

Recording the Rainforest Part 1: The Sounds of Borneo Story Map Student Handout

Directions:

Go to The Sounds of Borneo Story Map at <http://arcg.is/2gBeUJk>. The following questions can be answered using information located in the Story Map text as well as through various hyperlinks located in the Story Map, which appear as blue text. The questions below follow the Story Map in chronological order.

1. Listen to a few minutes of the first and second movements of the rainforest symphony. Compare and contrast the soundscape you hear in each. How are they similar? How are they different? Speculate why they are different.
2. How old is the Bornean rainforest?
3. Explore the IUCN website (<http://www.iucnredlist.org/>) to discover the status of the Bornean orangutan, proboscis monkey, Sumatran elephant (listed as a subspecies of Asian elephant), and Sunda clouded leopard and list below.
4. Define and give examples of ecosystem services.
5. Describe how trees sequester carbon.
6. List 3 types of medicines that have come from rainforest plants.
7. Describe at least two local and/or global ecosystem services provided by rainforests.

8. Using the swipe map, describe how Borneo’s forest cover has changed over time.

9. Using the legend to the left of the map, note some of the main land cover types that have replaced intact or old-growth forest in the period from 1973 to 2015.

10. The legend contains a category called “non-forest”. What do you think might exist in these areas? You can consult more maps at <http://bit.ly/2khlqud> to enhance your answer.

11. Describe the impacts of ecosystem threats like mining, acacia and oil palm plantations, and logging on Borneo’s landscape.

12. List three products you use that contain palm oil.

13. Describe some of the ways to measure biodiversity. What are the benefits and limitations of each?

14. Describe the difference between alpha and beta-diversity.

15. Why is knowing the beta-diversity of a landscape critical to the development of conservation strategies and land management plans?

16. Measuring and protecting biodiversity might be one goal in a land management strategy. What are other things that must be considered when deciding how to manage land?

17. Use the online tone generator (<http://onlinetonegenerator.com/hearingtest.html>) to determine the highest frequency you can hear and record it here.

18. Audio recordings in a rainforest can capture a variety of organisms, but what are some of the organisms they can't capture and how could you account for them in a study of biodiversity?

19. Describe the acoustic niche hypothesis.

20. How have animals evolved in response to competition for space in the soundscape?

21. What happens to soundscape saturation when a habitat is disturbed?

22. Describe the three types of sounds in an environment.

23. List all of the animals you can think of in the rainforest environment that can vocalize or produce sounds.
24. Can you hear anthrophony, geophony, and biophony in the sound clip? Describe the sounds you heard and categorize them.
25. Answer the following questions about the spectrogram example shown in the Story Map (and below):

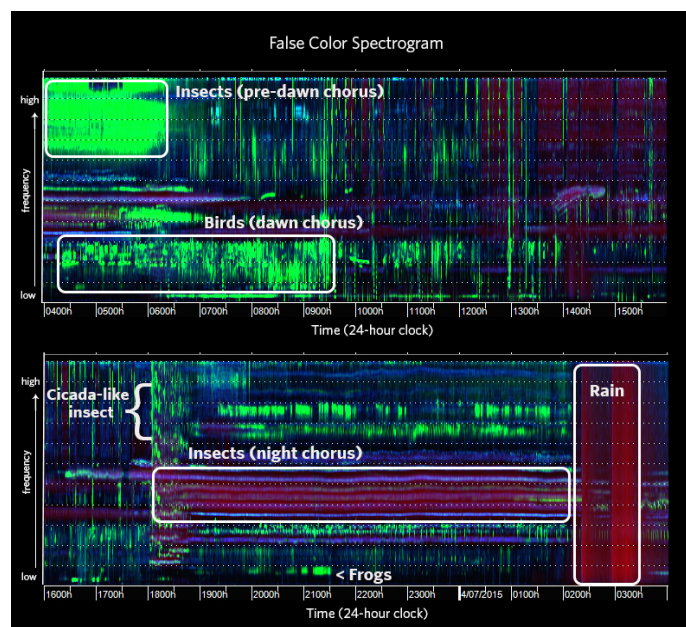


Image credit: Michael Towsey and Anthony Truskinger, Queensland University of Technology

- What time of day appears to be the loudest and with most frequencies filled with sound?
- What type of geophony is depicted in this spectrogram and what time did it occur?
- Using frequency information from the spectrogram, describe how the sounds of the rainstorm differ from those of the animals.

26. Listen again to a few minutes of the first and second movements of the rainforest symphony. Based on what you've learned by looking at a false-color spectrogram of rainforest sounds, when do you think they were recorded?

27. How can acoustic data inform land management decisions?

28. Conduct an Internet search to find one example of another use of acoustic technology in conservation and describe it briefly.

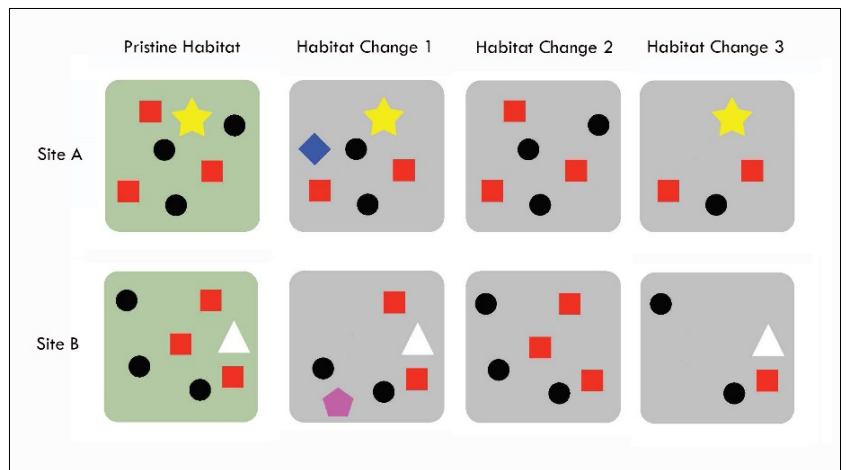
Homework Questions:

29. Imagine you want to do an acoustic survey of your own. What would you record? How could you capture the sounds of your life in order to compare them? What might you want to investigate? How might you compare and contrast the differences between locations?

30. If you recorded the sounds of your school for 24-hours (e.g. the gym, cafeteria, library, etc.), what might you learn about the inhabitants? What sounds do you think you would hear? Is there a dawn chorus? A night chorus? What are the noisiest and quietest times of day? Is there anything unexpected you might hear?

A conservation organization was working with a community to determine how different habitat changes affected the alpha and beta-diversity at two different locations—sites A and B.

Refer to the images to the right to answer questions 31-36. In these images, different shapes represent species. The number of shapes corresponds to the number of a particular species. For example, there are three species living in the pristine version of site A (red square, black circle, and yellow star). The red square and black circle are more abundant, numbering three individuals each, while there is only one yellow star. The red square and black circle are more abundant, numbering three individuals each, while there is only one yellow star.



Remember that alpha-diversity (α) is a count of the number of species in an area and beta-diversity (β) is a measure of how different the species are between the two locations. If the two sites have the same species, then beta diversity is low, if the two sites have very different species then beta diversity is high.

31. Describe what happens to the alpha-diversity (α) of sites A and B for habitat changes 1, 2, and 3? (Hint: does it increase or decrease?)
32. How does the beta-diversity (β) **between sites A and B** change when habitat changes 1, 2, and 3 are implemented? (Hint: does it increase or decrease?)
33. In which of the habitat changes are individuals lost, resulting in smaller populations, but the overall species richness remains the same compared to the pristine habitat?
34. Is an increase in alpha-diversity always a good thing? Can you imagine a scenario in which increased alpha-diversity is not a desirable change?
35. In which habitat change scenario is there a possibility that the increase in alpha-diversity is not a positive change?
36. Let's assume that the habitat changes pictured are due to different selective logging strategies in a forest. **If the conservation organization's goal is to find the land management strategy that best preserves biodiversity across the two sites, which of the habitat changes in this scenario best meets that goal?** In this example, all of the shapes represent native species, except the blue diamond and the purple pentagon, which are invasive species.