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Notes	
Attachments	

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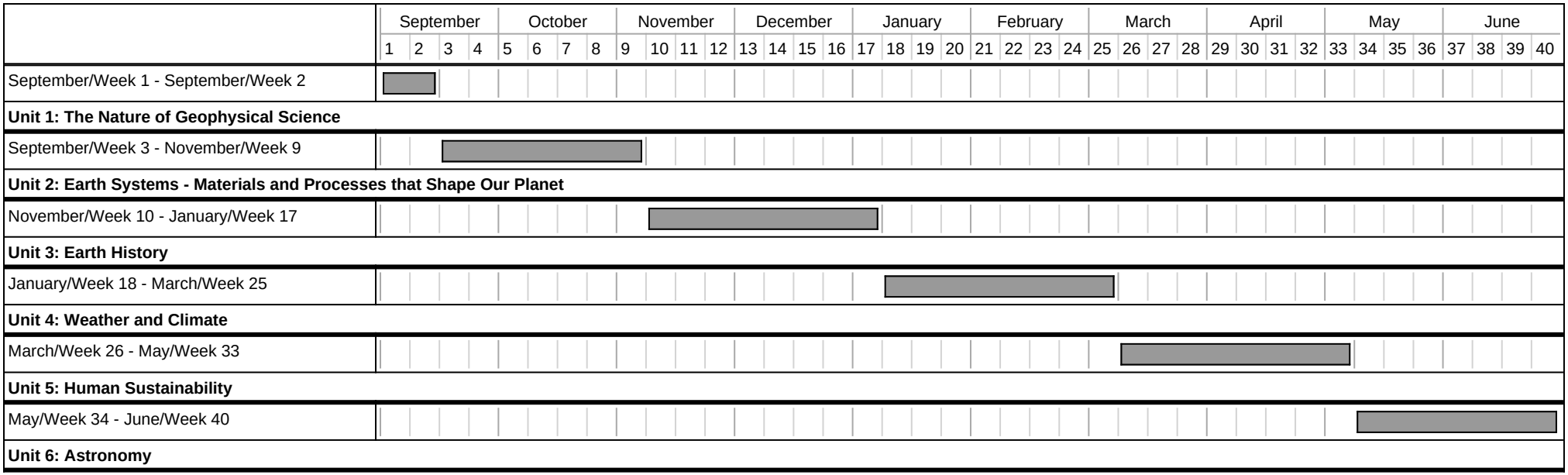

Title : Roxbury High School Geo-Physical Science B
Type : Consensus

Duration: September/Week 1 - September/Week 2					
UNIT NAME: Unit 1: The Nature of Geophysical Science					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
• Measurement and observation tools are used to categorize, represent and interpret the natural world. • Evidence is used for building, refining, and/ or critiquing scientific explanations. • Scientific knowledge builds itself over time. • The growth of scientific knowledge involves critique and communication - social practices that are governed by a core set of values and norms	• Why is lab safety important? • What might cause changes in accepted scientific ideas and theories? • What is science? • What is Earth Science? • What is the importance of the collaboration of knowledge between scientistswhen testing scientific ideas? • How do science and society interact and how do each affect each other? •	• Many different kinds of people are involved in Earth science and its related fields. • Scientists use observation, experimentation, and theoretical and mathematical models to explain nature. • Over the years many scientists have contributed to today's scientific knowledge. • New information can lead to new scientific theories and alterations of existing theories.	• Develop a logical argument to show how scientists use the scientific method as an organized system to solve a problem. • Construct a scientific method and explain how it is used. • Demonstrate proper laboratory safety procedures. • Record all lab data using the SI unit system. • Construct a graph using the results of lab data. • Collaborate with peers the results of lab findings. • How to interpret scientific data and derive conclusions.		
Plans:					

Title : Roxbury High School Geo-Physical Science B
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Duration: September/Week 3 - November/Week 9					
UNIT NAME: Unit 2: Earth Systems - Materials and Processes that Shape Our Planet					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
• Earth's components form systems. These systems continually interact at different rates of time, affecting the Earth locally and globally. • Plate tectonics is the underlying theory that explains the past and current movements of rocks at Earth's surface and provides a framework for understanding its geologic history. • 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. • Evidence from deep probes and seismic waves, reconstruction of historical changes in Earths surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of a layered Earth.	• How and why is Earth constantly changing? • How does radioactive decay of unstable isotopes generate new energy within the Earth's crust and mantle drive convection? • How can continental rocks, which can be older than 4 billion years, be so much older than rocks of the ocean floor, which are less than 200 million years old? • What is thermal convection and how does it act as the mechanism in which tectonic plates are moved across the surface of our planet? • What is the theory of plate tectonics and how does it explain the past and current movements of the rocks at Earth's surface?	• The crust, mantle, and core are the three main layers of Earth's interior. • Plate tectonics explains the formation, movement, and subduction of Earth's crust. • Heat inside Earths causes convection currents in the mantle. • Molten material from the mantle rises at the mid-ocean ridge and old crust sinks back into the mantle at deep-ocean trenches. • Scientists used SONAR, submersibles, and other technology to gather and support evidence of sea-floor spreading.	• Identify Earth's systems and how they could potentially interact. • Identify and describe the components of the physical Earth as a system (inner core, outer core, mantle, crust). • Explain and give examples of the dynamic balance between matter and energy within and on the physical Earth. • Give examples of how changes in the physical Earth affect other Earth systems and human activity. • Use selected properties to identify common rock forming mineral groups, including carbonates, halides, oxides, silicates, sulfates, and sulfides.		HS.ESS2.1-Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.3-Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.2-Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.5-Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. (09-12) [Regional:Next Generation

• Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials towards the interior.	• How are plate movements responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust?		• Describe the physical characteristics of igneous, metamorphic, and sedimentary rocks, including crystal size and shape, mineral and chemical composition, density and origin. • Describe how convection, density, and the law of conservation explain the movement of materials within the rock cycle. • Describe the constructive and destructive processes that drive the rock cycle, including sedimentation, lithification, crystallization, deformation, deposition, erosion, melting, cooling, metamorphism, subsidence, and weathering. • Explain the role of gravity and natural agents (water,wind, glaciers) on Earth (landform changes) and how they impact the rock cycle).		Science Standards (NGSS)] HS.ESS1.5-Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. (09-12)[Regional:Next Generation Science Standards (NGSS)]

			• Explain the principles of hydrology, including evaporation, transpiration, surface and groundwater flows. • Describe current efforts and technologies used to study Earth's land features, including spectroscopy, remote sensing, GIS, GPS, imaging, and topographic mapping using satellite and ground-based data. • Summarize the evidence and thinking that resulted in the development of the Theory of Plate Tectonics. • Explain plate tectonics in terms of magnetic reversals and outer core circulation, mantle convection, sea-floor spreading, and subduction. • Describe how the Theory of Plate Tectonics explains the location of earthquakes, volcanoes, hot spots, mountains, mid-ocean ridges, deep-sea trenches, and island arcs.		

			• Give examples of how progressive changes on Earth's surface, including Pangaea, are used to document the evolution of Earth through time. • Describe the purpose of current tools and techniques used to study plate tectonics including seismograph data, triangulation (epicenter location and travel-time graphs), satellite sensors, image analysis, sonar and distance measurement, and magnetometers.		
Plans:					

Title : Roxbury High School Geo-Physical Science B
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Duration: November/Week 10 - January/Week 17					
UNIT NAME: Unit 3: Earth History					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
• Use concepts of system analysis to identify major historical geology topics and discuss their relationship to other fields of Earth and Space Science. • Understanding past processes and contributions is essential in building scientific knowledge. • Organisms and their environments are interconnected.	• How and why is Earth constantly changing? • How is the scientific theory of evolution supported by the fossil record? • What objects can provide information about Earth's formation and early history? • How do geologic events occurring today provide insight into Earth's past?	• Weathering, erosion, and deposition act together in a cycle that wears down and builds up Earth's surface. • During radioactive decay, the atoms of one element break down to form atoms of another element. • The fossil record provides evidence that many different organisms have existed at different times and that groups of organisms have changed over time. • Fossils help scientists infer how Earth's surface has changed. • Rock layers provide a record of Earth's geologic history.	• Identify and describe the components of historical geology. • Explain and give examples of the dynamic balance between matter and energy throughout the geologic history of Earth. • Give examples of how changes in one part of historical geology affected other parts of Earth's systems. • Compare similarities and differences between relative age and absolute age. • Describe the principles used to determine relative age. • Describe the principles used to determine absolute age, including radioactive dating, index fossils, fossil correlation.		HS.ESS1.6-Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.7-Construct an argument based on evidence about the simultaneous co-evolution of Earth systems and life on Earth. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.6-Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.* (09-12) [Regional:Next Generation Science Standards (NGSS)]

			• Create a geologic time scale (using eras, periods, and epochs) that shows the major geologic and biologic events, including human's place in the time continuum. • Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct and account of Earth's formation and early history. • Describe the dramatic changes in the composition of Earth's atmosphere (introduction of O2) once the presence of single-celled life forms became established. • Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.		

			• Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.		
Plans:					

Title : Roxbury High School Geo-Physical Science B
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Duration: January/Week 18 - March/Week 25					
UNIT NAME: Unit 4: Weather and Climate					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
• Earth's components form systems which are continually interacting at different rates of time, affecting the Earth regionally and globally. • The structure and composition of Earth's atmosphere is vital to life as we know it. • Solar radiation is responsible for global wind patterns and major climate zones on Earth. • The Earth's characteristics and position have made it an ideal habitat for life as we know it. • Climates have sometimes changed abruptly in the past as a result of volcanic eruptions or impacts of huge rocks from space. • Water evaporates from the surface of Earth, rises and cools, condenses into rain or snow, and falls again to the surface.	• How do changes in one part of an Earth system affect other parts of the system? • What is climate and how does it differ from weather? • What are current climate conditions dependent on? • How and why is Earth constantly changing? • How have changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities affected global and regional climate? • What are the varying time-scales that global and regional climate change can occur on? • What phenomena cause the reoccurring cycle of ice ages and gradual climate change? • What importance does the abundance of liquid water play in Earth's systems?	• Energy travels to Earth from the sun as electromagnetic waves. • Different materials absorb radiation at different rates. • The movement of air between the equator and the poles produces global winds. • Nearly all the energy in Earth's atmosphere comes from the sun. • Water moves between the atmosphere and Earth's surface in the water cycle. • As the sun heats Earth's surface, the amount of water in the atmosphere changes. • Human activities are affecting Earth's climate and atmosphere.	• Identify and describe the components of the atmosphere. • Summarize the processes of conduction, convection, and radiation. • Explain how the transfer of energy in the atmosphere affects the water cycle. • Analyze measurable elements of weather (atmospheric pressure, dew point, relative humidity, forms of precipitation, wind speed, direction) essential to predicting large-scale and local weather events. • Describe the causes of local and global air and wind patterns, including pressure gradients, density, land and sea breezes, Coriolis effect, and energy exchange.		HS.ESS2.6-Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.4-Use a model to describe how variations in the flow of energy into and out of Earth systems result in changes in climate. (09-12) [Regional:Next Generation Science Standards (NGSS)] 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 systems. (09-12) [Regional:Next Generation Science Standards (NGSS)]

• The cycling of water in and out of the atmosphere is a significant aspect of weather patterns on Earth. • Human beings are an integral part of Earth's climate system. • Human activities such as fossil fuel burning or deforestation can affect climate and alter the equilibrium of the climate system.	• What role does electromagnetic radiation from the sun, as well as reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space play in global climate? • How do plants and other organisms that captured carbon dioxide and release oxygen cause atmospheric changes? • How has human activity changed the atmosphere?		• Analyze and compare the heat transfer systems (radiation, convection, conduction) affecting atmospheric circulation pattern which causes differences vertical air motions and their effects on cyclones and anticyclones. • Identify the different types of fronts and air masses. • Apply the weather concepts learned to predict weather when given a scenario and then analyze the limitations of the given predictions. • Analyze how a severe weather system forms by breaking it into various components. • Identify factors that affect climate. • Construct scientific arguments using data to support claims that spatial and temporal patterns in weather and climate found around the Earth are created by complex global, regional, and local interactions involving sunlight, and all of the Earth's spheres.		

			• Research and describe how changes in atmospheric and hydrologic conditions cause long-term climatic changes. • Describe the carbon cycle, and identify carbon sinks, including atmospheric CO2, organic carbon, fossil fuels, and carbonate rocks.		
Plans:					

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Duration: March/Week 26 - May/Week 33					
UNIT NAME: Unit 5: Human Sustainability					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
• Resource availability has guided the development of human society. • All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. • New technologies and social regulations can change the balance of these factors. • Natural hazards and other geologic events have shaped the course of human history; they have significantly altered the sizes of human populations and have driven human migrations. • The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.	• How do the outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere? • What are the associated economic, social, environmental, and geopolitical costs and risks as well as benefits of all forms of energy production and other resource extraction? • How have natural hazards and other geologic events significantly altered the sizes of human populations and driven human migrations?	• What it means to be sustainable and the measures we can take to achieve sustainability. • Economics and environmental science are related. • The government has developed regulations to protect our health and our environment. • The media can distort information about the environment. • Humanity benefits from biodiversity.	• Analyze how natural resources, hazards, and climate change have influenced human activity. • Identify how changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the crops and livestock that can be raised. • Create a model of how rising sea levels will affect the world's population. • Describe renewable verses non-renewable. • Use a variety of methods to model the different types of mining. • Research alternative energy methods. • Compare extinction rates of the past to today.		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 systems. (09-12) [Regional:Next Generation Science Standards (NGSS)] 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. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.2-Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.3-Create a computational simulation to illustrate the

• Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste that preclude ecosystem degradation. • Human have the abilities to model, predict, and manage current and future impacts. • Important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities.	• What type of regulations and responsible management of natural resources are needed to ensure the sustainability of human societies and biodiversity that supports them?		• Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. • Graph real world data of changes in carbon in the atmosphere and predict possible outcomes. • Interpret the effects of the atmospheric and hydrologic cycles on human activity (severe weather, floods, sea-level changes, emergent and submergent coastlines, etc.).		relationships among management of natural resources, the sustainability of human populations, and biodiversity. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.4-Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.6-Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.* (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Geo-Physical Science B
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Duration: May/Week 34 - June/Week 40					
UNIT NAME: Unit 6: Astronomy					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
• Scientific knowledge grows and changes in light of new observations and new technological developments. • Scientists employ modeling and mathematics to seek answers and solve problems. • Space is big. • Scientist knowledge of stars is based on modeling with limited observations. • The contemporary models of the solar system are based on observation and deduction.	• What is the universe, and what is Earth's place in it? • What are Kepler's three laws of planetary motion? • How does Newton's law of circular motion relate to the motion of Earth, Moon, and Sun? • How have scientific discoveries affected human perception of Earth? • How are the sun, planets, and other parts of our solar system related? • How are the physical properties of stars determined? • What is the scientific theory of the origin of the universe? • How do the activities of the sun affect Earth and its life? What evidence supports the Big Bang Theory? • How is the universe organized? • What are the different types of galaxies and their properties?	• Newton's laws govern the motion of rockets and satellites as well as the motion of Earth and the moon. • Astronomy has advanced our understanding of the universe with scientific tools such as computers, telescopes, and spectrographs. • Astronomers use mathematical techniques of graphing to classify starts. • Stars are classified according to size, color, temperature, and brightness. • Despite the differences in size, all stars follow the same basic laws of physics.	• Identify and describe the components of the solar system and the universe. • Identify the evolution of the solar system and the information gleaned from the properties of the planets. • Apply Keplar's Laws and Newton's Universal Law of Gravitation to planetary motion. • Describe the Sun-Moon-Earth system. • Relate knowledge of geologic processes and features on Earth to geologic processes and features of the moon. • Communicate scientific ideas about the way stars, over their life cycle, produce elements. • Describe the life cycle of stars (nebulae, protostar, red giants, white dwarfs, neutron stars, pulsars, supernovas, black holes), and the role of gravity in their stellar evolution.		HS.ESS1.1-Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.2-Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.3-Communicate scientific ideas about the way stars, over their life cycle, produce elements. (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS1.4-Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. (09-12)

			• Describe the role of solar weather on Earth-based technologies. • Construct an explanation of the Big Bang Theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. • Describe the structure and evolution of galaxies using their visible characteristics.		[Regional:Next Generation Science Standards (NGSS)] HS.ESS1.6-Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					