Standard 4: Populations, Communities and Ecosystems
The student will use physical, chemical, biological, and ecological concepts to analyze and explain the interdependence of humans and organisms in populations, communities and ecosystems.

A. CYCLING OF MATTER AND ENERGY
1. Explain how organisms are linked by the transfer and transformation of matter and energy at the ecosystem level.

<table>
<thead>
<tr>
<th>PK-2</th>
<th>3-5</th>
<th>6-8</th>
<th>9-12</th>
<th>Supporting Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Develop an awareness of the relationship of features of living things and their ability to satisfy basic needs that support their growth and survival. SCI 3(K)E1</td>
<td>• Recognize that materials continue to exist even though they change from one form to another. SCI 3(3)E1</td>
<td>• Explain that the transfer and transformation of matter and energy links organisms to one another and to their physical setting. SCI 3(7)E1</td>
<td>• The student will be able to compare the transfer and use of matter and energy in photosynthetic and non-photosynthetic organisms. SCI CLG 3.1.3</td>
<td>English Language Arts R1K-2.3,10 R1.3-5,7,10 W.3.2,7 W.4.2,7,9 W.5.2,7,9 RST.6-8.4,5,7,8,9,10 W.6-8.1,2,7,8,9 RST.9-12.4,5,7,8,9,10 W.9-12.1,2,7,8,9</td>
</tr>
<tr>
<td>• Describe some of the ways in which animals depend on plants and on each other. SCI 3(1)E1</td>
<td>• Recognize food as the source of materials that all living things need to grow and survive. SCI 3(4)E1</td>
<td></td>
<td>Mathematics SMP1-8 PK-2MD 3-5MD 6-8SP S-IC S-ID</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Recognize that some source of energy is needed for all organisms to grow and survive. SCI 3(5)E1</td>
<td></td>
<td>Health 6(3)D1a 6(3)I1a 6(4)D1a 6(6)I1a,b 6(7)D1a 6(7)I1a,b</td>
<td></td>
</tr>
</tbody>
</table>

Science: PK-8: 6(5)B2a-c = Standard,(Grade),Topic, Indicator, Objectives
CLG: 1.1.1 = Goal, Expectation, Indicator
Math: SMP3 = Standards for Mathematical Practice, Standard
3.NBT = Grade, Content Domain, Standard
CTE: GTT(3.1)2-3 = Course Lesson Concepts

Social Studies: 1(PK-2)A1a,b = Standard, (Grade), Topic, Indicator, Objectives
Health: 3(5)D1a-c = Standard, (Grade), Topic, Indicator, Objectives
English Language Arts: W.1.8 = Strand, Grade, Standard
Fine Arts: PK-8: Standard, (Grade), Indicator, Objectives
HS: Subject, Outcome, Expectation, Indicator
### B. POPULATION DYNAMICS

1. Analyze the growth or decline of populations and identify a variety of responsible factors.

<table>
<thead>
<tr>
<th>PK-2</th>
<th>3-5</th>
<th>6-8</th>
<th>9-12</th>
<th>Supporting Curriculum</th>
</tr>
</thead>
</table>

- **Describe ways that animals and plants interact with each other and with their environment, such as birds nesting in trees, deer eating plants, bees pollinating flowers, spiders eating insects, etc.**
  - SCI 3(K)F1
- **Describe how geographic characteristics determine choices, such as climate guides, decisions about food, clothing, and shelter.**
  - SS 3(2)B.1.d
- **Give reasons supporting the fact that the number of organisms an environment can support depends on the physical conditions and resources available.**
  - SCI 3(6)F1
- **Identify and describe physical characteristics that influenced human settlement**
  - SS 3(6-7)B.1.a
- **Analyze how geographic characteristics stimulated regional growth, such as the purchase of the Louisiana Territory**
  - SS 3(8)B.1.c
- **Identify why people migrate, such as economic opportunity, climate, political reasons, and government policies**
  - SS 3(6-7)C.1.a
- **Compare the natural/physical and human characteristics of the three colonial regions (New England, Middle, Southern)**
  - SS 3(5)B.1.c
- **Give reasons supporting the fact that the number of organisms an environment can support depends on the physical conditions and resources available.**
  - SCI 3(6)F1
- **Identify and describe physical characteristics that influenced human settlement**
  - SS 3(6-7)B.1.a
- **Analyze how geographic characteristics stimulated regional growth, such as the purchase of the Louisiana Territory**
  - SS 3(8)B.1.c
- **Identify why people migrate, such as economic opportunity, climate, political reasons, and government policies**
  - SS 3(6-7)C.1.a
- **Compare the natural/physical and human characteristics of the three colonial regions (New England, Middle, Southern)**
  - SS 3(5)B.1.c
- **Identify the reasons for the movement of peoples to, from, and within Maryland and the United States**
  - SS 3(4)C.1.e
- **Compare the natural/physical and human characteristics of the three colonial regions (New England, Middle, Southern)**
  - SS 3(5)B.1.c
- **Give reasons supporting the fact that the number of organisms an environment can support depends on the physical conditions and resources available.**
  - SCI 3(6)F1
- **Identify and describe physical characteristics that influenced human settlement**
  - SS 3(6-7)B.1.a
- **Analyze how geographic characteristics stimulated regional growth, such as the purchase of the Louisiana Territory**
  - SS 3(8)B.1.c
- **Identify why people migrate, such as economic opportunity, climate, political reasons, and government policies**
  - SS 3(6-7)C.1.a
- **Compare the natural/physical and human characteristics of the three colonial regions (New England, Middle, Southern)**
  - SS 3(5)B.1.c

---

**Science:**  PK-8: 6(5)B2a-c = Standard,(Grade),Topic, Indicator, Objectives  
   CLG: 1.1.1 = Goal, Expectation, Indicator  
   Math:  SMP3 = Standards for Mathematical Practice, Standard  
   3.NBT = Grade, Content Domain, Standard  
   CTE:  GTI(3.1)2-3 = Course Lesson Concepts

**Social Studies:**  PK-2: A1a,b = Standard, (Grade), Topic, Indicator, Objectives  
   Health:  3(5)D1a-c = Standard, (Grade), Topic, Indicator, Objectives  
   English Language Arts:  W.1.8 = Strand, Grade, Standard  
   Fine Arts:  PK-8: Standard, (Grade), Indicator, Objectives  
   HS: Subject, Outcome, Expectation, Indicator
### C. COMMUNITY AND ECOSYSTEM DYNAMICS

1. Explain how the interrelationships and interdependencies of organisms and populations contribute to the dynamics of communities and ecosystems.

#### PK-2
- Describe ways that animals and plants interact with each other and with their environment, such as birds nesting in trees, deer eating plants, bees pollinating flowers, spiders eating insects, etc.
  - SCI 3(K)F1
- Describe some of the ways in which animals depend on plants and on each other.
  - SCI 3(1)E1
- Explain that organisms can grow and survive in many very different habitats.
  - SCI 3(2)F1
- Modifying and Adapting to the Environment
  - SCI 3(Pk-2)D

#### 3-5
- Explain ways that individuals and groups of organisms interact with each other and their environment.
  - SCI 3(4)F1
- Modifying and Adapting to the Environment
  - SCI 3(5)D

#### 6-8
- Give reasons supporting the fact that the number of organisms an environment can support depends on the physical conditions and resources available.
  - SCI 3(6)F1
- Recognize and explain how human activities can accelerate or magnify many naturally occurring changes.
  - SCI 3(8)B1
- Modifying and Adapting to the Environment
  - SCI 3(6-8)D

#### 9-12
- The student will analyze the interrelationships and interdependencies among different organisms and explain how these relationships contribute to the stability of the ecosystem.
  - SCI CLG 3.5.2
- The student will explain how organisms are linked by the transfer and transformation of matter and energy at the ecosystem level.
  - SCI CLG 6.2.1
- The student will conclude that populations grow or decline due to a variety of factors.
  - SCI LG 6.2.3
- The student will evaluate the role of government in addressing land use and other environmental issues SCI 3(G)D.1

#### Supporting Curriculum
- **English Language Arts**
  - RL.K-2.3,10
  - RI.3-5.3,7,10
  - W.3.2,7
  - W.4.2,7,9
  - W.5.2,7,9
  - RST.6-8.4,5,7,8,9,10
  - W.6-8.1,2,7,8,9
  - RST.9-12.4,5,7,8,9,10
  - W.9-12.1,2,7,8,9
- **Mathematics**
  - SMP1-8
  - PK-2MD
  - 3-5MD
  - 6-8SP
  - S-IC
  - S-ID

---

Science: PK-8: 6(5)B2a-c = Standard,(Grade),Topic, Indicator, Objectives  
  CLG: 1.1.1 = Goal, Expectation, Indicator  
  Math: SMP3 = Standards for Mathematical Practice, Standard  
  3.NBT = Grade, Content Domain, Standard  
  CTE: GTT(3.1)2-3 = Course Lesson Concepts

Social Studies: 1(PK-2)A1a,b = Standard, (Grade), Topic, Indicator, Objectives  
  Health: 3(5)D1a-c = Standard, (Grade), Topic, Indicator ,Objectives  
  English Language Arts: W.1.8 = Strand. Grade. Standard  
  Fine Arts: PK-8: Standard, (Grade), Indicator, Objectives  
  HS: Subject, Outcome, Expectation, Indicator
### D. STABILITY IN POPULATIONS, COMMUNITIES AND ECOSYSTEMS

**Indicator 1. Use models and provide examples to show how the interaction and interdependence of populations contribute to the stability of populations, communities and ecosystems.**

<table>
<thead>
<tr>
<th>PK-2</th>
<th>3-5</th>
<th>6-8</th>
<th>9-12</th>
<th>Supporting Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Examine a variety of physical models and describe what they teach about the real things they are meant to resemble. SCI 1(PK-2)D3</td>
<td></td>
<td></td>
<td></td>
<td>English Language Arts RI.K.1,3,4,5,7,8,10 RI.1-2.1,1,2,3,4,5,7,8,10 RI.3-5.1-10 W.3.5.2,7,9 RST.6-8.3,9,10 W.6.8.1,2,7,8,9 RST.9-12.3,9,10 W.9.12.1,2,7,8,9</td>
</tr>
<tr>
<td>• Explain that organisms can grow and survive in many very different habitats. SCI 3(2)F1</td>
<td>• Examine and modify models and discuss their limitations. SCI 1(3-5)D3</td>
<td>• Analyze the value and the limitations of different types of models in explaining real things and processes. SCI 1(6-8)D3</td>
<td>• The student will use models and computer simulations to extend his/her understanding of scientific concepts. SCI CLG 1.4.8</td>
<td>Mathematics SMP1-8 PK-2MD 3-5MD 6-8MD 6-8SP SMP1-8 S-ID S-IC</td>
</tr>
<tr>
<td></td>
<td>• Explain ways that individuals and groups of organisms interact with each other and their environment. SCI 3(4)F1</td>
<td>• Give reasons supporting the fact that the number of organisms an environment can support depends on the physical conditions and resources available. SCI 3(6)F1</td>
<td>• The student will explain why interrelationships &amp; interdependencies of organisms contribute to the dynamics of ecosystems. SCI CLG 6.2.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The student will conclude that populations grow or decline due to a variety of factors. SCI CLG 6.2.3</td>
<td></td>
</tr>
</tbody>
</table>

**Indicator 2. Use models and provide examples to show how species’ interactions may generate ecosystems that are stable for hundreds or thousands of years.**

<table>
<thead>
<tr>
<th>PK-2</th>
<th>3-5</th>
<th>6-8</th>
<th>9-12</th>
<th>Supporting Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Examine a variety of physical models and describe what they teach about the real things they are meant to resemble. SS 1(PK-2)D3</td>
<td>• Examine and modify models and discuss their limitations. SCI 1(3-5)D3</td>
<td>• Analyze the value and the limitations of different types of models in explaining real things and processes. SCI 1(6-8)C1</td>
<td>• The student will use models and computer simulations to extend his/her understanding of scientific concepts. SCI CLG 1.4.8</td>
<td>English Language Arts RI.K.1,3,4,5,7,8,10 RI.1-2.1,1,2,3,4,5,7,8,10 RI.3-5.1-10 W.3.5.2,7,9 RST.6-8.3,9,10 W.6.8.1,2,7,8,9 RST.9-12.3,9,10 W.9.12.1,2,7,8,9</td>
</tr>
<tr>
<td></td>
<td>• Explain ways that individuals and groups of organisms interact with each other and their environment. SCI 3(4)F1</td>
<td></td>
<td>• The student will explain why interrelationships &amp; interdependencies of organisms contribute to the dynamics of ecosystems. SCI CLG 6.2.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mathematics SMP1-8</td>
</tr>
</tbody>
</table>

**Science:** PK-5: 6(5)B2a-c = Standard,(Grade),Topic, Indicator, Objectives  
CLG: 1.1.1 = Goal, Expectation, Indicator  
Math: SMP3 = Standards for Mathematical Practice, Standard  
3.NBT = Grade, Content Domain, Standard  
CTE: GTT(3.1)2-3 = Course Lesson Concepts

**Social Studies:** 1(PK-2)A1a,b = Standard, (Grade), Topic, Indicator, Objectives  
Health: 3(5)D1a-c = Standard, (Grade), Topic, Indicator ,Objectives

**English Language Arts:** W.1.8 = Strand. Grade. Standard  
Fine Arts: PK-8: Standard, (Grade), Indicator, Objectives  
**HS:** Subject, Outcome, Expectation, Indicator
## ENVIRONMENTAL LITERACY INFUSION IN SCIENCE & SOCIAL STUDIES CURRICULA

### Topic E. DIVERSITY

**Indicator 1.** Provide examples and evidence to show that a greater diversity of genes, species and/or environments increases the chance that at least some living things will survive in the face of large changes in the environment.

<table>
<thead>
<tr>
<th>PK-2</th>
<th>3-5</th>
<th>6-8</th>
<th>9-12</th>
<th>Supporting Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Observe a variety of familiar plants and animals to describe how they are alike and how they are different. SCI 3(PK)A1</td>
<td>• Observe, describe and compare different kinds of animals and their offspring SCI 3(PK)C1</td>
<td>• Explain that individuals of the same kind differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing. SCI 3(4)D1</td>
<td>• Explain that in any particular environment, the growth and survival of organisms and species depend on the physical conditions. SCI 3(6)D1</td>
<td>• The student will explain how new traits may result from new combinations of existing genes or from mutations of genes in reproductive cells within a population. SCI CLG 3.4.1</td>
</tr>
<tr>
<td>• Observe a variety of familiar animals and plants (perhaps on the school grounds, in the neighborhood, and at home) to discover similarities and differences among them SCI 3(K)A1</td>
<td>• Recognize that living things are found almost everywhere in the world and that there are somewhat different kinds of living things in different places. SCI 3(K)D1</td>
<td>• Explain the idea that in any particular environment, some kinds of plants and animals survive well, some less well, and some cannot survive at all. SCI 3(5)A1</td>
<td>• The student will provide examples and evidence showing that natural selection leads to organisms that are well suited for survival in particular environments. SCI CLG 6.2.4</td>
<td></td>
</tr>
<tr>
<td>• Recognize that living things are found almost everywhere in the world and that there are somewhat different kinds of living things in different places. SCI 3(K)D1</td>
<td>• Explain that there are differences among individuals in any population. SCI 3(1)C1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Science: PK-8: 6(5)B2a-c = Standard, (Grade), Topic, Indicator, Objectives

- CLG: 1.1.1 = Goal, Expectation, Indicator
- Math: SMP3 = Standards for Mathematical Practice, Standard
- CTE: GTT(3.1)2-3 = Course Lesson Concepts

### Social Studies: 1(PK-2)A1a,b = Standard, (Grade), Topic, Indicator, Objectives

- Health: 3(5)D1a-c = Standard, (Grade), Topic, Indicator, Objectives
- English Language Arts: W.1.8 = Strand, Grade, Standard
- Fine Arts: PK-8: Standard, (Grade), Indicator, Objectives
- HS: Subject, Outcome, Expectation, Indicator
• Observe and describe examples of variation (differences) among individuals of one kind within a population.
SCI 3(2)D1

KEYS

English Language Arts
RST: Reading, Science & Technical Subjects
W: Writing
WHST: Writing in History, Science, & Technical Subjects

CTE
GTT: Gateway To Technology, the middle school program
POE: Principles of Engineering, a foundation course in the high school engineering program
CEA: Civil Engineering and Architecture, a specialty course in the high school engineering program
MI: Medical Interventions, the third course in the biomedical sciences program
BI: Biomedical Innovation, the fourth and capstone course in the biomedical sciences program
Mathematics

Standards for Mathematical Practices
1: Make sense of problems and persevere in solving them.
2: Reason abstractly and quantitatively.
3: Construct viable arguments and critique the reasoning of others.
4: Model with mathematics.
5: Use appropriate tools strategically.
6: Attend to precision.
7: Look for and make use of structure.
8: Look for and express regularity in repeated reasoning.

Content Standards

OA: Operations and Algebraic Thinking (K-5)
NBT: Number and Operations in Base Ten (PK-5)
MD: Measurement and Data (PK-5)
G: Geometry (PK-8)
CC: Counting and Cardinality (PK-K)
NF: Number and Operations-Fractions (3-5)
RP: Ratio and Proportional Relationships (6-7)
NS: The Number System (6-8)
EE: Expressions and Equations (6-8)
SP: Statistics and Probability (6-8)
F: Functions (8)

High School

N-RN: The Real Number System
N-Q: Quantities
N-CN: The Complex Number System
N-VM: Vector and Matrix Quantities
A-SSE: Seeing Structure in Expressions
A-APR: Arithmetic with Polynomials and Rational Expressions
A-CED: Creating Equations
A-REI: Reasoning with Equations and Inequalities
F-IF: Interpreting Functions
F-BF: Building Functions
F-LE: Linear, Quadratic and Exponential Models
F-TF: Trigonometric Functions
G-MG: Modeling with Geometry
S-ID: Interpreting Categorical and Quantitative Data
S-IC: Making Inferences and Justifying Conclusions

Science: PK-8: 6(5)B2a-c = Standard, (Grade), Topic, Indicator, Objectives
CLG: 1.1.1 = Goal, Expectation, Indicator
Math: SMP3 = Standards for Mathematical Practice, Standard
   3.NBT = Grade, Content Domain, Standard
CTE: GTT(3.1)2-3 = Course Lesson Concepts

Social Studies: 1(PK-2)A1a,b = Standard, (Grade), Topic, Indicator, Objectives
Health: 3(5)D1a-c = Standard, (Grade), Topic, Indicator, Objectives
English Language Arts: W.1.8 = Strand. Grade. Standard
Fine Arts: PK-8: Standard, (Grade), Indicator, Objectives
   HS: Subject, Outcome, Expectation, Indicator