encompasses all of the food chains within an ecosystem.



Producers

All food chains, and thus food webs, start with plants. Plants need nutrients, water, and sunlight to grow. Green plants absorb sunlight and transform it into chemical energy through a process known as **photosynthesis**.

In the context of food chains, plants that photosynthesize are known as "producers." This is because they are able to produce their own energy from inorganic compounds. Plants, or **producers**, form the base of every food chain.



Primary, Secondary, and Tertiary Consumers

Animals that eat plants (**herbivores**) are known as "**primary consumers**" because they directly eat the producers (plants). Some examples of primary consumers are rabbits and caterpillars. But primary consumers can also be larger animals such as elephants, giraffes, and bison.



Secondary consumers are usually small to medium-sized **omnivores** or **carnivores**. These secondary consumers might eat plants, but they also prey upon many of the primary consumers as well. Examples of secondary consumers include songbirds, lizards, chickens, and frogs.

The animals that prey upon the primary and secondary consumers are called **tertiary consumers**. These animals are mainly carnivores. Some examples include snakes, foxes, and seals. And this goes on and on up the food chain until we reach the top predators. But what is the difference between a predator and a **top predator**?

Birds of Prey as Top Predators

Predators are those animals that hunt for food. However, they are also hunted by many other animals. Top predators, on the other hand, are those animals that hunt but have few or no other natural predators that hunt them. Lions, Great White Sharks, tigers, and wolves are all examples of top predators.

Top predators play a very important role in maintaining balance within the ecosystems in which they live. When a top predator is hungry, it will most often try to trap prey that requires the least amount of energy to catch. This means that if it has the choice between trying to catch a healthy, energetic animal or an animal that is slow, old, sick, or injured, it will attempt to hunt the slower animal. This is important because, by killing and eating sick or old individuals, top predators keep prey populations healthy, essentially by stopping diseases from spreading to other individuals of the same species (and possibly to other wildlife or humans).



Photo top left by Munir Virani, top right and bottom left by Marta Curti, and bottom right by Angel Muela

Top predators also help prevent overpopulation of prey animals. When animals face overpopulation, often times because their natural predators are disappearing, this can lead to overconsumption of food resources, starvation, and other problems.

Apart from the benefit top predators - like birds of prey - provide to other wildlife, they also play a very big role in helping humans. They control some animals that, in large numbers, can damage agricultural fields and homes, and can spread disease to humans and domestic animals. Rats and mice are a good example of this. While rats and mice have their own very important roles to play in nature, too many of them can create many health problems for other animals and humans alike. Birds of prey like hawks, falcons, and owls often specialize in feeding on rodents. But when humans kill off these natural predators, they help create an imbalance in nature and help rodent populations to increase.



Some people will wonder how diurnal raptors manage to capture nocturnal rodents. There are several reasons they are able to do so: 1) though rodents are mostly active at night, they will move around during daylight hours, particularly in forested areas which are shaded by trees, 2) many birds of prey are active at dawn and dusk, when rodents are also active, and 3) with extremely keen vision, raptors are able to spot rodents sleeping in trees, other vegetation, or elsewhere.

The number and abundance of prey in an area influences the number of predators in this area. To survive and stay healthy, prey species rely on predators just as much as predators rely on prey. Sadly, island predators are particularly vulnerable to extinction and if they disappear, this could greatly affect the health of the habitats and wildlife of these islands. In the Caribbean, we have many aquatic top predators, such as sharks and crocodiles. But it is important to remember that, with a few exceptions, our only major land predators are raptors!

Decomposers

When talking about a food chain or food web, we cannot forget about the decomposers. After all, they have a very important job to do. After a plant or animal dies, decomposers help break down the dead matter and convert it back into nutrients. These nutrients are then returned to the soil, and help plants - the producers - grow! Thus, decomposers help complete the circle. Fungi and bacteria are some of the most important **decomposers**.

While it might be tempting to think of vultures, and other scavengers, as decomposers - after all they too consume dead animal tissue - it is important to remember that there is a big difference between the roles scavengers and decomposers play. While vultures help rid an area of disease by consuming dead (and sometimes rotting) animals, they do not break this dead matter down into chemical nutrients that help support plant and other life. Only the decomposers are able to do that.

Decomposer



Scavenger



How Do Raptors Help Us?

Study the two pictures below. Compare picture A and picture B.

How many rodents are in each image? How are the rodents affecting the cacao plant? What happens when the hawk arrives?

Describe the role a hawk might play in a farm field and why this is important. Is the hawk helping the cacao plant? Humans? The mice? If so, how and why? Think about how having hawks in your neighborhood might help you!



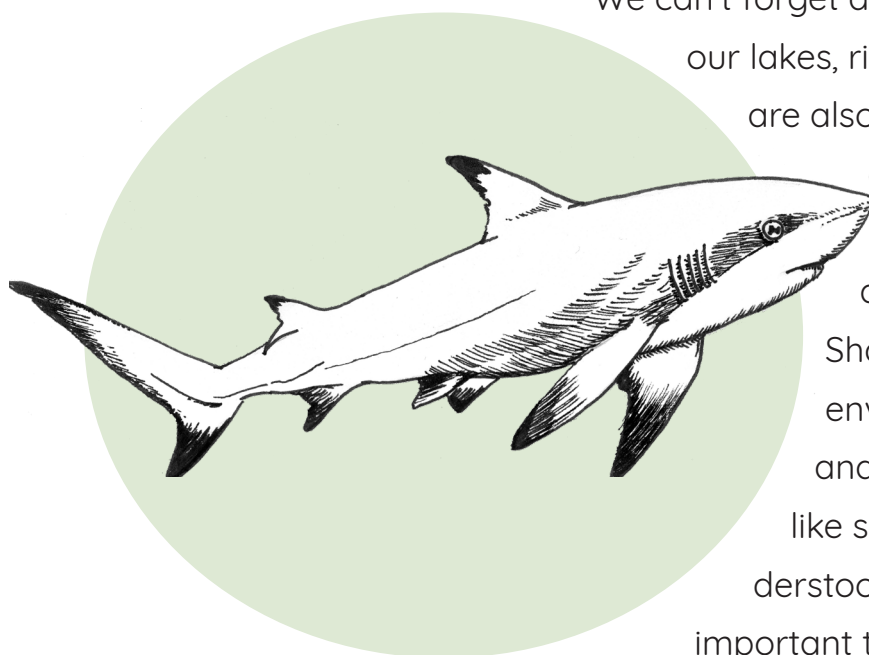
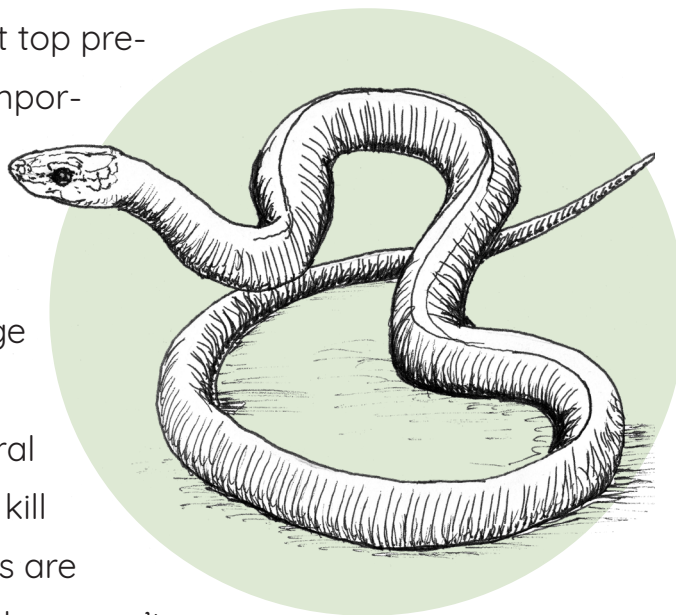
◀ Picture A

Picture B ▶



Let's Take a Closer Look!

Snakes are predators, but most aren't top predators. Even so, snakes play a very important role in the ecosystems in which they live. Snakes help control rodent populations. This can help stop the spread of disease and the damage that rodents, in large numbers, may cause to crops and households. Several non-venomous snakes also hunt and kill venomous ones! Though some snakes are venomous, if you don't bother them, they aren't a threat to people. Snakes, in general, shouldn't be feared. They should be protected like all other wildlife.



We can't forget about the food webs in our lakes, rivers, and oceans. These are also important to the health of our planet. One of the ocean's main top predators is the shark.

Sharks help keep marine environments balanced and healthy. Sadly, sharks, like snakes, are often misunderstood and feared. But it is important to protect them as well!

Sharks are essential in keeping our marine ecosystems healthy.

Let's Review

How many food chains can you create? Each should have one producer, one primary, secondary, or tertiary consumer, and a top predator.



Birds of Prey as Bioindicators

Studying birds of prey can help scientists understand the status of the overall health of an ecosystem and to understand current or future potential threats not just to wildlife, but also to humans. Thus, birds of prey are indicators of the quality of the ecosystem in which they live. This is why they are known as **bioindicators**.

An example of this happened when scientists were studying the Peregrine Falcon in North America in the 1950s and 1960s. These studies led them to realize the damaging effects of a chemical called DDT. In the 1940s and 1950s, the insecticide DDT was used to control insects. When small birds caught and ate the poisoned insects, they also ingested the poison. With each insect they ate, the DDT accumulated more and more in their systems. When Peregrine Falcons hunted and consumed these small birds that had high concentrations of the poison in their systems, the falcons too became poisoned. The DDT accumulated in each species as it traveled up the entire food chain.

Though the DDT didn't kill the Peregrine Falcons, it did affect their ability to reproduce. The DDT which had accumulated in their systems prevented the absorption of calcium and fats. This caused the females to lay eggs that had very thin shells. The result was that the females were breaking their own eggs while trying to incubate them. So, the falcons were unable to reproduce enough young to sustain the population. Thus, Peregrine Falcons began to disappear rapidly from different areas in the United States. In less than twenty years Peregrine Falcons had disappeared east of the Mississippi River. And other species of raptors were also seriously affected.

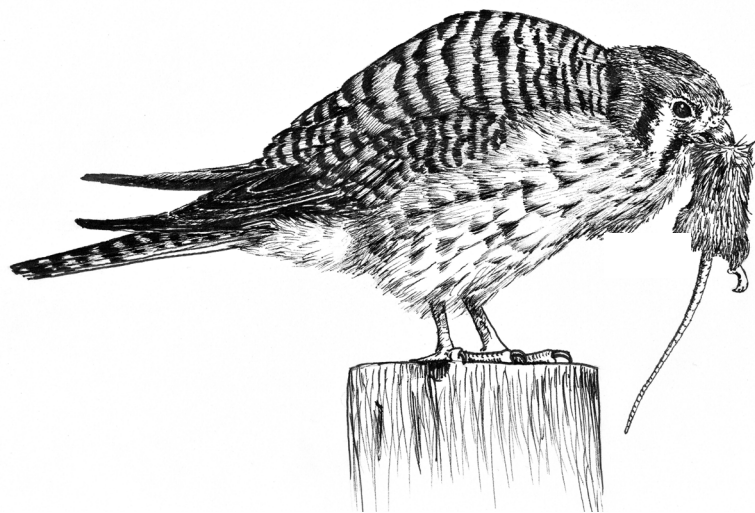
When scientists set out to understand the reason behind the decline in Peregrine Falcon populations, they soon discovered that DDT was the cause. This discovery helped scientists to understand that if DDT was harmful to falcons and other wildlife, it was also very likely harmful to humans as well. As a result, the

United States banned DDT, and it was understood how raptors can serve as indicators of the health of the environment in which they are found.

Looking at raptors as bioindicators is especially useful for a number of reasons.

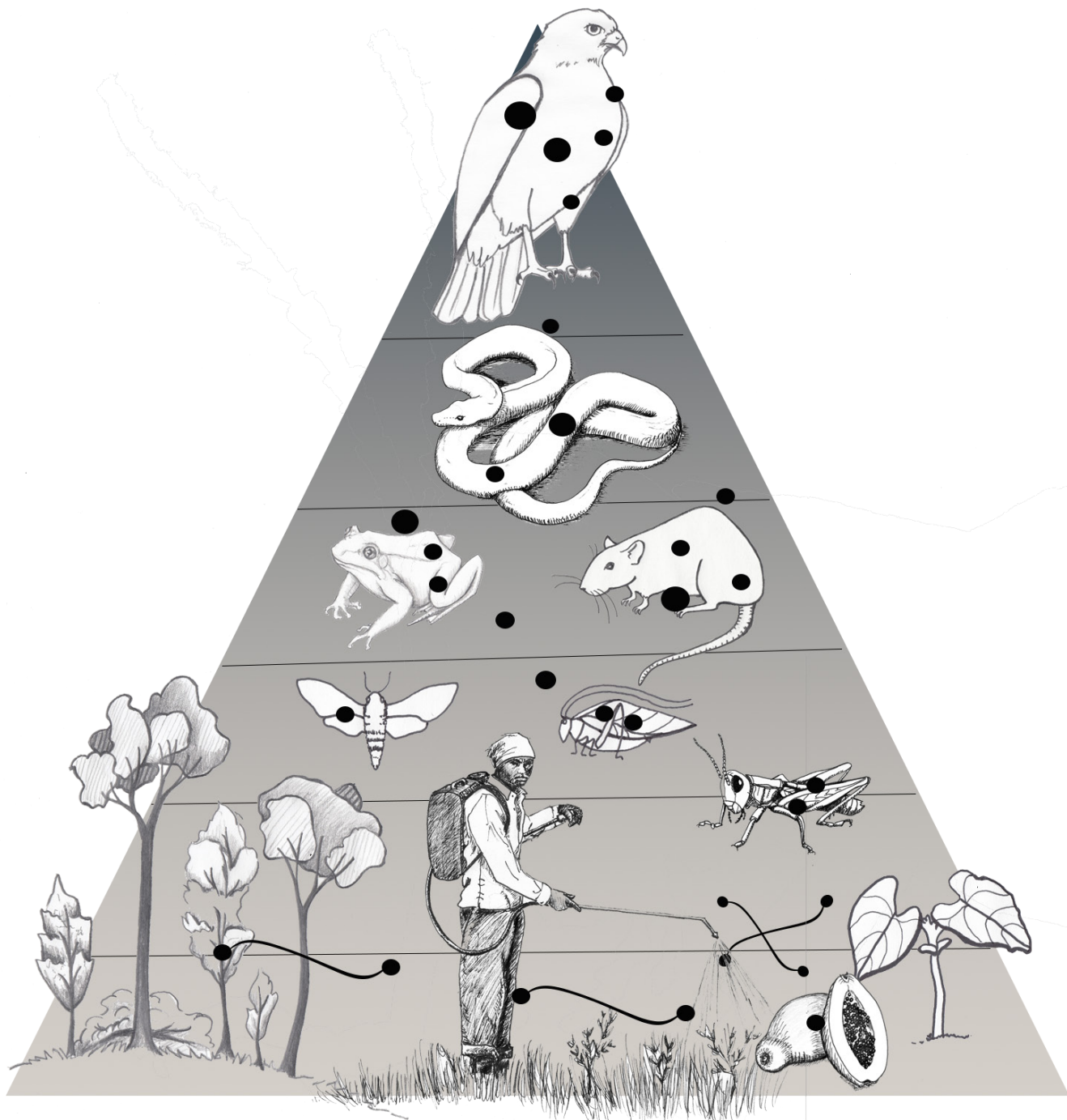
1) Because raptors are at the top of the food chain, any contaminants or poisons found in the environment will often be extremely high in birds of prey as opposed to other animals farther down the food chain. This is due to something called **biomagnification**. When chemicals are sprayed in the environment - on plants, for example - these chemicals are ingested, very often by primary consumers, and the chemicals build up in their systems. When secondary or tertiary consumers eat many contaminated primary consumers, the toxins build up even more. These toxins are most highly concentrated in the top predator. Biomagnification can occur in both terrestrial and aquatic ecosystems.

2. Another reason why raptors make good bioindicators is because they often depend on large, healthy tracts of habitat (which provide them with food, shelter, and space) in order to survive. If there are factors that are limiting the health or the number of prey or nest sites available, this will eventually also affect the size and health of raptor populations. By studying raptors scientists can gain a better understanding



Let's Review

Look at the image below. The dots represent chemicals in the environment. In your own words, explain what is happening in this image as it relates to biomagnification. How would this help alert scientists to problems in an ecosystem? As a class, create a similar image showing biomagnification in an ocean.



Birds of Prey as Keystone Species

A **keystone species** is an organism - large or small - that plays a key function in the ecosystem in which it lives. Leafcutter ants and Central American Agoutis are both examples of keystone species because they both have a big impact on plant growth in a Neotropical forest.

Vultures are one of the Caribbean's most important keystone species. They consume tons of dead animals each year, helping to keep the environment clean and preventing the spread of diseases. Even though other scavengers are found in ecosystems with vultures, no other animal consumes a dead carcass as quickly or efficiently as a group of vultures can.

Birds of Prey as Umbrella Species

Imagine you are caught in a rainstorm with a group of people. Only one person has an umbrella, but that umbrella is big enough to protect everyone in the group and keep them dry. This is kind of what an **umbrella species** does too. The conservation of umbrella species indirectly helps conserve all the other plants and animals that share its ecosystem. Let's imagine a bird of prey such as a Red-tailed Hawk. This medium-sized raptor depends on large, healthy trees for nesting - so if we are to protect Red-tailed Hawks, we also need to protect all the trees it needs. By ensuring that those trees survive, we are automatically saving other species that depend on those trees for food, shelter, or nesting. Red-tailed hawks also need to eat. They have a varied diet and eat small mammals, reptiles, and birds. So, if we are protecting the hawk, we also need to ensure that the animals it hunts are also safe and healthy. So, in turn, we must protect everything these smaller animals need to survive. And so on and so on - until entire ecosystems are protected.

Birds of Prey in Culture

Raptors' agility, strength, and grace, coupled with their extraordinary powers of flight and their penetrating gaze, have fascinated humans throughout time. As a result, birds of prey have been important figures in different cultures all over the world. They have been revered as gods, and have been, and continue to be, represented in poems, plays, paintings, dances, and origin stories. In some parts of the world, people used raptors as hunting partners in a practice known as falconry.



Falconry



Falconry is one of the oldest sports in the world. It is a hunting method based on a unique alliance between a human and a raptor. There is evidence that falconry was first practiced in Mongolia, other parts of Asia, and Egypt. This sport was introduced to Europe by Romans and flourished mostly during the Middle Ages. During the Renaissance, falconry was used in warfare, especially to intercept carrier pigeons from enemy

camps. In its early days, falconry was a necessity and raptors helped people to get food. These days, many falconers enjoy the sport more because of the special relationship between them and their raptors.

Today, falconry techniques are also used to help rehabilitate injured raptors and to help human beings. For example, many airports are employing falconers to fly their birds of prey near the runway. This is because the raptor's presence will frighten away pigeons, waterbirds, and other birds that could collide with aircrafts, which can be very dangerous. Thus, having a trained raptor flying around airports helps prevent accidents.

Birds of Prey in Ecotourism

It shouldn't be surprising to learn that there are people from all over the world who love to watch birds! Some enjoy watching or listening to birds in their own backyards, while others travel the globe searching for different bird species to observe, sketch, photograph, and otherwise enjoy. The number of endemic species, ease of travel, and logistics make the Caribbean a major destination for birding tourism. This can create important economic revenue for communities and help provide increased job opportunities.

Mindful Birding

Recent research is showing how important it can be to spend time in nature. It helps increase concentration, and promotes good physical, emotional, and mental health. Watching birds is a wonderful way to introduce students to the natural world. Birds are found in every major habitat, including deserts, coastlines, dense forests, mangroves, grasslands, open fields, and even major cities. Additionally, they can be seen along trails, from an overlook, and even from one's own home. Observing birds is not only done visually, but also through sounds. All of these factors mean that birds are accessible to almost everyone!

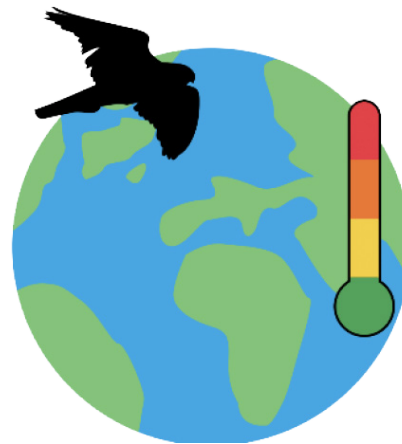


Let's Discuss

Below is a list of just a few types of services raptors provide to humans and the planet. Is one more important than the other? Or are they all equally so? Think about it and discuss with your class.



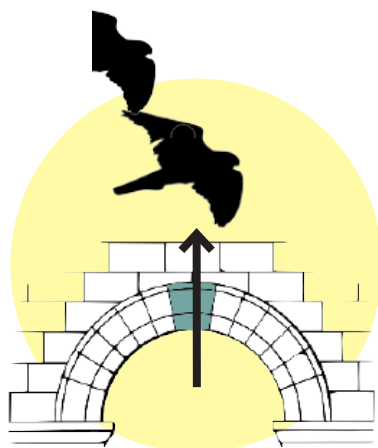
Umbrella Species



Bioindicator



Cultural Inspiration



Keystone Species



Ecosystem Balancer

PREDATOR & PREY

Learning Activity 5

Materials:

- paper cut into small squares (approx. 3 squares per student)

Subjects:

- Science
- Critical Thinking

Grade Levels:

- K-12

Objectives:

Participants will
1) understand and express the important roles that raptors and other top predators play in controlling prey populations and maintaining a balance in nature.

Ecological Message:

All predators are important components of the ecosystems in which they live.

Introduction:

Ask students to define the word “raptor” and ask them to identify several prey animals that some raptors might eat. Ask them how they feel about raptors that eat animals like rabbits or squirrels. Are raptors “bad” because they kill animals that are “cute”? Is it okay if they eat things like rats, insects, or snakes? Collect opinions from students through a discussion. Tell the students that they are going to role-play and then decide if raptors are beneficial to the natural world or not.

Process:

1. Find a place outside the classroom, a garden, a nearby park, or the schoolyard.
2. Divide the class in half. One half will represent the mice. In the center of the play area, throw out the “food” (cut papers) for the mice so that there are at

least three pieces of food per student. The rest of the group forms a circle around the playing area.

3. Allow each “mouse” to gather food from inside the circle. Each time a “mouse” picks up a piece of food, he or she should select a student from the circle to represent their offspring and then continue feeding. (When a lot of food is available, some animals often reproduce quickly.) The descendants must also pick up food, and when they have found a piece of food, they select another student from the circle to represent a third generation. This continues until there are no more students or no more food.

4. Once all the food has been collected, gather the students in a circle and ask them to count how many pieces of food each has. Tell them that, to survive, each mouse must have at least five pieces of food. Was there enough? Why or why not?

5. Replay the game. This time, select two or three students to take on the role of a raptor. The game is played the same way, but every 15 seconds the raptors enter the playing field and tag or “catch” one mouse each. (Predators as a whole, including raptors, reproduce much more slowly than other animals further down the food chain. No “offspring” should be added to raptors). When the “mice” are caught, they must drop all of their food on the ground and wait outside the circle until they are chosen again. After about five minutes, stop the game and ask the students to sit in a circle.

6. Ask students what differences they saw in food availability when raptors were present compared to when they were not. Why is this? What would happen to the mouse population if there were no predators? What would happen to their food supply? Did all the surviving mice have enough food (four pieces each)? How many mice were eaten by raptors? How is life and death an important part of the natural cycle of life?

Extensions:

- a) Have students write a story - imagining what would happen if all predators were removed from an ecosystem. They can focus on the effects on an entire ecosystem or choose one or two animals as their main characters. Ask students to include one or two illustrations. Share these stories with the class. Then join the stories to make a class book. Make the book available in the school library.
- b) Take a classic fairy tale where the predators are portrayed as the “bad guys” such as “Little Red Riding Hood” or “The Three Little Pigs”, or any other, and have the students rewrite the stories, putting the predators in a positive light.
- c) Ask the students to pretend that they are journalists and that they are going to “interview” a predator such as a hawk, a wolf, a jaguar, or any other predator. Have students write 3-5 questions that they would ask a predator if they could. Then separate the students in pairs. Let one student be the predator and the other the journalist. Conduct an interview between the two, then switch so that each student has a chance to be both a predator and a journalist. Share some of the answers with the class.

HABITAT MOBILE

Learning Activity 6

Materials:

- Small sticks/wire
- string
- scissors
- coloring sheets
- colored pencils
- tape
- Activity Sheet cut-outs (pgs. 126, 127)**

Subjects:

- Science
- Art

Grade Levels:

- 2-12

Objectives:

Participants will be able to 1) identify the various levels of a food chain, 2) explain why these elements are important for the survival of raptors.

Ecological Message:

All living things are connected. When one element of a food chain or habitat is destroyed or damaged, this can affect entire ecosystems.

*** Print one copy per student or group. For mobiles, thicker paper is better, but not required. If possible, teacher should create a sample mobile before the start of class.*

Process:

Just like humans, all living things need a safe place to rest, enough members of the same species to reproduce, and plenty of clean food and water. All of these elements (shelter, space, food, and water) together make up an animal's habitat.

As a class, think of a specific raptor species, perhaps one found locally. On the board, make a list of everything this bird would need in its habitat. Place these items in one column. In a second column, make a list of potential prey animals that raptor might eat. In one final column, select a prey animal and list all of the things that animal needs to survive, based on the example on the following page.

Example:

Raptor	Hawk Prey	Songbird Survival
Puerto Rican Sharp-shinned Hawk	Mice Songbirds Insects	Food (Insects, Fruits) Nesting trees Water

2. Pass out colored pencils, string, and scissors (enough for the children to share). Then distribute the Activity Sheets, one to each student. Show the students how to cut the pictures (for the bird and bat images, cut along the line running lengthwise across the body, and fit the wings into this thin slit, as pictured below), tie the string, and build the mobile. Give students time to color in the pictures.



3. Using the teacher's mobile as an example, ask students What would happen if many trees were cut down? Cut the thread that connects a tree to a nest or prey to show that when we lose trees, we not only lose that plant, we lose nests, animal food, prey, etc. Discuss this with the students.

Variations:

Rather than creating a mobile, students glue the figures they cut and color on a large sheet of paper or cardboard, gluing the string to show how the different elements of the food web and habitat are connected.

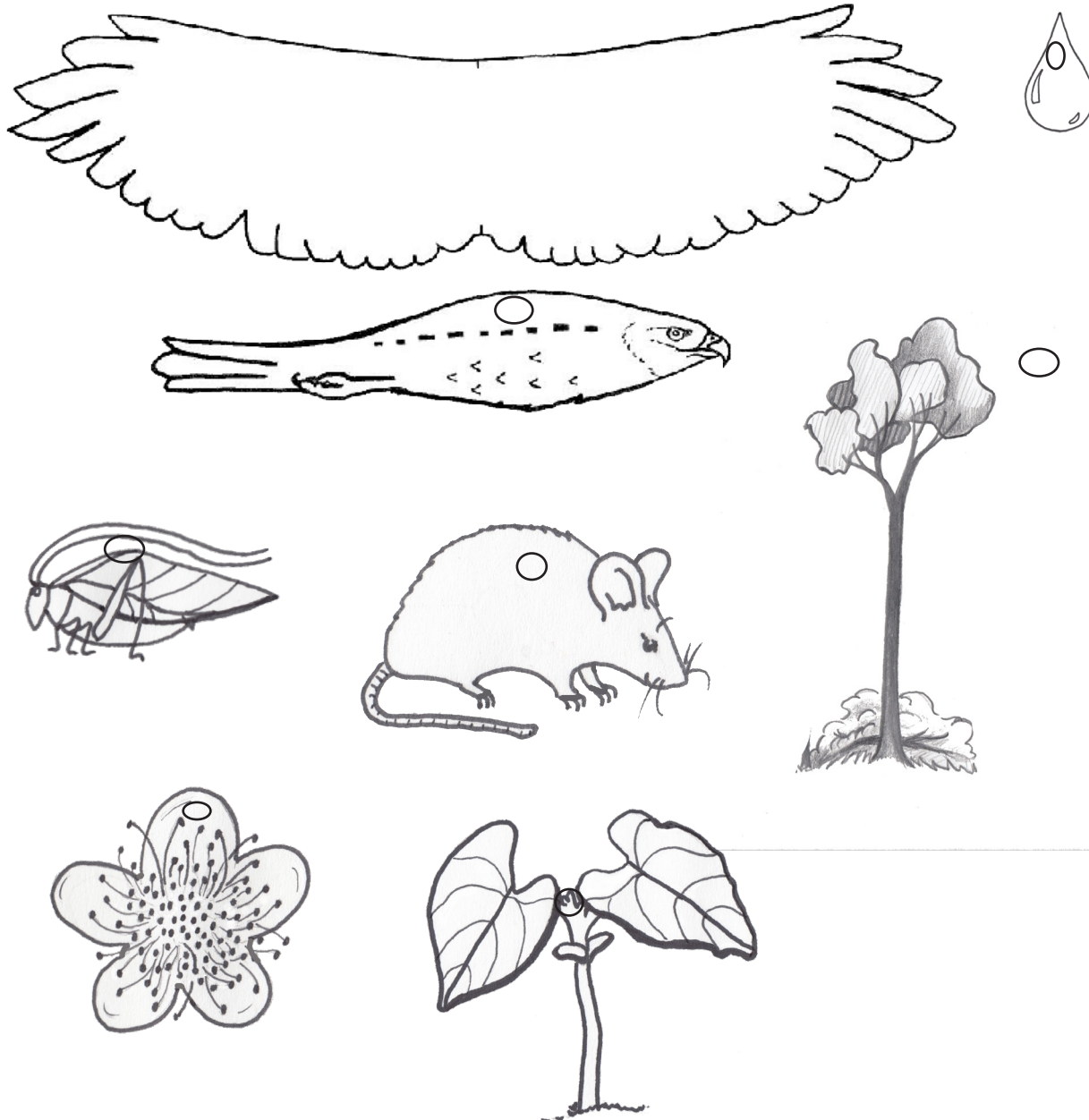
Extensions:

- Create a habitat/food web mobile in the classroom on a large scale - perhaps along one wall.
- Organize a "Habitat Cleanup Day" in the neighborhood. Invite other students, teachers, and parents to participate.

HABITAT MOBILE

Photocopy & Distribute

Directions: Color and cut out each image. Poke a small hole at the top of each image (where the circle is). Tie a string of varying lengths through each hole and tie to a stick or hanger.



HABITAT MOBILE

Photocopy & Distribute



MEMORY GAME

Evaluation Activity 3

Materials:

- Game Cards*
- tape or thumb tacks
- scissors

Subjects:

- Language
- Science

Grade Levels:

- 5th-12th

Objectives:

Measure students' knowledge of the topics in this guide, in a fun and dynamic way.

It is important that the teacher uses this activity to assess the students' knowledge and discuss any questions or concerns they have about the topics at the end of the activity.

Ecological Message:

To protect raptors, we need to understand their habitats, biology, and other elements important to their survival.

**Cutting up old cereal boxes or other old cardboard is a great way to repurpose these materials for this activity.*

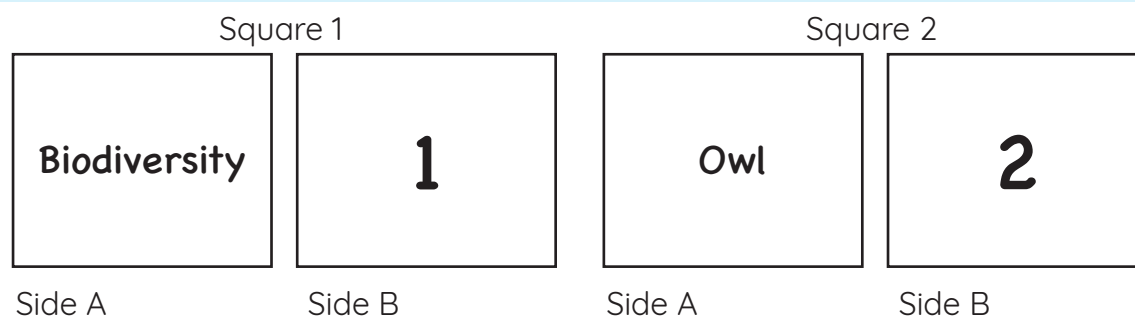
Preparation:

1. Print the Game Cards on thick paper or hand-write the words on cut up squares of old cardboard.
2. If making the cards by hand, write each one of the key words found on page 130 on individual squares of paper or cardboard, or add additional words of your choice.
3. On the other side of each square, write one number or letter.

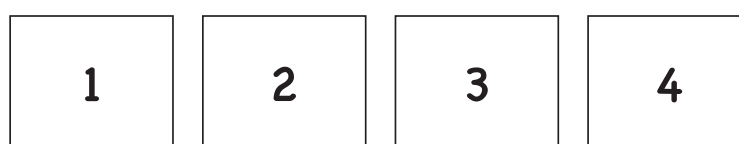
Example:

square 1- Side A - keyword: BIODIVERSITY

square 1 - Side B - The letter "A", or the number 1



4. Using tape, velcro, or thumbtacks, hang the squares side by side, with only Side B facing out.



Process:

1. Place participants into teams of 3-5 students. After consulting with team members, a student from the first group selects one, two, or three squares (based on the number/letter on side B). The teacher turns the squares over so that the students can see the words written on the back of the cards, then returns the cards to their original places. For example, a student may choose number 4 and form a sentence with that one word. Or they may choose numbers 4 and 9 and form a sentence with both those words, or they may choose numbers 4, 9, and 2 to form a sentence with all three words.

2. As a team, students have one minute to form ONE SENTENCE with the word(s) they chose in this round. If the word is a verb, it can be conjugated; words may be used in the singular or plural. Students cannot repeat the same phrases from their own group, nor from the other groups. However, they may use the same words to form different sentences.

3. For every correct sentence, the team receives one point for each word. If the sentence is not right, they lose one point for each word. Play a few rounds and then tally up the points. Discuss the activity as a group.

MEMORY GAME CARDS

Photocopy & Cut Out

Print on cardstock and cut along the dotted lines. On the back of each card (side B), number each card in sequential order (1-20; or A-T alphabetically)

Caribbean	Habitat	Top Predator	Ecosystem
Raptor	Food Chain	Owl	Carnivore
Endangered	Primary Consumer	Prey	Hunt
Conservation	Bioindicator	Disease	Producer
Decomposer	Vulture	Rodent	Biodiversity

CONSERVATION

Chapter 4

Words to Know

climate change
conservation
poaching habitat
top predator

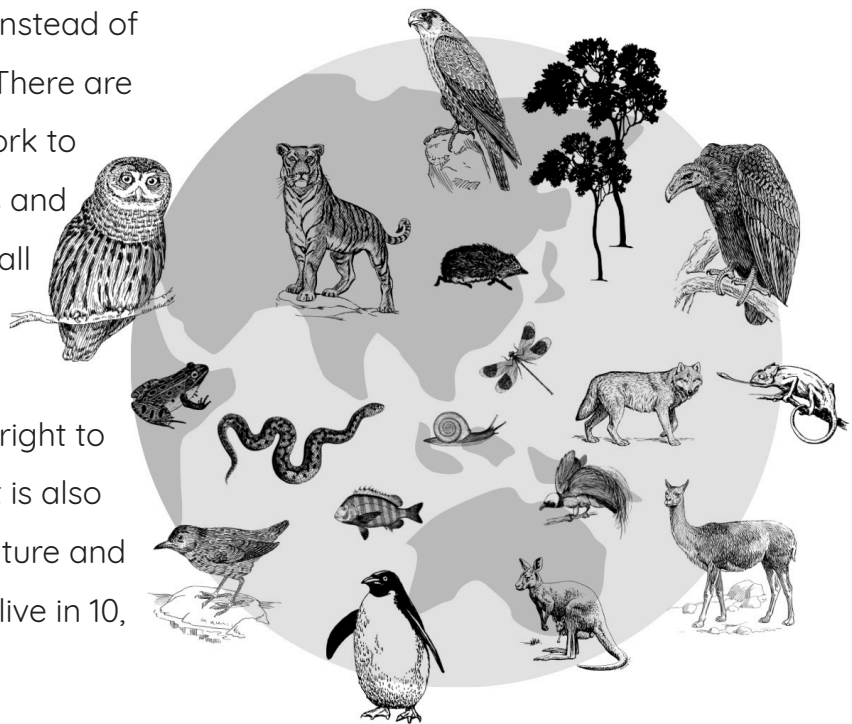
Learning Objectives for Chapter 4

Participants will be able to:

1. Name three threats to raptors
2. Describe three ways in which humans can help raptors
3. Engage in one activity to help birds or other wildlife in their area

Conservation begins with a desire to improve our world and ends with action. An example of **conservation** can be declaring a large, natural area as a national park, or it can be a simple act, such as putting our groceries in a canvas bag instead of using disposable plastic bags. There are many reasons why we must work to conserve the natural resources and wildlife on our planet. After all, all living things, be they humans or hawks, deer or jaguars, orchids or butterflies, have the right to live in a healthy environment. It is also important to think about our future and what kind of world we hope to live in 10, 20, or even 50 years from now.

Engaging in conservation right now is the best way to ensure a healthy planet for us and for future generations.



Raptors: Just Like Us

Raptors and humans are both interacting components within the environments in which they live. Like all other organisms, they are part of nature and cannot live independently of the natural world. After all, all living things are connected to each other. A healthy planet is vital to all of us.

You have now learned quite a bit about birds of prey, and have probably realized that they need all of the things humans need in order to be healthy. They need healthy food to eat, clean water to drink and bathe in, shelter from bad weather and from danger, and space to move about freely. And just like us, raptors must work very hard to survive. In fact, most raptors, up to 75%, don't survive their first year of life!

Just like humans, most raptors are very good parents. The male and female often stay together for life and both work very hard to raise their young. The adults defend their family against predators, bring their offspring food to eat, and do their best to care for their offspring until the young birds become independent and leave their natal territory.

In general, the things that cause us harm are the same things that can harm raptors, too. For example, hurricanes can destroy a raptor's home, just as they can destroy ours. Now, imagine what it might feel like if someone took all the food from your farm or from your home. When humans kill animals like snakes, lizards, frogs, or insects, they are essentially stealing food from hungry raptors. When we poison rodents with rodenticides, we are poisoning raptor food. This makes it very hard for birds of prey to survive.

Raptors, like us, also need large spaces to fly in and roam free. When we lock a raptor, or any wild animal, in a cage we are taking away its freedom to fly, to hunt, to find a mate, and more! Think about it... humans don't want to live in cages, and animals don't either. When wild animals are forced to live in a cage, or tied up, they suffer, just as we would.

We have learned so many ways that raptors help humans. So, how can we help raptors? To better understand that, we first need to learn a bit more about some of the biggest threats they are facing.

Industrial Threats to Birds

Industrial advances have helped to bring about some positive changes to society through advanced technologies, employment, and other benefits. However, many industries are also extremely destructive to the natural world and have caused **climate change**, forest destruction, large-scale pollution, and more. All of these factors together are having a devastating effect on all life on this planet. Here are some examples.

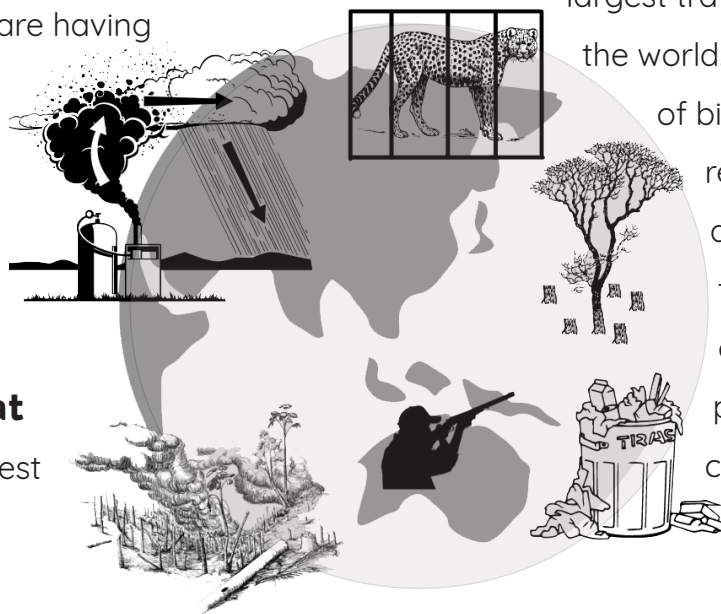
Loss of habitat

Perhaps the biggest threat to raptors, other birds, and most wildlife is the loss of their habitat. Like us, they need basic resources to survive, including food, space, shelter, and water - all the components that make up a species' **habitat**. However, changes that large corporations and industries have made to the environment have spoiled the quality, balance, and availability of these resources. Habitat loss can occur in many ways. The

logging of trees in a forest, the filling in of wetlands, and converting grasslands to large-scale cattle pastures are just some examples of how important ecosystems around the globe are being altered.

Wildlife Trade & Overfishing

The illegal trade of wildlife is one of the largest trafficking operations in the world. Each year, millions of birds, invertebrates, reptiles, amphibians, and mammals are trapped across the globe to be sold as pets and for private collections. The majority of these animals will die during transport. Some animals, like elephants and rhinos, are killed only for certain body parts, such as their tusks and horns, which are later sold on the black market. Unfortunately, many people forget that fish are wildlife too! Overfishing - the catching of so many fish at once that breeding populations are depleted and struggle to recover - is one of the greatest threats to our oceans.



Contamination

Pollution occurs when microorganisms, chemicals, toxic substances, or wastes are introduced into the air, water, or soil, in concentrations that make these resources unfit for safe use. It is the cause of the decline of many wildlife species, as we saw in the previous chapter about the use of DDT and the disappearance of the Peregrine Falcon. When a substance is harmful to an animal such as a raptor, it is very likely that it is harmful to humans, as well.

Plastics and chemicals in the ocean are another major threat. Plastic and other garbage threatens the health of marine ecosystems, and all the organisms found there. Also, many species of fish have high levels of toxins, such as mercury, in their systems. This, of course, not only affects the fish themselves, but it also affects all the animals along the food chain that will consume these fish - including humans.

Think about when an oil tanker spills its cargo into the water due to an accident, a major storm, or other factors. Birds that come into contact with oil will die if their feathers are covered with this substance. Birds die of hypothermia because when the feathers are covered in pollutants, they

lose their properties that help maintain body temperature. Additionally, oil-coated birds die because they cannot fly, hunt for food and are vulnerable to other predators. Many scavengers might eat these dead birds, and also die from the same chain of pollutants.

Collisions & Electrocutions

Birds of prey suffer from collisions with vehicles, windfarms, and even large windows. Barn Owls that fly low over roads at night in search of rodents, and raptors that feed on roadkill, are particularly vulnerable to vehicle collisions. Many raptors also die each year from electrocution when they perch on power lines. Thankfully, there are simple modifications that power companies can use to help keep raptors safe from electrocution.

Climate Change

One of the greatest threats to all life on the planet is that of climate change. In some areas, temperatures are going to rise quickly; in other areas temperatures will fall just as dramatically. We will begin to see extremes in rainfall and drought. Hurricanes, tornadoes, and other weather events will occur more often and with greater force.

Our Everyday Actions that Threaten Wildlife

Sometimes learning about the threats to our natural world can feel overwhelming. However, there are things we do every day that can either harm or help raptors and other wildlife. It is up to us to decide!

Littering

Though we might not think too much about what happens to a piece of garbage we toss in the street, the truth is, trash can harm wildlife and us in a number of ways. Accumulated garbage attracts rodents and cockroaches and provides habitat for breeding mosquitoes.

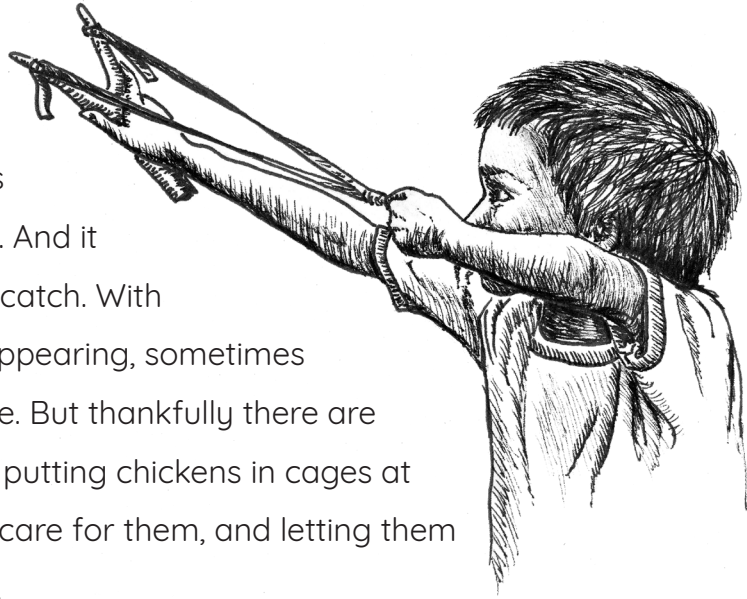
Second, when we throw trash onto the ground, it often gets washed out to rivers and, eventually the ocean, during heavy rains. Garbage and chemicals thrown into or near water bodies cause serious contamination to those waterways and the animals that live there. Many fish caught for human consumption have accumulated plastic particles (microplastics) in their systems. Sea turtles mistake floating plastic bags for jellyfish and can die when trying to swallow the bags. Fish, seals, whales, and other marine life become entangled in fishing line, plastic six-pack rings, and other garbage. Some seabirds mistake floating plastic for food and consume it, filling their stomachs with indigestible plastic, which eventually kills them.

Indiscriminate Hunting

Many people around the world hunt animals to obtain their food. They often do this because they do not have the resources or access to buy food in a supermarket. This is known as subsistence hunting, and it generally has a lower impact on wildlife populations.

Unfortunately, however, some people kill animals - sometimes at very high rates - not to eat them but because they fear them or view them as pests; or to use or sell their parts. This has been one of the main direct causes of extinction of many species of animals, including raptors, worldwide. One big problem in the Caribbean, and around the world, is

that some people kill raptors because they prey on domestic animals, such as chickens. It is important to remember that when a raptor hunts a domestic animal, it doesn't know it is causing problems for that animal's owner. It is simply trying to survive. And it often takes the easiest prey it can catch. With much of raptors' natural prey disappearing, sometimes chickens are all they have available. But thankfully there are solutions to this problem - such as putting chickens in cages at night or when no one is around to care for them, and letting them roam free when someone is home.



Of course, raptors suffer from the indiscriminate killing of their prey animals, too! In many parts of the Caribbean, people fear snakes although venomous snakes are rare in this region. Some islands, such as Jamaica and Hispaniola, don't have any venomous snakes at all! People also fear and kill bats, toads, and tarantulas. Humans may also kill birds like woodpeckers because they sometimes damage crops. But all of these animals have a very important role to play in the environment, including being an important food source for raptors.

Keeping Wild Animals as Pets

When we keep a wild animal in a cage, or chained up, we are causing a lot of harm to this animal. It is essentially like putting it in prison for the rest of its life. We are preventing it from interacting with other members of its species, reproducing, searching for food, walking, flying, or otherwise interacting with its environment in a natural way. Even though some people might like looking at an animal - such as a parrot - in a cage, the truth is that person is causing enormous suffering to that animal. Remember, always keep wild animals in the wild.

Rodenticides

It is important to remember that rats and mice are also part of our natural world and have important roles to play in their ecosystems. However, many rodent species have been introduced to the Caribbean, and when their populations get very large, they may cause problems for humans by damaging their crops and entering their homes. One of the reasons rodents are so abundant is because people have been killing their natural predators (raptors, snakes) for centuries, and throwing litter in the streets (which provides them with food and shelter).



Today, many people use rodenticides (poisons) to control rats. But this may lead to an even bigger problem. Though rodenticides do kill some individual rodents, they also kill many other animal species.

Let's learn how. When a rodent eats the poisoned pellet, it does not die right away. In fact, it can survive for five days or more! During this time, it often returns to eat more poison, so the poison is now in high concentrations in its body. After several days, the rodent will start to feel sick. As you learned in

Chapter 3, a sick animal is easy prey for many predators, including raptors. When an owl or hawk eats a poisoned rodent, the owl or hawk becomes poisoned too. If it eats too many poisoned rats, the hawk or owl will also die. In essence, rodenticides are killing off natural rodent predators! So, with fewer and fewer owls and hawks, more and more rodents will be able to survive. Not to mention that rodenticides can be very dangerous for pets and humans, especially children!

Cats

Though it might be hard to imagine, cats (both pets and feral) kill millions of birds every year, as well as native lizards, snakes, and other wildlife. If you have a pet cat, get it spayed or neutered, and always keep it indoors.

How Can We Protect Raptors?

Most of the problems faced by raptors are caused by human activities, and the solutions are not always easy. We need food to eat, wood to build, and we need jobs. However, we need wildlife as well. We need forests and deserts, savannas, and streams. We need coral reefs, healthy soil, and clean water and air. Finding a balance between human progress and the preservation of species presents a great challenge to the modern world. Wildlife needs advocates for its preservation, and there are many things we can do to help.

Here is a short list of just some of the things one person, one school, or one community can do to help save the wildlife in your area.

Learn & Teach

Environmental education is a key component in reducing some of the day-to-day threats faced by raptors and other wildlife. As more and more people better understand the importance of raptors, and the role they play in nature, more and more people will want to protect them. So what can you do? Read everything you can about environmental issues. Spend time in nature learning about birds and other wildlife. Share everything you learn with students, teachers, family, and friends. Remember, each human being regardless of where they live, who they are, or their age, has an important role in conservation and can contribute positively to the protection of birds of prey and their habitats.

Reduce

One of the biggest problems we are facing right now is the huge amount of trash generated every year around the world. Manufacturing of these items also often requires the use of a lot of water, electricity, and raw materials and can generate a lot of pollution too! One way you can help is by taking care of all your things. Every time you break or damage something, you must replace it and that creates garbage. Another tip - when you go to the supermarket, take cloth bags to put your groceries in, rather than using a plastic bag. What other ways can you think of to reduce the amount of garbage we generate?

Repair, Reuse, and Donate

No matter how well we take care of things, they will eventually break or become worn out. When this happens, we can think of creative uses for these items. Old clothes can be made into canvas bags, potholders, or rags for cleaning. Used cans and empty plastic bottles can be turned into pencil holders or pots for plants, and old paper can be used for art projects. What other ideas can you think of? Remember, too, that there might be people in need of the items you no longer want or use. Donate old clothes and household items in good condition to local charities.

Treat All Life As You Wish To Be Treated

This might be the most important way to help of all! If we think about how we would like to be treated, and treat everyone else - including wildlife - that way, we will naturally avoid harming other living things.



Build & Plant

- Plant one tree, plant many.
- Build “nest boxes/houses” for bats and raptors so they have a safe haven in your neighborhood. Many sites on the Internet provide information on how to build these boxes without many materials.
- Plant an organic vegetable garden at school without the use of pesticides. When they are ready to eat, organize a party with the students.
- Organize a clean-up day at a river, park, or other area near the school or community. Invite the entire neighborhood to participate.



Set an example

The best way to teach others is through example. If there is an animal that you think is ugly, that scares you, or that you just don't like, rather than continuing to fear it, spend some time learning all you can about it.

- Instead of killing an animal with a slingshot, practice drawing it instead.
- Wild animals want to be free, not pets. Never buy a wild animal that is for sale. Never catch a wild animal or put one in a cage.
- Spend some time watching animals in their natural environment with friends. Create a birdwatching club in your school.
- You wouldn't want someone to throw trash inside your home - likewise, animals don't want to live in a trash-filled environment. Throw all trash in the garbage can.

Volunteer

In Appendix 3, we have created a list of some of the conservation organizations working in the region. Reach out to one or more to see how you can help support their mission. If that doesn't work out, perhaps start your own conservation club at school and volunteer your time helping wildlife and conservation.

What other ideas can YOU think of?

Let's Conserve!

Work on your own, in a group, or as a class to develop a project that will help protect wildlife and wild places in your home, school, or community.



Treat all
life as you
wish to be
treated



Repair,
Reuse &
Donate

Learn & Teach



Brainstorm here: _____

[illegible]

Make a list of the materials or resources you will need to carry out your activity:

List the steps to make this happen:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

After you have carried out your project, write about how it went. What did you learn? Did you have any setbacks? Did you get the results you hoped for?

MAP OF EXTINCTION

Learning Activity 7

Materials:

- Hawk images*
- Extinction Cards**
- Map of your country or the Caribbean***
- a container (i.e., cardboard box) in which to place the Extinction Cards

Subjects:

- Geography
- Art
- Math & Critical Thinking

Grade Levels:

- 3rd-12th

Objectives:

Participants will identify some of the factors that may positively or negatively affect a species' survival.

Ecological Message:

We can do our part to protect nature and help prevent many species of animals from disappearing from our planet.

* Images found on page 145. Print several copies and cut out, so that there are at least 20 hawk silhouettes per group.

**Extinction cards can be printed on thicker paper and laminated for durability.

*** Map of the Caribbean is provided on page 190.

Preparation & Notes:

This activity is best carried out using one large map at the front of the classroom that all students can see and interact with. If this is not possible, small groups can work together sharing one small map each.

Option 1. Working in groups, students can create a large map (the bigger the better) of the country they live in (this activity may take several days or several hours, depending on the size of the map, materials used, etc.).

Option 2: From the internet or other source, print or photocopy a map on a regular 8.5x11 paper (one per group).

Option 3: Use the map of the Caribbean provided.

No matter which map you use, you may choose to highlight some important geographical points such as: the demarcated provinces/countries, traditional cultural sites, the Caribbean Sea, national parks, etc.

Step 1: Prior to beginning the activity, place several “hawks” on the large map or give each group a few hawks to place on their printed maps. There should be extra “hawks” nearby.

Place the “Extinction Cards” in a container and mix them up. The “Extinction Cards” represent actions by the following groups: poachers, students, biologists, politicians, and loggers.

As a class, discuss the importance of the Caribbean, its ecosystems, and the animals and vegetation found there. Talk about the loss of biodiversity and some of the reasons for it. Ask students what “endangered” means. Ask them if they think that they, personally, can influence whether an animal is in danger of extinction or not. Who is in control of this? Discuss briefly. Explain to students that they are going to be learning about some of the contributing factors to wildlife extinction and some positive actions they can take to help prevent this.

Process:

1. Divide the class into 3 or 4 different groups.
2. Pass around the container containing the Extinction Cards allowing each group to choose an Extinction Card at random
3. When each group has a card, they will take turns reading what it says and decide whether 1) the activity described on the card is positive or negative for the environment and 2) the impact (low or high) it may have for conservation. They will then remove or add hawks to the map accordingly.

For example, if the card says: “biologists reintroduce hawks to a national park,” students decide if this will have a positive impact or a negative im-

impact on the environment. If they believe it will have a negative impact, they must remove 1-3 hawks from the map, based on their opinion of the level of impact the action will have. The greater the negative impact, the more hawks should be removed. If they believe the action is positive, they will put more hawks on their map (they may put 1-3 hawks based on their assessment of the positive impact level of this activity. The greater the positive impact, the more hawks should be placed). They must work in groups and reach a consensus on their decisions. They may even decide an action is neutral, which will mean no hawks are removed or placed on the map.

4. Play several rounds of the game. When the groups have finished, take a few minutes to look at the map. How many hawks are remaining? Discuss how certain actions affect hawk populations. What are the factors that affect the hawk positively or negatively?

Variant:

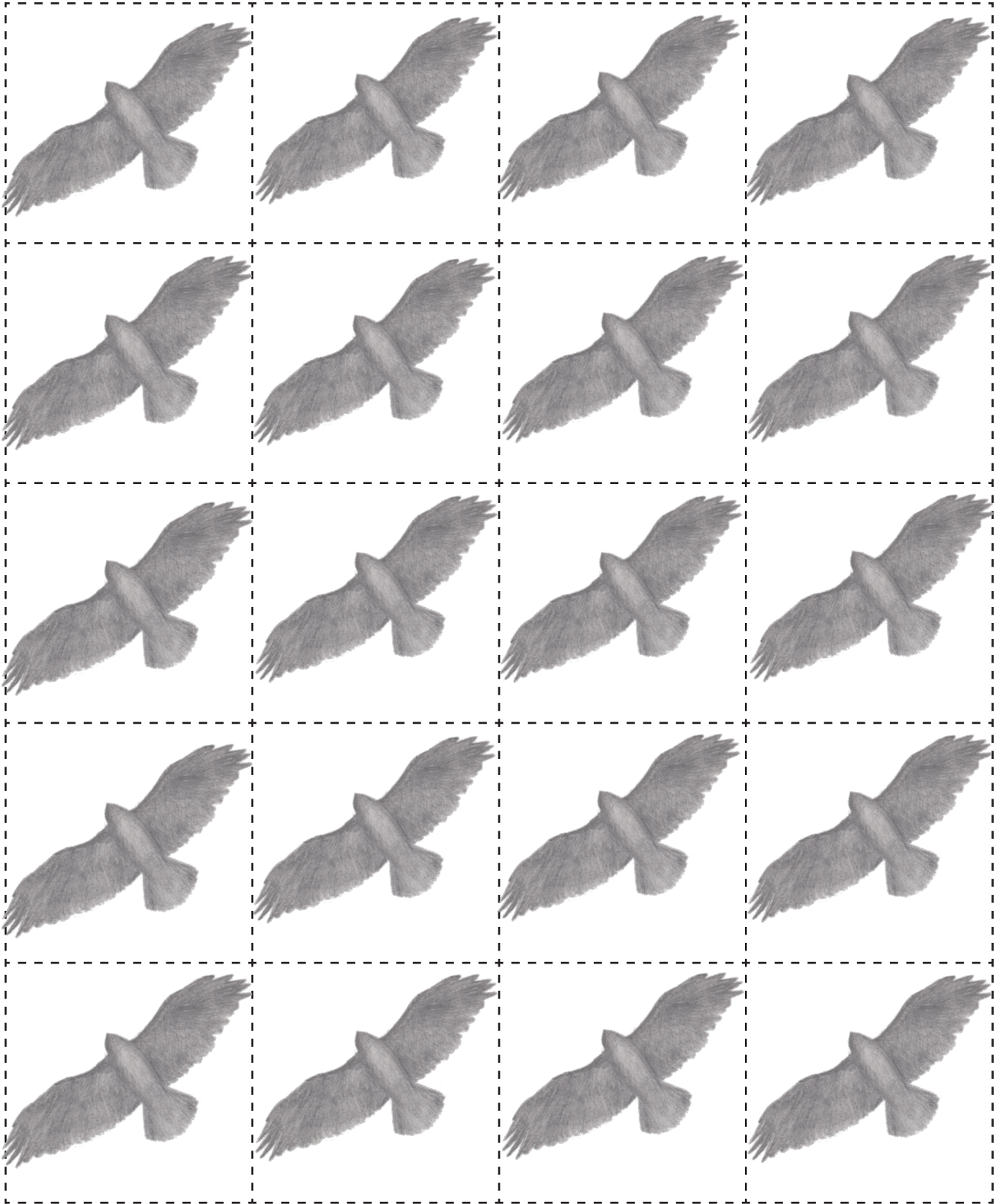
Do the activity again, but this time remove all actions students classified as “positive” from the Extinction Cards. Watch how quickly the hawks die off. How will this affect other animals? Would this affect humans? How?

Extensions:

- a) Students write their own “Extinction Cards.” Play the game again.
- b) Have students choose an endangered animal to write about. They can tell their stories from the point of view of the animal, other animals that share their habitat, or from the point of view of humans. Make sure they include information on why the animal is going extinct and how this will affect the other animals around it.
- c) Have students research an animal that is now extinct, or a highly threatened animal, and present a report to the class.

MAP OF EXTINCTION HAWK IMAGES

Photocopy, Cut & Distribute



MAP OF EXTINCTION CARDS

Photocopy, Cut & Distribute

Action: Positive, Negative or Neutral? Two nestling hawks hatch in a wild nest Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Biologists release hawks in the forest Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Biologists protect two hawk nests Will you add or remove hawks from the map? How many?
Action: Positive, Negative or Neutral? Biologists discover a new species of insect Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Biologists petition to form a new national park Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Students plant a school garden that attracts birds and insects Will you add or remove hawks from the map? How many?
Action: Positive, Negative or Neutral? Students start a recycling program at their school Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Students throw trash on the street Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Students work to protect a forest near their school Will you add or remove hawks from the map? How many?

MAP OF EXTINCTION CARDS

Photocopy, Cut & Distribute

Action: Positive, Negative or Neutral? Students write to the President urging her to protect wildlife habitat Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Students throw stones at animals Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? A student drops trash on the street Will you add or remove hawks from the map? How many?
Action: Positive, Negative or Neutral? A hunter kills only the animals she needs to feed her family Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Hunters collect the trash they find in the forest Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Someone kills an Osprey to steal the fish it has in its talons Will you add or remove hawks from the map? How many?
Action: Positive, Negative or Neutral? Someone kills a nesting female hawk Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? People catch wild animals to sell as pets Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Politicians declare a new protected area Will you add or remove hawks from the map? How many?

MAP OF EXTINCTION CARDS

Photocopy, Cut & Distribute

Action: Positive, Negative or Neutral? A farmer uses rodenticides to kill rats on his farm Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? A windfarm is built along a raptor migration route Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Someone places their young chickens in a cage Will you add or remove hawks from the map? How many?
Action: Positive, Negative or Neutral? Politicians pass a law declaring May 25 as Ridgway's Hawk Day Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Contractors fill in a wetland to build a school Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Students start a birding club at their school Will you add or remove hawks from the map? How many?
Action: Positive, Negative or Neutral? Politicians eliminate laws that help keep air and water clean Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Politicians vote to cut forest to build a shopping mall Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Your neighbor doesn't obey traffic laws and drives very fast Will you add or remove hawks from the map? How many?

MAP OF EXTINCTION CARDS

Photocopy, Cut & Distribute

Action: Positive, Negative or Neutral? Someone cuts a tree that has an active hawk nest in it Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Your neighbor puts out food to feed feral cats Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Your friend practices sketching birds in her backyard Will you add or remove hawks from the map? How many?
Action: Positive, Negative or Neutral? Your neighbor lets his pet cat roam free Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Ecotourism increases in a bird sanctuary Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? A student buys a bird on the street and re-releases it Will you add or remove hawks from the map? How many?
Action: Positive, Negative or Neutral? Someone kills a venomous snake Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? A neighbor takes a baby hawk from its nest to keep as a pet Will you add or remove hawks from the map? How many?	Action: Positive, Negative or Neutral? Someone kills a non-venomous snake Will you add or remove hawks from the map? How many?

FLYING! FLYING! FLYING!

Learning Activity 8

Materials:

- Game Pieces*
- paper bags (or other individual containers - clean juice boxes with the top cut off can work well)
- string or rope

Subjects:

- Natural Science
- Physical Education

Grade Levels:

- K-12th

Objectives:

Participants will:

- 1) identify the threats and factors that influence the disappearance of raptors
- 2) understand the importance of healthy habitat for wildlife.

Ecological Message:

Raptors and other animals need suitable habitat to survive.

**Make enough photocopies of the Game Pieces (Resource sheet on page 153) so that there are plenty of pieces for each student.*

Preparation:

This activity is best done outside, but can be done in an indoor setting, as space permits.

1. Photocopy, color in (optional) and cut out the game pieces from the Teacher Resource Sheet (page 153). Laminate if possible.

2. In the classroom, or outdoors, mark two parallel lines about 5 meters apart from each other. These will be routes A and B. Beside each line, place piles of twigs or leaves in areas where hawks would stop to rest. These should be separated about 1.5 -2 meters from each other.

3. On route A (which represents well-conserved habitat), all stopover sites will have enough mice so that

each student can collect at least 1-2 mice each. For example, if the group consists of 10 children, place at least 20 mice (from Game Piece Resource Page) in each spot. Also add sufficient trees and nests. Here, you can add just a few contaminated mice and one or two other threats (from Game Piece Resource Page).

4. On route B (degraded areas, with little food and many threats), place healthy mice in some places, but only a few, so that there are not enough for all the hawks. Also place objects that represent pollutants, garbage, or other dangers for birds. Add other mice marked with the X to represent contaminated animals.

Process:

1. Explain to the students that they are going to pretend to be young hawks that have just left their parents' territory. They will be passing through different places in search of suitable territory of their own.
2. Divide the students into two groups. One will travel route A and the other will travel route B. Pass out one paper bag to each student.
3. When you indicate, both groups should travel along their respective routes, moving their arms to imitate hawks flying (if desired, for younger children).
4. Let students know they have 15 seconds to search for food. Each student should try to pick up as many cut-out pieces as they can and place them in the paper bag. Once all the pieces have been collected, allow students to move on to the next stop-over point as a group.
5. Repeat steps 4 until they reach the last site. Once there, instruct the students to return quickly to their place of origin.
6. As a group, have each student share the contents of their bags. The students who have collected many threats (gun, contaminated food,

power line, etc.) move to one side as a sign that their hawk didn't survive.

Ask them to discuss the difference between group A and B. Which group has the most survivors? Which hawks are better fed? What problems do raptors face in their search for new territory? What can we do to help them?

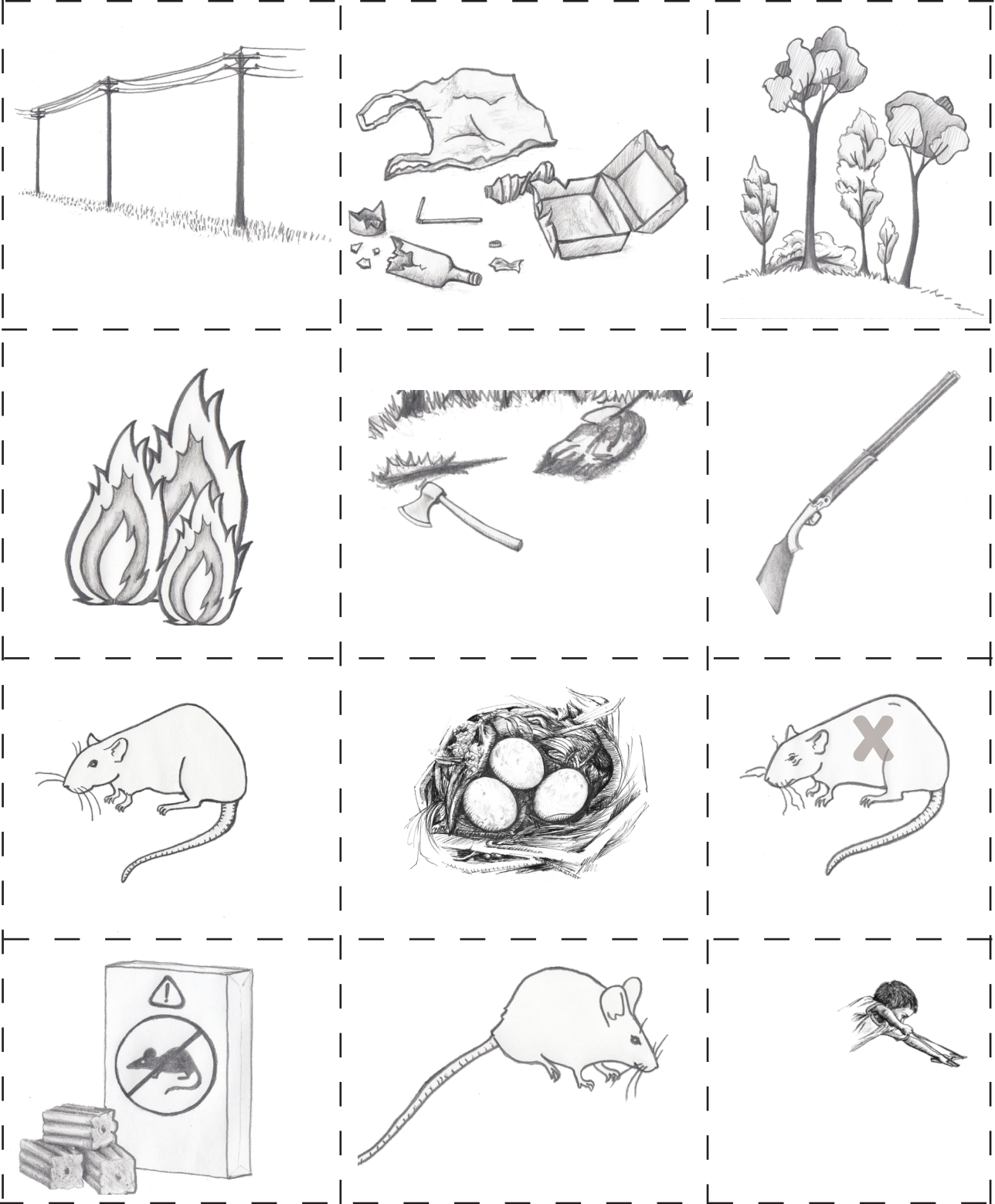
7. Discuss with your students a specific example of problems faced by raptors and other animals.

Extensions:

- a) Students will research potential wildlife habitats in areas near the school. What kind of habitats are found and what kind of food, etc., is there for raptors? What can we do to protect habitats?
- b) Students will make a mural or a work of art depicting a bird of prey in its habitat.

FLYING! GAME PIECES

Photocopy & Distribute



RAPTOR BINGO

Evaluation Activity 4

Materials:

- Bingo Cards
- Questions (provided) written on small pieces of paper
- cardboard box or other container
- stones, beans, or other material to serve as game pieces

Subjects:

- Language
- Science

Grade Levels:

- 4th-12th

Objectives:

This activity is designed to measure students' knowledge about birds of prey in a fun and dynamic way.

Ecological Message:

Birds of prey play an important role in the natural world.

Preparation:

Photocopy several copies of each Bingo Card (1-5) so there are enough cards per student or group. Photocopy the Questions page and cut out each sentence so that it is on its own slip of paper. Place these slips of paper in a small cardboard box or other container.

Process:

1. Pass out a Bingo Card to each student, or let the students work as a group - sharing a card between 3 students. Supply enough stones, beans, etc. to be able to cover each square on the card (16 should be enough).
2. The teacher selects a random question card from the cardboard box. Read the question out loud. Students should place the stone on top of the square on the card that corresponds to what they believe is the correct answer.*

3. Keep playing until a student (or group) has 4 stones in a solid horizontal, vertical, or diagonal line. When this happens, they have achieved “BINGO” and should raise their hands to let the teacher know.
4. The teacher will review the bingo card and compare it with the questions that were asked to ensure they match.
5. Students can play multiple rounds, removing all the rocks from the card after each round.

*Please note: each card is different, so not all cards will contain the correct answer. When reviewing student cards, if there is doubt as to whether the image they covered corresponded correctly to an answer or not, it is very important that the teacher allows the students the opportunity to explain their reasoning behind why they believe their answer is correct. A few images can correctly correspond to several different questions.

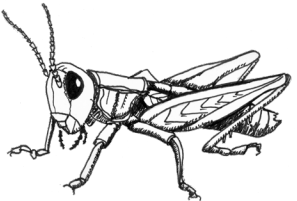
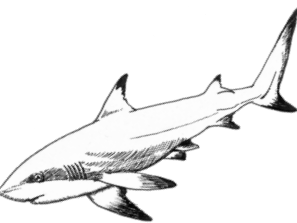
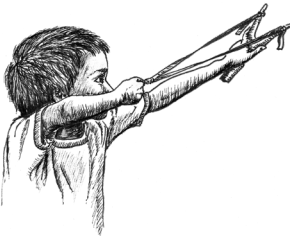
SUGGESTED BINGO QUESTIONS

Photocopy & Cut Out

1. The raptor with the keenest sense of smell
2. A threat to wildlife
3. A top predator
4. A characteristic of raptors
5. A favorite prey of hawks
6. A decomposer
7. Active during the day
8. When chemicals, toxic substances, or wastes are introduced into the air, water, or soil, in concentrations that make these resources unfit for the use they should have.
9. The sequence of plants and animals that eat each other
10. An important characteristic of raptors
11. The Producer in the food chain
12. Group of birds that hunt for food, and have curved beaks, strong legs, and sharp vision.
13. State of a living being, in which there is a high probability of disappearing from the planet
14. Measurement of outstretched wings, from one end to the other
15. A primary consumer
16. Active at night
17. How raptors get rid of indigestible parts of their prey
18. What scientists sometimes place on birds' legs to help identify them

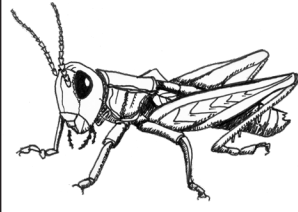
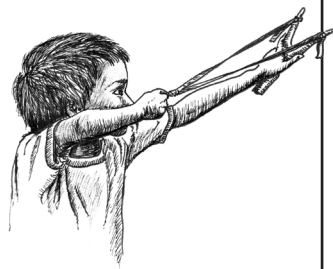
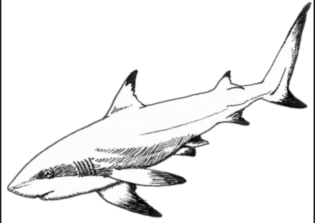
RAPTOR BINGO CARD #1

Photocopy & Distribute

FREE			ENDANGERED
		CONTAMINATION	
WINGSPAN	FOOD CHAIN		
			DIURNAL

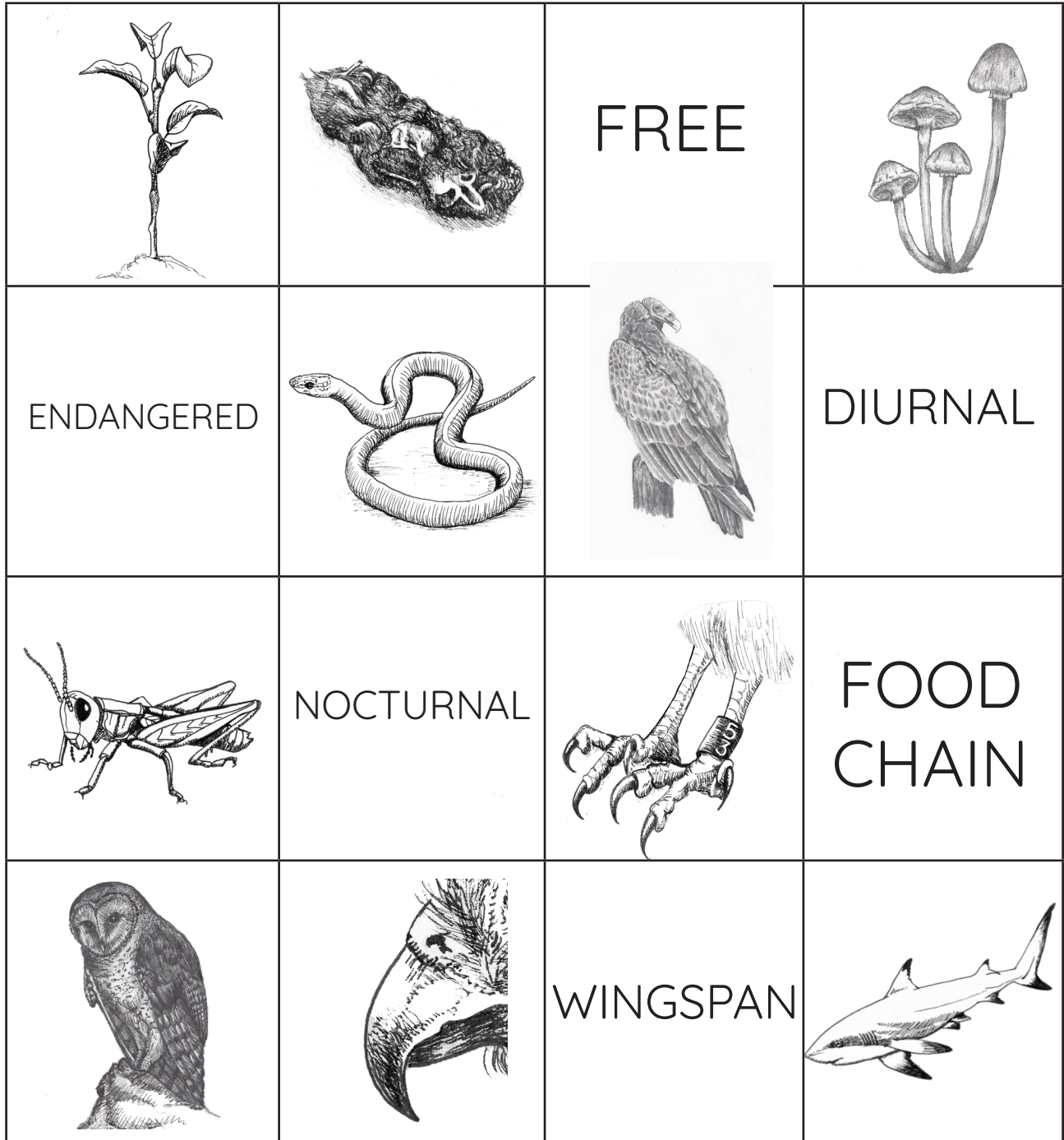
RAPTOR BINGO CARD #2

Photocopy & Distribute

NOCTURNAL			DIURNAL
			FOOD CHAIN
WINGSPAN		FREE	
	ENDANGERED		

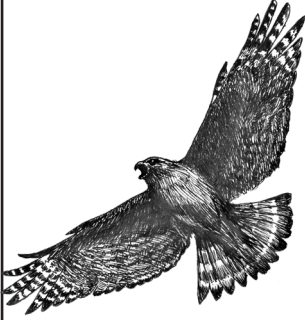
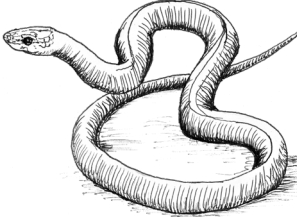
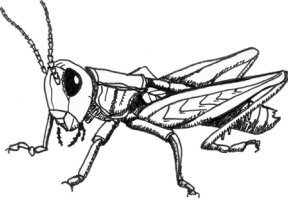
RAPTOR BINGO CARD #3

Photocopy & Distribute



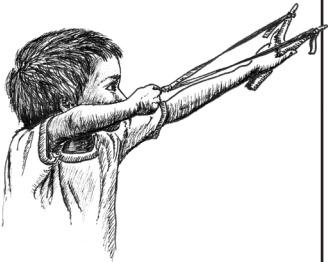
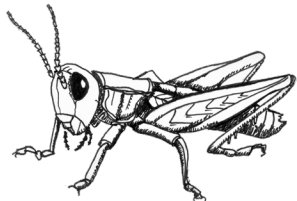
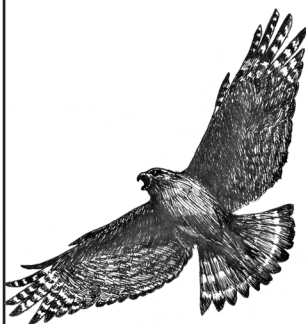
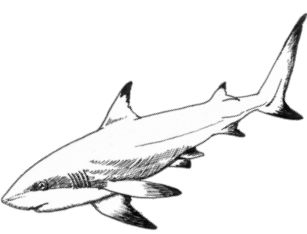
RAPTOR BINGO CARD #4

Photocopy & Distribute

	DIURNAL		WINGSPAN
	CONTAMINATION		
	FREE		ENDANGERED
		NOCTURNAL	

RAPTOR BINGO CARD #5

Photocopy & Distribute

FOOD CHAIN			
	CONTAMINATION		FREE
			
ENDANGERED			DIURNAL

Appendix 1:

Conservation Stories from Around the Globe

1. Peregrine Falcons & DDT

Learn how a pesticide made its way up the food chain and threatened a top predator

2. California Condors & Lead

Read about lead and its deadly effects on scavengers

3. African Vulture Crisis

Find out how human-wildlife conflicts with predators are causing the decline of some scavengers

4. Indian Vulture Crisis

Discover how a veterinary drug nearly wiped out an entire population of vultures



PEREGRINE FALCONS & DDT

Photo: Jim Shane

The Problem

Peregrine Falcons are found all over the world, in almost every type of habitat and on every continent except Antarctica. But in the 1950s and 1960s, scientists in North America began noticing something very strange. Peregrine Falcon populations were declining drastically.

To understand why this was happening, they began at the beginning - the eggs! When biologists climbed into Peregrine Falcon nests, instead of finding fluffy white nestlings, they found a cluster of broken eggshells. After analyzing the eggshells, they found high amounts of the pesticide DDT (dichlorodiphenyltrichloroethane), which didn't kill the Peregrine Falcons, but prevented them from absorbing calcium and fats. This caused the females to lay eggs with very thin shells. So, when the females tried to incubate them, the eggs simply broke. Because the falcons were unable to reproduce enough young to sustain the population, they began to disappear rapidly from different areas in the United States. In less than twenty years Peregrine Falcons had disappeared east of the Mississippi River. And other species of raptors were also seriously affected.

First Steps

Determined to learn how to breed and raise Peregrine Falcons in captivity, conservationists started the first conservation breeding facility in North America in 1970. Over 30 years, more than 1,000 Peregrine Falcons were hatched in captivity and released back into the wild.

Challenges

- Before 1970, very few people had experience successfully hatching and breeding raptors in captivity, and certainly not at a scale large enough to restore a species. So, conservationists had a lot to learn and they had to do it quickly!
- DDT was being used on a wide scale across North America, affecting other wildlife as well. It is still being used in many countries around the world.

Solutions

- Large-scale captive breeding and release of Peregrine Falcons.
- Banning the use of DDT in North America

Results

Thanks to the discovery of the negative effects of DDT on wildlife, this pesticide was banned in the United States and other countries. After nearly 30 years of captive breeding and releases to the wild, in 1999 the Peregrine Falcon was considered fully recovered from its brush with extinction and was removed from the U.S. Endangered Species List. Even to this day, the effort to save the Peregrine Falcon in North America is considered one of the greatest conservation successes of all time!

Today, Peregrine Falcon populations are stable throughout most of the species' range, and it is classified as a species of Least Concern. However, many other chemicals and pesticides are being used that can have unintended negative consequences for birds of prey and other wildlife, especially species at the top of the food web.



Photo: Rob Palmer, falconphotos.com



Left: Peregrine Falcon eggs weakened because of DDT. When the female sat on them to incubate them, the eggs were severely damaged. Right: Educational signs put up around release sites to inform people about the plight of the Peregrine Falcon and efforts to help protect it.

A Hidden Danger

Even though DDT was banned in North America, it is still being used in other parts of the world as a pesticide. How could this be affecting raptors across the globe? What about raptors that migrate from one hemisphere to another? Are raptors being exposed to DDT where you live? How can you find out? If so, what do you think you could do to raise awareness about the effects DDT has on living things, including humans?



Watch a nest camera video of a Peregrine Falcon feeding her nestlings. Scan the QR Code below.



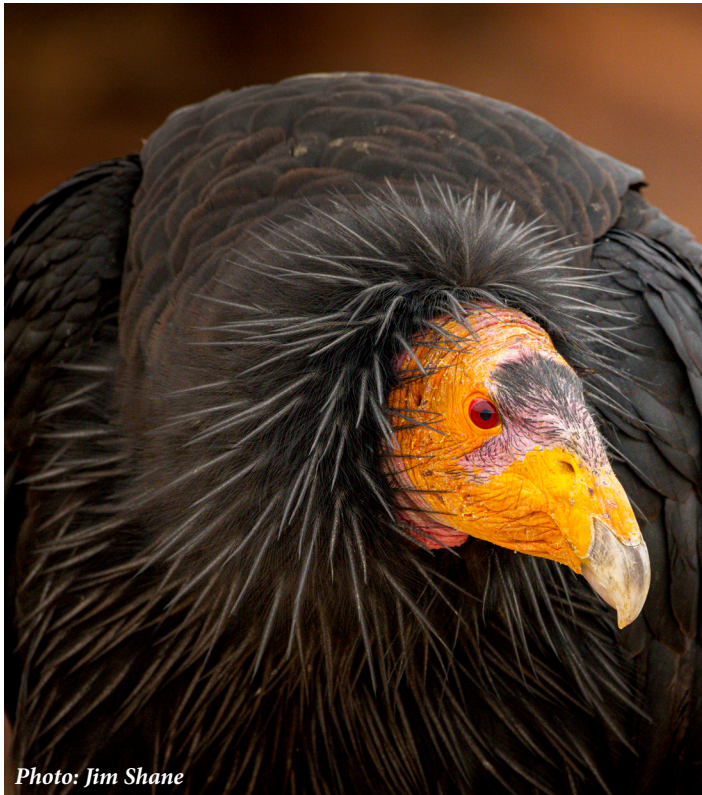


Photo: Jim Shane

CALIFORNIA CONDORS & LEAD

The Problem

California Condors are found in parts of California, the southwestern United States, and northern Mexico. They are Critically Endangered and lead poisoning is the most significant challenge to their recovery.

Lead is a metal that occurs naturally in the environment. In the past, it was used in the fabrication of many household items. But research has shown that it is very harmful to humans and wildlife. Though it has been banned from use in most things, it is still used to make some bullets. When these bullets hit an animal, they fragment into very small pieces. These pieces can then easily be ingested by condors and other scavengers when they feed upon that dead animal. Condors get very sick after ingesting lead and many die. Due to lead poisoning and other factors, by 1982, the California Condors totaled only 22 individuals.

Conservationists realized that drastic measures were needed to help save the species, and an intensive recovery program began. At one point, every single living condor was placed in captivity.

First Steps

Wild chicks were removed from nests to be raised in zoos, and adult condors were trapped and brought to special facilities where they would be safe and where they could continue to produce young.

Challenges

- Though safer ammunition is on the market, many people use cheaper lead ammunition, especially when hunting animals they perceive as pests, such as coyotes.
- Some people don't believe the science behind the discovery that lead is harmful.
- Condors can't reproduce until they are at least 5 or 6 years old. And they reproduce very slowly.

Solutions

- Captive breeding and release of California Condors in Arizona, California, and Mexico.
- Trapping, testing, and treating of Condors that scientists suspect have ingested lead.
- Developing awareness programs that have resulted in hunters voluntarily switching to non-lead ammunition or removing carcasses containing lead from the environment.
- Development of the North American Non-lead Partnership to create a coalition of hunters and others dedicated to protecting wildlife by choosing non-lead options.

Results

By switching to non-lead ammunition, hunters can eliminate the potential for lead exposure to any scavenging animal. Thanks to work with Arizona and Utah wildlife agencies over the last decade, more than 87% of deer hunters on Arizona's Kaibab Plateau now take voluntary actions to prevent exposure. Their conservation ethic will inspire others to make the switch to copper, but the message needs to be spread to a wider audience.

Today there are more California Condors in the wild than in captivity. The world population of California Condors continues to grow slowly, with more than 500 now in existence. More than half live in the wilderness, ready to fill their niche as skilled scavengers if only we can make their world a little safer.



Left: X-ray showing lead fragments in a deer after it had been shot with a lead bullet. Right: X-ray showing a lead fragment in a California Condor's stomach. Biologists were able to save this bird, but other California Condors haven't been as lucky.

Taking the Lead on Lead

An x-ray of a deer shot with lead-based bullets reveals tiny bullet fragments, too numerous to count. California Condors and many other species, even humans, may be exposed to lead-tainted meat. The California Condor has alerted us to an unforeseen and preventable hazard. How do California Condors help us? What can we do to help Condors? Think about the birds where you live. Are they being exposed to lead? How can you find out?



Watch a video about a day in the life of a field team working to save California Condors. Scan the QR Code below.



A photograph of a vulture in flight over a savanna landscape. The vulture is shown from the side, with its wings spread wide, revealing dark feathers on the upper wings and lighter feathers on the underside. Its head is turned towards the left, showing a red, featherless face and a sharp, hooked beak. The background consists of a vast, flat landscape with tall, dry grass under a clear blue sky.

AFRICAN VULTURE CRISIS

Photo: Munir Virani

The Problem

Vultures, and other wildlife throughout sub-Saharan Africa, are dying from direct and indirect poisoning. This is happening in a number of ways.

First, when a lion or other major predator kills a cow or other domestic animal, livestock owners react to protect their animals. They lace the dead animal's carcass with poison, hoping to kill lions and other predators. When vultures, hyenas, storks, eagles, and other scavengers feed on this tainted meat, they become sick and die.

Second, poachers deliberately poison vultures in an effort to eliminate them. This is because when vultures detect a dead animal, they fly in large numbers over the carcass, before coming in to feed. Poachers worry that the vultures' presence will alert the authorities to their presence, so they kill them.

Finally, vultures are poisoned so that their body parts can be sold for medicinal and other belief-based uses.

First Steps

When biologists first noticed a decline in vulture populations, they conducted studies to understand what the causes of the decline were, in order to create strategies to mitigate these threats and protect raptors.

Challenges

A recent study shows that raptor populations are declining drastically across Kenya in both protected and unprotected areas. And human-wildlife conflicts continue to affect the conservation of birds of prey across the continent.

Solutions

- Training ranchers to build sturdy and affordable enclosures, called "bomas" that help keep livestock safe from predators.
- Training Vulture Liaison Officers to collect intelligence on potential poisoning activities as well as conduct outreach, poisoning intervention training, mitigation, and conservation activities.
- Creating the "Vulture Protector Network" - a WhatsApp communication group with 22 different conservation organizations that share information on livestock predation and poisoning incidents.

Results

Over the last three years, conservationists have made significant strides towards better protecting vultures in Kenya, and other parts of Africa where poisoning is decimating vulture populations. They have built trust and made an important impact within local communities, instilling a sense of ownership and responsibility about vultures, other wildlife, and the inappropriate use of poisons.

Through important networks, they achieved successful prevention of carnivore conflict and effective response when poisoning incidents occur. Without Coexistence Training to prevent poisonings and rapid response when poisonings occur, many more vultures and other scavengers would have died. While there is still a lot of work to do to protect raptors, biologists aren't giving up. Their work means there is hope for the future survival of vultures and other birds of prey in Kenya and throughout Africa.



Left: Rapid Response Team collecting information on a poisoning incident. Right: Community members receive training in techniques and materials needed to build “bomas” - secure enclosures to protect livestock from predators.

Protecting Livestock to Conserve Wildlife

It is important to remember that for conservation to work, we need to make sure that humans are able to thrive alongside wildlife. In Kenya, conservationists are training people to build enclosures that protect their livestock from predators. What human-wildlife conflicts might occur in your country? Perhaps hawks are predating on chickens, or Osprey are taking fish from fish farms. What solutions can you think of that would help both humans and raptors?



To learn more about vulture poisoning in Africa, watch a video by scanning the QR code below.





ASIAN VULTURE CRISIS

Photo: Munir Virani

The Problem

Vultures fill a vital ecological niche as nature's clean-up crew. These remarkable birds can pick a carcass clean long before it has time to contaminate land and water resources. Prior to the introduction of diclofenac, an anti-inflammatory drug used to treat sick livestock - many millions of vultures could be found throughout South Asia. But when livestock treated with diclofenac die, this drug remains in their systems. Even a trace of diclofenac in the carcass is enough to poison vultures, causing them to die slowly and painfully of kidney failure. Just one cow carcass can poison many vultures, which eat in social groups. In less than a decade some populations of vulture species dropped by more than 90%.

Losing vultures puts people at risk, too. Because there aren't many vultures around to eat large dead animals, populations of feral dogs and rats have increased because now they have access to this ample food source. This has caused increased instances of dog bites, rabies, and other problems for humans. This really makes clear how important vultures are to the well-being of an ecosystem and to the humans who share this ecosystem with them.

First Steps

When vulture populations began to drop dramatically, biologists from around the world joined together to discover the cause.

Challenges

Diclofenac is still used to treat livestock in some areas although a safer alternative, meloxicam, is now available. Vulture populations may be stabilizing, but, tragically, some species already have declined by up to 99 percent, making extinction a continued threat to these ecologically and culturally important birds.

Solutions

- Biologists establish vulture "restaurants" wherein diclofenac-free livestock carcasses are placed out in the open, providing vultures with a clean food source.
- India, Pakistan, and Nepal banned diclofenac for veterinary use in 2006, and Bangladesh took similar action in 2010.
- Education and training help people understand how important vultures are.

Results

Thankfully, the ban on diclofenac in some countries and the implementation of vulture restaurants have helped protect the last remaining vulture populations. Biologists annually measure conservation impacts at vulture breeding colonies in India as partners in Saving Asia's Vultures from Extinction (SAVE). Conservation and government partners petitioned to ban veterinary use of diclofenac in Nepal, Pakistan, and India, and bans were enacted three years later.

To measure the ban's effects, biologists monitor 450 pairs of Long-billed Vultures in the Indian states of Madhya Pradesh and Rajasthan. The population stabilized in the five-year period after the ban was enacted, leading researchers to believe a positive trend had begun; but more recently they've observed declines, pointing to a need for vigilance and further action.



Photo: Munir Virani



Left: Vultures congregating around a “vulture restaurant” where biologists placed safe food for them to eat. Right: Before the use of diclofenac, millions of vultures could be found throughout South Asia.

Vultures as Keystone Species

Think about what you have just read, in particular how populations of feral dogs and rats increased when vulture populations declined. Explain in your own words why this happened. What are the ways in which vultures help keep humans healthy? Think about vultures in your own country. Do you think people like vultures or dislike them? Why? What can you do to help educate people about why vultures are important?



Scan the QR code below to watch a TedTalk entitled “Why I love Vultures.”



Appendix 2:

Additional Resources

1. Coloring Sheets

Let's Color a Ridgway's Hawk

Let's Color a Hawk

2. Story Book Cut-outs

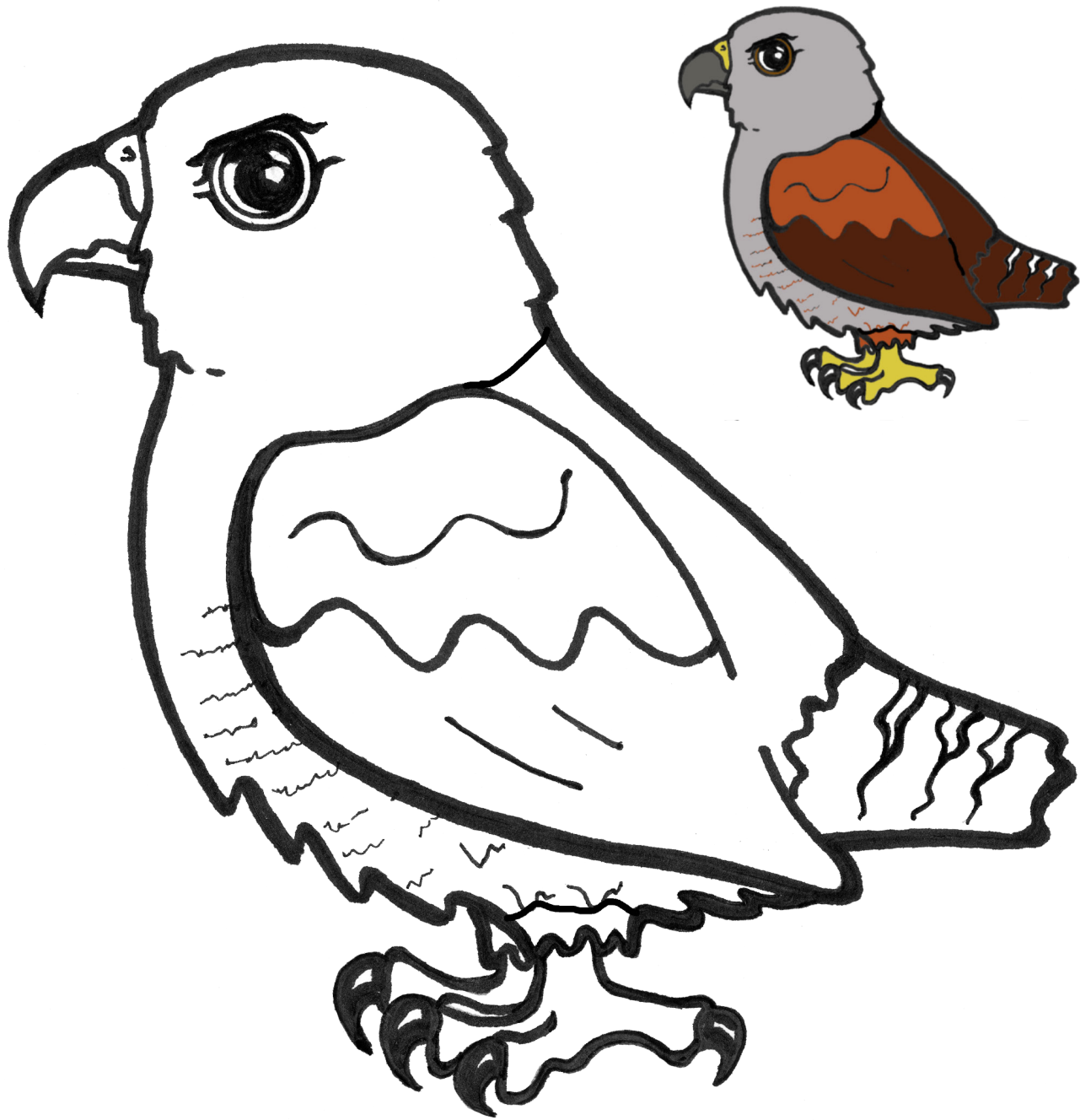
Cut them out and have students paste them as illustrations in stories they write, or practice placing the photos in sequential order

3. Script for a Play

Hannah the Hawk Finds a New Home

4. Map of the Caribbean

LET'S COLOR A RIDGWAY'S HAWK



Let's Color a Hawk



Storybook Cut-outs



Storybook Cut-outs



Hannah the Hawk Finds a New Home: A Play

adapted from a work by Adrian Benedetti

Characters:

Animals:

Hannah - Hawk
Mom - Hawk
Dad - Hawk
Carla - Hummingbird
Bernardo - Boa
Paola - Parrot
Martin - Bat
Dying Hummingbird # 1
Dying Hummingbird # 2
Dying Hummingbird # 3
Young Bernardo

Humans:

Narrator
Man with axe
Boy with Slingshot # 1
Boy with Slingshot # 2
Woman
Girl
Boy
Man with shotgun

ACT I: SCENE I

A forest setting with many green plants, colorful flowers, and a large nest in a tree.

NARRATOR

The sun begins to peek out over the forest. Songbirds sing, welcoming a new day and green parrots fly through the morning sky in search of food. On a large tree, we can see a hawk nest. Today is a very important day for the youngest hawk in the family, Hannah. Today, she must leave the nest and find her own territory.

(sound of birds chirping, and parrots fly across the stage).

(While the narrator speaks, Mom, Dad, and Hannah are busy preparing things Hannah might need on her trip.)

MOM

(very dramatically)

Oh, my baby, my baby! I can't believe my little nestling is leaving the nest. Are you sure you have everything you need?

HANNAH

Yes mom, I have...

MOM

Are you carrying your toothbrush?

HANNAH

I don't have a toothbrush. Mom, you know that hawks don't have teeth. We have a strong hooked beak to eat our food with.

MOM

You're right, you're right. I know. I know. I just want to make sure you have what you need. Are you wearing your raincoat?

HANNAH

Ehh... when have I ever used a raincoat? You know that hawks have many feathers that help protect us from the rain and that our feathers are covered with an oily substance to repel water and keep us dry.

MOM

I can't even think straight. Well, how about some sunglasses to protect your eyes?

HANNAH

(Hannah and Dad exchange glances)

Mom, you know I don't need those things. We hawks have a special eyelid called a nictitating membrane which I can close to protect my eyes.

(Mom is restlessly looking in the nest, picking up sticks and putting them back in place. She is very nervous, in a very funny way.)

HANNAH

Okay, I think I'm ready.

DAD

(pulling out food from underneath some twigs)

I have something for you before you go. You are already three months old. You have learned to hunt well with your strong feet and talons, and I am proud of you. You are kind, have courage and common sense, and those are the most important things you need. Since we hawks are carnivores and cannot eat the fruits and nuts of the forest, I wanted to make sure you had enough food for your trip.

HANNAH

(Takes the food, hugs her father and then her mother)

Thank you very much! Wish me luck!

DAD

Good luck!

MOM

(yelling at Hannah who has already left the stage)

Did you remember to pack clean underwear?

The curtain closes

ACT II: SCENE I

(While the "nest" is taken off the stage, Hannah "flies" in front of the curtain)

HANNAH

Well, it's happening! I'm leaving home for the first time. Right now, I'm a juvenile and when I turn two years old I will be an adult. Before that happens, I need to find my own territory. It must be a safe forest with lots of food for me to eat, and many tall trees. My parents told me about a beautiful place that is only 25 kilometers north of here. I'm heading there. I'm excited to venture out on my own, but a little scared, too. It makes me feel better knowing that I have a place to go.

(Hannah starts to fly, and after a few moments...)

Phew, I finally arrived. This must be the place. I followed the directions my parents gave me exactly. Let's see what my new home looks like.

SCENE II

The curtain opens. Instead of forest, there are trucks, fallen trees, some cows, buildings, etc.

HANNAH

What? This can't be! I know this is the right place. But what happened? What am I going to do now? I can't go home because it's time for my parents to raise more young. I need to find my own home. A pair of hawks needs a lot of space to fly. We cannot all stay in one place. All juvenile hawks must leave their parents' territory eventually.

(Hannah sees a man chopping down a tree with an axe. She flies over to him.)

HANNAH

Excuse me, but can you tell me ...

(The man looks up and screams. Hannah screams. The man screams.)

MAN WITH AXE

Shoo! Go away! Out of here! Oh I hate animals! I hate trees! I hate the forest!

(The man runs off and Hannah, scared, takes off very quickly leaving her food behind.)

The curtain closes

SCENE III

Hannah flies for a long time in front of the curtain.

HANNAH

I am so tired. I need to rest. I'm hungry. I need to find something to eat.

(She sits down and begins to cry.)

ACT III: SCENE I

The curtain opens - the setting is a wooded area with some houses in the background.

(As Hannah cries, she hears a loud "buzz". She looks around and stands up. Then a hummingbird enters the scene.)

HANNAH

Hello... who are you?

CARLA

My name is Carla Colibrí. I'm a hummingbird.

HANNAH

Hi Carla, my name is Hannah. I'm a hawk.

CARLA

Why were you crying?

HANNAH

I was supposed to find a new home, but when I arrived, it had been destroyed by

large machines. There are no trees and nothing to eat.

CARLA

I'm really sorry. What are you going to do now?

HANNAH

I have to keep flying until I find a good place I can call home. How about here?

CARLA

This used to be a good place. Full of trees and enough nectar-filled flowers for all my friends and me to feed on. Did you know that hummingbirds need to visit hundreds of flowers during the day just to get enough nectar to survive?

HANNAH

I didn't know that. Wow! That must make foraging difficult. Hawks only need to forage once or twice a day!

CARLA

Wow! You are lucky. We need to eat almost every hour. But the problem isn't the lack of food. When people first moved here, it was fine because they planted several beautiful gardens and we had plenty of food. But one day some children made something called a slingshot.

HANNAH

What's that?

CARLA

It is something that children use to throw stones at us.

HANNAH

That doesn't sound nice.

CARLA

It isn't. You see, the kids started throwing rocks at my other hummingbird friends and some other birds and animals.

(While Carla narrates - in the background, two children with slingshots begin to throw stones at several hummingbirds that fall dead to the ground - everything is done in silence - like a memory.)

Soon, none of my friends were left and now I am alone.

HANNAH

But why would children do something like that?

CARLA

They say it's "just for fun." They were having fun and now I'm all alone.

HANNAH

You're not alone. You've got me!

CARLA

And you have me! I'm going to go with you, and together we'll find a new home.

HANNAH

I would love to have your company. I'm going to go slow to make sure you can follow me.

CARLA

Oh yeah? Did you know that hummingbirds are the only birds that can fly back and forth? Watch this! (Carla flies back and forth). We can hover in the air (she hovers) and we can flap our wings more than 80 times per second! Don't you worry about me! Let's go!

The Curtain Closes

ACT IV: SCENE I

Carla and Hannah fly for a while, until they reach an area where Bernardo Boa (snake), Paola Perico (parrot), and Martín Murcielago (bat) live in cages, next to a house. They enter the scene in the middle of a conversation.

BERNARDO

I don't know how much longer I can stand being in this cage. I want to be free to climb trees, to slither across the forest floor, and to hunt something good to eat.
(*Bernardo eyes Martin. Martin looks nervous.*)

PAOLA

Oh! don't worry Martin, Bernardo is just joking. Although boas can dislocate their jaws and eat prey as large as they are, you are his friend. He will never eat you.

MARTIN

But Bernardo is venomous!

PAOLA

You know perfectly well that he isn't venomous. In fact, snakes are very important for the environment.

HANNAH

Excuse me ...

BERNARDO

(without noticing Hannah is there)

I'm sorry, Martin. I didn't mean to scare you. I would never eat you. But I'm getting hungry. I would love a good rat stew.

HANNAH

(clears her throat)

Hello?

PAOLA

(ignoring Hannah)

You're always thinking about your stomach! Everything you say has to do with food, food, food. What about me? Parrots need to fly free. We need to be with other parrots. You both are great, but I'm lonely.

BERNARDO

(Bernardo imitating Paola, because he has heard the same speech many times)

and fruits! Why do you think we have such strong beaks? Not to mention that we should be free exercising our wings, seeing the scenery, letting the breeze run through our feathers. We have things to do, people to see! Here we are trapped in these cages and...

(Paola realizes that Bernardo is making fun of her.)

PAOLA

I know, I'm a bit repetitive - that's what parrots do!

HANNAH

Excuse me!!

(Bernardo, Paola, and Martin are startled.)

BERNARDO

Who are you?

CARLA

I'm Carla Colibrí and this is Hannah the Hawk. We need a new home. Can we

stay with you?

(Bernardo, Paola, and Martín look at each other in silence for a few seconds and start laughing and laughing.)

HANNAH

What's so funny?

BERNARDO

Do we think we're here by choice? This isn't an all-you-can-eat buffet! Or a nice forest home. We are prisoners!

HANNAH

Well, I ...

PAOLA

Each one of us was caught and taken from our home. Then they put us in these cages.

HANNAH and CLARA

Who would do such a thing?

PAOLA

These people say they love animals and they come and look at us from time to time, but we are so unhappy. Wild animals should stay wild. Neither I nor Martín can fly and Bernardo cannot climb trees. People seem to be happy when they see us, but we feel sad!

HANNAH

(looking at the cages)

It looks like these rocks are the only things holding down the top of the cages. I can try to lift them.

PAOLA

We tried that. We tried to push them up to move them, but we couldn't do it.

HANNAH

I'm a bird of prey. We are very strong. I think I can do it.

(Hannah picks up the rocks in her talons and lets them fall to the ground. Bernardo, Paola, and Martín escape. They hug each other and jump with happiness.)

BERNARDO / PAOLA / MARTÍN:

We're free! We're free!
(A woman enters the stage.)

WOMAN

But what...? How did you get out?
(All the animals look at the woman, then look at each other.)

MARTIN

Let's go!

PAOLA

Fly away!

BERNARDO

Slither away!

WOMAN

Come back here!
(All the animals flee)

The curtain closes

ACT V: SCENE I

The animals run away. After a few moments, they stop and look at each other to make sure everyone is okay.

HANNAH

That was close!

MARTIN

What do we do now?

HANNAH

We are looking for a forest that we can call home. You can come with us!
(They continue traveling.)

SCENE II

The curtain opens. There is a beautiful forest in the distance.

MARTIN

I need to stop. I'm used to flying at night! I get very tired flying during the day

HANNAH

Hey everyone, the...

PAOLA

I feel like my wings are going to fall off.

HANNAH

I think we found a ...

BERNARDO

My stomach is growling.

HANNAH

(very loudly)

I think we're home!

(All the animals look at the beautiful forest before them and start cheering. Suddenly, they hear movements in the bushes.)

HANNAH

Sshh... let's hide.

(Everyone hides; a boy and a girl are walking along a path in the forest toward the animals.)

PAOLA

Oh no! More people.

BERNARDO

Let's get out of here.

CLARA

Okay. On the count of three, let's carefully go to ...

MARTÍN

(yelling)

They're coming for us! We're doomed.

(Bernardo, Paola, and Martín flee in different directions so that they bump into each other and fall at the children's feet. The children stop and look at the

animals. Clara and Hannah are still hiding.)

BERNARDO / PAOLA / MARTÍN

(whimpering, covering their heads)

Please don't hurt us. Please don't hurt us.

HANNAH

I'm going to go talk to those children.

CLARA

No, Hannah... it's dangerous.

HANNAH

We have to help our friends.

(Hannah flies and lands in front of the children.)

BOY

(with amazement)

Are you ... Are you a hawk?

HANNAH

Yes, and these are my friends Bernardo, Paola, and Martín. We are just looking for a safe place to live. Please don't hurt us.

GIRL

We aren't going to hurt you or them.

HANNAH

You're not?

PAOLA

You're not?

BERNARDO

(immediately straightens up, trying to act nonchalant)

You're not? Um... I mean, I knew they weren't going to do anything. I just, I just... I had something in my eye (wiping a tear). I get nervous when I don't eat.

PAOLA

Oh brother...

HANNAH

(to the children)

We're just trying to find a place to live. My home was destroyed by chainsaws and axes, someone threw rocks at Carla's family, the others were all taken from their home and put in cages. So, we are afraid of people.

BOY

Not all people want to hurt animals or nature. Many of us are trying to save the forest.

GIRL

After all, we depend on wilderness too. It provides us with food, wood to build our homes, oxygen, clean water and beautiful flowers, plants and animals that make our planet a more pleasant place to live.

HANNAH

And aren't you afraid of me?

GIRL

Why would I be afraid of you? Hawks don't hurt people or our pets. We know you help maintain balance in nature. We are supposed to protect you!

BERNARDO

I'm important too, you know.

BOY

Yes we know. All plants and animals are important. For example, Carla helps pollinate many different plants by passing pollen from one flower to another when you feed. Martín, you are an important mammal. You eat a lot of mosquitoes. Paola, every time you eat seeds, and the seeds pass through your digestive system, you help regenerate the forest too! Without animals like you, we wouldn't have many of the trees we see around us!

(Martín, Paola, and Clara look very proud of themselves.)

BERNARDO

Yes, yes, pollinator... seed disperser, mosquito controller... but, I...

GIRL

You're right, Bernardo! Just as many people fear the hawk, they are afraid of snakes, too. They don't understand that snakes are important and that most are not even venomous. Like Hannah, you are an important predator and help

maintain balance in nature. This helps all the forest animals stay healthier!

BOY

There is a beautiful area of tall trees with clean rivers and lots of flowers not far from here. You can make it your home! Nobody is going to bother you.

(The animals and the children hug.)

(Suddenly there is a loud bang. Carla screams. Hannah falls down.

A man runs towards the children.

MAN

Is everyone okay?

GIRL

What did you do? Why did you kill her? Hannah was our friend.

MAN

What do you mean, why did I do it? None of you were afraid? I was afraid. I thought it was here to eat my chickens.

BOY

No sir. She is very beneficial to us. We must take care of her.

(Hannah starts to move, but nobody notices.)

GIRL

You don't go around shooting everything that scares you. If you are afraid of it, first learn about it and you will see how most of the time the fear disappears.

(Hannah moves a little more.)

MARTÍN

Not only that, but you may discover that it is really great having us around. We are very beneficial.

PAOLA

Martín, that was very well said...

(Hannah starts to wake up.)

HANNAH

Where am I? What ... what ... happened to me? Look at my wing. I lost some feathers ... I must have fainted.

(Everyone runs to her and hugs her.)

MAN

Everyone move out of the way!
(Everyone stands still, even Hannah who sees the shotgun and understands what happened. The man approaches her.)

Hannah, I'm very sorry for what I did. Can you forgive me? I always heard that hawks are bad and that I should be afraid of them. I know that my ignorance is no excuse, but it's the only reason I can give you. I am willing to learn more about your species, and I will never hurt a member of your great family again.
(Bernardo clears his throat loudly. The man looks at all the animals.)

MAN

You're right. I'm not going to hurt *any* animal. To be honest with you, I never realized that even though I have been hunting your food sources, destroying your homes, and shooting you and your families, you have never done anything to me. From now on I will respect you and your home. We will be good neighbors.
(Everyone cheers.)

HANNAH

Let's go to see our new home!

CARLA

Come on!

BERNARDO

(whispers to Paola)
I hope there are sandwiches!

*** THE END ***

Map of the Caribbean



Appendix 3:

List of Some Conservation Organizations working in the Caribbean

BirdsCaribbean works throughout the region for bird conservation. The Peregrine Fund is a global organization. In the Caribbean, it supports conservation in Dominican Republic, Haiti, Grenada, Cuba, and Puerto Rico. What follows is a list of just some of many other conservation organizations working in the Caribbean:

Anguilla

- Anguilla National Trust
- Anguilla National Youth Council

Antigua and Barbuda

- Environmental Awareness Group

Aruba

- Aruba Birdlife Conservation

Bahamas

- Bahamas National Trust
- Friends of the Environment

Barbados

- Barbados Environmental Conservation Trust

Bonaire

- STINAPA Bonaire
- Echo Bonaire

British Virgin Islands

- Green VI
- Unite BVI Foundation

Cayman Islands

- National Trust for the Cayman Islands
- Cayman Eco

Cuba

- Sociedad Cubana de Zoologia

Curaçao

- Caribbean Research and Management of Biodiversity

Dominica

- Wild Dominique
- Dominica Youth Environmental Organization

Dominican Republic

- Fundacion Grupo Puntacana
- Fundacion Propogas
- ZOODOM
- Grupo Jaragua

Dutch Caribbean

- Dutch Caribbean Nature Alliance

Grenada

- Grenada Fund for Conservation
- Gaea Conservation Network

Guadeloupe

- Parc National de la Guadeloupe

Haiti

- Action pour la Sauvegarde de l'Ecologie en Haiti
- Haiti National Trust

Jamaica

- Jamaica Conservation and Development Trust
- Jamaica Environment Trust

Martinique

- Association le Carouge

Montserrat

- Montserrat Natural Trust

Puerto Rico

- Para la Naturaleza
- Casa Pueblo

Saba

- Saba Conservation Foundation

St. Barthelémy

- Green St. Barths

St. Eustatius

- Stenapa St Eustatius

St. Kitts and Nevis

- Caribbean Youth Environment Network

St. Lucia

- Saint Lucia National Trust

St. Martin

- La Réserve Naturelle Nationale de St. Martin
- Les fruits de mer

St. Maarten

- Nature Foundation St. Maarten

St. Vincent and the

Grenadines

- SVG Conservation Fund Environment Fund
- SusGren

Trinidad and Tobago

- TT Field Naturalists' Club
- Environment Tobago

Turks and Caicos

- TCI Environmental Club
- Turks and Caicos National Trust

U.S. Virgin Islands

- U.S. Virgin Islands Wildlife Conservation Society
- Virgin Islands Audubon Society

Glossary

Anthropogenic - Made by humans. Human actions.

Bird of prey - Birds that hunt other animals for food and have certain physical traits in common, such as keen eyesight, down-curved beaks, and sharp talons which they often use to kill their prey.

Bioaccumulation - When toxins build up in an individual organism over time.

Biodiversity - The totality of species and ecosystems in the world, or in an area. It derives from BIO, which means life and DIVERSITY which means variety, difference, and abundance.

Biodiversity Hotspot - A region that meets two important criteria: having at least 1,500 endemic plant species and 30% or less than its original native vegetation.

Bioindicator - Organisms that can be studied to learn about the health of the ecosystem in which they live.

Biological controller - An animal that eats other animals and keeps their populations under control, preventing them from reproducing too much.

Biomagnification - When toxins move up the different trophic levels of a food web and increase in concentration as they do so.

Carnivore - An organism that eats meat.

Carrion - Meat from a dead animal that is decomposing and eaten by some birds of prey, as well as other animals.

Climate Change - Changes in long-term weather and temperature patterns caused by human activities.

Conservation - Sustainable ways to protect natural resources and the beings that inhabit them, so that the two coexist in balance.

DDT - Acronym for Dichlorodiphenyl Trichloroethane. It is a pesticide used

extensively in the past to control insects. It is solid, white or crystalline and without color, odor, or taste.

Decomposer - An organism, especially a soil bacterium, fungus, or invertebrate, that breaks down organic material.

Deforestation - Action of stripping plants from an area or region.

Diurnal - Animals that normally carry out their activities during the day.

Ecological niche - Role that a species plays within its environment.

Ecosystem - Set of communities of living beings that interrelate between themselves and their environment.

Ecosystem Services - The benefits humans receive from wildlife, flora, or ecosystems.

Endangered - State of a living being, in which there is a high probability of disappearing from the planet.

Endemic - Found only in one generally small geographic area.

Facial disc - A series of feathers around the faces of some raptors that are raised to direct sound waves to the ears.

Falconry - Sport or art of hunting with trained raptors.

Food chain - Transfer of energy between producers and consumers. The food chain is a relationship between organisms that indicates who eats whom.

Habitat - Space, food, shelter, and water that is needed to survive and that is found in an area or region.

Herbivore - An animal that feeds on plant material.

Incubation - Process whereby the adult birds sit on their eggs for a certain period of time, to keep the eggs at the right temperature so they will hatch.

Invertebrate - All organisms that lack a spinal cord or spinal column; the oppo-

site of the vertebrate.

Migratory - A species that moves back and forth from one region to another each year as a response to changes in season, length of days, food availability, and other factors.

Nocturnal - Animals that are active at night.

Omnivore - An organism that feeds on plant matter and meat among other things. It has a varied diet.

Pellet - Set of remains of prey animals that are not digested by raptors, and that are regurgitated in the form of a ball.

Pesticide - Chemical substance used to prevent, destroy, or repel insects and animals. Most pesticides can be harmful to people, animals, and the environment.

Photosynthesis - A process that takes place in the leaves of green plants and that transforms the sun's energy into chemical energy.

Poaching - Killing animals illegally.

Pollination - Act of carrying pollen to different flowers, fertilizing them, and thus facilitating the production of fruits and their respective seeds.

Pollution - Addition of foreign, harmful substances in the environment.

Predator - An animal that eats other animals.

Prey - An animal that is hunted by another animal.

Producer - An organism that can produce its own food, such as plants and phytoplankton. They are at the lowest levels of food chains.

Raptor - Please see definition for bird of prey.

Recycle - Process or reuse some materials in different ways.

Resident - A species that remains in the same general area all year long; non-migratory.

Species - Individuals who share the same physical characteristics, can reproduce with each other and have fertile offspring.

Talons - A raptor's claws, which they often use for grabbing and killing their prey.

Taxonomy - Science that studies the classification of living things.

Tomial tooth - Projection on both sides of the upper part of the beaks of some falcons, which is used to break the neck of their prey.

Top Predator - Predators that have none or few natural enemies, except humans.

Vertebrate - All organisms that have a spinal cord or spinal column; the opposite of the invertebrate.

Wingspan - Measure of the wings extended, from one tip to the other.

Vulnerable - Facing a high risk of extinction in the wild.

References

- Acevedo-Rodríguez, P., and Strong, M. (2008) Floristic richness and affinities in the West Indies. *Botanical Review*, 74(1), 5-36.
- Anderson, D. L., R. Thorstrom, C. D. Hayes, T. Hayes, M. Curti, and P. F. D. Boesman (2021). Ridgway's Hawk (*Buteo ridgwayi*), version 2.0. In *Birds of the World* (T. S. Schulenberg and B. K. Keeney, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.ridhaw1.02>
- Arizmendi, M. d. C., C. I. Rodríguez-Flores, C. A. Soberanes-González, and T. S. Schulenberg (2020). Stygian Owl (*Asio stygius*), version 1.0. In *Birds of the World* (T. S. Schulenberg, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.styowl1.01>
- Barnes, J. (2020). Bare-legged Owl (*Margarobyas lawrencii*), version 1.0. In *Birds of the World* (S. M. Billerman, B. K. Keeney, P. G. Rodewald, and T. S. Schulenberg, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.balowl.01>
- Bierregaard, R. O., A. F. Poole, M. S. Martell, P. Pyle, and M. A. Patten (2020). Osprey (*Pandion haliaetus*), version 1.0. In *Birds of the World* (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.osprey.01>
- BirdLife International. 2000. *Threatened birds of the World*. Barcelona and Cambridge, UK: Lynx Editions and BirdLife International.
- BirdLife International. 2016. *Pseudoscops grammicus*. The IUCN Red List of Threatened Species 2016: e.T22689501A93232472. <https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22689501A93232472.en>. Downloaded on 21 April 2021.
- Cade, T.J. 1971. Survival of the Peregrine Falcon: protection or management? *Raptor Research News* 5:83-87.
- Delannoy, C.A. 1984. The Puerto Rican Sharp-shinned Hawk, *Accipiter striatus venator*: the ecology and breeding biology of a neotropical island bird of prey. Ph.D. diss., Univ. Colorado, Boulder. 168pp.

Delannoy, C.A. 1988. Breeding biology of the Puerto Rican Sharp-shinned Hawk (*Accipiter striatus venator*). Auk 105:649-662.

Delannoy, C.A. 1997. Status of the Broad-winged Hawk and Sharp-shinned Hawk in Puerto Rico. Caribbean Journal of Science 33:21-33.

Ferguson-Lees, J. & Christie, D. A. 2001. Raptors of the World. Boston New York, Printed in Singapore.

del Hoyo, J., N. Collar, J. S. Marks, and C. J. Sharpe (2020). Cuban Black Hawk (*Buteogallus gundlachi*), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.cubblh1.01>

Gallardo, J.C. and F.J. Vilella. 2014. The Puerto Rican Sharp-shinned Hawk (*Accipiter striatus venator*): An endangered insular species on the edge. Spizaetus: Neotropical Raptor Network Newsletter 17:2-13.

Gallardo, J.C. and F.J. Vilella. 2017. Conservation status assessment of the Sharp-shinned Hawk, an endangered insular raptor in Puerto Rico. Journal of Field Ornithology. 88(4):349-361

Gilbert, M., R.T. Watson, M.Z. Virani, J.L. Oaks, S. Ahmed, M.J.I. Chaudhry, M.Arshad, S. Mahmood, A. Ali, and A.A. Khan. 2006. Rapid population declines and mortality clusters in three Oriental White-backed Vulture (*Gyps bengalensis*) colonies in Pakistan due to diclofenac poisoning. Oryx 40:388-399.

Goodrich, L. J., S. T. Crocoll, and S. E. Senner (2020). Broad-winged Hawk (*Buteo platypterus*), version 1.0. In Birds of the World (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.brwhaw.01>

Josep del Hoyo, Andrew Elliot, Jordi Sargatal. 1994. Handbook of the Birds of the World. Lynx Editions. Birdlife International.

Keith, A. R., J. W. Wiley, S. C. Latta, and J. A. Ottenwalder. 2003. The birds of Hispaniola: Haiti and the Dominican Republic. BOU Checklist 21:203.

Kirk, D.A. and Gosler, A.G., 1994. Body condition varies with migration and competition in migrant and resident South American vultures. The Auk, 111(4), pp.933-944.

Kirk, D. A. and M. J. Mossman (2020). Turkey Vulture (*Cathartes aura*), version 1.0. In Birds of the World (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.turvul.01>

Langalier, L. 1992. Wise as an Owl. A resource and teacher's guide to birds of prey. Peregrine Fund Publication.

Leigh, E., et al. 1992. Ecología de un Bosque Tropical. Smithsonian Institution Press.

Marti, C. D., A. F. Poole, L. R. Bevier, M.D. Bruce, D. A. Christie, G. M. Kirwan, and J. S. Marks (2020). Barn Owl (*Tyto alba*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.brnowl.01>

McClure, C., R.S. James, J.A. Westrip, A. Johnson, S. E. Schulwitz, M.Z. Virani, R. Davies, A. Symes, H. Wheatley, R. Thorstrom, A. Amar, R. Buij, V. R. Jones, N. P. Williams, E. R. Buechley, and S.H.M. Butchart. 2018. State of the world's raptors: Distributions, threats, and conservation recommendations, Biological Conservation, Volume 227, 2018, Pages 390-402, ISSN 0006-3207.

Méndez, P., M. Curti, K. Herrera de Montuto and A. Benedetti. 2006. Las Aves Rapaces: Guía Didáctica de Educación Ambiental. The Peregrine Fund.

Meyer, K. D. (2020). Swallow-tailed Kite (*Elanoides forficatus*), version 1.0. In Birds of the World (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.swtkit.01>

Oberle MW. 2010. Puerto Rico's Birds in Photographs. Editorial Humanitas. Seattle, Washington

Pearce, F. 2012. Busting the Forest Myths: People as Part of the Solution. Yale Environment 360. <http://www.e360.yale.edu>

Pérez-Rivera, R.A., 2019. Unusual sightings and displacement of birds in Puerto Rico after Hurricane Maria. Journal of Caribbean Ornithology, 32, pp.77-80.

Peter Ward and Ken Hall, XC603734. Accessible at www.xeno-canto.org/603734.

- Poulin, R. G., L. D. Todd, E. A. Haug, B. A. Millsap, and M. S. Martell (2020). Burrowing Owl (*Athene cunicularia*), version 1.0. In Birds of the World (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.burowl.01>
- Preston, C. R. and R. D. Beane (2020). Red-tailed Hawk (*Buteo jamaicensis*), version 1.0. In Birds of the World (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.rethaw.01>
- Raffaele H., Wiley J., Garrido O., Keith A., Raffaele J. 2003. A guide to the birds of the West Indies. Princeton University Press, Princeton, NJ, USA
- Raffaele, H.A., Wiley, J., Garrido, O.H., Keith, A. and Raffaele, J.I., 2010. Birds of the West Indies. Princeton University Press.
- Rajchard, J., 2009. Ultraviolet (UV) light perception by birds: a review. Veterinární medicína, 54(8), pp.351-359.
- Reichert, B. E., C. E. Cattau, R. J. Fletcher, Jr., P. W. Sykes Jr., J. A. Rodgers Jr., and R. E. Bennetts (2020). Snail Kite (*Rostrhamus sociabilis*), version 1.0. In Birds of the World (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.snakit.01>
- Schmitt, Jonathan & Valqui, Thomas & Witt, Christopher. 2013. The expanding known range of Stygian Owl (*Asio stygius*) in the Andes. Boletín Informativo UNOP. 8. 2-2013.
- Sherrod, S., W.R. Heinrich, W.A. Burnham, J. H. Barclay and T.J. Cade. 1982. Hacking: A method for releasing Peregrine Falcons and other birds of prey. The Peregrine Fund.
- Smallwood, J. A. and D. M. Bird (2020). American Kestrel (*Falco sparverius*), version 1.0. In Birds of the World (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.amekes.01>
- Thorstrom, R., J. Almonte, S. Balbuena de la Rosa, P. Rodríguez, and E. M. Fernández. 2005. Surveys and breeding biology of *Buteo ridgwayi* (Ridgway's Hawk) in Los Haitises, Dominican Republic. Caribbean Journal of Science 41:864-869.

Thorstrom, R., J. Almonte, and S. Balbuena de la Rosa. 2007. Current status and breeding biology of the Ridgway's Hawk. Pages 33-39 in K. L. Bildstein, D. R. Barber, and A. Zimmerman (eds.), Neotropical raptors. Hawk Mountain Sanctuary, Orwigsburg, PA.

Thorstrom, R. and J.C. Gallardo. 2017. The Owls of Hispaniola and Puerto Rico. In Neotropical Owls (pp. 517-534). Springer, Cham.

US Fish and Wildlife Service (USFWS). 1997. Puerto Rican Broad-winged Hawk and Puerto Rican Sharp-shinned Hawk recovery plan. Atlanta, GA, USA. 30 pp.

Weidensaul, S. 2000. The Raptor Almanac. Lyons Press.

Wiley, J. W., and B. N. Wiley. 1981. Breeding season ecology and behavior of Ridgway's Hawk (*Buteo ridgwayi*). Condor 83:132-151.

Wiley, J.W. 1985. Status and conservation of forest raptors in the West Indies, pp. 199-204 in I. Newton and R.D. Chancellor (eds.) Conservation Studies on Raptors. ICBP Tech. Pubi. No. 5, Cambridge, England.

Wiley, J. W. 1986. Status and conservation of raptors in the West Indies. Birds of Prey Bulletin 3:57-70.

Woolaver, L. 2005. Conserving Ridgway's Hawk in the Dominican Republic. BirdLife Caribbean 3:13-14.

Woolaver, L. G., Jr. 2011. Ecology and conservation genetics of Ridgway's Hawk *Buteo ridgwayi*. Ph.D. dissertation, York University, Toronto, Ontario, Canada.



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