

DATA *Nugget*

Is chocolate for the birds?

Featured scientist: Skye Greenler from Colorado College

Research Background:

About 9,000 years ago humans invented agriculture as a way to grow enough food for people to eat. Today, agriculture happens all over the globe and takes up 40% of Earth's land surface. To make space for our food, humans must clear large areas of land, creating a **disturbance**, or drastic change, to the habitat. This disturbance removes the native plants already there, including trees, small flowering plants, and grasses. Many types of animals including mammals, birds, and insects need these native plants for food or shelter and will now find it difficult to live in the area. For example, a woodpecker bird cannot live somewhere that has no trees because they live and find their food in the trees.

However, some agriculture might help some animals because they can use the crops being grown for the food and shelter they need to survive. One example is the cacao tree, which grows in the rainforests of South America. Humans use the seeds of this plant to make chocolate, so it is a very important crop! Cacao trees need very little light. They grow best in a unique habitat called the forest understory, which is composed of the shorter trees and bushes under the large trees found in rainforests. To get a lot of cacao seeds for chocolate, farmers need to have large rainforest trees above their cacao trees for shade. In many ways, cacao farms resemble a native rainforest. Many native plant species grow there and there are still taller tree species. However, these farms are different in important ways from a native rainforest. For example, there are



Skye out in the field counting birds along one of her four transects.

Name _____

many more short understory trees in the farm than there are in native rainforests. Also, there are fewer small flowering plants on the ground because humans that work on cacao farms trample them as they walk around the farm.

Skye is a biologist who wanted to know whether rainforest birds use the forest when they are disturbed by adding cacao farms. Skye predicted she would see many fewer birds in the cacao farms, compared to the rainforest. To measure bird **abundance**, she simply counted birds in each habitat. To do this she chose one rainforest and one cacao farm and set up two transects in each. Transects are parallel lines along which the measurements are taken. She spent four days counting birds along each transect, for a total of eight days in each habitat. She had to get up really early and count birds between 6:00 and 9:00 in the morning because that's when they are most active.

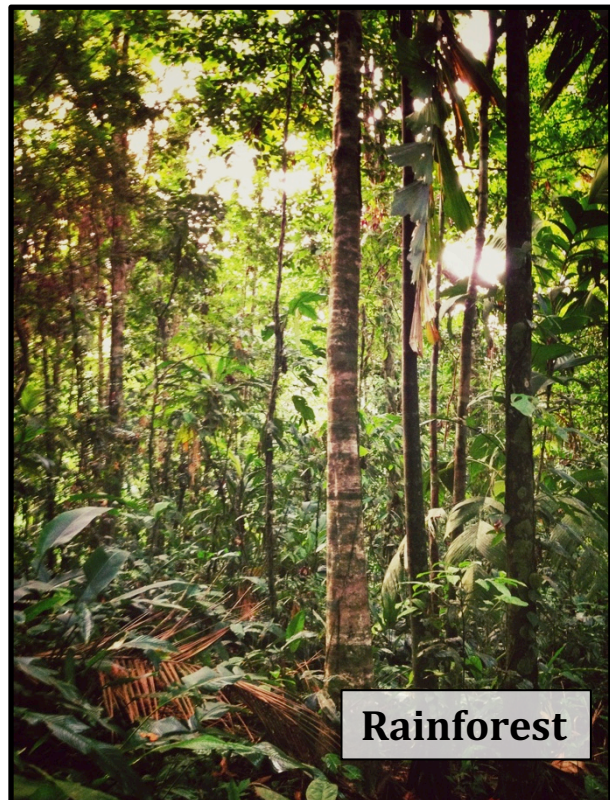
Scientific Question 1: What is the effect of cacao farms on bird abundance?

Scientific Data 1:

Use the data from Table 1 to answer scientific question 1:

Table 1: Bird Observation Data

| | Total Bird Count |
|------------|------------------|
| Cacao | 106 |
| Rainforest | 116 |



The image on the left shows a typical cacao farm with some taller trees remaining to provide shade for the cacao. The image on the right shows an undisturbed rainforest. In the rainforest, all the taller trees and small flowering plants remain.

What data will you use to answer question 1?

Independent variable: _____

Dependent variable: _____

Interpret the data:

Make a claim that answers scientific question 1 – What is the effect of cacao farms on bird abundance?

What evidence was used to write your claim? Reference specific parts of the table or graph.

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about how agriculture may act as a disturbance.

Skye's next steps: Skye was shocked to see so many birds in cacao farms! She decided to take a closer look at her data. Skye wanted to know how the types of birds she saw in the cacao farms compared to the types of birds she saw in the rainforest. She predicted that cacao farms would have different types of birds than the undisturbed rainforest. She thought the bird types would differ because each habitat has different types of food available for birds to eat and different types of plants for birds to live in.

Skye broke her abundance data down to look more closely at four groupings of birds:

1. Toucans (Eat: large insects and fruit from large trees, Live: holes in large trees)
2. Hummingbirds (Eat: nectar from flowers, Live: tree branches and leaves)
3. Wrens (Eat: small insects, Live: small shrubs on the forest floor)
4. Flycatchers (Eat: small insects, Live: tree branches and leaves)

Scientific Question 2: What is the effect of cacao farms on the abundance of different bird types?

What is the hypothesis? Find the hypothesis in *Skye's next steps* (above) and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation.

Scientific Data 2:

Use the data from Table 2 to answer scientific question 2:

Table 2. Bird Observation Data by Bird Type

| Date | Habitat | Toucans | Hummingbirds | Wrens | Flycatchers |
|---------|------------|---------|--------------|-------|-------------|
| 3/16/13 | Cacao | 0 | 0 | 0 | 11 |
| 3/22/13 | Cacao | 1 | 2 | 0 | 7 |
| 3/25/13 | Cacao | 0 | 3 | 0 | 10 |
| 4/4/13 | Cacao | 0 | 7 | 1 | 5 |
| 4/8/13 | Cacao | 0 | 7 | 0 | 9 |
| 4/12/13 | Cacao | 0 | 6 | 0 | 9 |
| 4/18/13 | Cacao | 0 | 6 | 0 | 6 |
| 4/25/13 | Cacao | 0 | 7 | 2 | 7 |
| 3/14/13 | Rainforest | 1 | 3 | 2 | 2 |
| 3/14/13 | Rainforest | 2 | 4 | 10 | 8 |
| 3/21/13 | Rainforest | 2 | 2 | 9 | 3 |
| 3/26/13 | Rainforest | 2 | 4 | 7 | 4 |
| 4/6/13 | Rainforest | 2 | 1 | 8 | 3 |
| 4/9/13 | Rainforest | 2 | 3 | 8 | 6 |
| 4/20/13 | Rainforest | 3 | 2 | 8 | 5 |
| 4/22/13 | Rainforest | 0 | 0 | 0 | 0 |

| Total Count (abundance) | Toucans | Hummingbirds | Wrens | Flycatchers |
|-------------------------|---------|--------------|-------|-------------|
| Cacao | | | | |
| Rainforest | | | | |

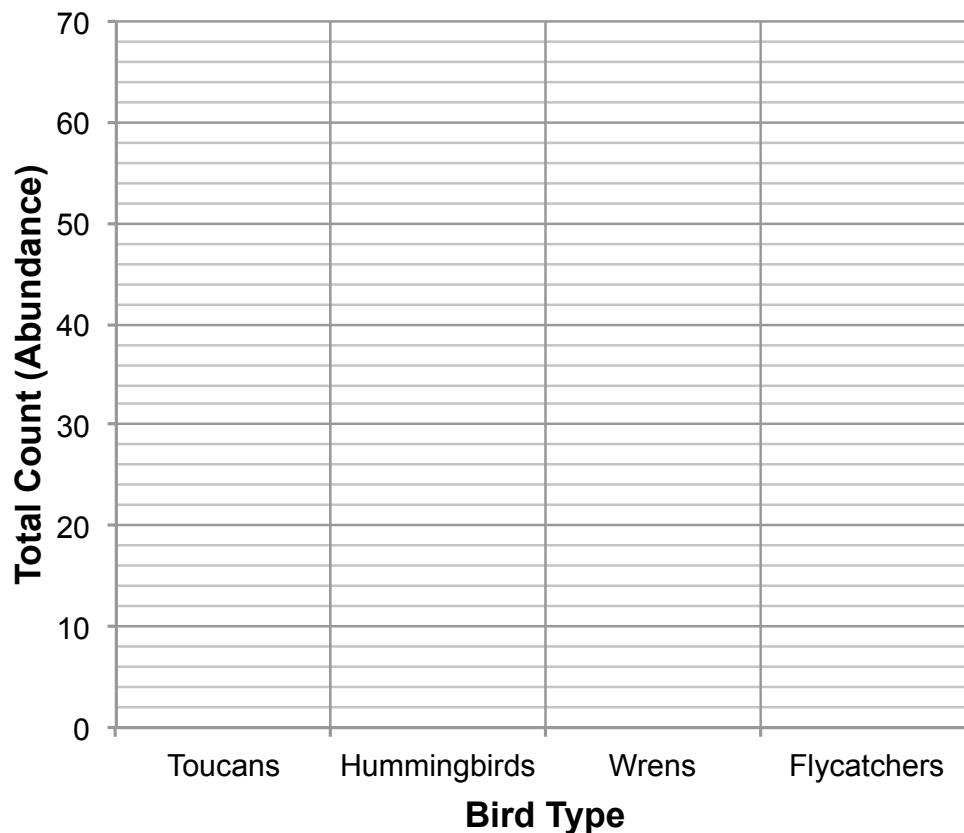
Name _____

What data will you graph to answer question 2?

Independent variable: _____

Dependent variable: _____

Draw your graph below: Identify any changes, trends, or differences you see in your graph. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.



Interpret the data:

Make a claim that answers scientific question 2 – What is the effect of cacao farms on the abundance of different bird types?

Name_____

What evidence was used to write your claim? Reference specific parts of the table or graph.

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about diet and living preferences of the different types of birds.

Did the data support Skye's hypothesis? Use evidence to explain why or why not. If you feel the data were inconclusive, explain why.

Your next steps as a scientist: Science is an ongoing process. What new question(s) should be investigated to build on Skye's research? What future data should be collected to answer your question(s)?