PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Citizen Scientist

Grade Level:

11-12

Date of Board Approval: _____2024_____

Curriculum writing committee: Bernadine Salak and James Albert

Science Department Marking Period Course Weighting: The Citizen Scientist

Major Assessments	**45%**
Skills Application	**30%**
Skills Practice	**20%**
Participation	**5%**
Total	**100%**

Curriculum Map

Overview:

The Citizen Scientist is an interdisciplinary science course that focuses on the ecology of Northeastern Pennsylvania and current events relating to scientific issues and the events to build science literacy. Relevant current events will be examined throughout the course on a local, state, national, and global level to foster science literacy in society. The biodiversity of the temperate deciduous forest and surrounding areas will be studied to understand cycles in nature and energy as they relate to current scientific issues and the phenology of natural events in relation to seasonal climatic changes. Students will examine 15 key units, including: worldviews, ethics, and science literacy; weather, cycles, and tropical systems; your biome in autumn parts 1, 2, and 3 (fall migrations and nature's events; pollinators and fall ecology; the temperate deciduous forest and winter preparations); your biome in winter part 1 (Pennsylvania wildlife); food, agriculture, and society; waste, consumerism, and sustainability; your biome in winter part 2 (Pennsylvania flora and fauna); air pollution and global change; biotechnology and human health; your biome in spring parts 1 and 2 (early spring ecology and late spring ecology); humans and sustainability; and your biome in summer. Citizen science projects will be incorporated throughout the course, along with current events and phenology. This course is designed to prepare students to be more scientific literate for issues with science and society and understanding the natural world found in Northeastern Pennsylvania.

Time/Credit for the Course: One full year, meeting daily for 46 minutes / 1 credit

Marking Period One: Over a 45-day period of time, students will aim to understand:

Goals:

- Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and also include the Science World current event topics.

Unit 1—Worldview, Ethics, and Science Literacy

- Conservation, Preservation, Sustainability
- Local and global weather during hurricane season
- Cause and effect in natural and anthropogenic systems
- Issues facing the planet and the human population
- The triple bottom line and ecological footprints
- Credible sources in science and the peer review process

Unit 2—Weather, Cycles, Tropical Systems

- Tropical systems
- Local and global weather during hurricane season
- Cycles in nature–weather and the seasons

Unit 3—Your Biome in Autumn—Fall Migrations, Insects, and Nature's Events

- Local and global weather during hurricane season
- Nature's Events for Autumn:
    - Based on phenology, this may include:
        - Monarch Migration
        - Fall caterpillars–wooly bear, tree caterpillars
        - Backyard bird migration
        - Raptors and Waterfowl–residents vs migrators
        - Fall Caterpillars–wooly bear, tree tent caterpillars
    - Fall Equinox

Unit 4—Your Biome in Autumn—Pollinators and Fall Ecology

- Local and global weather during hurricane season
- Nature's Events for Autumn:
    - Based on phenology, this may include:
        - Fall wildflowers–goldenrod vs ragweed, jewelweed and other late fall wildflowers
        - Pollination strategies and the importance of Pennsylvania's pollinators
        - Mushrooms and Decomposers

Unit 5-Your Biome in Autumn—The Temperate Deciduous Forest and Winter Preparations

- Local and global weather during hurricane season
- Nature's Events for Autumn:
    - Based on phenology, this may include:
        - The Autumn Harvest, preparation for winter
        - Temperate deciduous forests, tree identification, fall foliage
        - Fall mammal behaviors
        - Hibernating snakes, turtles, frogs, salamanders

Marking Period Two: Over a 45-day period of time, students will aim to understand:

Goals:

- Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.

Unit 6–Your Biome in Winter Part 1–Pennsylvania Wildlife

- Local and global weather during the winter season
- Nature's Events for Winter
    - Based on phenology, this may include:
        - Winter preparations and challenges to wildlife (The 8 -ates)
        - PA White-tailed deer–issues to local ecology
        - Porcupines
        - Animal survival strategies for winter

Unit 7–Food, Agriculture, and Society

- Local and global weather during the winter season
- Food security and the challenges to feed over 8 billion people
    - Food Additives and Food Safety
    - Green Revolution
    - GMOs
    - CAFOs
    - Biotechnology and Food
    - Sustainable agriculture

Unit 8–Waste, Consumerism, and Sustainability

- Local and global weather during the winter season
- Winter Solstice
- Waste generation and management
- Trash, E-waste, Plastic Waste, and Pollution Issues

Marking Period Three: Over a 45-day period of time, students will aim to understand:

Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.

Unit 9–Your Biome in Winter Part 2

- Local and global weather during the winter season
- Nature's Events for Winter
    - Based on phenology, this may include:
        - PA Black Bears
        - Hibernations and other winter challenges to flora and fauna
        - Winter animal activity (skunks, mating mammals, great horned owls)

Unit 10–Air Pollution and Global Change

- Local and global weather during the spring season
- Maple Syrup and Pennsylvania
- Indoor Air Pollution
    - Sources
    - Sick Building Syndrome
    - Strategies
- Noise Pollution
    - Human and Ecological Impacts
- Outdoor Air Pollution
    - Air Quality Index
    - Criteria Pollutants
    - Human and Ecological Impacts
- Global Change
    - Trends and Data Analysis
    - Technology Solutions and the Future
    - Human and Ecological Impacts

Unit 11–Biotechnology and Human Health

- Local and global weather during the spring season
- CRISPR
- Cloning
- Stem Cells
- Reproductive Technologies
- Ethics in Biotechnology–Limits, Counterfeit Materials, Zoos, Endangered Species, Uses and Limits
- Epidemiology

Marking Period Four: Over a 45-day period of time, students will aim to understand:

Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.

Unit 12–Your Biome in Spring Part 1

- Local and global weather during the spring season
- Nature's Events for Spring
    - Based on phenology, this may include:
        - Vernal Pools
        - Early Spring Amphibians and Reptiles
        - Early Bloomers–maple trees, shadbush and shad fish migration

Unit 13–Your Biome in Spring Part 2

- Local and global weather during the spring season
- Nature's Events for Spring
    - Based on phenology, this may include:
        - Early Wildflowers
        - Spring Insects–The Big Hatch
        - Birds of Spring
        - PA Reptiles–Lizards, Snakes, Turtles
        - Spring Mammals

Unit 14–Humans and Sustainability

- Local and global weather during the spring season
- Water Issues
- Emerging Pathogens–Tick-Borne and Mosquito-Borne Illnesses
- The Future You–Renewable Energy and Emerging Technologies

Unit 15–Your Biome in Summer

- Local and global weather during the spring season
- Nature's Events for Summer
    - Based on phenology, this may include:
        - Late Spring Amphibians and Reptiles
        - Summer Ecological Observations
        - Butterflies and Moths
- Final Projects

Big Ideas:

Big Idea #1: Organisms have characteristic structures which enable functions and behaviors that allow them to grow, reproduce, and die.

Big Idea #2: Ecosystems are complex systems that include both living (biotic) and non-living (abiotic) components that interact with each other.

Big Idea #3: The cycling of matter and the flow of energy within ecosystems occur throughout interactions among different organisms and between organisms and the physical world.

Big Idea #4: Technology and engineering have both positive and negative impacts on society and the environment.

Textbook and Supplemental Resources:

Serrao, J. (1992). *Nature's Events*.

Scholastic Science World–Current Science Monthly Magazine.

Science World–Science World | Teacher Homepage (scholastic.com)

Curriculum Plan

Unit 1—Worldview, Ethics, and Science Literacy Approximately 8 days

Standards:

Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:

Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:

3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.3.9-12.H– Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth systems.
3.3.9-12.S– Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
3.4.9-12.A–Analyze and interpret how issues, trends, technologies, and policies impact agriculture, food, and environmental systems and resources.
3.4.9-12.D–Apply research and analytical skills to systematically investigate environmental issues ranging from local issues to those that are regional or global in scope.
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.
3.4.9-12.I–Analyze and interpret data on a regional environmental condition and its implications on environmental justice and social equity.

Eligible Content:

-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.

-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.

-Communicate results of investigations using multiple representations

Objectives: (Students will be able to:)

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Investigate local and global weather during hurricane season. (DOK 3)
4. Examine and discuss various worldviews, such as conservation, preservation, and sustainability. (DOK 3)
5. Diagnose and discuss some of the major scientific dilemmas of today and the impacts on the planet and human population. (DOK 3)
6. Identify the triple bottom line, ecological footprints, and challenges with sustainability. (DOK 1)
7. Examine to investigate how data can be manipulated. (DOK 3)
8. Explore graphs, statistics, interpretation, analysis and the process of peer review and credible sources within science. (DOK 3)

Core Activities and Corresponding Instructional Methods: (be specific, list activities related to materials/resources, include hot links, article titles etc.)

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
3. Use NOAA and the National Hurricane Center websites to track local and global weather during hurricane season (this is ongoing during the first marking period because of the sporadic nature of hurricanes this time of the year).
    a. National Weather Service
    b. National Hurricane Center (noaa.gov)
4. Describe worldview using introductory notes and class discussion.
    a. Make a list of environmental issues facing the local community and build to state, national, and global issues.
    b. Show video examples of conservation, preservation, and sustainability.
    c. Introduce Tock's Island Case Study and show student documentary:
        i. Controversy on the Delaware: A Look Upstream at the Tocks Island Dam Project (youtube.com)
    d. Complete reflection questions on Worldview and Tock's Island.
5. Examine the triple bottom line, sustainability, and the human impact with cause/effect questions, notes, discussion, and video examples.
6. Calculate ecological footprints using online calculators.
    a. Example: Ecological Footprint Calculator
7. Use case studies and current event articles to examine graphs, statistics, and how data can be manipulated.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
    b. Credible Science Journals and News Articles (current events).
8. Discuss credible sources, peer reviewed articles, and conduct research on what would be a credible source for a local, state, national or global environmental issue.

9. Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observation
  - Teacher prepared diagnostic tests or surveys on topic
  - Exploration and examination of local issues to demonstrate prior knowledge of topics
  - Current event discussion
- **Formative:**
  - Teacher observations and questioning techniques
  - Assorted worksheets and class work–example problems, video questions, readings and reading comprehension questions
  - Diagrams if applicable
  - Current event logs/journals; Science World articles and questions
  - Structured class discussion
- **Summative:**
  - Case studies and questions
  - Video summaries and knowledge questions
  - Essays, debates, presentations, and other lab activities and class projects
  - Common Assessments (consists of both multiple choice and free response questions) - Unit 1
- **Extensions:**
  - Teacher demonstrations
  - Extended reading
  - Current event articles and videos
  - Online Resources and activities
  - Other readings from a variety of applicable sources
  - Nature walks or local ecosystem exploration
- **Correctives:**
  - Reviewing objectives
  - Testing your comprehension handouts for each unit/topic
  - Guided reading with guides as needed

Unit 2: Weather, Cycles, Tropical Systems **Approximately 7 days**

Standards:

Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:

Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:

3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.1.9-12.H–Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
3.1.9-12.I– Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
3.3.9-12.H– Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth systems.
3.3.9-12.O–Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
3.3.9-12.R–Evaluate or refine a technological solution that reduces the impact of human activities on natural systems.
3.3.9-12.S– Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
3.4.9-12.B–Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.

Eligible Content:

-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.

-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives: (Students will be able to:)

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Investigate local and global weather during hurricane season. (DOK 3)
4. Make observations about the negative and positive impacts of hurricanes on both humans and ecology. (DOK 2)
5. Assess the environmental justice and ethical considerations of hurricane damage and negative human impacts. (DOK 3)
6. Analyze hurricane paths and trends in recent history. (DOK 4)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
3. Use *Science World* magazine articles and resource worksheets and activities to explore current events and science literacy.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
4. Use NOAA and the National Hurricane Center websites to track local and global weather during hurricane season (this is ongoing during the first marking period because of the sporadic nature of hurricanes this time of the year).
    a. National Weather Service
    b. National Hurricane Center (noaa.gov)
5. Describe tropical systems and hurricanes using introductory notes and class discussion.
    a. National Weather Service
    b. National Hurricane Center (noaa.gov)
6. Track current hurricanes daily and examine impacts.
7. Read case studies and articles to complete note sheets, worksheets, knowledge questions, and projects to demonstrate understanding of hurricanes and tropical systems.
    a. Positive Impacts on Animals and Knowledge Questions.
        i. https://sciencing.com/positive-effects-hurricane-4462.html
    b. Other current events from this year's hurricane season and its impacts with knowledge questions.
8. Utilize relevant video resources to introduce, enforce, or foster questions regarding hurricanes and the considerations of hurricane damage and human impacts.
    a. Some useful examples that may be updated based on current hurricane season:
        i. 60 Minutes–S49E51–The Storm after the Storm
            1. https://www.youtube.com/watch?v=clMIlKZHIMM
        ii. 60 Minutes–S50E1–Hurricane Harvey
        iii. BBC News–Hurricane Harvey
        iv. The New York Times–Harvey: Into the Deluge

1. https://www.youtube.com/watch?v=O1BWVUz2KXw

9. Use Science World to examine current events–Science World | Teacher Homepage (scholastic.com)
10. Evaluate student knowledge with a Unit 2 exam.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observation
  - Exploration and examination of local issues to demonstrate prior knowledge of topics
  - Current event discussion
- **Formative:**
  - Teacher observations and questioning techniques
  - Assorted worksheets
  - Class work–example problems, video questions, readings and reading comprehension questions
  - Current event logs/journals; Science World articles and questions
  - Structured class discussion
- **Summative:**
  - Case studies and questions
  - Video summaries and knowledge questions
  - Essays, debates, presentations, and other lab activities and class projects
  - Common Assessments (consists of both multiple choice and free response questions) - Unit 2
- **Extensions:**
  - Teacher demonstrations
  - Extended reading
  - Current event articles and videos
  - Online Resources and activities
  - Other readings from a variety of applicable sources
  - Nature walks or local ecosystem exploration
- **Correctives:**
  - Reviewing objectives
  - Testing your comprehension handouts for each unit/topic
  - Guided reading with guides as needed

Unit 3–Your Biome In Autumn–Fall Migrations, Insects, and Nature's Events

Approximately 16 days

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.1.9-12.H–Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
3.1.9-12.I– Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
3.1.9-12.J–Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
3.1.9-12.L– Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
3.1.9-12.M– Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.
Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.

-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).

-Compare the rate of use of natural resources and their impact on sustainability.

-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.

-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate local and global weather during hurricane season. (DOK 3)
3. Make observations through nature walks with discussion of the ecological community. (DOK 2)
4. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
5. Investigate monarch migration. (DOK 3)
6. Make observations of seasonal change that occurs with the fall equinox. (DOK 2)
7. Explain the phenomena of bird migration (backyard birds, raptors, waterfowl). (DOK 3)
8. Summarize the strategies of fall caterpillar survival. (DOK 2).
9. Analyze seasonal changes in the temperate deciduous forest. (DOK 4)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
3. Examine NOAA and the National Hurricane Center websites to track local and global weather during hurricane season (this is ongoing during the first marking period because of the sporadic nature of hurricanes this time of the year).
    a. National Weather Service
    b. National Hurricane Center (noaa.gov)
4. Use *Science World* magazine articles and resource worksheets and activities to explore current events and science literacy.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
5. Explain monarch migration using notes, readings, and knowledge questions.
    a. Nature's Events #27–Migration of the Monarch with knowledge questions.
    b. Possible videos:
        i. Monarch Migration and Metamorphosis (National Geographic)
            1. https://www.bing.com/videos/riverview/relatedvideo?q=monarch+migration+national+geographic+video&&view=riverview&mmscn=mtsc&mid=E951A3850EA973555C20E951A3850EA973555C20&&aps=3&FORM=VMSOVR
            2. Current news stories regarding migration
6. Rear, catch, tag and release monarchs migrating through our area using the Monarch Watch organization to demonstrate citizen science.
    a. Monarch Watch
    b. https://www.monarchwatch.org/
7. Use interactive websites to explore the Fall Equinox and complete research projects.
    a. Research Example:
        i. Why Do We Have Seasons

1. https://ny.pbslearningmedia.org/resource/npls13.sci.ess.seasons/why-seasons/

8. Read from or present information about bird migration from Nature's Events (pages 141-146; 147-158; 187-194) and assign reflection/knowledge questions to provide students with resources for learning and mastering the content.
    a. September's Songbirds (25)
    b. Hundreds of Hawks (26)
    c. Flying in Formation (32)
9. Use videos to enhance the content with class discussion and knowledge questions.
    a. Videos Examples:
        i. Wild America S12E6–Wings Over the Marsh
        ii. Wild America S8E4–Birds of Prey
10. Use notes, case studies, and video examples to present the topic of bioaccumulation and biomagnification.
11. Conduct a biomagnification laboratory activity to show how pollutants move through trophic levels.
    a. Example of online simulation lab:
        i. BiomagnificationDirections.pdf (virtualbiologylab.org)
12. Use data from Hawk Mountain to graph the impacts of DDT on raptor migration through the observation site:
    a. Migration Data | Hawk Mountain Sanctuary: Learn Visit Join
13. Present notes and images about fall caterpillars and read about fall web caterpillars and winter survival.
    a. Nature's Events 22–Webs Everywhere, with knowledge questions.
14. Review and reflect upon the changes that autumn brings to our biome and complete a common assessment for Unit 3.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observation
    - Exploration and examination of local issues to demonstrate prior knowledge of topics
    - Current event discussion
- **Formative:**
    - Teacher observations and questioning techniques
    - Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
    - Current event logs/journals; Science World articles and questions
    - Laboratory activities–DDT graphing, Biomagnification
- **Summative:**
    - Essays, debates, presentations, and other activities and class projects
    - Common Assessments (consists of both multiple choice and free response questions)-Unit 3
- **Extensions:**
    - Teacher demonstrations
    - Extended reading
    - Current event articles and videos
    - Online Resources and activities
    - Other readings from a variety of applicable sources
    - Nature walks or local ecosystem exploration

- **Correctives:**
  - Reviewing objectives
  - Testing your comprehension handouts for each unit/topic
  - Guided reading with guides as needed

Unit 4–Your Biome in Autumn–Pollinators, Insects, Fall Ecology
Approximately 7 days
Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.1.9-12.H–Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
3.1.9-12.I– Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
3.1.9-12.J–Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
3.1.9-12.L– Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
3.1.9-12.M– Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).

-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Investigate local and global weather during hurricane season. (DOK 3)
4. Make observations through nature walks with discussion of the ecological community. (DOK 2)
5. Identify the characteristics of fungi. (DOK 1)
6. Classify the types, pollination strategies, and varieties of fall wildflowers. (DOK 2)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
3. Use NOAA and the National Hurricane Center websites to track local and global weather during hurricane season (this is ongoing during the first marking period because of the sporadic nature of hurricanes this time of the year).
    a. National Weather Service
    b. National Hurricane Center (noaa.gov)
4. Use *Science World* magazine articles and resource worksheets and activities to explore current events and science literacy.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
5. Explain characteristics of fungi using notes, readings, videos, and knowledge questions.
    a. Nature's Events 23–The Magic of Mushrooms
6. Use notes, readings, and images to identify various fall wildflowers and pollination strategies.
    a. Ragweed, goldenrod, jewelweed, knotweed, joe pye weed.
7. Explore campus to find examples of fall wildflowers and fungi and make observations.
8. Review and reflect on Unit 4 and complete a common assessment.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observation
    - Exploration and examination of local issues to demonstrate prior knowledge of topics
    - Current event discussion
- **Formative:**
    - Teacher observations and questioning techniques
    - Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
    - Current event logs/journals; Science World articles and questions

- Nature journaling and outdoor observations

- **Summative:**
  - Essays, debates, presentations, and other activities and class projects
  - Common Assessments (consists of both multiple choice and free response questions)-Unit 4
- **Extensions:**
  - Teacher demonstrations
  - Extended reading
  - Current event articles and videos
  - Online Resources and activities
  - Other readings from a variety of applicable sources
  - Nature walks or local ecosystem exploration
- **Correctives:**
  - Reviewing objectives
  - Testing your comprehension handouts for each unit/topic
  - Guided reading with guides as needed

Unit 5–Your Biome in Autumn–Temperate Deciduous Forest, Winter Preparation
Ecology **Approximately 7 days**

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.I– Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
3.1.9-12.L– Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.4.9-12.B–Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.
3.4.9-12.F–Communicate scientific and technical information (e.g., about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Investigate local and global weather during hurricane season. (DOK 3)
4. Make observations through nature walks with discussion of the ecological community. (DOK 2)
5. Investigate the characteristics of the temperate deciduous forest and autumn changes. (DOK 3)
6. Make observations about the changes to fall foliage. (DOK 2)
7. Examine phenomena of the autumn harvest and animal preparations for winter. (DOK 3)
8. Investigate the winter survival strategies of reptiles and amphibians. (DOK 3)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
3. Use NOAA and the National Hurricane Center websites to track local and global weather during hurricane season (this is ongoing during the first marking period because of the sporadic nature of hurricanes this time of the year).
    a. National Weather Service
    b. National Hurricane Center (noaa.gov)
4. Use *Science World* magazine articles and resource worksheets and activities to explore current events and science literacy.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
5. Use notes, diagrams, readings, knowledge questions, and video examples to present the characteristics of the temperate deciduous forest and the changes of autumn.
    a. Nature's Events 29–The Autumn Harvest
    b. Nature's Events 30–Flaming Fall Foliage
    c. PA DCNR
6. Use the trees on campus to identify and describe the characteristics of specific trees and create tree profiles.
7. Demonstrate chromatography with various types of leaves and have students make observations.
8. Use notes, diagrams, readings, knowledge questions, and video examples to present strategies for reptile and amphibian survival.
    a. Nature's Events 31–Hibernating Herptiles
9. Review and reflect on Unit 5 and complete a common assessment.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observation
    - Exploration and examination of local issues to demonstrate prior knowledge of topics
    - Current event discussion
- **Formative:**
    - Teacher observations and questioning techniques

- Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
- Forestry labs and observations
- Current event logs/journals; Science World articles and questions
- Nature journaling and outdoor observations

- **Summative:**
  - Tree Profile Projects
  - Common Assessments (consists of both multiple choice and free response questions)- Unit 5
- **Extensions:**
  - Teacher demonstrations
  - Extended reading
  - Current event articles and videos
  - Online Resources and activities
  - Other readings from a variety of applicable sources
  - Nature walks or local ecosystem exploration
- **Correctives:**
  - Reviewing objectives
  - Testing your comprehension handouts for each unit/topic
  - Guided reading with guides as needed

Marking Period 2

Unit 6–Your Biome in Winter Part 1–Pennsylvania Wildlife Approximately 15 days

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.J–Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
3.1.9-12.M– Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.3.9-12.R–Evaluate or refine a technological solution that reduces the impact of human activities on natural systems.
3.4.9-12.A–Analyze and interpret how issues, trends, technologies, and policies impact agriculture, food, and environmental systems and resources.
3.4.9-12.B–Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.
3.4.9-12.D–Apply research and analytical skills to systematically investigate environmental issues ranging from local issues to those that are regional or global in scope.
3.4.9-12.F–Communicate scientific and technical information (e.g., about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).

-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Investigate survival strategies for Pennsylvania wildlife in winter. (DOK 3)
4. Make observations about the Pennsylvania white-tailed deer population. (DOK 2)
5. Investigate how white-tailed deer survive Pennsylvania winters. (DOK 3)
6. Identify characteristics of other Pennsylvania wildlife in winter (porcupine and other mammals). (DOK 1)
7. Investigate strategies for winter survival for Pennsylvania's wildlife. (DOK 3)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Use *Science World* magazine articles and resource worksheets and activities to explore current events and science literacy.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
3. Use notes, diagrams, readings, knowledge questions, and video examples to present survival strategies for Pennsylvania wildlife.
    a. "The 8-ates"
    b. Nature's Events 38–The "False" Hibernators
    c. "Snow Thanks"--how snow can be beneficial to wildlife
4. Use notes, diagrams, readings, knowledge questions, and video examples to present characteristics of the Pennsylvania white-tailed deer and winter survival strategies.
    a. "Don't Feed the Deer" Articles and knowledge questions
    b. PA Wildlife Notes–The White-Tailed Deer
    c. Wild America S5E1–Pennsylvania White-Tail
    d. PA Game Commission–Pennsylvania White-Tails: Creating New Traditions
5. Use notes, diagrams, readings, knowledge questions, and video examples to present characteristics of porcupines and their role in Pennsylvania's forests.
    a. Wild America S10E5–The Prickly Porcupines
    b. PA Wildlife Notes–Porcupines
6. Review and reflect on Unit 6 and complete a common assessment.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observation
    - Exploration and examination of local issues to demonstrate prior knowledge of topics
    - Current event discussion
- **Formative:**
    - Teacher observations and questioning techniques

- Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
- Winter survival strategy project
- Current event logs/journals; Science World articles and questions

- **Summative:**
  - Common Assessment (consists of both multiple choice and free response questions)- Unit 6
- **Extensions:**
  - Teacher demonstrations
  - Extended reading
  - Current event articles and videos
  - Online Resources and activities
  - Other readings from a variety of applicable sources
  - Nature walks or local ecosystem exploration
- **Correctives:**
  - Reviewing objectives
  - Testing your comprehension handouts for each unit/topic
  - Guided reading with guides as needed

Unit 7–Food, Agriculture, and Society **Approximately 15 days**

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.1.9-12.H–Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
3.1.9-12.J–Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.3.9-12.H– Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth systems.
3.3.9-12.R–Evaluate or refine a technological solution that reduces the impact of human activities on natural systems.
3.3.9-12.S– Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
3.4.9-12.A–Analyze and interpret how issues, trends, technologies, and policies impact agriculture, food, and environmental systems and resources.
3.4.9-12.B–Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.
3.4.9-12.G–Evaluate competing design solutions to a real world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g., economic, societal, environmental, ethical considerations).
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.
3.4.9-12.I–Analyze and interpret data on a regional environmental condition and its implications on environmental justice and social equity.

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).

-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Analyze food security and issues facing feeding over 8 billion people. (DOK 4)
4. Investigate food additives and food ingredients. (DOK 3)
5. Explain the agricultural advancements of the green revolution and the impacts on the planet. (DOK 3)
6. Analyze the role of biotechnology in agriculture. (DOK 4)
7. Analyze the challenges of sustainable agriculture. (DOK 4)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
3. Use notes, diagrams, readings, knowledge questions, and video examples to present food security issues and the challenges of feeding 8 billion people.
    a. 60 Minutes–"Plumpy Nut"
        i. 'Miracle' Food Saves Lives - 60 Minutes (youtube.com)
    b. Global Famine current events
        i. Explainer: What is famine? | UN News
4. Use notes, diagrams, readings, knowledge questions, and video examples to present information about food additives, food ingredients, and food labels.
    a. "Relax, you don't have to eat clean."
        i. Opinion | Relax, You Don't Need to 'Eat Clean' - The New York Times (nytimes.com)
    b. 60 Minutes–"The Flavorists"
        i. The "super-tasters" flavoring your food - CBS News
5. Have students research various food ingredients to determine the safety, impacts, and issues of each ingredient.
6. Use notes, diagrams, readings, knowledge questions, and video examples to present the Green Revolution benefits and drawbacks for the planet.
    a. GMOs, CAFOs, Animal-Based Protein, Aquaculture, and other current issues.

7. Use notes, diagrams, readings, knowledge questions, and video examples to present the role that biotechnology is now taking in modern agriculture.
    a. No Kill Meat
        i. Leather and meat without killing animals | Andras Forgacs (youtube.com)
    b. Counterfeit foods
        i. Olive Oil Fraud and Adulteration in America (youtube.com)
        ii. Truffles: The Most Expensive Food in the World (youtube.com)
    c. Ethics in Agriculture
8. Use documentaries and current events to examine the challenges of sustainable agriculture.
    a. "The Biggest Little Farm"
    b. Food Documentaries and current events.
9. Review and reflect on Unit 7 and complete a common assessment.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observation
    - Exploration and examination of local issues to demonstrate prior knowledge of topics
    - Current event discussion
- **Formative:**
    - Teacher observations and questioning techniques
    - Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
    - Current event logs/journals; Science World articles and questions
- **Summative:**
    - Food Ingredient Projects
    - Common Assessment (consists of both multiple choice and free response questions)- Unit 7
- **Extensions:**
    - Teacher demonstrations
    - Extended reading
    - Current event articles and videos
    - Online Resources and activities
    - Other readings from a variety of applicable sources
    - Nature walks or local ecosystem exploration
- **Correctives:**
    - Reviewing objectives
    - Testing your comprehension handouts for each unit/topic
    - Guided reading with guides as needed

Unit 8–Waste, Consumerism, and Sustainability Approximately 15 days

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.3.9-12.H– Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth systems.
3.3.9-12.O–Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
3.3.9-12.R–Evaluate or refine a technological solution that reduces the impact of human activities on natural systems.
3.4.9-12.A–Analyze and interpret how issues, trends, technologies, and policies impact agriculture, food, and environmental systems and resources.
3.4.9-12.D–Apply research and analytical skills to systematically investigate environmental issues ranging from local issues to those that are regional or global in scope.
3.3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.
3.4.9-12.I–Analyze and interpret data on a regional environmental condition and its implications on environmental justice and social equity.

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).

-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Define winter solstice. (DOK 1)
4. Investigate waste generation and waste management strategies. (DOK 3)
5. Differentiate between biodegradable and nonbiodegradable materials. (DOK 3)
6. Investigate E-waste, plastic pollutants, recycling, and the issues of each. (DOK 3)
7. Make observations about personal waste generation and individual ecological footprints. (DOK 2)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
3. Use notes, diagrams, readings, knowledge questions, and video examples to present winter solstice information.
    a. Nature's Events 40–"Day Conquers Night"
4. Use notes, diagrams, readings, knowledge questions, and video examples to present examples of waste and waste management.
    a. Examples:
        i. EPA–Wastes
            1. https://www.epa.gov/report-environment/wastes
5. Conduct individual waste surveys and separate biodegradable waste from non-biodegradable waste.
6. Use notes, diagrams, readings, knowledge questions, and video examples to present information on e-waste, plastic waste, recycling, and issues with waste management.
    a. 60 Minutes–"The Recyclers"
    b. SciShow–Why Can't We Scoop all the Plastic out of the Ocean?
    c. PBS News Hour–What really happens to e-waste
    d. Other current event examples.
7. Review and reflect on Unit 8 and complete a common assessment.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observation
  - Exploration and examination of local issues to demonstrate prior knowledge of topics
  - Current event discussion
- **Formative:**
  - Teacher observations and questioning techniques
  - Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
  - Personal Waste Audits/Surveys
  - Biodegradable and Non-biodegradable research
  - Current event logs/journals; Science World articles and questions
- **Summative:**
  - Common Assessment (consists of both multiple choice and free response questions)- Unit 8
- **Extensions:**
  - Teacher demonstrations
  - Extended reading
  - Current event articles and videos
  - Online Resources and activities
  - Other readings from a variety of applicable sources
  - Nature walks or local ecosystem exploration
- **Correctives:**
  - Reviewing objectives
  - Testing your comprehension handouts for each unit/topic
  - Guided reading with guides as needed

Marking Period 3:
Unit 9–Your Biome in Winter Part 2–Pennsylvania Wildlife and Plants
Approximately 15 days

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.1.9-12.H–Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
3.1.9-12.I– Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
3.1.9-12.L– Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
3.1.9-12.M– Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.4.9-12.D–Apply research and analytical skills to systematically investigate environmental issues ranging from local issues to those that are regional or global in scope.
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).

-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Investigate the characteristics of the Pennsylvania black bear and the role it plays in our region. (DOK 3)
4. Compare winter survival strategies of Pennsylvania wildlife, hibernation and other winter challenges to flora and fauna. (DOK 2)
5. Identify characteristics of evergreens and adaptations to survive winter. (DOK 1)
6. Make observations of winter mammal activity and strategies. (DOK 2)
7. Investigate early bird activity and the advantages of early nesters. (DOK 3)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
3. Use notes, diagrams, readings, knowledge questions, and video examples to present characteristics and information on Pennsylvania black bears.
    a. PA Game Commission–On the Trail of the Pennsylvania Black Bear
        i. On The Trail of Pennsylvania Black Bears (1991) (youtube.com)
        ii. PGC Biologist Talks About Black Bear Cubs in Den (youtube.com)
    b. Nature's Events 42–New Year Babies
    c. PA Wildlife Notes–PA Black Bears
        i. Black Bear (pa.gov)
4. Use notes, diagrams, readings, knowledge questions, and video examples to present hibernation and winter challenges to flora and fauna.
    a. Wild America–Those Smell Skunks (S11E9)
        i. Wild America (1992) | S11 E9 'Those Smelly Skunks' | Full Episode | FANGS (youtube.com)
    b. Wild America–Evergreens (S8E2)
        i. Wild America | S8 E2 Evergreen | Full Episode HD (youtube.com)
    c. Nature's Events 44–First to Nest (Great Horned Owls)
    d. Nature's Events 46–Mating Mammals
    e. Nature's Events 47–Winter's Silence Ends
5. Review and reflect on Unit 9 and complete a common assessment.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observation
    - Exploration and examination of local issues to demonstrate prior knowledge of topics
    - Current event discussion
- **Formative:**
    - Teacher observations and questioning techniques

- Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
- Survival Summaries
- Current event logs/journals; Science World articles and questions

- **Summative:**
  - Common Assessment (consists of both multiple choice and free response questions)- Unit 9
- **Extensions:**
  - Teacher demonstrations
  - Extended reading
  - Current event articles and videos
  - Online Resources and activities
  - Other readings from a variety of applicable sources
  - Nature walks or local ecosystem exploration
- **Correctives:**
  - Reviewing objectives
  - Testing your comprehension handouts for each unit/topic
  - Guided reading with guides as needed

Unit 10–Air Pollution and Global Change **Approximately 15 days**

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.3.9-12.H– Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth systems.
3.3.9-12.O–Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
3.3.9-12.R–Evaluate or refine a technological solution that reduces the impact of human activities on natural systems.
3.3.9-12.S– Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
3.4.9-12.A–Analyze and interpret how issues, trends, technologies, and policies impact agriculture, food, and environmental systems and resources.
3.4.9-12.B–Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.
3.4.9-12.D–Apply research and analytical skills to systematically investigate environmental issues ranging from local issues to those that are regional or global in scope.
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.
3.4.9-12.I–Analyze and interpret data on a regional environmental condition and its implications on environmental justice and social equity.

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).

-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Describe types of indoor air pollution. (DOK 2)
4. Investigate indoor air quality. (DOK 3)
5. Investigate noise pollution and the impacts on humans and wildlife. (DOK 3)
6. Explain outdoor air quality and the Air Quality Index (AQI). (DOK 3)
7. Explain the phenomena of global change using evidence and data. (DOK 3)
8. Analyze the impacts of global change on humans and the environment. (DOK 4)
9. Investigate the role of biotechnology and global change. (DOK 3)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
3. Local and global weather during the spring season
4. Explore the maple syrup season in Pennsylvania.
    a. Nature's Events 1–It's Maple Syrup Time (with reflection questions)
5. Use notes, diagrams, readings, knowledge questions, and video examples to present indoor air pollution sources and impacts.
    a. Particulate matter, radon, smoke, VOCs, carbon monoxide, and other dangerous indoor pollutants.
6. Conduct indoor air pollution surveys and walks.
    a. Particulate matter laboratory activity
7. Use notes, diagrams, readings, knowledge questions, and video examples to present the concept of sick building syndrome and mitigation strategies.
    a. Video examples may include:
        i. What Is Sick Building Syndrome? (youtube.com)
8. Use notes, diagrams, readings, knowledge questions, and video examples to present the concept of noise pollution and the impacts on humans and wildlife.
    a. CBS News–Nature's Quietest Places
        i. Recording the sounds of nature's quietest places (youtube.com)
9. Use notes, diagrams, readings, knowledge questions, and video examples to present the concept of outdoor air pollution and the Air Quality Index.

    a. Air Quality Index (AQI) | AirNow.gov
10. Conduct research on various types and sources of outdoor air pollution.
11. Use notes, diagrams, readings, knowledge questions, and video examples to present the concept of global change.
    a. "Too Pooped to Peak" (impacts of melting mountain ice)
        i. Why isn't the world covered in poop? - Eleanor Slade and Paul | TED-Ed
    b. Ticks and Climate Change
    c. Home – Climate Change: Vital Signs of the Planet (nasa.gov)
    d. Climate Change - NASA Science
    e. Can We Cool the Planet? | NOVA | PBS
    f. Climate change and confused animals
    g. Human and Animal conflicts growing
12. Conduct research on the trends and data associated with global change.
    a. Home – Climate Change: Vital Signs of the Planet (nasa.gov)
    b. Climate Change - NASA Science
    c. AR6 Synthesis Report: Climate Change 2023 — IPCC
13. Use notes, diagrams, readings, knowledge questions, and video examples to present impacts at the poles.
    a. Impacts at the poles.
    b. Greenland's Ice Sheets
        i. From the 60 Minutes Archive: Top of the World (youtube.com)
14. Use notes, diagrams, readings, knowledge questions, and video examples to present the role of technology solutions and the future of global change.
    a. Current events on global change technology
    b. Return of the Wooly Mammoth–Siberia's Pleistocene Park: Bringing back pieces of the Ice Age to combat climate change (youtube.com)
15. Review and reflect on Unit 10 and complete a common assessment.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observation
  - Exploration and examination of local issues to demonstrate prior knowledge of topics
  - Current event discussion
- **Formative:**
  - Teacher observations and questioning techniques
  - Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
  - Particulate matter laboratory activity
  - NASA Data Analysis
  - Current event logs/journals; Science World articles and questions
- **Summative:**
  - Common Assessment (consists of both multiple choice and free response questions)-Unit 10
- **Extensions:**
  - Teacher demonstrations
  - Extended reading
  - Current event articles and videos
  - Online Resources and activities
  - Other readings from a variety of applicable sources

        - Nature walks or local ecosystem exploration
    - **Correctives:**
        - Reviewing objectives
        - Testing your comprehension handouts for each unit/topic
        - Guided reading with guides as needed

Unit 11–Biotechnology and Human Health **Approximately 15 days**

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5,
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.3.9-12.R–Evaluate or refine a technological solution that reduces the impact of human activities on natural systems.
3.4.9-12.A–Analyze and interpret how issues, trends, technologies, and policies impact agriculture, food, and environmental systems and resources.
3.4.9-12.B–Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.
3.4.9-12.G–Evaluate competing design solutions to a real world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g., economic, societal, environmental, ethical considerations).

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Formulate ethical considerations of various biotechnology advancements in CRISPR, cloning, stem cells, reproductive technology, and other advancements. (DOK 3)
4. Investigate biotechnology uses in wildlife conservation/endangered species, zoos, and wildlife management. (DOK 3)
5. Investigate medical fraud and counterfeit issues in biotechnology advancements. (DOK 3)
6. Explain epidemiology and the impacts of communicable disease on humans. (DOK 3)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
3. Use notes, diagrams, readings, knowledge questions, and video examples to present ethical considerations of biotechnology advancements.
    a. Topics may include:
        i. CRISPR
            1. How CRISPR lets you edit DNA - Andrea M. Henle | TED-Ed
            2. CRISPR's Next Advance Is Bigger Than You Think | Jennifer Doudna | TED (youtube.com)
        ii. Cloning
            1. A new era of cloning is here—on the polo field (youtube.com)
            2. Pet cloning: Man's best friend, again (youtube.com)
        iii. Stem cell uses
            1. What are stem cells? - Craig A. Kohn (youtube.com)
            2. What are STEM CELLS? And What Can they Do? (youtube.com)
        iv. Reproductive Technologies
            1. How in vitro fertilization (IVF) works - Nassim Assefi and | TED-Ed
        v. Other Advancements
            1. How advancements in prosthetic technology allow feeling, control | 60 Minutes (youtube.com)
            2. Genetically modified pigs could provide unlimited organs for human transplants : Shots - Health News : NPR
4. Use notes, diagrams, readings, knowledge questions, and video examples to present uses of biotechnology in wildlife conservation/endangered species, zoos, and wildlife management.
    a. Topics may include:
        i. Captive breeding–Genetic matches and zoos
            1. Are zookeepers playing God? (youtube.com)
        ii. Wildlife corridors
            1. How wildlife crossings protect both animals and people - CBS News
            2. Wild Ways | NOVA | PBS
        iii. De-extinction projects
            1. Search ongoing for extinct Tasmanian tiger amid efforts to revive species | 60 Minutes (youtube.com)
5. Use notes, diagrams, readings, knowledge questions, and video examples to present epidemiology topics and issues.

a. Topics may include:
    i. Food-borne illnesses (picnic and barbeque season)
        1. Food Safety by Events and Seasons | FoodSafety.gov
    ii. Giardia
        1. Giardia | Parasites | CDC
6. Review and reflect on Unit 11 and complete common assessment essay prompts.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observation
    - Exploration and examination of local issues to demonstrate prior knowledge of topics
    - Current event discussion
- **Formative:**
    - Teacher observations and questioning techniques
    - Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
    - Biotechnology video questions
    - Epidemiology research
    - Current event logs/journals; Science World articles and questions
- **Summative:**
    - Common Assessment (consists of both multiple choice and free response questions or be an essay exam based on the topics covered)-Unit 11
- **Extensions:**
    - Teacher demonstrations
    - Extended reading
    - Current event articles and videos
    - Online Resources and activities
    - Other readings from a variety of applicable sources
    - Nature walks or local ecosystem exploration
- **Correctives:**
    - Reviewing objectives
    - Testing your comprehension handouts for each unit/topic
    - Guided reading with guides as needed

Marking Period 4:
Unit 12–Your Biome in Spring Part 1 **Approximately 10 days**

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.1.9-12.H–Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
3.1.9-12.I– Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
3.1.9-12.J–Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
3.1.9-12.L– Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
3.1.9-12.M– Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.3.9-12.R–Evaluate or refine a technological solution that reduces the impact of human activities on natural systems.
3.4.9-12.B–Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).

-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Make observations through nature walks with discussion of the ecological community. (DOK 2)
4. Make observations about the phenology of spring in Pennsylvania. (DOK 2)
5. Investigate vernal pools and the awakening of the amphibians. (DOK 3)
6. Examine early tree and shrub blooms and the migration of the American shad in the Delaware River. (DOK 2)
7. Investigate the resurfacing of the reptiles and the phenology of frog songs. (DOK 3)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
3. Make observations through nature walks with discussion of the ecological community.
4. Use notes, diagrams, readings, knowledge questions, and video examples to present characteristics of vernal pools and the early emergence of some amphibians.
    a. Vernal Pool notes
    b. Nature's Events 4–Awakening Amphibians
5. Use notes, diagrams, readings, knowledge questions, and video examples to present early tree and shrub blooms and the phenology connections between the American shad migration in the Delaware River.
    a. Maple trees are blooming.
    b. Shadbush/serviceberry blooming
    c. Nature's Event 6–"Shadfish" and Shadbush
6. Use notes, diagrams, readings, knowledge questions, and video examples to present timing of reptile and later amphibian resurfacing and characteristics of each animal.
    a. Reptile and amphibian notes
    b. Nature's Events 5–Resurfacing Reptiles
    c. Wild America S10E4–Prince of the Pond
        i. Wild America | S4 E5 Prince of the Pond | Full Episode HD (youtube.com)
7. Review and reflect on Unit 12 and complete common assessment.

Assessments:

- **Diagnostic:**
  - Teacher questioning and observation
  - Exploration and examination of local issues to demonstrate prior knowledge of topics
  - Current event discussion
- **Formative:**
  - Teacher observations and questioning techniques
  - Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
  - Spring phenology observations
  - Current event logs/journals; Science World articles and questions
- **Summative:**
  - Common Assessment (consists of both multiple choice and free response questions)- Unit 12
- **Extensions:**
  - Teacher demonstrations
  - Extended reading
  - Current event articles and videos
  - Online Resources and activities
  - Other readings from a variety of applicable sources
  - Nature walks or local ecosystem exploration
- **Correctives:**
  - Reviewing objectives
  - Testing your comprehension handouts for each unit/topic
  - Guided reading with guides as needed

Unit 13–Your Biome in Spring Part 2 **Approximately 15 days**

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.1.9-12.J–Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
3.1.9-12.L– Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
3.1.9-12.M– Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.3.9-12.R–Evaluate or refine a technological solution that reduces the impact of human activities on natural systems.
3.4.9-12.A–Analyze and interpret how issues, trends, technologies, and policies impact agriculture, food, and environmental systems and resources.
3.4.9-12.B–Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.
3.4.9-12.G–Evaluate competing design solutions to a real world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g., economic, societal, environmental, ethical considerations).
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.
3.4.9-12.I–Analyze and interpret data on a regional environmental condition and its implications on environmental justice and social equity.

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).

-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
    a. Science World–Science World | Teacher Homepage (scholastic.com)
3. Make observations through nature walks with discussion of the ecological community. (DOK 2)
4. Make observations about the phenology of spring in Pennsylvania. (DOK 2)
5. Investigate early wildflowers of Pennsylvania. (DOK 3)
6. Explain the phenomena and phenology of spring insect activity. (DOK 3)
7. Examine the phenomena and phenology of spring bird activity. (DOK 3)
8. Make observations of Pennsylvania reptile spring activity. (DOK 3)
9. Examine activity of Pennsylvania wildlife in spring (opossums and other small organisms). (DOK 2)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
3. Make observations through nature walks with discussion of the ecological community.
4. Use notes, diagrams, readings, knowledge questions, and video examples to present examples of phenology of early Pennsylvania wildflowers.
    a. Early wildflower notes and diagrams.
    b. Spring wildflower articles and questions.
        i. Pocono Record Wildflower series
        ii. US Wildflower's Database of Wildflowers for Pennsylvania (uswildflowers.com)
    c. Wild America S7E4–Peculiar Plants
5. Use notes, diagrams, readings, knowledge questions, and video examples to present information of the phenology of Pennsylvania's spring insect hatching.
    a. Spring insect notes and diagrams.
        i. Nature's Events 9–The Big Hatch
        ii. Early butterflies and other insects
6. Use notes, diagrams, readings, knowledge questions, and video examples to present information on the activity of birds of spring in Pennsylvania.
    a. Spring bird notes
    b. Wild America S2E4–A Call to Courtship
        i. Wild America | S2 E4 Call To Courtship | Full Episode HD (youtube.com)
    c. Ground nesting Bird Article

7. Use notes, diagrams, readings, knowledge questions, and video examples to present phenology of Pennsylvania's reptiles–lizards, snakes, turtles.
    a. Pennsylvania reptile notes–lizards, snakes, turtles
    b. Pocono Record reptiles series of articles
    c. Pocono snakes of PA video series:
        i. Up close: Eastern hognose snake (youtube.com)
8. Use notes, diagrams, readings, knowledge questions, and video examples to examine activity of Pennsylvania wildlife in spring (opossums and other small organisms).
    a. PA Wildlife notes–Opossum
        i. Opossum (pa.gov)
        ii. Spring Mammals and early activity
9. Review and reflect on Unit 13 and complete common assessment.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observation
    - Exploration and examination of local issues to demonstrate prior knowledge of topics
    - Current event discussion
- **Formative:**
    - Teacher observations and questioning techniques
    - Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
    - Spring phenology observations
    - Reptiles of Pennsylvania Profiles
    - Current event logs/journals; Science World articles and questions
- **Summative:**
    - Common Assessment (consists of both multiple choice and free response questions)-Unit 13
- **Extensions:**
    - Teacher demonstrations
    - Extended reading
    - Current event articles and videos
    - Online Resources and activities
    - Other readings from a variety of applicable sources
    - Nature walks or local ecosystem exploration
- **Correctives:**
    - Reviewing objectives
    - Testing your comprehension handouts for each unit/topic
    - Guided reading with guides as needed

Unit 14–Humans and Sustainability **Approximately 10 days**

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.3.9-12.H– Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth systems.
3.3.9-12.O–Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
3.3.9-12.R–Evaluate or refine a technological solution that reduces the impact of human activities on natural systems.
3.4.9-12.A–Analyze and interpret how issues, trends, technologies, and policies impact agriculture, food, and environmental systems and resources.
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.
3.4.9-12.I–Analyze and interpret data on a regional environmental condition and its implications on environmental justice and social equity.
Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Make observations through nature walks with discussion of the ecological community. (DOK 2)
4. Examine local water issues and global water challenges. (DOK 2)
5. Investigate emerging pathogens linked to ticks and mosquitoes. (DOK 3)
6. Analyze technology that will contribute to sustainability in your future. (DOK 4)

Core Activities and Corresponding Instructional Methods: (be specific, list activities related to materials/resources, include hot links, article titles etc.)

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.
2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
3. Make observations through nature walks with discussion of the ecological community.
4. Use notes, diagrams, readings, knowledge questions, and video examples to present current event water issues.
    a. Water issues notes
        i. Availability of freshwater and issues
        ii. Water borne pathogens
            1. Water Testing (pa.gov)
5. Use notes, diagrams, readings, knowledge questions, and video examples to present emerging insect pathogen information.
    a. Tick-borne diseases–Lyme's disease, babesiosis, etc
        i. Lyme & Tick-Borne Disease Testing & Statistics | PA Tick Research Lab (ticklab.org)
        ii. TickCheck Tick Testing - Test your tick for Lyme and other tick-borne diseases
    b. Mosquito-borne diseases–zika, West Nile Disease, Jamestown Canyon Virus, etc
        i. Mosquitoes (pa.gov)
6. Use notes, diagrams, readings, knowledge questions, and video examples to present sustainable technologies in renewable energy, water purification, transportations, DARPA, and future research.
7. Review and reflect on Unit 14 and complete common assessment.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observation
    - Exploration and examination of local issues to demonstrate prior knowledge of topics
    - Current event discussion
- **Formative:**
    - Teacher observations and questioning techniques
    - Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
    - Water Issues Projects
    - Insect borne pathogen project

- Current technology for sustainability project
- Current event logs/journals; Science World articles and questions

- **Summative:**
  - Common Assessment (consists of both multiple choice and free response questions) or Unit Project for Assessment-Unit 14
- **Extensions:**
  - Teacher demonstrations
  - Extended reading
  - Current event articles and videos
  - Online Resources and activities
  - Other readings from a variety of applicable sources
  - Nature walks or local ecosystem exploration
- **Correctives:**
  - Reviewing objectives
  - Testing your comprehension handouts for each unit/topic
  - Guided reading with guides as needed

Unit 15–Your Biome in Summerand Final Projects **Approximately 10 days**

Standards:
Biology; Environment and Ecology; Technology
3.1.12.A2, 3.1.12.A9, 4.5.12.F, 4.3.12.C, 4.1.12.F—Science as Inquiry
4.5.12.A, 4.5.12.B, 4.5.12.C, 4.5.12.D, 4.5.12.E, 4.4.12.A, 4.4.12.B, 4.4.12.C, 4.4.12.D, 4.4.12.E, 4.3.12.A, 4.3.12.B, 4.2.12.A, 4.2.12.B., 4.2.12.C, 4.2.12.D, 4.1.12.A, 4.1.12.B, 4.1.12.C, 4.1.12.D, 4.1.12.E. 3.1.12.B1. 3.1.12.B2, 3.1.12.B4, 3.1.12.B5, 3.1.12.C1, 3.3.12.A1, 3.3.12.A2, 3.3.12.A5, 3.3.12.A6, 3.4.12.A3, 3.4.12.B1, 3.4.12.B2, 3.4.12.E1, 3.4.12.E2, 3.4.12.E3, 3.4.12.E6, 3.4.12.C3

Anchors:
Anchor(s): BIO.B.4.1.1, BIO.B.4.1.2., BIO.B.4.2.1. BIO.B.4.2.2, BIO.B.4.2.3, BIO.B.4.2.4, BIO.B.4.2.5, S11.A.1.1.1, S11.A.1.3.4, S11.A.2.1.3. S11.A.2.1.5
Unifying Themes: 3.3.12.A

2025 STEELS Standards:
3.1.9-12.C– Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
3.1.9-12.H–Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
3.1.9-12.I– Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
3.1.9-12.J–Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
3.1.9-12.L– Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
3.1.9-12.M– Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
3.1.9-12.N– Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.3.9-12.H– Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth systems.
3.3.9-12.O–Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
3.3.9-12.R–Evaluate or refine a technological solution that reduces the impact of human activities on natural systems.
3.3.9-12.S– Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
3.4.9-12.A–Analyze and interpret how issues, trends, technologies, and policies impact agriculture, food, and environmental systems and resources.
3.4.9-12.B–Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.
3.4.9-12.C–Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
3.4.9-12.D–Apply research and analytical skills to systematically investigate environmental issues ranging from local issues to those that are regional or global in scope.

3.4.9-12.E– Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
3.4.9-12.F–Communicate scientific and technical information (e.g., about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).
3.4.9-12.G–Evaluate competing design solutions to a real world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g., economic, societal, environmental, ethical considerations).
3.4.9-12.H–Design and evaluate solutions in which individuals and societies can promote stewardship in environmental quality and community well-being.
3.4.9-12.I–Analyze and interpret data on a regional environmental condition and its implications on environmental justice and social equity.

Eligible Content:
-Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
-Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
-Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).
-Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
-Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
-Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
-Describe the effects of limiting factors on population dynamics and potential species extinction.
-Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
-Compare the rate of use of natural resources and their impact on sustainability.
-Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
-Communicate results of investigations using multiple representations

Objectives:

1. Explore relevant current events on a local, state, national, and global level as they become available to foster science literacy in society. (DOK 3)
2. Investigate current events from *Science World* and other credible sources to build science literacy. (DOK 3)
3. Make observations through nature walks with discussion of the ecological community. (DOK 2)
4. Investigate late spring amphibians and reptiles and the phenology of Pennsylvania wildlife. (DOK 3)
5. Explore summer ecology and phenology for Pennsylvania flora and fauna. (DOK 2)
6. Analyze course topics for final projects. (DOK 4)

Core Activities and Corresponding Instructional Methods:

1. Due to the ongoing implementation of current events and topics in the course, flexibility is needed in the presentation of materials and content.

2. Ongoing exploration of current events on a local, state, national, and global level as they become available to foster science literacy in society and to utilize the Science World topics.
    a. Science World–Science World | Teacher Homepage (scholastic.com)
3. Make observations through nature walks with discussion of the ecological community.
4. Use notes, diagrams, readings, knowledge questions, and video examples to investigate late spring amphibians and reptiles.
    a. Nature's Events 12–Bellowing Bullfrogs and Trilling Treefrogs
    b. Nature's Events 13–Turtles Ashore
    c. Turtles Too Beloved Article
    d. PA Wildlife notes for summer ecology.
    e. Butterflies and Moths of North America
        i. Species Search | Butterflies and Moths of North America
5. Use topics from the year to complete a final research project.

Assessments:

- **Diagnostic:**
    - Teacher questioning and observation
    - Exploration and examination of local issues to demonstrate prior knowledge of topics
    - Current event discussion
- **Formative:**
    - Teacher observations and questioning techniques
    - Assorted worksheets and class work–case studies, example problems, video questions and summaries, readings and reading comprehension questions or knowledge questions
    - Wildlife observations
    - Current event logs/journals; Science World articles and questions
- **Summative:**
    - Final Project for Course
        - Create a visual artifact that examines an environmental issue or current science topic discussed throughout the course. Student choice of a video, presentation, poster, bulletin board, or other appropriate media will be considered. Topics will be assigned (only one topic per student each year for this individual project).
- **Extensions:**
    - Teacher demonstrations
    - Extended reading
    - Current event articles and videos
    - Online Resources and activities
    - Other readings from a variety of applicable sources
    - Nature walks or local ecosystem exploration
- **Correctives:**
    - Reviewing objectives
    - Testing your comprehension handouts for each unit/topic
    - Guided reading with guides as needed