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Ecology

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UNDERSTANDING BY DESIGN

Ecology Unit Cover Page

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.

(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.

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	Skills
Students will know… <u>Readiness</u> ♦ 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	*Students will be able to…* <u>Readiness</u> ♦ 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)

populations and species diversity. (11B,11D)
♦ 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

Days	Topics	TEKS/Objective	Assignments
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

Days	Topics	TEKS/Objective	Assignments
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
11	INTRODUCE PROJECT	10C, 11B, 11C, 11D, 12A, 12B, 12C, 12D, 12E, 12F	PROJECT – check for mastery
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

MY BIOME:_____ **DUE DATE: _____**

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

_____ 100 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.
1pg: The food web with all 15 organisms and the consumers labeled.
1pg: Four abiotic factors in your biome
1-2pg: Carbon and water cycles with the corresponding labels
1pg: Energy pyramid
1pg: Five relationships
1pg: Toxic pollutant
1pg: Carrying capacity
1pg: 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.

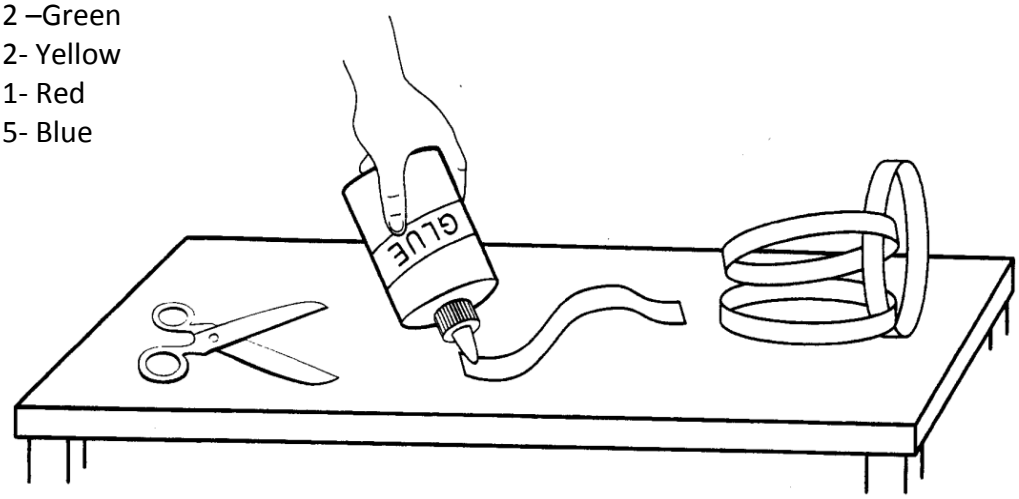
Other Side: You will make a minimum of 6 small pockets with the following labels: Abiotic, Carbon Cycle, Water Cycle, Energy Pyramid, Toxic Pollutants, Carrying Capacity

Food Web: Who Eats Whom?

Purpose:

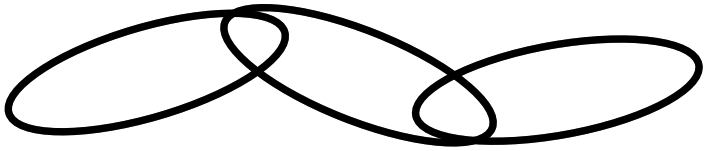
Using strips of construction paper you will first show a food chain and then construct a food web. You will need 10 long strips of construction paper about 3cm x 30cm in the following colors:

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.

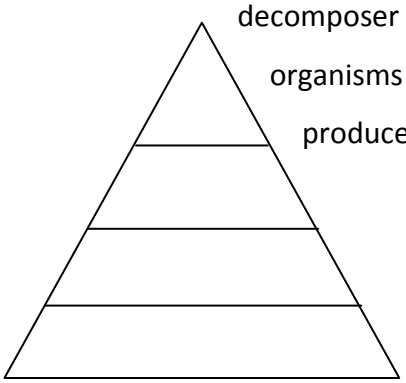
8. Label the other green strip "**vegetable"** and add it to your food chain. Remember that rabbits and mice both eat vegetables and grass.

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

Criteria	Unacceptable 0	Limited 1	Adequate 2	Proficient 3	Exemplary 4
The student will be able to:		__1.0 Define biodiversity __1.1 Know the steps of each level in the cycles (N, C, H2O) (12C,E) __1.2 Identify energy flow and trophic levels (12C) __1.3 Recall types of heterotrophs (12C) __1.4 Describe food chains, food webs, and ecological pyramids. (12C) __1.5 Know energy transfer within a food chain (12C) __1.6 Describe interactions between organisms (predator-prey, symbiosis, competition). (12A) __1.7 Define carrying capacity (12D) __1.8 Identify limited resources (12D) __1.9 Identify ecological succession on populations (11D) __1.10 List ways that humans influence the environment (12F)	__2.0 Compare the levels of organization in the biosphere (10C) __2.1 Explain how limited resources affect the ecosystem (12D) __2.2 Explain survival of the fittest (11C, 12B) __2.3 Define types of adaptations (7E, 12B) __2.4 Calculate energy conversion within a food chain. (12C) __2.5 Identify decomposers (11C) __2.6 Recognize bacteria's role in nitrogen fixation (11C) __2.7 Describe the effect of succession on biodiversity (11D) __2.8 Define biomagnificatio ns (12C) __2.9 Identify consequences in disrupting the cycles (N, C, H2O) (12C,E)	__3.0 Evaluate how different organisms compete for the same limited resources (11B) __3.1 Evaluate environmental changes on ecosystems (11B, 12F) __3.2 Analyze how external factors affect organisms, populations and communities (11B) __3.3 Identify ways that bacteria can help and harm organisms (11C) __3.4 Explain the effects of biomagnificatio ns on organisms (12B)	__4.0 Relate the importance of bacteria to animals with regards to nitrogen fixation. (11C) __4.1 Summarize the role of decomposers in how matter is recycled (11C) __4.2 Create a representation of symbiotic relationships (12A) __4.3 Evaluate and summarize a real life scenario of biomagnification (12C) __4.4 Evaluate and summarize a real life scenario of ecological succession. (11D, 12F)
	On Level and Honors - 0%	On Level – 70% Honors – 60%	On Level – 78% Honors – 75%	On Level – 88% Honors – 85%	Both – 100%