What's Included?

Unit Planning

- NGSS and APES Standards document
- Unit Pacing Guide for 50 min classes
- Differentiation ideas for honors students and virtual students ***Digital links for virtual learning found here**
- Honors assignment list

Notes

- Unit 3 PowerPoint (19 slides)
  - Biomes
  - Ecological Succession
  - Biodiversity
- Cornell Notes Pages (3 pgs)
- Doodle Notes Pages (3 pgs)
  - Guide to Using Doodle notes
  - Doodle Notes Keys & Examples
- Web-quests (6 pgs) (Can be used as an alternative to notes)

Activities

- Biome Travel Brochure Research Activity (3 pgs)
- Biome Food Web Poster Project (26 pgs)
- Geocaching Lab (6 pgs)
- Plant Transect Biodiversity Lab (3 pgs)
- Lionfish Invasive Species Panel Discussion (4 pgs)
- Answer Keys for all activities

Student Pages

- This folder contains duplicate copies of every student page. They are in order according to the pacing guide for QUICK PHOTOCOPYING if you are using the pacing guide as is.

Extensions

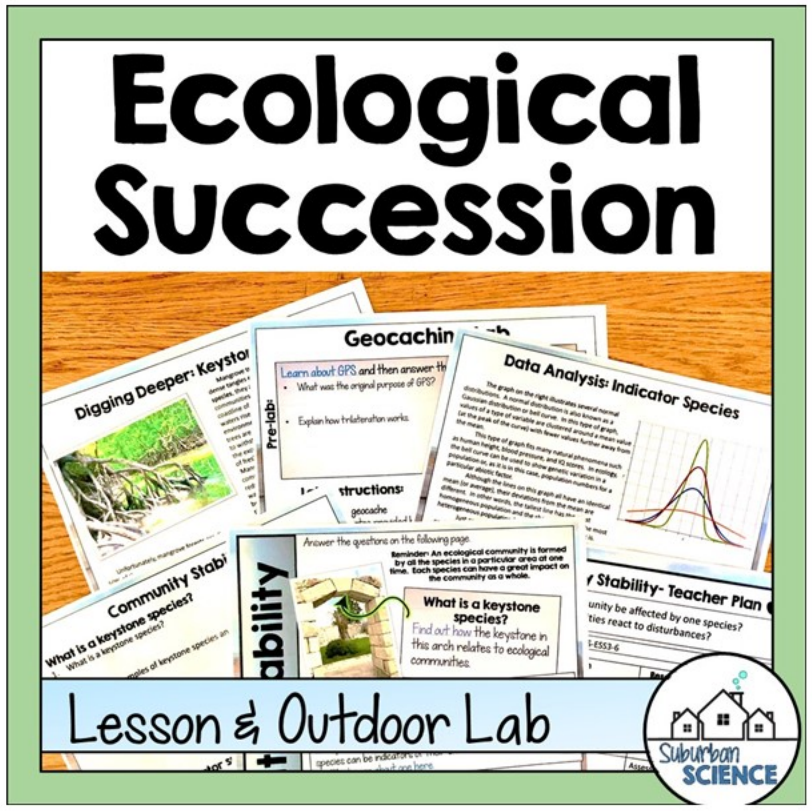
- Data Analysis: Climatograms
- Digging Deeper: Vegetation & Climate
- Digging Deeper: Keystone Species Project
- Data Analysis: Indicator Species*
- Data Analysis: Biodiversity Indices*
- Digging Deeper: Invasive Species Research

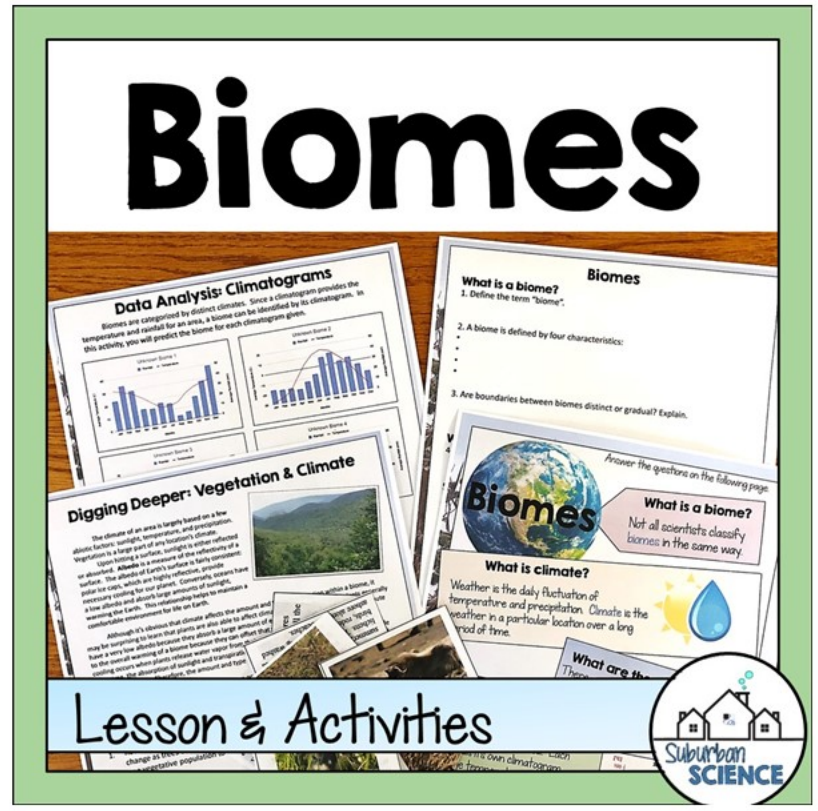
*Honors Options

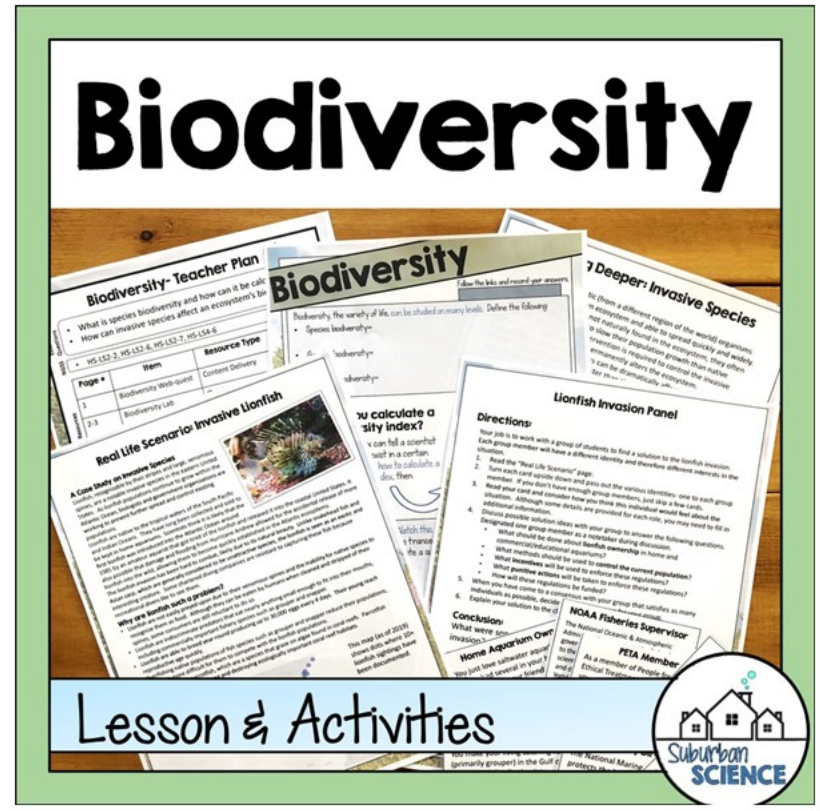
Review and Assessment

- Biomes & Succession Online Quiz through Google Forms
- Editable Task Card Review (32 cards) with answer sheet
- Biomes, Succession & Biodiversity Test (paper)- both Honors and Regular versions with answer sheets

Includes the following individual lessons which were previously available separately in my store:







If you have already purchased one of these lessons, please contact me at support@suburbanscience.com for a discount on this unit.

Unit Planning

What's Included?

Biosphere: Unit 3

Included Resources by Folder:

Unit Planning
- NGSS Standards document
- Unit Pacing Guide for 50 min classes
- Differentiation ideas for honors students and virtual students
- Honors assignment list

Notes
- Unit 3 PowerPoint (19 slides)
  - Species & Speciation
  - Population Growth
  - Populations: Survivorship
- Cornell Notes Pages (3 pgs)
  - Editable Cornell Notes version
- Doodle Notes Pages (3 pgs)
  - Guide to Using Doodle notes
  - Doodle Notes Keys & Examples
- Web-quests (6 pgs) (Can be used as an alternative to notes)

Activities
- Biome Travel Brochure Research Activity (3 pgs)
- Biome Food Web Poster Project (26 pgs)
- Geocaching Lab (6 pgs)
- Plant Transect Biodiversity Lab (3 pgs)
- Lionfish Invasive Species Panel Discussion (4 pgs)
- Answer Keys for all activities

Extensions
- Data Analysis: Climatograms
- Digging Deeper: Vegetation & Climate
- Digging Deeper: Keystone Species Project
- Data Analysis: Indicator Species*
- Data Analysis: Biodiversity Indices*
- Digging Deeper: Invasive Species Research

*Honors Options

Review and Assessment
- Biomes & Succession Online Quiz through Google Forms (Make a copy of this file to your Drive. Do NOT assign to students using this link.)
- Editable Task Card Review (14 cards) with answer sheet
- Biomes, Succession & Biodiversity Test (paper)- both Honors and Regular versions with answer sheets

Student Pages
- This folder contains duplicate copies of every student page. They are in order according to the pacing guide for QUICK PHOTOCOPYING if you are using the pacing guide as is.

Not included:

Supplementary Resources
- Biome Research Online
- Video instructions for making a climatogram using Excel
- Website that provides climate data for climatograms
- Information about invasive lionfish
- Data Nuggets extension activity on transects & succession after disturbance
- Data Nuggets extension activity on biodiversity & invasive species

Materials Needed
- General classroom use: computers, calculators, rulers, colored pencils, paper, scissors
- Biome Food Web Poster Project: posterboard, glue sticks
- Geocaching Lab: cell phones or GPS units, outdoor space with geocaches, plant ID guides or apps (ex: iNaturalist)
- Biodiversity Lab: outdoor space with variety of plants, plant ID guides or apps, tall garden stakes, yarn or fishing line

Unit Overview Page
plus
Supplementary Resource Ideas
and **Materials Lists**

NGSS and APES Standards Document

If you have specific state standards, contact me by email (support@suburbanscience.com) and I'll help you figure out which ones are covered!

Biosphere Unit 3 Guide

Biodiversity	HS-LS2-2	Use mathematical representations to support
	HS-LS2-6	
	HS-LS2-7	
	HS-LS4-6	

Biosphere Unit 3 Guide

Standards:

Choosing Standards:
Although many states use NGSS, there are some states that do not. I would be glad to help you determine which of your state standards are covered in this unit. You can send me an email at support@suburbanscience.com to find out. Thank you!

The NGSS standards included in this unit are addressed multiple times throughout this course, rather than just once. As the course builds upon itself, the standards will be met with greater depth and detail further into the course.

Topic	NGSS Standard	Description	APES Topics
Biomes	HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	1.1: Terrestrial Biomes 1.11: Food Chains and Food Webs 5.10: Impacts of Urbanization 8.2: Human Impacts on Ecosystems
	HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.	
	HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	
	HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.	
	HS-ETS1-2	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	
Ecological Succession	HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	2.4: Ecological Tolerance 2.5: Natural Disruptions to Ecosystems 2.7: Ecological Succession 8.4: Human Impacts on Wetlands and Mangroves
	HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.	

Editable Pacing Guides

50 min classes

	Day	Instruct	Assess	Homework
Biodiversity	8	• **Geocaching Lab** (Part 2: Creating a Geocache) Materials: water-proof container for each class, trinket/sticker to hide in geocache	• Informal assessment of student behavior and participation during geocache creation • Quick check of completion and/or accuracy of geocache lab questions	
	9	• Finish Geocaching Lab, if necessary • Online Quiz on Biomes & Ecological Succession	• Formal assessment of student understanding via quiz	
	10	• Unit 3 PPT (Section 3) • **Cornell Notes** (Biodiversity) • **Biodiversity Lab** (Introduction only) Materials: 200 beads in a container (at least 3 different colors)	• Cornell Notes summary • Informal discussion and questions • Informal class discussion after introductory lab questions	
	11	• **Biodiversity Lab** (Lab Procedures Page & Discussion questions) Materials: outdoor space with a variety of plants, plant identification guides or apps, tall garden stakes, 50' of yarn or fishing line		
	*	• Optional Day: Use **Doodle Notes** to Review concepts if Cornell Notes have been used for primary note-taking (Biomes, Succession, & Biodiversity pages)		
	12	• **Digging Deeper: Invasive Species**		
	13	• **Real Life Scenario: Invasive Lionfish**		
Review	14	• Use **Task Cards** to review unit concepts (also copy **Task Card Answer Sheet**)		
Assess	15	• Take **Unit 3 Test**		

The daily topics coincide with the previous standards document.

Lesson planning is now quick and easy!

Biosphere Unit 3 Pacing Guide

50 min classes

	Day	Instruct	Assess	Homework
Biomes	1	• Unit 3 PPT (Section 1) • **Cornell Notes** (Biomes) • **Data Analysis: Climatograms**	• Cornell Notes summary • Informal discussion and questions • Informal class discussion to check climatogram questions	
	2	• Begin research and creation of **Biome Travel Brochure** • Provide students with **Biome Travel Brochure Rubric**	• Informal progress check during research time	
	3	• Finish Biome Travel Brochure • **Digging Deeper: Vegetation & Climate**	• Formal assessment using Biome Travel Brochure grading rubric • Informal class discussion to check vegetation questions	
	4	• Begin **Biome Food Web Poster** • Provide students with printed instructions **(Student Instruction Page, Student Notes Page, Grading Rubric, Map, Biome images)**	• Informal progress check during research time	
	5	• Finish **Biome Food Web Poster**	• Formal assessment using Biome Food Web Poster grading rubric	
Ecological Succession	6	• Unit 3 PPT (Section 2) • **Cornell Notes** (Community Stability) • **Digging Deeper: Keystone Species**	• Cornell Notes summary • Informal check of progress and finished Keystone Species flyer	Honors: **Data Analysis: Indicator Species**
	7	• **Geocaching Lab** (Pre-lab & Part 1: Finding a geocache) Materials: Computers, cell phones or GPS units, location of several geocaches near school, plant and/or tree identification guides or apps	• Informal progress check during pre-lab research • Quick check of pre-lab questions • Informal assessment of student behavior and participation during geocache search	

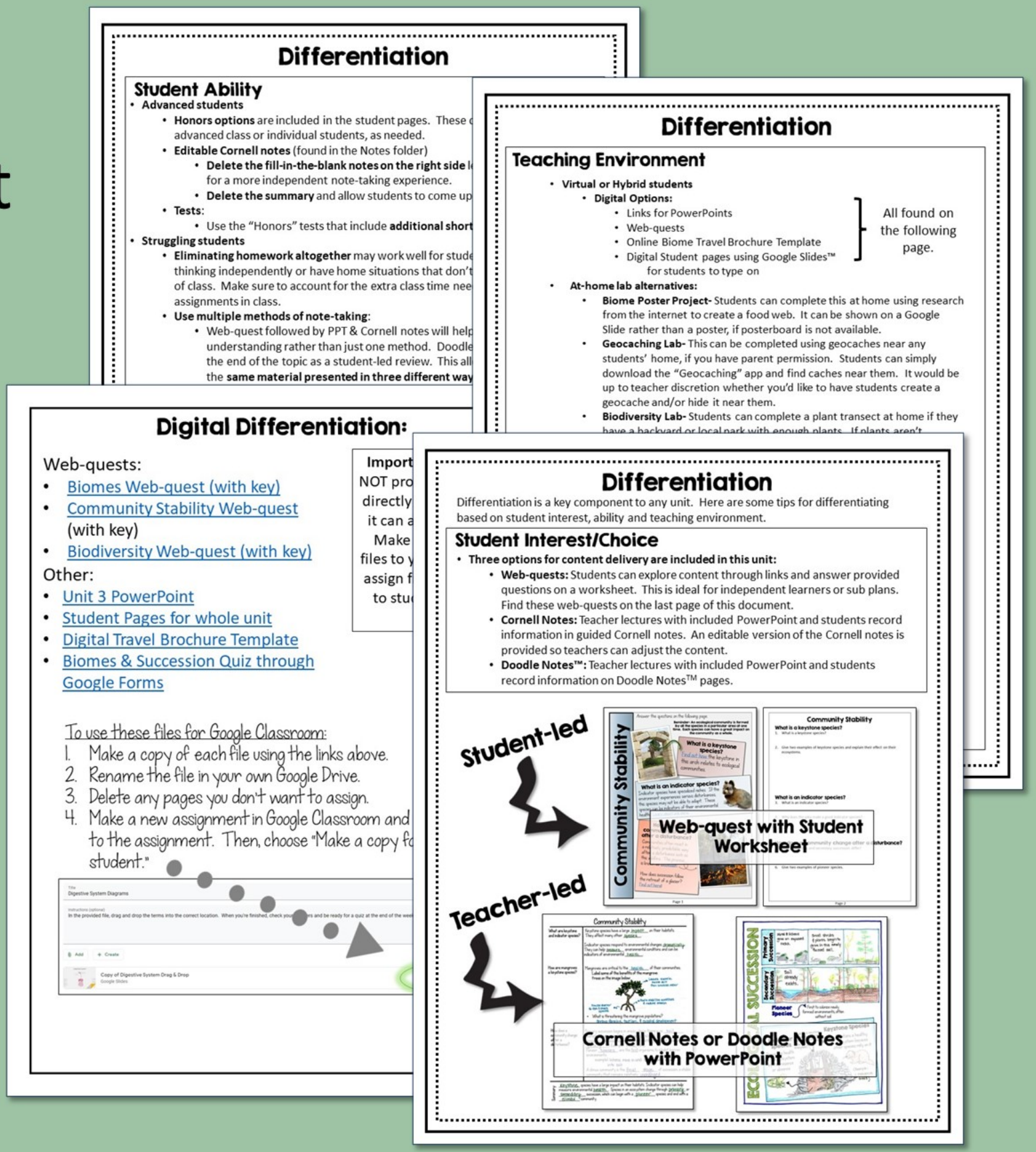
Coincide with NGSS document in Unit Planning Folder

***Bold items** must be photocopied.

This icon is found on the top right corner of Honors pages for easy identification.

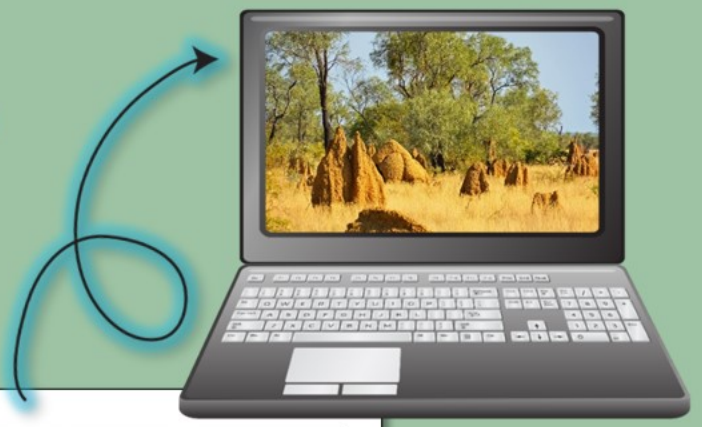
Differentiation Ideas for:

- Student Interest
- Student Ability
- Teaching Pace
- Teaching Environment (Virtual, in-class, or hybrid)



Content Delivery Option I: Student Webquest

Live video links for independent learning on any device!



Answer the questions on the following page.

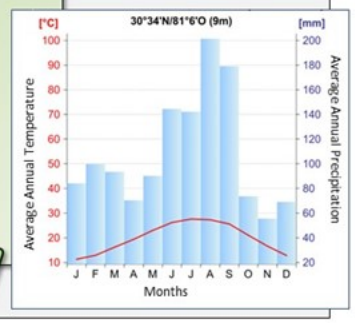
Biomes

What is a biome?
Not all scientists classify biomes in the same way.

What is climate?
Weather is the daily fluctuation of temperature and precipitation. Climate is the weather in a particular location over a long period of time.

What are the common biomes?
There are 9 common terrestrial (land) biomes.

What is a climatogram?
A climatogram is a graph that displays the temperature and rainfall for a certain area. Each biome has its own climatogram. Average temperatures are displayed in a line graph while average rainfall is displayed in a bar graph. Find out how to make one– because you'll need to!



Page 1

Biomes

What is a biome?
1. Define the term "biome".

2. A biome is defined by four characteristics:
   -
   -
   -
   -

3. Are boundaries between biomes distinct or gradual? Explain.

What is climate?
4. Describe the weather and climate in your location.

5. Name and **briefly** describe the 9 world biomes.
   -
   -
   -
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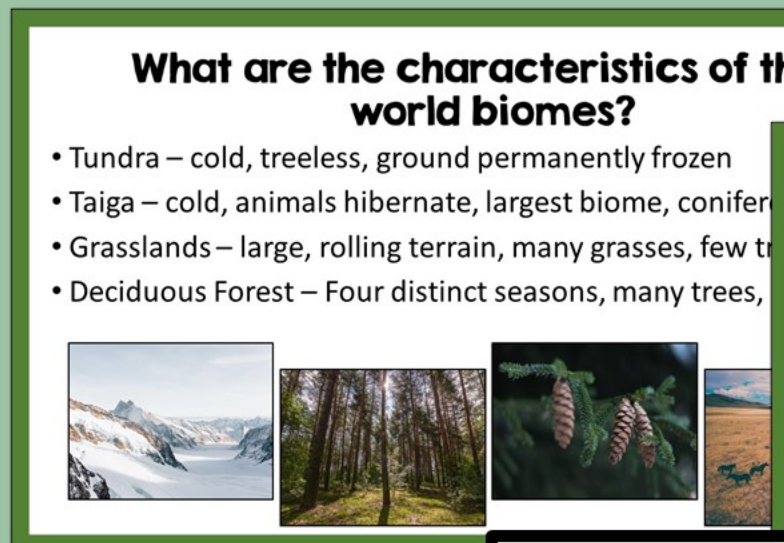
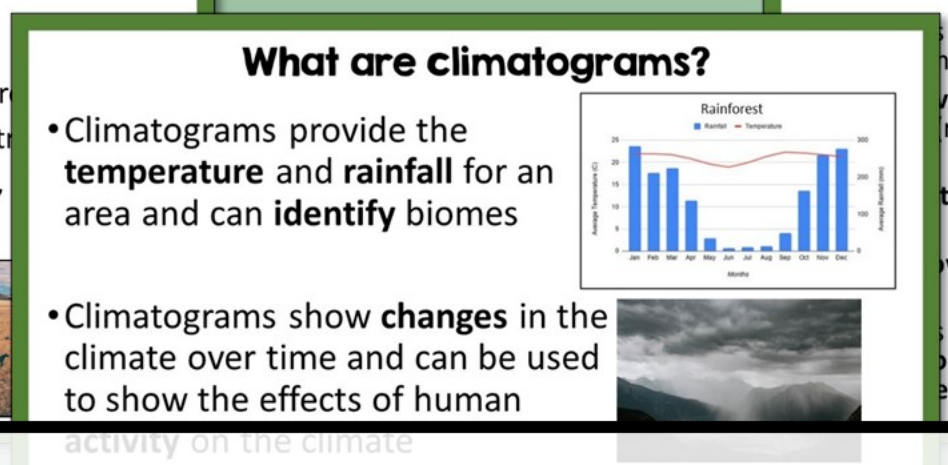
Page 2

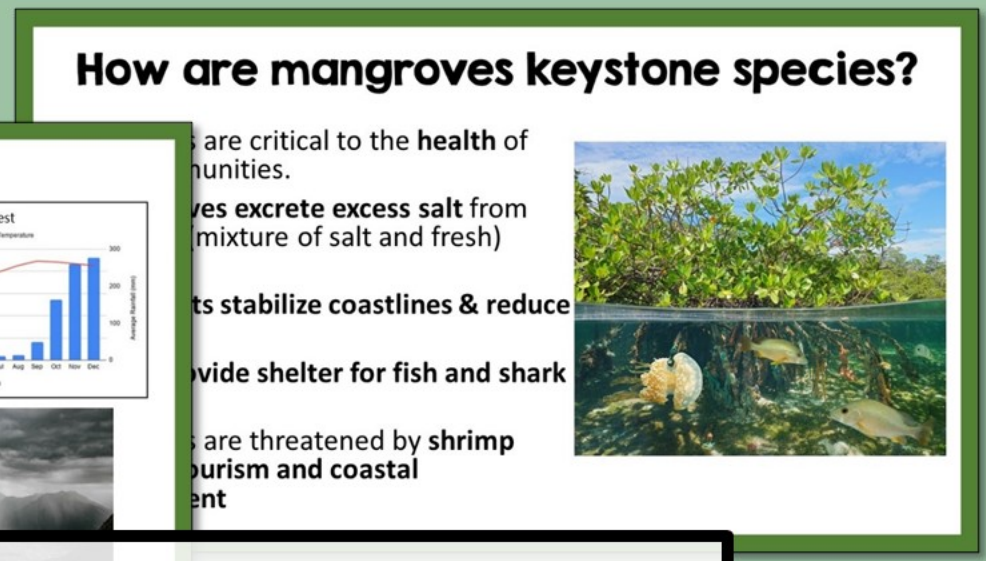
Corresponding Comprehension Questions

Content Delivery Option 2: PowerPoint Presentation

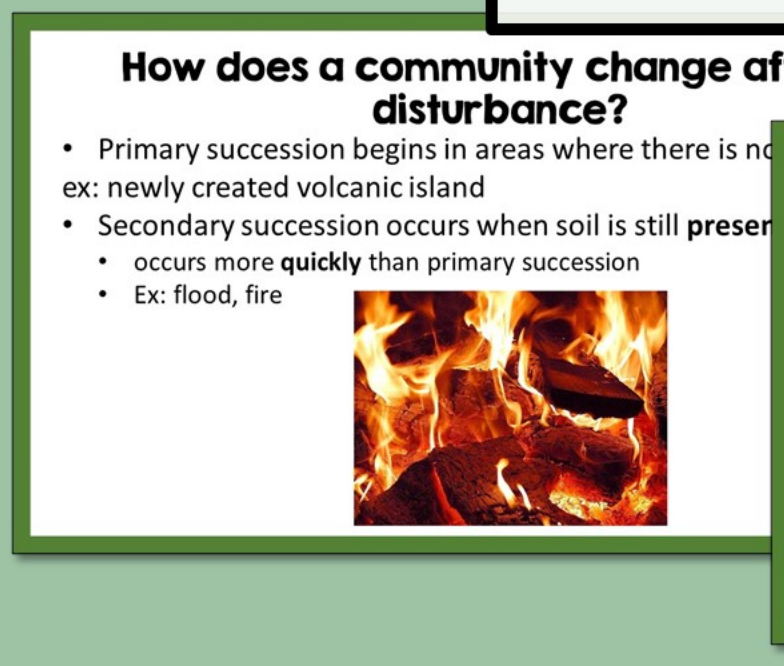
19 **editable**, fully-animated slides

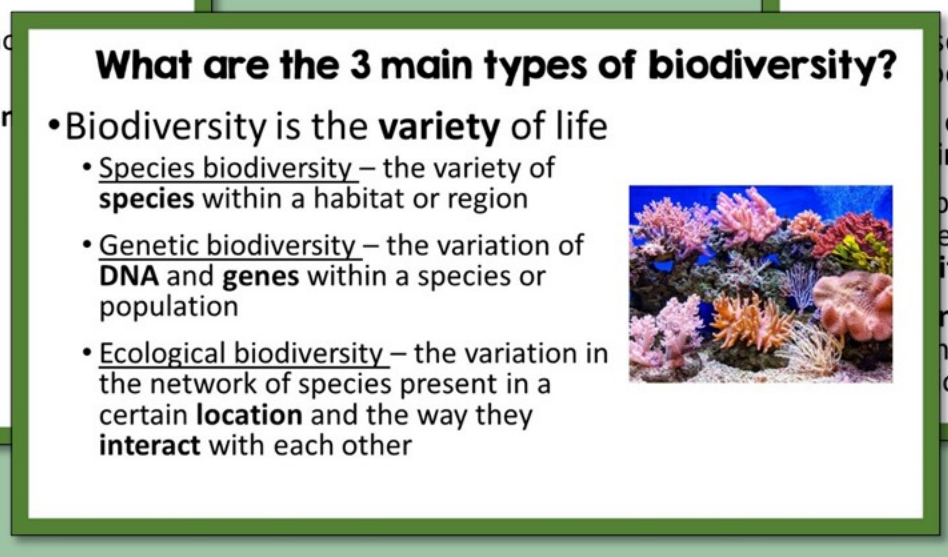


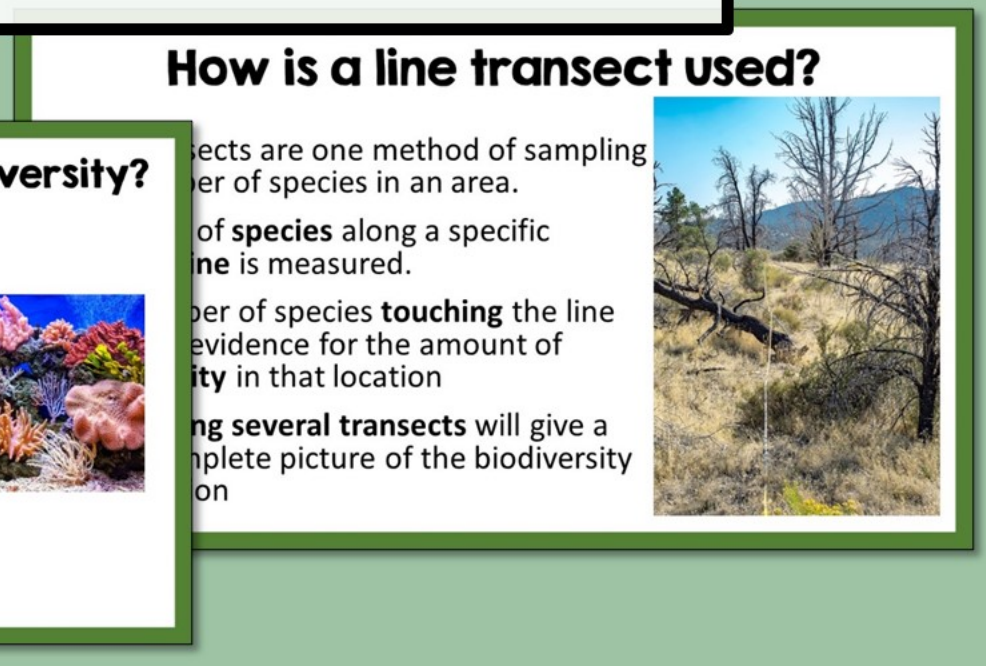




Sample Slides



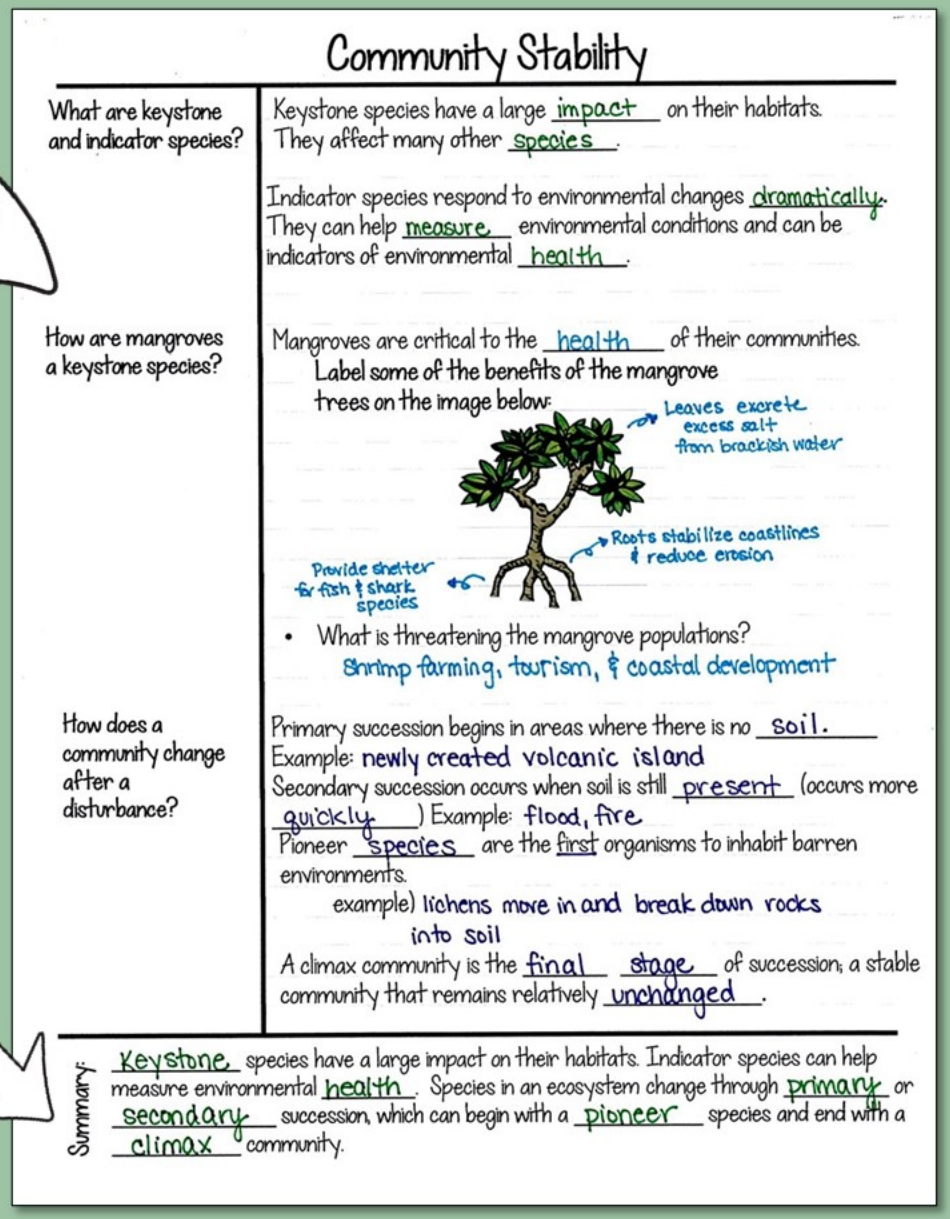


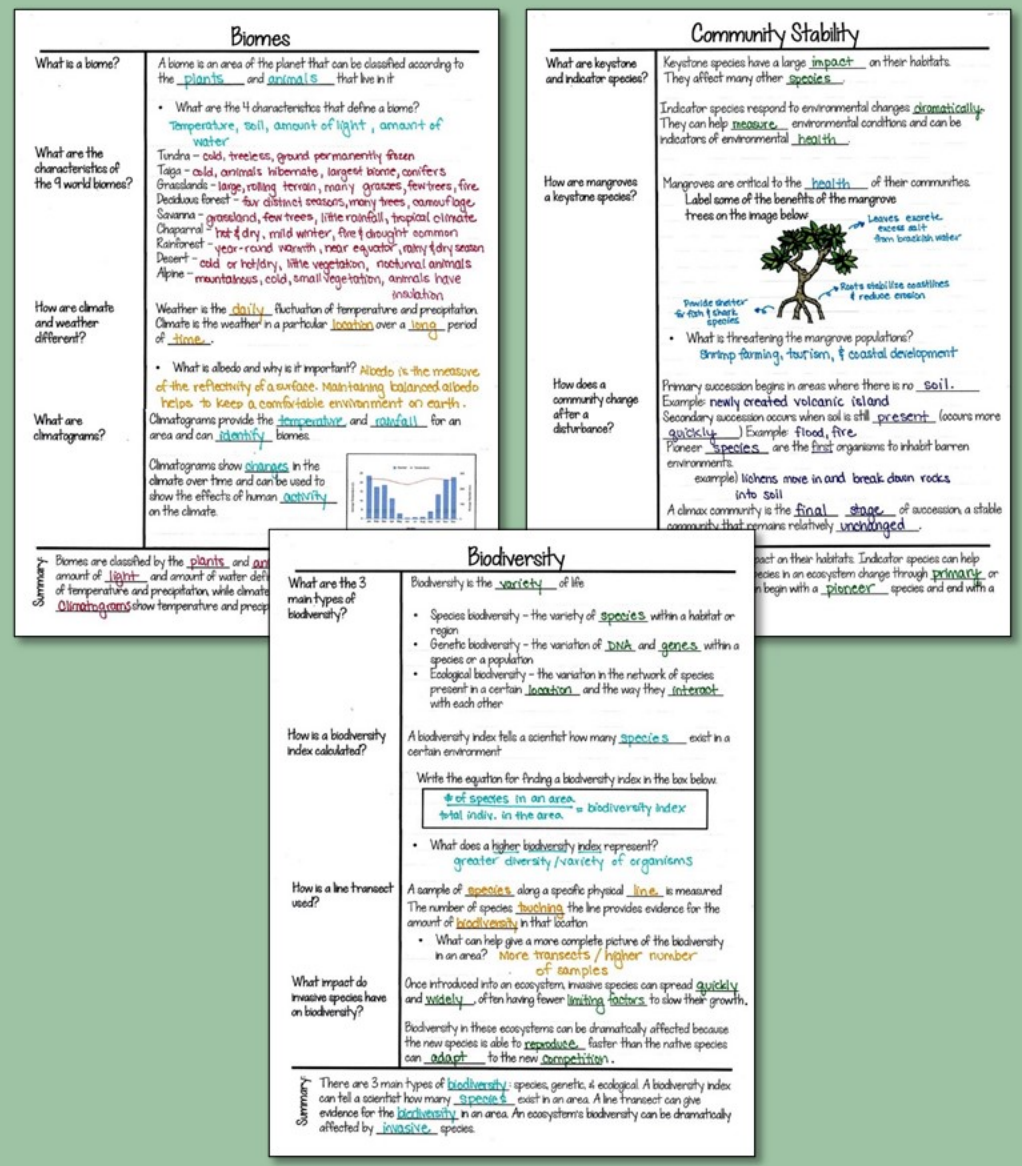


3 pages of Cornell Notes

Big concept questions

Content summary for each page



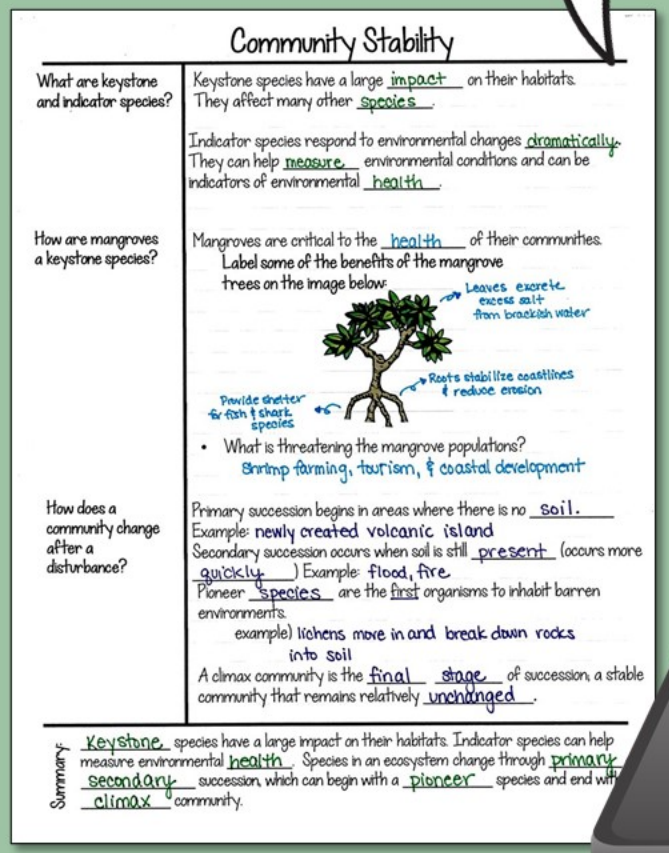


Each page is **editable**.

Add and delete text, questions, and summaries to meet the needs of your students.

Every student page also comes in a digital version on Google Slides

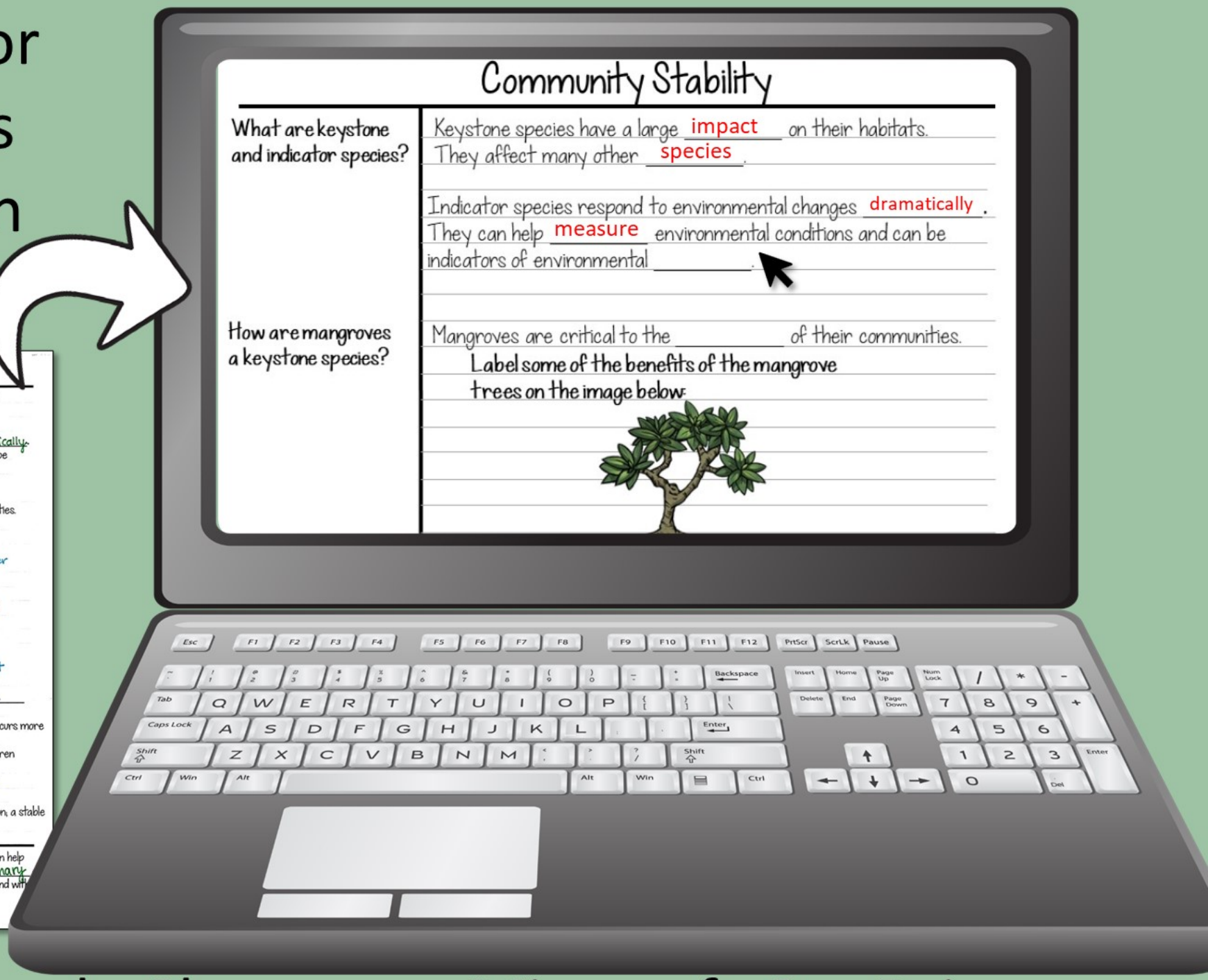
Virtual, hybrid, or absent students can stay right on track!



Community Stability

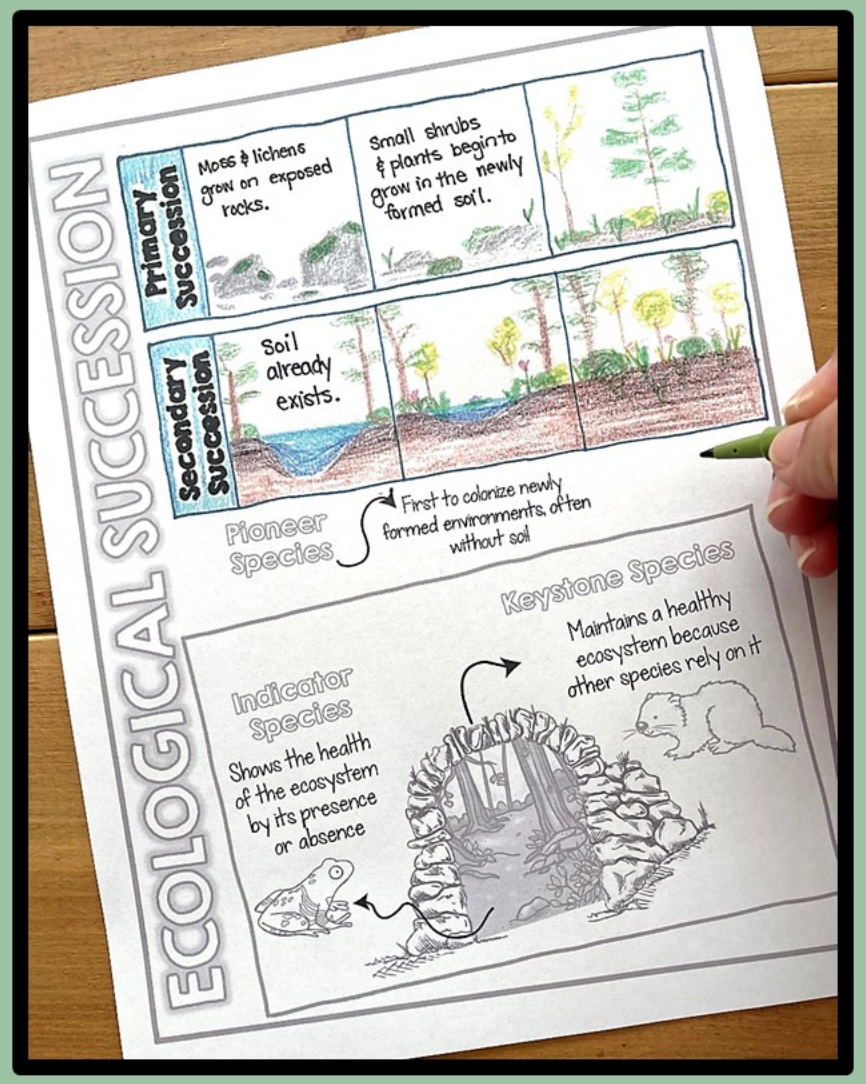
What are keystone and indicator species?	Keystone species have a large impact on their habitats. They affect many other species. Indicator species respond to environmental changes dramatically. They can help measure environmental conditions and can be indicators of environmental health.
How are mangroves a keystone species?	Mangroves are critical to the health of their communities. Label some of the benefits of the mangrove trees on the image below: Leaves excrete excess salt from brackish water Roots stabilize coastlines & reduce erosion Provide shelter for fish & shark species • What is threatening the mangrove populations? Shrimp farming, tourism, & coastal development
How does a community change after a disturbance?	Primary succession begins in areas where there is no soil. Example: newly created volcanic island Secondary succession occurs when soil is still present (occurs more quickly) Example: flood, fire Pioneer species are the first organisms to inhabit barren environments. example) lichens move in and break down rocks into soil A climax community is the final stage of succession, a stable community that remains relatively unchanged.

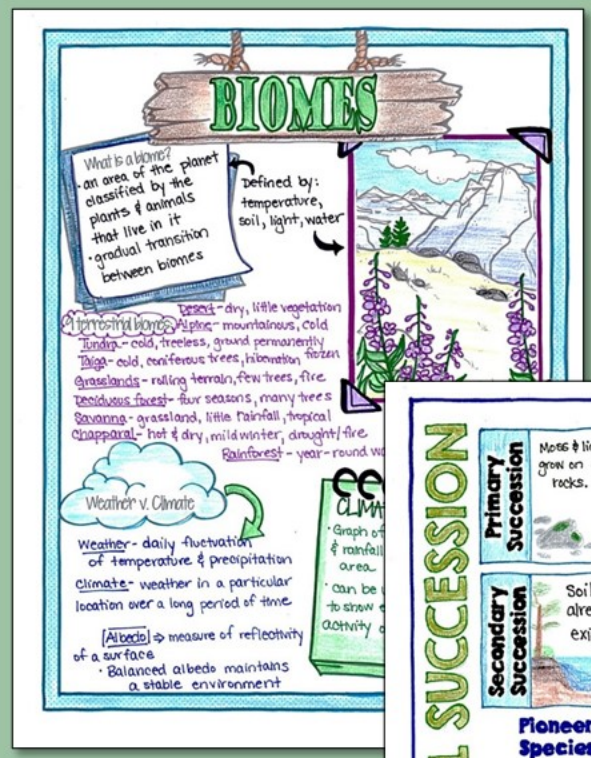
Summary: Keystone species have a large impact on their habitats. Indicator species can help measure environmental health. Species in an ecosystem change through primary or secondary succession, which can begin with a pioneer species and end with a climax community.

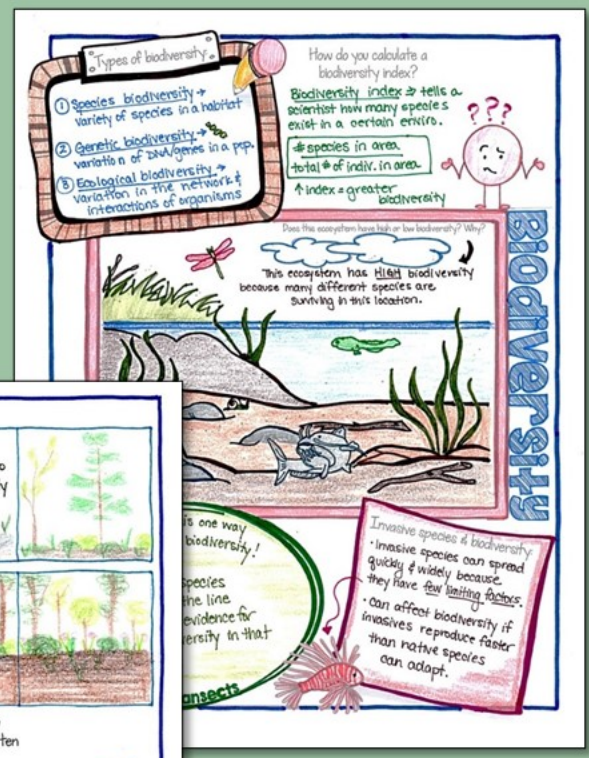


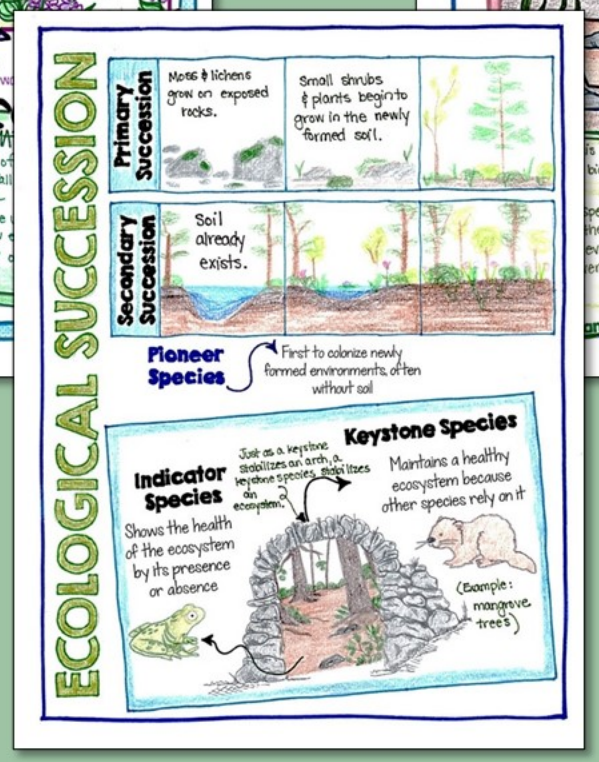
Can be used in Google Classroom, Microsoft OneDrive or many other platforms!

3 pages of Doodle Notes for Summarizing & Review









Doodle Notes™ increase student focus and memory- and they're great fun!

A guide for using them in your classroom is included.

Includes 5 Activities

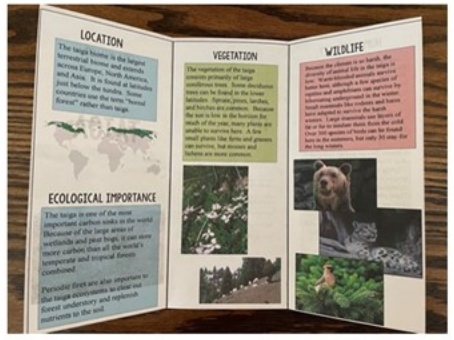
- Biome Travel Brochure Research Activity
- Biome Food Web Poster Project
- Geocaching Lab
- Plant Transect Biodiversity Lab
- Lionfish Invasive Species Panel Discussion

Biome Travel Brochure

Objective:
Describe a particular biome and explain the ecological importance of that area.

Research:
- Research a biome of your choice.
- Use the template provided on the following page to make a trifold travel brochure for your biome. You must include all the information that is listed below. You may add more text, images, backgrounds, etc.
- You will be graded using a grading rubric. Please look at the rubric while completing the project.
- (Optional) You may turn in an electronic version of the travel brochure on a computer or tablet if given permission by your teacher.

To be included in the brochure:
- Description & image of the biome's location (Hint: you should choose a location within that geographic region. Then, research the average temperature & rainfall for that city to make your climatogram.)
- Description & images of main vegetation types in the biome
- Description & images of animals found in the biome
- Explanation of the biome's ecological importance
- Explanation of how humans have impacted the biome



Biome Travel Brochure Sample Page

Biome Poster Project Teacher Instructions

Objective: Students will construct a food web for a specific biome using the photos and descriptions of organisms provided.

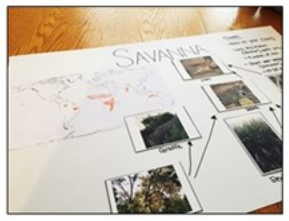
1. Print all the pages that follow this one. (pages 3-28) Pages 6-27 are pictures of animals found in each biome and their matching descriptions including information about their diets (**The pictures and descriptions are arranged to be printed in two-sided format**. Optionally, you could laminate these cards and reuse them year after year. To do this, students can use tape for their poster.)

2. It would be helpful to provide some background information about food chains and food webs prior to this activity. Students should understand how energy is transferred up the food chain and the names of the different levels (producers, primary consumers, secondary consumers, tertiary consumers). Students should also have an idea of the role that scavengers and decomposers play in the food web although they are not represented in this activity.

3. Each group should receive:
   - A copy of the directions for the activity
   - A copy of the Biome Notes page
   - A copy of the grading rubric (you can cut these in half)
   - A copy of the world map
   - A set of biome pictures (biome title, picture page, description page)
   - (The pictures and descriptions are arranged to be printed in two-sided format.)

4. Students should follow directions on the student directions page.

5. Information about specific biomes can be found in most life science textbooks or online. For suggested websites, see the "Start Here" document.



Biome Food Web Poster Project Sample Pages

Geocaching Lab

Pre-lab:

Using the internet, find the answers the following questions.

- What was the original purpose of GPS?
- Explain how trilateration works.

Lab Instructions:

Part 1: Finding a geocache
Using the [illegible] locate 1 or more geocaches near your school.
After arriving at the geocache, take a picture of at least one teammember with the geocache as proof.

Part 2: Creating a geocache
In this part of the lab, you will **create a geocache with your class**. This geocache will be educational in nature. The purpose is to teach future geocache hunters about the ecological community around them.

With your teacher and the rest of your class, select a location for your future geocache.

Find and record the information on the following page to include in your geocache.

Page 6

Geocaching Lab Sample Page

Biodiversity Lab

Lab Procedures: (Take these outside with you!)

1. Tie one end of your cord to one of the stakes.
2. Push the tent stake into the ground at your team's designated starting point.
3. Stretch the cord to its full length, being careful not to step on the plants that [illegible] want to disturb

[illegible] to the ground.

[illegible] ot identify.
[illegible] cord and record
[illegible] s you walk the
[illegible] nts that touch

[illegible] ord the letter of
[illegible] name of the

[illegible] nd rewind the

Biodiversity Lab

Introduction: (Do these before the lab)

1. Look at the container of 200 beads. If you were asked to <u>estimate</u> the number of each color of bead in the container, how might you do it?

2. Choose 18 beads as a "sample" of the bead population. After the 18 beads are collected, list the colors and number of each color below.

3. Calculate the diversity index of the "bead population" by using this formula:
   #of colors (or species) in sample/ # of individuals in sample

4. Circle the population that has the most diversity:

[illegible] Page 4

Discussion Questions: (Do these after the lab)

1. Calculate the diversity index for the [illegible] sample [illegible] (Show your work.)

2. Why is it important for scientists to do several sample transects in the same location?

3. What possible sources of error might have occurred during this lab that would affect your diversity index?

Plant Transect Biodiversity Lab Sample Pages

Real Life Scenario: Invasive Lionfish

A Case Study on Invasive Species

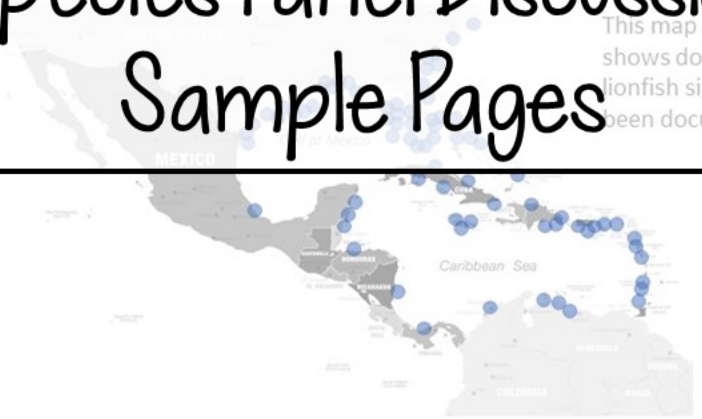
Lionfish, recognizable by their stripes and large, venomous spines, are a notable invasive species in the eastern United States. As lionfish populations continue to grow within the Atlantic Ocean, biologists and government organizations are working to prevent further spread and control existing populations.

Lionfish are native to the tropical waters of the South Pacific and Indian Oceans. They have long been collected and sold to be kept in home aquariums. Scientists think it is likely that the first lionfish was introduced into the Atlantic Ocean around 1985 by an amateur aquarist that got tired of the lionfish and released it into the coastal United States. It also possible that damage and flooding from Hurricane Andrew allowed for the accidental release of more lionfish into the wild, allowing them to become quickly established in the Atlantic ecosystems.

The lionfish invasion has been hard to combat, likely due to its natural beauty. Unlike snakehead fish and Asian carp, which are generally considered to be unattractive species, the lionfish is seen as an exotic and interesting creature. Some chartered diving companies are resistant to capturing these fish because recreational divers like to see them.

Why are lionfish such a problem?

- Lionfish are not easily preyed upon due to their venomous spines and the inability for native species to recognize them as food. Although they can be eaten by humans when cleaned and stripped of their spines, some consumers are still reluctant to do so.
- Lionfish are indiscriminate predators that eat nearly anything small enough to fit into their mouths, including commercially important fishery species such as grouper and snapper.
- Lionfish are able to breed year-round, producing up to 30,000 eggs every 4 days. Their young reach reproductive age quickly.
- Overfishing native predators such as grouper and snapper also contributes to their populations, making it more difficult for them to compete with the lionfish populations.
- Lionfish feed on parrotfish, which are species that graze on algae found in coral reefs. Parrotfish prevent algae from growing and destroying ecologically important coral reef habitats.



This map (as of 2019) shows dots where 10+ lionfish sightings have been documented.

Lionfish Invasive Species Panel Discussion Sample Pages

PETA Member

As a member of People for the Ethical Treatment of Animals (PETA), you are committed to preventing the harm and abuse of any animals. You also don't approve of the use of ...r food.

Home Aquarium Owner

You just love saltwater aquariums. You've had several in your house for 10+ years and your friends love to look at the fis... over for dinne... fish from loca... trade shows.

Director of Florida Keys Tourism Council

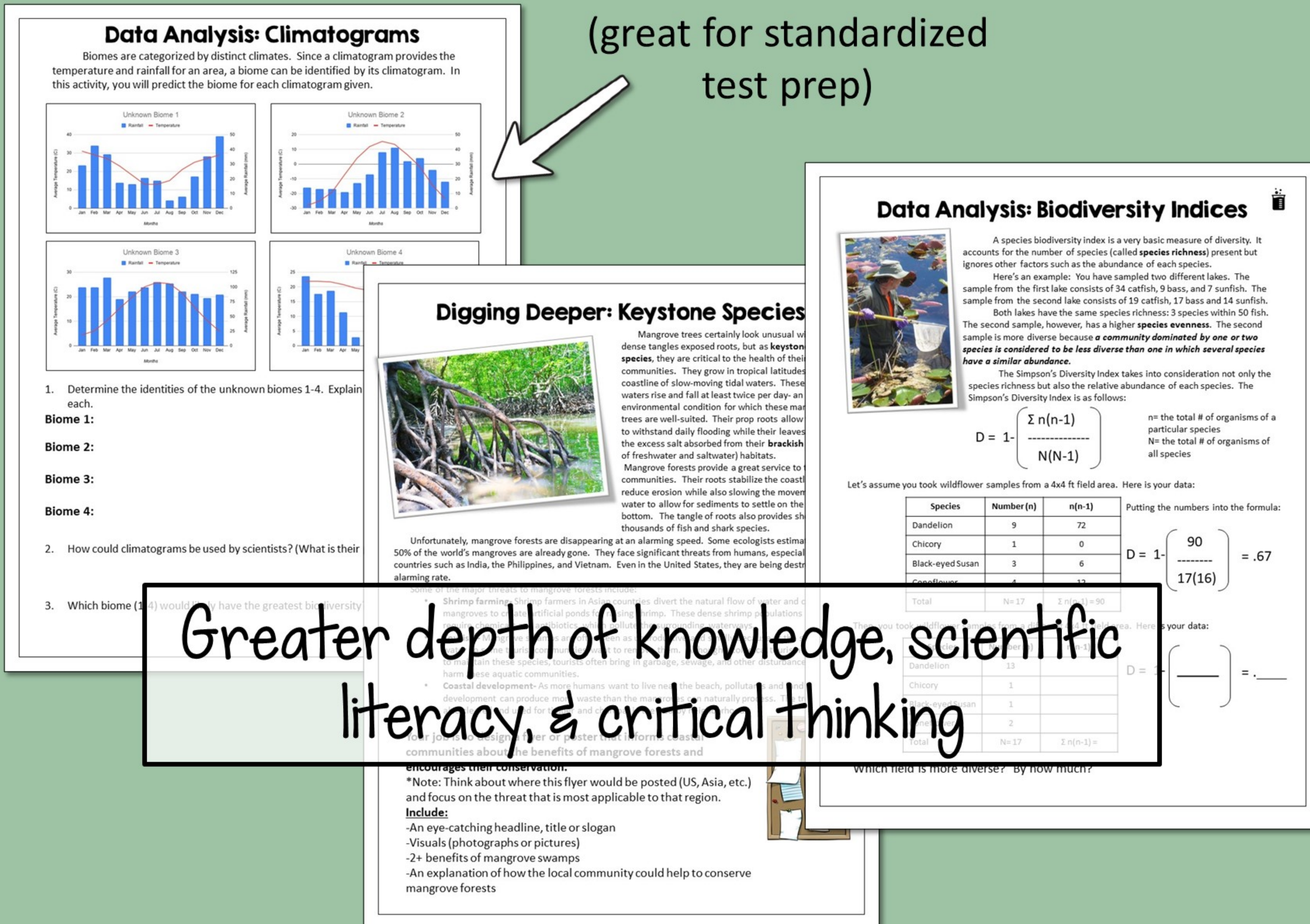
Tourism accounts for a large portion of the Florida Keys' economy. Many tourists come to enjoy the natural beauty of this location. You work ...nd media ... visitors to

National Marine Sanctuary Director

The National Marine Sanctuary protects the habitats and species of the marine coastlines of the United States. Your job is to safeguard the species of marine life for future generations.

Extension Pages

Math skills check!
(great for standardized test prep)



Greater depth of knowledge, scientific literacy, & critical thinking

14 Editable Task Cards for Review

Sample Task Cards

1 Describe the tundra & taiga biomes.

2 Describe the grasslands, savanna & chaparral

3 Describe the rainforest, deciduous forest biomes.

4 Describe the desert and alpine biomes.

5 Compare and contrast the terms climate and weather

6  What do the bars

7 What is albedo and how do vegetation and climate change affect it?

8 Why are mangroves considered a keystone species? What threats exist for mangroves?

Teacher Tips

Using Editable Task Cards

How to set-up:

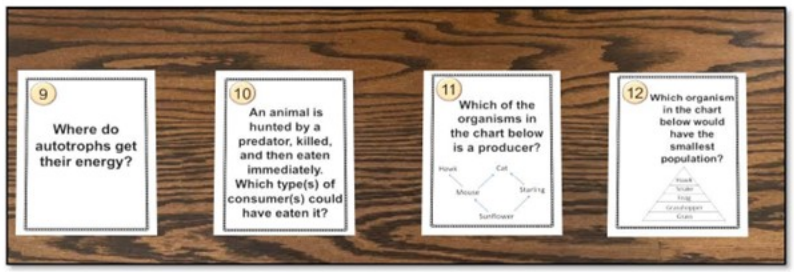
1. Print the cards on cardstock or paper.
2. Cut the pages so that each card is separate. If you'd like to use them in future years, it may be worth laminating them to protect them from student writing and other damage.
3. Place each task card at a seat around the room.
4. Students will rotate to each seat until all cards are finished. Answers are recorded on their "Task Card Answer Sheet" or notebook paper.

*TIP: It is important to set a timer for each station. Usually 1-2 minutes is appropriate. Without a timer, students will get backed up while rotating and chaos will ensue. ☺

Modifications:

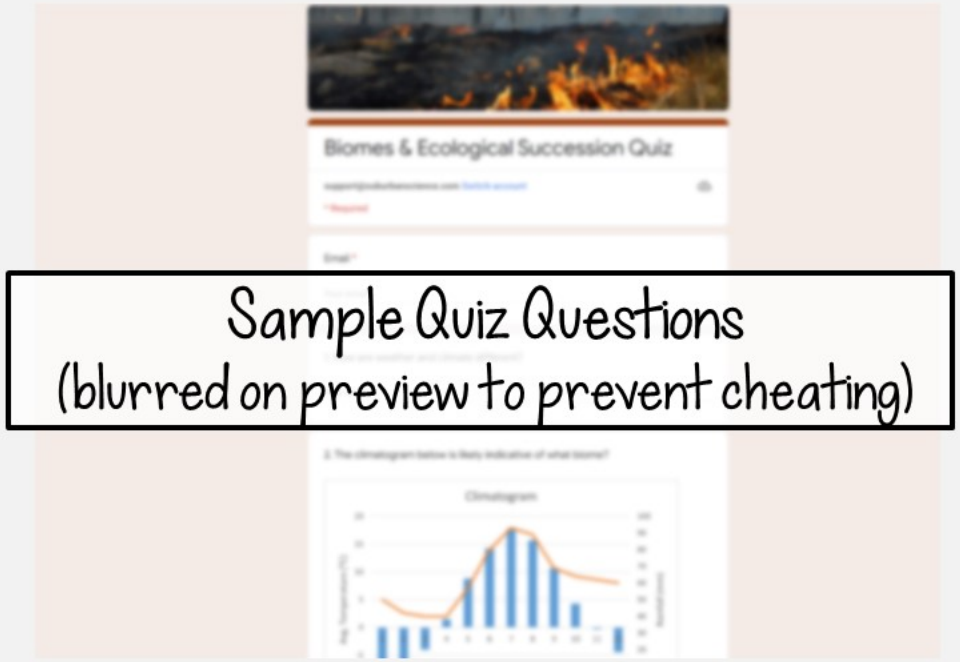
- These task cards are editable so you can change the text on any card.
- There are additional cards at the end of the document for adding questions. Be sure to add the correct number, as well!

- If moving around your room isn't possible, you can have students pass the cards in one direction.
- Other options:
  - Students can use notes or not depending on the level of memorization you expect prior to reviewing.
  - Students can work in pairs, which adds confidence.



Assessments

Editable Online Quiz through Google Forms



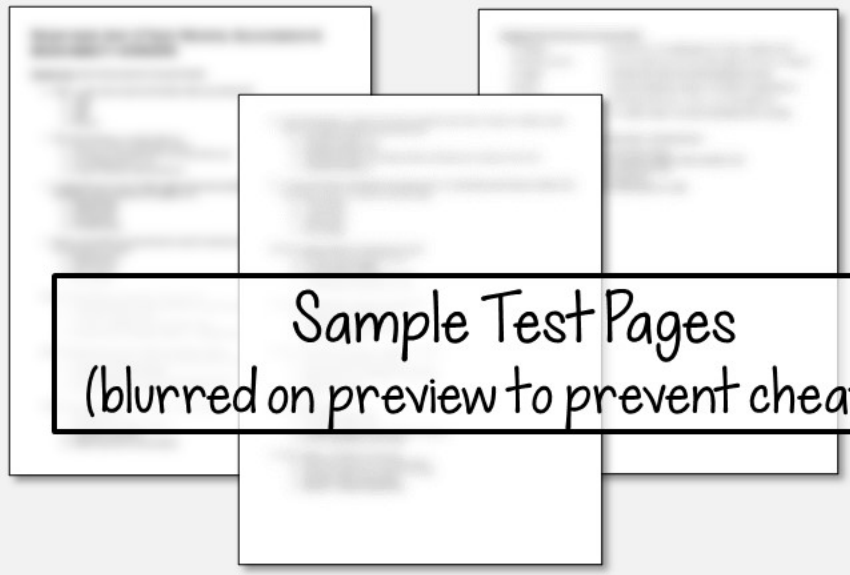
Sample Quiz Questions
(blurred on preview to prevent cheating)

- 11 questions
- Fully editable
- Answer key included for automatic grading

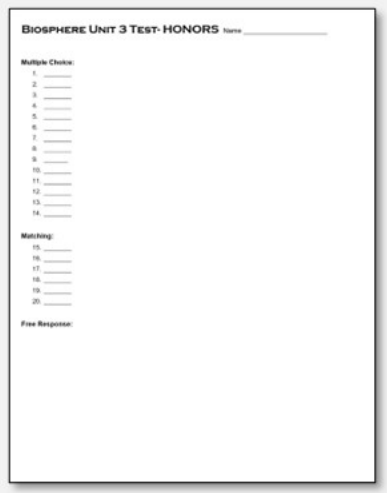
Editable Unit Test

- 14 multiple choice questions
- 5 free response questions

Two Versions: Honors & Regular



Sample Test Pages
(blurred on preview to prevent cheating)



Student answer sheet & answer keys included
(both fully editable)

I'd love to hear from you!

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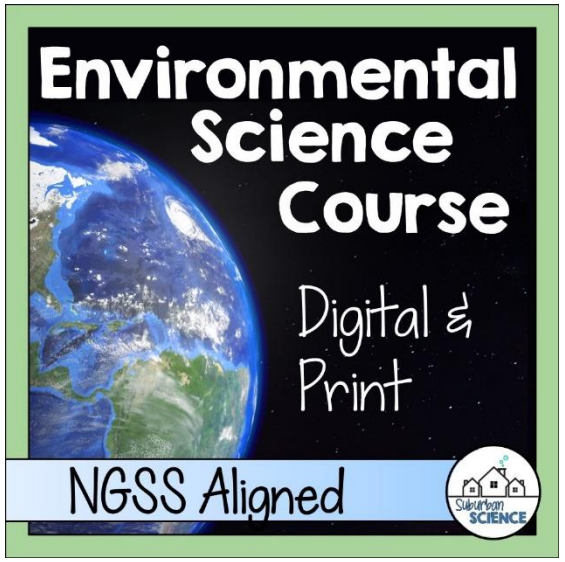
Didn't meet your needs?

Please email me (support@suburbanscience.com) so I can **respond directly** to your concerns. Your satisfaction is my goal.

This unit is part of my Full Environmental Science Curriculum.



The full course includes resources for a full year of high school Environmental Science. If you **choose to purchase this full curriculum** after purchasing this unit, you can **receive a refund for the duplicate** unit. See the TpT return policy for details.

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2. Click the "Leave a Review" button.
3. Answer each question about your experience with this resource.

Then simply **redeem your credits** the next time you check out!

Want to connect?

I sincerely hope this resource will make your school year easier and more fun.

For more teaching tips and ideas, subscribe to my email list or check out my blog.

You can also follow me on TpT or social media:

Sincerely,
Anne from Suburban Science