

### What is feeding ecology?

**Feeding Ecology:** The relationship between the environment, evolutionary processes, and the feeding behavior of different organisms.

- Beaks have different shapes and sizes for different functions.

Main classes of bird beaks/functions:

- **To crack nuts and seeds:** Strong, thick, cone-shaped beaks. Examples: cardinals and finches.
- **To primarily eat large fruits:** Large, strong beak. Example: toucans, which eat wild avocados and other large fruits.



- **To eat fish:** Long, skinny beaks for “spearing” the fish. Fish are fast and difficult to capture: a long beak gives these birds a better chance of catching their prey. Some have special adaptations, such as the pelican’s fish-scooping pouch under its beak. Other examples of fish-eaters: kingfishers and gulls.



- **To search through mud and water:** There are two main kinds of beaks for birds who filter their food from mud and water. Some of these birds have long, skinny, curved beaks (avocets, curlews), for dipping into mud sweeping through with more efficiency. Others have flat beaks for either sweeping through water (spoonbill), or for picking up mouthfuls of mud and straining out anything that isn’t food (ducks).



- **To eat insects:** These birds need small, sharp beaks for swiftly and deftly snaring an insect in their jaws. An exception is the woodpecker, which has a long, strong beak for hammering through bark to find the larvae it eats. Examples: woodpeckers, warblers, American robin.
- **To eat meat:** A beak with a hook is used to tear meat from the bones of prey. Examples: hawks, vultures, falcons.
- **To drink nectar:** A long, straw-like beak is used for reaching into flowers and sipping nectar. Example: hummingbirds.

Visit [http://fernbank.edu/Birding/bird\\_beaks.htm](http://fernbank.edu/Birding/bird_beaks.htm)

This site is a good visual guide to the concepts defined above.

## **Bird Evolution: How do birds adapt to different foods?**

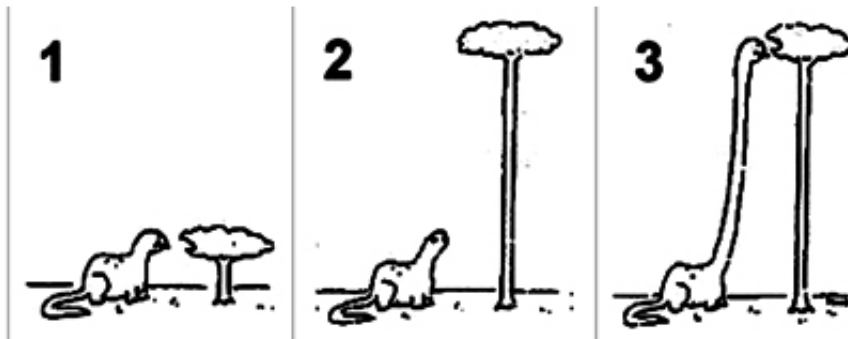
*Main Principles of Evolution:*

**Variation:** All life forms vary genetically within a population. It is this genetic variation upon which selection works.

**Inheritance:** Genetic traits are inherited from parents and passed on to offspring.

**Selection:** Organisms with traits that are favorable to their survival get to live and pass on their genes to the next generation.

**Time:** Evolution takes time. Evolution can happen in a few generations, but major change, such as speciation, often takes long periods of time.



### **Natural selection applied to bird beaks:**

1.) Birds that have the best beak for effectively partaking in a food source will survive better than birds with unsuitable beaks. The birds with beak suited for the most nutritious food source for that species will survive longer and produce the most offspring...

2.) These offspring will inherit the traits of their parents. For example, if a certain population of cardinals lives in an area with large nuts, the cardinals with the larger, stronger beaks will be more likely to survive, because they will be more equipped to eat the available food.

### Other Examples:

- Ant-eaters need a long snout to reach into holes and eat ants = longer snouts evolved over time, for easier access to food.
- Anhinga need a hook on the tip of their beaks to keep fish from getting away, since their beaks aren't strong enough to simply hold the slippery prey without a helpful hook. These beaks evolved over time to have a hook as the hold-fast.
- Carnivorous mammals have sharp teeth for ripping and eating meat, while herbivores don't need those sharp teeth for chewing plants, so they did not evolve them. The same is true for meat-eating birds, such as hawks, which have evolved a sharp hook on the tip of the beak in order to rip flesh from bone, similar to their mammalian carnivore counterparts.

*\*\*\*Feeding adaptations aren't just what is in or on the mouth, but also include adaptations such as evolving claws, fingers for grasping, stomachs suitable to the food being eaten, etc.*

### **Specialist vs. Generalist**

A *Specialist*, in terms of feeding, is a bird (or other animal) that is specially adapted to eat a certain food. An example of a specialist is a hummingbird, whose long, thin beak is excellent for reaching into flowers for nectar, but not very good for eating other foods.

A *Generalist* is a bird (or other animal) that can eat many different kinds of food, and whose beak isn't specially adapted for just one type of food. These birds can eat anything from insects to seeds to trash. Examples of generalists are the American Crow and the Common Grackle.



Hummingbird



American Crow

➤ Specialists are more at risk of dying due to habitat loss than are generalists. If flowers disappear from an area, the hummingbirds that drink the flowers' nectar will not survive. If a food source of a generalist disappears, the generalist will be able to survive by using another food source.

Visit <http://www.pbs.org/lifeofbirds/evolution/>

This site gives you solid, easily understood, yet detailed, information on bird evolution.

## Evolution Leads to Diversity

- *What other adaptations can you think of, particularly with birds?*
  - **Wings evolved for flight:** There are different shapes of wings for birds that fly for different reasons. *Examples:* Falcons are adapted so that their wings can fold back nicely when they are ready to dive onto their prey. Vultures have long, broad, wings that end in a point, which make it easy to glide without having to flap their wings as much.
    - Birds have different colors for camouflage and for males to be more attractive to females. Two kinds of birds may eat nuts and seeds but have completely different coloring.
  
- *Local examples of bird feeding adaptations:*
- **Northern cardinal, American Goldfinch, Sparrows:** Thick beak to break seeds.
- **Downy woodpecker, Hairy woodpecker, Yellow-bellied Sapsucker (also a woodpecker):** Long, strong beaks, and a strong skull, for hammering into tree bark and finding insects and larvae.
- **Black-capped chickadee, Tufted titmouse:** Small, sharp beak that is helpful for catching insects while flying.

## Implications and Home Applications

- During the winter birds have less food, since insects die and plants stop producing fruit. Feeding them foods with high-fat content, such as black oil sunflower seeds, will help them to survive and stay fat and warm during the winter months.

### **Seed Choices for Bird Feeders**

- Different seeds attract different kinds of birds.

1.) **Regular feeder with seeds, millet, and/or corn:** attracts most birds that eat seeds in the wild, along with sometimes attracting insect-eating birds.

2.) **Suet feeder:** Suet is a mixture of beef fat, seeds, and berries. Suet usually attracts insect-eating birds, such as woodpeckers, titmice, chickadees, and nuthatches.

**Suet >**



3.) **Nectar feeders:** Specially designed for hummingbirds to be attracted to an artificial setup that resembles flowers, and contains a mixture of sugar and water.

- Specific birds to expect in the Northeast in terms of feeder seeds and suet:

**Black oil sunflower:** Will attract most birds (common being: chickadees, nuthatches, finches, cardinals, grosbeaks, sparrows, blackbirds, jays, woodpeckers, and titmice).

**Safflower:** Nuthatches, finches, cardinals, grosbeaks, titmice.

**Corn:** Sparrows, blackbirds, jays, pigeons/doves.

**Millet:** Finches, sparrows, blackbirds, jays, pigeons/doves.

**Thistle:** finches.

**Suet:** Chickadees, nuthatches, jays, woodpeckers, titmice.

*Visit:* <http://www.birds.cornell.edu/pfw/AboutBirdsandFeeding/BirdFoods.htm>

This site is useful if you and your students are really interested in setting up a feeder. The Cornell Laboratory of Ornithology has a lot of useful information on local birds and preferred diets of local birds in both the eastern and western U.S.A.

*And* <http://www.birds.cornell.edu/pfw/>

Project FeederWatch is a great start if you want to get involved with citizen science while watching your feeder. The project has contributors from all over the U.S.A., and records the birds seen at people's feeders nationwide throughout the winter.

*And* <http://www.wbu.com/education/winterbirdfeeding.html>

This is yet another source on how you can help birds by feeding them and providing cover and water during the winter.