Subject and Grade:	**Earth Science, Grade 9**	**School Year:**	2023-2024
Unit Title:	**Scientific Basics & Earth Science Overview**	**Author/s:**	Stephen Shepherd

NYS Next Gen Learning Standards	**Essential Question/Big Ideas**
MS-PS1-7. Use evidence to illustrate that density is a property that can be used to identify samples of matter. MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and phase (state) of a substance when thermal energy is added or removed.	What is Earth Science comprised of? How do we measure density? How do we graph data, and how do we interpret graphs?

Brief Unit Summary	**Content Vocabulary**
We kick off the school year with reminders of some of the basics in any Jr/Sr High science class: density, graphing, observations & inferences. We also look at what the bulk of this course is going to be about: geology, meteorology, and astronomy.	Quantitative, Qualitative, Observation, Inference, Sources of Error, Scientific Theory, Hypothesis, Direct Relationship, Indirect Relationship, Matter, Density, Mass, Volume, Independent Variable, Dependent Variable, Meteorology, Geology, Astronomy, Environment, Weather, Climate, Universe, Planet

Content Skills or Learning Targets	**Assessments (Pre-Assessments, Formative, and Summative)**	**Timeframe**
Analyzing graphs and other evidence, Applying formulas and knowledge to solve problems, Understanding what this course entails in the bigger picture	Pre-Assessment: Have them take an old Earth Science Regents Formative- bellringers, exit tickets Summative- labs, homework assignments, at least one quiz/test	2-3 weeks, September

Subject and Grade:	Earth Science, Grade 9	School Year:	2023-2024
Unit Title:	Models & Dimensions of the Earth	Author/s:	Stephen Shepherd

NYS Next Gen Learning Standards	Essential Question/Big Ideas
4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.	How do we read a map or a globe? Why do we have time zones? How do we read and plot isolines?

Brief Unit Summary	Content Vocabulary
After brushing up on geography, we delve into how the Earth itself is modeled: through globes and maps, in particular contour maps and topographic profiles.	Latitude, Longitude, Oblate Spheroid, Altitude, Isoline, Isotherm, Contour Line, Topography, Contour Map, Elevation, Slope, Gradient, Time Zones, Profile

Content Skills or Learning Targets	Assessments (Pre-Assessments, Formative, and Summative)	Timeframe
Understanding how to read various maps, Analyzing contour maps, Creating isolines, contour maps, and profiles	Formative- bellringers, exit tickets Summative- labs, homework assignments, at least one quiz/test	2-3 weeks, late September into mid-October

Subject and Grade:	Earth Science, Grade 9	School Year:	2023-2024
Unit Title:	Earth's Interior, Plate Tectonics, & Earthquakes	Author/s:	Stephen Shepherd

NYS Next Gen Learning Standards	Essential Question/Big Ideas
HS. ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. 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. 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. 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.	What is the working mechanism behind the theory of plate tectonics? How do we obtain information about the interior of the Earth? How can we extrapolate seismic data to ascertain other information about earthquakes?

Brief Unit Summary	Content Vocabulary
We start to figure out how the Earth works at the ground level, as well as deep underground. A bulk of this learning happens to be in regards to earthquake activity.	Plate Tectonics, Divergent Boundary, Convergent Boundary, Transform Boundary, Fault, Hot Spot, Asthenosphere, Lithosphere, Earthquake, Tsunami, P-Wave, S-Wave, Seismograph, Seismogram, Richter Scale, Mercalli Scale, Convection Cells, Continental Crust, Oceanic Crust, Continental Drift

Content Skills or Learning Targets	Assessments (Pre-Assessments, Formative, and Summative)	Timeframe
Applying given knowledge of Earth's interior to figure out mechanisms and properties, Evaluating seismic data to find epicenters and related wave times, Understanding the theories of plate tectonics and continental drift	Formative- bellringers, exit tickets Summative- labs, homework assignments, at least one quiz, at least one test	5-6 weeks, late October through the beginning of December

Subject and Grade:	Earth Science, Grade 9	School Year:	2023-2024
Unit Title:	Minerals, Rocks, Rock Cycle	Author/s:	Stephen Shepherd

NYS Next Gen Learning Standards	Essential Question/Big Ideas
HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.	How do we analyze minerals? What determines mineral properties? How do we identify rocks, and what determines their properties?

Brief Unit Summary	Content Vocabulary
We get into more specifics about what the geosphere itself is made of, as well as distinguishing features in the various classes of minerals and rocks.	mineral, Moh's hardness scale, Sedimentary, Igneous, Metamorphic, Rock Cycle, cleavage, fracture, crystal, banding, luster, streak

Content Skills or Learning Targets	Assessments (Pre-Assessments, Formative, and Summative)	Timeframe
Understanding that rocks are made of minerals & that rocks are constantly changing into other rocks through the rock cycle, Analyzing samples to classify rocks and identify minerals	Formative- bellringers, exit tickets Summative- labs, homework assignments, at least one quiz/test	~3 weeks, December

Subject and Grade:	Earth Science, Grade 9	School Year:	2023-2024
Unit Title:	Surface Processes	Author/s:	Stephen Shepherd

NYS Next Gen Learning Standards	Essential Question/Big Ideas
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. HS. ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to Earth's systems. HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. 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. HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	How do the forces of weathering, erosion, and deposition shape the surface of the Earth? How does water interact with other parts of the lithosphere and troposphere?

Brief Unit Summary	Content Vocabulary
As we prepare to move into studying the atmosphere two units from now, we bridge the gap by talking about the processes of weathering, erosion, and deposition. One of the largest agents of weathering/erosion is water, and we break down various water-specific processes & relevant landscape formations.	River, Meander, Weathering, Erosion, Deposition, Channel, Capacity, Tributary, Delta, Competence, Discharge, Watershed, Drainage Basin, Continental Divide, Infiltration, Water Cycle, Evaporation, Transpiration, Condensation, Precipitation, Porosity, Permeability, Glacier, Sustainability

Content Skills or Learning Targets	Assessments (Pre-Assessments, Formative, and Summative)	Timeframe
Understanding how surface processes work, Applying that knowledge to make predictions, Analyzing existing landscape features to figure out what processes led to them	Formative- bellringers, exit tickets Summative- labs, homework assignments, at least one quiz, at least one test	4-5 weeks, Introduce just before December Break & go through beginning of February [Keep in mind that midterms are in mid-January.]

Subject and Grade:	**Earth Science, Grade 9**	**School Year:**	2023-2024
Unit Title:	**Earth's History**	**Author/s:**	Stephen Shepherd

NYS Next Gen Learning Standards	**Essential Question/Big Ideas**
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. 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. HS-ESS2-7. Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth. HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.	How can we tell the age of the Earth? How can we tell when certain events happened in Earth's history? How can we tell the ages of previously living organisms?

Brief Unit Summary	**Content Vocabulary**
We hark back to the geology-based units and bring in a wider perspective of the history of Earth's surface, both the abiotic aspects and the biotic factors	Radioactive dating, relative age, absolute age, inclusion, half-life, geologic time, period, epoch, era, fossil, index fossil, geological event, supercontinent

Content Skills or Learning Targets	**Assessments (Pre-Assessments, Formative, and Summative)**	**Timeframe**
Analyzing timelines and diagrams to determine sequences of events, Understanding how scientists can determine the absolute age of something (not just the relative age)	Formative- bellringers, exit tickets Summative- labs, homework assignments, at least one quiz/test	3-4 weeks, the rest of February

Subject and Grade:	**Earth Science, Grade 9**	**School Year:**	2023-2024
Unit Title:	**Weather & Climate**	**Author/s:**	Stephen Shepherd

NYS Next Gen Learning Standards	**Essential Question/Big Ideas**
HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. 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. HS-ESS2-8. Evaluate data and communicate information to explain how the movement and interactions of air masses result in changes in weather conditions. HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to Earth's systems. 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.	How do we interpret meteorological data? How can we use weather data over a long period of time to analyze and forecast climate change? How are humans affecting the atmosphere?

Brief Unit Summary	**Content Vocabulary**
Spring is arriving, and it's the perfect time to focus on studying the atmosphere, specifically the weather in the troposphere. We get into many sub-topics: some weather factors which meteorologists emphasize, and some that they breeze by without much explanation. We also look at the bigger atmospheric picture: climate.	Weather, Climate, Pressure, Air Mass, Source Region, Temperature, Humidity, Dew Point, Relative Humidity, Jet Stream, Atmosphere, altitude, elevation, rain shadow, hurricane, tornado, Coriolis Effect

Content Skills or Learning Targets	Assessments (Pre-Assessments, Formative, and Summative)	Timeframe
Understanding how certain weather events occur and how atmospheric factors affect the weather and climate, Analyzing & creating weather maps and station models	Formative- bellringers, exit tickets Summative- labs, homework assignments, at least one quiz, at least one test	8-9 weeks, March & April

Subject and Grade:	**Earth Science, Grade 9**	**School Year:**	2023-2024
Unit Title:	**Space**	**Author/s:**	Stephen Shepherd

NYS Next Gen Learning Standards	Essential Question/Big Ideas
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. 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. HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements. HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. HS-ESS1-7. Construct an explanation using evidence to support the claim that the phases of the moon, eclipses, tides and seasons change cyclically.	How does the Earth have distinct seasons, eclipses, and tides? What evidence do we have that the universe was formed by a Big Bang? What is the life cycle of a star?

Brief Unit Summary	Content Vocabulary
We end the course by exploring Earth's place in outer space, especially the Solar System, as well as the observable universe itself. We explore how planets and stars were made, and how the orientation of the Earth, Earth's moon, and Sun affect each other.	Moon Phases, Insolation, Star, Protostar, Thermonuclear fusion, Nebula, Planetary Nebula, Supernova, Black hole, neutron star, gravity, orbit, revolution, rotation, axial tilt, ellipse, eclipse, elliptical orbit, period, mass, weight, astronomical units

Content Skills or Learning Targets	Assessments (Pre-Assessments, Formative, and Summative)	Timeframe
Understanding the Big Bang Theory, Understanding how stars are born, Applying knowledge of Earth's movements around the Sun to explain seasons & eclipses, Creating elliptical orbits and analyzing their eccentricity & periods	Pre-Assessment- quiz or survey to see what they remember about astronomy from previous grades Formative- bellringers, exit tickets Summative- labs, homework assignments, at least one quiz, at least one test	5-6 weeks, very late April through very early June