MIDLAND PARK PUBLIC SCHOOLS
Midland Park, New Jersey
CURRICULUM

Environmental

Science

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Superintendent of Schools:
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Approved by the Midland Park Board of Education on August 16, 2016

Midland Park Public Schools

HS Environmental Science Curriculum Overview

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 though 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.

Suggested Course Sequence*:

Unit A - Local Environment - Flora: 37 days
Unit B - Local Environment - Fauna: 35 days
Unit C- Ecology In General: 23 days
Unit D - Population Studies: 22 days
Unit E - Diminishing Biodiversity - Habitat Fragmentation and Human Predation: 40 days
Unit F - Diminishing Biodiversity - Introduced Species and Pollution: 25 days

Pre-Requisites: 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 Environmental - Flora

Grade Level: 11/12

Unit Summary: 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.

Interdisciplinary Connections:
Math, Art, History, Chemistry, English

21st Century Themes and Skills:
CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

Standards (Content and Technology):

CPI#:	Statement:
Next Generation Science Standards	
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.
2014 New Jersey Core Curriculum Content Standards - Technology	
8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
8.1.12.E.2	Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers.
8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
8.2.12.B.5	Research the historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product, and present the competing viewpoints to peers for review.

Unit Essential Question(s):	**Unit Enduring Understandings:**
• 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?	• Phenology • Local tree Identification • Human activities affect on species • Personal responsibility • Structure of flowers • Wildflower Species

• 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?	• Medicinal and other uses of wildflowers • Diversity of Wildflowers

Unit Learning Targets/Objectives:

Students will

- Maintain an Environmental Journal
- Define Phenology and apply knowledge to a year long study
- Describe leaf anatomy and how it relates to the biological processes of the tree
- Relate cause and effect of tree diseases
- Distinguish between native and non-native tree pathogens
- Describe the human effects on tree pathology
- Increase appreciation of local species
- Maintain an Environmental Journal - Wildflower notes
- Describe flower anatomy and how it relates to biological processes
- Relate cause and effect of human introduction of a flower species to the local ecology
- Identify medicinal and other benefits of wildflowers
- Understand personal responsibility when landscaping
- Increase ability to identify and appreciate local wildflowers

Formative Assessments:

Teacher feedback, class discussion

Summative/Benchmark Assessment(s):

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

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.

Modifications:

- Special Education Students
  - modified readings
- At-Risk Students
  - modified readings

- student choice on topics
- English Language Learners
  - modified readings
  - student choice on topics
- student choice on topics
- Gifted and Talented Students
  - advanced readings
  - mathematical analysis problems

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Understanding a Nature Journal	Introduction to purpose, skills, responsibilities and format of a nature journal in class	5 days
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	2 days
Tree Silhouette	Initial sketch and description of assigned tree outside on campus	1 day
Leaf Guides	Create collection of leaves, leaf rubbings, completed identification key	2 weeks
Tree Pathology	Study of current tree diseases affecting local ecosystems	1 week
Leaf Anatomy	Complete diagrams and definitions related to leaf anatomy	2 days
Chromatography lab	Identify pigments found in leaves	4 days
Wildflower Parts	Identify and define parts of flower on a typical flower and describe modifications of specific (assigned)species	2 days
Wildflower journal study	Outdoor study of species	3 days
Wildflower research	Research descriptions and facts related to assigned species	3 days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

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

Content Area: Environmental Science

Unit Title: Local Environmental - Fauna

Grade Level: 11/12

Unit Summary: 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. 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.

Interdisciplinary Connections:
Math, Art, History, Chemistry, English

21st Century Themes and Skills:
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CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
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Unit Essential Question(s):	**Unit Enduring Understandings:**
• 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 ?	• Insect Anatomy • Insect Classification • Insect Identification • Bird Anatomy • Bird Classification • BIrd Identification • Environmental Concerns related to species

• 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?	• Niche and Habitat of species • Migration

Unit Learning Targets/Objectives:

Students will

- Maintain an Environmental Journal - Birds
- Increase ability to identify and appreciate local songbirds
- Research and keep a bird count and apply knowledge to a year long study (H)
- Describe flower anatomy and how it relates to the biological processes of the flower
- Describe insect anatomy and how it relates to the biological processes of the insect
- Environmental Issues related to insect populations ie. honeybee populations
- Maintain an Environmental Journal - Insect notes and sketches
- Increase appreciation of local species of insects
- Understand personal responsibility when landscaping

Formative Assessments:

Teacher feedback, class discussion

Summative/Benchmark Assessment(s):

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

Resources/Materials (copy hyperlinks for digital resources):

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.

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Modifications:

- Special Education Students
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- English Language Learners
- At-Risk Students
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  - student choice on topics
- Gifted and Talented Students

- modified readings
- student choice on topics
- advanced readings
- mathematical analysis problems
- advanced bird count studies

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Insects Inside and Out	Identify External Anatomy of Insects	2 days
Insects Inside and Out	Compare specific anatomies of various insect modifications	2 days
Life Cycles	List steps of metamorphosis	1 day
Life Cycles	Analyze different forms of metamorphosis	2 days
Insects Orders	Use spot ID markings to classify insects into various orders	6 days
Beneficial Insects	Recognize the benefits of insects	3 days
Threats to insects	Identify, research and discuss solutions to current threats to certain insect species	4 days
Bird Identification	List various bird orders and classify birds into the orders	3 days
Bird Journal	Observe details of birds through journal entries	5 days
Bird Songs	Listen to and identify bird songs	2 days
Migration	Claim and support the argument that NJ is important to the migration of bird species	2 days
Threats to birds species	Recognize environmental concerns related to bird species in the local environment	3 days
Bird Populations	Collect and analyze population data of songbirds	Year long study

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

http://www.environmentalscience.org/birds-ecosystem-services

http://www.njaudubon.org/SectionOases/WhyisNJimportantformigratingbirds.aspx

https://academy.allaboutbirds.org/features/birdsong/songbirds-in-action

Content Area: Environmental Science

Unit Title: Ecology In General

Grade Level: 11/12

Unit Summary: This unit covers the concepts related to Ecology in general. There is a focus on the energy and 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.

Interdisciplinary Connections:
Math, Art, History, English

21st Century Themes and Skills:
CRP1. Act as a responsible and contributing citizen and employee.
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Standards (Content and Technology):

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Unit Essential Question(s):
- 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?

Unit Enduring Understandings:
- Food chains and webs
- Biotic and abiotic factors
- Ecosystems' nutrient flow
- Species interactions
- Biomes

• 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?	• Species Diversity

Unit Learning Targets/Objectives:

Students will

- Identify organisms in terms of their role in an ecosystem producer consumer, decomposer.
- Describe the role of biotic and biotic factors in the environment and in environmental issues.
- Explain how energy flows in a community.
- Describe the cycling of nutrients in an ecosystem, including carbon, oxygen, nitrogen and phosphorus.
- Describe species interaction and roles in the mixed deciduous forest ecosystem.
- Collect and analyze data related to barn owls' diets.

Formative Assessments:

Teacher feedback, class discussion

Summative/Benchmark Assessment(s):

Journals, Quizzes, Tests, Lab analysis

Resources/Materials (copy hyperlinks for digital resources):

Journals, owl pellets, edpuzzle 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.

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Modifications:

- Special Education Students
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- English Language Learners
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  - student choice on topics
- At-Risk Students
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- Gifted and Talented Students
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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Ecological Roles	Define and identify the roles of organisms in ecosystems	3 days
Ecosystem factors	Compare and contrast abiotic and biotic factors	2 days

Energy Flow (pyramids)	Demonstrate the relationships among ecological components by organizing them into energy pyramids.	2 days
Energy Flow (food web)	Trace the energy through a food web	2 days
Energy Flow (analysis)	Analyze effects of a change in a food web	3 days
Nutrient Cycle	Describe the cycling of nutrients in an ecosystem, including carbon, oxygen, nitrogen and phosphorus.	1 week
Owl Pellets	Make a conclusion about the stability of an ecosystem based on the diversity of prey	6 days

Teacher Notes:

Additional Resources

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

Content Area: Environmental Science

Unit Title: Population Studies

Grade Level: 11/12

Unit Summary: 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.

Interdisciplinary Connections:
Math, Art, History, Chemistry, English

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Unit Essential Question(s):

- How are sample census data and true census data useful?
- What are the benefits of certain census techniques?
- What are limiting factors?

Unit Enduring Understandings:

- Census
- Limiting factors
- Population Studies
- Growth Curves
- Communities
- Primary Succession
- Secondary Succession

• 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?	• Levels of Forest Layers • Benefits of Ecological Succession

Unit Learning Targets/Objectives:

Students will

- Estimate Population using sample census techniques
- Analyze growth curves
- Compare limiting factors
- Explain how populations can be distributed in an ecosystem
- Describe species interaction and roles in the mixed deciduous forest
- Analyze the succession after the eruption of Mount St. Helens
- Compare and contrast forest succession to lake succession

Formative Assessments:

Teacher feedback, class discussion

Summative/Benchmark Assessment(s):

Journals, Quizzes, Tests, Data Analysis, research

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.

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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
Deer Population	Compare starvation vs. predation as factors affecting populations	2 days
Population Growth	Study data and analyze different population growth curves	3 days
Population Terms	Define terms related to population studies	1 day
Population Census Lab	Perform sample census techniques and estimate populations	5 days
Temperate Deciduous Forest	Describe the specific biome using websites, textbook and illustrations	3 days
Mt. St Helens	Describe succession in the area after eruption	5 days
Processes of Succession	Explain how the steps of succession can occur with resets along the way	3 days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

http://www.bozemanscience.com/ap-environmental-science/

http://www.ecoplexity.org/?q=node/496

http://blueplanetbiomes.org/deciduous_forest.htm

Content Area: Environmental Science

Unit Title: Earth's Diminishing Biodiversity - Habitat Fragmentation and Human Predation

Grade Level: 11/12

Unit Summary: 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.

Interdisciplinary Connections:
Math, Art, History, Chemistry, English

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Unit Essential Question(s):	**Unit Enduring Understandings:**
• 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?	• 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

• 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?	• The positive and negative use of technology for human predation concerns

Unit Learning Targets/Objectives:

Students will

- Compare and contrast arguments for preserving biodiversity
- Propose ways of dealing with the current endangered species issues, citing current examples of successful conservation programs
- Identify actions individuals can take at the local level to preserve wildlife habitat
- Articulate arguments for preservation or continued exploitation of biological diversity, as well as strategies for both
- Synthesize knowledge of the impact of human needs on the needs of other organisms by creating a map of land development
- Trace the changes of human use of fish a food source over the past century
- Recognize the issues of Habitat Use and Human Predation as both a local and global issue
- Cite case studies of poaching in the world

Formative Assessments:

Teacher feedback, class discussion

Summative/Benchmark Assessment(s):

Journals, Quizzes, Tests, lab activities, research work

Resources/Materials:

Textbooks:

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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)
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)	3 days (introduction, research, present)
Political Acts and Laws	Define and Understand the value of C.I.T.E.S	2 days
Political Acts and Laws	Explain the importance of the Endangered Species Act (ESA)	2 days
National vs Global Concerns	Compare the benefits and challenges of certain national and global policies in relation to diminishing populations	2 days
"Who Cares?"	Make choices on what endangered species to put financial support into saving	3 days
Plants in Peril	Recognize the value of saving often overlooked species such as plants	4 days
Habitats - The Choice is yours	Make responsible choices when deciding how to develop land for a human community	1 week
Songbirds	Make correlation between habitat fragmentation and the decline of songbird populations	2 days
Real Life Case Study	Argue the value in land planning case studies (Portland OR, Phoenix AR,...)	2 days
Homeostasis - populations	Investigate the effect of hunting by studying quail populations	2 days
Fish Banks	Argue the importance of sustainability in reference to renewable resources (fish populations)	1 week
Red Knots	Observe the connection of species populations through	3 days

	the study of the over hunting of horseshoe crabs and its effect on Red KNot population	
Poaching - Case Studies	Communicate effectively the issues related to poaching wildlife and solutions to those issues (elephant, rhinoceros, gorilla)	1 week

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

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

Content Area: Environmental Science

Unit Title: Earth's Diminishing Biodiversity - Introduced Species and Pollution

Grade Level: 11/12

Unit Summary: 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.

Interdisciplinary Connections:
Math, Art, History, Chemistry, English

21st Century Themes and Skills:
CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

Standards (Content and Technology):

CPI#:	Statement:
Next Generation Science Standards	
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.
2014 New Jersey Core Curriculum Content Standards - Technology	
8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
8.1.12.E.2	Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers.
8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
8.2.12.B.5	Research the historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product, and present the competing viewpoints to peers for review.

Unit Essential Question(s):

- 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?

Unit Enduring Understandings:

- 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

• 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?	

Unit Learning Targets/Objectives:

Students will

- Discuss several case studies of invasive species
- Relate invasive species to the effects on biodiversity
- Analyze control methods (invasive species)
- Compare forms of pollution
- Research pollution cleanup and prevention methods
- Understand impact of personal choices of increasing and decreasing pollution by locally and globally

Formative Assessments:

Teacher feedback, class discussion

Summative/Benchmark Assessment(s):

Journals, Quizzes, Tests, lab activities, research work

Resources/Materials:

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.

Modifications:

- Special Education Students
  - modified readings
  - student choice on topics
- English Language Learners
  - modified readings
  - student choice on topics
- At-Risk Students
  - modified readings
  - student choice on topics
- Gifted and Talented Students
  - advanced readings
  - mathematical analysis problems

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete)

Invasive plants (locally)	Identify local plants that are invasive species	2 days
Invasive species (globally)	Research an area where an invasive species has negatively affected the ecosystem	3 days
Invasive Species Awareness	Design public service announcement to bring about awareness of invasive species	5 days
Types of Pollution	Compare water, land and air pollution	1 day
Point vs Nonpoint	Understand difference between point and nonpoint pollution	2 days
Personal impact	Identify various ways individuals contribute to pollution in our environment	2 days
Regulations	Identify and evaluate current laws/regulations related to pollution	5 days
Current Events	Research and discuss current news related to pollution issues (cause, clean up, long term effects..)	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