Climate Change Standards - Science Band Grades 6 - 8		**Please Note: These are Grade Band Standards and can be completed any time in grades 6, 7, or 8**		
Core Ideas	**Performance Expectations**	**Grade 6 Science - Unit & Aligned "Activity"**	**Grade 7 Science - Unit & Aligned "Activity"**	**Grade 8 Science - Unit & Aligned "Activity"**
-Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.	MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.		**"Unit- Ecosystems:Interaction, Energy, and Dynamics-** Changes in climate directly corralate with nataural resources avaliable to organisims - Resources can deminnish or increase based on these envirnmental factors Generation Genius- Energy Flow,- Watch, Read respond Brainpop - Food Chains,Food Web, Enegy Pyramid--Challenges, Q&A, Related Reading Webquest- Food Web vs Energy Pyramid- Build and design an energy pyramid, **Understanding Carrying capacity - Interactive Fox Rabbit Simulation.** **Performance Assessment:** Students can watch the video linked or a similar video and then create a 2D drawing/model of how regenerative farming can mimic natures way of cycling matter. Additionally they should be able to diagram the flow of energy from the sun through all of the organisms in the process. **Regenerative Farming Video**	
-Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.	MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.		**"Unit- Maintaining Biodiversity and Climate Change** Changes in climate directly corralate with nataural resources avaliable to organisims - Resources can deminnish or increase based on these envirnmental factors Generation Genius- Competion in the Ecosystem,- Watch, Read, Respond Key Stone Species Investigations- Wolves of Yellowstone, Otters of the Specific, Sea Stars of the Tidepools, Invasive species Keystone species project and impact to ecology **Performance Assessment Option:** **-**1. Have students watch a phenomenon such as this one linked here **Attack of the Killer Fungi** 2. Have students discuss and share how cahnges to a single organism can shapre the whole population and what effects that might have on the ecosystem. 3. Students can then be given an age appropriate version of a reading similar to this or other video that hihglights the increase in range of diseases and pestsas a result of climate change. https://www.climatehubs.usda.gov/hubs/northeast/topic/insects-change-story 4. Students should then be asked to construct and argument supoted by textual evidence that cliamte changes can have indirect impacts on ecosystems. "	

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-Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. -Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. -There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.	MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.		**Unit- Maintaining Biodiversity and Climate Change** Maintaining Biodiversity- Read, Watch Respond, Generation Genus- Climates Change- Watch, read respond, Brainpop- Climate Change- Challenge and Q&A Bioindicator Species, Exploring National Parks and their influence in protecting. Endangered Species Project, Unit- Molecules to Organisim- Celll Structures and Processes Bacteria - Bioremediation Unit- Inheritance and Variation of Trait Atrificial Selection, Geneticaly modify, and GMO crops Wonder of Science: Fish Canon Phenomena Video Environmental Impacts of Food Data Explorer This interactive resource provides students an opportunity to investigate the environmental impacts of a number of common foods. Students can select many different environmental impacts to explore: carbon footprint, land use, water use, scarcity-weighted water use, and water pollution. Students can choose the foods they are interested in, customize the graphs, and see the relative percent of emissions in each step of the supply chain.	
-All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.	MS-ESS2-1: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.	**Unit- Exploring Earth** rock cycle, earth system diagrams, layers lab Wonder of Science: Manpupuner Rock Formations **Performance Assesment:** Student version "A view from Below" Scoring rubric with sample student responses		

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-Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization and precipitation, as well as downhill flows on land.	MS-ESS2-4: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.	**"Unit- Weather and climate** Water cycle model, Generation Genius, National Geographic When doing the following design challenge of a model or real living shoreline, rain garden or other solution if students then design a method to monitor data on human impacts, such as pollutants or debris movement the following standards can be met at the same time. (MS-ESS3-3, MS-ESS2-4, MS-ETS1-4, with possible extensions for MS- ETS1-2, MS- ETS1-3, MS- ETS1-4). Ecological solutions can help ensure the water cycle follows in natural path as opposed to one that is impacted by humans and our structures such as paved roads parkinglots, roofs, and other impervious surfaces. Design challenges can include living shoreline investigations and models (spring lake), schoolyard rain gardens designs and actual implementation if time permits. Or others, see NJDEP Education links for various ideas and resources. NJDEP Resources Spring Lake NJ Living Shoreline Design Challenge Installing Rain Gardens to Absorb Rainwater Runoff Wonder of Science: Modeling the Hydrologic Cycle		
The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. Because these patterns are so complex, weather can only be predicted probabilistically.	MS-ESS2-5: Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.	**Unit - Weather and climate** global air mass map activity, weather map activities, Generation Genius, BrainPOP **Wonder of Science: Why is Wellington So Windy?** . **How Frigid Polar Vortex Blasts Are Connected to Global Warming (Actively Learn Reading)**		
-Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. -Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms and living things. These interactions vary with latitude, altitude and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. -The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time and globally redistributing it through ocean currents.	MS-ESS2-6: Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	**Unit - Weather and Climate -** Severe storms research - Scholastic Study Jams, Generation Genius, Wonder of Science: Same Latitudes and Different Climates		

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-Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.	MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	**Unit - Geologic Change** natural disaster research, plate tectonics webquest Weather and Climate - Severe storms research - Scholastic Study Jams, Generation Genius **Storm Surge Synthesis Lesson / Lab Activity** Natural Hazards Short Performance Assessment: Cover Page Student version: Scoring Rubric and sample student responses: Climate Change connections should be made to the increased frequency and intensity with which we are observing natural hazards.		
-Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.	MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	**"Unit- Weather and climate** **-** Water cycle model, Generation Genius, National Geographic When doing the following design challenge of a model or real living shoreline, rain garden or other solution if students then design a method to monitor data on human impacts, such as pollutants or debris movement the following standards can be met at the same time. (MS-ESS3-3, MS-ESS2-4, MS-ETS1-4, with possible extensions for MS- ETS1-2, MS- ETS1-3, MS- ETS1-4). Ecological solutions can help ensure the water cycle follows in natural path as opposed to one that is impacted by humans and our structures such as paved roads parkinglots, roofs, and other impervious surfaces. Design challenges can include living shoreline investigations and models (spring lake), schoolyard rain gardens designs and actual implementation if time permits. Or others, see NJDEP Education links for various ideas and resources. NJDEP Resources Spring Lake NJ Living Shoreline Design Challenge Installing Rain Gardens to Absorb Rainwater Runoff Wonder of Science: Modeling the Hydrologic Cycle Other resources: Generation Genius- Bill Nye - Layers of the Atmosphere model Wonder of Science: Polar Bear Going, Going, Gone		
-Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.	MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	**Unit - Water and other resources** Generation Genius, Carbon Footprint Calculator, Energy Resource slideshow, The Ocean Agency - Chasing Coral **Wonder of Science: Las Vegas and Lake Mead** **Population and Climate Lesson Plan - Making the connection between human population and Earth's systems.**		

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-Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.	MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused climate change over the past century.	**Unit - Water and other resources** Generation Genius, Carbon Footprint Calculator, Natural Resource foldables and Energy Resource slideshow, The Ocean Agency - Chasing Coral **Wonder of Science: Clarifying Climate Claims**		
-The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions.	MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.			**Unit - Energy Resources** Renewable and Nonrenewable Resources BrainPop - Energy Sources; Conserving Energy; Solar Energy; Wind Energy; Biofuels Bill Nye - Energy **Design Challenge:** Design an Insulator for use in homeas and buildings and assess how environmentally frinedly it is. One of the best ways to reduce emissions from energy consumption (heating, cooling in particular) is to reduce the need for it whcih means better insulating areas we want to control the temperature and humidity of. Designing better insualtion practices can thus help fight climate change, and if we can do so with materials that are less harmful to the environment then that is even better. One idea is green roofs. Video Resource
There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.	MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.			**Unit - Energy Resources** Renewable and Nonrenewable Resources BrainPop - Energy Sources; Conserving Energy; Solar Energy; Wind Energy; Biofuels Bill Nye - Energy **Design Challenge:** Design an Insulator for use in homeas and buildings and assess how environmentally frinedly it is. One of the best ways to reduce emissions from energy consumption (heating, cooling in particular) is to reduce the need for it whcih means better insulating areas we want to control the temperature and humidity of. Designing better insualtion practices can thus help fight climate change, and if we can do so with materials that are less harmful to the environment then that is even better. One idea is green roofs. Video Resource

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-There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. -Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. -Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design.	MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.			**Unit - Energy Resources** Renewable and Nonrenewable Resources BrainPop - Energy Sources; Conserving Energy; Solar Energy; Wind Energy; Biofuels Bill Nye - Energy **Design Challenge:** Design an Insulator for use in homeas and buildings and assess how environmentally frinedly it is. One of the best ways to reduce emissions from energy consumption (heating, cooling in particular) is to reduce the need for it whcih means better insulating areas we want to control the temperature and humidity of. Designing better insualtion practices can thus help fight climate change, and if we can do so with materials that are less harmful to the environment then that is even better. One idea is green roofs. Video Resource
-A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. -Models of all kinds are important for testing solutions. -The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool or process such that an optimal design can be achieved.			**Unit - Energy Resources** Renewable and Nonrenewable Resources BrainPop - Energy Sources; Conserving Energy; Solar Energy; Wind Energy; Biofuels Bill Nye - Energy **Design Challenge:** Design an Insulator for use in homeas and buildings and assess how environmentally frinedly it is. One of the best ways to reduce emissions from energy consumption (heating, cooling in particular) is to reduce the need for it whcih means better insulating areas we want to control the temperature and humidity of. Designing better insualtion practices can thus help fight climate change, and if we can do so with materials that are less harmful to the environment then that is even better. One idea is green roofs. Video Resource