TEACHER PREPARATION OVERVIEW

SUSTAINABILITY: CHANGING HUMAN IMPACT

Listed below is a summary of the activities in this introductory sequence. Note that the total teaching time as listed is 5–9 class sessions (approximately 1–2 weeks if you teach the activities as recommended every day). Because this is an introductory unit that builds fundamental skills that students will revisit throughout the course, we recommend that the total teaching time not exceed two weeks.

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
1	**INVESTIGATION: Changing Landscapes** Students examine maps and additional data on changing land use practices around the world and develop a working definition of sustainability.	**sustainable / sustainability**	Decide whether to use the cards provided in the kit or to use computers in conjunction with Student Sheet 1.2, "Directions for Using the Global Forest Watch Website," to conduct the activity.	1–2
2	**LABORATORY: Measuring Human Impact** Students test soil samples in the laboratory to investigate the effects of different land use practices on sustainable land use.	**control** sustainable / sustainability **trade-off**	Conduct sample test to confirm the freshness of the testing solution and to determine if distilled water is needed. Gather a local soil sample if desired.	2–3
3	**INVESTIGATION: Our Global Community** Students analyze data on a series of global indicators across regions of the world and apply their use to sustainability.	**economic pillar** **environmental pillar** **indicator** **pillars of sustainability** **social pillar** sustainable / sustainability	Post region signs around the classroom.	1–2
4	**MODELING: Sustaining the Commons** Students use a hands-on model to explore the impact of different fisheries practices in order to identify sustainable solutions.	**common resource** trade-off		1–2

TEACHER PREPARATION OVERVIEW

ECOLOGY: LIVING ON EARTH

Listed below is a summary of the activities in this unit. Note that the total teaching time as listed is 33–38 class sessions* (approximately 7–8 weeks if you teach the activities as recommended every day).

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
1	**PROBLEM SOLVING: Establishing a Baseline** Students use hands-on models to learn how to estimate population size.	**fishery** population	Determine a method for polling students. Fill a jar with one type of small object, such as marbles, pennies, or beads—enough so that it's impossible to count all of them directly. Decide if students will use the poster or the online simulation. If using the poster, place sticky notes over the numbers. Determine when to order live specimens for Activity 6. Prepare the Student Sheet. Gather calculators, one for each pair of students.	2–3
2	**COMPUTER SIMULATION: Population Growth Models** Students use a hands-on model and computer simulations to explore models of population growth.	**carrying capacity (*K*)** **exponential growth** **intrinsic growth rate (*r*)**	Preview the simulation. Prepare Student Sheets.	2–3
3	**COMPUTER SIMULATION: Factors Affecting Population Size** Students use a computer simulation based on actual data to explore factors affecting population size among song sparrows.	abiotic biotic **brood parasites** **inbreeding**	Preview the simulation. Preview the video. Prepare Student Sheets.	2
4	**MODELING: Scaling Up: Ecosystems** Students read about four ecosystems that exist at different scales, from global to a microbiome.	boundary component ecosystem interaction scale **system** **system model**	Prepare the Student Sheet.	1–2
5	**INVESTIGATION: Patterns of Biological Diversity** Students examine maps of species diversity and compare them to maps of a range of abiotic factors that may influence the patterns students observe in the data.	biological diversity	Prepare Student Sheets.	2

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
6	**LABORATORY: Producers and Consumers** Students use cards to develop a model ecosystem for orcas. They refine their models based on the living and prepared plankton specimens they observe, using a microscope.	**biomass** consumer energy fishery food web matter producer	Order specimens (if you haven't already). Check the plankton sample to determine if methyl cellulose is needed. Obtain a local pond water specimen, if possible. Decide how students will work with the prepared plankton slides. Gather microscopes, one for each student pair. Prepare Student Sheets.	2
7	**INVESTIGATION: The Photosynthesis and Cellular Respiration Shuffle** Students use cards to explore the cellular processes of photosynthesis and cellular respiration.	cellular respiration consumer photosynthesis producer sugar	Prepare Student Sheets. Try to obtain a document camera.	2
8	**READING: Life in the Dark** Students read about an ecosystem that is based on chemosynthesis rather than photosynthesis.	**chemosynthesis** energy matter photosynthesis	Preview the video. Obtain an online or print article to model the Read, Think, and Take Note strategy. Gather sticky notes, 3–5 per student.	2
9	**MODELING: Modeling Energy Flow in Ecosystems** Students read and analyze a series of scientific findings to develop a model for energy flow in ecosystems.	**ecological efficiency** **gross productivity** **net productivity** system model **trophic levels**	Prepare the Student Sheet.	2
10	**INVESTIGATION: Crossing Ecosystem Boundaries** Students read about the complex life cycle of Chinook salmon and develop a mathematical model to explain the impact of these fish on both ocean and stream ecosystems.	energy matter system model trophic level	Gather chart paper. Gather sticky notes in four colors. Preview the video. Prepare the Student Sheet.	2
11	**MODELING: Ecosystems and the Carbon Cycle** Students develop a model to explain how carbon cycles among all four of Earth's subsystems.	atmosphere biosphere **carbon cycle** hydrosphere lithosphere	Prepare the Student Sheet.	2

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
12	**MODELING: Rebalancing the Equation?** Students revise their models to incorporate the effect of human activity on the carbon cycle. They discuss ways that human impact might be mitigated.	atmosphere biosphere carbon cycle hydrosphere lithosphere	Gather red pens or colored pencils, one per student.	2
13	**INVESTIGATION: Ecosystems at the Tipping Point** Students read about the resilience of the Yellowstone ecosystem after the 1988 fire, then watch a video about the collapse of the Aral Sea ecosystem. Students compare and contrast the two cases.	**anthropogenic** disruption **resilient** **resistant** stable	Preview the video and determine whether to show some or all of it. Prepare Student Sheets.	2
14	**INVESTIGATION: The Great Lakes Ecosystem** Students conduct research using a curated set of resources to examine the status of the Great Lakes ecosystem and the potential threat from invasion by invasive carp species.	disruption resilient resistant stable	Preview the video. Decide if you will have students work individually, in pairs, or in groups for the research component. Preview the annotated list of websites for student use. Obtain a map or globe showing the Great Lakes. Prepare Student Sheets.	2–3
15	**MODELING: Is Aquaculture a Solution?** Students use a hands-on model to explore the role of aquaculture in sustainability efforts.	**aquaculture** **criteria** **constraints**	Preview the video clips. Prepare the Student Sheet. Gather graph paper, 1 sheet per student.	2
16	**READING: Sustainable Fisheries Case Studies** Students read case studies of four different approaches to sustainable fisheries.	aquaculture ecosystem **marine reserve**	Decide whether and how to assign students to a case study. Prepare Student Sheets. Gather sticky notes, 3–5 per student.	2–3
17	**PROBLEM SOLVING: Making Sustainable Fisheries Decisions** Students use a hands-on simulation to design, monitor, and refine a plan for restoring and maintaining a fictional fishery.	ecosystem fisheries management population sustainability	Decide how you will distribute indicator cards to each group. Separate the cards ahead of time so they are readily available to hand out. Preview the video and decide if you will show it as a culminating activity for this unit. Prepare Student Sheets.	2

* If the carbon cycle is covered in a different course in your school, you might choose to omit Activities 11 and 12; this would shorten the total teaching time by 4 class sessions.

TEACHER PREPARATION OVERVIEW

CELLS: IMPROVING GLOBAL HEALTH

Listed below is a summary of the activities in this unit.Note that the total teaching time as listed is 31–42 periods* (approximately 6–8 weeks if you teach the activities as recommended every day).

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
1	**INVESTIGATION: Survival Needs** Students investigate the effects of extreme heat by imagining a survival scenario in a desert and ranking the importance of 13 items (such as food, water, and clothing) for survival.	extreme heat event **feedback loop** function sustainability	Consider modifying the desert survival scenario. Prepare Student Sheets.	2
2	**LABORATORY: Everyday Hydration** Students conduct an investigation of plant cells to explore the effects of changing conditions on homeostasis at the level of the cell.	**accuracy** cell dehydration hydration organ **precision** **reliability** **reproducibility** structure system tissue	Prepare red onion slices and set up microscopes and scissors for student use. Develop a classroom safety plan. Prepare for disposal of all materials. Prepare the Student Sheet.	2–3
3	**CASE STUDIES: Homeostasis Disrupted** Students explore three case studies on infectious and noninfectious diseases that explain how disruptions to homeostasis can result in illness or be caused by illness.	**disease** **homeostasis** **infectious** model **negative feedback loop** **noninfectious** sustainability **thermal energy vector**	Gather sticky notes, 12–20 per student. Prepare Student Sheets. Consider preparing a list of human body systems as a reference for students.	2
4	**INVESTIGATION: Body Systems in Balance** As students sort cards representing levels of organization in the human body system, they develop models of four different systems—cardiovascular, digestive, respiratory, and endocrine—at varying levels of organization and scale.	cell homeostasis levels of organization model organ system tissue	Consider providing students who need more time processing language a set of cards in advance. Prepare Student Sheets.	1–2

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
5	**LABORATORY: Evidence of Disease** Based on their observations of the blood cells of normal individuals and individuals with disease symptoms, students construct causal explanations of how structural changes observed at the cellular level can lead to disruptions in the function of tissues, organs, body systems, and the organism and thereby disrupt homeostasis.	cell disease infectious levels of organization **microbe** sustainability system tissue	Set up microscopes for student use. Prepare the Student Sheet as needed.	1–2
6	**COMPUTER SIMULATION: Specialized Cells and Disease** Students use a computer simulation to explore how specialized cells and their specialized protein components carry out normal functions on a cellular level.	cell disease infectious levels of organization noninfectious organelle tissue	Arrange for computers with Internet access for use by each pair of students. Preview the "What Do Specialized Cells Do?" simulation. Prepare Student Sheets. Decide whether groups will present one or more of their models and whether to provide additional time for groups to design more formal presentations.	2
7	**READING: Homeostasis and Medical Treatment** The worldwide spread of COVID-19 (caused by the novel coronavirus) highlights many issues related to global health, sustainability, and science. Students read about the effect of the disease on interacting systems and their functions.	cell disease homeostasis infectious levels of organization model negative feedback loop noninfectious sustainability system **vaccine**	Prepare Student Sheets.	1–2
8	**INVESTIGATION: Feedback Loops in Humans** Students plan and conduct an investigation to gather data on how human body systems—specifically, the circulatory and respiratory systems—interact to maintain homeostasis.	feedback loop homeostasis model qualitative quantitative sustainability system	Provide students with access to calculators and a wall clock or watch that displays seconds. Determine where you will conduct the activity (i.e., indoors or outdoors, in the classroom or another space) [If you recorded them yourself] Gather students' responses to the driving question from Activity 3. Prepare Student Sheets as needed.	2

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
9	**INVESTIGATION: Global Nutrition** Students interpret data to identify global disparities in the food supply and explain the impacts of an unhealthy food supply on human homeostasis related to energy balance.	feedback loop homeostasis **macronutrients** **malnutrition** **micronutrients** **nutrition**	Arrange for computers with Internet access for use by each pair of students. Provide students with access to calculators as needed. Prepare the Student Sheet.	2
10	**LABORATORY: Burning Calories** Students investigate the energy stored in food by measuring the energy transferred from food to the environment when the food is burned.	**calorie** **Calorie** **nutritional sustainability** product reactant **stored energy** thermal energy	Gather materials, including sample food labels, food items for students to burn, aluminum cans, wire coat hangers (or ring stands and clamps), wooden matches or gas lighters, and tongs or pot holders. Gather chemical splash goggles for each student. Find out in advance whether any of your students have food allergies. Construct a sample calorimeter (or prepare a class set of calorimeters). Experiment ahead of time with lighting a food item. Decide how groups will obtain matches or lighters. Review Procedure Steps 1–6 and set up the required materials. Review the Safety notes; ensure that you have adequate ventilation and tools on hand to extinguish flames. Prepare Student Sheets.	3–4
11	**INVESTIGATION: How Plants Make Food** Students more closely examine the process of photosynthesis through experiments from the history of science.	**chemical energy** energy photosynthesis sustainability	Consider providing students who need more time processing language a set of cards in advance. Prepare Student Sheets as needed.	1–2
12	**LABORATORY: Photosynthesis and the Environment** Students design and conduct an investigation of how environmental variables affect the rate of matter cycling and energy flow due to photosynthesis.	accuracy photosynthesis precision reliability reproducibility sustainability	Gather materials, including spinach (and/or ivy) leaves, dish soap, and a balance. Be sure that students will have at least one source of heat and one source of light during the activity. Make 0.1% bicarbonate solution. Gather chemical splash goggles for each student. Prepare Student Sheets as needed.	2–3

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
13	**TALKING IT OVER: Feeding the World's Population** Graphs and data sets provide multiple models from which students construct preliminary explanations of the changing supply and quality of food.	nutritional sustainability	Prepare Student Sheets.	2
14	**LABORATORY: Investigating Cellular Respiration** Students plan and carry out an investigation of respiration by germinated beans to produce data that will serve as evidence for the continual need for cellular respiration by bean plants.	accuracy cellular respiration photosynthesis precision reliability reproducibility sustainability	Germinate beans at least two days in advance. Consider germinating a small sample prior to when you need them to determine approximate germination rate. Gather chemical splash goggles for each student. Have water of varying temperatures (and ice, if possible) available during the lab. Dilute phenol red for the demonstration. Decide what variables students may test and how you will have students share their data. Prepare Student Sheets as needed.	2–3
15	**INVESTIGATION: Energy for Life** Students continue to build their disciplinary knowledge about cellular respiration, and they use models to develop explanations for the flow and conservation of energy transferred from food to an organism.	**aerobic cellular respiration** **anaerobic cellular respiration** atom **ATP** **bond** **chemical bond** **chemical energy** energy molecule thermal energy	Construct a model of a water molecule. Gather sticky notes, 6–10 per student. Consider reviewing physical science middle and high school standards to decide whether to make connections to chemistry concepts during the activity. Prepare Student Sheets as needed.	2–3
16	**MODELING: Matter for Cells** Students use evidence from cards to develop models that explain how the body uses matter from food as a source of both energy and matter.	**amino acid** atom **complex carbohydrate** energy matter molecule protein sugar	Prepare the Student Sheet.	2–3

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
17	**TALKING IT OVER: Designing Solutions: World Health** Students apply the concepts they have learned over the course of the unit to develop an integrated approach to human health, using a case study as a model.	disease extreme heat event infectious **integrated approach** noninfectious sustainability	Consider doing an online search for relevant local news articles. Decide whether to provide additional time for students to design their proposals and if groups should construct a more formal proposal to present to the class. Prepare Student Sheets as needed.	2–3

* If students have previously investigated the variables that affect the rate of photosynthesis and its impact on food supply and quality, you may choose to omit Activities 12 and 13; this would shorten the total teaching time by 4–5 class sessions.

TEACHER PREPARATION OVERVIEW

GENETICS: FEEDING THE WORLD

Listed below is a summary of the activities in this unit. Note that the total teaching time as listed is 23–34 periods* (approximately 4½–7 weeks if you teach the activities as recommended every day).

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
1	**INVESTIGATION: Superweeds! Where Did They Come From?** Students brainstorm, generate, and consider different ways that superweeds could have gotten into Farmer Green's fields.	**herbicide** **superweed**	Prepare Student Sheets.	1–2
2	**LABORATORY: Creating Genetically Modified Bacteria** Students genetically modify a population of *E. coli* and read a case study about genetic engineering.	**biofuel** DNA gene **gene expression** **genetic engineering** **genetically modified organism (GMO)**	Order live materials in time for class use. Prepare Student Sheets. Prepare LB-only and LB-ampicillin plates. Prepare *E. coli* source plates. Prepare tubes of plasmid and $CaCl_2$. Decide how students will share the ultraviolet light source. Gather materials for student groups and prepare water bath.	2–3
3	**MODELING: Mitosis and Asexual Reproduction** Students work with an online simulation and physical models to explain the process of mitosis.	asexual reproduction centromere chromatid chromosomes daughter cells **mitosis** parent cell	Preview the mitosis simulation. Locate additional mitosis simulations. (optional) Prepare Student Sheets.	1–2
4	**INVESTIGATION: Breeding Corn** Using the traditional model of the Punnett square, students analyze and predict the results of genetic crosses for one trait and are introduced to the concept of *selective breeding* as one way to improve crops.	**alleles** **dominant** **Punnett square** **recessive** **selective breeding** sexual reproduction trait	Prepare Student Sheets.	1–2

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
5	**INVESTIGATION: Breeding Corn For Two Traits** Students continue their investigation of patterns of heredity, expanding their model from the last activity to explore two inherited traits, and they read about the history of selective breeding in corn.	llele **dihybrid cross** gamete **genome** genotype phenotype Punnett square selective breeding trait	Laminate the corn ears and gather dry-erase markers. (optional) Prepare Student Sheets.	2
6	**TALKING IT OVER: How Did This Happen? Class Consensus** Students draw on their understanding of genetic inheritance to generate a class consensus explanation of how superweeds most likely arrived in the farmer's corn fields and were able to spread.	genetic engineering genome phenotype Punnett square selective breeding trait	None	1
7	**MODELING: Protein Synthesis: Transcription and Translation** Students use cards, physical models, and online simulations to explore the molecular process of protein synthesis and what happens inside a plant's cell when a genetic modification is introduced.	**amino acid** DNA **mRNA** mutation protein **protein synthesis** RNA **transcription** **translation** **tRNA**	Prepare Student Sheets. Preview the protein synthesis simulation. Photocopy the Transcription and Translation cards. (optional)	2–3
8	**MODELING: Cell Differentiation and Gene Expression** Students use a physical model to investigate gene expression as it relates to cell differentiation in different cell types.	chromosome **differentiation** DNA expressed (gene) gene expression **repressed (gene)** **stem cells** **transcription factor**	Prepare Student Sheets.	1–2

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
9	**MODELING: Explaining Herbicide Resistance in Weeds** Students revise and refine their models of genetic modification to include information at the level of DNA, genes, and proteins.	DNA gene **transgene migration**	None	1
10	**MODELING: Burning Calories** Students read about enzymes and generate a model to compare normal and genetically modified enzyme structures.	DNA **enzymes**	Cut chenille stems in fourths. Wrap ends of coated wire in electrical tape. Prepare Student Sheets.	2
11	**Investigation: Meiosis and Sexual Reproduction** Students use a computer simulation and pop-bead models to investigate the phases of meiosis.	chromosome **crossing over** daughter cell DNA **gametes** gene **meiosis** mitosis parent cell	Prepare Student Sheets. Preview the meiosis simulation.	1–2
12	**READING: Genes and Chromosomes** Students deepen their understanding of genetic variation as a result of meiosis through a reading about genes and chromosomal behaviors.	chromosome crossing over **diploid** gamete gene **haploid** karyotype meiosis mitosis **nondisjunction** **polyploidy** somatic cells	Prepare Student Sheets.	1
13	**LABORATORY: Which Plant is Genetically Modified?** Students use gel electrophoresis to determine whether gene migration is responsible for herbicide resistance in the weeds from Farmer Green's fields.	DNA gel electrophoresis gene mutation transgene migration	Decide whether to show students an online simulation of the gel electrophoresis process. Prepare Student Sheets. Prepare buffer solution and gels at least 1 day beforehand. Decide whether to have students practice with pipettes before beginning lab.	3

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
14	**INVESTIGATION: Genetically Modified Organisms and Biodiversity** Students analyze data that shows how weed and insect populations have changed prior to and after reports of superweeds being present in fields.	biodiversity	None	1–2
15	**READING: Benefits and Trade-Offs of Genetically Modified Organisms** Students collect evidence to support their ability to make recommendations and, if appropriate, to seek alternative solutions to GMO farming. Students read four case studies that highlight some benefits and trade-offs of GMOs.	**CRISPR** gene genetic modification trade-off	Prepare the Student Sheet.	1–2
16	**TALKING IT OVER: Evaluating Genetically Modified Organisms** Students analyze and interpret data gathered from four scientific studies on a fictitious genetically modified soybean. Students evaluate and compare the studies and examine the potential benefits and trade-offs of growing this GMO.	genetic engineering trade-offs	Prepare an electronic copy Student Sheet 16.1 to project and fill in, or devise another method to collect and display this information. Prepare Student Sheets.	1–2
17	**TALKING IT OVER: Alternatives to GMO Farming** Students read about four farming proposals being considered by an agricultural board that ensures sustainable food production and biodiversity in Farmer Green's county. Students participate in a Walking Debate and make a recommendation supported by evidence about which proposal should go forward.	biodiversity genetic modification monoculture transgene trade-off	None	1–2

* If your students had robust instruction in middle school on genetic crosses and Punnett Squares, you might choose to omit Activity 4 (single trait crosses) and Activity 5 (two-trait crosses); this would shorten the total teaching time by 3-4 class sessions.

TEACHER PREPARATION OVERVIEW

EVOLUTION: MANAGING CHANGE

The activities in this unit are summarized below. Note that the total teaching time as listed is 27–33 periods* (approximately 6–7 weeks if you teach the activities as recommended every day).

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
1	**INVESTIGATION: Changing Environments** Students examine textual and graphical evidence for evolution of body size in marine iguanas.	adaptation competition evolution natural selection population	Order the aquatic plants required for Activity 2.	2–3
2	**LABORATORY: Increasing Temperatures** Students conduct a laboratory to investigate how the rate of photosynthesis in two different aquatic plants is affected by different temperatures.	climate change competition photosynthesis species	Order the aquatic plants required for this activity. Prepare aquatic plants for use. Gather lab materials for student groups. Prepare water baths and light sources for class use. Decide if you want to show the video of bubble formation. Prepare the Student Sheet and Visual Aid.	2
3	**INVESTIGATION: Social Behavior** Students examine textual and graphical evidence for the behavioral trait of alarm-calling in two group-living mammal species: black-tailed prairie dogs and meerkats.	adaptation kin natural selection social behavior	Preview the one-minute video on black-tailed prairie dogs.	2
4	**COMPUTER SIMULATION: Genetic Variation and Change** Students use a computer simulation to examine the factors that contribute to genetic variation in a population by focusing on the relationship between cystic fibrosis and TB.	carrier evolution gene genetic variation mutation	Preview the Cystic Fibrosis and Tuberculosis simulation. Prepare the Student Sheet.	2
5	**INVESTIGATION: Is It Evolution?** Students examine familiar and novel scenarios to determine what is required for evolution by natural selection to occur.	ecological evolution natural selection	Prepare the Student Sheet and Visual Aids.	2

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
6	**VIEW AND REFLECT: Increasing Timescales** Students watch a video to understand how evolution by natural selections leads to speciation in anoles in the Caribbean.	**biological species** biological species concept gene gene flow gene pool **speciation**	Preview the videos. Prepare the Student Sheet.	2
7	**INVESTIGATION: Extinction** Students investigate changes in life-forms over time and come to understand that extinction is a natural part of the evolutionary process.	extinction **mass extinction event**	Either cut apart the Time Period cards, or gather scissors for each pair and plan to have students do it. Prepare the Visual Aids.	2
8	**TALKING IT OVER: The Anthropocene** Students evaluate the evidence for a sixth mass extinction and think about which human activities are contributing to the loss of biodiversity.	**Anthropocene** **sixth mass extinction**	Preview the curated list of additional resources (websites and articles). Prepare the Student Sheets.	2
9	**READING: Evidence and the Theory of Evolution** Students explore additional types of evidence on the theory of evolution, including embryology, comparative anatomy, and genetics, and reflect on the types of evidence presented in the first learning sequence.	**comparative anatomy** DNA **embryology** **embryos** evolution fossil record genes **homologous genes** scientific theory	Preview infographic templates.	1–2
10	**INVESTIGATION: Applying Evolutionary Thinking** Students explore how evolutionary evidence is used in a practical way by analyzing and interpreting data about primates to make a recommendation about which area of a fictional island should be conserved.	comparative anatomy evolution gene sustainability	Prepare the Student Sheet (optional).	2

Activity	What Students Do	Key Scientific Terms	Advance Preparation	Class Sessions
11	**LABORATORY: The Evolution of Resistance** Students use a hands-on model to explore how human actions can cause evolutionary changes as they investigate a fictional case of antibiotic-resistant TB.	antibiotic resistance evolution **zone of inhibition**	Purchase materials at least two days in advance. Prepare agar plates. Prepare bacterial culture. Prepare 10% and 1% bleach solutions. Gather materials for student groups. Preview the list of annotated resources for Procedure Step 6. Preview the optional simulation on antibiotic resistance, "The Full Course," and decide if you will have students conduct this simulation. Prepare the Student Sheets.	2
12	**READING: Emerging Diseases** Students read about the increasing rate of emerging diseases through an evolutionary lens.	**epidemic** **pandemic** **zoonotic**		1
13	**MODELING: Shrinking Salmon** Students learn about the evolutionary impact of humans on salmon body size and develop a system model to guide possible mitigation strategies.	adaptation anadromous boundary component natural selection system model	Preview the videos on salmon and decide whether to show any of them in class. Prepare the Visual Aid.	1–2
14	**COMPUTER SIMULATION: Mitigating Change** Students use a computer simulation to to examine how changing environmental variables affect salmon's body size, and they design a mitigation strategy for a hypothetical salmon population.	adaptation evolution mitigating mitigation natural selection	Preview the simulation. Prepare the Visual Aid and Student Sheets.	2–3
15	**PROJECT: Human Impact on Evolution** Students create a presentation illustrating the evolutionary impact of one human activity on biodiversity and sustainability.	biodiversity evolution mitigation strategies sustainability	Gather a few webpages to share with students. Gather and provide a variety of supplies for student presentations. Prepare the Student Sheets (optional).	2–3

* If your students had robust instruction in middle school on the evidence for the theory of evolution, particularly embryology and genetics, you might choose to omit Activity 9; this would shorten the total teaching time by 1–2 class sessions.