Unit 03: Populations (Weeks 13-18)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

SCI.HS-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
SCI.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.
SCI.HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
SCI.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
SCI.HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
SCI.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
SCI.HS-ESS3-3	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
3-ESS3	Earth and Human Activity

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.

CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.2	Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.12.B.2	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.
TECH.8.2.12.B.3	Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.
TECH.8.2.12.B.4	Investigate a technology used in a given period of history, e.g., stone age, industrial revolution or information age, and identify their impact and how they may have changed to meet human needs and wants.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

	Key Ideas and Details
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
	Craft and Structure
LA.K-12.NJSLSA.R4	Interpret words and phrases as they are used in a text, including determining technical,

	connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
	Integration of Knowledge and Ideas
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.K-12.NJSLSA.W	Writing
	Text Types and Purposes
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.K-12.NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.RI.11-12.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
LA.RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
LA.W.11-12.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.K-12.NJSLSA.SL	Speaking and Listening
	Comprehension and Collaboration
LA.W.11-12.1.C	Use transitions (e.g., words, phrases, clauses) to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
LA.K-12.NJSLSA.SL1	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
LA.W.11-12.1.E	Provide a concluding paragraph or section that supports the argument presented (e.g., articulating implications or the significance of the topic).
LA.W.11-12.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.W.11-12.2.A	Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
LA.W.11-12.2.B	Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
LA.W.11-12.2.C	Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
LA.W.11-12.2.F	Provide a concluding paragraph or section that supports the argument presented (e.g., articulating implications or the significance of the topic).

LA.SL.11-12	Speaking and Listening
	Comprehension and Collaboration
LA.SL.11-12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
LA.SL.11-12.1.D	Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit…

The purpose of this unit is to analyze populations of organisms (including the human population) and how they can be affected by the environment

Meaning

Essential Questions

Essential Questions

- **What factors can limit population growth or cause decline?**
- **How do populations of species interact with each other?**
- **How do ecologists study and analyze human population?**
- **In what ways is biodiversity being threatened and how are scientists working to solve the problem?**

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

Students will understand that:

- **No populations can grow indefinitely due to limitations of resources, carrying capacity and competition within populations**
- **Each species has a role in the environment; species can interact with other species in five different ways**
- **Demographers look at many properties of populations in order to predict significant changes in the future, such as age structure, survivorship, fertility rates and migration**
- **Humans depend on the biodiversity of life in many ways, however current human activities threaten many species with extinction**

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

- **A population is all the members of a species living together in the same place at the same time**
- **Populations can be described in terms of size, density or dispersion**
- **A population's growth rate can be determined by subtracting the death rate from the birth rate**
- **Reproductive potential controls how fast a population can grow**
- **Reproductive potential increases when individuals produce more offspring at one time, reproduce often and earlier in life**

- **The greater number of offspring an individual has at one time, the less paternal care they put towards raising the offspring**
- **Exponential growth can occur in nature when populations have plenty of food and space, and have little or no competition or predators**
- **The carrying capacity, amount of resources and competition within a species can limit the growth of a population**
- **Population size can be limited by both density dependent factors and density independent factors**
- **The unique role of an organism within an ecosystem is its niche**
- **A niche is an organism's pattern of use of its habitat**
- **The five major types of species interactions are competition, predation, parasitism, commensalism and mutualism**
- **Symbiosis, a close association between species, can be seen in parasitism, commensalism and mutualism**
- **Symbiosis can result in coevolution**
- **Demography is the study of populations**
- **Developed countries versus developing countries**
- **Demographers use age structure, survivorship, fertility rates and migration to predict changes in the population**
- **Adequate food, medicine, clean water and safe sewage disposal have all helped to contribute to the decline in death rates**
- **The human population is approaching 8 million**
- **In developed countries, the life expectancy has increased to 80 years of age**
- **The demographic transition is a model that describes how economic and social changes affect population growth rates**
- **The four stages of demographic transition**
- **Increasing education and economic independence for woman have helped to decrease the birth rate**
- **Infrastructure is the basic facilities and services that support a community**
- **Rapidly growing populations use resources faster than the environment can renew them**
- **Rapid growing populations may result in a shortage of fuelwood, unsafe drinking water and significant impacts on the land**
- **Growth rates are relatively stable in developed countries while they are still growing rapidly in less developed regions**
- **Some countries, such as China, Thailand and India have tried several different methods to reduce birth rates**
- **Demographers predict a human population of 9 billion by the year 2050**
- **Humans need to understand and preserve biodiversity for their own survival**
- **Scientists have identified 1.7 million different species on Earth, however the actual number of species on Earth is unknown**
- **Biodiversity can be studied/described at the genetic level, species level, or at an ecosystem level**
- **Keystone species are critical to the functioning of an ecosystem**
- **The smaller a population of a species, the greater the chances of inheriting genetic diseases**
- **Species (in one way or another) depend on one another for survival**
- **Humans depend on organisms for food, clothing, shelter and medicine**
- **Scientists fear we are in the midst of another mass extinction, with the rate of extinction higher now than ever seen before**
- **Humans cause extinction by deforestation and habitat destruction, introducing exotic and invasive species, harvesting, hunting, poaching, and pollution**
- **Tropical rain forests contain the most biodiversity and are currently at risk due to deforestation**
- **Efforts have been made to protect endangered species, such as captive breeding programs; preserving genetic material; zoos, aquariums, parks and gardens; conservation; passing of laws, such as the Endangered Species Act**

Skills

Skills

Student will be skilled at …

- **Develop a definition for population**
- **Describe the three main properties of a population**
- **Explain how a population grows**
- **Illustrate and describe exponential population growth**
- **Describe how the reproductive behavior of individuals can affect the growth rate of their population**
- **Analyze the relationship between the age of sexual maturity, the amount of time raising young and reproductive survival of the offspring**
- **Explain how population sizes in nature are limited by carrying capacity, resources and competition within a species**
- **Define carrying capacity**
- **Infer that members of a species with compete for food, sex and shelter**
- **Differentiate between density dependent density independent limits in population**
- **Explain the difference between niche and habitat**
- **Provide examples of parts of a niche**
- **Describe the five major interactions between species and give examples of each**
- **Explain why parasitism, mutualism and commensalism are examples of symbiosis**
- **Describe how the size and growth of the human population has changed in the last 200 years**
- **Define four properties that scientists use to predict population sizes**
- **Generate predictions about population trends based on age structure**
- **Describe the four stages of the demographic transition**
- **Explain why different countries may be at different stages of demographic transition**
- **Describe several issues that may result from rapid population growth**
- **Evaluate the relationship between declining birth rates and increasing education and economic independence for women**
- **Infer several reasons for the increased life expectancy seen among the human population**
- **Compare population growth problems in more developed countries and less developed countries**
- **Analyze strategies countries may use to reduce their population growth**
- **Describe worldwide population projections into the next century**
- **Describe the diversity of species types on Earth, relating the difference between known numbers and estimated numbers**
- **List and describe the three levels of biodiversity**
- **Explain several ways in which biodiversity is important to ecosystems and humans**
- **Analyze the potential value of a single species, especially a keystone species**
- **Define and provide examples of endangered species and threatened species**
- **Describe several ways that species are being threatened with extinction globally**
- **Identify areas of the world that have high levels of biodiversity and current threats to species**
- **Compare the amount of biodiversity in the U.S. to other parts of the world**
- **Describe the four types of efforts to save individual species**
- **Explain the advantage of protecting the entire ecosystem rather than individual species**
- **Discuss the provisions to the Endangered Species Act**
- **Discuss ways in which efforts to protect endangered species can result in controversy**

- **Describe three examples of worldwide cooperative efforts to help prevent extinction**

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

- **Powerpoint presentations**
- **Textbook Environmental Science (Holt)**
- **Scienceworld Magazines**
- **Articles related to topics**
- **Youtube videos**
- **Materials for labs**
- **National Geographic populations video and article 7 Billion**
- **“Racing Extinction” movie**
- **Human population graph resources**
- **"Finite" Ted Talk**
- **60 minutes episode: Bee Clip**

Formative Assessment Strategies

Formative Assessment Strategies

- **Quick Thoughts**
- **Exit Slips**
- **Kahoot**
- **Bingo**
- **White Board Participation**
- **Homework**
- **Teacher Check**
- **Thumbs up/thumbs down**
- **Create a Test/Take a Test**

- **Whole class questioning and answering**
- **Graphic Organizers**
- **Foldables**
- **Species Interaction Quiz**

Learning Activities/Unit of Study

Learning Activities/Unit of Study

- **Human Population Growth Graphing lab**
- **Calculating Change in Population Size**
- **Species Interaction Foldable**
- **RACE Prompt: Where Should the Wolves Roam? controversial essay**
- **Photo Hunt: Name that Interaction**
- **Human Population Time-Line**
- **Human population worksheet**
- **"Finite" Ted Talk: Listen and Fill in the Blank**
- **Racing Extinction Movie**
- **60 Minute Activity "Where did the Bees Go?"**
- **RACE prompt "The 6th Mass Extinction" - What do scientists claim is the 6th mass extinction, what is causing it and what are they doing to stop it? One Paragraph Essay**

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply

acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.