Richmond Public Schools
Department of Curriculum and Instruction
Curriculum Pacing and Resource Guide

Course Title/ Course #: 4340 Ecology

Start day: 1

Meetings: 180 days

Course Description

This course will focus on the factors that define an ecosystem and the unique interrelationships between organisms and the non-living environmental factors affecting their development and existence. Students will be encouraged to develop a research project for entry into STEM/Science Fair**.**

Pacing Resources Assessments MP1

Time Frame	Standards of Learning	Units/ Topics/ Concepts	Resources	Assessments
3 Weeks	• EC.1a-g	**Scientific Inquiry: Experimental Design**	**Virginia Department of Education of Enhanced Scope and Sequence Lessons:** • VDOE- Scientific Process and Experimental Design: • VDOE- Safety and the Material Safety Data Sheet: • VDOE- Current Applications in Science: **Biology Corner** • Lab Safety • Lab Safety Guidelines • Introducing Inquiry and the Nature of Science • Help the Simpsons find the variables and determine the conclusion from	• **3-2-1** – Students write down on a note card 3 things they learned from today's lesson, 2 questions they have about the topic and 1 thing [they] want the teacher to know from today's lesson. • **Discussion questions**: -Explain how a scientific investigation can involve both a laboratory observation and a field observation. -Explain how a hypothesis and a theory are related. • **Postcards** – Students write a post card to an absent student explaining the key ideas presented in the day's lesson. • **Key Ideas** – Students list the key ideas from the lesson and why they were important. • **Doodles** – Students can sketch or draw 3 concepts they learned from the lesson using

			these lab scenarios Controls and Variables **Internet Activities:** • VDOE Safety Manual with sample documents: http://www.pen.k12.va.us/VDOE/Instruction/safetymanual.pdf • Using Chromatography: http://www.phys.virginia.edu/Education/outreach/8thgradesol/ChromatographyFrm.htm • Candy Chromatography http://personal.cfw.com/~rollinso/SciFood.html • Chemistry Lesson Plans with worksheets http://www.newton.mec.edu/tigerscience/chem/Chemhomepage.htm http://www.sciencenetlinks.com/ Writing Lab Reports: • http://www.columbia.edu/cu/biology/faculty/mowshowitz/howto_guide/lab_report.html • http://slhs.lafourche.k12.la.us/mstp/Chemistry/How%20to%20write%20a%20lab%20report.pdf • http://www.science.smith.edu/departments/Chem/Courses/labreports.htm • http://www.mhhe.com/biosci/genbio/maderinquiry/writing.html • Two more scenarios on the scientific method are in these Scientific Method Stories	words or images. • **Gallery Walk** – Students create a graphic organizer or infographic to represent their learning. Students then post them on the wall for students to get up and view different visual representations of understanding. • **Comic Strip** Students create a comic strip that illustrates the content. • **Discovery Streaming** Students will watch Discovery Streaming videos and will answer discussion questions regarding the video. **Online Assessment Tools** • Question based technology applications: Socrative Plickers Kahoot! Poll Everywhere Piazza • Performance -based tasks • Teacher observation of students engaged in cooperative learning investigations • KWL • Class created science rubrics • Science notebooks • Informal assessment through observation of students' participating in hands -on • Use of vocabulary in the classroom discussions. • **Collage or Poster-**Ask students to make a collage or poster from magazine photos for demonstrating understanding of a concept. • **Metacognition Table-**At the end of class, each student answers the following questions presented to them on index cards: 1. What did we do in class? 2. Why did we do it? 3. What did I learn today?

			• Scientific Method Vocabulary is found at Scientific Method Steps & Vocabulary • Here are brief notes on Scientific Method with a simple example of using the method. • Krusty Krab & Other Bikini Bottom Experiments and Sponge Bob Science variables give great lab scenarios that students use to identify dependent & independent variables and controls. • NOTES: Steps of the Scientific Method • Identify the Controls and Variables • Solving that Problem • DO this Interactive Tutorial on the Scientific Method • Read What is "Good Science"? • Scientific Method is a good presentation to cover the basics of the scientific method and it comes with a Question Guide **Experience Science with Explore Learning**: **Graphs and Statistic-Reaction Time 1** • http://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=1028 **Graphs an Statistics-Reaction Time 2** • http://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=1009 **Weight and Mass** • http://www.explorelearning.com/gizmo/id?653 **Determining Density via Water**	4. How can I apply it? 5. What questions do I have about it? • **Journal entry** -Have students write a summary of what they learned. • **Discussion questions**: Explain how a scientific investigation can involve both a laboratory observation and a field observation. Explain how a hypothesis and a theory are related • **Twitter Board-**Students summarize what was learned in a lesson using 140 characters. Pin small strips of paper to a poster or corkboard to resemble a Twitter feed. • **Vocabulary development: visual flashcards** • **Vocabulary quiz** • **Text-based reading: Task/question cards** • **Graphic organizers** • **Scientific articles: questions & discussion** • **Class discussion/Q & A** • **Analogie**s A useful formative assessment strategy is to ask students to create an analogy between something they are familiar with and the new information they have learned. When asked to create an analogy for an atom, students may come up with an atom being like a community. The nucleus of the atom is like your immediate family. The electrons that fly around the nucleus are like members of the community that you may or may not interact with on a regular basis. Asking students to explain their analogies will show the depth of their understanding about a topic. • **Roll the Die-**Put a die at each desk. At the end of class, each student rolls and briefly answers aloud a question based on the number rolled: 1. I want to remember … 2. Something I learned today 3. One word to sum up what I learned 4. Something I already knew 5. I'm still confused about …

			Displacement • https://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=400 **Triple Beam Balance** • https://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=385 **Density via Comparison** • https://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=396 **Science Live binder:** http://www.livebinders.com/play/play?id=270464 • Scientific Method & Genetics has students gather group data, manipulate and graph the data, and then draw a conclusion from this. • Students learn to form a hypothesis, conduct experiments around that hypothesis, and collect and analyze data with Scientific Method & Blood Flow • In Vitruvian Man student's task is to design an experiment to test one of more of Vitruvius's theories • This is a good web quest on the Scientific Method. **The Nature of Science** • What is Science?- Notes • The Nature of Science- Powerpoint • Why Do We Need Science Anyway?- Article	6. An "aha" moment that I had today • **Misconception Check-**Present students with common or predictable misconceptions about a designated concept, principle or process. Ask them whether they agree or disagree and explain why. The misconception check can also be presented in the form of a multiple-choice or true-false quiz. • **Student Conference-**One on one conversation with students to check their level of understanding. • **Debriefing-**A form of reflection immediately following an activity. 1. Graphic organizers 2. Content quizzes 3. Drawings & diagrams • **Open Ended Questions-**Asking questions that require more than simple yes-or-no responses encourages students to use their higher-order reasoning skills. Additionally, when students are asked questions like "Does this make sense?" or "Do you understand?", they may answer "yes" even if they need more help • Graphic organizers • Content quizzes • Drawings & diagrams (cells, tissues) • Cell models • Demonstrations (cell transport) • Guided practice using terminology • **S-O-S Summary-**An S-O-S Summary is an assessment that can be used at any point in a lesson. The teacher presents a statement (S), asks the student's opinion (O) (whether the student agrees or disagrees with the statement), and asks the student to support (S) his or her opinion with evidence. This summary can be used before or during a unit to assess student attitudes, beliefs, and knowledge about a topic. It can be used at points throughout a unit or lesson to assess what students are coming to understand about the topic. And it can be used at the end of a unit to see if

			• Vocabulary Terms- Science Skills **Scientific Method** • Introduction to the Scientific Method- Powerpoint • Scientific Method- Powerpoint • Looking at Data - Notes • Scientific Inquiry- Lesson • Designing an Experiment- Notes • Experiments- Notes • Identifying Variables-Powerpoint • Variables- Notes • What is a Variable- Notes • Hypothesis- Notes and Worksheet • Hypotheses- Notes and Worksheet • Collecting Data- Notes • "Save Fred"- Lab **Graphing** • Introduction to Graphing- Lesson • Presentation of Data- Powerpoint • Graphing- Powerpoint • Line Graphs- Lesson • Line Graphs- Worksheet • Double Line Graphs- Worksheet • Bar Graphs- Lesson • Bar Graphs- Worksheet • Double Bar Graphs- Worksheet • Pie Graphs- Lesson • Pictographs- Lesson • Pictograph- Worksheet • Bar Graph- Graphic • Line Graph- Graphic • Circle Graph- Graphic • Pictograph- Graphic	attitudes and beliefs have been influenced or changed as a result of new learning. • **Two Stars and a Wish-**After discussion of the work, ask each student or group to write down two stars (areas where the work excelled) and a wish (an area where it may be improved) about a peer's project or essay. • **Bullet List-**At the end of a lesson, encourage students to itemize three things that he or she didn't understand about the material. Students may write down their responses or send them electronically via a classroom edtech system. After writing them down, you may also ask them to share their questions with the class to provide an opportunity for peer feedback. • **Quiz Bowl-** To hold a bowl of your own, separate the class into teams. Use a buzzer, bell, or raised hands for teams to answer, with each correct answer earning the team points. • **Mini Meetings-**Meet with each student, perhaps even for a few minutes or once per week, to discuss a specific assignment or concept. Allow them to ask questions and receive feedback. Scheduling these meetings while the rest of the class is working on a project ensures learning continues for all students. • Vocabulary development: visual flashcards • Vocabulary quiz • Text-based reading: • Task/question cards • Lab Constructed • Response/Literacy • Graphic organizers • Content quizzes

			• Creating Graphs with Excel Spreadsheet Basics • Making a Column Graph • Making a Pie Chart • Copying an Excel graph to a Word document **Scientific Notation and the Metric System** • Scientific Notation- Lesson • The English/Metric System- Notes • The Metric System- Powerpoint • Using the Metric System- Worksheet • Metric Chart- Notes • Metric Conversion Chart 1- Notes • Metric Conversion Chart 2- Notes **Measurement- Length, Volume, Mass, Time, Temperature** • Measuring Length- Powerpoint • Metrics and Measurement- Notes • Scientific Notation- Lesson • Scientific Measurement (Part 1)- Powerpoint • Scientific Measurement (Part 2)- Powerpoint • Measurement- Powerpoint • Measurement- Notes • Length- Notes • Metric Ruler- Graphic • Metric Conversion- Worksheet • Measuring Volume- Worksheet • Volume- Powerpoint • Meniscus- Graphic • Mass- Lesson	• Class discussion/Q & A • **A Quick Check Quiz-** Ask student to answer questions that will demonstrate their mastery of material. Their responses will help you determine if it is time to move on, divide students into groups, provide more examples, or identify students that need a little extra help. • **3x Summarization-**To check understanding, ask students to write three different summaries: One in 10-15 words One in 30-50 words One in 75-100 words. The different lengths require different attention to details. Compare/ contrast with peers/ look at teacher model (via document camera.) • **Venn Diagram-**Have students compare and contrast a topic using a Venn diagram. • **Hand in, pass out-**Ask students questions, have them respond on notebook paper anonymously. Students then hand their papers in. Teacher immediately, randomly gives them back to students for grading. Students get practice grading others work, but shouldn't know who is who. Teacher then takes informal poll about how many questions students answered correctly. • **Caption Photos-**Choose three photos that represent a process. Ask students to caption each photo. • **Four Corners-**This is a great way to encourage dynamic movement while learning multiple-choice questions. Designate each corner of the classroom to represent A, B, C, and D. Students go to the corner that they believe corresponds with the correct answer. • **Stop & Go Cards-**Students create index cards with a large green marker circle on one side and red on the other. If they are following along and understanding the lesson, the green side of their card is upright and visible to you. When they do not understand something and need clarification, they flip the card to show you the red side. • Vocabulary development: Visual Flashcards

			• Measuring Mass, Volume, Density- Worksheet • Mass and Weight- Powerpoint • Weights and Measurements- Notes • Mass vs. Weight- Notes • Measuring Mass- Powerpoint • Measuring Time • Measuring Temperature- Worksheet • Temperature Scale- Notes • Volume- Powerpoint **Density** • How do we Measure Density • Density of a Regular Solid- Lesson • Density of Liquid- Notes • Density- Powerpoint **Scientific Tools** • Scientific Tools 1- Notes • Scientific Tools 2- Notes • Scientific Tools 3- Notes • Scientific Tools 4- Notes • Scientific Tools 5- Notes • Triple Beam Balance • Practice Using a Triple Beam Balance- Interactive Website • Microscope Diagram • Thermometer • Beakers- Graphic • Microscopes- Powerpoint • Triple Beam Balance- Graphic **Lab Safety** • Lab Safety Procedure • Lab Safety- Quiz pg.1 • Lab Safety Symbols- Notes	• Vocabulary quiz • Text-based reading: Task/question cards • Lab Constructed Response/Literacy • Graphic organizers • Content quizzes • Demonstrations • Class discussion/Q & A • Scientific & current events news articles/literacy: questions & discussion • Close Read/Literacy: Lab Safety • Characteristics • Video questions &discussion • Side Partner review • Peer collaboration • Entrance/Exit Ticket • **Mini-whiteboards** Each student, or groups of students, has a mini-whiteboard. As they work through problems, they can share them either with you as a class, or you can walk around the classroom and see their work. • **My Favorite No** Assign students a warm up problem or two. Hand out index cards to the students. Sort the index cards into yes/no piles. Choose your favorite no response and analyze it as a class. • **Create something** This is similar to checking for transfer. Have students build/create something that requires that they apply what they have learned. • **Chalkboard Splash** Numerous students respond to a prompt/question on the chalkboard. • **Thumbs up, middle, or down** Ask the class if they understand a concept. If they (think) they get it, thumbs up. If they are not sure,

			• Lab Safety- Quiz pg.2 • Lab Safety- Quiz pg.3	thumbs middle, if they don't get it, thumbs down. • **Two Roses and a Thorn:** Name two things that you liked about a chapter, lesson, etc. and one thing you did not like or you still have a question about.
4 Weeks	• **EC.2a-f**	**Studying Earth**	• Display a bag of soil, a beaker of water, a stoppered test tube filled with air, a potted plant, and a photograph of an animal. 1. Ask the students what each these objects have in common. Explain that each object represents a distinct and interesting part of Earth. 2. Have the students list ways in which they think each object relates to Earth. Tell students that they will revise their list over the next several weeks. • Display a world map, a globe, and a photograph of Earth as seen from space. Have students study the three views of Earth and write a paragraph in their notebooks or journals explaining how the information conveyed by each view differs. • Ask students to use the Earth models to speculate about what percentage of the Earth is covered by land and what percentage is covered by water. • Have the students add this information to their notebooks or journals. • Ask students to make a list of features of Earth that are not	• **S-O-S Summary**-An S-O-S Summary is an assessment that can be used at any point in a lesson. The teacher presents a statement (S), asks the student's opinion (O) (whether the student agrees or disagrees with the statement), and asks the student to support (S) his or her opinion with evidence. This summary can be used before or during a unit to assess student attitudes, beliefs, and knowledge about a topic. It can be used at points throughout a unit or lesson to assess what students are coming to understand about the topic. And it can be used at the end of a unit to see if attitudes and beliefs have been influenced or changed as a result of new learning. • **Laundry Day**-This is a strategy where students evaluate their own learning in preparation for a chapter or unit test. They group themselves in the classroom around four different kinds of laundry detergent: Tide, Gain, Bold and Cheer. In their chosen corner they will work on activities to enrich or improve their understanding of the required content. The teacher can readily assess the students' level of understanding of the basic concepts covered in the unit or chapter. The teacher provides support as needed, as well as help being provided by students who are sure they have mastered the content. None of the work generated during this time counts as a grade, but students are scaffolded to increase their chances of success on the upcoming test.

			• shown on the models. Tell students over the next several weeks week will focus on the many features of Earth. • Arrange students in groups of three. Provide each groups with a stack of old magazines a. Write the terms land, water, and air on the chalkboard and have the students cut out five examples of organisms that live in each kind of environment. b. Tell the students to combine their examples with those of other students to create a classroom bulletin board display. c. On the chalkboard, create a concept map that shows the components of the biosphere. d. Write the term *biosphere* near the top of the chalkboard. Draw a circle around the term. e. Write the *terms lithosphere, hydrosphere, and atmosphere* below, and circle each term. Connect the circles into a concept map. f. Write the words *life-supporting zone, land, water, and air* beside the appropriate circle. g. Have students copy the concept map into their notebooks. • Divide the class into eight approximately equal-sized groups. Assign each group a planet, other than Earth, on which to conduct library research. • Have each group find the following information for their planet: • distance from the sun, • period of revolution, • period of rotation, • whether the planet has seasons, • the type of atmosphere, and	• **Appointment Clock-** The teacher directs students to find thee people with whom to schedule appointments at the quarter hour, the half hour, and the 45-minute mark. The teacher begins the lesson and provides information to move students to higher-order thinking. The teacher determines the stopping point and asks students to meet with their quarter hour appointment to discuss their thinking about a couple of questions the teacher has posed. The teacher walks around and listens to the conversations taking place between partners, noting any misconceptions or misunderstandings. The teacher uses this information to adjust instruction by redirecting the next segment of the lesson. Students meet with their half hour appointment and the teacher conducts the same informal observation and adjusts the third section of the lesson. Students continue this process until the lesson is complete. By structuring a lesson in the manner, the teacher is able to determine the current level of understanding for the class and for individual students, and make immediate adjustments to instruction to assist students in their learning. • **Think-Pair-Share-** During the "think" stage, the teacher tells students to ponder a question or problem. This allows for wait time and helps students control the urge to impulsively shout out the first answer that comes to mind. Next, individuals are paired up and discuss their answer or solution to the problem. During this step students may wish to revise or alter their original ideas. Finally, students are called upon to share with the rest of the class. There is also a Think-Pair-

			• surface temperature. • Ask each group to predict whether the planet is capable of supporting life. • Have each group prepare and present a power point presentation to present their planet. (Arty the part time astronaut activities can be use here also) **Internet Activities:** • Online Activity (see hard copy) Give each student copy of the hard copy and have the go to the following web address to complete the activity: http://www.powayschools.com/projects/mt&r/TreasureHunt.cfm. The Earth's Treasures: An Ecology Treasure Hunt: The Earth's Treasures is an interactive activity for students. It exposes students to several current environmental issues, asks them to identify treasures in their own community, and encourages them to make a personal commitment to help the environment. • Cool Ecology Worksheets http://www.biologycorner.com/worksheets.php • Ecology Hot List http://www.powayschools.com/projects/mt&r/hotlist.htm • Planet Earth Quiz #21. Brain Drains. Click on the answer bars to reveal the answers! 1. How many years old is **planet earth**? Answer: 4,600,000,000. www.funology.com/braindrains/bd021.	Square-Share. In this strategy, partners discuss answers with another pair before sharing with the class. This activity ensures that all students are interacting with the information. Teachers can use this activity in the formative assessment process as they walk about the room listening to student conversations. • **Stop & Go Cards**-Students create index cards with a large green marker circle on one side and red on the other. If they are following along and understanding the lesson, the green side of their card is upright and visible to you. When they do not understand something and need clarification, they flip the card to show you the red side. • Vocabulary development: Visual Flashcards • Vocabulary quiz • Text-based reading: Task/question cards • Lab Constructed Response/Literacy • Graphic organizers • Content quizzes • Demonstrations • Class discussion/Q & A • Scientific & current events news articles/literacy: questions & discussion • Close Read/Literacy: Lab Safety • Characteristics • Video questions &discussion • Side Partner review • Peer collaboration • Entrance/Exit Ticket • **Mini-whiteboards** Each student, or groups of students, has a mini-whiteboard. As they work through problems, they can share them either with you as a class, or you can walk around the classroom and see their work. • **My Favorite No** Assign students a warm up problem or two. Hand

			htm Earth Fact • http://www.space.com/scienceastronomy/101_earth_facts_030722-1.html. **Writing Lab Reports:** • http://www.columbia.edu/cu/biology/faculty/mowshowitz/howtoguide/lab_report.html • http://slhs.lafourche.k12.la.us/mstp/Chemistry/How%20to%20write%20a%20lab%20report.pdf • http://www.science.smith.edu/departments/Chem/Courses/labreports.htm • http://www.mhhe.com/biosci/genbio/maderinquiry/writing.html	out index cards to the students. Sort the index cards into yes/no piles. Choose your favorite no response and analyze it as a class. • **Create something** This is similar to checking for transfer. Have students build/create something that requires that they apply what they have learned. • **Chalkboard Splash** Numerous students respond to a prompt/question on the chalkboard. • **Thumbs up, middle, or down** Ask the class if they understand a concept. If they (think) they get it, thumbs up. If they are not sure, thumbs middle, if they don't get it, thumbs down. **Online Assessment Tools** • Question based technology applications: Socrative Plickers Kahoot! Poll Everywhere Piazza • Performance -based tasks • Teacher observation of students engaged in cooperative learning investigations
2 Weeks	• EC. 1a-g, EC. 2a-f	• **Review/Reteach /Assessment**	**Review objectives**	**Summative Assessment**

Pacing Resources Assessments MP2

Time Frame	Standards of Learning	Units/ Topics/ Concepts	Resources	Assessments
3 Weeks	• EC.3a-e	• Change in the Biosphere	**Inquiry Activity**: What Happens to Household Trash? 1. Have Students look through the contents of a bag containing roughly the amount of dry trash produced per person each day in the United States. 2. Students sort the trash into items that can be reused, items that can be recycled, items that can be composted, and items that must be discarded because they cannot be recycled or composted in Richmond. **3. Questions for students to answer with lab group:** • Which materials make up most of the trash? Does this reflect the amount and types of trash you produce? • What do you think happens to the trash you produce? Think of at least three ways in which trash can have an impact on living things. • List three ways you can reduce the amount of trash you produce. • (Draw a timeline representing the age of the earth on a strip of paper about 5 m long. Use a scale of 1m=1 billion years and 1mm= 1million years. Compare the time frame of human history with the time frame of Earth's history. Point out that Earth has undergone many changes since its formation. Have student's research specific changes and add the information to the timeline. • Ask students to describe some natural disasters that have occurred over the past two years. Examples may include forest or brush fires, floods, earthquakes, volcanic eruptions and storms, such as hurricanes and tornadoes. Ask students to describe changes to the environment in the areas in which these disasters occurred. Lead students to focus on how organisms other than humans are affected by such changes. • Use a map showing crustal plates to discuss how the seven major plates and thirteen smaller plates are floating on the lower part of the mantle. Use sheets of multicolored paper to demonstrate what happens when these plates collide. With the paper, also demonstrate the mountain-building process of folding and faulting and the process of sea-floor spreading.	**Online Assessment Tools** ***Question based technology applications:*** Socrative Plickers Kahoot! Poll Everywhere Piazza • Performance - based tasks • Teacher observation of students engaged in cooperative learning investigations • Group discussions • Student reports • Writing Assignment • Lab Reports • Rubrics • Skits

			• Display a live goldfish, plant, small mammal or reptile beside a model or photograph of the same organism. Ask what characteristics are used to identify something as living (ex. Respiration, nutrition, stimulus response, excretion, development, maintaining homeostasis, metabolism, circulation, and growth.) Remind students that nonliving things do not carry out all these activities. Explain that organisms get the energy and materials needed for these activities from the environment. • On the chalkboard, construct a chart with the headings *Organisms, Materials Needed for Life, and Sources of Life Materials*. List the following organisms in the first column: *frog, fish, owl, and dandelion*. Complete the chart as a class. Discuss the completed chart and instruct students to copy it into their notebooks for use as a study tool. • Allow a plant to grow on a windowsill. Tell students that a plant gets energy from the process of photosynthesis. Explain that light energy for this process comes from the sun, and that the leaves of a plant seek light by turning and bending toward the sun. Demonstrate this phenomena, called phototropism, by having students observe the plant for 48 hours and discuss how the position of the leaves change. • Have the students design three separate controlled experiments to show that a plant needs three of the following: nutrients, air, water, light, living space, or a proper temperature. Instruct students to include a control and predict the outcomes of each experiment. After receiving approval, have students carry out their experiments. Beans, grasses and radishes are fast-growing plants easily grown from seed. • Have student write a 2-3 paragraph conclusion, summarizing what was illustrated in the labs, and what information or insight you gained from it. Remind them not to summarize the procedure, except as necessary to explain you conclusion. • Have students create a Public Service Announcement: Making a difference in your environment. **Have students to write questions in notebooks** • What is the difference between a renewable and a nonrenewable resource? • List two human activities that affect land resources, and explain the	• **Stop & Go Cards**-Students create index cards with a large green marker circle on one side and red on the other. If they are following along and understanding the lesson, the green side of their card is upright and visible to you. When they do not understand something and need clarification, they flip the card to show you the red side. • Vocabulary development: Visual Flashcards • Vocabulary quiz • Text-based reading: Task/question cards • Lab Constructed Response/Literacy • Graphic organizers • Content quizzes • Demonstrations • Class discussion/Q & A

			changes that can result. • Do the same for air and water resources. How does the decline in world fisheries represent a "tragedy of the commons?" • Identify two ways in which environmental resources are important to human health. **Plate Tectonic Movie** • http://home.earthlink.net/~mjkrech/Krech/plate.htm • http://www.cbv.ns.ca/marigold/history/dinosaurs/drift.html **Plate Tectonic Activities** • http://www.quia.com/jg/262313.html • http://www.math.montana.edu/~nmp/materials/ess/geosphere/expert/activities/planet_earth/ **Geological Timeline** • http://www.ucmp.berkeley.edu/help/timeform.html • http://www.sdnhm.org/fieldguide/fossils/timeline.html **Geological Timeline Activities** • http://www.enchantedlearning.com/subjects/Geologictime.html • http://www.acad.carleton.edu/curricular/BIOL/classes/bio302/Pages/Timestring.html	• Scientific & current events news articles/literacy: questions & discussion • Close Read/Literacy: Characteristics • Video questions &discussion • Side Partner review • Peer collaboration • Entrance/Exit Ticket • **Mini-whiteboards** Each student, or groups of students, has a mini-whiteboard. As they work through problems, they can share them either with you as a class, or you can walk around the classroom and see their work. • **My Favorite No** Assign students a warm up problem or two. Hand out index cards to the students. Sort the index cards into yes/no piles. Choose your favorite no

				response and analyze it as a class. • **Create something** This is similar to checking for transfer. Have students build/create something that requires that they apply what they have learned. • **Chalkboard Splash** Numerous students respond to a prompt/question on the chalkboard. • **Thumbs up, middle, or down** Ask the class if they understand a concept. If they (think) they get it, thumbs up. If they are not sure, thumbs middle, if they don't get it, thumbs down.
4 Weeks	• EC 4a-h	• Ecological Interaction	• Obtain a copy of a chart that identifies and explains the four food groups, or a copy of the "eat right" pyramid, from a health teacher. Display the chart or pyramid and ask students the names of the organisms from which each food is derived. Use the exercise to lead students to recognize that all of the foods they eat come from other	• **The Probe**-. The probe itself consists of a question prompt, choices for

			organisms. Continue this exercise until it is established that the ultimate energy source for all human food is the sun. • On the chalkboard, make a list of producers such as grass, trees, clover, and lettuce. Make a second list of consumers such as cows, deer bison and elephants. List lions, tigers, pythons and wolves in a third column. Ask students to state the common characteristics of the organisms in each list. Point out that organisms are sometimes classified according to how they obtain energy. • Set up a row of dominos on a table. Ask students to speculate about why the dinosaur became extinct. Explain that one hypotheses about dinosaur extinction is that many plants died when large amount of dust entered the atmosphere, blocking out the sunlight. Push over the first domino so that all the dominoes fall and explain the lack of sunlight became scarce, plants began to die as plants starved to death. Animals that fed upon plant-eating animals also starved. In time almost all the organisms died. • Have student write a 2-3 paragraph conclusion, summarizing what was illustrated in the tag activity, and what information or insight you gained from it. Remind them not to summarize the procedure, except as necessary to explain you conclusion. **Food Web/chains resources** • http://www.eagle.ca/~matink/themes/Biomes/foodweb.html **Writing Lab Reports:** • http://www.columbia.edu/cu/biology/faculty/mowshowitz/howto_guide/lab_report.html • http://slhs.lafourche.k12.la.us/mstp/Chemistry/How%20to%20write%20a%20lab%20report.pdf • http://www.science.smith.edu/departments/Chem/Courses/labreports.htm • http://www.mhhe.com/biosci/genbio/maderinquiry/writing.html • Using colored chalk: construct an ecological pyramid on the chalkboard. Label each trophic level and include the names of plants and animals that represent each level. Be sure students are able to distinguish between the producers and consumers. Using actual numbers, trace the amount of energy lost at each higher level of the	students to select as a response, direction to the student for selecting a response, and a request to the student to elaborate the thinking or reasoning they used in making their answer choice. • **Checklists** - Class checklists are a great tool for collecting data about students during a unit of study. Before beginning a new unit, make a list of all the skills students will need to demonstrate mastery of the unit's outcome(s). On a chart, list the students names down the left hand side and the skills across the top. Clip the chart to a clipboard and position it in an easily accessible place. As students are participating

			pyramid. Show how the amount of energy affects the number of organisms each level can support. • **Have the students work in cooperative groups to construct three-dimensional food pyramids. Suggest the use of boxes, colored paper, photographs from magazines, or original artwork. Tell the students to label each trophic level in the pyramid.** • Make a poster of a food web in your community. Then create two ecological pyramids, and a pyramid of numbers and a biomass pyramid. Ask the students to study a food web diagram. Have students use the food web to construct three food chains. Based on the food chains, ask students to create ecological pyramids and then summarize the relationship between biomass, energy, and number of organisms in an ecosystem. • Have students conduct a research project on an ecological topic of interest to them (student must obtain parent/teacher permission). Students should receive a grading rubric. • Ecological Pyramid http://www.4j.lane.edu/~whitley/ecology/units/units.html http://www.eduhound.com/ewarchives/111303.html http://www.suder.cps.k12.il.us/science_bookmarks.htm http://www.sturgeon.ab.ca/rw/Pyramids/pyrakind.html • Writing Lab Reports: • http://www.columbia.edu/cu/biology/faculty/mowshowitz/howto_guide/lab_report.html • http://slhs.lafourche.k12.la.us/mstp/Chemistry/How%20to%20write%20a%20lab%20report.pdf • http://www.science.smith.edu/departments/Chem/Courses/labreports.htm • http://www.mhhe.com/biosci/genbio/maderinquiry/writing.html • Have students work in cooperative groups to create a visual display that shows the water, carbon and nitrogen cycles. • Students will review the water cycle with the "Water Cycle Boogie" Song Activity • What is the role of plants in a water cycle? • Have student write a 2-3 paragraph conclusion, summarizing what was illustrated in the labs, and what information or insight you gained from it. Remind them not to summarize the procedure, except as necessary	in various learning opportunities, observe the students and check off the skills you see students demonstrating with proficiency. • **Choral Response** - If you need a quick assessment of student understanding, ask students to respond to a series of questions "as a class." If you listen carefully to the number and content of responses, you will get a good idea of whether or not the students are clear on what you are presenting. • **Cloze Procedure** - The cloze procedure can be used to determine the level of student understanding regarding a particular topic or

			to explain you conclusion. **Water Cycle Lessons** • http://faldo.atmos.uiuc.edu/w_unit/LESSONS/water.cycle.html **Carbon-Oxygen Cycle Lessons** • http://library.thinkquest.org/11226 • http://www.agricola.umn.edu/anpl3010/3010carbon.htm • http://www.cotf.edu/ete/modules/carbon/efcarbon.html **Nitrogen Cycle Lessons** • http://www.cnr.colostate.edu/~bobw/sam_o_l/Ecosystems/econitro.htm • http://www.scienceman.com/scienceinaction/pgs/hot_7u1.html **Writing Lab Reports:** • http://www.columbia.edu/cu/biology/faculty/mowshowitz/howto_guide/lab_report.html	unit of study. Create or use a passage that relates to the unit. Make sure the passage is at a readability level for your students. Two or three passages at different readability levels may be needed to accommodate all the students in your class. • Vocabulary development: Visual Flashcards • Vocabulary quiz • Text-based reading: Task/question cards • Lab Constructed Response/Literacy • Graphic organizers • Content quizzes • Demonstrations • Class discussion/Q & A • Scientific & current events news articles/literacy: questions & discussion • Close Read/Literacy: • Characteristics • Video questions &discussion • Side Partner review

				• Peer collaboration • Entrance/Exit Ticket • **Mini-whiteboards** Each student, or groups of students, has a mini-whiteboard. As they work through problems, they can share them either with you as a class, or you can walk around the classroom and see their work. •
2 Weeks	• EC. 3 a-e, EC. 4 a-h	**Review/ Reteach/Assessment**	Review Objectives	Summative Assessment

Course Title/ Course #:4340 Ecology

Pacing Resources Assessments MP3

Time Frame	Standards of Learning	Units/ Topics/ Concepts	Resources	Assessments
5 Weeks	• EC.5a-g	• Ecological Interactions	• Ask students to think of what the phrase "survival of the fittest" means. Discuss responses as a class. Point out that this phrase is often used to describe one of the components oh Darwin's theory of evolution. Explain that according to this idea, the most well-adapted organisms in a population survive to reproduce and pass their successful traits to their offspring. Have students explain how the idea of the "survival of the fittest may relate to the principle of competitive exclusion. • Ask students to define the term habitat. (A habitat is a place within an ecosystem where an organism lives.) Next ask the students to define niche. (A niche is the role an organism plays in its environment). You may tell students that they can think of an organisms' habitat as its address within an ecosystem. Its niche can be thought of as its job. Have students use this analogy to state their habitat and niche. • Habitats and Niches http://www.press.uchicago.edu/cgi-bin/hfs.cgi/00/15593.ctl http://www.reachoutmichigan.org/funexperiments/agesubject/lessons/fishhead.html • Evolution http://www.indiana.edu/~ensiweb/evol.fs.html • Have student write a 2-3 paragraph conclusion, summarizing what was illustrated in the labs, and what information or insight you gained from it. Remind them not to summarize the procedure, except as necessary to explain your conclusion. • Construct a collage of density-dependent limiting factors of human population. Use pictures and graphs and magazine, and also work with short article or captions. Organize your collage so that different types of density-dependent factors occur together.	**Concept Maps** - Concept ps are a type of web that vides a visual representation of dent understanding about a ticular topic being studied. ogle "concept maps graphic anizers" for a variety of ntable concept maps that your dents can use. Students print the ic or main idea in the oval in the ter of the page. They then write porting details in the spaces rounding the center oval. pending on the age and ability he students, they can also group ilar supporting details together. **Conferences** - Student derstanding can be formatively essed using one-on-one ferences with each student in r class or with select students whom you want to further ess their learning. Determine r target questions ahead of time nsure you are gathering rmation related to your goal or come. **Computer Surveys** -. Create short response questions - e/false, multiple choice, or one rd completion questions, and a platform like Survey Monkey reate the assessment. Survey nkey allows you to see ividual responses as well as viding a summary of class ponses.

				Demonstration Stations - dway through a unit on gnets, set up a number of ions and have students nonstrate how much they lerstand about the topic. At each ion, the students could also lain their thought processes to or write their thoughts in a ence journal. **Discussions** - Focus the cussions on higher level nking skills and give students a minutes to reflect on their rning before beginning the cussion. Encourage students to re what they have learned and w that knowledge may have an act on their daily lives. instorm ways that the wledge could be transferred to er subject areas or situations the dents may come across. **Teach a Friend -** A good tegy for determining if students lerstand a concept or process is have them teach it to a friend. dents need to think about the wledge and skills needed for lerstanding and include that rmation in their teaching. Pair dents up and have them "teach" ir partner about the concept or cess. **Journal entry** -Have dents write a summary of what y learned. **Discussion questions**: lain how a scientific estigation can involve both a oratory observation and a field servation.

				lain how a hypothesis and a ory are related Twitter Board-Students nmarize what was learned in a son using 140 characters. Pin all strips of paper to a poster corkboard to resemble a Twitter d. Vocabulary development: ual flashcards Vocabulary quiz Text-based reading: k/question cards Graphic organizers Scientific articles: questions discussion Class discussion/**Q & A** **Analogie**s A useful formative essment strategy is to ask dents to create an analogy ween something they are niliar with and the new ormation they have learned. nen asked to create an analogy an atom, students may come up h an atom being like a nmunity. The nucleus of the m is like your immediate nily. The electrons that fly und the nucleus are like mbers of the community that may or may not interact with a regular basis. Asking students explain their analogies will w the depth of their derstanding about a topic. **Roll the Die-**Put a die at each k. At the end of class, each dent rolls and briefly answers

				ud a question based on the nber rolled: I want to remember … Something I learned today One word to sum up what I rned Something I already knew I'm still confused about … An "aha" moment that I had ay **Misconception Check-** sent students with common or dictable misconceptions about a ignated concept, principle or cess. Ask them whether they ee or disagree and explain why. e misconception check can also presented in the form of a ltiple-choice or true-false quiz. **Student Conference-**One one conversation with students heck their level of derstanding. **Debriefing-**A form of ection immediately following activity. Graphic organizers Content quizzes Drawings & diagrams **Open Ended Questions-** king questions that require more n simple yes-or-no responses courages students to use their her-order reasoning skills. ditionally, when students are ed questions like "Does this ke sense?" or "Do you derstand?", they may answer s" even if they need more help Graphic organizers Content quizzes

				Drawings & diagrams (cells, ues) Cell models Demonstrations (cell transport) Guided practice using minology **S-O-S Summary-**An S-O-S mmary is an assessment that can used at any point in a lesson. e teacher presents a statement , asks the student's opinion (O) nether the student agrees or agrees with the statement), and s the student to support (S) his ner opinion with evidence. This mmary can be used before or ing a unit to assess student tudes, beliefs, and knowledge out a topic. It can be used at nts throughout a unit or lesson assess what students are coming understand about the topic. And an be used at the end of a unit to if attitudes and beliefs have n influenced or changed as a ult of new learning.
2 Weeks	• EC.6a-h and EC.7a-e	• Biomes	• Show students photographs of spider webs. Ask students why spiders build webs. Develop an understanding that spiders construct webs to capture prey, usually insects. Use this example to discuss the roles of predator and prey. • http://www.teacherstryscience.org/lp/dynamic-population-dynamics • Have student write a 2-3 paragraph conclusion, summarizing what was illustrated in the labs, and what information or insight you gained from it. Remind them not to summarize the procedure, except as necessary to explain you conclusion. • Have students do library research to find names of ten common parasites that affect people. Have students create a table in which they name the parasites and describe any related diseases.	

			• Ask student to describe what happens to a lawn or garden that is left untended for a long time. Use their descriptions to introduce the idea that landscapes undergo change over time. Explain that such changes in the landscape over time are called succession. • Point out to students that the action of wind, water, of seeds to a new idea. Extend the discussion by having students conduct library research to find out what adaptations seeds have to aid in their dispersal. • Show students a piece of Velcro. Explain to students that the inventor of Velcro got the idea for the produce from his observation of seeds that stick or cling to clothing and animal's fur. • Have students working in cooperative groups use photography, sketches, or other materials to create models that show the stages in one of the kinds of succession. • Take your students on a day hike, preferably to the oldest forest community in your immediate area. While on your hike make observations about the vegetation and habitat. Predict what the area may have been like 100 years ago and what it may be like a 100 years from now. • Write the following terms on the chalkboard: temperature, predators, sunlight, water, and parasite. Have students predict how an ecosystem would be affected by an increase or decreased in each of these factors. • Students are given a medical case study to review and write a script describing the scenario. They will also analyze the case and create a diagram that illustrates the interaction between the invading antigen and the immune system. • As a class or in small groups, review the terms associated with the immune system. • Distinguish between viruses and bacteria. Explain the similarities and differences in the way they affect the immune system. • Discuss how the immune response contributes to homeostasis. • Debate whether mass inoculation is worth the risk of the few who die each year as a result of receiving a vaccination. • Students should respond to the following prompt in their journals (written on the board prior to class): "How has the media's focus on the shark attacks that occurred in the affected you? Are you more aware or afraid of being attacked by a shark yourself? Do you think	

			that there was an increase in shark attacks this summer, or do you think there was more awareness about them because of media attention to them? What factors do you think might be the cause of the summer's shark attacks?" After a few minutes, encourage students to share their answers. Jot down responses to the last journal question on the board for later reference. • The Center for Marine Conservation (http://www.cmc-ocean.org/) aims to protect ocean ecosystems and conserve the global abundance and diversity of marine wildlife. • Wildlife Conservation Society (http://www.wcs.org), which runs the Bronx Zoo and the New York Aquarium, works to save wildlife and wild lands throughout the world. • Living Oceans (http://www.audubon.org/campaign/lo/), the marine conservation program of the National Audubon Society, uses science-based policy analysis, education, and grassroots advocacy to put science to work on behalf of marine fish and ocean ecosystems • Have students use the data regarding climate and location of the various land biomes to predict the types of organisms that will live in each biome. Have students organize their predictions into a table or chart. • Have students use library sources to find a novel with the setting in a particular land biome. Have students read and write a report about the book they chose, pointing out how the characteristics of the biome affected the story. • Have student write a 2-3 paragraph conclusion, summarizing what was illustrated in the labs, and what information or insight you gained from it. Remind them not to summarize the procedure, except as necessary to explain your conclusion. • Have students identify a city that they would like to visit in each biome shown on the map. Challenge students to use that data regarding climate to identify five articles of clothing that would be appropriate to the climate conditions. • Have students use the data regarding climate and location of the various land biomes to predict the types of organisms that will live in each biome. Have students organize their predictions into a table	

			or chart. • Have students use library sources to find a novel with the setting in a particular land biome. Have students read and write a report about the book they chose, pointing out how the characteristics of the biome affected the story. • Have student write a 2-3 paragraph conclusion, summarizing what was illustrated in the labs, and what information or insight you gained from it. Remind them not to summarize the procedure, except as necessary to explain your conclusion. • Have students identify a city that they would like to visit in each biome shown on the map. Challenge students to use that data regarding climate to identify five articles of clothing that would be appropriate to the climate conditions. • **Biomes** of the World - **Activities** **...** into poems about the importance of the **biomes** and the interdependence of the cycles of the earth and the creatures on it. www.teachersfirst.com/lessons/**biomes**/**activities**.html • Land **Biomes** **...** deserts. Brain Pop's Land **Biomes** This site allows the user to watch a cool cartoon and try **activities** about land **biomes**. Brain **...** www.state.sd.us/deca/DDN4Learning/ ThemeUnits/Biomes/**activities**.htm • **Activities** - **Biomes** of Minnesota: Minnesota DNR **...** What **biome** does your community belong to? 1. Look at the map, find the county where you are, check which **biome** your county is in. **...** www.dnr.state.mn.us/**biomes**/**activities**.html • **Biome**/Habitat Animal Printouts - EnchantedLearning.com **...Biomes** Calendar A calendar to print, color, and read. **...** Habitats/**Biomes**. The **...** Animals. An Enchanted Learning Web Page **Biomes** - Habitats. **...** www.enchantedlearning.com/**biomes**/ • Quia - Geography World - Ecosystems / **Biomes** Geography World - Ecosystems / **Biomes**. terms related to the world's living ecosystems and **biomes**. Create your own **activities**	

			Email this **activity** to a friend. **...** www.quia.com/jg/515.html • **Biomes** Lesson Plans **Biomes** Lesson Plans. **...** at Sea, Year of the Ocean, Education World (tm) - Lesson Planning:Celebrate the Year of the Ocean - eighteen **activities** for students to **...** www.picadome.fcps.net/lab/teacherl/lesson_plans/**biomes**/default.htm • Students may invent an animal or plant perfectly suited for survival in a desert environment. They must draw or build this organism and explain how it is perfectly suited either in writing or an oral presentation. • Have student write a 2-3 paragraph conclusion, summarizing what was illustrated in the labs, and what information or insight you gained from it. Remind them not to summarize the procedure, except as necessary to explain you conclusion. • Have students use their own sketches or pictures cut from magazines to create a desert scene that includes desert flora a fauna. Tell students to include labels that identify the annual temperature and precipitation data for their desert. • Read today's weather report. Have students name the factor that determines weather (temperature, precipitation, cloudiness, humidity, wind speed and direction, and air pressure). List these factors on the chalkboard. Ask students to define climate. Lead students to recognize that weather is a short-term description of atmospheric conditions, while climate decries long-term weather patterns. • Demonstrate how a sponge absorbs water from a beaker of water. Have students observe how the water levels, in the beaker changes as the sponge absorbs water. Tell students that air acts like a sponge in that it students that air acts like a sponge in that it removes moisture from soil as it moves over land. • Using a map of North America, describe how maritime polar air masses form over cold ocean regions, while tropical maritime air masses form over waters near the equator. Also identify continental polar air masses that equator. Explain that movement of these air masses is responsible for weather conditions. • Distribute graph paper and tell students they will be plotting data as	

			follows: Average monthly temperature will be plotted as a line graph. On the same sheet of paper, average monthly rainfall will be plotted as a bar graph. Provide students with the following data for Point Barrow, Alaska. Rainfall in cm: Jan, 1.25; Feb, 2.0; Mar, 1.5; Apr, 2.0; May 1.75; Jun, 1.75; Jul, 2.5; Aug, 2.5; Sep, 2.0; Oct, 2.0; Nov, 1.25; Dec, 1.5. Temperature in C: Jan, -29; Feb, -27; Mar,-23; Apr, -23; May, -18; Jun, -7; Jul, 2; Aug, 6; Sep, 4; Oct, -1; Nov,-12; Dec, -21. • Have students use their plotted data to describe the conditions of the tundra biome. • Display samples of moss or lichens and distribute small clumps of grasses to student working in groups of three. Have students examine the root or rhizoid system that the plans use to absorb water. Note that a thick, shallow root ground's surface. Tell students that deep roots would have difficulty penetrating the permafrost of the tundra. • Have students grow and display plants they develop using vegetative propagation methods. Sweet potatoes, carrots, tulips, and forsythia are excellent plants for such project. • Have students examine a bird migratory flyway map and elicit explanations of why birds make these long trips. Contact a local birding club for a copy of local flyway maps or obtain copies of the maps from a birding book. Relate bird migration to migrations of other animals. Have students explains why migration is so important to tundra animals. • **Ecosystems** www.eagle.ca/~matink/themes/Biomes/systems.html**Tundra** www.enchantedlearning.com/**biome**s/**tundra**/**tundra**.shtml www.enchantedlearning.com/painting/**tundra**.shtml - www.eagle.ca/~matink/themes/Biomes/**tundra**.html	
2 Weeks	• EC. 5a-g, EC.6a-h, EC.7a-e	• **Review/ Reteach/Assessment**	**Review objectives**	Summative Assessment

Course Title/ Course #:4340 Ecology

Pacing Resources Assessments MP4				
Time Frame	**Standards of Learning**	**Units/ Topics/ Concepts**	**Resources**	**Assessments**
2 Weeks	• EC.8a-f	• Biomes	• Ask students what they think a prairie schooner might be. Explain that this name was given to the covered wagons used to move people and their household goods across the grassland of central North America during the 1800's. Tell them that a schooner is a type of ship. Explain that the word prairie comes from a French word meaning "Grasslands." The people who traveled in covered wagons thought they were like ships that carried them over a sea of grass. • Using a world map, have students locate the Great Plains of the United States, the Russian steppes, the South African veldt, and the Argentinean pampas. Point out that all these areas are prairies. Show photographs of prairies and have students develop a list of prairie characteristics. • Divide students into groups of three. Instruct them to use paper to make two funnels ant to place the funnels into the tops of two 50 mL graduated cylinders. Have them place some sand into the other funnel and the same amount of sod into the other. Then have them slowly pour 30 ml of water into each funnel and measure the amount of water that empties into each graduated cylinder. Have students determine the absorption capabilities of the sand and the soil. Ask students to relate their result to the impact of overgrazing and poor farming techniques. • Have students identify animals that inhabit grasslands. Direct students to identify whether these animals are helpful or harmful in maintaining the grassland biome. Have students justify their responses. • Have students construct a climatogram using the following data from a prairie region of Wyoming. Remind students that a climatogram shows temperature on a line graph and precipitation on a bar graph. Have students use their climatogram to describe the climate conditions on a prairie. • On the chalkboard, construct a chart comparing steppes and prairies. Include data about climate, height of grass, type of grass, and other conditions.	

1.5 Weeks	• EC.9a-f	• Biomes	• Have students collect pictures of animals that live in coniferous forest. Ask students to work in cooperative groups to contract food chains and food webs with the pictures. • Have students prepare a chart with two columns. In one columns have them list the major environmental factors affecting the plants and another column have them list the adaptations each plant or animals has for surviving in its biome. • Have student write a 2-3 paragraph conclusion, summarizing what was illustrated in the labs, and what information or insight you gained from it. Remind them not to summarize the procedure, except as necessary to explain you conclusion. • Assign students the task of surveying their neighborhoods for evergreen trees. Have students collect samples of different kinds of needles and cones and use a field guide to identify the types of coniferous tree each sample came from. Instruct students to mount some of their specimens for exhibition along with a short factual report. • Display a can of coffee, a chocolate bar, a banana, a rubber band, quinine tablets, and samples of rosewood, ebony, balsa, teak, or mahogany. Ask students what these items have in common. Point out that all are products of a tropical rain forest. • Display a large world map and point out the locations of the different climate zones. Have students use the climate zone information to describe the latitudes where tropical rain forest exists. • Have students construct a climatogram using the following data obtained from a tropical rain forest near Singapore. Have students use the climatogram to describe the conditions of this biome. • Have students make a diagram that shows the vertical levels of a tropical rain forest. Point out that although many animals can move easily from one level to the next, most tend to remain within one level. Discuss the reason for this behavior. • Have student define deforestation. Hold a pro and con discussion about rainforest destruction taking into account the various viewpoints of people and governments in the rainforest regions, as well as the viewpoints of people outside to rainforest regions. • On Which side of a tree do lichens grow? • Have student write a 2-3 paragraph conclusion, summarizing what	

			was illustrated in the labs, and what information or insight you gained from it. Remind them not to summarize the procedure, except as necessary to explain you conclusion. • Have students make a chart summarizing the characteristics of a rain forest. Have them include abiotic and biotic factors that describe this biome.	
2 Weeks	• EC.10a-d	• Biomes	• Display a goldfish in a small bowl. Ask students what factors must be considered when keeping a goldfish as a pet. Make sure students mention fresh water. Discuss what makes fresh water different from salt water. Tell students that the amount of salt in the water is called the salinity**.** • Allow a tall cylinder of cold water to remain standing at the front of the classroom. Have students observe the bubbles that form in the water as the water warms. Gently heat a test tube before the water begins to boil. Point out that the bubbles are air that was dissolved in the water. Explain that air dissolved in water provides the gases needed for aquatic organisms to carry on respiration. • Make a Secchi disk using the top of a gallon paint can. Fit a screw eye through the center of the lid and divide the lid into four sections. Paint opposite sections black and the others white. Explains to student that a Secchi disk is a device used to devices used to determine the depth to which light penetrates in an aquatic ecosystem. Point out that in dirty or polluted water, visibility disappears nearer to the water surface than in cleaner, unpolluted water. • Demonstrate that tap water contains dissolved salts by evaporating some tap water in an evaporating dish. Have students observe the resultant particles in the dish. • Have students summarize the factors used to characterize aquatic biomes. ask how these factors differ from those used to describe land biomes. • List the names of the kinds of aquatic ecosystems on the chalkboard in two columns. Place rivers, streams, and creeks in one column. Place lakes, ponds, marshes, and swamps in another column. Ask students what criteria were used for grouping these environments. Lead students to see that one column lists types of	

			standing-water ecosystems while the other column list types of flowing-water ecosystems. • Ask the class to define wetland and then give examples and descriptions of different types of wetlands. List the examples and descriptions on the chalkboard. Have students copy this information in their notebooks. As a homework assignment, have student list representative types of plants and animals for each wetland ecosystem	
2 Weeks	• EC.11a-f	• Biomes	• Ask students to speculate about what life would be like in a totally aquatic environment. You may want to refer to examples form Jules Verne's novel 20, 00 Leagues Under the Sea. • Have students design an underwater city in which they provide habitats for families, a means of transportation, schools, and farms. • Have students create drawings of the designs and make a bulletin board or other visual display. • Display pictures of ocean animals such as whales and tuna. Ask students what these animals have in common. Ask students what part of the ocean these animals are likely to frequent. • Place a 100 mL beaker on a tripod and fill it with cold water. Using tongs, place a small crystal of potassium permanganate into the water. Allow the crystal to settle on the bottom of the beaker and gently heat the beaker directly below the crystal. Have students observe the motion of the warm and cold water indicated by the movement of the color through the beaker. Relate the movement to the concept of density currents. • Ask students to name as many of the major oceans and seas as they can. Make a list of names on the chalkboard. Distribute outline maps of the world and have students label the locations of these oceans and seas. On the same map, have them draw and label the major ocean currents. • Draw a box on the chalkboard and tell students it represents the oceanic zone. Divide the zone into three sections: the photic zone, the aphotic zone, and the benthic zone. Ask students the names and characteristic of each zone and write this information in the appropriate box.	
1.5 Weeks	• EC.8a-f, EC.9a-f,	• **Review/Final Exam**	**Review objectives**	**Summative Assessment**

	EC.10a-d, EC.11a-f			

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