Ecology

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Unit Title: Ecology

Grade Level: 9th

Subject/Topic Area(s): Biology

Designed By: Daisy Wang & Yipsel Ramos

Time Frame: 14 days

School District: Cypress Fairbanks ISD

School: Cy-Lakes High School

School Address and Phone: 5750 Greenhouse Rd. 
Katy, TX 77449 (281) 856-3800

Goals/TEKS:

(10) The student knows that biological systems are composed of multiple levels. The student is 
expected to:

(C) analyze the levels of organization in biological systems and relate the levels to each other 
and to the whole system.

(11) The student knows that biological systems work to achieve and maintain balance. The student is 
expected to:

(B) investigate and analyze how organisms, populations, and communities respond to 
external factors;

(C) summarize the role of microorganisms in both maintaining and disrupting the health of 
both organisms and ecosystems

*(D) describe how events and processes that occur during ecological succession can change 
populations and species diversity.

(12) The student knows that interdependence and interactions occur within an environmental 
system. The student is expected to:

*(A) interpret relationships, including predation, parasitism, commensalism, mutualism, and 
competition among organisms;

(B) compare variations and adaptations of organisms in different ecosystems;

*(C) analyze the flow of matter and energy through trophic levels using various models, 
including food chains, food webs, and ecological pyramids;

(D) recognize that long-term survival of species is dependent on changing resource bases that 
are limited;

(E) describe the flow of matter through the carbon and nitrogen cycles and explain the 
consequences of disrupting these cycles; and

*(F) Describe how environmental change can impact ecosystem stability.

*readiness standards

[Note: This unit/performance task was created with the intentions of being used for mastery learning and 
standard based grading].
## Unit 2: Ecology

### Grade: 9th

### Stage 1: Desired Results

#### Established Goals (Standards)

**Established Goals:** *(Readiness standards are in bold)*

Science process skills (TEKS 1-3: investigations, safety, scientific methods, problem solving, and reasoning) should be taught in context to allow for more authentic integration and assessment, as these include up to 40% of EOC test items.

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(C) analyze the levels of organization in biological systems and relate the levels to each other and to the whole system.

(11) The student knows that biological systems work to achieve and maintain balance. The student is expected to:

(B) investigate and analyze how organisms, populations, and communities respond to external factors;

(C) summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems

**D**escribe how events and processes that occur during ecological succession can change populations and species diversity.

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(A) interpret relationships, including predation, parasitism, commensalism, mutualism, and competition among organisms;

(B) compare variations and adaptations of organisms in different ecosystems;

(C) analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids;

(D) recognize that long-term survival of species is dependent on changing resource bases that are limited;

(E) describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles; and

(F) **D**escribe how environmental change can impact ecosystem stability.

### Understandings

*Students will understand that...*

- Matter and energy flow through Earth's biosphere.
- There is a great biodiversity that interact with each other and the environment on Earth.
- Environmental change can impact ecosystem stability.

### Essential Questions

- How does matter and energy flow through an ecosystem?
- How do organisms interact within an ecosystem?
- How does environmental change affect an ecosystem?

### Knowledge

*Students will know...*

**Readiness**
- ♦ diversity within a population contributes to its versatility in obtaining resources and survival of the species. (11C,12B,11D)
- ♦ carrying capacity is defined by resources available. (11D, 12D,12F)
- ♦ interactions and symbiotic relationships among

### Skills

*Students will be able to...*

**Readiness**
- ♦ distinguish between various ecological models and how they show matter and energy flow through an ecosystem. (12C,12E)
- ♦ explain effects of changing environmental resources on living systems. (10C,11D,12E,12F)
- ♦ describe how ecological succession can change
organisms. (11B,11C,12A)

- human activity influences all aspects of an ecosystem. (11B,12F)

**Supporting**
- the different levels of biosphere organization. (10C,11B)
- living systems have a limited amount of resources available, which will impact survival. (11B,11C, 12B, 12D,12E)

- discuss the relationship between matter and energy flow through an ecosystem. (9A,12C,12E)
- analyze interactions and relationships among organisms. (12A,11C)
- describe the flow of matter through the carbon and nitrogen cycles, and explain the impact of disrupting these cycles. (9A,10C,11B,12E)
- analyze the flow of matter and energy through trophic levels using food chains, food webs, and ecological pyramids. (9A,12C)

**Supporting**
- compare variations and adaptations of organisms in different ecosystems. (11B,12B)

### Stage 2: Assessment Evidence

**Performance Task:**

Students will show their learning by creating a project of a biome that integrates the matter and energy flow within an ecosystem of the biome. Students will also incorporate different types of relationships between organisms as well as showing the effects of succession, pollutants and limiting resources on the ecosystem.

See rubric attached.

*Note: This unit/performance task was created with the intentions of being used for mastery learning and standard based grading. The numbers in the [ ] on the project rubric is aligned with the standard-based unit rubric (attached on the last page of the UbD). However, a point system out of 100 is included for traditional grading.

**Other evidence:**

( quizzes, check for understanding/mastery, tests, academic prompts, self-reflection, etc.)

### Stage 3: Learning Activities

<table>
<thead>
<tr>
<th>Days</th>
<th>Topics</th>
<th>TEKS/Objective</th>
<th>Assignments</th>
</tr>
</thead>
</table>
| 1    | Review biosphere:  
- Biodiversity  
- Biotic / abiotic factors  
- Habitat / niche  
- Levels of organization | 10C, 11B, 12B, 12F | - Watch video clip on biodiversity on  
- Answer questions in notebook from ProjectShare  
- levels of organization  
- Use pictures of different levels in the environment for students to organize. |
| 2    | Cycles Review:  
Carbon, Nitrogen, Water | 12E | - Watch video clips on N cycle, C cycle and Q&A in notebook  
- Traveling N-cycle game, Q&A refection in notebook |
| 3    | Review  
- Heterotrophs / Autotrophs  
- Food Chain/ Food Web  
- Energy flow | 11C, 12A, 12C | - ProjectShare activities (online games and demos).  
- Build food chain online  
- Energy flow video  
- Build a food pyramid foldable |
| 4    | Practice food webs with:  
“Who eats whom?” activity | 11C, 12A, 12C | - ”Who eats whom?”: build a food web with paper links (WS attached)  
- Q&A reflection in notebook |
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| 5    | Review biome: List 3 food chains in a specific biome (Research using books, etc...) | 11C, 12A, 12C | -Prepare for project without student knowledge  
- Biomes interactive map |
| 6    | FLEX DAY | | - Quiz |
| 7    | Relationships: Symbiosis (comm., mut, par) Predator Vs. Prey | 12A, 12D | - notes, video clips  
- ABCD whispers |
| 8    | Relationships: Competition Limited Resources Carrying capacity | 12A, 12D | ProjectShare activities/Notes/Q&A  
Choose: Bearly Enough / Ohh Deer / Marsh Munchies |
| 9    | Recap: niche/habitat destruction Succession & human impact on ecosystem | 11B, 11C, 11D, 12F | -Video on primary succession and ecological succession  
-Q&A /discussion/reflection in notebook  
-Discuss Mt. St. Helen, our city/school, 2004 tsunami |
| 10   | Biomagnification/ Bioaccumulation Borneo Cats | 12C, 12E | United streaming video and reflection questions  
Choose: Borneo Cats / Anchovies / Beads in cups |
| 12   | INTRODUCE PROJECT | | PROJECT – check for mastery |
| 13   | Review Day | | Review concepts for test, check for understanding, re-teach  
Check for final mastery through project. Continue finishing projects. |
| 14   | TEST DAY/PROJECT DUE | | TAKE TEST / PROJECT DUE |
ECOLOGY BIOME PROJECT

Introduction:
For this project you will need to either choose an already existing biome or artistically design and depict a biome from planet X. You must include the following:

Must Include: 10 Organisms (Must contain producers, consumers, and decomposers)

- 10 Each consumer labeled correctly as either herbivore, carnivore, omnivore, or decomposer [1.3, 2.5]
- 20 1 Food web with 3 distinct food chains [1.4]
  - Food chain includes a minimum 3 trophic levels [1.2]
  - Food chain includes a minimum of 2 producers
  - Food chain includes a decomposer [2.5]
  - Food chain includes correctly drawn arrows and pictures
- 4 Minimum of 4 abiotic factors must be included and labeled
- 8 Red arrows showing the flow of the carbon cycle using all of the following terms: photosynthesis, feeding, respiration, decomposition [1.1]
- 8 Blue arrows showing the flow of water using all of the following terms at least once: condensation, precipitation, transpiration, evaporation [1.1]
- 9 Choose one of the food chains and draw its energy pyramid [1.4]
  - label the trophic levels [1.5]
  - calculate the amount of energy transferred [2.4]
- 15 Identify (label and draw picture) and explain the following relationships in your biome: commensalism; mutualism; parasitism; predator-prey; competition [1.6, 4.2]
- 10 Explain and illustrate the effects of a toxic pollutant entering your biome. Which organisms will be affected the most? [4.3, 2.8, 3.5]
- 10 What would decrease the carrying capacity of one of your organisms in your biome? List 3 examples [1.7, 1.8]
- 15 Illustrate a natural or human disturbance in your biome. Identify the type of succession and its effects on biodiversity [1.9, 2.7, 1.0, 4.4]
- 10 Neatness/ Clarity/ Creativity

TOTAL POINTS

There are three ways to prepare your Biome Project. You may choose to do a poster board, a Scrapbook or a Biome Suitcase. All three choices must include all the above. On the back of this paper there are specific instructions on where to place your information in each of the choices.
Choice One:

**Biome Poster:**

**Front of poster:**
You will give an illustrated representation of your biome which includes all 15 organisms with the consumers labeled accordingly, the 3 food chains, the abiotic factors, and the carbon and water cycle arrows.

**Back of Poster:**
You will include the energy pyramid, the 5 relationship examples with their explanations, the illustrations and explanations of: toxic pollutant, carry capacity, and the human or natural disaster to your biome.

Choice Two:

**Biome Scrapbook:**
1 pg: Cover page that gives the name of your biome.
1 pg: The food web with all 15 organisms and the consumers labeled.
1 pg: Four abiotic factors in your biome
1 pg: Carbon and water cycles with the corresponding labels
1 pg: Energy pyramid
1 pg: Five relationships
1 pg: Toxic pollutant
1 pg: Carrying capacity
1 pg: Natural or human disturbance.

Choice Three:

**Biome Suitcase:** Using a Manila Folder and some construction paper (or index card) you will construct a suitcase for your upcoming travel to that biome.

- **Outside of Manila Folder:**
  One Side includes the food web including the 15 organisms and the labeled consumers.

  The Other side put all five relationships.

- **Inside of Manila Folder**
  One Side: You will include the illustration and the explanation of the natural or human disaster that occurred in your biome.

  Other Side: You will make a minimum of 6 small pockets with the following labels: Abiotic, Carbon Cycle, Water Cycle, Energy Pyramid, Toxic Pollutants, Carrying Capacity
**Food Web: Who Eats Whom?**

**Purpose:**
Using strips of construction paper you will first show a food chain and then construct a food web. You will need 10 long strips of construction paper about 3cm x 30cm in the following colors:
2 – Green
2- Yellow
1- Red
5- Blue

**Procedures - Build a food chain**
1. Write your name and class period on one side of the red strip of paper.
2. Label one green strip “grass”, one yellow strip “mouse” and one red strip “hawk”.
3. To begin, take the green strip of paper (grass) and glue its ends together to form a link (circle).
4. To represent the mouse consuming the grass, take the yellow strip of paper (mouse) and pass it through the grass link. Glue the ends of this strip together to form your next link.
5. To represent the hawk consuming the mouse, take the red strip of paper (hawk) and pass it through the mouse link. Glue the ends of this strip together to form your next link.
6. You have now formed a food chain!
Procedures - Build a food web

7. Label the other yellow strip “rabbit” and add it to your food chain. Remember that just like the mouse, rabbits eat grass and are eaten by hawks.

8. Label the other green strip “vegetable” and add it to your food chain. Remember that rabbits and mice both eat vegetables and grass.

9. Label the remaining 5 blue strips “decomposers.” Decomposers are organisms that eat dead animals and dead plants. Show that each organism is consumed by a different decomposer by adding your decomposer strips to your food web.

10. Now you have formed a food web!!

Questions to answer in your spirals: [1.2, 1.3, 1.4, 1.5, 2.4, 2.5]

1. Draw your food web in your spiral (make sure your arrows ( ) are pointing on the correct direction)

2. What type of consumers/heterotrophs do the following colors represent?
   (Herbivore, carnivore, etc...)
   a. Blue_________  b. Green_________
   c. Red_________  d. Yellow_________

3. List 2 producers in your food web._____________ and _______________

4. List 2 primary consumers in your food web._________ and __________

5. Give an example of a decomposer that could be found in your food web __________

6. How much energy is transferred from one trophic level to the other? _____

7. Draw an energy pyramid of one of your food chains in your food web with the decomposer at the 4th trophic level. Label the trophic levels, illustrate your organisms and calculate the energy available at each trophic level if your producer made 350kcal.
## Standard-Based Grading Ecology Unit Rubric

<table>
<thead>
<tr>
<th>Criteria Descriptions</th>
<th>Unacceptable 0</th>
<th>Limited 1</th>
<th>Adequate 2</th>
<th>Proficient 3</th>
<th>Exemplary 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student will be able to:</td>
<td></td>
<td>__1.0 Define biodiversity</td>
<td>__2.0 Compare the levels of organization in the biosphere (10C)</td>
<td>__3.0 Evaluate how different organisms compete for the same limited resources (11B)</td>
<td>__4.0 Relate the importance of bacteria to animals with regards to nitrogen fixation. (11C)</td>
</tr>
<tr>
<td>__1.1 Know the steps of each level in the cycles (N, C, H2O) (12C,E)</td>
<td></td>
<td>__1.1 Know the steps of each level in the cycles (N, C, H2O) (12C,E)</td>
<td>__2.1 Explain how limited resources affect the ecosystem (12D)</td>
<td>__3.1 Evaluate environmental changes on ecosystems (11B, 12F)</td>
<td>__4.1 Summarize the role of decomposers in how matter is recycled (11C)</td>
</tr>
<tr>
<td>__1.2 Identify energy flow and trophic levels (12C)</td>
<td></td>
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<td>__2.2 Explain survival of the fittest (11C, 12B)</td>
<td>__3.2 Analyze how external factors affect organisms, populations and communities (11B)</td>
<td>__4.2 Create a representation of symbiotic relationships (12A)</td>
</tr>
<tr>
<td>__1.3 Recall types of heterotrophs (12C)</td>
<td></td>
<td>__1.3 Recall types of heterotrophs (12C)</td>
<td>__2.3 Define types of adaptations (7E, 12B)</td>
<td>__3.3 Identify ways that bacteria can help and harm organisms (11C)</td>
<td>__4.3 Evaluate and summarize a real life scenario of biomagnification (12C)</td>
</tr>
<tr>
<td>__1.4 Describe food chains, food webs, and ecological pyramids. (12C)</td>
<td></td>
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<td>__2.4 Calculate energy conversion within a food chain. (12C)</td>
<td>__3.4 Explain the effects of biomagnifications on organisms (12B)</td>
<td>__4.4 Evaluate and summarize a real life scenario of ecological succession. (11D, 12F)</td>
</tr>
<tr>
<td>__1.5 Know energy transfer within a food chain (12C)</td>
<td></td>
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<td>__2.5 Identify decomposers (11C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>__1.6 Describe interactions between organisms (predator-prey, symbiosis, competition). (12A)</td>
<td></td>
<td>__1.6 Describe interactions between organisms (predator-prey, symbiosis, competition). (12A)</td>
<td>__2.6 Recognize bacteria’s role in nitrogen fixation (11C)</td>
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<td></td>
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<tr>
<td>__1.7 Define carrying capacity (12D)</td>
<td></td>
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<td>__2.7 Describe the effect of succession on biodiversity (11D)</td>
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<tr>
<td>__1.8 Identify limited resources (12D)</td>
<td></td>
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<td>__2.8 Define biomagnifications (12C)</td>
<td></td>
<td></td>
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<tr>
<td>__1.9 Identify ecological succession on populations (11D)</td>
<td></td>
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<td>__2.9 Identify consequences in disrupting the cycles (N, C, H2O) (12C,E)</td>
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<tr>
<td>__1.10 List ways that humans influence the environment (12F)</td>
<td></td>
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<tr>
<td></td>
<td>On Level and Honors - 0%</td>
<td>On Level – 70%</td>
<td>On Level – 78%</td>
<td>On Level – 88%</td>
<td>Both – 100%</td>
</tr>
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