

Environmental Science High School

Prepared by:

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Superintendent of Schools:

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Approved by the Midland Park Board of Education on

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Born on **January 3, 2022**

Revised NJSLS 2020

HS Environmental Science

Course Description:

High School Environmental Science is taught in six units throughout the school year. The course is designed to foster a sense of stewardship regarding the environment by enabling the students to understand ecological issues from various points of view. The students will become knowledgeable of the critical issues that impact the natural world thus producing environmentally aware adults whose actions in the community will reflect an understanding and appreciation of the environment. The curriculum is a hands-on, open-ended and sequential process of learning about the local environment and the global environment. Aspects of physical science; life science; and engineering, technology & applications of science are taught throughout the year. A guided inquiry program gives students the opportunity to explore topics and concepts through investigations. Participating in this hands-on program helps students:

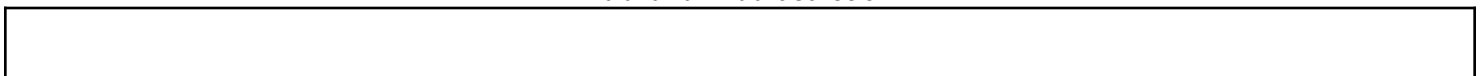
1. To foster a life-long enjoyment of learning science.
2. To observe science in the world around them.
3. To meet the science standards for New Jersey Public Schools.

Course Sequence:

- Unit 1 - Local Environment - Flora: 37 days
- Unit 2 - Local Environment - Fauna: 35 days
- Unit 3 - Ecology In General: 23 days
- Unit 4 - Population Studies: 22 days
- Unit 5 - Diminishing Biodiversity - Habitat Fragmentation and Human Predation: 40 days
- Unit 6 - Diminishing Biodiversity - Introduced Species and Pollution: 25 days

Pre-requisite: Biology

**The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 48 minutes of seat time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.*



Content Area: Environmental Science	
Unit Title: Local Environment - Flora	
Grade Level: 11/12	
Core Ideas: Local Flora, Leaf Anatomy, Parts of a flower, Chromatography	
<p>Although this unit begins in the Fall at the start of the school year, portions of this unit continue through June so that students can get a true study of the cyclical changes of organisms as a natural seasonal phenomena. Students will examine the form and function of trees and wildflowers of the Midland Park High School Campus, as well as the diversity, uses and populations of these organisms. Many lessons are weather dependent and therefore assignments and topics may be adjusted as needed.</p>	
Standards (Content and Technology):	
CPI#:	Statement:
Performance Expectations (NJSL)	
HS-LS2-6 and LS2.C	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 and LS2.C & LS4.D	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
Career Readiness, Life Literacies, and Key Skills	
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.IML.7	Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change
Computer Science and Design Thinking	
8.1.12.DA.1	Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.2.12.ETW.2	Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	

ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science
ELD-SC 9-12 Explain Interpretive	Defining investigable questions or problems based on observations, information, and/or data about a phenomenon • Paraphrasing central ideas in complex evidence, concepts, processes, and information to help explain how or why a phenomenon occurs • Evaluating the extent to which reasoning, theory and/or models link evidence to claims and support conclusions
ELD-SC 9-12 Explain Expressive	Describe reliable and valid evidence from multiple sources about a phenomenon • Establish neutral or objective stance in how results are communicated • Develop reasoning to illustrate and/ or predict the relationships between variables in a system or between components of a system • Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs
ELD-SC 9-12 Argue Interpretive	<ul style="list-style-type: none"> • Identifying appropriate and sufficient evidence from data, models, and/ or information from investigations of a phenomenon or design solutions • Comparing reasoning and claims based on evidence from competing arguments or design solutions • Evaluating currently accepted explanations, new evidence, limitations (trade-offs), constraints, and ethical issues
ELD-SC 9-12 Argue Expressive	Introduce and contextualize topic/ phenomenon in current scientific or historical episodes in science <ul style="list-style-type: none"> • Defend or refute a claim based on data and evidence • Establish and maintain an appropriate tone and stance (neutral/objective or biased/ subjective) • Signal logical relationships among reasoning, evidence, data, and/or models when making and defending a claim, counterclaim, and/or rebuttal
Interdisciplinary Connection	
NJSLSA.R7.	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
NJSLSA.R 10 .	Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.
RST.11-12.1.	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
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.
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 <i>grades 11-12 texts and topics</i> .

RST.11-12.8.	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
NJLSA.W1.	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
NJLSA.W7.	Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.
WHST.11-12.1.	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, and evidence.

<p>Unit Essential Question(s):</p> <ul style="list-style-type: none"> • How can we study plants’ cyclic and seasonal changes as natural phenomena, especially in relation to climate and ecosystems? • What are the deciduous trees of our local ecosystem (NJ)? • How can humans prevent the spread of invasive tree pathogens? • How can understanding of local ecosystems and species help me become invested in caring for the environment? • What are the wildflowers found in our local environment? • How do the life cycles of wildflowers vary? • In what ways have humans affected the populations of local and invasive species of wildflowers? • Are there important uses of wildflowers? • How do wildflowers interact with other organisms in the environment? • What impact has technology had on our study of the Flora in our area? 	<p>Unit Enduring Understandings:</p> <ul style="list-style-type: none"> • Phenology • Local tree Identification • Human activities affect on species • Personal responsibility • Structure of flowers • Wildflower Species • Medicinal and other uses of wildflowers • Diversity of Wildflowers
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Formative Assessments:

Teacher feedback, class discussion

Summative/Benchmark Assessment(s):

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Journals, Quizzes, Tests, Leaf Guide, Wildflower Watercolor print and research, Labs

Alternative Assessments:

Create an MPHS Field guide, Write a how-to-guide on identifying local flora

Resources/Materials:

Journals, paints, field guides

Textbooks:

Withgott, Jay, Grant P. Wiggins, Marylin Lisowski, Judy Scotchmoor, and Anastasia Thanukos. *Pearson Environmental Science: Your World, Your Turn*. Boston, MA: Pearson, 2011. Print.

Enger, Eldon D., and Bradley Fraser. Smith. *Environmental Science: A Study of Interrelationships*. Boston, Mass: McGraw-Hill, 2006. Print.

Miller, G. Tyler, and Scott Spoolman. *Environmental Science: Problems, Concepts, and Solutions*. Belmont, CA: Brooks Cole, 2008. Print.

Key Vocabulary: Flora, Field Guide, Identification Key, Dichotomous Key, Chromatography, Pigment, Pistil, Stigma, Style, Ovary, Anther, Stamen, Filament, Petal, Sepal, Receptacle, Pedicel

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete Entire Unit: 37 Days
Understanding a Nature Journal	Introduction to purpose, skills, responsibilities and format of a nature journal in	- Nature Journaling	5 days

	class		
Phenology Journal	Maintain journal throughout year		Year long Project - weekly entries (weather permitting)
Tree Silhouette	Initial sketch and description of assigned tree from field guide	<ul style="list-style-type: none"> - How to use a field guide - Tree drawing 	2 days
Tree Silhouette	Initial sketch and description of assigned tree outside on campus	<ul style="list-style-type: none"> - Campus nature walk - Tree drawing 	1 day

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Leaf Guides	Create collection of leaves, leaf rubbings, completed identification key	<ul style="list-style-type: none"> - How to use an identification key - Leaf collection - Leaf rubbings 	2 weeks
Tree Pathology	Study of current tree diseases affecting local ecosystems	<ul style="list-style-type: none"> - Tree disease research 	1 week
Leaf Anatomy	Complete diagrams and definitions related to leaf anatomy	<ul style="list-style-type: none"> - Leaf anatomy diagram - Leaf anatomy lab 	2 days
Chromatography lab	Identify pigments found in leaves	<ul style="list-style-type: none"> - Types of chromatography intro - Chromatography lab 	4 days
Wildflower Parts	Identify and define parts of flower on a typical flower and describe modifications of specific (assigned) species	<ul style="list-style-type: none"> - Parts of a flower - Wildflower individual research project 	2 days
Wildflower journal study	Outdoor study of species	<ul style="list-style-type: none"> - Wildflower individual research project 	3 days
Wildflower research	Research descriptions and facts related to assigned species	<ul style="list-style-type: none"> - Wildflower individual research project 	3 days

Teacher Notes:**Additional Resources:**

<http://www.nwf.org/Wildlife/Wildlife-Conservation/Phenology.aspx>,
<http://www.arborday.org/trees/whattree/WhatTree.cfm?ItemID=E6A>,
<http://uswildflowers.com/stateref.php?State=NJ>, <http://www.wildflowerinformation.org/Glossary.asp>

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504Students
<ul style="list-style-type: none">• Consult with Guidance Counselors and follow plan	<ul style="list-style-type: none">•Assign a buddy, same language or English speaking	<ul style="list-style-type: none">•Provide extension activities•Build on students'	<ul style="list-style-type: none">•Provide extended time to complete tasks	<ul style="list-style-type: none">•Allow errors•Rephrase questions, directions, and

<p>procedures/action plans</p> <ul style="list-style-type: none"> • Allow extended time to answer questions and permit drawing as an explanation • Accept participation on any level, when necessary and appropriate 	<ul style="list-style-type: none"> •Allow errors in speaking •Rephrase questions, directions, and explanations •Allow extended time to answer questions •Accept participation at any level, even one word 	<p>intrinsic motivation</p> <ul style="list-style-type: none"> •Consult with parents to accommodate students' interests in completing tasks at their level of engagement 	<ul style="list-style-type: none"> •Consult with other members of the 11th/12th grade team for specific behavior interventions •Provide rewards as necessary 	<p>explanations</p> <ul style="list-style-type: none"> •Allow extended time to answer questions and permit drawing as an explanation •Accept participation on any level, even one word •Consult with Case Managers and follow IEP accommodations/modifications
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<p>Content Area: Environmental Science</p>
<p>Unit Title: Local Environment - Fauna</p>
<p>Grade Level: 11/12</p>
<p>Core Ideas: Local Fauna, Insect Anatomy, Bird Identification, Taxonomic Rankings, Migration</p> <p>Although this unit begins in the Fall at the start of the school year, portions of this unit continue through June so that students can get a true study of the cyclical population changes a natural seasonal phenomena.</p> <p>Students will study the local animal populations that live around their environment. A focus will be on the insect and bird species. Emphasis will be placed on the identification and appreciation of these species.</p>

Standards (Content and Technology):	
CPI#:	Statement:
Performance Expectations (NJSLs)	
HS-LS2-6 and LS2.C	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 and LS2.C & LS4.D	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
Career Readiness, Life Literacies, and Key Skills	
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.IML.2	Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources
9.4.12.TL.2	Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data
Computer Science and Design Thinking	
8.1.12.DA.1	Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.5	Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
8.2.12.ETW.2	Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.

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Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science
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Interdisciplinary Connection

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NJSLSA.R 10 .	Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.
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RST.11-12.8.	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
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NJSLSA.W1.	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
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WHST.11-12.1.	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, and evidence.

<p>Unit Essential Question(s):</p> <ul style="list-style-type: none"> • How can we study plants' cyclic and seasonal changes as natural phenomena, especially in relation to climate and ecosystems? • What are some of the common insects and birds of our local ecosystem (NJ)? • How can humans help the local animal populations flourish in this ecosystem ? • How can understanding of local ecosystems and species help me become invested in caring for the environment? • What are the major parts of an insect? • How does the function of certain insect parts vary their form? • What are the insect orders and their spot ID's? • What are some ways that insects are important to us? • How do the populations of birds' migration affect their seasonal populations? • What are some bird orders and how do they differ? • What are identifying features of certain bird species? • Why is NJ important to migrating birds? • How and why should I keep a bird count? 	<p>Unit Enduring Understandings:</p> <ul style="list-style-type: none"> • Insect Anatomy • Insect Classification • Insect Identification • Bird Anatomy • Bird Classification • Bird Identification • Environmental Concerns related to species • Niche and Habitat of species • Migration
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<p>Formative Assessments:</p> <p>Teacher feedback, class discussion</p> <p>Summative/Benchmark Assessment(s):</p>

Journals, Quizzes, Tests, Songbird Watercolor print and research, Labs, Insect sketches, Bird Feeder Count

Alternative Assessments:

Create an MPHS field guide, Write a how-to-guide for identifying local fauna

Resources/Materials:

Journals, paints, field guides

Textbooks:

Withgott, Jay, Grant P. Wiggins, Marylin Lisowski, Judy Scotchmoor, and Anastasia Thanukos. *Pearson Environmental Science: Your World, Your Turn*. Boston, MA: Pearson, 2011. Print.

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Miller, G. Tyler, and Scott Spoolman. *Environmental Science: Problems, Concepts, and Solutions*. Belmont, CA: Brooks Cole, 2008. Print.

Key Vocabulary: Fauna, Metamorphosis, Antenna, Thorax, Abdomen, Taxonomy, Migration

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete Entire Unit: 35 Days
Insects Inside and Out	Identify External Anatomy of Insects	- Insect picture evaluation	2 days
Insects Inside and Out	Compare specific anatomies of various insect modifications	- Virtual insect dissection and anatomy	2 days
Life Cycles	List steps of metamorphosis	- Metamorphosis diagrams	1 day

Life Cycles	Analyze different forms of metamorphosis	- Metamorphosis research	2 days
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Insects Orders	Use spot ID markings to classify insects into various orders	- Taxonomic ranking of insects - Insect sorting and classification	6 days
Beneficial Insects	Recognize the benefits of insects	- Effects of insects project	3 days
Threats to insects	Identify, research and discuss solutions to current threats to certain insect species	- Insect threat research project	4 days
Bird Identification	List various bird orders and classify birds into the orders	- Taxonomic Ranking of Birds - Bird sorting and classification	3 days
Bird Journal	Observe details of birds through journal entries	- Individual bird research and observation project	5 days
Bird Songs	Listen to and identify bird songs	- Individual bird research and observation project	2 days
Migration	Claim and support the argument that NJ is important to the migration of bird species	- Importance of migration	2 days
Threats to birds species	Recognize environmental concerns related to bird species in the local environment	- Bird threat research project	3 days
Bird Populations	Collect and analyze population data of songbirds		Year long study

Teacher Notes:

Additional Resources:

- <http://www.environmentalscience.org/birds-ecosystem-services>
- <http://www.njaudubon.org/SectionOases/WhyisNJimportantformigratingbirds.aspx>
- <https://academy.allaboutbirds.org/features/birdsong/songbirds-in-action>

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	505Students
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<ul style="list-style-type: none"> • Consult with Guidance Counselors and follow plan procedures/action plans • Allow extended time to answer questions and permit drawing as an explanation • Accept participation on any level, when necessary and appropriate 	<ul style="list-style-type: none"> •Assign a buddy, same language or English speaking •Allow errors in speaking •Rephrase questions, directions, and explanations •Allow extended time to answer questions •Accept participation at any level, even one word 	<ul style="list-style-type: none"> •Provide extension activities •Build on students' intrinsic motivation •Consult with parents to accommodate students' interests in completing tasks at their level of engagement 	<ul style="list-style-type: none"> •Provide extended time to complete tasks •Consult with other members of the 11th/12th grade team for specific behavior interventions •Provide rewards as necessary 	<ul style="list-style-type: none"> •Allow errors •Rephrase questions, directions, and explanations •Allow extended time to answer questions and permit drawing as an explanation •Accept participation on any level, even one word •Consult with Case Managers and follow IEP accommodations/modifications
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Content Area: Environmental Science	
Unit Title: Ecology in General	
Grade Level: 11/12	
Core Ideas: Ecosystems, Energy Flow, Cycle of Matter	
<p>This unit covers the concepts related to Ecology in general. There is a focus on the energy and material transfer through ecosystems. Students will also study the habitats, niches and relationships of species within certain ecosystems. After completing this unit students will be prepared to further investigate the human impacts on ecosystems.</p>	
Standards (Content and Technology):	
CPI#:	Statement:
Performance Expectations (NJSL)	
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9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.TL.2	Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data
Computer Science and Design Thinking	
8.2.12.ETW.1	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.
8.2.12.ETW.2	Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science

ELD-SC 9-12 Explain Interpretive	Defining investigable questions or problems based on observations, information, and/or data about a phenomenon • Paraphrasing central ideas in complex evidence, concepts, processes, and information to help explain how or why a phenomenon occurs • Evaluating the extent to which reasoning, theory and/or models link evidence to claims and support conclusions
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RST.11-12.8.	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

<p>NJSLSA.W1.</p>	<p>Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.</p>
<p>NJSLSA.W7.</p>	<p>Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.</p>
<p>WHST.11-12.1.</p>	<p>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, and evidence.</p>
<p>Unit Essential Question(s):</p> <ul style="list-style-type: none"> • What roles do certain organisms serve in their ecosystem? • What are the differences between abiotic factors and biotic factors? • How do limiting factors affect an ecosystem? • How does energy flow through an ecosystem? • How are nutrients cycled through an ecosystem? • How do species interact in an ecosystem? • What makes an ecosystem more stable and sustainable? • What are the properties of various biomes? 	<p>Unit Enduring Understandings:</p> <ul style="list-style-type: none"> • Food chains and webs • Biotic and abiotic factors • Ecosystems' nutrient flow • Species interactions • Biomes • Species Diversity
<p>Formative Assessments:</p> <p>Teacher feedback, class discussion</p> <p>Summative/Benchmark Assessment(s):</p> <p>Journals, Quizzes, Tests, Lab analysis</p> <p>Alternative Assessments:</p> <p>Create a flowchart of energy in an ecosystem, Create a visual guide to dissecting an owl pellet</p>	

<p>Resources/Materials: Journals, owl pellets, edpuzzle videos</p> <p>Textbooks:</p>	<p>Key Vocabulary: Energy pyramid, Food Web, Trophic Levels, Biotic, Abiotic, Ecosystem, Niche</p>
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<p>Withgott, Jay, Grant P. Wiggins, Marilyn Lisowski, Judy Scotchmoor, and Anastasia Thanukos. <i>Pearson Environmental Science: Your World, Your Turn</i>. Boston, MA: Pearson, 2011. Print.</p> <p>Enger, Eldon D., and Bradley Fraser. Smith. <i>Environmental Science: A Study of Interrelationships</i>. Boston, Mass: McGraw-Hill, 2006. Print.</p> <p>Miller, G. Tyler, and Scott Spoolman. <i>Environmental Science: Problems, Concepts, and Solutions</i>. Belmont, CA: Brooks Cole, 2008. Print.</p>	
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Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete Entire Unit: 23 Days
Ecological Roles	Define and identify the roles of organisms in ecosystems	- Ecosystem Intro - Niche investigations	3 days
Ecosystem factors	Compare and contrast abiotic and biotic factors	- Biotic vs. Abiotic	2 days
Energy Flow (pyramids)	Demonstrate the relationships among ecological components by organizing them into energy pyramids.	- Energy Pyramids - Flow of Energy and Matter	2 days
Energy Flow (food web)	Trace the energy through a food web	- Food webs - Trophic levels	2 days
Energy Flow (analysis)	Analyze effects of a change in a food web	- Disruptions to the food web	3 days

Nutrient Cycle	Describe the cycling of nutrients in an ecosystem, including carbon, oxygen, nitrogen and phosphorus.	<ul style="list-style-type: none"> - Cycle of matter - Carbon cycle - Oxygen cycle - Nitrogen cycle - Phosphorous cycle 	1 week
Owl Pellets	Make a conclusion about the stability of an ecosystem based on the diversity of prey	<ul style="list-style-type: none"> - Owl pellet lab 	6 days

Teacher Notes:

Additional Resources:

<http://education.nationalgeographic.org/activity/ecological-relationships/>

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<http://sci.waikato.ac.nz/farm/content/nutrientcycling.html>
<http://www.learner.org/courses/envsci/interactives/ecology/ecology.html>
<http://money.howstuffworks.com/30927-dirty-jobs-owl-vomit-video.htm>

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	506Students
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<ul style="list-style-type: none"> • Consult with Guidance Counselors and follow plan procedures/action plans • Allow extended time to answer questions and permit drawing as an explanation • Accept participation on any level, when necessary and appropriate 	<ul style="list-style-type: none"> •Assign a buddy, same language or English speaking •Allow errors in speaking •Rephrase questions, directions, and explanations •Allow extended time to answer questions •Accept participation at any level, even one word 	<ul style="list-style-type: none"> •Provide extension activities •Build on students' intrinsic motivation •Consult with parents to accommodate students' interests in completing tasks at their level of engagement 	<ul style="list-style-type: none"> •Provide extended time to complete tasks •Consult with other members of the 11th/12th grade team for specific behavior interventions •Provide rewards as necessary 	<ul style="list-style-type: none"> •Allow errors •Rephrase questions, directions, and explanations •Allow extended time to answer questions and permit drawing as an explanation •Accept participation on any level, even one word •Consult with Case Managers and follow IEP accommodations/modifications
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<p>Content Area: Environmental Science</p>
<p>Unit Title: Population Studies</p>
<p>Grade Level: 11/12</p>

Core Ideas: Population Curves, Population Studying, Ecological Succession, Temperate Deciduous Forests

This unit covers the concepts of population changes, factors that affect populations and methods in which ecologists study populations. Students will examine the limiting factors and carrying capacities in a ecosystems. There will be opportunities to analyze the different growth curves found in nature. Class labs and activities will give students the chance to model various sample census taking techniques. A study of how succession occurs in ecosystems will also be covered in this unit.

Standards (Content and Technology):**CPI#:****Statement:****Performance Expectations (NJSL)**HS-LS2-6
and LS2.C

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
and LS2.C
& LS4.D

Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Career Readiness, Life Literacies, and Key Skills

9.4.12.CI.1

Demonstrate the ability to reflect, analyze, and use creative skills and ideas

9.4.12.CT.2

Explain the potential benefits of collaborating to enhance critical thinking and problem solving

9.4.12.TL.2

Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data

Computer Science and Design Thinking

8.1.12.DA.1

Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.

8.1.12.DA.5

Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

Intercultural Statements (Amistad, Holocaust, LGBT, etc...)

ELD Standard 4

English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science

ELD-SC 9-12 Explain Interpretive	Defining investigable questions or problems based on observations, information, and/or data about a phenomenon • Paraphrasing central ideas in complex evidence, concepts, processes, and information to help explain how or why a phenomenon occurs • Evaluating the extent to which reasoning, theory and/or models link evidence to claims and support conclusions
ELD-SC 9-12 Explain Expressive	Describe reliable and valid evidence from multiple sources about a phenomenon • Establish neutral or objective stance in how results are communicated • Develop reasoning to illustrate and/ or predict the relationships between variables in a system or between components of a system • Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs
ELD-SC 9-12 Argue Interpretive	<ul style="list-style-type: none"> Identifying appropriate and sufficient evidence from data, models, and/ or information from investigations of a phenomenon or design solutions Comparing reasoning and claims based on evidence from competing arguments or design solutions Evaluating currently accepted explanations, new evidence, limitations (trade-offs), constraints, and ethical issues
ELD-SC 9-12 Argue Expressive	<p>Introduce and contextualize topic/ phenomenon in current scientific or historical episodes in science</p> <ul style="list-style-type: none"> Defend or refute a claim based on data and evidence Establish and maintain an appropriate tone and stance (neutral/objective or biased/ subjective) Signal logical relationships among reasoning, evidence, data, and/or models when making and defending a claim, counterclaim, and/or rebuttal
Interdisciplinary Connection	
NJSLSA.R7.	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
NJSLSA.R10.	Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.
RST.11-12.1.	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
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.
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 <i>grades 11-12 texts and topics</i> .
RST.11-12.8.	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

<p>NJSLSA.W1.</p>	<p>Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.</p>
<p>NJSLSA.W7.</p>	<p>Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.</p>
<p>WHST.11-12.1.</p>	<p>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, and evidence.</p>
<p>Unit Essential Question(s):</p> <ul style="list-style-type: none"> • How are sample census data and true census data useful? • What are the benefits of certain census techniques? • What are limiting factors? • What are the differences between density dependent and density independent factors? • How can population density be distributed? • What is a community? • What is ecological succession? • How can succession differ in certain circumstances? • How do the species change during succession? • Why do certain species die out during succession while others become the climax community? • What case studies have scientists used to study the process of succession? 	<p>Unit Enduring Understandings:</p> <ul style="list-style-type: none"> • Census • Limiting factors • Population Studies • Growth Curves • Communities • Primary Succession • Secondary Succession • Levels of Forest Layers • Benefits of Ecological Succession

Formative Assessments:

Teacher feedback, class discussion

Summative/Benchmark Assessment(s):

Journals, Quizzes, Tests, Data Analysis, research

Alternative Assessments:

Create a flip book for ecological succession, Create a Temperate Deciduous Forest model

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Resources/Materials:

Lab kits, videos,

Textbooks:

Withgott, Jay, Grant P. Wiggins, Marylin Lisowski, Judy Scotchmoor, and Anastasia Thanukos. *Pearson Environmental Science: Your World, Your Turn*. Boston, MA: Pearson, 2011. Print.

Enger, Eldon D., and Bradley Fraser. Smith. *Environmental Science: A Study of Interrelationships*. Boston, Mass: McGraw-Hill, 2006. Print.

Miller, G. Tyler, and Scott Spoolman. *Environmental Science: Problems, Concepts, and Solutions*. Belmont, CA: Brooks Cole, 2008. Print.

Key Vocabulary: Population Demographics, Population density, Fecundity, Mortality, Sex Ratio, Age Structure, Succession, Nudation, Invasion, Ecesis, Aggregation, Stabilization

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete Entire Unit: 22 Days
Deer Population	Compare starvation vs. predation as factors affecting populations	<ul style="list-style-type: none"> - Carrying capacity of an environment - Starvation vs. Predation 	2 days

Population Growth	Study data and analyze different population growth curves	- Population growth curves research and analysis	3 days
Population Terms	Define terms related to population studies	- Population demographics	1 day
Population Census Lab	Perform sample census techniques and estimate populations	- Population recording - Population analysis	5 days
Temperate Deciduous Forest	Describe the specific biome using websites, textbook and illustrations	- Temperate Deciduous Forest research project	3 days
Mt. St Helens	Describe succession in the area after eruption	- Pioneer species - Mt. St. Helens case study	5 days

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Processes of Succession	Explain how the steps of succession can occur with resets along the way	- Steps of Succession	3 days
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Teacher Notes:

Additional Resources:

<http://www.bozemanscience.com/ap-environmental-science/>
<http://www.ecoplexity.org/?q=node/496>
http://blueplanetbiomes.org/deciduous_forest.htm

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	507Students
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				<p>ations/modifications</p>
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<p>Content Area: Environmental Science</p>
<p>Unit Title: Earth's Diminishing Biodiversity – Habitat Fragmentation and Human Predation</p>

Grade Level: 11/12

Core Ideas: Political Acts and Laws, Endangered Species, Human Impact on Species

During this unit students will learn about the importance of biodiversity and the issues that are impacting biodiversity globally. A focus on the major issues of Habitat Fragmentation will be addressed through research, current statistics and modelling of land planning. Human predation will introduce the issues related to overfishing, poaching and other ways that humans (as predators) have caused a decline in populations.

Standards (Content and Technology):

CPI#:

Statement:

Performance Expectations (NJSLS)

HS-LS2-6
and LS2.C

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
and LS2.C
& LS4.D

Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Career Readiness, Life Literacies, and Key Skills

9.4.12.CI.1

Demonstrate the ability to reflect, analyze, and use creative skills and ideas

9.4.12.CT.2

Explain the potential benefits of collaborating to enhance critical thinking and problem solving

9.4.12.IML.2

Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources

9.4.12.IML.7

Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change

9.4.12.TL.2

Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data

Computer Science and Design Thinking

8.1.12.DA.1

Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.

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8.1.12.DA.5

Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

8.2.12.ETW.1	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.
8.2.12.ETW.2	Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science
ELD-SC 9-12 Explain Interpretive	Defining investigable questions or problems based on observations, information, and/or data about a phenomenon • Paraphrasing central ideas in complex evidence, concepts, processes, and information to help explain how or why a phenomenon occurs • Evaluating the extent to which reasoning, theory and/or models link evidence to claims and support conclusions
ELD-SC 9-12 Explain Expressive	Describe reliable and valid evidence from multiple sources about a phenomenon • Establish neutral or objective stance in how results are communicated • Develop reasoning to illustrate and/ or predict the relationships between variables in a system or between components of a system • Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs
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RST.11-12.1.	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
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.

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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 <i>grades 11-12 texts and topics</i> .
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NJSLSA.W1.	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
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WHST.11-12.1.	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, and evidence.

Unit Essential Question(s):

- What are the major levels of concerns when discussing diminishing populations?
- What are some of the laws/acts are there that address the topics of Habitat Use and Human Predation? • How can I make responsible choices when making land planning decisions?
- What are some species that are most affected by habitat fragmentation?
- Why are certain species more vulnerable to habitat fragmentation than others?
- Is hunting (human predation) always a bad thing? Why/Why not?
- How has poaching been regulated over the years? Are there effective methods for controlling illegal poaching? • What is overfishing? How have humans contributed to the over hunting of fish populations over the years? • Which populations of fish have most been adversely affected by humans?
- What has history taught us about overfishing? • How has technology contributed to the problem? How has it helped with the issues?

Unit Enduring Understandings:

- The levels of concern for populations
- How personal choices affecting biodiversity • The effects of habitat fragmentation on biodiversity • Decision making for land planning and urban growth • Issues related to overfishing
- History of poaching
- The positive and negative use of technology for human predation concerns

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Formative Assessments:

Teacher feedback, class discussion

Summative/Benchmark Assessment(s):

Journals, Quizzes, Tests, lab activities, research work

Alternative Assessments:

Create a children's book about an endangered species and why it is endangered

<p>Resources/Materials: Journals, Labs, Case Studies</p> <p>Textbooks:</p> <p>Withgott, Jay, Grant P. Wiggins, Marylin Lisowski, Judy Scotchmoor, and Anastasia Thanukos. <i>Pearson Environmental Science: Your World, Your Turn</i>. Boston, MA: Pearson, 2011. Print.</p> <p>Enger, Eldon D., and Bradley Fraser. Smith. <i>Environmental Science: A Study of Interrelationships</i>. Boston, Mass: McGraw-Hill, 2006. Print.</p> <p>Miller, G. Tyler, and Scott Spoolman. <i>Environmental Science: Problems, Concepts, and Solutions</i>. Belmont, CA: Brooks Cole, 2008. Print.</p>	<p>Key Vocabulary: C.I.T.E.S., Endangered, Extinct, Habitat fragmentation, land planning, poaching</p>
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Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete Entire Unit: 40 Days
Historical Perspective	Describe how human activity affected certain species in the past and what we can learn from that (Great Auk, Stellar Sea Cow, Passenger Pigeon)	- Extinct species research project	3 days (introduction, research, present)

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Political Acts and Laws	Define and Understand the value of C.I.T.E.S	- Effects of international trade on species - Understanding C.I.T.E.S.	2 days
Political Acts and Laws	Explain the importance of the Endangered Species Act (ESA)	- Case studies of the Endangered Species Act	2 days

National vs Global Concerns	Compare the benefits and challenges of certain national and global policies in relation to diminishing populations	- Local vs. Federal Vs. International issues	2 days
“Who Cares?”	Make choices on what endangered species to put financial support into saving	- Endangered species financial support debate	3 days
Plants in Peril	Recognize the value of saving often overlooked species such as plants	- Important plant case studies	4 days
Habitats - The Choice is yours	Make responsible choices when deciding how to develop land for a human community	- City planning and the environment	1 week
Songbirds	Make correlation between habitat fragmentation and the decline of songbird populations	- The Decline of songbirds	2 days
Real Life Case Study	Argue the value in land planning case studies (Portland OR, Phoenix AR,...)	- Land planning case studies	2 days
Homeostasis - populations	Investigate the effect of hunting by studying quail populations	- Quail population analysis	2 days
Fish Banks	Argue the importance of sustainability in reference to renewable resources (fish populations)	- Sustainability of resources - Fish populations analysis	1 week
Red Knots	Observe the connection of species populations through the study of the over hunting of horseshoe crabs and its effect on Red Knot population	- Horseshoe crab investigation - Red Knot population	3 days
Poaching - Case Studies	Communicate effectively the issues related to poaching wildlife and solutions to those issues (elephant, rhinoceros, gorilla)	- Poaching research project	1 week

Teacher Notes:

Additional Resources:

- <http://www.innovateus.net/earth-matters/how-habitat-fragmentation-affecting-songbirds>
- <https://www.nwf.org/Wildlife/Threats-to-Wildlife/Habitat-Loss.aspx>
- <https://mitsloan.mit.edu/LearningEdge/simulations/fishbanks/Pages/fish-banks.aspx>
- http://gcrl.usm.edu/fisheries_center/docs/brochure.horseshoe.crab.pdf

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	508Students
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Content Area: Environmental Science	
Unit Title: Earth's Diminishing Biodiversity – Introduced Species and Pollution	
Grade Level: 11/12	
Core Ideas: Invasive Species, Types of Pollution, Laws and Regulations, Current Events	
<p>During this unit students will learn about the importance of biodiversity and the issues that are impacting biodiversity globally. A focus on the major issues of Introduced Species and the negative effects it has on an ecosystem will be addressed through research, current statistics and case studies. A study of human activity will introduce students to the various causes of pollution and the types of pollution. Students will study and evaluate solutions for reducing the impacts of human activities on the environment and biodiversity.</p>	
Standards (Content and Technology):	
CPI#:	Statement:
Performance Expectations (NJSL)	
HS-LS2-6 and LS2.C	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 and LS2.C & LS4.D	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
Career Readiness, Life Literacies, and Key Skills	
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.IML.7	Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change
Computer Science and Design Thinking	
8.2.12.ETW.1	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.
8.2.12.ETW.2	Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	

ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science
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ELD-SC 9-12 Explain Interpretive	Defining investigable questions or problems based on observations, information, and/or data about a phenomenon • Paraphrasing central ideas in complex evidence, concepts, processes, and information to help explain how or why a phenomenon occurs • Evaluating the extent to which reasoning, theory and/or models link evidence to claims and support conclusions
ELD-SC 9-12 Explain Expressive	Describe reliable and valid evidence from multiple sources about a phenomenon • Establish neutral or objective stance in how results are communicated • Develop reasoning to illustrate and/ or predict the relationships between variables in a system or between components of a system • Summarize and refine solutions referencing scientific knowledge, evidence, criteria, and/or trade-offs
ELD-SC 9-12 Argue Interpretive	<ul style="list-style-type: none"> Identifying appropriate and sufficient evidence from data, models, and/ or information from investigations of a phenomenon or design solutions Comparing reasoning and claims based on evidence from competing arguments or design solutions Evaluating currently accepted explanations, new evidence, limitations (trade-offs), constraints, and ethical issues
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Interdisciplinary Connection

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NJSLSA.W1.	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
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WHST.11-12.1.	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, and evidence.

<p>Unit Essential Question(s):</p> <ul style="list-style-type: none"> • What has been the human impact on the species decline in relation to invasive species and pollution? • How and why have humans introduced species into an ecosystem? • What have been the negative effects of these introduced species on other populations? • What are some control methods that address the impact of the introduced species? • Are there some control methods that are more effective? • What are the categories of pollution that are affecting our ecosystems? • How have we learned from pollution issues of the past and how do we apply this understanding to prevent future pollution issues? • How can we balance our needs for resources and the pollution that is a byproduct of these needs? • How can we engineer solutions to our pollution problems? 	<p>Unit Enduring Understandings:</p> <ul style="list-style-type: none"> • Levels of concern for populations • Personal Choices affecting biodiversity • Introduced species impact on other species • Analysis of control methods (invasive species) • Point and Nonpoint Pollution • Methods of clean up • Case Studies and the lessons learned
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Formative Assessments:

Teacher feedback, class discussion

Summative/Benchmark Assessment(s):

Journals, Quizzes, Tests, lab activities, research work

Alternative Assessments:

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Create a field guide to local invasive species, Create a public service announcement about personal impact of pollution

Resources/Materials:

Journals, Labs, Case Studies

Textbooks:

Withgott, Jay, Grant P. Wiggins, Marylin Lisowski, Judy Scotchmoor, and Anastasia Thanukos. *Pearson Environmental Science: Your World, Your Turn*. Boston, MA: Pearson, 2011. Print.

Enger, Eldon D., and Bradley Fraser. Smith. *Environmental Science: A Study of Interrelationships*. Boston, Mass: McGraw-Hill, 2006. Print.

Miller, G. Tyler, and Scott Spoolman. *Environmental Science: Problems, Concepts, and Solutions*. Belmont, CA: Brooks Cole, 2008. Print.

Key Vocabulary: Invasive Species, Point source pollution, Non-point source pollution, Air quality index, parts per million, Particulate matter

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete Entire Unit: 25 Days
Invasive plants (locally)	Identify local plants that are invasive species	- Local invasive plant species case studies	2 days

Invasive species (globally)	Research an area where an invasive species has negatively affected the ecosystem	- Global invasive plant species research project	3 days
Invasive Species Awareness	Design public service announcement to bring about awareness of invasive species	- Invasive Species case studies - Public service announcement project	5 days
Types of Pollution	Compare water, land and air pollution	- Water pollution - Land pollution - Air pollution	1 day
Point vs Nonpoint	Understand difference between point and nonpoint pollution	- Point source pollution	2 days

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		- Non-point source pollution	
Personal impact	Identify various ways individuals contribute to pollution in our environment	- Garbage timeline - Human impact on pollution - Personal impact on pollution	2 days
Regulations	Identify and evaluate current laws/regulations related to pollution	- Pollution law investigation - Clean air act - Clean water act	5 days
Current Events	Research and discuss current news related to pollution issues (cause, clean up, long term effects..)	- Current events	5 days

Teacher Notes:

Additional Resources:

<https://www3.epa.gov/>
<http://www.educationscotland.gov.uk/stemcentral/contexts/water/interactive/pollution.asp>
http://seagrant.oregonstate.edu/main/healthy-coastal-ecosystems-and-habitats/watershed-education_conservation/watershed-and-invasive

Students with Disabilities	English Language	Gifted and Talented	Students at Risk	509Students
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	Learners	Students		
<ul style="list-style-type: none"> • Consult with Guidance Counselors and follow plan procedures/action plans • Allow extended time to answer questions and permit drawing as an explanation • Accept participation 	<ul style="list-style-type: none"> •Assign a buddy, same language or English speaking •Allow errors in speaking •Rephrase questions, directions, and explanations •Allow extended time to 	<ul style="list-style-type: none"> •Provide extension activities •Build on students' intrinsic motivation •Consult with parents to accommodate students' interests in completing tasks at their level of 	<ul style="list-style-type: none"> •Provide extended time to complete tasks •Consult with other members of the 11th/12th grade team for specific behavior interventions 	<ul style="list-style-type: none"> •Allow errors •Rephrase questions, directions, and explanations •Allow extended time to answer questions and permit drawing as an explanation

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<p>on any level, when necessary and appropriate</p>	<p>answer questions</p> <ul style="list-style-type: none"> •Accept participation at any level, even one word 	<p>engagement</p>	<ul style="list-style-type: none"> •Provide rewards as necessary 	<ul style="list-style-type: none"> •Accept participation on any level, even one word •Consult with Case Managers and follow IEP accommodations/modifications
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