

A Green New Deal

During the commencement address of a small private university in Atlanta, Georgia in May 1932, future president Franklin Delano Roosevelt spoke these famous lines:

“The country needs and, unless I mistake its temper, the country demands bold, persistent experimentation. It is common sense to take a method and try it: If it fails, admit it frankly and try another. But above all, try something.”

The “something” Roosevelt tried was the New Deal. Throughout his mission to end the Great Depression, the Roosevelt administration experimented with programs, projects, and outreach methods to ease the fears of U.S. citizens and steer the country toward a prosperous future.



During the 116th Congress, House Resolution 109 was introduced calling for “the creation of a Green New Deal.” Citing *Global Warming of 1.5 °C*, a special report produced by the Intergovernmental Panel on Climate Change and the 2018 National Climate Assessment report, the resolution sets forth a number of claims, including the following:

1. Human activity is the principal cause of climate change in the past 100 years.
2. Climate change leads to rising sea levels as well as extreme weather events.
3. Global warming greater than 2°C will result in a loss of 99% of the world’s coral reef.

The text of the resolution presents goals of the Green New Deal such as “restoring and protecting threatened, endangered, and fragile ecosystems through locally appropriate and science-based projects that enhance biodiversity and support climate resiliency” but it does not explain how such goals should be accomplished. That’s your challenge!

Ecosystems are highly complex, interactive systems that include both biological communities and physical components of the environment. A variety of factors affect the carrying capacity, biodiversity, and populations, which in turn, have an impact on the cycling of matter and energy. In such a delicate and intricate system, it is of the utmost importance that we, as humans, strive to have minimum negative influence while cultivating the greatest possible positive effects on an ecosystem.

Collaborate with your peers to explore and evaluate current models for reducing the effects of climate change on the Earth’s ecosystems. Which solutions are the most realistic? Which have the greatest potential for unintended consequences? How could you improve on current plans and/or suggestions?

All people can benefit from your ideas, so share them far and wide in using the digital platform of your choice.

It’s your world. . . . Time to save it!

A Green New Deal Rubric (Individual Design Journal)

	Novice	Apprentice	Practitioner	Expert
Explore: Populations Within Ecosystems	<ul style="list-style-type: none"> explains and illustrates the concept of carrying capacity ranks factors affecting biodiversity and populations within an ecosystem 	<ul style="list-style-type: none"> explains carrying capacity in general and represents the concept mathematically for one ecosystem supports ranking of factors affecting biodiversity and populations within an ecosystem with mathematical representations mathematically represents the interactions of two ecosystems of different scales 	<ul style="list-style-type: none"> explains carrying capacity in general and mathematically represents the concept for two ecosystems of different scales supports ranking of factors affecting biodiversity and populations within an ecosystem with mathematical representations mathematically represents the interactions of two ecosystems of different scales, including how factors in one influence change in another 	all of <i>Practitioner</i> plus: creates interactive model of mathematical representations
Explore: Cycles	<p>illustrates cycling of energy and matter in aerobic and anaerobic conditions by including the following concepts:</p> <ul style="list-style-type: none"> photosynthesis cellular respiration chemical reactions 	<p>explains cycling of energy and matter in aerobic and anaerobic conditions with mathematical representations and by including the following concepts:</p> <ul style="list-style-type: none"> photosynthesis cellular respiration chemical reactions 	<ul style="list-style-type: none"> compares and contrasts cycling of energy and the cycling of matter in aerobic and anaerobic conditions with mathematical representations and by including the following concepts: <ul style="list-style-type: none"> photosynthesis cellular respiration chemical reactions explains the cycling of carbon among the biosphere, hydrosphere, geosphere, and atmosphere 	all of <i>Practitioner</i> plus: evaluates explanations in light of recent research data
Explore: Explanations	<p>evaluates two or more explanations of changing ecosystems (one explanation must focus on human impact) using information related to the cycle of matter, energy, or carbon</p>	<p>evaluates three or more explanations of changing ecosystems (one explanation must focus on human impact) using information related to:</p> <ul style="list-style-type: none"> carrying capacity density dependent or independent factors cycle of matter, energy, or carbon 	<p>evaluates four or more explanations of changing ecosystems (one explanation must focus on human impact) using information related to:</p> <ul style="list-style-type: none"> carrying capacity density dependent factors density independent factors cycle of matter, energy, or carbon 	all of <i>Practitioner</i> plus: includes information for each type of cycle listed

Green New Deal Rubric (Group Solution)

Ideate	using information from individual design journals: <ul style="list-style-type: none"> • generates one new idea • identifies one existing solution 	using information from individual design journals: <ul style="list-style-type: none"> • generates two or more new ideas • identifies two or more existing solutions 	using information from individual design journals: <ul style="list-style-type: none"> • generates two or more new ideas • identifies two or more existing solutions and expands on one 	all of <i>Practitioner</i> plus: integrates new idea(s) and existing solutions to create an innovative solution
Sift	includes pros and cons of each potential solution	includes: <ul style="list-style-type: none"> • pros and cons of each potential solution • description of feasibility of each potential solution 	includes: <ul style="list-style-type: none"> • pros and cons of each potential solution • description of feasibility of each potential solution • comparison of unintended consequences of potential solutions 	all of <i>Practitioner</i> plus: describes why final solution was adopted
Simulate	includes evaluation of solution based on mathematics, diagrams, or models that considers the cycle of matter, energy, or carbon	includes evaluation of solution based on mathematics, diagrams, and/or models that considers: <ul style="list-style-type: none"> • carrying capacity • density dependent or independent factors • cycle of matter, energy, or carbon 	includes evaluation of solution based on mathematics, diagrams, and models that considers: <ul style="list-style-type: none"> • carrying capacity • density-dependent factors • density-independent factors • cycle of matter, energy, or carbon 	all of <i>Practitioner</i> plus: incorporates new learning to enhance solution
Advocate	digital presentation includes: <ul style="list-style-type: none"> • explanation of how and why proposed solution would work • supporting scientific evidence from three or more reliable resources • supporting mathematical representations of proposed solution • acknowledgment of potential counterclaims 	digital presentation includes: <ul style="list-style-type: none"> • detailed explanation of how and why proposed solution would work • supporting scientific evidence from five or more reliable resources • supporting mathematical representations of proposed solution • fair description of potential counterclaims 	digital presentation includes: <ul style="list-style-type: none"> • detailed explanation of how and why proposed solution would work • supporting scientific evidence from five or more reliable resources • supporting mathematical representations of proposed solution • fair description of potential counterclaims • explanation of academic or technical vocabulary 	all of <i>Practitioner</i> plus: includes links to both cited and additional resources

A Green New Deal Scaffold for Learning

Benchmark Video and Discussions

- Unit launch to create felt need for task
- Using the Design Process
- What is an ecosystem
- The math-science connection



Instructional Activities: Learning

Instructional Activities: Additional

<p>Instructional Texts/Websites</p> <ul style="list-style-type: none"> • Identify density factors (I) • Population growth patterns • Roles in an ecosystem • Food web/food chain • Exponential/logistical • Code scientific texts for macrostructure (P) • Counterclaims • Academic text structures • Carbon cycle (SG) • Biodiversity/trophic levels 	<p>Instructional Videos</p> <ul style="list-style-type: none"> • Identify density factors (I) • Population growth patterns • Roles in an ecosystem • Food web/food chain • Exponential/logistical • Code scientific texts for macrostructure (P) • Counterclaims • Academic text structures • Carbon cycle (SG) • Biodiversity/trophic levels 	<p>How-to Sheets</p> <ul style="list-style-type: none"> • Set up Design Journal • Note-taking • Identify primary producers • Code scientific/academic texts • Text structures • Counterclaims • Density factors 	<p>Practice</p> <ul style="list-style-type: none"> • Identify producers and consumers in ecosystems (HW) • Describe food chains and webs in local ecosystems (HW) • Identify density factors (I, P) • Identify text structures (I,P) <p>Application</p> <ul style="list-style-type: none"> • Compare and contrast density factors (P, SG) • How organisms get food? (SG) • Label trophic levels with producers/consumers (I,P) • Determine text structure (I,P) <p>Assessment</p> <ul style="list-style-type: none"> • Using rubric, peer edit work (P) • Self-assess text structure (I) • Use rubric, assess Journal (I, P) • Self-assess understanding of domain/academic vocabulary (I) <p>Reflection (I)</p> <ul style="list-style-type: none"> • In the Design Journal share thoughts on the Design Process. What is challenging/easy? • What area do you wish you had more time for? Why?
<p>Interactive Websites</p> <ul style="list-style-type: none"> • Population growth patterns • Interactive food web • Text structure match (P) • Earth's ecosystems 	<p>Learning Centers</p> <ul style="list-style-type: none"> • Categorize: density factors, populations growth patterns, roles in an ecosystem (I) • Label roles in an ecosystem • Analyze food chain/webs • Categorize texts with text structure (SG) • Identify counterclaims (P) • Vocabulary practice • Explore Carbon Cycle 	<p>Small-Group Mini-Lessons</p> <ul style="list-style-type: none"> • Identify density factors • Population growth patterns • Roles in an ecosystem • Food web/food chain • Exponential/logistical • Code scientific texts for macrostructure • Counterclaims • Academic text structures • Carbon cycle • Biodiversity/trophic levels 	

Key: Individual (I), Pairs (P), Small Groups (SG), Activities suitable for homework (HW)

A Green New Deal Facilitation Questions

<p>COMPREHENSION: <i>Ask questions that ensure students understand content and skills needed to solve the problem.</i></p>	<ul style="list-style-type: none"> • What are trophic levels? • What are some economic benefits of biodiversity? • What are decomposers? What purpose do they serve in an ecosystem? • What are the sources of nutrients in an ecosystem? • What current solutions exist for slowing or stopping the sixth mass extinction?
<p>APPLICATION: <i>Ask questions that ensure the ability of students to apply learning to new situations.</i></p>	<ul style="list-style-type: none"> • How are food chains and food webs similar? How are they different? • How do ecosystems benefit from biodiversity? • How are the flow of energy and the flow of matter similar? How are they different? • How are photosynthesis, cellular respiration, and the carbon cycle related?
<p>CONNECTION: <i>Ask questions that ensure the ability of students to apply learning to their lives.</i></p>	<ul style="list-style-type: none"> • How would you describe your impact on a local ecosystem? • In what ways are you part of the carbon cycle? • What actions would you be willing to take towards a solution for decreasing the negative impact on ecosystems?
<p>SYNTHESIS: <i>Ask questions that encourage students to create new information from existing data.</i></p>	<ul style="list-style-type: none"> • What could we do to increase the short-term cycling of carbon? How could we positively influence the long-term cycling of carbon? • How could you model the change in carbon dioxide concentration to the effects of the industrial revolution? • Explain the possible effects of introducing non-native species to an ecosystem to increase biodiversity.
<p>METACOGNITION: <i>Ask questions that prompt students to think about their own thinking process.</i></p>	<ul style="list-style-type: none"> • How would you describe your group’s ability to solve conflict, come to consensus, and collaborate toward a shared solution? • How did you ensure the fair treatment of counterclaims as you advocated for your solution? • What was the most difficult part of this task? Why?

A Green New Deal *Transfer Task*

In a 2019 article published by *National Geographic*, reporter Christina Nunez stated, “Humans have the solutions to address climate change.” What do you think? Is it possible that you or your peers developed a solution that will save Earth’s precious ecosystems from climate change?

Evaluate the solution designed by a group of your peers. In your evaluation, include explanations of the mathematics, diagrams, and/or models related to the following:

- Carrying capacity
- Density-dependent factors
- Density-independent factors
- Cycle of matter, energy, and carbon

Then, explain how you could or could not incorporate your peers’ ideas into your own solution.

Unit Overview	
<p>Franklin Delano Roosevelt introduced the New Deal in response to desperate times caused by financial insecurity as a result of the Great Depression. Today, some are calling for a Green New Deal in response to the Earth’s changing climate and its impact on fragile ecosystems. In this <i>authentic learning unit</i>, students use the IDE Corp. Design Process to develop an innovative solution aligned with the recommendations in the Green New Deal resolution presented to Congress in early 2019.</p>	
Enduring Understandings	Essential Questions
<ul style="list-style-type: none"> • An infinite number of organisms cannot survive within an ecosystem due to various factors, including the organisms’ relationships with one another. • Most of the energy for life on Earth is provided through photosynthesis and cellular respiration. • Energy cannot be created or destroyed; its movement is cyclical. 	<ul style="list-style-type: none"> • How can you use the <i>Design Process</i> to develop innovative solutions to solve real-world problems? • How can mathematics be used to support and explain scientific thinking? • What effects do changes in one ecosystem have on another ecosystem and how does the scale of an ecosystem play a role?
Common Core State Standards Addressed	
<p>CCSS.ELA-LITERACY.RST.9-10.1; CCSS.ELA-LITERACY.RST.9-10.2; CCSS.ELA-LITERACY.RST.9-10.4; CCSS.ELA-LITERACY.RST.9-10.5; CCSS.ELA-LITERACY.RST.9-10.6; CCSS.ELA-LITERACY.RST.9-10.7; CCSS.ELA-LITERACY.RST.9-10.8; CCSS.ELA-LITERACY.RST.9-10.9 CCSS.ELA-LITERACY.RST.11-12.1; CCSS.ELA-LITERACY.RST.11-12.2; CCSS.ELA-LITERACY.RST.11-12.4; CCSS.ELA-LITERACY.RST.11-12.5; CCSS.ELA-LITERACY.RST.11-12.6; CCSS.ELA-LITERACY.RST.11-12.7; CCSS.ELA-LITERACY.RST.11-12.8; CCSS.ELA-LITERACY.RST.11-12.9 CCSS.ELA-LITERACY.WHST.9-10.1a; CCSS.ELA-LITERACY.WHST.9-10.1b; CCSS.ELA-LITERACY.WHST.9-10.6; CCSS.ELA-LITERACY.WHST.9-10.7; CCSS.ELA-LITERACY.WHST.9-10.8 CCSS.ELA-LITERACY.WHST.11-12.1a; CCSS.ELA-LITERACY.WHST.11-12.1b; CCSS.ELA-LITERACY.WHST.11-12.6; CCSS.ELA-LITERACY.WHST.11-12.7; CCSS.ELA-LITERACY.WHST.11-12.8 CCSS.ELA-LITERACY.SL.9-10.4; CCSS.ELA-LITERACY.SL.9-10.5 CCSS.ELA-LITERACY.SL.11-12.4; CCSS.ELA-LITERACY.SL.11-12.5</p>	
Other National Standards Addressed	
<p>HS-LS2-1; HS-LS2-2; HS-LS2-3; HS-LS2-4; HS-LS2-5; HS-LS2-6; HS-LS2-7; HS-LS2-8</p>	

21st Century Skills Addressed	
<p><i>Core Content and Interdisciplinary Themes</i></p> <ul style="list-style-type: none"> • Subject-Area Mastery • Global Awareness • Environmental Literacy 	<p><i>Information and Media Literacy</i></p> <ul style="list-style-type: none"> • Information Literacy • Media Literacy • Information and Communication Technology
<p><i>Learning and Innovation</i></p> <ul style="list-style-type: none"> • Critical Thinking and Problem Solving • Creativity and Innovation • Communication and Collaboration 	<p><i>Life and Career</i></p> <ul style="list-style-type: none"> • Flexibility and Adaptability • Initiative and Self-Direction • Social and Cross-Cultural Skills • Productivity and Accountability • Leadership and Responsibility