This document is designed to help North Carolina educators teach the Essential Standards (Standard Course of Study). NCDPI staff are continually updating and improving these tools to better serve teachers.

## Earth/Environmental

## 2009-to-2004 Standards Crosswalk

This document is a general comparison of the current 2004 Science Standard Course of Study and the new 2009 Science Essential Standards. It provides initial insight into sameness and difference between these two sets of standards. This document is not intended to answer all questions about the nuance of the new standards versus the old - in fact, we imagine you will develop questions as you do a close reading of the new standards. Please send the science section of NC DPI any thoughts, feedback, questions and ideas about additional resources that would help you start preparing to teach the Essential Standards. Email Beverly Vance at <a href="mailto:bvance@dpi.state.nc.us">bvance@dpi.state.nc.us</a>.

Important Note: The current 2004 SCOS will continue to be the operational standards in the 2010-11 and 2011-12 school years as resource materials are developed to support the new Science Essential Standards, professional development is conducted and assessments are designed to align to the new Science Essential Standards. We expect the new Essential Standards to be taught and assessed in schools for the first time in the 2012-13 school year. That said, we are providing Essential Standards resources now and over the next two-years so that schools and teachers can get a head start on internalizing and planning to teach the new standards.

		2009 Essential Standards			2004 NC SCOS	
Strand	ctive	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
Earth in the Universe	EEn.1.1.1	Explain the Earth's role as a body in space.  Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy.	Earth in the Solar System and its	02	Analyze planetary motion and the physical laws that explain that motion:      Rotation     Revolution     Apparent diurnal motions of the stars, sun and moon	The remaining bullet in objective 6.02  • Effects of the tilt of earth's axis is addressed in EEn.1.1.2  Specific terms have been delineated in the 2009 Essential Standards: precession, nutation and barycenter.

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		2009 Essential Standards			2004 NC SCOS	1
Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
	EEn.1.1.2	Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides.		6.02	Analyze planetary motion and the physical laws that explain that motion:  • Effects of the tilt of earth's axis	Other bullets of 6.02 are addressed in EEn.1.1.1  • Rotation • Revolution • Apparent diurnal motions of the stars, sun and moon This is the only bullet of objective 6.02 addressed by EEn.1.1.2.
	EEn.1.1.3	Explain how the sun produces energy which is transferred to the Earth by radiation.				New to 2009 Essential Standards
	EEn.1.1.4	Explain how incoming solar energy makes life possible on Earth.				New to 2009 Essential Standards
esses		Explain how processes and forces affect the lithosphere.  Explain how the rock cycle, plate tectonics,			Analyze the historical development of the theory of plate tectonics.	
Earth Systems, Structures, and Processes	EEn.2.1.1	volcanoes, and earthquakes impact the lithosphere.	Lithospheric Materials, Tectonic Processes, and the Human and Environmental Impacts	2.03	Investigate and analyze the processes responsible for the rock cycle:      Trace the path of elements through the rock cycle     Relate rock formation to plate tectonics     Identify forms of energy that drive the rock cycle	These are the only bullets of objective 2.03 that address EEn.2.1.1 This objective is now completed prior to the Earth/Environmental course.  • Analyze the origin, texture and mineral composition of rocks This objective is now addressed in EEn.2.1.3  • Analyze the relationship between the rock cycle and processes in the atmosphere

		2009 Essential Standards			2004 NC SCOS	1
Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
				2.04	Analyze seismic waves including velocity and refraction to:  • Infer Earth's internal structure  • Locate earthquake epicenters  • Measure earthquake magnitude  • Evaluate the level of seismic activity in North Carolina	and hydrosphere
			Origin and Evolution of the Earth Systems	3.01	Assess evidence to interpret the order and impact of events in the geologic past:  • Relative and absolute dating techniques • Statistical models of radioactive decay • Fossil evidence of past life • Uniformitarianism • Stratigraphic principles • Divisions of Geologic Time	These are the only bullets of objective 3.01 that address EEn.2.1.1.  These bullets are addressed prior to the Earth/Environmental course.  Origin of the earth system Origin of life
			Hydrosphere and its Or interactions and	4.03 3.02	Evaluate the geologic history of North Carolina.  Analyze the mechanisms that produce the various types of shorelines and their resultant landforms:  Nature of underlying geology  Long-and short-term sea-level history	These are the only bullets of objective 4.03 addressed by EEn.2.1.1.  This bullet is addressed in EEn.2.1.3  • Formation and breaking of waves on adjacent topography  This bullet is addressed in EEn.2.2.1  • Human impact
	EEn.2.1.2	Predict the locations of volcanoes, earthquakes, and faults based on information contained in a variety of maps.	Lithospheric Materials, Tectonic	2.03	Investigate and analyze the processes responsible for the rock cycle: (relates with plate tectonics)  • Relate rock formation to plate tectonics	This is the only bullet of objective 2.03 that addresses EEn.2.1.2. It also addresses EEn.2.1.1. This bullet is completed prior to Earth/Environmental course.  • Analyze the origin, texture and mineral composition of rocks

		2009 Essential Standards			2004 NC SCOS	]
Strand	ctive	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
				2.04	Analyze seismic waves including velocity and refraction to:  (relates with earthquakes)  • Infer Earth's internal structure	These bullets are addressed in EEn.2.1.1.  Trace the path of elements through the rock cycle  Identify forms of energy that drive the rock cycle  This bullet is addressed in EEn.2.1.3.  Analyze the relationship between the rock cycle and processes in the atmosphere and hydrosphere  This is the only bullet of objective 2.04 that addresses EEn.2.1.2. It also is addressed in EEn.2.1.4.  These bullets are addressed in EEn.2.1.4.  Locate earthquake epicenters  Measure earthquake magnitude  Evaluate the level of seismic activity in North Carolina
			ig 1	2.05	Create and interpret topographic, soil and geologic maps using scale and legends.  Evaluate the geologic history of North Carolina.	
	EEn.2.1.3	Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface.	Hydrosphere Orig	4.01 3.02	Evaluate erosion and depositional processes:  • Formation of stream channels with respect to the work being done by the stream (i.e. down-cutting, lateral erosion, and transportation)  • Nature and characteristics of sediments	These are the only bullets of the objective 4.01 addressed by EEn.2.1.3. They are also addressed in EEn.2.4.2 This bullet is addressed in EEn.2.4.1 and EEn.2.4.2.

		2009 Essential Standards			2004 NC SCOS	1
Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
						<ul> <li>Effects on water quality</li> <li>This bullet is addressed by</li> <li>EEn.2.2.1, EEn.2.4.1, EEn.2.4.2.</li> <li>Effect of human choices on the rate of erosion</li> </ul>
			Lithospheric Materials, Tectonic Processes, and the Human and		Investigate and analyze the processes responsible for the rock cycle: (relates with soil formation as part of rock cycle).  • Analyze the relationship between the rock cycle and processes in the atmosphere and hydrosphere	This is the only bullet of objective 2.03 addressed by EEn.2.1.3. These are addressed in EEn.2.1.1 and EEn.2.1.2.  • Analyze the origin, texture and mineral composition of rocks  • Trace the path of elements through the rock cycle • Relate rock formation to plate tectonics • Identify forms of energy that drive the rock cycle
			Hydrosphere and its Interactions and Influences	4.03	Analyze the mechanisms that produce the various types of shorelines and their resultant landforms:  • Formation and breaking of waves on adjacent topography	This is the only bullet of objective 4.03 addressed by EEn.2.1.3. This bullet is addressed prior to the Earth/Environmental course.  • Nature of underlying geology This bullet is addressed in EEn.2.6.4.  • Long-and short-term sea- level history This bullet is addressed in EEn.2.2.1.  • Human impact

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Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
Г	4.	Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data	aterials,	2.02	Analyze the historical development of the theory of plate tectonics.	
	EEn.2.1.		Lithospheric Materials, Tectonic Processes, and the	2.04	Analyze seismic waves including velocity and refraction to:  • Infer Earth's internal structure  • Locate earthquake epicenters  • Measure earthquake magnitude  • Evaluate the level of seismic activity in North Carolina	
			T	2.05	Create and interpret topographic, soil and geologic maps using scale and legends.	
		derstand how human influences impact the osphere.	onic nd		Investigate and analyze the importance and impact of the economic development of earth's finite rock, mineral,	
Earth Systems, Structures, and Processes	EEn.2.2.1	Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present.	Lithospheric Materials, Tectonic Processes, and the Human and	2.07 2.06	soil, fossil fuel and other natural resources to society and our daily lives:  • Availability • Geographic distribution • Conservation/Stewardship • Recycling • Environmental impact • Challenge of rehabilitation of disturbed lands  Analyze the sources and impacts of society's use of energy. • Renewable & nonrenewable sources	
Earth Systems, S	EEn.		Hydrosphere and its Interactions and		The impact of human choices on Earth and its systems  Evaluate erosion and depositional processes:     Effect of human choices on the rate of erosion	This is the only bullet of objective 4.01 addressed in EEn.2.2.1. These bullets are addressed by EEn.2.1.3 and EEn.2.4.2.  • Formation of stream channels with respect to the work being done by the stream (i.e. down-cutting,

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Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
				4.03	Analyze the mechanisms that produce the various types of shorelines and their resultant landforms:  • Human impact	lateral erosion, and transportation)  Nature and characteristics of sediments  Effects on water quality  This is the only bullet of objective 4.03 that is addressed by EEn.2.2.1.  This bullet is addressed prior to the Earth/Environmental course.  Nature of underlying geology  This bullet is addressed by  EEn.2.6.4.  Long-and short-term sealevel history  This bullet is addressed by  EEn.2.1.3.  Formation and breaking of waves on adjacent topography
	EEn.2.2.2	Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood).	Lithospheric Materials, Tectonic Processes, and	2.06	Investigate and analyze the importance and impact of the economic development of earth's finite rock, mineral, soil, fossil fuel and other natural resources to society and our daily lives:  • Availability • Geographic distribution • Conservation/Stewardship • Recycling • Environmental impact • Challenge of rehabilitation of disturbed lands	

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Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
				2.07	Analyze the sources and impacts of society's use of energy.  • Renewable & nonrenewable sources  • The impact of human choices on Earth and its systems	
		Explain how water is an energy agent (currents and heat transfer).	hosphere, the	4.02	Analyze mechanisms for generating ocean currents and upwelling.  Temperature Coriolis effect Climactic influence	
Earth Systems, Structures, and Processes	EEn.2.3.2	Explain how ground water and surface water interact.	Hydrosphere and its Interactions and Influences on the Lithosphere, the Atmosphere, and Environmental Quality	4.04	Evaluate water resources:  • Storage and movement of groundwater	This is the only bullet of objective 4.04 addressed by EEn.2.3.2. It is also addressed by EEn.2.4.1 These bullets are all addressed in EEn.2.4.1 and EEn.2.4.2.  • Ecological services provided by the ocean • Environmental impacts of a growing human population • Causes of natural and manmade contamination

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Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
	Eva	luate how humans use water.			Evaluate erosion and depositional processes:	These are the only bullets of
d Processes	EEn.2.4.1	Evaluate human influences on freshwater availability.  Evaluate human influences on freshwater availability.	Hydrosphere and its Interactions and Influences on the Lithosphere, the Atmosphere, and Environmental Quality	4.01	<ul> <li>Effects on water quality</li> <li>Effect of human choices on the rate of erosion</li> </ul>	objective 4.01 addressed in EEn.2.4.1. They are also addressed in EEn.2.4.1 and EEn.2.4.2. These bullets are addressed in EEn.2.1.3 and EEn.2.4.2.  • Formation of stream channels with respect to the work being done by the stream (i.e. down-cutting, lateral erosion, and transportation)  • Nature and characteristics of sediments
Earth Systems, Structures, and Processes	EEn.		and Influences on the L Environmental Quality	4.04	Evaluate water resources:      Storage and movement of groundwater     Ecological services provided by the ocean     Environmental impacts of a growing human population     Causes of natural and manmade contamination	These bullets are also addressed in EEn.2.3.2 and EEn.2.4.2.
Earth System			its Interactions and I Envii	4.05	Investigate and analyze environmental issues and solutions for North Carolina's river basins, wetlands, and tidal environments:  • Water quality	This is the only bullet of objective 4.05 addressed in EEn.2.4.1. It is also addressed in EEn.2.4.2. The following bullets are addressed by EEn.2.4.2.  • Shoreline changes • Habitat preservation
	EEn.2.4.2	Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments.	Hydrosphere and	4.01	<ul> <li>Evaluate erosion and depositional processes:</li> <li>Formation of stream channels with respect to the work being done by the stream (i.e. down-cutting, lateral erosion, and transportation)</li> <li>Nature and characteristics of sediments</li> <li>Effects on water quality</li> <li>Effect of human choices on the rate of erosion</li> </ul>	These are also addressed in part/whole by EEn.2.1.3, EEn.2.2.1, EEn.2.4.1.

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Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
				4.04	Evaluate water resources:	These are the only bullets of objective 4.04 addressed in EEn.2.4.2. They are also addressed in EEn.2.4.1. This bullet is addressed by EEn.2.4.1.  • Storage and movement of groundwater
				4.05	Investigate and analyze environmental issues and solutions for North Carolina's river basins, wetlands, and tidal environments:  • Water quality  • Shoreline changes  • Habitat preservation	
Processes		lerstand the structure of and processes nin our atmosphere.  Summarize the structure and composition of our atmosphere.	mosphere and its ing Climate and	5.01	Analyze air masses and the life cycle of weather systems:  • Planetary wind belts  • Air masses  • Frontal systems  • Cyclonic systems	
Earth Systems, Structures, and Processes	EEn.2.5.2	Explain the formation of typical air masses and the weather systems that result from air mass interactions.(new)	sition of the Atocesses Influence	5.01	Analyze air masses and the life cycle of weather systems:  • Planetary wind belts  • Air masses  • Frontal systems	These are the only bullets of objective 5.01 addressed by EEn.2.5.2.  This bullet is addressed in EEn.2.5.3.  • Cyclonic systems
Earth Systems,	EEn.2.5.3	Explain how cyclonic storms form based on the interaction of air masses.	Dynamics and Composition of the Atmosphere and its Local and Global Processes Influencing Climate and	5.01	Analyze air masses and the life cycle of weather systems:  • Cyclonic systems	This is the only bullet of objective 5.01 specifically addressed by EEn.2.5.3. These bullets are addressed in EEn.2.5.2.  • Planetary wind belts • Air masses • Frontal systems

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Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
	EEn.2.5.4	Predict the weather using available weather maps and data (including surface, upper atmospheric winds, and satellite imagery).		5.02 5.02	Evaluate meteorological observing, analysis, and prediction:  • Worldwide observing systems  • Meteorological data depiction  Evaluate meteorological observing, analysis, and prediction:  • Worldwide observing systems  • Meteorological data depiction	
	EEn.2.5.5	Explain how human activities affect air quality.		5.03	Analyze global atmospheric changes including changes in CO <sub>2</sub> , CH <sub>4</sub> , and stratospheric O <sub>3</sub> and the consequences of these changes:  • Climate change • Changes in weather patterns • Increasing ultraviolet radiation • Sea level changes	
sses	Ana time	alyze patterns of global climate change over e.  Differentiate between weather and climate.	of the I Global	5.03	Analyze global atmospheric changes including changes in CO <sub>2</sub> , CH <sub>4</sub> , and stratospheric O <sub>3</sub> and the consequences of these changes: (in the 2004 Detailed Description of Course Content)  • Climate change	
and Proce	EEn.2.6		omposition s Local and	5.0	<ul> <li>Changes in weather patterns</li> <li>Increasing ultraviolet radiation</li> <li>Sea level changes</li> </ul>	
Earth Systems, Structures, and Processes	EEn.2.6.2	Explain changes in global climate due to natural processes.	Dynamics and Composition of the Atmosphere and its Local and Globs	Dynamics and Composition of the Atmosphere and its Local and Global 5.03 5.03	Analyze global atmospheric changes including changes in CO <sub>2</sub> , CH <sub>4</sub> , and stratospheric O <sub>3</sub> and the consequences of these changes:  • Climate change • Changes in weather patterns • Increasing ultraviolet radiation • Sea level changes	
Earth	EEn.2.6.	Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, greenhouse effect, and deforestation).	Lithosph eric	2.07	Analyze the sources and impacts of society's use of energy.  • Renewable & nonrenewable sources  • The impact of human choices on Earth and its systems	

		2009 Essential Standards			2004 NC SCOS	
Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
			Dynamics and Composition of	5.03	Analyze global atmospheric changes including changes in CO <sub>2</sub> , CH <sub>4</sub> , and stratospheric O <sub>3</sub> and the consequences of these changes:  • Climate change • Changes in weather patterns • Increasing ultraviolet radiation • Sea level changes	
	2.6.4	Attribute changes to Earth's systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.).	Hydrosphere and its Interactions and Influences on the Lithosphere,	4.03	Analyze the mechanisms that produce the various types of shorelines and their resultant landforms:  • Long-and short-term sea-level history	This is the only bullet of objective 4.03 addressed by EEn.2.6.4. This bullet of objective 4.03 is addressed prior to the Earth/Environmental course.  • Nature of underlying geology This bullet is addressed in EEn.2.1.3.  • Formation and breaking of waves on adjacent topography This bullet is addressed in EEn.2.2.1.  • Human impact
	EEn.2.6.4		Dynamics and Composition of the Atmosphere and its Local and	5.03	Analyze global atmospheric changes including changes in CO <sub>2</sub> , CH <sub>4</sub> , and stratospheric O <sub>3</sub> and the consequences of these changes:  • Climate change • Changes in weather patterns • Increasing ultraviolet radiation	

2009 Essential Standards					2004 NC SCOS	
Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
Earth Systems, Structures, and Processes	atm	olain how the lithosphere, hydrosphere, and cosphere individually and collectively affect biosphere.  Explain how abiotic and biotic factors interact to create the various biomes in North Carolina.	Origin and Evolution of the	3.02	Evaluate the geologic history of North Carolina.	
	EEn.2.7.2	Explain why biodiversity is important to the biosphere.				New to the 2009 Essential Standards.
	EEn.2.7.3	Explain how human activities impact the biosphere.	Hydrosphere and Lithospheric Materials, Tectonic its interactions Processes, and the Human and	2.07	Investigate and analyze the importance and impact of the economic development of earth's finite rock, mineral, soil, fossil fuel and other natural resources to society and our daily lives:	

2009 Essential Standards					2004 NC SCOS	
Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
Earth Systems, Structures, and Processes	like	luate human behaviors in terms of how ly they are to ensure the ability to live ainably on Earth.  Evaluate alternative energy technologies for use in North Carolina.	Lithospheric Materials, Tectonic F vironmental Impacts of Natural and	2.07 2.06	Investigate and analyze the importance and impact of the economic development of earth's finite rock, mineral, soil, fossil fuel and other natural resources to society and our daily lives:  • Availability • Geographic distribution • Conservation/Stewardship • Recycling • Environmental impact • Challenge of rehabilitation of disturbed lands  Analyze the sources and impacts of society's use of energy. • Renewable & nonrenewable sources • The impact of human choices on Earth and its systems	
	EEn.2.8.2	Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts.		2.06	Investigate and analyze the importance and impact of the economic development of earth's finite rock, mineral, soil, fossil fuel and other natural resources to society and our daily lives:  • Availability  • Geographic distribution  • Conservation/Stewardship  • Recycling  • Environmental impact  • Challenge of rehabilitation of disturbed lands  Analyze the sources and impacts of society's use of energy.	
	EEn.2.8.3	Explain the effects of uncontrolled population growth on the Earth's resources.	Hydrosphere and its E	4.04	<ul> <li>Renewable &amp; nonrenewable sources</li> <li>The impact of human choices on Earth and its systems</li> <li>Evaluate water resources:</li> <li>Environmental impacts of a growing human population</li> </ul>	This is the only bullet of objective 4.04 addressed by EEn.2.8.3. It is also addressed in EEn.2.4.1 and EEn.2.4.2.  This bullet is addressed in EEn.2.3.2.  • Storage and movement of

2009 Essential Standards			2004 NC SCOS			
Strand	Objective	Essential Standard  Text of Clarifying objective	Goal	Objective	Text of objective	Comments
	EEn.2.8.4	Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.	eric Materials, Tectonic	2.06	Investigate and analyze the importance and impact of the economic development of earth's finite rock, mineral, soil, fossil fuel and other natural resources to society and our daily lives:  Conservation/Stewardship Recycling Environmental impact Challenge of rehabilitation of disturbed lands	groundwater These bullets are addressed in EEn.2.4.1 and EEn.2.4.2.  • Ecological services provided by the ocean  • Causes of natural and manmade contamination These are the only bullets of objective 2.06 specifically addressed in EEn.2.8.4. They are also addressed in EEn.2.7.3, EEn.2.8.1 and EEn.2.8.2. The following bullets are addressed in EEn.2.7.3, EEn.2.8.1 and EEn.2.8.2.  • Availability
			Lithospheric Processes, a	2.07	Analyze the sources and impacts of society's use of energy.  Renewable & nonrenewable sources  The impact of human choices on Earth and its systems	Geographic distribution

Goal 1 in 2004 SCOS, "develop abilities necessary to do and understand scientific inquiry," should be integrated in classroom instructional unit design.

Objective 2.01 not addressed Objective 6.01 not addressed Objective 6.03 not addressed Objective 6.04 not addressed Objective 6.05 not addressed