Natural Resources and Land Use

Content Area: **Science**
Course(s): **CP Environmental Science**
Time Period: **Marking Period 1**
Length: **3-4 weeks**
Status: **Published**

Course Pacing Guide

Unit	Quarter	# weeks
Biodiversity	1	4
Natural Resources and Land Use	1	5
Ecology	2	6
Pollution	2	4
Energy Use and Options	3	6
Agriculture	3	5
Human Health and the Environment	4	4
Climate Change	4	5

Unit Overview

Humans require resources for our basic survival and to support the systems we have set up as part of our communities, cultures and economies. Resources are those materials extracted from the envionment to support these uses. Some resources are perpetual, others are renewable and still other non-renewable. How we use resources impacts their continued availability, the access of these resources by all people and the effects on the environment. Fresh water, forests, fish and fertile soil are four renewable resources that all humans require and that must be used sustainably to ensure human welfare and a stable environment. Various types of maps are used to identify resources, plan for their extraction, examine potential impacts on the environment and potential remediation.

Enduring Understandings

Natural Resources can be perpetual, non-renewable or renewable.

How resources are used will imapct continued availability and imapct on the environment.

Sustainability must be employed to protect resources and the environment.

We must assess impacts on the environment in order to evaluate resource use.

Trees are a main resource we extract from forests.

Tree harvest techniques have historically not been sustainable.

Tree harvest techniques can be sustainable.

Fresh water is in limited supply and must be used sustainably - there are a variety of approaches to ensure this.

Fertile soil can be lost based on poor land use, but can be sustained using a variety of approaches.

Global fisheries have not been sustainable in most regions of the world due to industrial fishing techniques.

Sound science and the Precautionary principle can be employed to make fishing technqiues more sustainable.

Maps are essential tools for protecting landscapes and seascapes while also using resources.

Essential Questions

What are the different types of resources and what are examples?

What has been the history of natural resource use and what has been the result to current access and environmental quality?

How can sustainability be employed to protect fresh water, fertile soil, forests and fisheries?

What are the ways in which trees are harvested and what are the pros and cons for these approcahes?

What are the main sources of fresh water and how can we ensure sustainability from these sources?

What land use and agriculture techniques can be used to increase soil sustainability?

What are the main methods for global fisheries and what is their impact?

What are some apporaches to increasing fish sustainability?

What are the different types of maps used to assess natural resources?

New Jersey Student Learning Standards (No CCS)

9-12.HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.
9-12.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
9-12.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
9-12.HS-ESS2-6	Develop a quantitative model to describe the cycling of carbon among the hydrosphere,

	atmosphere, geosphere, and biosphere.
9-12.HS-ESS1-1.2	Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).
9-12.HS-ESS2-3.2	Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).
9-12.HS-ESS1-1.2.1	Develop a model based on evidence to illustrate the relationships between systems or between components of a system.
9-12.HS-ESS3-1.2.1	students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.
9-12.HS-ESS1-4.3.1	Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).
9-12.HS-ESS3-3.5.1	Create a computational model or simulation of a phenomenon, designed device, process, or system.
9-12.HS-ESS3-1.6	Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories.
9-12.HS-ESS3-4.6.1	Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
9-12.HS-ESS3-1.6.1	Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
9-12.HS-ESS3-2.7.1	Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations).
9-12.HS-ESS2-2.ESS2.A.1	Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.
9-12.HS-ESS2-5.ESS2.C.1	The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks.
9-12.HS-ESS2-2.ESS2.D.1	The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
9-12.HS-ESS2-6.ESS2.D.2	Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.
9-12.HS-ESS3-1.ESS3.A	Natural Resources
9-12.HS-ESS3-1.ESS3.A.1	Resource availability has guided the development of human society.
9-12.HS-ESS3-3.ESS3.C	Human Impacts on Earth Systems
9-12.HS-ESS3-3.ESS3.C.1	The sustainability of human societies and the biodiversity that supports them requires

	responsible management of natural resources.
9-12.HS-ESS3-5.ESS3.D.1	Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.
9-12.HS-LS2-6	Evaluate 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.
9-12.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.
9-12.HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
9-12.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
9-12.HS-LS2-1.3	Scale, Proportion, and Quantity
9-12.HS-LS2-1.3.1	students understand the significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. They recognize patterns observable at one scale may not be observable or exist at other scales, and some systems can only be studied indirectly as they are too small, too large, too fast, or too slow to observe directly. Students use orders of magnitude to understand how a model at one scale relates to a model at another scale. They use algebraic thinking to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).
9-12.HS-LS4-6.5	Using Mathematics and Computational Thinking
9-12.HS-LS2-2.5	Using Mathematics and Computational Thinking
9-12.HS-LS4-6.5.1	Create or revise a simulation of a phenomenon, designed device, process, or system.
9-12.HS-LS2-7.6	Constructing explanations and designing solutions in 9– 12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.
9-12.HS-LS2-7.6.1	Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
9-12.HS-LS1-3.7.1	Feedback (negative or positive) can stabilize or destabilize a system.
9-12.HS-LS2-1.LS2.A.1	Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.
9-12.HS-LS2-2.LS2.A.1	Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.
9-12.HS-LS2-7.LS2.C	Ecosystem Dynamics, Functioning, and Resilience
9-12.HS-LS2-7.LS2.C.1	Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.
9-12.HS-LS2-2.LS2.C.1	A complex set of interactions within an ecosystem can keep its numbers and types of

	organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.
9-12.HS-LS2-8.LS2.D.1	Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives.
9-12.HS-LS4-6.LS4.D.1	Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.
9-12.HS-LS2-7.LS4.D.1	Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction).
9-12.HS-LS2-7.LS4.D.2	Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.
9-12.HS-LS2-7.ETS1.B	Developing Possible Solutions

Amistad Integration

LA.RI.11-12.10b	By the end of grade 12, read and comprehend literary nonfiction at grade level text-complexity or above.
SEL.PK-12.1.2	Recognize the impact of one's feelings and thoughts on one's own behavior

Holocaust/Genocide Education

Interdisciplinary Connections

MA.S-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
MA.S-ID.A.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
MA.S-ID.B.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
PFL.9.1.12.A.8	Analyze different forms of currency and how currency is used to exchange goods and services.
SOC.9-12.1.1.1	Compare present and past events to evaluate the consequences of past decisions and to

	apply lessons learned.
SOC.9-12.1.1.2	Analyze how change occurs through time due to shifting values and beliefs as well as technological advancements and changes in the political and economic landscape.
SOC.9-12.1.2.1	Construct various forms of geographic representations to show the spatial patterns of physical and human phenomena.
SOC.9-12.1.2.2	Relate current events to the physical and human characteristics of places and regions.

Technology Standards

List specific standards that are relevant
No general statements

TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.1.12.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.12.D.CS2	Demonstrate personal responsibility for lifelong learning.
TECH.8.1.12.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

21st Century Themes/Careers

List specific standards that are relevant
No general statements

HPE.2.2.8.A.2	Demonstrate the use of refusal, negotiation, and assertiveness skills when responding to peer pressure, disagreements, or conflicts.
CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.6	Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business.

Financial Literacy Integration

Instructional Strategies & Learning Activities

Lab Reports

Natural Resource Mapping

Inventory of Species Composition in a forest

Economic vs. Ecological Assessment in Local Woodland/ park

MSC and FSC strategy Prioritization and Evaluation

Watershed Mapping and Forest Frgmantation Inventory in Camden County

Field Trip - Franklin Parker Preserve

Guest Speaker on land Use Case Studies

Mock Town Meeting

Differentiated Instruction

Examples may include:

- Curriculum Map
- Inquiry/Problem-Based Learning
- Learning preferences integration (visual, auditory, kinesthetic)
- Tiered Learning Targets
- Meaningful Student Voice & Choice
- Relationship-Building & Team-Building
- Self-Directed Learning
- Debate
- Mastery Learning (feedback toward goal)
- Goal-Setting & Learning Contracts
- Grouping
- Socratic Seminar
- Rubrics
- Learning Menus
- Learning Through Workstations
- Concept Attainment
- Mentoring
- Student Interest & Inventory Data

Formative Assessments

Environmental Impact Statement - students write an environmental impact statement based on natural resource use

Water Use Inventory - students examine and quantify their household fresh water use and create a report based on use and conservation.

Students model fish abundance in a pond - applications for Maximum sustainable yield and population assessment techniques.

Quiz on natural resources and sustainability.

Quiz on tree harvest techniques.

Forest Fragmentation activity - assessing fragmentation in Cooper River Park

Summative Assessment

Lab Report on Forest Conservation Study - i acre plot of tree diversity, density and data

Lab Report on Fisheries population Model Study

Exam on Natural Resources and Land Use

Benchmark Assessments

reference above

Alternate Assessments

reference above

Resources & Technology

Environmental Science Textbook

NOAA NMFS fisheries data

USFS forest data sets

Google Earth

USGS Maps

GPS technology

BOE Approved Texts

Miller and Spoolman - Environmental Science - Sustaining your World

E.O. Wilson - Half Earth

Closure

Such as:

- Sequence It - create timelines of major events discussed
- Low-Stakes Quizzes - Give a short quiz using technologies like Kahoot or a Google form.
- Have students write down three quiz questions (to ask at the beginning of the next class).
- Kids answer the following prompts: "What takeaways from the lesson will be important to know three years from now? Why?
- Ask a question. Give students ten seconds to confer with peers before you call on a random student to answer. Repeat.
- Have kids orally describe a concept, procedure, or skill in terms so simple that a child in first grade would get it.
- Direct kids to raise their hands if they can answer your questions.
- Have students complete the following sentence: "The [concept, skill, word] is like _____ because _____."
- Ask students to write what they learned, and any lingering questions

ELL

Such as:

- Alternate Responses
- Advance Notes
- Extended Time
- Teacher Modeling

- Simplified Written and Verbal Instructions
- Frequent Breaks
- E-Dictionaires
- Google Translate

Special Education

List is not inclusive but may include examples such as:

- Shorten assignments to focus on mastery of key concepts.
- Shorten spelling tests to focus on mastering the most functional words.
- Substitute alternatives for written assignments (clay models, posters, panoramas, collections, etc.)
- Specify and list exactly what the student will need to learn to pass.
- Evaluate the classroom structure against the student's needs (flexible structure, firm limits, etc.).
- Keep workspaces clear of unrelated materials.
- Keep the classroom quiet during intense learning times.
- Reduce visual distractions in the classroom (mobiles, etc.).
- Provide a computer for written work.
- Seat the student close to the teacher or a positive role model.
- Use a study carrel. (Provide extras so that the student is not singled out.)
- Provide an unobstructed view of the chalkboard, teacher, movie screen, etc.
- Keep extra supplies of classroom materials (pencils, books) on hand.
- Maintain adequate space between desks.
- Give directions in small steps and in as few words as possible.
- Number and sequence the steps in a task.
- Have student repeat the directions for a task.
- Provide visual aids.
- Go over directions orally.
- Provide a vocabulary list with definitions.
- Permit as much time as needed to finish tests.
- Allow tests to be taken in a room with few distractions (e.g., the library).
- Have test materials read to the student, and allow oral responses.
- Divide tests into small sections of similar questions or problems.
- Allow the student to complete an independent project as an alternative test.
- Give progress reports instead of grades.
- Grade spelling separately from content.
- Allow take-home or open-book tests.
- Show a model of the end product of directions (e.g., a completed math problem or finished quiz).
- Stand near the student when giving directions or presenting a lesson.
- Mark the correct answers rather than the incorrect ones.
- Permit a student to rework missed problems for a better grade.
- Average grades out when assignments are reworked, or grade on corrected work.
- Use a pass-fail or an alternative grading system when the student is assessed on his or her own growth.

504

Examples of accommodations in 504 plans include but are not limited to:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

At Risk

Examples may include:

- Use of mnemonics
- Have student restate information
- Provision of notes or outlines
- Concrete examples
- Use of a study carrel
- Assistance in maintaining uncluttered space
- Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
- Peer or scribe note-taking
- Lab and math sheets with highlighted instructions
- Graph paper to assist in organizing or lining up math problems
- Use of manipulatives
- No penalty for spelling errors or sloppy handwriting
- Follow a routine/schedule
- Teach time management skills
- Verbal and visual cues regarding directions and staying on task
- Adjusted assignment timelines
- Visual daily schedule
- Immediate feedback
- Work-in-progress check
- Pace long-term projects

- Preview test procedures
- Film or video supplements in place of reading text
- Pass/no pass option
- Cue/model expected behavior
- Use de-escalating strategies
- Use peer supports and mentoring
- Have parent sign homework/behavior chart
- Chart progress and maintain data

Gifted and Talented

Focus on effort and practice

Offer the Most Difficult First

Offer choice

Speak to Student Interests

Allow G/T students to work together

Encourage risk taking