

## *Bird Beak Buffet*

Wetlands worldwide support countless numbers of shorebirds that use this habitat as a refuge and refueling spot. While huge flocks of different shorebirds can be seen feeding in the same area at the same time, they rarely compete for the same food. Though they appear to be feeding together, the shape of their body and beaks, their food preference and their behavior patterns help them to specialize on food types for which they are most well-adapted. This is called **resource partitioning** and it decreases the competition between species of shorebirds. In a wetland habitat, many different kinds of birds can feed together because there are many different kinds of food items available.

In Session 1, students go on a video journey to the wetlands as if they were scientists studying the habitat. As they are watching the video, they work with a partner to complete an Anticipatory Guide which helps them to take notes and organize their observations. They then participate in a Thought Swap to access their prior knowledge about birds and birds feeding.

In Session 2, students role-play species of birds with beaks of different shapes and sizes. They gather different food items with their "beaks," graph the results, and compare their feeding success. They also listen to a book about a competition between birds to discover which has the best beak.

In Session 3 students complete the buffet as they determine which food item they should gather when all three types of food items are offered at the same time. Students then work in small groups to generate their own key concepts about what they learned about birds feeding on a wetland. Students discover that different types of shorebirds can feed together in one area because each type is adapted to feed on different types of prey. (This is called resource partitioning.) They also discover that scientists often use math when they gather data about animals and graphing the data helps us to discover patterns and explain observations.

## What You Need

### For Session 1

#### For the class

- ❑ video showing wetlands and wetland birds (See Getting Ready)
- ❑ 2 sheets of chart paper for "Video Journey" Anticipatory Guide (See Getting Ready)
- ❑ 1 sheet chart paper for "What Do We Want to Know?"
- ❑ water-colored markers (several colors, wide-tip)
- ❑ masking tape

#### For each student:

- ❑ 1 sheet 8 1/2 x 11" inch paper
- ❑ 1 pencil
- ❑ 1 bird picture (See Getting Ready)

#### For each pair of students:

- ❑ 1 sheet 8 1/2 x 11" inch paper
- ❑ 1 pencil

### For Session 2:

#### For a class of 30:

- ❑ carpeted floor or enough blankets or mats so that students can sit in a circle around a "non-slippery" floor
- ❑ 50 each of three different colored tokens (3 small colored "Post-It" pads or 2" square pieces of construction paper (See Getting Ready)
- ❑ masking tape
- ❑ water-colored markers (various colors - we suggest Mr. Sketch wide-tip)
- ❑ two 3 foot wide x 6 foot long sheets of butcher paper (See Getting Ready)
- ❑ 30 paper cups
- ❑ 150 of each of the following to represent food:
  - pennies
  - round toothpicks
  - rubber bands
  - (alternatives include 3/16" washers, marbles, different sizes and shapes of pasta)
- ❑ 10 of each of the following to represent beaks:
  - spoons
  - tweezers
  - chopsticks (pairs)
  - (alternatives include: clothespins, popsicle sticks, tongue depressors, tongs, plastic forks, tea strainers, and ice cream scoops)

- various bird books, field guides and posters (See Getting Ready)
- Key Concepts
- Optional: tape or CD player
- Optional: CD or audio tape of the song "Butts Up" from *Slugs at Sea* by the Banana Slug String Band (See Getting Ready)

### Session 3

#### For the class

- 20 or more sentence strips
- 5 sheets of scratch paper
- 5 pencils
- colored markers
- tape
- 2 sheets of chart paper
- *The Best Beak in Boonaroo Bay* by Narelle Oliver, Fulcrum Publishing, 1995. ISBN 1-55591-227-3
- Key concepts (See Getting Ready)

## Getting Ready

### 1. Video Journey

Obtain a video you would like to use to take the students on the "Video Journey to the Wetlands." See the MARE On-line Resources for suggested titles and ordering information.

Many libraries and large video stores will also carry nature titles, so be sure to check there as well.

### 2. Anticipatory Guide

Make the Anticipatory Guide for the Video Journey by writing five questions on chart paper pertaining to the video you have chosen. If you decide to use *Fabulous Wetlands* or *Yellowlegs, Eelgrass and Tidelands*, the questions to write on the chart paper are as follow:

#### *Fabulous Wetlands*

- What are some other names for wetlands?
- Why are wetlands important?
- What plants and animals live in wetlands?
- What are some threats to wetlands?
- What's so funny about wetlands?

#### *Yellowlegs, Eelgrass and Tidelands.*

- Draw a picture of three different types of beaks you see on the video.
- How many different types of birds can you see on the video? Can you make up names for them?

- Describe or draw the habitat where you see the birds feeding.
- Can you tell if the birds are feeding at high tide or low tide? How?
- What do you think the birds are eating? What clues do you see?

*(Note: This is a longer video. Preview it and select a 5–10 minute segment showing birds feeding on the mudflats. Show the segment with the sound off.)*

### 3. Bird Pictures

Gather bird pictures from old calendars, magazines or postcards showing different types of beaks. Try to include as many different kinds of beaks as possible, including various shorebirds. Many nature stores and large book stores and card shops sell their old calendars at 50% off starting in January. At the end of the year, they will often even give them away to teachers.

### 4. Beak Implements and Food Items

Decide which implements you would like to use to represent beak types and which items you will use to represent the food items. Then start gathering the materials. Parents are a great source to loan you tweezers.

Use your own judgment to determine which implements to use as beak types. For example, chopsticks are an excellent representation of a shorebird beak type with long bills, but if your students do not have the experience or dexterity to use the chopsticks, it is not worth the frustration! In this case, use the clothespins and replace pennies with real, not decorative, marbles instead. (Decorative marbles are too small and get caught in the clothespins.)

*Sidebar: Teachers have told us that chopsticks work great even if their students had never tried them before - if they let the students decide how best to use them. Some will decide to use them as a spear to collect rubber bands by the gobs, or even use one chopstick in each hand. They don't have to be experienced at using them the "correct" way.*

### 5. Making the Data Charts

Use the following directions to make the Bird Beak Buffet Data Chart #1: One Food Item at a Time (See attached pattern):

1. Use one 3 foot wide x 6 foot long sheet of butcher paper with squares for graphing.
2. Label the chart across the top with the title: Bird Beak Buffet Data Chart #1: One Food Item at a Time

3. Draw two horizontal lines the length of the paper to create three rows. Label one row Spoonbills, one Tweezerbills and one Chopstickbills.
4. Tape one sample of each food type (penny, toothpick, rubber band) to the graph next to the corresponding word.

*Sidebar: Butcher paper with graphing squares is ideal, but certainly not required. If your butcher paper doesn't have graphing squares, simply draw horizontal lines on it so that the tokens can be stuck to it in straight lines.*

6. Repeat the procedure in #5 above for Bird Beak Buffet Data Chart #2: All Three Food Items at One Time. (See sample chart.)

### 7. Tokens to Represent Each Food Item

Decide what you would like to use for tokens. There are two different options for making tokens:

- One option uses 3 small pads of "Post-its" notes, each a different color to represent a different food item.
- The other option uses construction paper squares cut from three different colors of paper; a different color to represent each food item. You will need to cut 50 2" squares of three different colors of construction paper (e.g. 50 red, 50 green and 50 blue.)
- You might review or introduce the math concept of rounding off to the nearest five as this skill is required in tallying the results of each food item collection in the "Buffet."

### 8. Graphing the Results

Decide how you would like to graph the results.

- If you use "post-its," stick them directly to the butcher paper graph end-to-end to represent the number of food items eaten.
- If you use construction paper squares, place long strips of two-sided tape on the butcher paper data chart and tape the construction paper tokens directly to the chart to represent the number of food items eaten.
- There is actually another option which can be used with either the "post-its" or the construction paper squares. Use watercolor markers in each of the three colors to match the "post-its" or colored construction paper squares. To graph the results, color in the graphing

squares on the data chart to represent the number of food items eaten. Use the same color of pen and token to represent one food item (e.g. red construction paper square and red pen to represent pennies; blue to represent toothpicks and etc.)

*Each of the methods for graphing has its advantages. The "Post-its" and the construction paper tokens placed directly on the graph are especially good for students less familiar with graphing. The tokens represent data that students then convey directly into a bar graph. For more experienced students, transforming the information from the number of tokens to squares on the graph is an excellent math skill to practice.*

*Sidebar: If you are only going to do this activity one time, then there is no need to laminate the materials. If you decide to make a reusable kit, it is best to laminate the construction paper or plan on replacing the "Post-it" pads after two to three uses. If you decide to use markers on the chart, you will definitely want to laminate it before using and use water colored markers when you tally the results. Mr Sketch markers are by far the best for writing on laminated charts. This activity is especially good to do more than one time allowing the students to experiment with using different beak types and or different substrates (see Going Further.)*

9. Write out the key concept for this activity on chart paper using colored markers and large bold letters.

**Different types of shorebirds can feed together in one area because each type is adapted to feed on different types of prey. (This is called resource partitioning.)**

**Adaptations are features or behaviors that improve an organisms chance for survival.**

**Scientists often use math when they gather data about animals. Graphing the data helps us to discover patterns and explain observations.**

10. Visit the MARE On-line Resources for references, ordering information and photos of birds and wetlands to download and use in your classroom.

*(Into the Activity)*

## **Session 1: The Virtual Wetlands**

### **Video Journey Using the Anticipatory Guide**

The Anticipatory Guide helps students take notes and organize their observations during a video.

1. Tell students they are about to go on a video journey to the wetlands as if they were scientists studying the habitat. Emphasize how important it is for scientists to take notes and make sketches that they can refer to later. This also helps them to better communicate their observations to others.
2. Post one of the two sample anticipatory guides below (or another one you have chosen) where the class can refer to them as they watch the video. Tell them that they will discover the answers to these questions as they watch the video.

#### ***Fabulous Wetlands***

- What are some other names for wetlands?
- Why are wetlands important?
- What plants and animals live in wetlands?
- What are some threats to wetlands?
- What's so funny about wetlands?

#### ***Yellowlegs, Eelgrass and Tideflats.***

- Draw a picture of three different types of beaks you see on the video.
- How many different types of birds can you see on the video? Can you make up names for them?
- Describe or draw the habitat where you see the birds feeding.
- Can you tell if the birds are feeding at high tide or low tide? How?
- What do you think the birds are eating? What clues do you see?

*Sidebar: If you decide to show Yellowlegs, Eelgrass and Tideflats remember to preview it and select a 5–10 minute segment showing birds feeding on the mudflats. Make sure you include the time lapse segment showing the tidal change. Be sure to show the segment with the sound off.*

3. Preview the Anticipatory Guide aloud with the students and review any words that seem unfamiliar to them.
4. Have the students sit in pairs to watch the video and distribute paper and pencils to each student. Tell the pairs to divide up the first four questions between them so that each student is responsible for two of the questions. Both students are responsible for answering the last question.
5. Turn on the wetland videotape and unless you are using *Fabulous Wetlands*, turn the sound off.

Sidebar: Watching a videotape with the sound off takes some getting used to - students have been heard to loudly protest and say "turn up the sound". There are many good reasons to turn off the sound including the presentation of too much information, in too furious a fashion which leads to overload and tuning out. Using an ocean sounds audio tape helps students to relax, focus and feel more like they are really on a field trip to the ocean.

6. While watching the videotape, have students quietly discuss with their partner what they observe as they record their ideas and answers to the Anticipatory Guide questions. Tell the students that if they hear or see the answer to their partner's question, they should point it out to them.
7. After the video, have pairs join together to create groups of four. Have the groups discuss the questions and share their answers. Tell them they can add to or modify their answers based on any new information the additional pair introduces.
8. After a few minutes, lead a whole class debrief and encourage each group to offer their ideas as you record them on the board or chart paper.

## Thought Swap

*This activity structure helps students to talk and write about their related prior knowledge. It emphasizes short discussions with different partners, cooperation, and social skills development. It creates opportunities for students to use language in a non-threatening, but highly relevant setting. In Thought Swap, students build on their active listening skills by learning how to hold short interesting discussions about a topic with a variety of different partners.*

1. Tell students that during this introductory activity, they will get a chance to talk with different classmates. They need to



cooperate, follow directions, and talk quietly with each of their partners.

2. Ask students to recall what a good listener should do [you don't interrupt; you are attentive.] In Thought Swap, both partners will be able to discuss each question or topic. To have a good discussion, each partner should be a good listener and speak clearly when it's her or his turn.

3. Distribute a bird picture to each student. Have students stand shoulder to shoulder to form two parallel lines, so each person is facing a partner. Students standing side by side should be at least six inches apart.

4. Tell students you will be asking a question or giving them an idea to talk about with their partner who is facing them. They will have about a minute to talk. Tell them that their bird picture will help them answer the question.

5. Pose the first question for students to discuss from the list that follows question #7 below. Walk along the two lines to help shy or resistant partners get started and to "eavesdrop" on their conversations. When you call time, have a few students report something that their partner told them.

*Sidebar: Asking students to report something that their partner told them encourages active listening. Students get better at this the more you reinforce it. This promotes oral language use and authentic dialog between student that may not normally converse. This activity builds student skills for working in "cooperative learning" settings.*

6. Before the next question, tell students the line needs to move along. Have *one* of the lines move one position to the left so that everyone is facing a new person; the person at the end of that line walks around to the beginning of the line. Everyone now has a new partner.

7. Repeat steps 5 and 6 until you've asked all the questions below:

- Have you ever seen birds by the ocean or other water? Where were they and what were they doing?
- What do you think the birds were eating?
- What foods do you like to eat and what do you use to help you eat those foods?
- What do birds use to help them eat?

- Describe what a bird's beak looks like.
- Do you think birds compete with each other for food? (How would you know if they were competing? What would it look like?)

## What Do We Want To Know?

1. Have students sit down with their last Thought Swap partner and then distribute one sheet of paper and one pencil to each pair.
2. Have one of the students in each pair act as the recorder first and make a t-chart on the paper, labeling one column "What we already know about birds" and the other "What we want to find out about birds."
3. The recorder can write down everything the two of them can remember about what they discussed with their various partners and what the rest of the class shared. Then they switch roles and the new recorder writes down all the questions they have in the second column.
4. Lead a class debrief and record on chart paper *What They Know* and *Want To Know* about birds in the wetlands.

*(Through the Activity)*

## **Session 2: The Buffet**

*This activity is easier to teach with two adults (or one adult and an older student helper) in the room. At various points, a task for 'another adult' is mentioned. You can teach Bird Beak Buffet alone to an orderly class of students, but it is highly recommended that you have help to make the activity go more smoothly and more quickly.*

1. Tape the Data Charts to a wall near where the students will sit on the floor. Have the students sit in a circle on a carpeted floor. Welcome them to the (your school's name) School Mudflat. Tell them that they are shorebirds that have come to this very productive wetland to feed at low tide. Shorebirds can only feed here at low tide.

*Your "data" will only be "clean" if your total number of shorebirds is a multiple of three. If you have too many students you can pull out one or two and make them into peregrine falcons and/or helpers (see directions further on). Each round you can cycle the falcons back into the game and pull new falcons out.*

2. Explain to students that there are only a limited number of coastal areas that have the right conditions to create a wetland. Many of those have been destroyed by people as we build on them. Since all shorebirds depend on wetlands and most can only feed at low tide, there are often huge numbers of birds at the same place at the same time, all trying to feed at once. What might the result be? Tell students they are about to find out.

3. Ask the students:

- Why do the birds only come here to feed at low tide? (the bird's food - clams, worms, snails, insects, crab, shrimp - are exposed at low tide and the birds can walk on the mud or wade in the shallow water to find them)
- Why don't the birds feed here at high tide? (water covers and protects their prey and the water is too deep to wade)
- Where do the birds go at high tide? (they are roosting in trees or sleeping on beaches)

4. Explain that since they are now shorebirds, they need some new body parts. Describe the parts as you draw on the chalkboard or chart paper a simple picture of a "student-bird," with a picture of a cup and an arrow pointing to the bird's stomach, and a picture of a spoon, tweezers, and chopsticks and arrows pointing to the bird's beak. Now introduce and draw or show each of the food items: penny "clams," toothpick "shrimp," and rubber band "worms."

5. Now give each student a paper cup "stomach" for collecting their food items.

6. Give the first student in the circle a spoon, the next tweezers and the third chopsticks. Repeat this pattern until each student has one of these implements. These are their "beaks."

*Some students may complain about the "beak" they received - especially if they feel they are unfamiliar with how to use it. Tell them that although they might initially feel at a disadvantage, their goal is to discover if their beak seems to be made just right for any of the food items.*

7. Tell the students that there are only three rules in this activity. Demonstrate each rule/procedure as you describe it.

Rule #1: When you say **Low Tide** (and the music starts if you decided to use music) they can begin to collect the

food items and put them into their upright cup-stomachs. They can move around the "wetland" floor a little, but they must stay on their knees.

Rule #2: The only way to pick up the food items is to use the beak they were given—fingers cannot be used to pick up the food. Also, the cup-stomachs must be held upright and cannot be used to scoop up the food from the "wetland-floor".

Rule #3: Everyone must immediately raise their cup-stomach, and implement-beak up in the air above their heads when you call out the words **High Tide** and the music stops.

8. Now explain to the students that in the real wetland, shorebirds stay together in flocks where all the birds do the same thing at the same time. Ask the students if they can guess why they might do that. Have they heard the statement "safety in numbers"? Tell them that the birds all do the same thing so that it appears as if they are just one very large individual bird. This is called "flocking behavior" and it is a very important survival strategy for these animals.

9. Add that the birds also do the same thing everyone else is doing so they won't call attention to themselves and get singled out by a predator who might eat them.

10. Tell students that predators in the wetland include very swift falcons. These are predator birds equipped with talons and a sharp bill for eating birds and other small prey. Here in the classroom, there are also peregrine falcons. Anyone caught feeding after "high tide" will be grabbed and eaten by the peregrine falcon. That means they must pour out all of their food and cannot play the next round. You or extra students can be the peregrine falcon.

### **Trial 1: The Penny Clam Buffet**

1. Spread food item #1 (marbles or pennies) approximately uniformly over the carpeted area within the circle of students. Remind them that you are a very hungry falcon and will "prey" upon (remove from the game) any bird that is calling attention to itself by doing something different than the other birds (not following directions).

*Some students might complain that there isn't as much food located in front of them as in front of some of the others. Tell students that out in nature food is not spaced uniformly*

*throughout the actual wetland either—it is usually very patchy. For this investigation, however, try to keep the food spread as evenly as possible. (See Going Further for extended experiments with patchy food distribution.)*

2. Give the birds (students) the prearranged signal, "On Your Mark, Get Set, LOW TIDE," to start picking up food items from the floor with their beaks and putting them into their stomachs (cups). You can also play music while the birds are feeding.
3. Time the food collection. After 20 - 25 seconds call out "HIGH TIDE" "Beaks Up—Stomachs Up" and turn off the music. Every student must immediately stop feeding and raise their stomachs and beaks up into the air.
4. Have each student count the number of food items they placed in their "stomach", and then round off that number to the nearest multiple of five. Call out a few numbers and have students practice rounding them off. (Depending on the experience of your students, you might have them put their food items into piles of five.)
5. Explain to them after they round off the number of food items they collected, that they will now be given one token (Post-it or construction paper square) to represent every five food items they collected. (1-2 items = 0 tokens; 3-7 items = 1 token; 8-12 items = 2 tokens; 13-17 items = 3 tokens and etc.). You and another adult can now pass out the tokens to each student.
6. Call on one volunteer representing each beak-type to help you with the data collection and graphing. Choose one student with a spoon beak and have them collect the tokens from each spoon beak bird. Choose a chopsticks bird to collect the tokens for the chopsticks and a tweezers bird to collect for the tweezers.
7. Have the three chosen students come to the front of the room where the graph is located and count the number of tokens they collected from all the birds with their beak type.

*Note: One adult can help students to graph their results using one of the options as described in the Getting Ready section, (stick the Post-its or tape the colored tokens on the graph or color in the bar graph using a different color of marking pen to represent each beak type—see sample graph.)*

8. As the three chosen students are collecting the tokens and graphing the results, have all the other students sit back in

their original spot in the circle. The other adult can choose helpers to collect all the food items from the stomachs, as well as the uneaten food from the floor. They can then direct the group's attention away from the graphs, and ask, "Who can predict which beak-type is best adapted to feed on penny clams? Which type do you predict is least adapted to eat penny clams? Why?"

*If you haven't already introduced the term **adaptation**, this is a good time to discuss it. Tell the students that an adaptation is something that helps an organism to be more successful in its habitat - to survive and thrive. For example, a duck's webbed feet are an adaptation to help it swim.*

9. Review the results on the bar graph. Use the following questions to guide the class discussion:

- Which beak type gathered the most penny clams? Which beak gathered the least?
- How did the predictions compare to what actually happened?
- Why are some birds with the same beak type more successful than others with the same beak type in gathering a particular food item? Tell them that individual student abilities or aggressiveness may give them an advantage which would show up as increased feeding efficiency—and then again, the aggressive student-bird may get picked off by a hungry falcon; in the birds' world, age and experience of an individual may also give an advantage.
- How might we test if it is aggressiveness or experience that helps certain students to collect more prey? (repeat the trial a number of times so that everyone gets a lot of practice with their beak and at the same time, remove any birds that are acting really aggressive)

10. Some students may be disappointed with how their "beak" did in comparison to others. Ask them:

- Why do they think their beak was not as well adapted to collecting that food item as some other beaks?
- What is it about the shape of their beak and the shape of the food item that might have made it more difficult for them to be successful?

- What sort of food item do they think they could successfully collect?

### **Trial 2: The Toothpick Shrimp Buffet**

1. Repeat as in Trial 1 above, using food item #2 (round toothpicks). Have the students predict which beak type will collect the most food items and why. Have them make predictions before and after the trial, but before seeing the graphed results.

2. After graphing the results of Trial 2, use the following questions to guide the class discussion:

- Which beak type gathered the most toothpicks? Which beak gathered the least? Have the students attempt to explain the results.
- How did the predictions compare to what actually happened?
- If there were only penny clams available in their wetland home for a long time, what might happen to each of the three types of birds?
- If there were only toothpick shrimps available, what might happen?
- What could a bird do if the only food item available in the habitat was toothpick shrimps, and it wasn't very good at gathering them? [fly to a different wetland which had food items available that it was good at gathering; starve; practice feeding on shrimps until it got better at eating them]

### **Trial 3: The Rubberband Worm Buffet**

1. Repeat as in Trial 2 above, using food item #3 (rubber bands). Again have the students make predictions before and after the trial, but before seeing the graphed results.

2. After graphing the results of Trial 3, use the following questions to guide the class discussion:

- Which beak type gathered the most rubber bands? Which beak gathered the least? Have the students attempt to explain the results.

- How did the predictions compare to what actually happened?

3. Tell the students that in the next session we will do one more feeding trial, but this time we will put all the food out at once instead of just one food item at a time. Lead a discussion about what they think will happen.

### Session 3: Putting It All Together

1. Have the students sit in a circle in front of the data charts from the previous session. Help them review some of the results as you lead them through the following questions.

- Are some birds on the graph good at gathering more than one type of food item? Which birds? These birds are called **generalists**. Are some birds good at gathering only one kind of food item? Which birds? These are called **specialists**.

- What would be an advantage of being a generalist? a specialist? What would be some disadvantages?

- Do you think that most wetlands have only one kind of food available?

- Imagine that all three of the foods are available to the birds at the same time. Do you think each bird would attempt to feed on all of the different types, just on one or on two of the three?

### *The Best Beak in Boonaroo Bay*

1. Tell the students that you are going to read them a book about a competition between all different sorts of birds to determine which of them has the very best beak. Ask the students if that sounds similar to what we are doing here with the Bird Beak Buffet activity.

2. Tell them that the book is called *The Best Beak in Boonaroo Bay*. Read all but the ending of the book aloud to your students. Ask them to discuss with a buddy what the book has in common with the activity we are doing here in class. Which bird in the book do they think will be the winner of the competition for who has the best beak? Lead a class discussion about their ideas.



3. Tell the students that you will read the ending of the book after they do the final feeding frenzy with all three food items placed in the classroom wetland at the same time.

### **Trial 4: The Clams, Shrimps and Worms Buffet—All Three Food Items at Once**

*The results of Trial 4 usually show that each beak type tends to specialize on the one food item for which it is most well-suited or adapted to gather. Ideally each bird specializes on a different food type, and this dramatically reduces competition. You may find however, that in your class one beak type seems to continue to be a generalist. Even if this is the case, hopefully you still won't have any birds starve to death. If you do, use a different combination of beak types and try another round of the activity.*

1. Repeat as in Trial 1 above, now using all three food items at the same time. Have students predict how each beak type will act when all the food is available at once. Have them think about what strategy they personally will use - will they be a generalist or a specialist?

2. After the trial, have the students make separate piles, count up and round off each food item separately, and give them the correctly colored tokens for each item. Again have student helpers collect the tokens and help record the results on the second graph (see example graph).

**As it takes a few minutes to record these results, have the rest of the class discuss how they think the results will turn out, go out for recess or read the rest of the book to the class as your helpers fill out the graph.**

3. Once the results are graphed, use the following questions to guide the discussion:

- What statements could we make about the results we obtained when all three food items were available at the same time?
- Did all three types of birds get enough of something to eat?
- Did birds seem to concentrate on gathering one type of food? Did each bird type go after a different food item?
- Was it easier to get food when one item or all three food items were available? Why?  
(If all species of birds are competing for the same type of food, even those birds best adapted to gather it may have to waste energy fighting off the competition. If more than one food item is present, each bird can specialize on the food items they are most well adapted to capture or that there is the least competition for. The

more that birds are able to specialize, the less they have to compete with other birds. They can spend all their time eating without wasting energy fighting.)

- If birds are concentrating on different food items, are they competing for food?

(No, the birds are specializing on particular food items in an effort to reduce such competition. This is called resource partitioning with each concentrating on the food item it is most well adapted to gather and eat, or the one that no one else wants. Birds of the same species may compete for the same food items if the resources are limited; age and experience may come into play in such cases.)

- Have the students look around the room at the bird posters and pictures or use bird books as reference. Which real birds seem to have beaks like our simulated beaks? (pelican, avocet, and spoonbills have spoon-shaped bills; ducks have clothespin-shaped bills; sanderlings and gulls have tweezer-shaped bills; long-billed dowitchers and godwits have chopstick- or popsicle stick-shaped bills)

3. If you haven't finished reading the ending of *The Best Beak in Boonaroo Bay*, now would be a good time to complete it. Have the students find the birds illustrated in the book on posters or books in your classroom. Which beak types shown in the book were most like our simulated beaks?

### Debrief and Generating Key Concepts

1. Review the "What We Know" and "Want To Know" about birds in the wetlands poster from Session 1. Ask the students if they would like to change anything in the "What We Know" column. Are there any questions left unanswered in the "What We Want to Know" column? How could we find out the answers to those questions?

2. Divide the students into small groups and distribute scratch paper and a pencil to each group. Tell the students that their job is to write one or more key concepts related to the Bird Beak Buffet activity. They will need to work as a group and have someone act as a recorder to write down their ideas on the scratch paper.

3. After most groups have recorded some sentences, ask for volunteers to read some of their key concepts aloud. Record their ideas on chart paper and lead a discussion eliciting student ideas about how we might make these key concepts even better.

4. Once the class agrees on the wording for one or more key

concepts, ask for student volunteers to write them on sentence strips with colored markers.

5. Hold up the key concepts that you previously prepared and have one or more students read them aloud. How are the key concepts similar and how are they different from the ones the students generated? Post all the concepts near the Bird Beak Buffet Data Charts.

**Different types of shorebirds can feed together in one area because each type is adapted to feed on different types of prey. (This is called resource partitioning.)**

**Adaptations are features or behaviors that improve an organisms chance for survival.**

**Scientists often use math when they gather data about animals. Graphing the data helps us to discover patterns and explain observations.**

*(Beyond the Activity)*

### **Going Further**

#### **Birds on the Schoolyard**

Observe real birds e.g. pigeons or gulls in the schoolyard, sparrows or hummingbirds in the garden. Have students observe the behavior of the birds including interactions they have with other individuals and other species, what they are eating, what time of day they are most active, where and what substrate do they search for their food, etc.. Do the birds appear to be partitioning the resources? Have students take turns visiting the school garden or observing the schoolyard and keeping notes in a journal.

#### **Field Trips: Creating a Bird Field Guide**

Go bird watching in a wetland, schoolyard, water treatment plant or nearby park. Have the class work together to prepare a Field Guide to Birds for the site you visit. Take copies of the Field Trip Notes from the Oyster Beds activity or use another journal. Their field notes could include a sketch of each bird species they see, what they saw it doing, and any other observations or discoveries they made. Did they see birds feeding? Did the birds seem to be competing?

What were they eating? Was more than one type of bird feeding together? What else did they observe the birds doing? Upon returning to class, have them use a reference book or the internet to learn more facts about the bird's natural history. Finally, compile all the information together in the form of a field guide to birds.

### **Field Trips: Bird Bingo**

Before going on a field trip, have the class do some preliminary research to determine what they are likely to see when they get there. They can call up the site and ask a docent, naturalist or ranger; they can get on the internet and search the web for the site's web page or enature.com which lists organisms by area and even has an "ask the expert" column. Find out if there are field guides already written about the field site. Using any information the class discovers, create a Bird Bingo Game with each box illustrating a different species of bird, food the bird eats, predators of the birds, or birds doing different actions and behaviors (preening, roosting, feeding, flying, etc.) Leave at least one box blank for the students to draw in something they didn't expect to see. Take the Bingo with you on the field trip and have a contest to see who can get a blackout first.

### **What If?**

Have the students work in cooperative groups to make posters about some of the consequences of the following scenarios:

What if...

- a city decided to dump its garbage in a wetland where the birds were feeding.
- pesticides entered into the wetland from the farmlands upriver.
- a new housing development was built on the wetlands.

Have the students brainstorm ideas about how they would know if something like this really was happening in their community and what they plan to do about it.

### **The Real Thing**

Ask the students to compare the beak they used in the buffet to the pictures and posters around the room. Which actual bird is it most like? Have those students who choose the same bird form into small groups to do library or internet research about that bird. They should find out some natural history information about it, including what it really eats. Were the pretend food items a good representation of their real prey? What else might we have used that would have

been closer to the real thing? Have the students do illustrated reports about their bird and make presentations to the class. These reports will be invaluable when the students create 3-d creatures in the Build a Wetland activity.

## *Bird Beak Buffet Home Activities*

### BIRD BINGO

Do some bird watching in your own backyard or nearby park. Make a list and sketch all the organisms you see (especially the birds) and the behaviors you notice. Using all the observations and discoveries you made about your own "study site," create a Bird Bingo Game with each box illustrating a different species of bird, food the bird eats, predators of the birds, or birds doing different actions and behaviors (preening, roosting, feeding, flying, etc.) Leave at least one box blank so your friends and family can draw in something you didn't observe before. Have a contest to see who can get a blackout first.

### BIRD BEAK BUFFET

Play the bird beak buffet game with your family. Choose the implement-beaks, food items (how about gummi worms and goldfish crackers?) and substrate (grass, mud etc.) combinations you would like to try. Have your family make predictions about the implement they think will be most well adapted to collect each food item. You will probably need to teach your family what adaptation means. Did your family end up being generalists or specialists? Did you notice if resource partitioning was going on? Teach your family about these words as well. Bring the results to school to share with your classmates.

### BACKYARD BIRD FEEDER

Create a bird field guide to your own backyard. What birds do you see? What do they eat? Attract more birds to your yard by placing hummingbird and other bird feeders around the area. How many birds visit your feeders? What seeds seem to be eaten by which birds? Do they seem to be generalists or specialists? What kinds of interactions between the birds do you see? Are some more aggressive than the others? What time of day do the birds seem to prefer to feed? Is it the same for all the species or does each have its own special time? Do you notice any predators (cats) coming around? Do the birds all react the same way when a predator comes? Remember, if you start feeding birds, you will need to continue feeding them over the winter. The birds have learned to count on the food resource you have been providing.

### FAMILY FIELD TRIPS

- Do some internet exploring (enature.com lists organisms by area and even has an "ask the expert" column) or ask the Audubon Society to find some really great wetland spots or other habitats to go birdwatching. Are there any areas located near to where you live? Encourage you family to make birdwatching one of the outdoor activities you do when you go on a vacation or take a weekend outing. Ask at your local library or on the internet for a bird field guide to use on your outing. Do you know anyone that you could ask to

borrow binoculars? Call up your local Audubon Society for suggestions on where to go to see birds and what birds you will likely see there. Participate in their yearly Christmas Bird Count - you can even do that from your own backyard!

- Plan a trip with your family to visit a pet store that sells birds. What kind of birds do they carry? Ask the owner of the store where he bought the birds. Did they come from the wild or were they born and raised in captivity? Where do the birds originally come from? Watch the birds closely for at least 15 minutes and write down every behavior and interaction you notice. Did you see them sleeping, feeding, fighting? Did the birds seem to be competing for food? What did you see them doing the most? What behavior did you see the least? Later do some internet or library research about one or more of the species of birds you saw. Do you think all their needs were being met in their cage? If not, what was missing? Would you like to have one of the birds you saw? Why or why not?

- Visit a wildlife park, zoo or aviary where you can observe birds. What kind of birds can you find? Try to locate some wetland or shorebird exhibits. Where in the world did they come from? Sketch the birds you see and take special care to show their beaks and feet. What prey do they seem especially well adapted to capture and eat? Try to see what the birds are being fed or locate a zookeeper and ask when and what they eat. Are they being fed the kind of food you predicted based on the shape of their beak? Watch them carefully for at least 15 minutes and write down all the behaviors you see.

## Background

Wetlands worldwide support countless numbers of shorebirds that use this habitat as a necessary refuge and refueling spot on their lengthy migrations, such as along the Pacific Flyway. Other birds spend their entire lives within the confines of a single wetland.

While huge flocks of different shorebirds can be seen feeding in the same area at the same time, they rarely compete for the same food items. Though they appear to be feeding together, their body size, leg length, beak length and shape, food preference, and behavior pattern help them to specialize on food types for which they are most well-suited or adapted. This is called **resource partitioning** and it decreases the competition between species of shorebirds. In a wetland habitat, many different kinds of birds can feed together because there are many different kinds of food items available.

Small birds like sanderlings pluck tiny insects and shrimp from the surface or first inch of mud with their tweezer-like beaks. Plovers and dowitchers pick up small crabs and shrimp from the next deeper inch of mud or sand. Willets and marbled godwits with bills 3 and 5 inches long respectively, pull out small clams, worms, and other burrowing animals. The long-billed curlew with its foot long, downward curving beak specializes in feeding in the deep, curving burrows made by the ghost shrimp. Avocets use their long, upturned beak to scoop brine shrimp from the surface of the water and pelicans dive from high above the water and use their large scoop to capture fish just below the surface. Ducks pluck weeds and dabble in the mud as they go "butts up" in the wetlands. Each type of bird can spend its time gathering prey without wasting energy competing with other birds.

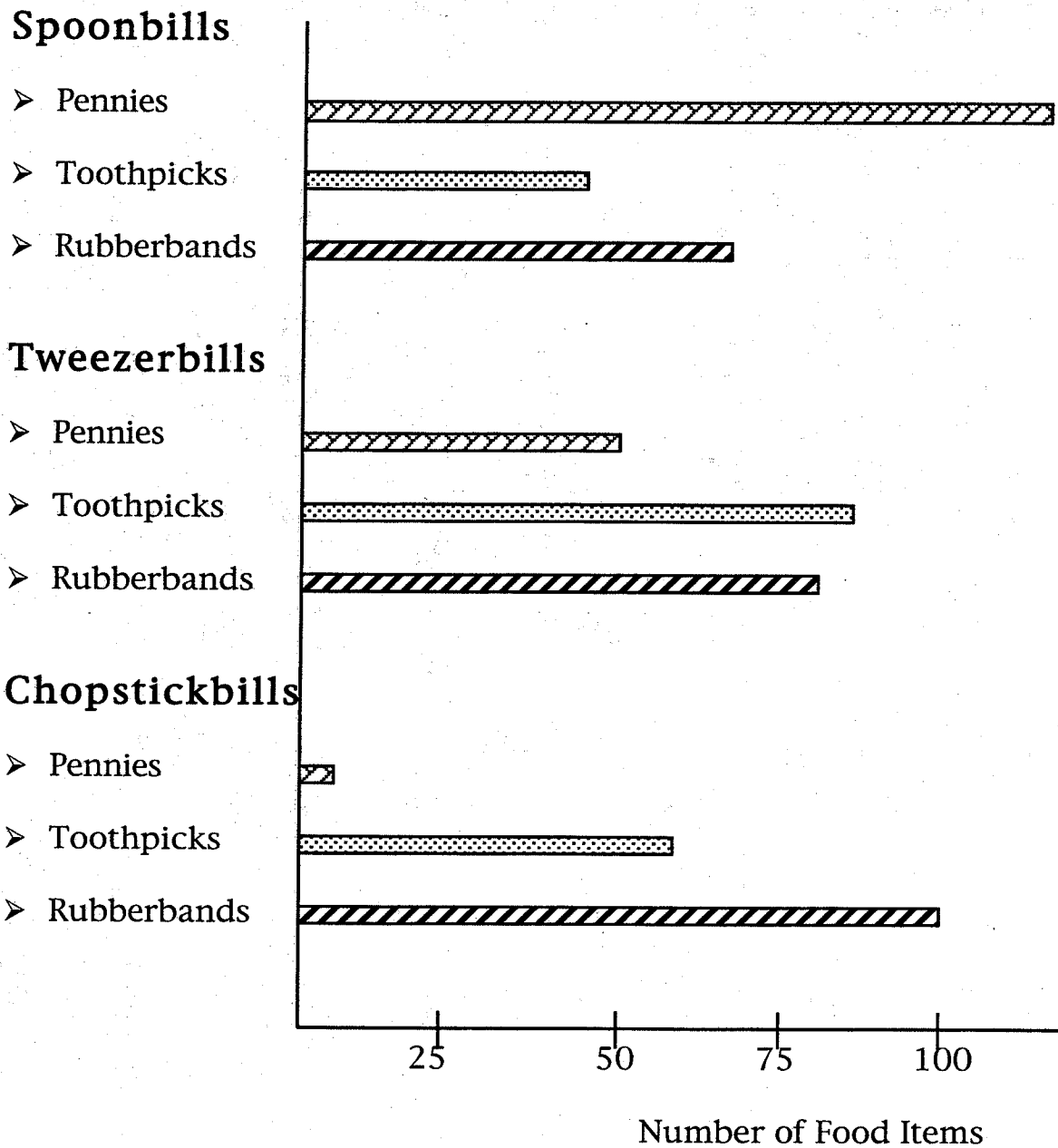
A bird which prefers and gathers a single type of prey is called a **specialist**. A **generalist** gathers many different kinds of prey. If a wetland doesn't contain the prey favored by a bird, it may find another wetland, switch to a different, similar prey (which may create more competition) or if neither is possible, perhaps perish.

Early European explorers to California described flocks of wetland birds so large that their wings beating sounded like thunder, and when the flocks passed overhead they blocked out the sun and cast immense shadows over the

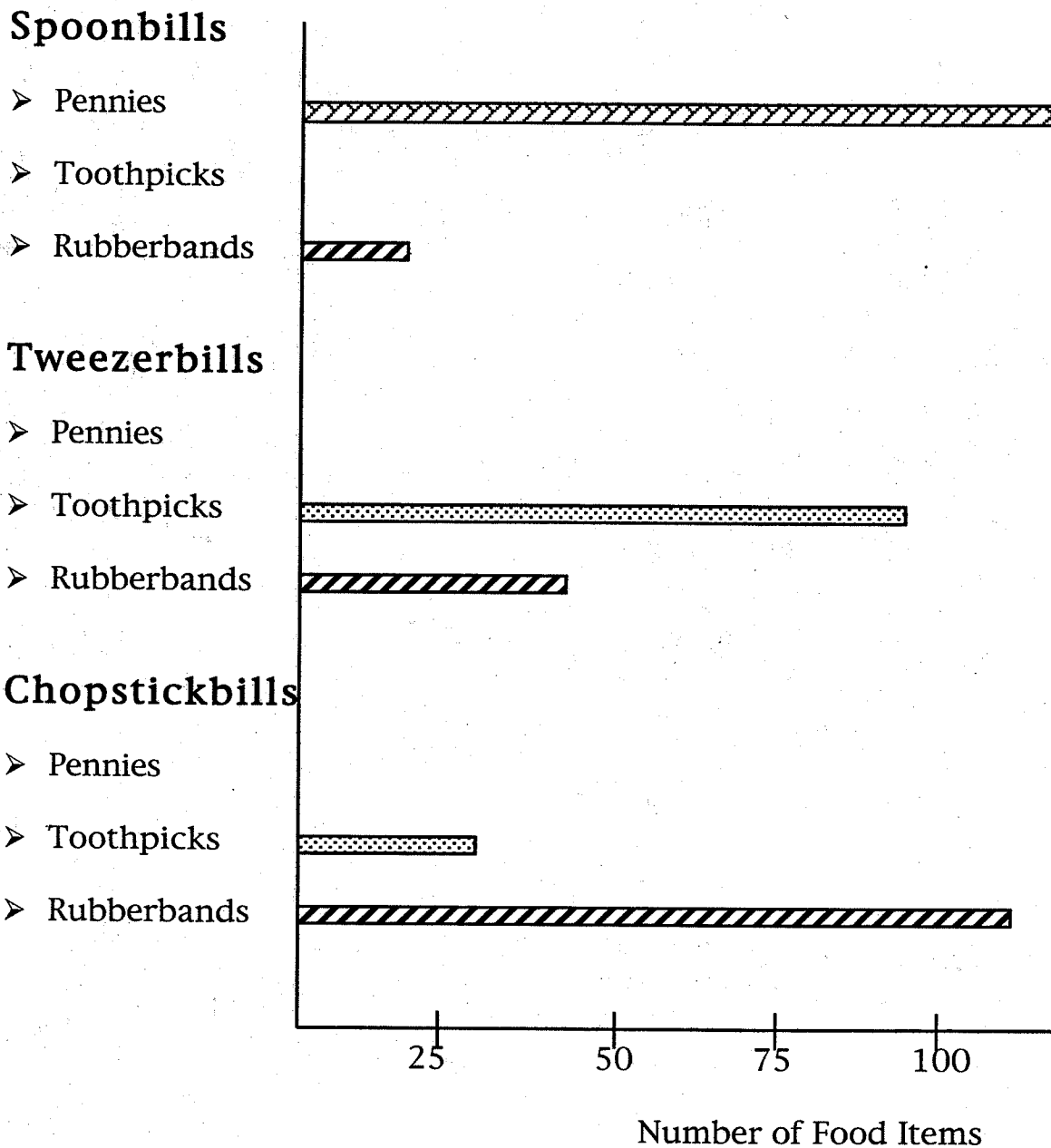


marshes. Today wetlands are rapidly disappearing due to filling and dyking to make more dry land for building and farming. Birds have an increasingly difficult time finding wetland habitat at all, much less their preferred prey. In the San Francisco Bay area, 95% of the historical wetlands are now gone. Gone with them are the refuge and resource for the countless number of birds that were once present.

**Example**  
**Bird Beak Buffet Data Chart #1**  
**One food item at a time**



*Example*  
**Bird Beak Buffet Data Chart #2**  
*All three food items at once*



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