High School Ecology Lesson Plan: Protecting Rocky Face Ridge

Standards:

SEC2. Obtain, evaluate, and communicate information to analyze factors influencing population growth, density, and dispersion. a. Construct an explanation of factors that regulate population density and growth within communities. (Clarification statement: This includes both density dependent and density independent limiting factors and their relationship to carrying capacity.)

SEC3. Obtain, evaluate, and communicate information to construct explanations of community interactions. d. Construct an explanation about species diversity and how it relates to the stability of ecosystems and communities. e. Develop a model to explain ecological succession in terms of changes in communities over time and the impact of disturbance on community composition.

SEC5. Obtain, evaluate, and communicate information on the impact of natural and anthropogenic activities on ecological systems. a. Analyze and interpret data on the ecological impacts of sustainable and non-sustainable use of natural resources and predict the cause and effect of unsustainable use of natural resources on ecosystems. d. Obtain, evaluate, and communicate mitigation strategies to reduce the impacts of non-sustainable activities on Georgia ecosystems.

Essential Question:

How does the conservation of Rocky Face Ridge maintain ecosystem stability, regulate population dynamics, and protect Dalton from environmental threats like erosion, flooding, and heat?

Time:

80 minutes

Background Information:

Rocky Face Ridge serves as a critical resource for Dalton, Georgia, by protecting the community from environmental threats such as flooding, erosion, and heat islands. It supports biodiversity, stabilizes the ecosystem, and regulates local temperatures. However, Whitfield County's growing population increases the demand for development, posing risks to the ridge's ecological stability. Understanding the impacts of development and exploring solutions are essential to balancing population growth with conservation needs.

Materials:

- GIS map showing species diversity on Rocky Face Ridge
- Population growth data for Whitfield County: https://docs.google.com/document/d/1enFBfIfQLCGRKHTaasQNfYN1k9-ZcaU88xA4f-4qm-A/edit?usp=sharing
- Ecosystem role cards (plants, animals, and decomposers from Rocky Face Ridge) (https://www.canva.com/design/DAGoSJO9pak/B0_GAjzYF_1gHn4k-Kd73A/view?utm_content=DAGoSJO9pak&utm_campaign=designshare&utm_medium=link2&utm_source=uniquelinks&utlId=h7a998909ed)
- Succession timeline vinyl (https://www.canva.com/design/DAGoSHvJ-8s/94HcdGeg59GrAQzyuJpoaQ/view?utm_content=DAGoSHvJ-8s&utm_campaign=designshare&utm_medium=link2&utm_source=uniquelinks&utlId=hc522e53844)
- Velcro cards to represent ecosystem components (e.g., trees, animals, buildings)
- Conservation strategy cards (e.g., building up, public transportation, vertical gardening, walkable cities, dense canopies)
- Entry tickets
- Data Tracking Sheets (https://www.canva.com/design/DAGoSHgjy0k/XTTnv6n0dseD9bS3VYMcKw/view?utm_content=DAGoSHgjy0k&utm_campaign=designshare&utm_medium=link2&utm_source=uniquelinks&utlId=h3051a168dc)
- Ecology Scenarios (https://www.canva.com/design/DAGoSq6xuDg/_BV87D0RNxilU8a6HtWEDw/view?utm_content=DAGoSq6xuDg&utm_campaign=designshare&utm_medium=link2&utm_source=uniquelinks&utlId=h341af651c4#2)
- Slide Deck (https://www.canva.com/design/DAGko37zysE/cXkQt0v9PzOK2TV627wGUA/view?utm_content=DAGko37zysE&utm_campaign=designshare&utm_medium=link2&utm_source=uniquelinks&utlId=h813076aab6)

Pre-Assessment (10 minutes):

Have students use an entry ticket and answer the following;

- **Question 1:** Name one conservation strategy.
- **Question 2:** Why is biodiversity important for stability?

Activities:

1. Ridge Overview and GIS Map Analysis (15 minutes):

Display the GIS map on the board. Use the GIS map to explore the species diversity and ecological significance of Rocky Face Ridge. Point out key areas of dense biodiversity and explain how they contribute to flood prevention, erosion control, and temperature regulation.

Discuss Whitfield County's population growth using provided data. Ask students how increased population might affect the ridge's ecosystems.

Key Question: How does Rocky Face Ridge protect our community, and what challenges arise as Dalton grows?

2. Biodiversity and Stability Web (25 minutes):

- **Step 1:** Assign each student an ecosystem role card (e.g., tree, deer, soil, rainfall, fungus). Cards include basic information about what the species does in the ecosystem and how it interacts with others.
- **Step 2:** Arrange students in a circle. Explain that they will create a "web" to show how all the parts of the ecosystem are connected.
- **Step 3:** Use yarn or string to connect species based on their relationships (e.g., a tree connects to soil for nutrients, soil connects to rain for moisture, rain connects to plants, and plants connect to herbivores).
- **Step 4:** Gradually remove key species (e.g., trees) to simulate biodiversity loss caused by deforestation. Each time a species is removed, discuss how it affects the remaining web and the carrying capacity.
- **Step 5:** Ask students: "What happens to the ecosystem's stability when we lose biodiversity? How does this relate to Rocky Face Ridge?"

3. Ecological Succession Model (30 minutes):

- **Step 1:** Spread out the succession vinyl on the floor or board. This vinyl has a horizontal line divided into 4 sections; Disturbance, Pioneer Species, Intermediate Species, and Climax Community.
- **Step 2:** Distribute ecosystem component Velcro cards that represent species, plants, and human impacts.
- **Step 3:** Begin by describing a disturbance, such as deforestation or fire, on Rocky Face Ridge. Ask students to place objects and sticky notes representing what remains after the disturbance (e.g., bare soil, dead plants).
- **Step 4:** Work as a class to add elements for each stage:
    - **Pioneer Species:** Add grasses, mosses, or fast-growing plants that appear first to stabilize the soil. These are often introduced through wind.

    - **Intermediate Species:** Add shrubs, young trees, and more diverse animal species as the habitat develops.
    - **Climax Community:** Add mature trees and a full range of plants and animals that form a stable ecosystem.
- **Step 5:** Discuss human interventions that could speed up recovery, such as replanting trees, erosion barriers, or creating protected areas.
- **Step 6:** Discuss that human interventions can also harm communities. Hand out the invasive species Velcro cards and ask what students expect to happen if we place these on the vinyl in the disturbance section. They should answer that it would limit competing native species and you will take those cards off the timeline. Ask what would happen if there were deforestation on the ridge? Remove some tree species and animal species cards. Place the development cards on the timeline in the climax community because of the lasting nature of development. Mention that development will increase heat, erosion, and runoff which will have an impact on the species still left. Remove some animals and plants.
- **Step 7:** Lead students in a short discussion with the key question "What does the ecosystem of the Rocky Face Ridge look like after the man-made disturbances? Can the biodiversity occur to the same extent or better than it was before?"

  4. Solution Discussion and Action Planning (15 minutes):

  Present conservation strategy slide deck including options like building up, vertical gardening, and land protection. As a class, discuss the pros and cons of each strategy and how it could address the growing population while protecting Rocky Face Ridge.

  Have students vote by show of hands on the best strategy or combination of strategies.

Post Assessment (10 minutes):

Have students use an exit ticket and answer the following;

- **Question 1:** Name one conservation strategy.
- **Question 2:** Why is biodiversity important for stability?

Differentiation:

For Struggling Learners:

- Simplify species role cards with visuals and key points.

Extension:

- Microhabitat Observation and Analysis
    - Create small "habitat jars" or trays with soil, plants, and small organisms like worms or insects.
    - Observe how changes (e.g., removing a plant, adding extra water) affect the habitat over time.
    - Discuss parallels between these microhabitats and larger ecosystems like Rocky Face Ridge.

Lesson developed by:

The Dalton Resilient Community Group with Keep Dalton-Whitfield Beautiful, Whitfield County 4-H, Sarah Ott, and the Dalton-Whitfield Solid Waste Authority.

ROOTING FOR THE RIDGE
Preserving Dalton's Rocky Face Ridge

KEEP DALTON/WHITFIELD BEAUTIFUL, INC
KEEP AMERICA BEAUTIFUL AFFILIATE

DALTON-WHITFIELD SOLID WASTE AUTHORITY