**Nutrient and Energy Movement in a Biome/Ecosystem Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*Adapted from an assignment by Elizabeth Ungrey*

For this assignment, you may work with a partner to do your research and discuss concepts. You must each complete the assignment in full and turn in your own work to get credit. You will be creating a single diagram that includes 4 biogeochemical cycles (as opposed to the typical way of representing the cycles with four separate diagrams), details of the carbon cycle at the molecular level, and specific flora and fauna from a food web of one of biomes found in the United States.

**Part I:** To begin, research about and pick a biome. You can access the biome powerpoint on my website for some basic information. The biome must exist in the United States. Research this biome enough to know where it is geographically, and be able to list at least 3 characteristic plants and 4 characteristic animals (2 vertebrates and 2 invertebrates) that live there. What kind of decomposers would be found there? Some info is available in your book. You can search online too. Try Enchanted Learning for some basic info. [**http://www.enchantedlearning.com/biomes**](http://www.enchantedlearning.com/biomes)

Biome selected: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Where in the U.S. can this biome be found? Be specific. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| List 3 specific plants characteristic of this biome/location. | List 4 specific animals characteristic of this biome/location. | Soil type, terrain, elevation,climate, precipitation, etc. |
|  | Vertebrate: |  |
|  | Vertebrate: |
|  | Invertebrate: |
| Decomposers characteristic of biome: | Invertebrate: |

Before you begin the next section of this assignment, please watch the [Bozeman Bio Video on Ecosystems](http://www.bozemanscience.com/047-ecosystems) (47).

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| --- | --- |
| Write 3 possible food chains for this biome. For each organism in your food chains, identify its trophic level (write it on the chain). | Assume the producers in your food chains can capture and store 1% of the 25,000,000 Joules of sunlight energy hitting their chloroplasts. How much energy (J) is available at the level of primary producer? Write this value (units!) under the label for each producer. Assuming a trophic efficiency of 10%, how much energy is available in the biomass of each trophic level. Write these values (J) on your food chains. What happened to the other 90% of the energy? Show this on your food chain model. |
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|  |

Create a food web (using the organisms above) for this biome here. Pay attention to the direction of your arrows. The arrows point in the direction of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. On the food web you’ve drawn in the space below, use **arrows to show matter cycling energy flow** through the system. Please use a highlighter to trace the energy flow through the system.

**Part II:**  On a sheet of legal-sized paper, make a sketch of this biome. It should include the organisms (stick figures are OK) you identified in Part I. Now draw yourself (stick figures are OK) into this biome. You must be having a meal. It can be something you caught/hunted/gathered at the site or a picnic you brought with you. You will be making A LOT of notes, arrows, etc. around yourself and the other organisms, so don’t make the picture too complicated. You might not officially be part of the food web you drew, but you can now be part of the biogeochemical cycling. In addition to your text, I’ve suggested a few online resources that may be of use.

1. Using the following color code, incorporate four biogeochemical cycles into your diagram.

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| --- |
| Helpful online resources:  <https://www.sciencelearn.org.nz/resources/958-biogeochemistry>  <https://www.sciencelearn.org.nz/resources/961-the-phosphorus-cycle>  <https://www.sciencelearn.org.nz/resources/1569-carbon-cycle>  <https://www.sciencelearn.org.nz/resources/960-the-nitrogen-cycle>  <https://www.sciencelearn.org.nz/resources/966-the-role-of-clover> |

The arrows, words and formulae that you write for a cycle must be in the **correct color to be counted**.

RED = CARBON

BLUE = WATER

GREEN = NITROGEN

BLACK = PHOSPHORUS

1. You must include the four reservoirs (conceptually represent them on the diagram) from Figure 42.13 (pages 896-897) in each cycle.
2. The carbon cycle must include specifics of cell respiration and photosynthesis. You do NOT need to draw/name/label individual molecules but you must include the basic phases of each process and demonstrate that you understand how they incorporate into the larger biogeochemical cycles. You must also indicate the role of energy in the cycling of carbon.
3. Your diagram must include information on digestion, assimilation, and excretion for yourself and your lunch.
4. Complete the table on the back of this sheet regarding the biogeochemical cycles.

**To turn in this project: Please be prepared to use this worksheet to present your diagram before turning both in for review.**

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| --- | --- | --- | --- | --- |
|  | **Carbon** | **Water** | **Nitrogen** | **Phosphorous** |
| **Importance:** Why is it critical that each element/nutrient cycle through biotic and abiotic parts of the ecosystem (i.e.,Why do living things need these atoms?) |  |  |  |  |
| **Reservoirs:** Major store locations |  |  |  |  |
| **Assimilation:** How the atoms and molecules are incorporated into living things. |  |  |  |  |
| **Release:** Describe how the element returns to the environment. |  |  |  |  |
| **Human Impact:** Explain one way humans are disrupting this cycle |  |  |  |  |