CCPS Environmental Science Unit Plan

Grade	9th-12th	**Subject**	Environmental Science	**Unit #**	1
Unit Name	Ecology and Ecosystems		**Timeline**	3 weeks	
How to use the Framework	This Framework should be used to implement daily science instruction. The resources and instructional strategies reflected in the Framework will provide a foundation for effective implementation and student mastery of standards. Please see the hyperlinked abbreviation document to ensure understanding all abbreviations used with this framework.				
Unit Overview	This unit covers the first half of the environmental science course, including population ecology, matter and energy flow, and biomes. Students can complete **Crosscutting Concept Graphic Organizers** as weekly homework assignments. Also, consider using the Environmental Science Self-Evaluation Checklist, daily or weekly, as informal feedback to support students' progress toward standard mastery. ***Students and their parents must review, sign, and submit the following safety acknowledge form prior to the first lab.**				
Lesson Plan guidance document and template	Lesson Plan Template Science-HS-Environmental-Science-Self-Evaluation-Checklist				

3Dimensional Instruction

GSE	Science and Engineering Practices	Crosscutting Concepts
SEV1. Obtain, evaluate, and communicate information to investigate the flow of energy and cycling of matter within an ecosystem.	• Asking questions and defining problems • Developing and Using Models • Planning and carrying out investigations • Analyzing and interpreting data • Constructing explanations and designing solutions • Engaging in argument from evidence • Obtaining, evaluating, and communicating information	• Cause & Effect: Mechanism and explanation • Patterns • Scale, Proportion, and Quantity • Systems and System Models • Energy and Matter: Flows, Cycles, and Conservation • Stability and Change

NGSS Alignment

NGSS Alignment to Disciplinary Core Ideas

Week 1	
Focused Concept: **Biotic and Abiotic Factors**	**GSE:** **SEVl.a. Develop and use a model to compare and analyze the levels of biological organization including organisms, populations, communities, ecosystems, and biosphere.**

	SEVl.c. Analyze and interpret data to construct an argument of the necessity of biogeochemical cycles (hydrologic, nitrogen, phosphorus, oxygen, and carbon) to support a sustainable ecosystem.				
Phenomenon: Daily phenomena are found in the Opening.			**DQ: How does the relationship between biotic and abiotic factors influence ecosystems?**		
SEP: **• Developing and Using Models** **•Analyzing and Interpreting Data** **• Constructing Explanations and Designing Solutions**			**CCC:** ● **Systems and System Models** ● **Energy and Matter: Flows, Cycles, and Conservation**		
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Learning Targets:	**I can...** ● **understand and compare the different levels of biological organization.** ● **develop and use models to analyze organisms, populations, communities, ecosystems, and the biosphere.** ● **explore the interconnectedness of biological organization levels.**	**I can...** ● **investigate how the levels of dissolved oxygen in a pond vary throughout a day.** ● **learn the source of dissolved oxygen in a pond.** ● **determine the effect of dissolved oxygen on the fish in a pond.** ● **compare dissolved oxygen levels in warm and cold ponds.** ● **determine the effect of farms on dissolved oxygen concentrations.**	**I can...** ● **explore how to identify the biotic and abiotic factors within an ecosystem and how the ecosystem is dependent upon them.** ● **identify the different ways in which matter is transformed in an ecosystem.**	**I can...** ● **explain how carbon moves through a closed system.** ● **identify the different ways in which matter is transformed in an ecosystem.**	**I can...** ● **explain about fixation and other processes that take place in the nitrogen cycle.** ● **address a real world issue concerning excess nitrogen by providing evidence to support a claim.**
Opening	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see?	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see?	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see?	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see?	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see?

	➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. **The essential vocabulary will be taught in context throughout the lesson.** **Organism** **Species** **Population** **Community** **Ecosystem**	➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. **The essential vocabulary will be taught in context throughout the lesson.** **Abiotic** **Biotic**	➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. **The essential vocabulary will be taught in context throughout the lesson.** **Biogeochemical cycle** **Phosphorus cycle** **Hydrologic cycle**	➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. **The essential vocabulary will be taught in context throughout the lesson.** **Nutrient cycle** **Carbon cycle** **Photosynthesis** **Cellular respiration**	➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. TTW show video Breakdown: Why lightning is good for agriculture (1:19 minute) TSW talk with an elbow partner for 1 minute to address the question. TTW select 3 students to respond to the question based on the video. Question: *Why is lightning good for agriculture?* **The essential vocabulary will be taught in context throughout the lesson.** **Nitrogen cycle** **Nitrogen-fixing bacteria** **Legumes**
Guided Practice/ Transition	TTW have students review the blue heading "Ecosystems Have Several Important Components" (p. 72) and graphic (Figure 3-6 Ladder of Matter, p. 72). The students will make 3–5 predictions about the text in the lesson. During or after reading "Ecosystems Have Several Important Components" (first two paragraphs, p. 72), the students will	TTW breakdown the word "**biotic**" by asking students the meaning of the prefix "**bio**" Based on the meaning, TTW ask the students what they think "biotic" means. TTW ask the students for examples of biotic factors. TTW write the list on the board. TTW breakdown the word "**abiotic**" by asking	**Part I.** TTW present a Nearpod lesson on Biotic and Abiotic Factors in Ecosystems: 7-12. TSW use the code to join the Nearpod and participate in the lesson by responding to the prompts as the teacher presents the information. **Part II.**	**Part I.** TTW review the POGIL Nutrient Cycles (p. 3) with the students. TTW model to students how to use Model 2 – The Carbon Cycle to address questions 11-14 on page 3. TSW participate in the lesson by responding to the prompts as the teacher models the information. **Part II.**	**Part I.** **SCIENCE TALK** **Human Impacts on the Nitrogen Cycle** (p. 88) Brainstorm with students about the potential for excess nitrogen in the local environment. Write students' responses on the board. **Part II.** TTW play the Nitrogen Cycle simulation for the

	revise their predictions to reflect on the lesson's content. Material: Sticky notes, pen/pencil, and White board TTW show the video Levels of Organization in Ecosystems (Time: 2:09 minutes). TTW address any questions students may have from the video. The students will write, on sticky note, at least two things they learned from the video and add to the white board. TTW present a Nearpod video on What Are Ecosystems? Crash Course Geography #15. TSW use the code to join the Nearpod and participate in the lesson by responding to the prompts as the teacher shows the video.	students the meaning of the prefix "a" Based on the meaning of "a" and "biotic", TTW ask the students what they think "abiotic" means. TTW ask the students for examples of abiotic factors. TTW write the list on the board. Pond Ecosystem Gizmo : Lesson Info : ExploreLearning TTW review the Prior Knowledge Questions via discussion with the students. TTW review and model the Gizmo Warm-up to the students via the Mimio Board.	TTW breakdown the word "**biogeochemical**" by asking students the meaning of the prefixes "**bio**" and "**geo**" Based on the meanings, TTW ask the students what they think "biogeochemical" means. TTW ask the students "Why do you think it is important to understand biogeochemical cycles?" TTW instruct students to complete **Lesson 3.4 Explore** READ WITH PURPOSE - Skimming (p. 82).	TTW show the What is the carbon cycle? video (Time: 1:25 minutes). TTW address any related questions from the students. TTW instruct the students to complete page 4 of the POGIL Nutrient Cycles. **Part III.** TTW explain and model to students how to use the Interactive Labs: Carbon Lab and Data Tables: Carbon Cycle for Lesson 1.	whole class. (This interactive activity illustrates how, through a process called fixation, nitrogen flows from the atmosphere, into the soil, through various organisms, and back to the atmosphere in a continuous cycle.) TTW ask students to explain in their own words what is occurring at each step in terms of the movement of matter (nitrogen). TTW address any misconceptions or questions students may pose from the simulation. (Teachers may use the notes on page 87 of the Teacher Edition textbook - READY TO GO Using Nitrogen.) **Part III.** TTW introduce the C-E-R by sharing the following: *The warm temperatures result in rapid growth of lawns and landscape plants, and lawn services are a booming business as a result. Some cities and counties have prohibited the sale and application of nitrogen-containing fertilizers during the summer months. Opponents of the ban say lawns need nitrogen during the summer months when most growth occurs.* (Teachers may use the notes on page 87 of the Teacher Edition textbook - DEBATE Nitrogen Ban.)

					TTW organize students, according to data, in groups of no more than 3. TTW model components of the CER using this template. TTW review the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric with the whole class and address any questions or concerns for completing the C-E-R.
Independent Practice	**Part I. Modeling Activity** Material: Poster paper and art supplies (markers, colored pencils, etc.), Laptops, tablets, or phones (for research) TTW divide students into small groups and provide each group with poster paper and art supplies. Each group will be assigned a specific level of biological organization to model. Each group will create a visual representation of their assigned level, clearly labeling and describing the components and interactions within that level. *Allow students to use laptops, tablets, or phones for research as needed. TSW address the following questions on their posters: 1. Why is it important to understand	TSW complete Activity A and Activity B of the Pond Ecosystem Gizmo. *** TTW circulate to monitor student performance and will clarify instructions as needed.**	**EXPLORE** READ WITH PURPOSE - Skimming TSW create a four-column chart with the headings "Water Cycle", "Carbon Cycle", "Nitrogen Cycle", and "Phosphorus Cycle". Students should note key points as they skim the text and study the lesson's diagrams. (pp. 82-89) *** TTW circulate to monitor student performance and will clarify instructions as needed.**	**Part II.** TSW address questions 15-20 on page 4 of the POGIL Nutrient Cycles. **Part III.** Using the simulation for the Interactive Labs: Carbon Lab, TSW complete the Data Tables: Carbon Cycle for Lesson 1. TSW use the instructions for the simulation and address the open-ended questions. **Lessons - The Carbon Cycle** - Step 1 - Step 2 - **For Your Consideration** *** TTW circulate to monitor student performance and will clarify instructions as needed.**	**Part II.** TSW read and annotate the Nitrogen Cycle Background Reading. Annotating Text **Part III.** **C-E-R: Nitrogen Cycle** Materials: White board, dry erase markers, dry eraser TSW complete a C-E-R with the Guiding Question: *Should nitrogen application be banned during summer rainy seasons in metropolitan areas?* *** TTW circulate to monitor student performance and will clarify instructions as needed.**

	biological organization levels? 2. How can human activities impact your assigned level of organization? 3. How does the concept of biological organization relate to environmental science? *** TTW circulate to monitor student performance and will clarify instructions as needed.**				
Assessment/Summary	TSW participate in **Ecological Levels of Organization Quiz** (Quizizz) **TTW use Illuminate to administer the Beginning of the Year (B.O.Y.) assessment or Unit 1 Pre-Assessment at the beginning of class.** **Homework:** **Students and their parents must review, sign, and submit the SCIENCE/STEM SAFETY ACKNOWLEDGEMENT FORM prior to the first lab.**	TSW complete the Pond Ecosystem Gizmo Assessment (5 multiple choice questions) located below the simulation on Explore Learning.	TSW participate in the Nearpod activity Time to Climb Gamified Quiz **Ecosystems: Biotic and Abiotic Factors: 9-12** (9 multiple choice questions)	TSW show their work for question #3 on page 90 for the 3.4 Assessment in the textbook. **Using Math** There are about 11,200,000 billion metric tons of O_2 in the atmosphere. Based on an estimated photosynthesis rate of 600 billion metric tons per year, how many years might it have taken to reach current O_2 levels? (Note: Assume for this exercise that the rate of O_2 production is constant even though it has changed over time.) **Answer: about 18,666 years**	TSW present their C-E-R whiteboards during a **Gallery Walk**. TTW use the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to evaluate the group's C-E-R on the whiteboard. TSW complete the following questions: 1. The atmosphere is 78% nitrogen. Why do you think plants and animals can't use nitrogen as it is found in the atmosphere? 2. Explain what is meant by nitrogen fixation. 3. What is the role of bacteria in the nitrogen cycle? 4. Why don't legumes need nitrogen-containing

					fertilizers? 5. Why is nitrogen so important for living things?
Small Group Tasks (TBA)					

Week 2					
Focused Concept: **Laws of Thermodynamics in Food Web**	**GSE:** **SEV1.b. Develop and use a model based on the Laws of Thermodynamics to predict energy transfers throughout an ecosystem (food chains, food webs, and trophic levels).** **(Clarification statement: The first and second law of thermodynamics should be used to support the model.)**				
Phenomenon: Daily **phenomena** are found in the Opening.			**DQ: Which member of an ecosystem would affect the food web the most if removed?**		
SEP: **• Developing and Using Models** **• Using Mathematics and Computational Thinking** **• Planning and carrying out investigations** **• Constructing Explanations and Designing Solutions**			**CCC:** ● **Cause and effect: Mechanism and explanation** ● **Systems and system models** ● **Energy and matter: Flows, cycles, and conservation** ● **Stability and change**		
	Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
Learning Targets:	**I can...** ● **classify organisms as producers or consumers.** ● **observe a food chain equilibrium.** ● **determine how one organism affects others in a food chain.** ● **observe how disturbing the equilibrium of an ecosystem can result in long-term population**	**I can...** ● **describe trophic levels and how they can be represented in a conceptual model.** ● **determine how the removal of different organisms will change the existing marsh food web.**	**I can...** ● **determine how the removal of different organisms will change the existing marsh food web.**	**I can...** ● **explain the roles of producers, consumers, and decomposers in an ecosystem.** ● **explain how the removal of different organisms will change the existing marsh food web.**	**I can...** ● **observe how energy is transferred through food chains.** ● **calculate the amount of energy transferred from light into plant material.** ● **calculate the amount of energy transferred from plant material to primary consumers.** ● **calculate the energy primary consumers lose during cellular respiration.** ● **use collected data to**

	fluctuations.				**demonstrate an understanding of the trophic flow of energy using energy pyramids.**
Opening	**FIGURE 2-1** **Nitrate Results** **INTERPRET VISUALS** **Reading Graphs (p. 46)** **Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see? ➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. Prompt: *The reason the experimenters graphed nitrate concentration is to show ...* TSW read the Case Study Experimenting with a Forest (p. 46). TTW ask the students to respond to the prompt using the Think-Pair-Share strategy. (The opening will serve as a review of the Day 5 lesson.) **The essential vocabulary**	**FIGURE 3-13** **Food Chain** **Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see? ➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. TTW display the diagram and provide students with the following information. *Organisms at each trophic level obtain high quality chemical energy from their food. However, about 90% of the chemical energy is lost at each link in the food chain, as required by the second law of thermodynamics.* Question 1: Where does the energy go? Question 2: How does	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see? ➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. TTW display the diagram and ask students to respond to the following question. Question: How does the Level 3 species impact the Level 1 species? **The essential vocabulary will be taught in context throughout the lesson.** **trophic cascade** **negative feedback loops** **positive feedback loops**	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see? ➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. TTW display the diagram and ask students to respond to the following question. Question: How do different types of organisms (producers, herbivores, carnivores) obtain the energy they need to survive? **The essential vocabulary will be taught in context throughout the lesson.** **Producer** **Herbivore** **Carnivore**	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see? ➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. TTW display the diagram and ask students to respond to the following questions. Question 1: How does energy move through an ecosystem? Question 2: What role does photosynthesis play in primary productivity? **The essential vocabulary will be taught in context throughout the lesson.** **first law of thermodynamics** **biomass** **productivity**

	will be taught in context throughout the lesson. **Energy pyramid** **Equilibrium** **Predator** **Prey**	(FIGURE 3-13) the food chain show that high-quality energy is not recycled? (Lesson 3.3, pages 79-80) **The essential vocabulary will be taught in context throughout the lesson.** **second laws of thermodynamics** **food web** **trophic level**			
Guided Practice/Transition	Food Chain Gizmo : Lesson Info : ExploreLearning TTW review the Prior Knowledge Questions via discussion with the students. TTW review and model the Gizmo Warm-up to the students via the Mimio Board.	**Part I.** ENGAGE SCIENCE TALK **Energy Flow** Have students open the palms of their hands and hold them very close to their cheeks, but not quite touching. Create awareness about energy flow. **Prompts:** • You feel heat on your palm because . . . • Your body releases heat because . . . • The energy your body releases as heat comes from . . . **Part II.** **Lab 11. Food Webs and Ecosystems** TTW guide the students in a discussion about what they already know about food webs. TTW model how to annotate the introduction of the ADI using the ADI Annotating Text format.	**Part I.** Science Focus 3.1 Nutrient Cycling (p. 70) TTW give students 7 minutes to read the information. TSW respond to the question. TTW guide students in a whole class discussion about the question. **Thinking Critically** **Infer** How would nutrient cycling be affected if all of Earth's producers died off? **Part II.** TTW instruct student to arrange the Food Web Matching Cards. TTW check for accuracy. TTW give students the 1.11 Food Chains and Food Webs to read and discuss with ADI group members while the teacher checks for the completion of the Food Web Matching Cards. **Part III.** **Lab 11. Food Webs and**	**Part I.** **Lab 11. Food Webs and Ecosystems** TTW review The 4 Ground Rules of Critique in Science and other protocols for providing peer feedback in preparation of groups presenting their ADI boards and peers giving feedback on sticky notes. * Ensure that students put their name or something for you to identify them for grading purposes. TTW give instruction to students on the procedure for presenting their boards. * **Gallery Walk**: One student per group presents the information while other group members rotate to other presentations. TTW used the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to evaluate the ADI board.	**Part I.** **EXPLORE** **READ WITH PURPOSE** **Get the Gist** After reading the section **Energy Changes Are Governed by Two Scientific Laws** (p. 57), ask students to write 4 sentences explaining what they just read. **checkpoint (p. 57)** **What is the difference between the first and second laws of thermodynamics?** **Part II.** **Pivot Interactives:** **Trophic Flow of Energy** TTW pair students to complete all four parts. TTW monitor student progress and provide students support for the completion of all four parts.

		Introduce the seven stages of ADI and provide a brief overview of each stage. **Task: Introduce a phenomenon to figure out and the task to complete.** **Ideas: Highlight some ideas that can be used during the investigation.** **Plan: Create, share, and revise a plan for collecting and analyzing data.** **Do: Collect the data needed and make sense of it.** **Share: Create, share, critique, and revise evidence-based arguments.** **Reflect: Discuss ways to use core ideas and practices in the future.** **Report: Write, share, critique, and revise reports about what they figured.** **Part III.** **Lab 11. Food Webs and Ecosystems** TTW organize students, according to data, in groups of no more than 3.	**Ecosystems** TTW allot students time to conduct investigation in their group. TTW model components of the CER using this template. TTW review and give the students the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to complete the ADI white board for next day presentation.	**Part II. Lab 11. Food Webs and Ecosystems** TTW provide instruction to student on how to complete the Argumentation Session Notes based on comments on sticky notes and presentations. *Sticky note instructions: TSW - write group number and initial of first and last name on sticky side - on the non-sticky side, write one question and one comment concerning the information on the presenter's board (not judging speech of presenter) **Part III. Lab 11. Food Webs and Ecosystems** TTW give students the ADI Lab 11 lab Report Outline Food Web to support their lab report completion.	
Independent Practice	TSW complete Activity A and Activity B of the Food Chain Gizmo. *** TTW circulate to monitor student performance and will clarify instructions as needed.**	**Part II.** **Lab 11. Food Webs and Ecosystems** TSW record, on the ADI Food Web Note Taking Worksheet, what they already know about food webs.	**Part II.** TSW arrange the Food Web Matching Cards. TTW check for accuracy. TSW read the 1.11 Food Chains and Food Webs and discuss with ADI group members while the teacher	**Part I.** **Lab 11. Food Webs and Ecosystems** TSW present their ADI boards while peers write comments on sticky notes to give to each group after presenting.	**Part I.** **EXPLORE** **READ WITH PURPOSE** **Get the Gist** After reading the section **Energy Changes Are Governed by Two Scientific Laws** (p. 57), students will write 4

		TSW be given no more than 15 minutes to read and annotate the introduction of the ADI using the ADI Annotating Text format. TSW complete the ADI Food Web Note Taking Worksheet based on annotating the introduction. **Part III.** **Lab 11. Food Webs and Ecosystems** TSW work on Investigation Proposal A. *** TTW circulate to monitor student performance and will clarify instructions as needed.** TTW monitor students progress and check Investigation Proposal A. TTW approve the proposal before allowing students to conduct the investigation.	checks for the completion of the Food Web Matching Cards. **Part III.** **Lab 11. Food Webs and Ecosystems** TSW be allotted time to conduct investigation in their group. TSW complete the second page of the Investigation Proposal A. Using the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric , TSW complete the ADI white board for next day presentation. *** TTW circulate to monitor student performance and will clarify instructions as needed.** TTW continuously monitor student progress in completing the ADI white board. TTW approve proposals, if needed.	**Part II.** **Lab 11. Food Webs and Ecosystems** TSW complete the Argumentation Session Notes based on comments on sticky notes and presentations. **Part III.** **Lab 11. Food Webs and Ecosystems** TSW use the ADI Lab 11 lab Report Outline Food Web to support their lab report completion. TSW complete and submit a lab report. *** TTW circulate to monitor student performance and will clarify instructions as needed.**	sentences explaining what they just read. **Part II.** **Pivot Interactives:** **Trophic Flow of Energy** TSW collaborate with their partners to complete the following activities: Part 1: Primary Productivity Part 2: Primary Consumer Part 3: Secondary Consumer Part 4: Energy Flow Through an Ecosystem *** TTW circulate to monitor student performance and will clarify instructions as needed.**
Assessment/Summary	TSW complete the Food Chain Gizmo Assessment (5 multiple choice questions) located below the simulation on Explore Learning.	**Lab 11. Food Webs and Ecosystems** TSW submit the following documents as the TTW record grades on the ADI Progression Grade Document for Day 1. • Annotation • Note Taking Worksheet • Investigation Proposal A (first	**Lab 11. Food Webs and Ecosystems** TSW submit the following document as the TTW record grades on the ADI Progression Grade Document for Day 2. • Investigation Proposal A (second page)	**Lab 11. Food Webs and Ecosystems** TSW submit the following documents as the TTW record grades on the ADI Progression Grade Document for Day 3. • Rubric • Commentary (sticky notes) • Session Notes	**Video:** **Primary Productivity and Practice Problems Explained** **TSW respond to any three of the questions from the worksheet.**

		page) **Checkpoint** 1. What does an organism's trophic level indicate about that organism? (p. 76) 2. What happens to energy as it flows through food chains and food webs? (p. 80)	Exit Ticket 1. What might happen if decomposers were eliminated from an ecosystem? 2. True or False. Plants, fungi, and bacteria are examples of decomposers. **Answer: False. Only fungi and bacteria**	Checkout Questions TSW respond to the six open-ended questions.	
Small Group Tasks (TBA)					

Week 3					
Focused Concept: **Aquatic and Terrestrial Biomes**	**GSE:** **SEV1.d. Evaluate claims, evidence, and reasoning of the relationship between the physical factors (e.g., insolation, proximity to coastline, topography) and organismal adaptations within terrestrial biomes.** **SEV1.e. Plan and carry out an investigation of how chemical and physical properties impact aquatic biomes in Georgia.** **(Clarification statement: Consider the diverse aquatic ecosystems across the state such as streams, ponds, coastline, estuaries, and lakes.)**				
Phenomenon: Daily phenomena are found in the Opening.			**DQ: What characteristics distinguish the terrestrial and aquatic biomes?**		
SEP: • **Planning and carrying out investigations** • **Developing and using models** • **Analyzing and interpreting data** • **Obtaining, evaluating, and communicating information**			**CCC:** • **Patterns** • **Cause and effect: Mechanism and explanation** • **Systems and system models** • **Stability and change**		
	Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
Learning Targets:	**I can...** • **describe the feeding relationships between 10 important**	**I can...** • **investigate the chemical and physical properties of water in aquatic**	**I can...** • **explain the role of incoming sunlight on temperature fluctuation.**	**I can...** • **research and explain the relationship between the physical factors**	**I can...** • **understand the relationship between physical factors (e.g., insolation,**

	organisms in a simplified model of a Caribbean reef ecosystem. • **model the effects of changing ocean conditions on a Caribbean reef, increased storms, elevated temperatures, and decreased pH.** • **model the effects of land use on a Caribbean reef, including logging, emission of raw sewage, and agriculture.**	**biomes** • **analyze the impact of the chemical and physical properties on the organisms and ecosystems in aquatic biomes.**	• **explain the role of water as a temperature regulator.** • **describe the relationship between albedo, the amount of energy reflected and absorbed, and temperature.** • **describe human impacts on terrestrial biomes, specifically through deforestation and urbanization.**	**and organismal adaptations in a biome.**	**proximity to coastline, topography) and organismal adaptations within terrestrial biomes.** • **identify key characteristics and examples of various terrestrial biomes.** • **interpret and analyze relevant text and visual materials.** • **discuss and explain how specific organisms adapt to their environment.**
Opening	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see? ➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. **The essential vocabulary will be taught in context throughout the lesson.** **Filter feeder**	**Video:** **Sedimentation** **Without showing the title of the video, use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see? ➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.	**Video:** **Map shows insolation during total solar eclipse** **Without showing the title of the video, use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see? ➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see? ➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. **The essential vocabulary will be taught in context throughout the lesson.** **flora**	**Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon** Ask students: ➢ What do you see? ➢ What do you think about what you are seeing? ➢ What does it make you wonder? • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. TTW ask the students the following question and ask them to explain their

	pH **Plankton** **Zooxanthellae**	**(This video shows the sediment runoff into a small creek in south Georgia during a 10 minute storm in August 2007. Notice the clear water from the naturally forested watershed upstream of the drainage ditch in contrast to the brown color of water washing into the creek from the ditch.)** **The essential vocabulary will be taught in context throughout the lesson.** **Aquatic biome** **Chemical properties** **Physical properties**	**The essential vocabulary will be taught in context throughout the lesson.** **insolation** **specific heat capacity** **urban heat island**	**fauna** **topography** **adaptation**	reasoning. **Prompt:** Which biome is depicted based on the data given in the graph? Answer: Tundra (Nome, Alaska) **The essential vocabulary will be taught in context throughout the lesson.** **biodiversity** **proximity**
Guided Practice/Transition	Coral Reefs 1 - Abiotic Factors Gizmo : Lesson Info : ExploreLearning TTW review the Prior Knowledge Questions via discussion with the students. TTW review and model the Gizmo Warm-up to the students via the Mimio Board.	**Part I.** TTW introduce the C-E-R by sharing the following video: All About Georgia's Aquatic Ecosystems (time: 8:47 minutes) TSW watch the video about the importance of aquatic biomes in Georgia and discuss key concepts. **Part II.** TTW model how to annotate the article General Threats and Conservation Actions for Aquatic Species and Habitats using the ADI Annotating Text format. **Part III.** TTW organize students into groups and assign each	**Pivot Interactives:** **Biomes and Climate** TTW pair students to complete all four parts. TTW monitor student progress and provide students support for the completion of all four parts.	**Part I.** Guiding question: **How are the physical characteristics of organisms linked to their biomes?** TTW show the video Plant Structure and Adaptations via Nearpod. Using their chromebooks, TSW respond to the prompts throughout the video. **Part II.** TTW organize the students in groups of no more than 4. TTW explain the project to the students based on the Project Rubric: Biomes in the United States. TTW either give or allow each group to choose a terrestrial biome to research. TTW either tell or allow	**Part I.** After the group presentations, TTW lead the class in an academic discussion using the questions from the Academic Discussion: Characteristics of Biomes. TSW write a paragraph (5 sentences) in response to one of the questions. **Part II.** TYING IT ALL TOGETHER (p. 94) **SCIENCE TALK** **Case Study** (p. 68) **Connections** TTW guide students to connect the Core Ideas and Skills of the lessons with the case study. Prompts: • *Ways Earth's spheres interact in a tropical*

		group a specified Georgia aquatic ecosystem (**streams, ponds, coastline, estuaries, and lakes**). TTW model components of the CER using this template. TTW review the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric with the whole class and address any questions or concerns for completing the C-E-R.		each group to choose a presentation format (ie., Google Slides, Flipgrid, Canvas Studio, etc.)	*rain forest include . . .* *• Energy and matter are transformed in a tropical rainforest by . . .* *• Ways to describe the flow of energy through a tropical rain forest include . . .*
Independent Practice	TSW complete Activity A, Activity B, and Activity C of the Coral Reefs 1 Gizmo. *** TTW circulate to monitor student performance and will clarify instructions as needed.**	**Part I.** TSW complete the Georgia's Aquatic Ecosystems video worksheet based on the video. **Part II.** TSW read and annotate the General Threats and Conservation Actions for Aquatic Species and Habitats using the ADI Annotating Text format. **Part III.** **C-E-R: Aquatic Biomes in Georgia** Using the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric, TSW conduct research on the chemical and physical properties of water and their impact on aquatic biomes in Georgia.	**Pivot Interactives:** **Biomes and Climate** TSW collaborate with their partners to complete the following activities: Part 1: Incoming Sunlight and Temperature Fluctuation Part 2: Water as a Temperature Regulator Part 3: Albedo Part 4: Human Impact *** TTW circulate to monitor student performance and will clarify instructions as needed.**	**Part II.** TSW explain the relationship between the physical factors and organismal adaptations in a biome by completing the Biomes in the United States Project according to the Project Rubric: Biomes in the United States. TSW conduct research for their terrestrial biome. They will present tomorrow. Resources: Textbook *6.2 - Biomes & Connection to Climates (pp. 163 - 175)* *** TTW circulate to monitor student performance and will clarify instructions as needed.**	**Part I.** TSW present their projects at the beginning of class. TTW evaluate the projects using the Project Rubric: Biomes in the United States. TSW take notes using the Getting to know the Biomes during the presentations. **Part II.** TYING IT ALL TOGETHER (p. 94) **SCIENCE TALK** **Case Study** (p. 68) **Connections** TSW use the table *Figure 3-23* to help them answer the six questions that follow on page 94. *** TTW circulate to monitor student performance and will clarify instructions as needed.**

		Resources: Georgia Biodiversity Portal Textbook *6.3 - Marine Ecosystems (pp. 176-181)* *6.4 - Freshwater Ecosystems (pp. 182-185)* Materials: Whiteboard, dry erase markers, dry eraser TSW complete a C-E-R with the Guiding Question: **How do the chemical and/or physical properties impact aquatic biomes in Georgia?** *** TTW circulate to monitor student performance and will clarify instructions as needed.**			
Assessment/Summary	TSW complete the Coral Reefs 1 Gizmo Assessment (5 multiple choice questions) located below the simulation on Explore Learning.	TSW present their C-E-R whiteboards during a **Gallery Walk**. TTW use the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to evaluate the group's C-E-R on the whiteboard.	TTW display the image Solar radiation or Fig 1(c): Solar Energy radiation in the form of Solar radiation Energy (p. 8 of 19) TSW write a paragraph explaining the diagram in five complete sentences. Extension: In at least three complete sentences, TSW respond to one of the	Guiding Question: How do abiotic factors determine the type of biome? Based on the evidence (Examples of Climographs (Northern Hemisphere Biomes)) provided, write a claim to address the guiding question.	**TTW use Illuminate to administer the Unit 1 Post-Assessment at the end of class.**

			following prompts: 1. What would happen if there were no clouds during the daytime? 2. How do the seasons in the temperate deciduous forest correlate to insolation?		
Small Group Tasks (TBA)					

Assessment Prep

Prepare students for assessment by reviewing the following Assessment Prep concepts.

Biotic and Abiotic Factors in Ecosystems

- Reference Chapter 3 Summary (p. 95)
  - **Section 3.2 - Levels of organization, abiotic and biotic factors, and trophic levels**
  - **Section 3.4 - Biogeochemical cycles**

Laws of Thermodynamics in Food Web

- Reference Chapter 2 summary (p. 61)
  - **Section 2.3 - Law of thermodynamics** (second bullet)
- Reference Chapter 3 Summary (p. 95)
  - **Section 3.3 - Energy in Ecosystem**

Characteristics of Aquatic and Terrestrial Biomes

- Reference Chapter 6 Summary (p. 187)
  - **Section 6.2 - Terrestrial Ecosystems**
  - **Section 6.3 - Marine Ecosystems**
  - **Section 6.4 - Freshwater systems**

Provide the following guidance:
Ask the students to use what they know about the tasks completed to answer the provided assessment prep question.

- What is the question asking you?
- What do you know about the vocabulary or concept in the question?
- Is this question similar to any investigations or tasks we've completed?
- How can what you've done help you answer this question?
- Just view the assessment question: What is the question asking you?

Guide students to think about how their experience connects to the question.
Using the answer choices provided, ask the students the following:

- Identify a wrong answer: How do I know this answer is incorrect?
- Identify the right answer: How do we know this answer is correct?

Allow the students time to discuss in collaborative groups.

Labs / Investigations

Mandatory Labs	Explore Learning Gizmo	Pivot Interactives/Phet
Lab 11. Food Webs and Ecosystems: Which Member of an Ecosystem Would Affect the Food Web the Most If Removed?	Food Chain Food Chain Gizmo : Lesson Info : ExploreLearning Coral Reefs Coral Reefs 1 - Abiotic Factors Gizmo : Lesson Info : ExploreLearning Pond Ecosystem Pond Ecosystem Gizmo : Lesson Info : ExploreLearning Forest Ecosystem Forest Ecosystem Gizmo : Lesson Info : ExploreLearning Water Cycle Water Cycle Gizmo : Lesson Info : ExploreLearning Carbon Cycle Carbon Cycle Gizmo : Lesson Info : ExploreLearning	• **Biomes and Climate** • **Nitrogen Fixation** • **Garden of Splendor** • **Trophic Flow of Energy**

Additional Resources/Tasks

Supplemental Resources	Lab 10. Predator-Prey Population Size Relationships: Which Factors Affect the Stability of a Predator-Prey Population Size Relationship? ADI Earth Science Lab 11: Cycling of Water ADI Earth Science Lab 13: Atmospheric Movement and Climate ADI Life Science - Lab 13: Carbon Cycling: Which Carbon Cycle Process Affects Atmospheric Carbon the Most? Biomes Stations and Task Cards Active Reading Workbook - Environmental Science: • The Organization of Life

POGIL - High School Biology

- Nutrient Cycles
- Biomes of North America
- Ecological Pyramids