Kindergarten
Cachalú Biological Reserve, Colombia

Lesson 3: Biodiversity

Concept
Rainforests are comprised of an extraordinary diversity of plants and animals. Diversity of life is an essential ingredient to healthy ecosystems.

Essential Question
Which forest, a tropical rainforest or temperate forest, is more diverse and by how much more?

Total Time
120+ minutes

Standards
Life Sciences Standard 6
Understands relationships among organisms and their physical environment.
Level I (K - 2)
Knows that living things are found almost everywhere in the world and that distinct environments support the life of different types of plants and animals.

Thinking and Reasoning Standard 3
Effectively uses mental processes that are based on identifying similarities and differences.
Level I (K - 2)
Classifies objects by size, color, or other significant characteristics.
Describes and compares things in terms of number, shape, texture, size, weight, color, motion, sound, and behavior.

Objectives
1. Students will identify and group different types of insects and trees in their local forest.
2. Students will create visual representations of plants and animals of temperate and tropical rainforests in order to illustrate the relative differences in diversity.
3. Students will explain to classroom guests how the diversity of life in a temperate forest compares to the diversity of life in a rainforest.

Additional Resources

- **Resource Index** – Check out this page at http://www.rainforest-alliance.org/programs/education/teachers/curriculum/resources/index.html for additional supplemental materials that complement these dynamic units and to access many of the resources listed below.

- **Slideshow** – The Learning Site provides a slideshow and script about the Cachalú reserve in Colombia that includes background information about the animals, people and landscape of this region. The slideshow can be downloaded for viewing in the classroom, printed out and read as a story, or viewed online with the students.

- **Unit-Specific Story -** The Rainforest Alliance has developed two original stories for use with these units, available in English, Spanish and Portuguese. The stories are available to download and print or can be viewed on-screen.

  Chayo's Andean Home
  Clara and the Armadillo

- **Species Profiles** – The species profiles, available to view on screen or download from the beginning of the unit or the Resource Index, include photos, habitat, foraging behavior, group relationships, threats and many more facts.

  – Andean Condor
  – Cock-of-the-Rock
  – Leaf-Cutter Ant
  – Nine-Banded Armadillo
  – Red-Eyed Tree Frog
  – Spectacled Bear
  – Praying Mantid

- **Rainforest Products** – Visit http://www.rainforest-alliance.org/resources/forest-facts/lives.html for a summary of products that we use in our everyday lives that originate in rainforests. Both teachers and students will find information on the products found in their homes and supermarkets that either originated in tropical forests or are currently produced there.

- **Conservation Coffee Summary** – Download this summary, which includes the environmental, social and cultural impact that coffee has had on the Americas, the connection between coffee farms and wildlife and a glossary of relevant terms.

- **Ranger Rick Article -** Download "*Rick and the Gang Find Out Why Some Coffee is Bad for Birds,"* a colorful article from the National Wildlife Federation's *Ranger Rick* magazine which describes the impact some coffee harvesting techniques have on bird habitat.

- **Profiles in Sustainability** – Visit http://www.rainforest-alliance.org/programs/profiles/index.html for case studies on companies who work closely with the Rainforest Alliance to ensure that their practices protect wildlife, workers and communities.

- **Fundación Natura (Nature Foundation)** - Check out these online resources for more information about the Rainforest Alliance's partner group in Colombia:
  www.rainforest-alliance.org/programs/aar/colombia.html
  www.natura.org.co

- **Certificate of Accomplishment** – Print out colorful rainforest certificates for your students to commemorate their completion of these units.

Informational Introduction for the Teacher
This lesson challenges students to examine the diversity of their own forest and make comparisons to a tropical rainforest. By exploring and grouping tree and insect types in their local forest, students will develop an understanding of diversity. This data will be compared to what is known about tropical rainforests, helping students to appreciate the tremendous amount of life in the tropics.

Step 1 - CONNECT (The Concept to Prior Knowledge) 45 minutes

Challenge
Students predict how many different types of insects and trees they will be able to find in a small area of a local forest and a tropical rainforest. Students collect data in their local forest and compare their findings with their original predictions. They then compare their findings with what others know about tropical rainforests.

Materials (per class)
-Colorful ribbons to mark perimeter of study area

Materials (per 2 students)
-Plastic containers for capturing insects for observation
-Nets for collecting insects
-Two copies of Chart 1- Local Forest: Tree and Insect Diversity
-Two copies of Chart 2- Tropical Rainforest: Tree and Insect Diversity

Procedure
1. Read aloud the introduction for students, above.

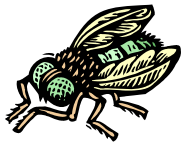
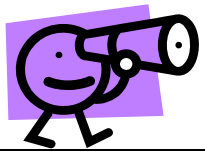
2. Ask students to predict how many different kinds of insects and trees live in a 40' x 40' area of their local forest (compare the area to the size of your classroom). Help the class realize that counting different types of insects and trees is different from counting the total number of insects and trees. Explain that although your classroom is filled with a diversity of children -- that is, children of different ages, sizes, colors, parents, etc…- they all are considered one type of animal called *Homo sapiens*. Have students write down their name and prediction on a piece of scrap paper and give to you.

3. Show students a large picture of a spider and an insect (of your choice). Ask students which one of these two animals is not an insect. Describe that insects must have 6 legs and 3 distinct body parts. Ask students to say aloud how they will know if they've discovered an insect in their area.

4. Show students a pile of woody and herbaceous (herb-like or non-woody) branches/twigs. Ask for volunteers to sort the twigs into two piles; one that they think came from trees and the other they think came from other plants. Elicit their ideas for telling the difference between a plant and a tree. Demonstrate the correct sorting (trees have woody branches and stems whereas non-tree plants have fleshy-like branches and stems).

5. Ask students to write down the number of different types of insects and trees they think they will find using Chart 1. Tell students they will compare their predictions to what they actually find.

Chart 1 - Local Forest: Tree and Insect Diversity

CHART 1	Trees  # of types	Insects  # of types
Guessed 	(Student indicates prediction here.)	
Found 		
Actual 		

6. Find a natural forested area to explore with your class and mark with colorful ribbons a 40’ x 40’ area that is representative of the larger forest.

7. Have students work in pairs and count the number of different trees and insects they find within the marked area. Ask students to share their ideas for how they plan to avoid counting the same item two or more times.

8. Tell students that insects may be found in the air, on trees and plants and on the ground.

9. Tell students they have 15 minutes to find as many different types of insects in the area. They should write this number next to their insect prediction number and circle it.

10. Tell students they have 15 minutes to find as many different types of trees in the marked area. They should write this number next to their tree prediction number and circle it.

11. Ask a team of students to show the entire class all the different trees they found in the area. Asks another pair if they agree with the first team's count: Did they repeat any? Did they miss any?

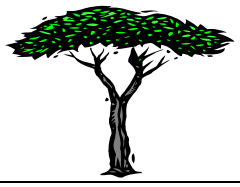
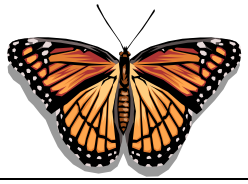
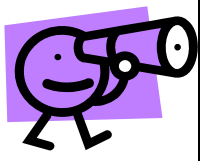
12. After returning to the classroom, ask students to record their findings in the "Found" row under the insects and trees headings in their chart.

13. Help students figure out the differences between their predictions and what they observed.

14. Ask, "Why might our number of different types of insects found not really show the actual number of insects that live in your type of forest?"

15. Ask students to imagine how many different types of trees and insects they think could be found in the same size area of a tropical rainforest. Tell students to write their predictions in Chart 2.

Chart 2 - Tropical Rainforest: Tree and Insect Diversity

CHART 2	Rainforest Tree 	Rainforest Insect 
Guess 	(Student indicates prediction here.)	
Found 		
Actual 		

16. After students have made their predictions, reveal the actual figures for a typical 40' x 40' plot of tropical rainforest.

Tropical rainforest trees:	50*
Tropical rainforest insects:	312**

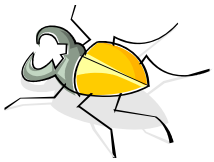
*Rainforest areas typically have 10 times more tree species than temperate forest patches of the same size. If students found 5 types of trees in their local forest, the corresponding rainforest figure is 50.

**One hectare of rainforest may contain up to 42,000 species of insects. This equates to 17,004 species in one acre. Scaling down further, a 40' x 40' area contains 1,600 square feet of space- approximately 4% of an acre. This equates to 312 insects.

Source: Sayer, April Pulley. *Tropical Rainforest*, Twenty-First Century Books, New York

17. Ask students to copy the "actual" numbers into Chart 3 so it looks like this:

Chart 3 - Local and Tropical Rainforest: Tree and Insect Diversity

CHART 3	**Trees**  **# of types**	**Insects**  **# of types**
Rainforest Actual 	**50**	**312**
Temperate Forest Actual 	**5**	**?**

18. Tell students that they will use their charts later in their unit.

Step 2 - LITERATURE/DISCUSS (Give Expert Information Book; Ask Questions)

15 minutes

Challenge
Students are read a book about tropical rainforests and learn that there are an impressive number of different types of plants and animals that live in the rainforest.

Materials
-The book **A Walk in the Rainforest** by Kristin Joy Pratt

Procedure
1. While reading **A Walk in the Rainforest**, * ask questions such as:
    a. How many different types of animals and plants do you see in each picture?
    b. How is the diversity of the tropical rainforest different from the diversity in our forest?
    c. Why do you think tropical rainforests are more diverse than temperate forests?
    d. How can so many different types of animals and plants live in the rainforest at the same time?

Nb. *The introduction to **A Walk in the Rainforest** provides a good summary of the concept of biodiversity and describes how much diversity exists in rainforests. The following descriptions may also be helpful in expressing how diverse rainforest are:

"The rainforest is an ideal place for many types of animals to live. There is plenty of water, shelter and food, and it is warm all year. These conditions mostly benefit the insects, which can grow and reproduce the year round, unlike the annual cycle in colder climates. Some insects grow very large. "Walking sticks" reach lengths of over 12". Beetles can be as large as your hand and some moths are the size of small birds. But the really amazing thing about them is their variety. One tree in the Amazon can house 200 different types of insects; not 200 insects but 200 different types! Scientists believe many insects that live in the rainforest have yet to be named and catalogued." (Source: http://www.tropical-forests.com/)

Step 3A - PRACTICE (Math and Learning Centers) **20 minutes**

Challenge
Students create simple bar graphs to illustrate the relative diversity of trees and insects between their local forest and a tropical rainforest.

Materials (per 2 students)
-Large butcher paper for graph
-Chart 3 from Step 1
-Scotch tape
-Approximately 60, 1" x 1" square pieces of paper
-Colored markers, crayons, etc. for coloring pictures

Procedure

1. Post a large representation of Chart #3 used in Step 1 with the appropriate data.

2. Ask the following questions:
    a. What do you notice about the difference between the number of insects/trees found in a tropical rainforest and a temperate forest?
    b. How many more types of insects are found in the tropical rainforest than in a temperate forest?
    c. How many more types of trees are found in the tropical rainforest than in a temperate forest?

3. Tell students that they are going to make a picture that will show a comparison between the number of different types of trees "actually" found by experts in a typical 40' x 40' area of their local forest and a tropical rainforest.

4. Give each pair of students a large piece of butcher paper. Ask them to copy your illustration of a large graph onto their paper. Tell them to make a quick sketch of a tree with a "#" next to it to indicate number of tree types. Ask them to put a "Te" and a "TR" along the horizontal axis and explain that the "Te" stands for a temperate forest and the "TR" stands for tropical rainforest.

5. Ask students to look at Chart 3 and tell you the actual number of different types of trees experts indicate are found in a 40' x 40' area of a temperate forest and tropical rainforest. Determine the average number of trees found and work with that for the rest of this activity.

6. Give pairs of students the materials listed above. Tell students that each 1" square piece of paper represents a different type of tree. Their goal is to tape, end to end on their graphs, the number of different types of trees found in the temperate forest and tropical rainforest. Start by taping one tree on the horizontal axis, and add each tree type vertically.

7. When all of the 1" squares are taped, to their graphs, ask students:
    a. What does the graph tell you?
    b. What other comparisons would you like to make between the diversity of temperate and tropical rainforests?

Step 3B - CREATE (Performance Tasks Related to Standard Indicators)

30+ minutes

Challenge

Students use real data to create 2- and 3-dimensional visual representations to illustrate the comparative diversity of different kinds of life in a temperate and tropical rainforest.

Materials (per student)

-Data on plant and animal diversity
-Art supplies

Procedure

1. Tell students that their challenge is to create a new way to illustrate the difference in diversity between the number of ants, birds, fish and/or trees in a tropical rainforest and a temperate forest.

2. Tell students they may choose a plant or animal from the list below and create a picture, terrarium or model to illustrate how many different types of plants/animals there are in each forest. For example, a student may draw a picture of two forests, one of a temperate forest containing 10 different types of trees, and one of a tropical rainforest containing 100 different types of trees (i.e., different color, shape, size, pattern, etc.). Other ideas include collections of origami birds, or constructed models of the plants and animals. Use the data chart below to guide their comparisons.

	Area	**Temperate Forest**	**Tropical Rainforest**
Ants	One tree	4 types	43 types
Birds	40'x40' area	10 types	50 types
Fish	Small river	10 types	80 types
Trees	40'x40' area	10 types	100 types

3. Help students figure out what types of supplies they can use to represent the different types of plants or animals in their comparisons.

Step 4 – PRESENT (Edit Work/Students Orally Present Projects)

20+ minutes

Challenge
Students display their projects to older students and family members and explain what they know about the biodiversity of the two types of forest.

Materials
-Exhibits created in Step 3b

Procedure
1. Designate a space for each student in the class to set up his/her project.

2. Tell students that they will be expected to explain several aspects of their project:
   a. Which part of the project represents the temperate forest and which represents the tropical rainforest?
   b. Which type of forest contains a greater diversity of life?
   c. If diversity in this project doesn't mean different sizes of the same animal, then what does diversity mean?

3. Invite members of the school and family community to view the exhibitions.

LESSON 3 ASSESSMENT RUBRIC:
Teacher observations of tasks with rubrics as listed below, as well as collected work samples.

Assessment Guidelines	3 = P (Proficient)	2 = S (Satisfactory)	1 = NW (Needs Work)
1. Student works well with partner to collect data on diversity of insects and trees in their local forest. Student is thorough in exploring, and works hard at sorting trees and insects into different groups.			
2. Student explains how initial predictions compared to actual data. Student can determine from data which forest has more diversity of trees and insects.			
3. Student accurately represents the provided data in 2D or 3D form. The project includes both rainforest and temperate forest representations. Student uses creativity to compare the chosen plant/animal.			
4. Student is able to explain how the representation illustrates the difference in diversity between the two forests. Student is able to explain which forest sustains a more diverse population of the chosen plants/animals and by how much.			