

## Bio/Diversity Project Species Diversity

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Grade Level: 7<sup>th</sup> grade – 8<sup>th</sup> grade

<b>AZ Science Standard:</b>	<p><i>Strand 1, Concept 4: Communicate results of investigations.</i></p> <ul style="list-style-type: none"> <li>• <i>PO 1. Choose an appropriate graphic representation for collected data:</i> <ul style="list-style-type: none"> <li>○ <i>line graph</i></li> <li>○ <i>double bar graph</i></li> <li>○ <i>stem and leaf plot</i></li> <li>○ <i>histogram</i></li> </ul> </li> <li>• <i>PO 2. Display data collected from a controlled investigation.</i></li> <li>• <i>PO 3. Communicate the results of an investigation with appropriate use of qualitative and quantitative information.</i></li> </ul>
<b>Content Objective:</b> Science	<ul style="list-style-type: none"> <li>• <i>Students will be able to define species diversity as a part of biodiversity.</i></li> <li>• <i>Students will be able to determine species richness and species abundance.</i></li> </ul>

Vocabulary	Materials
<ul style="list-style-type: none"> <li>• Classification</li> <li>• Species</li> <li>• Species abundance</li> <li>• Species diversity</li> <li>• Species richness</li> </ul>	<ul style="list-style-type: none"> <li>• Video shown on SMART Board along with laptop and internet connection</li> <li>• Desert picture</li> <li>• Simple sample drawings of plants and human</li> <li>• Paper and pencils</li> <li>• Timer with second hand like a watch or clock</li> </ul> <p style="text-align: center;"><i>See the Species Accumulation Curve Math Activity for additional directions, species cards, and species counts</i></p>
<p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"> <li>• Why do we count species?</li> <li>• What do we call the number of different species in a sample? (Species richness)</li> <li>• What do we call the number of individuals of the same species within a sample? (Species abundance)</li> <li>• What do we call the relative number of individuals of different species within a sample? (Species evenness)</li> </ul>	

**Engagement/Introductory Activity:**

- “Scientist of the Day” video (optional): Discuss how citizen scientists such as Billy Barr can be instrumental in collecting and monitoring data and in the progression of scientific thinking. Talk about how his research in Colorado is extremely important for Arizonans due to our use of the Colorado River water for drinking water and municipal water. National Geographic video: <http://video.nationalgeographic.com/video/short-film-showcase/he-spent-40-years-alone-in-the-woods-and-now-scientists-love-him>
- Go over the objective for the day, tie species diversity into discussions of biodiversity from previous lessons.

**Exploratory Activity:**

1. Have students write down the names of as many species as they can think of that live in the desert in 60 seconds.
  - Ask students to write their names on the top of their papers.
  - Have students write down all of the organisms they can think of that live in the Sonoran Desert in 60 seconds.
  - Students will share what they wrote down with the class (Was it mostly animals? Did anyone write down the saguaro?)
  - What is the name of our desert? (Show placement of Sonora, Mexico on classroom map)
  - Have a discussion to remind students what the definition of a species is.
  
2. Hand students a desert photo that is dominated by plants and ask them to determine the number of different species in the photo – define this as species richness. Then have students count the number of individuals of the same species in the photo – define this as species abundance.
  - Give students two minutes to write down the names of the six main species closest to the camera in the desert picture: Saguaros, ocotillo, Palo Verde, barrel cactus, cholla, and a human (mammal and animal)
  - Define the total number of species recognized in this “sample” as species richness
  - Instruct students to count and record the number of individuals of each of the species – something like 4 saguaros, 3 ocotillo, 2 Palo Verdes, 1 barrel cactus, 1 cholla, and 1 human
  - Define the numbers of individuals of each species as the species abundance.
  - Define species diversity as species richness (number of species) and species abundance (number of individuals of each species)

Discuss with students that species diversity is variable. Species can migrate – species richness may increase in the spring and fall when migrant species like bats and birds fly north (spring) or south (fall). Species richness can also vary because some species hibernate or otherwise stay hidden in burrows – some species like Gila monsters, spadefoot toads, desert tortoises, even rattlesnakes will not be active during the coldest or driest times of the year.

Species abundance can also be variable. Some species, both plants and animals, will not flower or reproduce during drought years, lowering the abundance that can be counted.

3. Students will complete the “Species Accumulation Curve Math Activity” activity. Students will be split into five groups. Each group will receive a set of species cards and a worksheet (data sheet). The worksheets include some background information, detailed step-wise instructions, a table to record data and a blank graph to make a species accumulation curve.

**Tips:**

- You may want to assign each student in a group to a certain role (recorder, dealer, etc.).
- Go through a trial run with the whole class first.

**Activity:**

- Students will shuffle the species cards and randomly select 10 cards (without looking!)
- Read the cards and, in the first column, record the number of individuals of species: for example 2 peccary, 1 desert cottontail, 1 gray fox, etc.
- At the bottom of the column, tally the total number of species for that sample
- Then, record the cumulative species count – which after the first sample, will be the same as the total species for the sample
- Then, return the cards to the deck, re-shuffle, and deal out 10 more cards
- Fill out the data sheet for Sample #2 as was done for Sample #1
- **Important!** To calculate the cumulative species count in Sample #2, add the total of new species in Sample #2 to the number of species in Sample #1
- Finally, fill out the graph of cumulative species per sample period using a line graph



Discuss why the cumulative species curve levels off as more samples are taken (because you are reaching the total number of species in the sampling area) and how scientists use this method to take species diversity counts in a given area.

Collect student papers (with names on top) with their lists of desert species and their species richness and species abundance numbers, and collect the Species Accumulation Curve Math Activity data sheet with the completed line graph.

**Explain/Evaluation Activity:**

- Why is species diversity important?
- What are some factors that affect species richness? (Hibernation)
- What are some factors that affect species abundance? (Climate change)
- What is one difference between species richness and species abundance?