# It's All About Birds!

**Grade 8**
**Science**

## *I. Introduction to Birds*

Birds are warm-blooded, have distinctive beaks, and their young hatch from hard-shelled eggs. A characteristic unique to birds is the presence of feathers. They provide insulation, enable flight, and are used in visual communication. Adaptations that enable flight include fused and lightweight hollow bones, and a keeled sternum (for the support of flight muscles). Variations in birds (e.g., coloration, wing shape, beak type) give clues to their habitat, feeding tendencies, and behavior.

## *II. Form, Function, and Survival*

Grade 8
Process Standard 4:1 – Report data in an appropriate method when given an experimental procedure or data.

Process Standard 4:2 – Interpret data tables, line, bar, trend, and/or circle graphs.

Process Standard 4:3 – Evaluate data to develop reasonable explanations, and/or predictions.

A bird's beak is made of bone and is part of its skull. It is covered by a moderately hard outer layer of keratin, the same material found in human fingernails. Like our nails, the tip and edges of the beak are re-grown as they wear away. Bird beaks are multi-purpose tools used in communication, grooming, nest construction, defense, offense, and to pick up, tear and/or catch food. Birds have adapted a variety of different beaks best suited to their feeding habits and behavior.

**Activity: Bird Beaks**

Objective: Students will observe different types of bird beaks and recognize that some beaks are better suited for particular foods.

Materials:
- Bird Adaptations - Beaks handout
- Bird Beaks Recording Sheet handout
- Bird Beaks Class Data Grid handout
- Graph paper
- Marbles
- Toothpicks
- Pennies
- Spoons
- Tweezers
- Chopsticks
- Plastic cups

Procedure:

1) Discuss with students how different beak shapes are better suited for different feeding habits.

2) Give each student a **Bird Beaks Recording Sheet**, plastic cup, and choice of beak.

3) While holding the 'beak' in one hand and 'stomach' (plastic cup) in the other hand, students pick up as many marbles ('food items') as they can in an allotted amount of time.

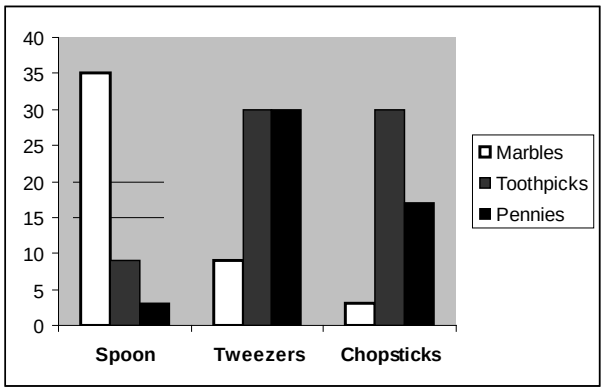
   Note: 'Food items' can be placed on the floor in the midst of a circle of students, or on individual plates. To avoid extreme competition, tell students that they can not pick up or steal a food item that another student is attempting to pick up, or from another student's 'stomach'.

4) Announce when time is up (usually 1-2 minutes works well). Have students count and record data on the **Bird Beaks Recording Sheet**, the number of items that were in their 'stomach'.

5) Repeat steps 3 and 4 with pennies, then toothpicks.

6) Collect data from students and record on **Bird Beaks Class Data Grid**.

7) Have students make a bar graph, using information from the **Bird Beaks Class Data Grid**, which shows the totals for each beak and food type.




9) Distribute **Bird Adaptations - Beaks**. Have students study each type of beak and note how it is suited for a particular diet. Along with other characteristics such as color, size, and song/call, beak shape is used in classification keys to determine bird species.

   * Fun additions: Replace toothpicks with strips of licorice or gummy worms, replace marbles with M&Ms or gumballs, replace pennies with oyster crackers, straw 'beak' and individual cups of fruit juice to simulate nectar feeders such as hummingbirds, etc.

*Activity adapted from Science NetLinks lesson: Bird Beaks.*

**Activity: Growing up Eagle**

Objective: Students role play as an Eagle parent or baby and analyze survival and mortality rates.

Materials: Masking Tape or Chalk
Plastic Forks (See Fork Modifications)
Brown/Black Beans (1 lb bag)
White Beans (5-10)
Paper Cups (small)
Set Up Diagram
Role Cards
Eaglet Food Data Sheet
Nest and Totals Data Sheet
Post Activity Discussion Sheet

Procedure:

1) Use masking tape or chalk to draw out circular "eagle nests" on the floor. Designate the nests by using signs, coloring the masking tape with markers, or by using colored chalk. Nests should not be overly large, but have enough room for all of the eaglets.

2) Mix brown/black beans and white beans together. Disperse piles of food (beans) around the room. Food piles should be of various sizes, of varying degrees of accessibility, and of various distances from the nests (see sample Set Up Diagram).

   *In nature, food isn't likely to be found in a pile, therefore the food piles are meant to be representative of an entire hunting area.

3) Have each student randomly draw a Role Card and go to the designated nest.

4) Distribute one paper cup to each eaglet. Have all plastic forks in a container, facing handle up, and have each parent pick two.

5) Instruct parents to collect food using their fork talons and to bring food back to their babies. Baby eagles may not help parents in any way. Babies may only hold their paper cups against their chests and chirp softly for food. If a baby goes outside the borders of a nest, he/she has fallen out of the nest and dies.

6) Allow 5-10 minutes for parents to collect food and feed babies. Remind students of their roles and keep track of babies that fall out of the nest.

7) When time is up, have students sit down. Have each eaglet count the number of beans in his/her cup. Have students with less than five beans raise their hand – they have died of starvation. Any eaglet with a white bean has died from poisoning. Record all information.

8) Review data and have students graph the amount of food eaten by eaglets. Ask questions, discuss activity and relate results to eagles in the wild (see Post Activity Discussion).

*This activity is an adaptation of Owl Family Survival by Meg W. and Liz LaRosa.*
*www.middleschoolscience.com*

## *III. Classification*

Grade 8
Process Standard 2:1 – Use observable properties, place an object, organism, and/or event into a classification system (e.g., dichotomous keys).

Process Standard 2:2 – Identify properties by which a set of objects, organisms, and/or events could be ordered.

Birds are categorized into Order, Family, Genus, and Species using both physical and molecular characteristics.

**Activity: Class Key**

Objective: Students get a better understanding of how classification keys work by making their own key to distinguish classmates.

Materials: Pencils
Paper

Procedure:
1) Have students build a key of classmates using characteristics such as boys/girls, color of hair, length of hair, color of eyes, hometown, and does/doesn't have a dog, etc.

2) Ask the principal (or another teacher/adult) to come into the class and, using the key, locate one particular student.

* See sample Class Key

**Activity: Classification of Common Birds**

Objective: Students learn to categorize and classify common birds.

Materials: Pencils
Paper
Bird Field Guide or Pictures of Common Birds

Procedure:
1) Observe and identify common birds outside, at a feeder, or through pictures.

2) Have students construct a classification key to common "bird feeder" birds using characteristics such as: birds with a crest or no crest, presence or absence of red color on chest, type of beak (straight, conical, etc.), overall color of bird, relative size (smaller than fist, size of fist, size of forearm, larger than forearm), etc.

* See sample Common Bird Key

There are approximately 10,000 different species of birds in this world, and every single one of them plays an important role in the web of life. As well as their individual roles in the food web, birds are also important in determining overall health in an ecosystem.

## *IV. Biodiversity and Bio-indicators*

An **ecosystem** refers to a group of living organisms interacting among themselves and with their environment. Whether predator or prey, birds are an integral part of our ecosystem. **Biodiversity** is the variety of life, and it includes several levels: living organisms (crows, cacti, coyotes, etc.), genetic variations among organisms (different colored roses, differences in body size among the same species), and different ecosystems (forest, prairie, wetland, coastal, etc.). Greater biodiversity in a system provides greater stability and resilience to both natural and human-caused disturbances.

Birds are found on every continent and in nearly every habitat. Their ability of flight demands a fast metabolism, which in turn leads to faster processing of environmental quality. Because birds show symptoms and indications of poor environmental health before many other animals, they are referred to as biological indicators or bio-indicators. **Bio-indicators** are a group or class of organisms whose populations or status can be used to determine environmental health.

Because all things on earth are interconnected, losing one species can have a devastating effect on other species in an ecosystem, sometimes in ways that we wouldn't foresee. That's why preserving biodiversity is important to us all.

**Activity: We're All Connected!**
**(This activity is also included in the Social Studies lesson plan)**

Objective: To demonstrate to students how all things on earth are connected and the importance of biodiversity.

Materials: Ball of Yarn
Species Cards
Tape

Procedure:

1) Explain to students that they are each going to play a component in a forest ecosystem.

2) Assemble students in a circle and assign each a species of plant, animal, or non-living thing (see suggested list).

   Note: If there is time, allow students to write and draw their component themselves.

3) Have students look around the circle at each other and think about how plants, animals, and non-living things are connected.

4) Have one student hold onto the end of the yarn and toss the ball to another student, explaining his/her ecological connection to the other student.

   Example: The Red-shouldered Hawk is connected to the tree because the tree provides a structure for the bird's nest, as well as a perch from which the hawk can hunt animals on the ground below.

5) Have the second student toss the ball of yarn to another student and explain their connection. As each student makes a connection, wrap the yarn around the student's waist. A big complicated web will start to form.

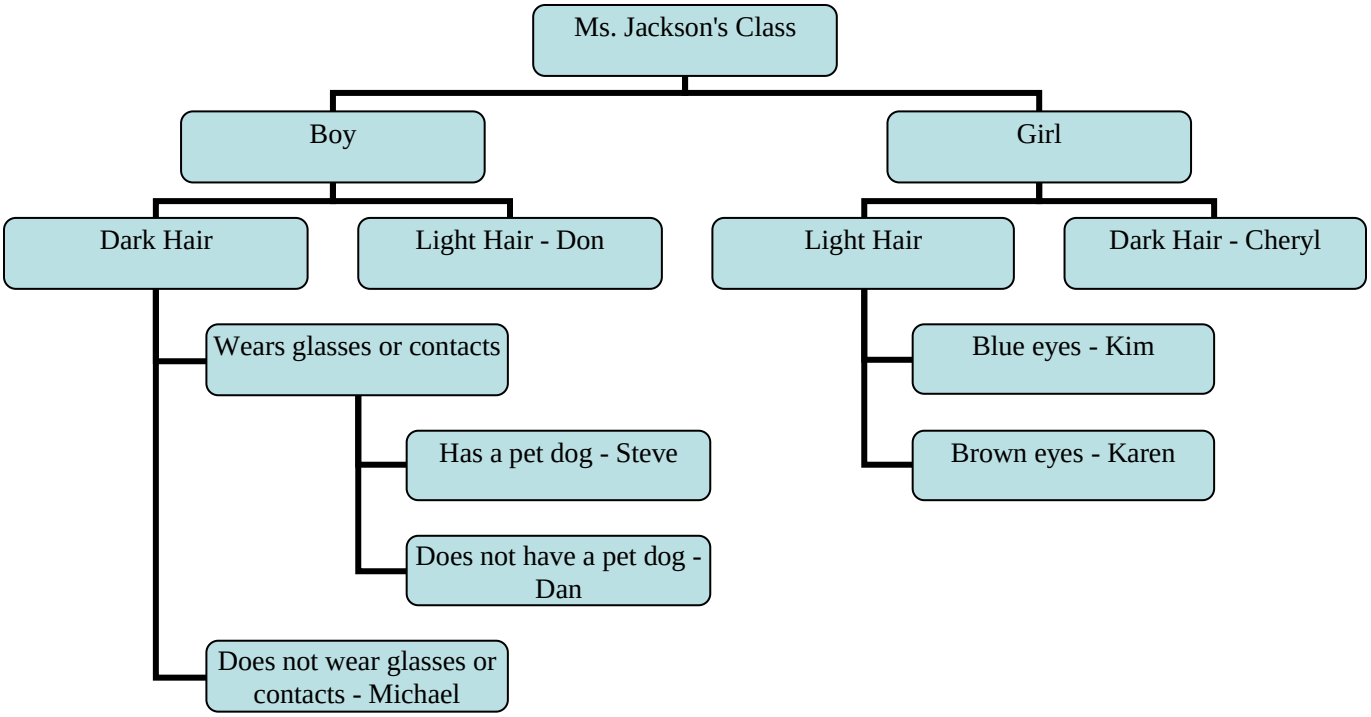
6) When all students are connected in the web, explain that harming any part of the web affects many other parts. Have students imagine what would happen if the tree was cut down (the tree student can shake or tug on the yarn). What would happen if the bird died (have the bird fall to the ground)? Ask the other students if they can feel the changes in their yarn.

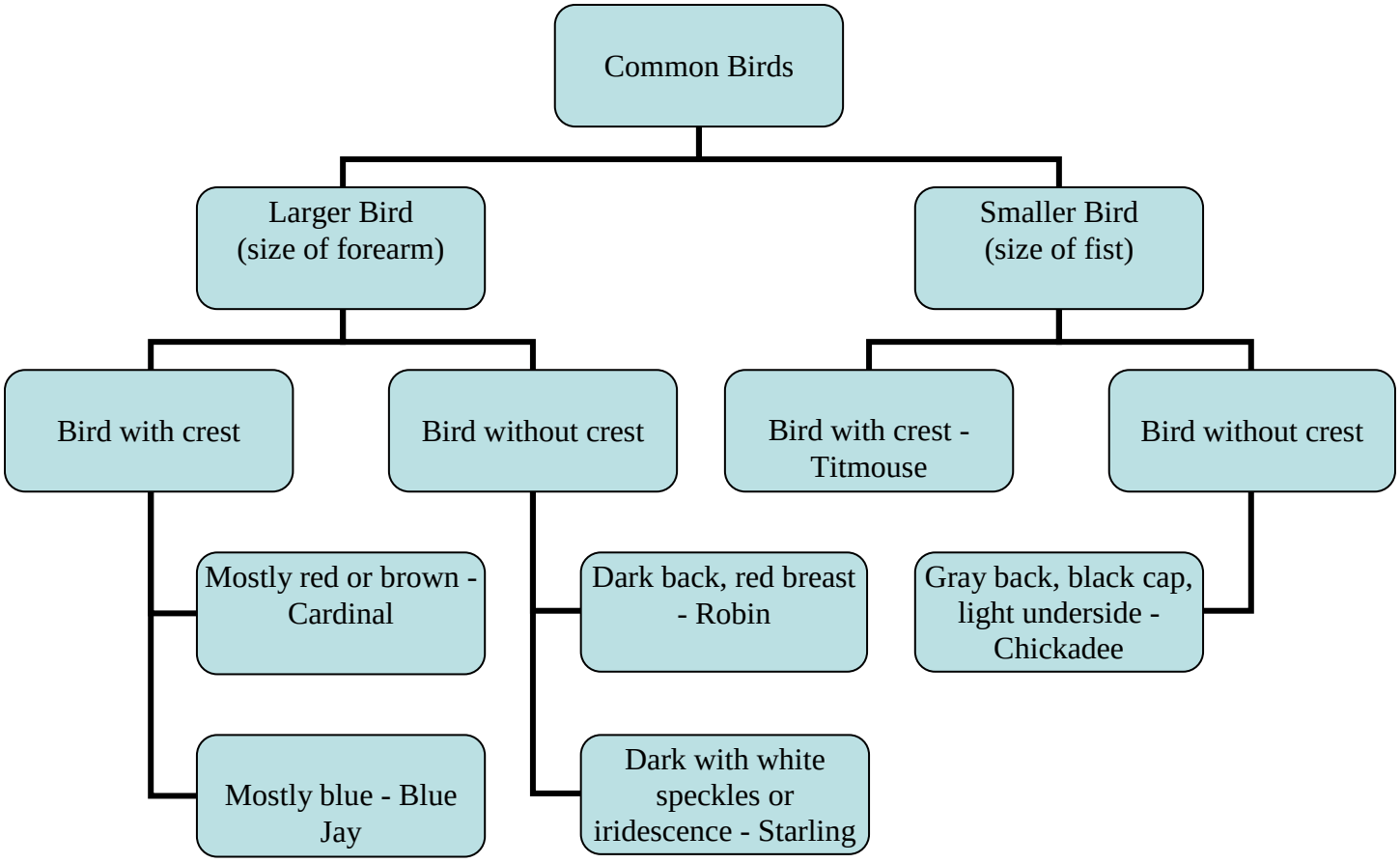
7) When the students have played for a while, ask them to stop and notice which components of the ecosystem have the most connections to others and why. Make note of components that would cause the most disturbance to the ecosystem.

**Suggested Ecosystem Components**

| | |
|---|---|
| Sun | Red-shouldered Hawk |
| Tree | Water |
| Vulture | Mouse |
| Sparrow | Bat |
| Mosquito | Mushroom |
| Turtle | Millipede |
| Fish | Eagle |
| Ant | Woodpecker |
| Frog | Log |
| Coyote | Fox |
| Rabbit | Pigeon |
| Sunflower | Spider |
| Moth | Deer |
| Crow | Scorpion |
| Poison Ivy | Human |

# Sample Keys


Ms. Jackson's Class
Boy
Girl
Dark Hair
Light Hair - Don
Light Hair
Dark Hair - Cheryl
Wears glasses or contacts
Blue eyes - Kim
Has a pet dog - Steve
Brown eyes - Karen
Does not have a pet dog - Dan
Does not wear glasses or contacts - Michael


Common Birds
Larger Bird (size of forearm)
Smaller Bird (size of fist)
Bird with crest
Bird without crest
Bird with crest - Titmouse
Bird without crest
Mostly red or brown - Cardinal
Dark back, red breast - Robin
Gray back, black cap, light underside - Chickadee
Mostly blue - Blue Jay
Dark with white speckles or iridescence - Starling

# Bird Adaptations - Beaks

Did you ever wonder why there are so many types of bird beaks (scientists call them bills)? The most important function of a bird bill is feeding, and it is shaped according to what a bird eats. If you want to learn more about birds, you may want to pay attention to bill shapes! You can use it as one of the characteristics you use to identify birds. If you have already identified a bird, you can learn more about its behavior by looking at the bill and thinking about what it eats. Then you may think about where it lives, and so on. To help you get started, here are some common bill shapes and the food that they are especially adapted to eat:

| SHAPE | TYPE | ADAPTATION |
|---|---|---|
|  | Cracker | Seed eaters like sparrows and cardinals have short, thick conical bills for cracking seed. |
|  | Shredder | Birds of prey like hawks and owls have sharp, curved bills for tearing meat. |
|  | Chisel | Woodpeckers have bills that are long and chisel-like for boring into wood to eat insects. |
|  | Probe | Hummingbird bills are long and slender for probing flowers for nectar. |
|  | Strainer | Some ducks have long, flat bills that strain small plants and animals from the water. |
|  | Spear | Birds like herons and kingfishers have spear-like bills adapted for fishing. |
|  | Tweezers | Insect eaters like warblers have thin, pointed bills. |
|  | Swiss Army Knife | Crows have a multi-purpose bill that allows them to eat fruit, seeds, insects, fish, and other animals. |

# Bird Beaks

## Recording Sheet

Name: _____ Date: _____

### Individual Data Grid

| | Marbles | Pennies | Toothpicks | Total Food Collected |
|---|---|---|---|---|
| **Type of beak:** | | | | |

### Class Data Grid

| | Marbles | Pennies | Toothpicks | Total Food Collected |
|---|---|---|---|---|
| **Spoon** | | | | |
| **Chopsticks** | | | | |
| **Tweezers** | | | | |

*Adapted from Science NetLinks lesson: Bird Beaks*

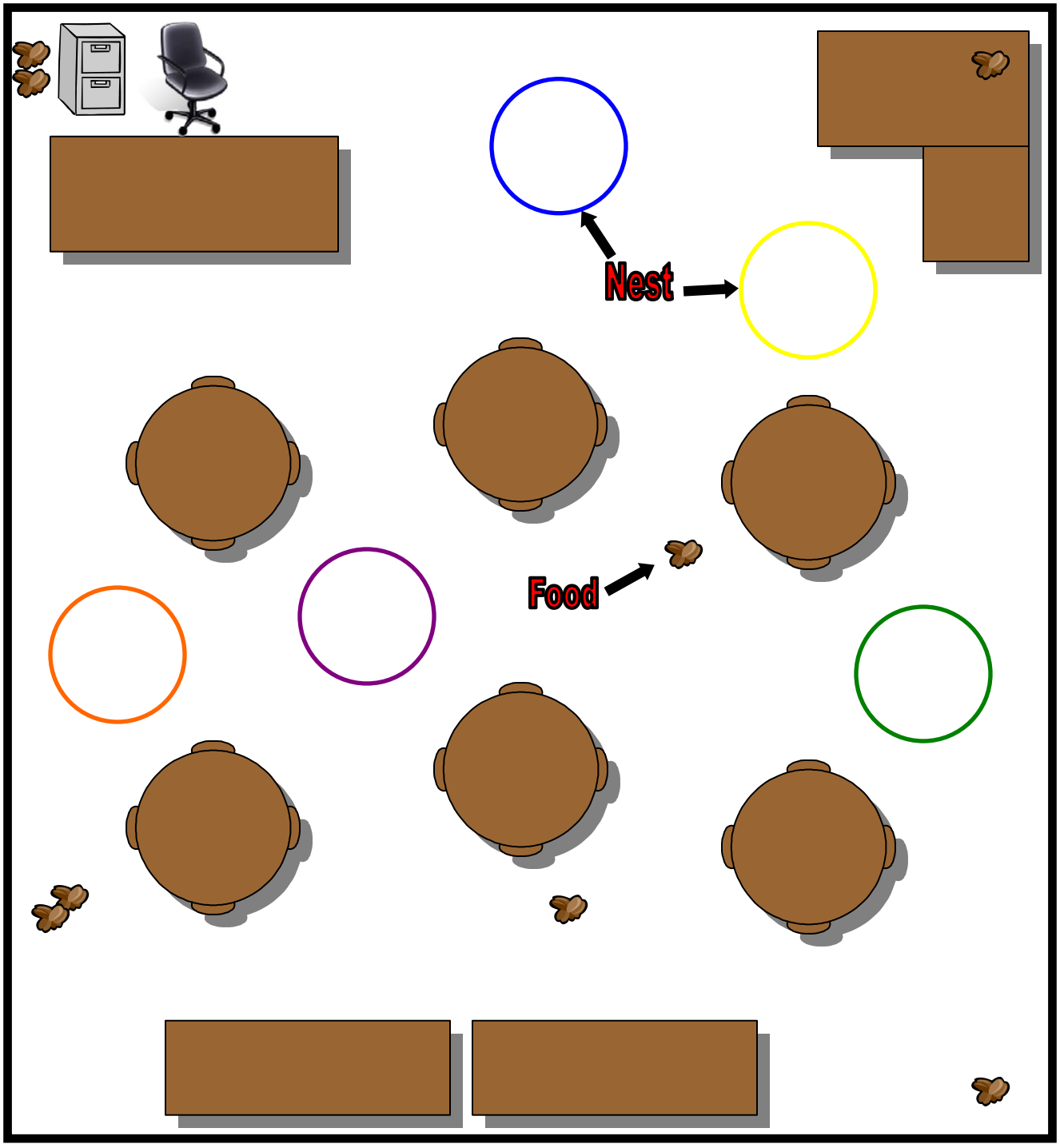
# Bird Beaks

## Class Data Grid

| | Marbles | Pennies | Toothpicks | Total Food Collected |
|---|---|---|---|---|
| **Spoon** | | | | |
| **Chopsticks** | | | | |
| **Tweezers** | | | | |

*Adapted from Science NetLinks lesson: Bird Beaks*

# Growing Up Eagle
# Set-up Diagram




*This activity is an adaptation of Owl Family Survival by Meg W. and Liz LaRosa.*
*www.middleschoolscience.com*

# Growing Up Eagle
# Role Cards

| | | | | | | |
|---|---|---|---|---|---|---|
| Red Parent | Blue Parent | Yellow Parent | Green Parent | Purple Parent | Purple Eaglet | Orange Parent |
| Red Parent | Blue Parent | Yellow Parent | Green Parent | Purple Parent | Purple Eaglet | Orange Parent |
| Red Eaglet | Blue Eaglet | Yellow Eaglet | Green Eaglet | Purple Eaglet | Pink Parent | Orange Eaglet |
| Red Eaglet | Blue Eaglet | Yellow Eaglet | Green Eaglet | Purple Eaglet | Pink Parent | Orange Eaglet |
| Red Eaglet | Blue Eaglet | Yellow Eaglet | Green Eaglet | Green Eaglet | Pink Eaglet | Orange Eaglet |
| Red Eaglet | Blue Eaglet | Blue Eaglet | Yellow Eaglet | Yellow Eaglet | Pink Eaglet | Pink Eaglet |

This sheet provides enough Role Cards for 42 students. Adjust the number of Role Cards that can be chosen (according to the number of students in your class) by removing eaglets from some color groups or by removing whole color groups. Be sure that you do not remove any parents from a color group you are using. Try to maintain a balanced spectrum of eaglets per nest, with at least one group with very few eaglets and one group with a large number of eaglets, and the remaining groups ranging between the highest and lowest.

Example: For 30 students – Remove the entire Blue Group (7 Role Cards), 2 eaglets from the Orange Group (2 Role Cards), 2 eaglets from the Green Group (2 Role Cards), and 1 eaglet from the Purple Group (1 Role Card).

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# Growing Up Eagle
# Fork Modifications

1) 12 Forks – Do not modify

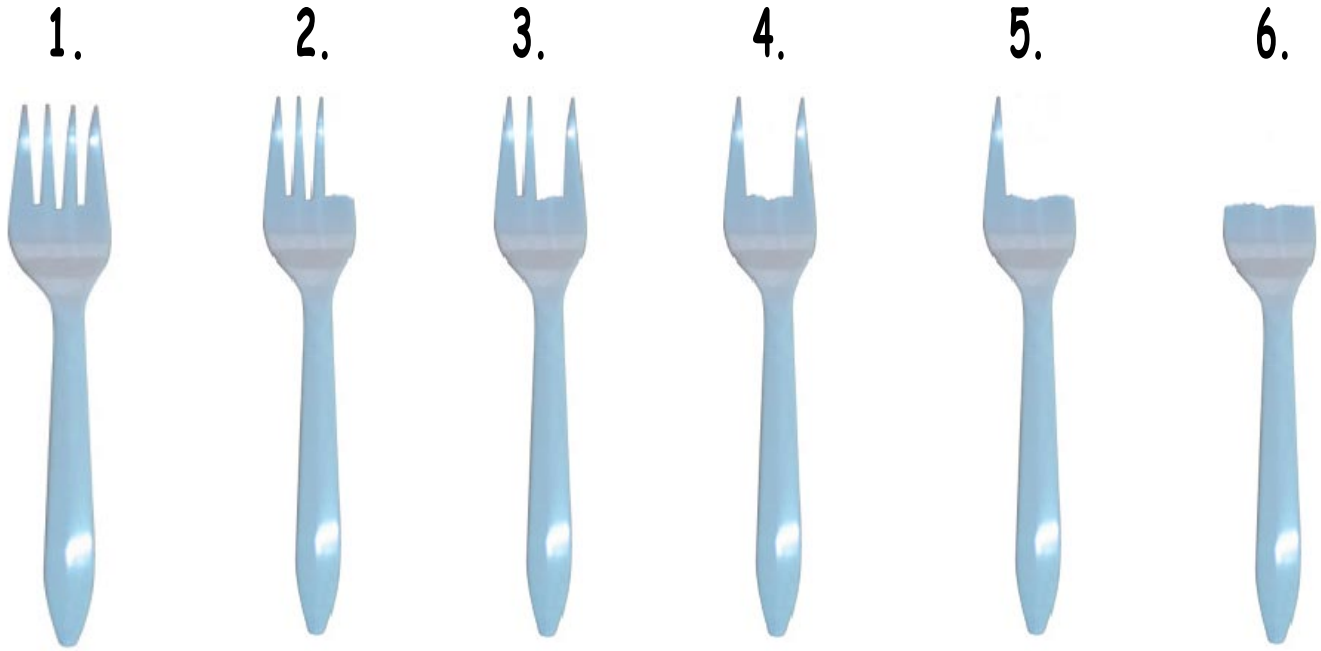
2) 4 Forks – Remove one outer tine

3) 4 Forks – Remove one inner tine

4) 2 Forks – Remove both inner tines

5) 1 Forks – Remove three tines

6) 1 Fork – Remove all four tines




**Fork Modifications are intended to represent an adult eagle's loss or injury to its talons, toes, and/or feet.**

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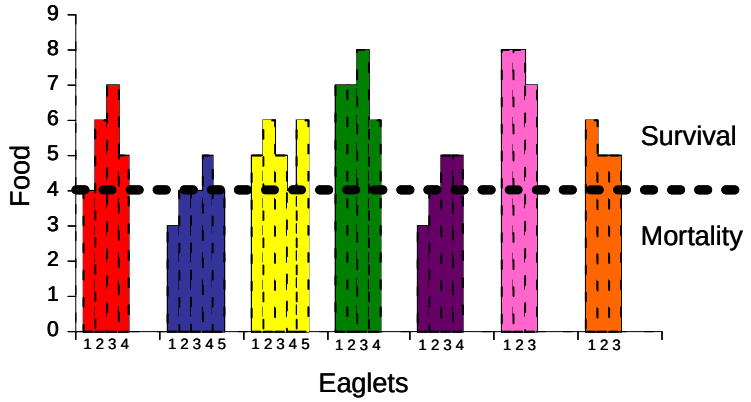
# Growing Up Eagle
# Data Recording Sheet

## Eaglet Food Consumption

| | Eaglet #1 | Eaglet #2 | Eaglet #3 | Eaglet #4 | Eaglet #5 | Eaglet #6 |
|---|---|---|---|---|---|---|
| **Red** | | | | | | |
| **Blue** | | | | | | |
| **Yellow** | | | | | | |
| **Green** | | | | | | |
| **Purple** | | | | | | |
| **Pink** | | | | | | |
| **Orange** | | | | | | |

Record the number of beans from each eaglet's cup. Use the data collected to construct a graph (see below).

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# Growing Up Eagle
# Data Recording Sheet

## Individual Nest Data

| | Eaglets | Death(s) from Nest Fall | Death(s) from Starvation | Death(s) from Poison | Deaths | Survivors | Survival Rate Percentage (Survivors / Total) |
|---|---|---|---|---|---|---|---|
| **Red Nest** | | | | | | | |
| **Blue Nest** | | | | | | | |
| **Yellow Nest** | | | | | | | |
| **Green Nest** | | | | | | | |
| **Purple Nest** | | | | | | | |
| **Pink Nest** | | | | | | | |
| **Orange Nest** | | | | | | | |

## Totals

| Eaglets | Death(s) from Nest Fall | Death(s) from Starvation | Death(s) from Poison | Total Deaths | Survivors | Survival Rate Percentage (Survivors / Total) |
|---|---|---|---|---|---|---|
| | | | | | | |

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# Growing Up Eagle
# Post-Activity Discussion

1) What was the highest cause of mortality (nest fall, starvation, poison)?

In the wild in Oklahoma, approximately 1/3 of all eagle nests fail, where none of the nestlings survive to leave the nest. Causes for mortality include inclement weather, falling out of the nest, siblicide (one sibling killing another), starvation, poisoning, and predation. It is to be noted that poisoning in nestlings is not very common. Most poisons, such as lead and some pesticides, take time to accumulate to toxic levels in the eagle's system, so death often does not occur until after the eagle has reached adulthood.

2) Which nest had the highest mortality? Why? Were the parents deformed? Was the food farther away? Did the nest contain a higher number of eaglets?

Eagles are sometimes involved in unfortunate accidents (electrocution, collisions, altercations with other eagles or birds, injury from prey) which can lead to the deformation or loss of talons, toes, and feet. Deformities to the feet of a bird of prey negatively affect its ability to catch, kill, and carry prey, thereby reducing not only the bird's chance of survival but also the survival of any offspring it is tending to.

Location, location, location! Nest site selection is an important choice for eagle parents-to-be. Abundance and availability of food affect an eagle parent's ability to provide food to its offspring. Food that is farther away or more difficult to access can reduce the amount of food or frequency that eaglets are fed.

Nests with larger numbers of eaglets are more likely to have a higher mortality rate due to starvation or siblicide. More mouths to feed leads to more work for an eagle parent.

*In the wild, the average eagle nest contains two babies, with sometimes one or three babies, and very rarely four babies.

3) Why did certain eaglet(s) in one nest get more food than his/her siblings? Did he/she chirp more, push other siblings out of the way, or out of the nest?

The squeaky wheel gets the grease. Often the louder and more aggressive chick in a nest gets the most food. Siblicide is not uncommon among eagles. Chicks have been known to push their siblings out of the nest, and attack weaker siblings causing injury or death.