# Community Partner NTI2DL
# Virtual/Hybrid Environmental Education

Citizen science.
STEM.
Place, project and problem-based learning.
Designing Solutions.

**Third Grade**

**Fifth Grade**

**Sixth Grade**

**Eighth Grade**

**HS Biology**

**HS Chemistry**

# 3rd grade
# Unit 3-3 *Environments & Survival*
(Jan 19-March 12)

## Disciplinary Core Ideas

LS4.D: *Biodiversity and Humans* Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

LS2.C: *Ecosystem Dynamics, Functioning, and Resilience* When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.(secondary)

LS4.B: *Natural Selection* Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

LS4.C: *Adaptation* For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

## Essential Vocabulary

Engineer
Organism
Survive
Inference
Environment
Predator
Trait

Population
Reproduce
Data
Explanation
Variation
Function
Structure

Adaptive
Non-adaptive
Design
Biomimicry
Criteria

# 5th grade
# Unit 5-4 *Ecosystem Restoration*
(March 15th-May 13th)

## Disciplinary Core Ideas

ESS3.C: *Human Impacts on Earth Systems* Human activities in agriculture, industry, and everyday life have had major effects on land, vegetation, streams, oceans, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

LS2.A: *Interdependent Relationships in Ecosystems* The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.

LS2.B: *Cycles of Matter and Energy Transfer in Ecosystems* Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment and release waste matter (gas, liquid, or solid) back into the environment.

PS3.D: *Energy in Chemical Processes and Everyday Life* The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).

## Essential Vocabulary

Ecologist
Observe
Matter
Molecule
Synthesize
Model
Argument
Claim
Evidence
Environment
Ecosystem
Food Web
Organism
Data
Restoration
Energy
Decomposer
Soil
Nutrient

# 6th grade
# Unit 6-8 *Populations & Resources*
(March 15th-April 16th)
# Unit 6-9 *Matter and Energy in an Ecosystem*
(April 19th-May 13th)

***Populations & Resources (March 15th-April 16th)***

**Disciplinary Core Ideas**

LS4.D: *Biodiversity and Humans* Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling.

LS2.A: *Interdependent Relationships in Ecosystems* Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and nonliving factors. Growth of organisms and population increases are limited by access to resources. Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.

LS2.C: *Ecosystem Dynamics, Functioning, and Resilience* *Ecosystems* are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.

LS2.B: *Cycle of Matter and Energy Transfer in Ecosystems* Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem.

**Essential Vocabulary**

| | | |
|---|---|---|
| Ecosystem | Energy Storage | Resource |
| Population | Molecule | Population |
| Stability | Consumer | Indirect Effect |
| Sample | Population | Competition |

***Matter and Energy in an Ecosystem (April 19th-May 13th)***

## Disciplinary Core Ideas

LS2.C: *Ecosystem Dynamics, Functioning, and Resilience* Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.

LS2.A: *Interdependent Relationships in Ecosystems* Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.

LS2.B: *Cycle of Matter and Energy Transfer in Ecosystems* Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.

## Essential Vocabulary

Abiotic
Biotic
Ecosystem
Energy Storage
Molecule
System
Consumer
Producer
Carbon
Carbon Dioxide
Photosynthesis
Cellular Respiration
Decomposer

# 8th grade
# Unit 8-8 *Earth's Changing Climate: Designing a Solution*
(March 22nd-May 13th)

## Disciplinary Core Ideas

ESS3.C: *Human Impacts on Earth Systems* Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

ETS1.B: *Developing Possible Solution* A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. Models of all kinds are important for testing solutions.

## Essential Vocabulary

| | | | | |
|---|---|---|---|---|
| Climate | Climate Change | Fluctuation | Trend | Energy |
| Temperature | Absorb | Atmosphere | Carbon Dioxide | Model |
| Human Activities | Combustion | Methane | Stability | |
| Change | | | | |
| Sulfur Dioxide | | | | |

# High School Biology w: Earth Space
# Unit 1B *Carbon and Climate*
(Sept 14th-Oct 16th)
# Unit 2B *Carrying Capacities and Resources: Designing A Solution*
(Nov 10th-Dec 4th)

## Carbon and Climate (Sept 14th-Oct 16th)

### Disciplinary Core Ideas

ESS3.D: *Global Climate Change* Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities.

ESS2.D: *Weather and Climate* Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere.

### Essential Vocabulary

Photosynthesis
Cellular Respiration
Aerobic
Anaerobic
Cycling
Biosphere
Quantitative Model
Atmosphere
Hydrosphere
Geoscience
Global Climate Model
Geosphere
Light Energy
Regional Climate Change Impacts
Chemical Energy
Energy Flow
Feedbacks
Computational Representation
Human Activity

## Carrying Capacities and Resources: Designing A Solution (Nov 10th-Dec 4th)

### Disciplinary Core Ideas

ESS3.C: *Human Impacts on Earth Systems*

The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.

LS4.D: *Biodiversity and Humans*

Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary)  Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

ETS1.B: *Developing Possible Solutions*

When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. (secondary)  Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs

LS4.C: *Adaptation*

Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline — and sometimes the extinction — of some species.

**Essential Vocabulary**

Mathematical Representations
Cycling of Matter
Flow of Energy
Organisms
Ecosystem
Computational Representations
Carrying Capacity
Scales
Biodiversity
Computational Simulation
Natural Resources
Sustainability
Environment
Natural Systems
Mitigate Natural Hazards
Climate Change

# High School Chemistry w: Earth Space
# Unit 4C *Mining Natural Resources: Designing Solutions*
(April 12th-May 13th)

## Disciplinary Core Ideas

ESS3.A: *Natural Resources*

All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors.

ETS1.B: *Developing Possible Solutions*

When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.

## Essential Vocabulary

Absorption
Energy
Chemical Reaction
Computational Model
Energy Flow
Cellular Respiration Chemical Process
Molecules
Net Transfer of Energy
Properties of Water
Surface Processes
Qualitative Criteria
Quantitative Criteria
Constraints
Mineral Resources
Cost-Benefits Ratios
Prioritized Criteria
Trade-Offs
Reliability
Aesthetics
Social Impacts
Societal Impacts
Environmental Impacts