Everett School District Framework: Green Sustainable Design and Technology
Environmental Systems Design – High School
MS - Populations and Ecosystems (7th Grade)

CIP Code: 030198	**Total Framework Hours** HS: 180 *MS: 60*
Course: Sustainable Design and Technology	**Type**: Exploratory
Career Cluster: STEM **Cluster Pathway:** Engineering and Technology	**Date Last Modified:** 12/23/2013

Resources and Standards used in Framework Development:
Course Resources:

Investigations in Environmental Science: Land Use, Water Management, and Energy
Publisher: It's About Time, 2005
Astrobiology – An Integrated Science Approach
Publisher: It's About Time, 2005
Populations and Ecosystems
Publisher: FOSS, 2005

Standards and competencies used in this framework are from OSPI Model Framework for Green Sustainable Design and Technology (030198).

Performance Assessments

High School:
1. Student will determine a suitable place for a new school construction and design the facility to have limited disruption to the environment.

2. Possible solutions to the salmon problem in the Chinook river are explored. Natural hazards are explored. The effects of removing the dams are analyzed. Water needs are calculated. Different viewpoints are discussed and argued.

3. Students build a model of a dam in a stream table and water what happens to the flow of the river and the area behind the dam. Designs are modified to determine the best structure for the intended purpose.

4. Students use their knowledge of soils as they relate to farms. Students use a computer program to simulate a farm. Precision farming methods to improve yield water-use efficiency, appropriate irrigation plan, and water calculation are determined.

5. Students analyze the community of Fresno, California. The viewpoints of different groups will be explored in relation to water use. Students will predict the best soil for growing crops, categorize soils, and calculate the amount of water a fertile soil capable of sustaining crops can hold.

6. Students calculate their own water use and determine means of reducing it. Watersheds are examined, and students calculate the recharge rates of aquifers and sustainable pumps. Implications of water over-use are determined.

Middle School:
Students study the complex interactions in Mono Lake, a high salinity lake in California. Energy distributions are studied in the lake system through the consideration of predator and prey relationships. Students then apply their understandings to an ecosystem in their community and analyze potential threats to the populations that inhabit the area.

Leadership Alignment
Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a

project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement. Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C-1 Standard: Principles of Sustainability

Total Learning Hours for Standard: HS: 20 hrs / *MS:15 hrs*

C=Core A=Advanced

Competency	Competency Description
C-1.1	Apply understanding of systems thinking and system dynamics
C-1.2	Define sustainability and sustainable design

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)

(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading

High School:
CC: Reading for Literacy in Science and Technical Subjects

Key Ideas and Details (9-10)
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure (9-10)
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas (9-10)
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity (9-10)
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Key Ideas and Details (11-12)
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure (11-12)
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to

grades 11–12 texts and topics.
RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas (11-12)

Middle School (6-8)
CC: Reading Informational Text
Key Ideas and Details:
RI.6.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
RI.6.2 Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.

Craft and Structure:
RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
RI.8.5 Analyze in detail the structure of a specific paragraph in a text, including the role of particular sentences in developing and refining a key concept.
RI.8.6 Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints.

Integration of Knowledge and Ideas:
RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
Range of Reading and Level of Text Complexity:
RI.6.10 By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Communications	
1.1.1	Applies a variety of listening strategies to accommodate the listening situation.
1.1.2	Applies a variety of listening and observation skills/strategies to interpret information.
Social Studies – Civics	
1.3.1	Understands the purposes and organization of international relationships and United States foreign policy.
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
3.2:	Understands human interaction with the environment.

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
WHST.11-12.1 Write arguments focused on discipline-specific content.
WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons,
WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form
WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter
WHST.11-12.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented.
WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables),
WHST.11-12.2b Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
WHST.11-12.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as

Production and Distribution of Writing (11-12)
WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge (11-12)
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience;
WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing (11-12)
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Middle School:
CC: Writing (8)
Text Types and Purposes:
W.8.1 Write arguments to support claims with clear reasons and relevant evidence.
W.8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.8.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

Production and Distribution of Writing:
W.8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
W.8.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.

Research to Build and Present Knowledge:
W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
W.8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Art	
1.1	Understand arts concepts and vocabulary

Science Standards

High School:
HS-LS2 Ecosystems: Interactions, Energy, and Dynamics
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS-LS2-6. 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.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

Middle School
MS-LS2 Ecosystems: Interactions, Energy, and Dynamics
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Science and Engineering Practices (Middle and High)
1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)
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.

SKILLS

Leadership: see leadership alignment above**:**

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☑ Observe	☑ Cause/Effect	☑ Finding Evidence	☐ Reasoning	☐ Originality
☑ Patterns	☐ Fact/Opinion	☑ Evaluation	☑ Problem Solving	☐ Risking
☐ Sequence	☐ Main Idea	☐ Detect Bias	☐ Goal Setting	☑ Inquisitiveness
☐ Classify	☐ Summary	☐ Inference	☐ Fluency	☐ Attending
☐ Compare/Contrast	☐ Point of View	☑ Conclusion	☐ Elaboration	☐ Persistence
☐ Predict	☑ Analysis	☐ Metacognition	☑ Flexibility	☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

High School:
1. Student will determine a suitable place for a new school construction and design the facility to have limited disruption to the environment.

2. Possible solutions to the salmon problem in the Chinook river are explored. Natural hazards are explored. The effects of removing the dams are analyzed, Water needs are calculated. Different viewpoints are discussed and argued.

3. Students build a model of a dam in a stream table and water what happens to the flow of the river and the area behind the dam. Designs are modified to determine the best structure for the intended purpose.

4. Students use their knowledge of soils as they relate to farms. Students use a computer program to simulate a farm. Precision farming methods to improve yield water-use efficiency, appropriate irrigation plan, and water calculation are determined.

5. Students analyze the community of Fresno, California. The viewpoints of different groups will be explored in relation to water use. Students will predict the best soil for growing crops, categorize soils, and calculate the amount of water a fertile soil capable of sustaining crops can hold.

6. Students calculate their own water use and determine means of reducing it. Watersheds are examined, and students calculate the recharge rates of aquifers and sustainable pumps. Implications of water over-use are determined.

Middle School:
Students raise populations of organisms to discover population dynamics and interactions over a range of conditions. They learn that food is the source of energy used by all life forms in all ecosystems to conduct life processes. Students analyze the changes caused by the influence of humans through the built environment. They are led to conclude that some changes are good, some are bad, and some are neither good nor bad. (C-2.1, 2.2, 2.3)

Leadership Alignment
Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement. Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C-2 Standard: Impact of Human Activities on Sustainability
Total Learning Hours for Standard: HS: 20 hrs / *MS: 15 hrs*

C=Core A=Advanced

Competency	Competency Description
C-2.1	Understand changes in the built environment
C-2.2	Understand changes in the natural environment (air, water, soil, flora and fauna)
C-2.3	Understand relationship between human activities and the environment
C-2.4	Define carbon footprint and global climate change
C-2.5	Understand and calculate ecological footprint

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)
(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading
High School: **CC: Reading for Literacy in Science and Technical Subjects** **Key Ideas and Details (9-10)** RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. **Craft and Structure (9-10)** RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. **Integration of Knowledge and Ideas (9-10)** RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. **Range of Reading and Level of Text Complexity (9-10)** RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. Key Ideas and Details (11-12) RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **Craft and Structure (11-12)** RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. Integration of Knowledge and Ideas (11-12) **Middle School (6-8)** **CC: Reading Informational Text** **Key Ideas and Details:** RI.6.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. RI.6.2 Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments. **Craft and Structure:** RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings. RI.8.5 Analyze in detail the structure of a specific paragraph in a text, including the role of particular sentences in developing and refining a key concept. RI.8.6 Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints. **Integration of Knowledge and Ideas:** RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
Range of Reading and Level of Text Complexity:
RI.6.10 By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Communications	
1.1.1	Applies a variety of listening strategies to accommodate the listening situation.
1.2.1	Evaluates effectiveness of and creates a personal response to visual and auditory information.
Social Studies – Civics	
1.2	Understands the purposes, organization, and function of governments, laws, and political systems.
1.3	Understands the purposes and organization of international relationships and United States foreign policy.
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
2.2.1 (9-10)	Understands and analyzes how planned and market economies have shaped the production, distribution, and consumption of goods, services, and resources around the world in the past or present.
2.2.1(11)	Understands that nations have competing philosophies about how best to produce, distribute, and consume goods, services, and resources.
4.2.3 (12)	Evaluates the ethics of current and future uses of technology based on how technology has shaped history.

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
WHST.11-12.1 Write arguments focused on discipline-specific content.
WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons,
WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form
WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter
WHST.11-12.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented.
WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables),
WHST.11-12.2b Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
WHST.11-12.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as

Production and Distribution of Writing (11-12)
WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge (11-12)
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each

source in terms of the specific task, purpose, and audience;
WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing (11-12)
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Middle School:
CC: Writing (8)
Text Types and Purposes:
W.8.1 Write arguments to support claims with clear reasons and relevant evidence.
W.8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.8.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

Production and Distribution of Writing:
W.8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
W.8.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.

Research to Build and Present Knowledge:
W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
W.8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Art	
1.1	Understand arts concepts and vocabulary

Science Standards

High School:
HS-LS2 Ecosystems: Interactions, Energy, and Dynamics
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS-LS2-6. 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.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

Middle School
MS-LS2 Ecosystems: Interactions, Energy, and Dynamics
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Science and Engineering Practices (Middle and High)
1. Asking questions and defining problems

2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)
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.

SKILLS

Leadership: see leadership alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☐ Observe	☐ Cause/Effect	☑ ☐ Finding Evidence	☑ Reasoning	☐ Originality
☑ Patterns	☐ Fact/Opinion	☑ Evaluation	☑ Problem Solving	☐ Risking
☐ Sequence	☑ Main Idea	☐ Detect Bias	☐ Goal Setting	☐ Inquisitiveness
☐ Classify	☑ Summary	☐ Inference	☐ Fluency	☐ Attending
☐ Compare/Contrast	☐ Point of View	☑ Conclusion	☐ Elaboration	☐ Persistence
☑ Predict	☐ Analysis	☐ Metacognition	☐ Flexibility	☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

High School:
1. Student will design a clean energy source in a given area. Cost, and disruption to the environment will be determined.

2. Students build a model of a dam in a stream table and water what happens to the flow of the river and the area behind the dam. Designs are modified to determine the best structure for the intended purpose.

Leadership Alignment

Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement.

Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C-4 Standard: Sustainable Power Generation Technology and Systems
Total Learning Hours for Standard: HS: 10 hrs

C=Core A=Advanced

Competency	Competency Description
C-4.1	Apply understanding of energy efficiency, conservation, and reduction
C-4.2	Apply understanding of carbon offsets
C-4.3	Apply understanding of wind generation
C-4.4	Apply understanding of solar generation
C-4.5	Apply understanding of hydro generation
C-4.6	Apply understanding of geothermal generation
C-4.7	Apply understanding of complex smart grid systems
C-4.8	Apply understanding of the issues surrounding nuclear power generation
C-4.9	Apply understanding of bio fuels and bio mass (e.g.: algae, biodiesel, methane, ethanol, etc.)
C-4.10	Identify relevant clean fossil fuel generation

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)

(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading

High School:
CC: Reading for Literacy in Science and Technical Subjects

Key Ideas and Details (9-10)
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure (9-10)
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas (9-10)
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity (9-10)
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Key Ideas and Details (11-12)
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure (11-12)
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas (11-12)

Communications	
1.1	Uses listening and observation skills and strategies to focus attention and interpret information.
Social Studies – Civics	
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
2.2.1 (9-10)	Understands and analyzes how planned and market economies have shaped the production, distribution, and consumption of goods, services, and resources around the world in the past or present.
3.2	Understands human interaction with the environment
4.2.3 (12)	Evaluates the ethics of current and future uses of technology based on how technology has shaped history.

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
WHST.11-12.1 Write arguments focused on discipline-specific content.
WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons,
WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form
WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter
WHST.11-12.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented.
WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables),
WHST.11-12.2b Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
WHST.11-12.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as

Production and Distribution of Writing (11-12)
WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge (11-12)
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience;
WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing (11-12)
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Art	
1.1	Understand arts concepts and vocabulary

Science Standards

Science and Engineering Practices
1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Science Crosscutting Concepts
4. Systems and system models.
5. Energy and matter: Flows, cycles, and conservation.

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)
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.

SKILLS

Leadership: see alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☐ Observe	☐ Cause/Effect	☑ Finding Evidence	☐ Reasoning	☑ Originality

☐ Patterns ☑ Sequence ☐ Classify ☑ Compare/Contrast ☐ Predict	☐ Fact/Opinion ☐ Main Idea ☐ Summary ☐ Point of View ☐ Analysis	☑ Evaluation ☐ Detect Bias ☐ Inference ☐ Conclusion ☐ Metacognition	☑ Problem Solving ☐ Goal Setting ☐ Fluency ☑ Elaboration ☐ Flexibility	☐ Risking ☐ Inquisitiveness ☐ Attending ☐ Persistence ☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

High School:
Student will determine a suitable place for a new school construction and design the facility to have limited disruption to the environment.
Students will determine their carbon footprint.

Leadership Alignment

Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement. Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C-5 Standard: Sustainable Resource, Materials, and Waste Management
Total Learning Hours for Standard: HS: 10 hrs

C=Core A=Advanced

Competency	Competency Description
C-5.1	Apply understanding of sustainable building products (wood, metals, composites, etc)
C-5.2	Apply understanding of deconstruction, reducing, reusing, and recycling
C-5.3	Apply understanding of food waste composting
C-5.4	Apply understanding of Electronic waste practices
C-5.5	Apply understanding of water resource issues and management

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)

(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading

High School:
CC: Reading for Literacy in Science and Technical Subjects

Key Ideas and Details (9-10)
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure (9-10)
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas (9-10)
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity (9-10)
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Key Ideas and Details (11-12)
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure (11-12)
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas (11-12)

Communications	
1.1.1	Applies a variety of listening strategies to accommodate the listening situation.
1.2.1	Evaluates effectiveness of and creates a personal response to visual and auditory information.
Social Studies – Civics	
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
3.2	Understands human interaction with the environment
4.2.3 (12)	Evaluates the ethics of current and future uses of technology based on how technology has shaped history.
5.3	Deliberates public issues
Writing	

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
WHST.11-12.1 Write arguments focused on discipline-specific content.
WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons,
WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form
WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter

WHST.11-12.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented.
WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables),
WHST.11-12.2b Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
WHST.11-12.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as

Production and Distribution of Writing (11-12)
WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge (11-12)
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience;
WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing (11-12)
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

3.1	Develops ideas and organizes writing.
3.3	Knows and applies writing conventions appropriate for the grade level.
Art	
1.1	Understand arts concepts and vocabulary

Science Standards

Science and Engineering Practices
1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)
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.

SKILLS

Leadership: see leadership alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☐ Observe	☑ Cause/Effect	☑ Finding Evidence	☑ Reasoning	☑ Originality
☐ Patterns	☐ Fact/Opinion	☑ Evaluation	☑ Problem Solving	☐ Risking
☐ Sequence	☐ Main Idea	☐ Detect Bias	☐ Goal Setting	☐ Inquisitiveness
☐ Classify	☐ Summary	☐ Inference	☐ Fluency	☐ Attending
☐ Compare/Contrast	☑ Point of View	☐ Conclusion	☐ Elaboration	☐ Persistence
☑ Predict	☐ Analysis	☐ Metacognition	☐ Flexibility	☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

High School:
1. Students use their knowledge of soils as they relate to farms. Students use a computer program to simulate a farm. Precision farming methods to improve yield water-use efficiency, appropriate irrigation plan, and water calculation are determined.

2. Students analyze the community of Fresno, California. The viewpoints of different groups will be explored in relation to water use. Students will predict the best soil for growing crops, categorize soils, and calculate the amount of water a fertile soil capable of sustaining crops can hold.

Leadership Alignment

Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement. Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C-6 Standard: Sustainable Agricultural Systems
Total Learning Hours for Standard: 20 high school

C=Core A=Advanced

Competency	Competency Description
C-6.1	Explain and apply issues and economics of sustainable practices in the agriculture industry including production, processing, marketing, and delivery systems
C-6.1.1	Apply understanding of biological integrated farming systems

C-6.1.2	Apply understanding of crop/livestock production
C-6.1.3	Apply understanding of organic farming
C-6.1.4	Apply understanding of sustainable forestry
C-6.1.5	Apply understanding of chemical use and safety (e.g. Methyl Bromide alternatives)
C-6.1.6	Apply understanding of Water Use (laws and practices)
C-6.1.7	Apply understanding of small farms and community gardens

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)

(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading

High School:
CC: Reading for Literacy in Science and Technical Subjects

Key Ideas and Details (9-10)
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure (9-10)
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas (9-10)
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity (9-10)
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Key Ideas and Details (11-12)
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure (11-12)
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas (11-12)

Communications	
1.1	Uses listening and observation skills and strategies to focus attention and interpret information.
2.1	Uses language to interact effectively and responsibly in a multicultural context.
Social Studies – Civics	
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
3.2	Understands human interaction with the environment
4.2.3 (12)	Evaluates the ethics of current and future uses of technology based on how technology has shaped history.

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
WHST.11-12.1 Write arguments focused on discipline-specific content.
WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons,
WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form
WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter
WHST.11-12.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented.
WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables),
WHST.11-12.2b Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
WHST.11-12.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as

Production and Distribution of Writing (11-12)
WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge (11-12)
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience;
WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing (11-12)
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Art	
1.1	Understand arts concepts and vocabulary

Science Standards

High School
HS-LS4 Biological Evolution: Unity and Diversity
HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity

Science Crosscutting Concepts
4. Systems and system models.
5. Energy and matter: Flows, cycles, and conservation

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)
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.

SKILLS

Leadership: see leadership alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☐ Observe	☑ Cause/Effect	☑ Finding Evidence	☑ Reasoning	☐ Originality
☐ Patterns	☐ Fact/Opinion	☑ Evaluation	☑ Problem Solving	☐ Risking
☐ Sequence	☐ Main Idea	☐ Detect Bias	☐ Goal Setting	☑ Inquisitiveness
☐ Classify	☐ Summary	☐ Inference	☐ Fluency	☐ Attending
☑ Compare/Contrast	☐ Point of View	☐ Conclusion	☐ Elaboration	☐ Persistence
☐ Predict	☐ Analysis	☐ Metacognition	☐ Flexibility	☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

High School:
1. Student will determine a suitable place for a new school construction and design the facility to have limited disruption to the environment. Students will determine their carbon footprint.

2. Possible solutions to the salmon problem in the Chinook river are explored. Natural hazards are explored. The effects of removing the dams are analyzed, Water needs are calculated. Different viewpoints are discussed and argued.

3. Students calculate their own water use and determine means of reducing it. Watersheds are examined, and students calculate the recharge rates of aquifers and sustainable pumps. Implications of water over-use are determined.

Middle School:
Students give advice to a small river town about how to deal with a new industry that wants to set up in the area. Using some of the practices and skills employed by ecologists, students study a challenge faced by a town that must determine how to save itself economically without destroying the quality of its land and water. The students working groups, and assume the role of four individuals, all of whom have interests in the town. Students should be able to present evidence to the town council that would explain what will or might happen to the town's water and land resources if a new manufacturing facility is built along the river.(C-7.1, C-7.2, C-7.3, C7.4)

Leadership Alignment
Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement. Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C-7 Standard: Sustainable Ecosystem Management
Total Learning Hours for Standard: HS: 20 hrs / *MS: 10 hrs*

C=Core A=Advanced

Competency	Competency Description
C-7.1	Apply understanding of environmental health and stewardship
C-7.2	Apply understanding of public land management and policy
C-7.3	Apply understanding of biological systems
C-7.4	Apply understanding of ecosystems services measurement

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)
(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading

High School:
CC: Reading for Literacy in Science and Technical Subjects

Key Ideas and Details (9-10)
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure (9-10)

RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas (9-10)
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity (9-10)
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Key Ideas and Details (11-12)
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure (11-12)
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas (11-12)

Middle School (6-8)
CC: Reading Informational Text
Key Ideas and Details:
RI.6.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
RI.6.2 Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
Craft and Structure:
RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
RI.8.5 Analyze in detail the structure of a specific paragraph in a text, including the role of particular sentences in developing and refining a key concept.
RI.8.6 Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints.
Integration of Knowledge and Ideas:
RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
Range of Reading and Level of Text Complexity:
RI.6.10 By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Communications	
1.1	Uses listening and observation skills and strategies to focus attention and interpret information.
3.1	Uses knowledge of topic/theme, audience, and purpose to plan presentations.
Social Studies – Civics	

1.4.1	Analyzes and evaluates ways of influencing local, state, and national governments to preserve individual rights and promote the common good.
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
3.2	Understands human interaction with the environment.
4.2.3 (12)	Evaluates the ethics of current and future uses of technology based on how technology has shaped history.
4.3.1	Analyzes the motives and interests behind an interpretation of a recent event.
5.1	Uses critical reasoning skills to analyze and evaluate positions.
5.3	Deliberates public issues.

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
WHST.11-12.1 Write arguments focused on discipline-specific content.
WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons,
WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form
WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter
WHST.11-12.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented.
WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables),
WHST.11-12.2b Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
WHST.11-12.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as

Production and Distribution of Writing (11-12)
WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge (11-12)
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience;
WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing (11-12)
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Middle School:

CC: Writing (8)
Text Types and Purposes:
W.8.1 Write arguments to support claims with clear reasons and relevant evidence.
W.8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.8.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

Production and Distribution of Writing:
W.8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
W.8.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.

Research to Build and Present Knowledge:
W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
W.8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Art	
1.1	Understand arts concepts and vocabulary

Science Standards

Science Standards

High School:
HS-LS2 Ecosystems: Interactions, Energy, and Dynamics
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS-LS2-6. 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.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

Middle School
MS-LS2 Ecosystems: Interactions, Energy, and Dynamics
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

Science and Engineering Practices (Middle and High)
1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence

8. Obtaining, evaluating, and communicating information

CC: Mathematical Practices (MP) (same for middle school and high school)

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.

SKILLS

Leadership: see alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☐ Observe	☑ Cause/Effect	☑ Finding Evidence	☑ Reasoning	☐ Originality
☑ Patterns	☐ Fact/Opinion	☑ Evaluation	☑ Problem Solving	☐ Risking
☐ Sequence	☐ Main Idea	☐ Detect Bias	☐ Goal Setting	☐ Inquisitiveness
☐ Classify	☑ Summary	☐ Inference	☐ Fluency	☐ Attending
☐ Compare/Contrast	☐ Point of View	☐ Conclusion	☐ Elaboration	☐ Persistence
☐ Predict	☐ Analysis	☐ Metacognition	☐ Flexibility	☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

High School:
Student will determine a suitable place for a new school construction and design the facility to have limited disruption to the environment.
Students will determine their carbon footprint.

Leadership Alignment

Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement. Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C-8 Standard: Sustainable Design and Construction
Total Learning Hours for Standard: HS: 10 hrs

C=Core A=Advanced

Competency	Competency Description
C-8.1	Apply understanding of “Cradle to Cradle Design” for buildings and products
C-8.2	Apply understanding of reusing and recycling construction materials
C-8.3	Apply understanding of energy efficiency practices
C-8.4	Apply understanding of retrofitting building

C-8.5	Apply understanding of green building rating systems (e.g. LEED and Green Building Council)
C-8.6	Apply understanding of sustainable landscape design, installation, and maintenance

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)

(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading

High School:
CC: Reading for Literacy in Science and Technical Subjects

Key Ideas and Details (9-10)
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure (9-10)
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas (9-10)
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity (9-10)
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Key Ideas and Details (11-12)
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
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RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas (11-12)

Communications

1.1.1	Applies a variety of listening strategies to accommodate the listening situation.
1.2.1	Evaluates effectiveness of and creates a personal response to visual and auditory information.

Social Studies – Civics

2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
3.2	Understands human interaction with the environment.
4.2.3 (12)	Evaluates the ethics of current and future uses of technology based on how technology has shaped history.

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
WHST.11-12.1 Write arguments focused on discipline-specific content.
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Range of Writing (11-12)
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Art	
1.1	Understand arts concepts and vocabulary

Science Standards

Science and Engineering Practices (Middle and High)

1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)
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.

SKILLS

Leadership: see leadership alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☐ Observe	☐ Cause/Effect	☑ Finding Evidence	☑ Reasoning	☐ Originality
☐ Patterns	☐ Fact/Opinion	☑ Evaluation	☑ Problem Solving	☐ Risking
☐ Sequence	☐ Main Idea	☐ Detect Bias	☐ Goal Setting	☐ Inquisitiveness
☐ Classify	☐ Summary	☐ Inference	☐ Fluency	☐ Attending
☑ Compare/Contrast	☐ Point of View	☐ Conclusion	☐ Elaboration	☐ Persistence
☐ Predict	☐ Analysis	☐ Metacognition	☐ Flexibility	☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

Standards based assessment on the below sub standards.

Leadership Alignment
Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement. Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C9 Standard: Sustainable Manufacturing Practices
Total Learning Hours for Standard: HS: 10 hrs

C=Core A=Advanced

Competency	Competency Description
C-9.1	Apply understanding of production line efficiency

C-9.2	Apply understanding ogproduction energy efficiency
C-9.3	Analyze sustainable manufacturing materials (e.g. biodegradable, reusable)
C-9.4	Apply understanding of reducing manufacturing toxic waste and emissions
C-9.5	Apply understanding of product packing efficiency
C-9.6	Analyze industrial materials and waste best practices (e.g. recycling manufacturing byproducts technology)

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)

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CC: Reading for Literacy in Science and Technical Subjects

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Integration of Knowledge and Ideas (11-12)

Communications

Social Studies – Civics	
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
3.2	Understands human interaction with the environment.
4.2.3 (12)	Evaluates the ethics of current and future uses of technology based on how technology has shaped history.
5.3	Deliberates public issues.
Writing	
CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12) **Text Types and Purposes (11-12)** WHST.11-12.1 Write arguments focused on discipline-specific content. WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter WHST.11-12.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented. WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), WHST.11-12.2b Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. WHST.11-12.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as **Production and Distribution of Writing (11-12)** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. **Research to Build and Present Knowledge (11-12)** WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research. Range of Writing (11-12) WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	
Art	
1.1	Understand arts concepts and vocabulary

Science Standards

Science and Engineering Practices (Middle and High)
1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)
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.

SKILLS

Leadership: see leadership alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☐ Observe	☑ Cause/Effect	☑ Finding Evidence	☑ Reasoning	☐ Originality
☐ Patterns	☐ Fact/Opinion	☑ Evaluation	☑ Problem Solving	☐ Risking
☐ Sequence	☐ Main Idea	☐ Detect Bias	☐ Goal Setting	☐ Inquisitiveness
☐ Classify	☐ Summary	☐ Inference	☐ Fluency	☐ Attending
☑ Compare/Contrast	☐ Point of View	☐ Conclusion	☐ Elaboration	☐ Persistence
☐ Predict	☑ Analysis	☐ Metacognition	☐ Flexibility	☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

High School:
Standards based assessment on the below sub standards.

Students calculate their own water use and determine means of reducing it. Watersheds are examined, and students calculate the recharge rates of aquifers and sustainable pumps. Implications of water over-use are determined.

Leadership Alignment
Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement.

Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C-10 Standard: Healthy Homes and Communities
Total Learning Hours for Standard: HS: 10 hrs

C=Core A=Advanced

Competency	Competency Description
C-10.1	Apply understanding of physical characteristics of a healthy home
C-10.2	Apply understanding to maintaining a healthy home – alternatives to toxic household products
C-10.3	Analyze household energy efficiency and retrofitting methods
C-10.4	Define a healthy sustainable community
C-10.5	Design and dvelop a healthy sustainable community

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)

(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading

High School:
CC: Reading for Literacy in Science and Technical Subjects

Key Ideas and Details (9-10)
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure (9-10)
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas (9-10)
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity (9-10)
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Key Ideas and Details (11-12)
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results

based on explanations in the text.

Craft and Structure (11-12)
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas (11-12)

Communications	
1.1	Uses listening and observation skills and strategies to focus attention and interpret information.
2.2	Uses interpersonal skills and strategies in a multicultural context to work collaboratively, solve problems, and perform tasks.
Social Studies – Civics	
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
3.2	Understands human interaction with the environment.
4.2.3 (12)	Evaluates the ethics of current and future uses of technology based on how technology has shaped history.

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
WHST.11-12.1 Write arguments focused on discipline-specific content.
WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons,
WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form
WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter
WHST.11-12.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented.
WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables),
WHST.11-12.2b Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
WHST.11-12.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as

Production and Distribution of Writing (11-12)
WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge (11-12)
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the

inquiry when appropriate; synthesize multiple sources on the subject
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience;
WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing (11-12)
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Art

1.1	Understand arts concepts and vocabulary

Science Standards

Science and Engineering Practices (Middle and High)
1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)
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.

SKILLS

Leadership: see leadership alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☐ Observe	☐ Cause/Effect	☑ Finding Evidence	☑ Reasoning	☐ Originality
☐ Patterns	☐ Fact/Opinion	☑ Evaluation	☑ Problem Solving	☐ Risking
☑ Sequence	☐ Main Idea	☐ Detect Bias	☐ Goal Setting	☐ Inquisitiveness
☐ Classify	☐ Summary	☐ Inference	☐ Fluency	☐ Attending
☐ Compare/Contrast	☐ Point of View	☐ Conclusion	☐ Elaboration	☐ Persistence
☑ Predict	☐ Analysis	☐ Metacognition	☐ Flexibility	☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

High School:

Students will determine their carbon footprint.
Students will complete the "Cool School" challenge.

Leadership Alignment

Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement. Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C-11 Standard: Sustainability in the Work Place
Total Learning Hours for Standard: HS: 10 hrs

C=Core A=Advanced

Competency	Competency Description
C-11.1	Analyze sustainable office systems creating a healthy, efficient, and effective workplace
C-11.2	Analyze sustainable office products
C-11.3	Apply understanding of sustainable lighting, heating, and cooling
C-11.4	Understand recycling in the workplace
C-11.5	Evaluate alternatives to the five day work week
C-11.6	Analyze the marketing of sustainability (e.g. "greenwashing" vs. real sustainability)

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)

(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading

High School:
CC: Reading for Literacy in Science and Technical Subjects

Key Ideas and Details (9-10)
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure (9-10)
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas (9-10)
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
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RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity (9-10)

RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
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RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
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RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas (11-12)

Communications	
1.1	Uses listening and observation skills and strategies to focus attention and interpret information.
2.2.2	Applies skills and strategies to contribute responsibly in a group setting.
Social Studies – Civics	
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
3.2	Understands human interaction with the environment.

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CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
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WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented.
WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
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specific purpose and audience.
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WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing (11-12)
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Art	
1.1	Understand arts concepts and vocabulary

Science Standards

Science Crosscutting Concepts
4. Systems and system models.
5. Energy and matter: Flows, cycles, and conservation

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)
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.

SKILLS

Leadership: see leadership alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☐ Observe	☐ Cause/Effect	☑ Finding Evidence	☑ Reasoning	☐ Originality
☐ Patterns	☐ Fact/Opinion	☑ Evaluation	☑ Problem Solving	☐ Risking
☐ Sequence	☐ Main Idea	☐ Detect Bias	☐ Goal Setting	☐ Inquisitiveness
☐ Classify	☐ Summary	☐ Inference	☐ Fluency	☐ Attending
☑ Compare/Contrast	☐ Point of View	☐ Conclusion	☑ Elaboration	☐ Persistence
☑ Predict	☑ Analysis	☐ Metacognition	☐ Flexibility	☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

High School:
1. Student will determine a suitable place for a new school construction and design the facility to have limited disruption to the environment.

2. Possible solutions to the salmon problem in the Chinook river are explored. Natural hazards are explored. The effects of removing the dams are analyzed. Water needs are calculated. Different viewpoints are discussed and argued.

3. Students build a model of a dam in a stream table and water what happens to the flow of the river and the area behind the dam. Designs are modified to determine the best structure for the intended purpose.

4. Students use their knowledge of soils as they relate to farms. Students use a computer program to simulate a farm. Precision farming methods to improve yield water-use efficiency, appropriate irrigation plan, and water calculation are determined.

5. Students analyze the community of Fresno, California. The viewpoints of different groups will be explored in relation to water use. Students will predict the best soil for growing crops, categorize soils, and calculate the amount of water a fertile soil capable of sustaining crops can hold.

6. Students calculate their own water use and determine means of reducing it. Watersheds are examined, and students calculate the recharge rates of aquifers and sustainable pumps. Implications of water over-use are determined.

Middle School:
Students give advice to a small river town about how to deal with a new industry that wants to set up in the area. Using some of the practices and skills employed by ecologists, students study a challenge faced by a town that must determine how to save itself economicallywithout destroying the quality of its land and water. The students working groups, and assume the role of four individuals, all of whom haveinterests in the town. Students should be able to present evidence to the town council that would explain what will or might happen to the town's water and land resources if a new manufacturing facility is built along the river. (C-12.1, 12.2, 12.3, 12.4, 12.5)

Leadership Alignment

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STANDARDS AND COMPETENCIES

C-12 Standard: Your Role in Building Sustainable Communities
Total Learning Hours for Standard: HS: 20 hrs / *MS:10 hrs*

C=Core A=Advanced	
Competency	**Competency Description**
C-12.1	Apply an understanding of making a difference: personal decisions and actions
C-12.2	Apply an understanding of making a difference: collective decisions and actions
C-12.3	Apply an understanding of the nature of change: decision-making processes
C-12.4	Apply an understanding of the nature of change: social marketing
C-12.5	Apply an understanding of the nature of change: research, assessment, advocacy, and action

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)

(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading

High School:
CC: Reading for Literacy in Science and Technical Subjects

Key Ideas and Details (9-10)
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure (9-10)
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas (9-10)
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity (9-10)
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Key Ideas and Details (11-12)
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure (11-12)
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas (11-12)

Middle School (6-8)
CC: Reading Informational Text
Key Ideas and Details:
RI.6.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
RI.6.2 Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
Craft and Structure:
RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
RI.8.5 Analyze in detail the structure of a specific paragraph in a text, including the role of particular sentences in developing and refining a key concept.
RI.8.6 Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints.
Integration of Knowledge and Ideas:
RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
Range of Reading and Level of Text Complexity:
RI.6.10 By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Communications	
1.1.1	Applies a variety of listening strategies to accommodate the listening situation.
2.2.2	Applies skills and strategies to contribute responsibly in a group setting.
Social Studies – Civics	
1.4.1	Analyzes and evaluates ways of influencing local, state, and national governments to preserve individual rights and promote the common good.
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.
3.2	Understands human interaction with the environment.
4.2.3 (12)	Evaluates the ethics of current and future uses of technology based on how technology has shaped history.
4.3.1	Analyzes the motives and interests behind an interpretation of a recent event.
5.1	Uses critical reasoning skills to analyze and evaluate positions.
5.3	Deliberates public issues.

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
WHST.11-12.1 Write arguments focused on discipline-specific content.
WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons,
WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form
WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter
WHST.11-12.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented.
WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables),
WHST.11-12.2b Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
WHST.11-12.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as

Production and Distribution of Writing (11-12)
WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge (11-12)
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience;
WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing (11-12)
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Middle School:
CC: Writing (8)
Text Types and Purposes:
W.8.1 Write arguments to support claims with clear reasons and relevant evidence.
W.8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.8.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

Production and Distribution of Writing:
W.8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
W.8.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.

Research to Build and Present Knowledge:
W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
W.8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Art	
1.1	Understand arts concepts and vocabulary

Science Standards

Science Crosscutting Concepts
4. Systems and system models.
5. Energy and matter: Flows, cycles, and conservation

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)
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.

SKILLS

Leadership: see leadership alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):

☐ Observe	☑ Cause/Effect	☑ Finding Evidence	☑ Reasoning	☐ Originality
☐ Patterns	☐ Fact/Opinion	☑ Evaluation	☑ Problem Solving	☐ Risking
☐ Sequence	☐ Main Idea	☐ Detect Bias	☐ Goal Setting	☐ Inquisitiveness
☐ Classify	☑ Summary	☐ Inference	☐ Fluency	☐ Attending
☐ Compare/Contrast	☐ Point of View	☑ Conclusion	☑ Elaboration	☐ Persistence
☐ Predict	☑ Analysis	☐ Metacognition	☐ Flexibility	☐ Precision

Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.

Performance Assessments

High School:
Assessed by in class discussion.

Middle School:
Assessed by in-class discussion. Intentional connections are made between the ecology concepts taught and the careers related to the concepts. Discussions center on the education students need to pursue these fields.

Leadership Alignment

Throughout the Environmental Systems Design and Population and Ecosystem courses student leadership skills are intentionally developed through a project based approach that incorporates 21st Century Skills and the application of science knowledge. Student collaboration is emphasized through group decision making and task interdependency. These opportunities allow teachers to address leadership directly and offer feedback for improvement. Students can also extend the leadership opportunities by participating in the associated CTSO.

STANDARDS AND COMPETENCIES

C-13 Standard: Career Paths in Sustainability – Postsecondary Options
Total Learning Hours for Standard: HS: 20 hrs / *MS: 10 hrs*

C=Core A=Advanced

Competency	Competency Description
C-13.1	Understand sustainability-related apprenticeship programs
C-13.2	Understand sustainability-related 2-year college degree and certificate program
C-13.3	Understand sustainability-related 4-year college degree programs
C-13.4	Understand sustainability-related entrepreneurship/innovation
C-13.5	Analyze sustainability-related business development models

EALRs, GLEs, Math and Science Standards (Taught & Assessed in Standards)

(Samples included below of GLEs, EALRS, Math and Science Standards must be modified for district frameworks)

Reading

High School:
CC: Reading for Literacy in Science and Technical Subjects

Key Ideas and Details (9-10)
RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure (9-10)
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
RST.9-10.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas (9-10)
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity (9-10)
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Key Ideas and Details (11-12)
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure (11-12)
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas (11-12)

Middle School (6-8)
CC: Reading Informational Text
Key Ideas and Details:
RI.6.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
RI.6.2 Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
Craft and Structure:
RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
RI.8.5 Analyze in detail the structure of a specific paragraph in a text, including the role of particular sentences in developing and refining a key concept.
RI.8.6 Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints.

Integration of Knowledge and Ideas:
RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
Range of Reading and Level of Text Complexity:
RI.6.10 By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Communications	
1.1.1	Applies a variety of listening strategies to accommodate the listening situation.
2.1	Uses language to interact effectively and responsibly in a multicultural context.
Social Studies – Civics	
2.1	Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11-12)
Text Types and Purposes (11-12)
WHST.11-12.1 Write arguments focused on discipline-specific content.
WHST.11-12.1a Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons,
WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form
WHST.11-12.1c Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter
WHST.11-12.1d Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
WHST.11-12.1e Provide a concluding statement or section that follows from or supports the argument presented.
WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.11-12.2a Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables),
WHST.11-12.2b Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
WHST.11-12.2c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
WHST.11-12.2d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as

Production and Distribution of Writing (11-12)
WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge (11-12)
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience;
WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing (11-12)
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Middle School:
CC: Writing (8)
Text Types and Purposes:
W.8.1 Write arguments to support claims with clear reasons and relevant evidence.
W.8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
W.8.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

Production and Distribution of Writing:
W.8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
W.8.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.

Research to Build and Present Knowledge:
W.8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
W.8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Art	
1.1	Understand arts concepts and vocabulary

Science Standards

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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.

Science Crosscutting Concepts
4. Systems and system models.
5. Energy and matter: Flows, cycles, and conservation

Mathematics Standards

CC: Mathematical Practices (MP) (same for middle school and high school)

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2 - Reason abstractly and quantitatively.
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SKILLS

Leadership: see alignment above

Analytical, Logical & Creative Thinking (check those that students will demonstrate in this lesson):				
☐ Observe ☐ Patterns ☐ Sequence ☐ Classify ☑ Compare/Contrast ☐ Predict	☐ Cause/Effect ☑ Fact/Opinion ☐ Main Idea ☐ Summary ☐ Point of View ☑ Analysis	☑ Finding Evidence ☑ Evaluation ☐ Detect Bias ☐ Inference ☑ Conclusion ☐ Metacognition	☑ Reasoning ☑ Problem Solving ☐ Goal Setting ☐ Fluency ☐ Elaboration ☐ Flexibility	☐ Originality ☐ Risking ☐ Inquisitiveness ☐ Attending ☐ Persistence ☐ Precision
Relevance to Work: Understanding that a strong work ethic will contribute to higher productivity in organizations.				