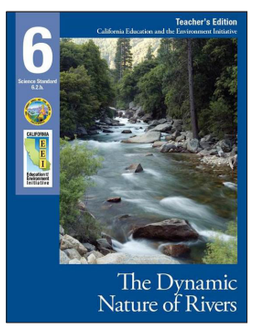
California Education and the Environment Initiative

The EEI Curriculum cohesively integrates science and engineering practices (SEPs), content (disciplinary core ideas/DCIs), and crosscutting concepts (CCs) within its lesson procedures. This preliminary analysis intentionally teases apart the individual SEPs, DCIs, and CCs as a means of correlating the EEI unit with specific performance expectations; however, the EEI lessons weave these components back together to provide three-dimensional learning for students.

Middle School (Grades 6, 7, and 8 in the Integrated Course Model)

6.2.b. - The Dynamic Nature of Rivers

"The Dynamic Nature of Rivers" examines how rivers function and gives students opportunities to learn about the flow and cycling of matter and how these Earth processes affect the planet's surface. It also helps students consider some of the many ways humans benefit from and manipulate river systems. Early lessons introduce students to the roles of water in Earth's surface processes and the principles of river system dynamics: how water moves, how water transports sediment, and how natural cycles of precipitation, flooding, and drought affect rivers and streams. Students discover how water's movement on the land causes weathering and erosion which changes the land's surface features. Through examining how the constantly shifting course of a river can affect human housing, students are introduced to some of the constraints influencing construction and engineering solutions.



Next Generation Science Standards* Correlation with the California Education and the Environment Initiative (EEI) Curriculum

The EEI Curriculum is a great choice for transitioning to NGSS and contributes toward achievement of the performance expectations for the disciplinary core idea reflected in the Summary Chart below: MS-ESS2 Earth's Systems, MS-ESS3 Earth and Human Activity, and MS-ETS1 Engineering Design. Each EEI unit highlights a small number of performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts. Therefore, the EEI units contribute to students' overall achievement of the performance expectations by the end of a school year, where they will have had multiple opportunities to engage in all appropriate science and engineering practices, disciplinary core ideas, and crosscutting concepts. While EEI was designed to teach the 1998 California science standards to mastery, it reflects the real world interconnections in science and already incorporates many of the paradigm shifts reflected in the NGSS. To learn more about how EEI supports NGSS, visit http://californiaeei.org/NGSSGuides/.

	Next Generation Science Standards								
	MS-ESS2			MS-ESS3			MS-ETS1		
California Connection		✓	✓		✓	✓			
Lesson 1 - Consider the dynamic ways that rivers and streams benefit human life, culture, and economies.	✓	✓	✓	✓	✓	✓	✓		
Lesson 2 - Examine the effects of waterborne energy on particles in moving water.	✓	✓	✓	✓		✓	✓		
Lesson 3 -Analyze the natural resources and other benefits rivers provide humans.		✓	✓	✓	✓		✓		
Lesson 4 -Explore how flooding of rivers and floodplains can affect human lives and communities.	✓		✓	✓	✓	✓	✓	✓	
Lesson 5 -Analyze how rain and snow affect California's river systems.	✓	✓	✓	✓	✓	✓	✓	✓	
Traditional Unit Assessment	✓	✓	✓	✓	✓	✓		✓	
Alternative Unit Assessment	✓	✓	✓	✓	✓	✓		✓	
	SEP	DCI	CC	SEP	DCI	CC	SEP	DCI	CC

Correlation Chart Key

SEP (Science and Engineering Practices)
DCI (Disciplinary Core Ideas)
CC (Crosscutting Concepts)

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EEI Unit 6.2.b. - The Dynamic Nature of Rivers

Disciplinary Core Ideas Supported by this EEI Unit

MS-ESS2 Earth's Systems
MS-ESS3 Earth and Human Activity
MS ETS1 Engineering Design

Performance Expectations	Suggestions for Using the EEI Unit to Support NGSS
MS-ESS2-1 *(Grade 7 in the Integrated Course Model):* Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.	Use the unit to have students study models of river systems and learn that the changing and recycling of Earth's materials through weathering, sedimentation, and deposition has a direct effect on ecosystems.
MS-ESS3-3 *(Grade 6 in the Integrated Course Model):* Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	Use the unit to have students evaluate historical solutions to meet the human need for fresh water and arable soil for agriculture. Then have them use that knowledge to assess the impacts of future solutions on both human populations and riparian habitats in and around a river system.
MS-ESS3-4 *(Grade 8 in the Integrated Course Model):* Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	Use the unit to have students study how human habitats have thrived near river systems for thousands of years, and that they continue to do so, often with negative consequences on multiple natural systems.
MS-ETS1-1 *(Grades 6, 7, and 8 in the Integrated Course Model):* 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.	Use the unit to have students study information that considers how rivers benefit humans and the consequences of damage due to flooding and erosion, and to use multiple criteria, including long-term consequences, to evaluate an engineering design solution.

Science and Engineering Practices (SEPs)	Suggestions for Using EEI to Support SEPs	Disciplinary Core Ideas (DCIs)	Suggestions for Using EEI to Support DCIs	Crosscutting Concepts (CCs)	Suggestions for Using EEI to Support CCs
Asking questions and defining problems (MS-ESS3-3, MS-ETS1-1)	Use the unit to have students consider the value of rivers to humans and human communities (Lessons 1, 2, and 3). Students use that knowledge to help define the problems associated with human communities near dynamic river systems. Have students ask if the designs humans have used to control riparian systems, through dams, levees, and canals, have been effective, and whether or not those designs can be improved (Lessons 4 and 5).	**ESS2.A: Earth's Materials and Systems:** 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)	Use the unit to have students identify that the cyclical processes of river systems, such as sedimentation and deposition, produce physical changes in Earth's materials. When combined with continual processes, such as erosion, the resulting materials and structures help sustain natural ecosystems and provide benefits to human communities (Lessons 1-3). Have students analyze three different river systems and how humankind's efforts to alter those systems have had effects, both positive and negative, on those systems (Lesson 5).	**Stability and Change (MS-ESS2-1)**	Use the unit to have students explore how that the natural, cyclical processes of rivers and streams help maintain healthy ecosystems (Lessons 1,2 and 3). Have students examine evidence explaining how natural systems can change over time through flooding, deposition, and erosion (Lesson 4). Have students examine evidence that designed systems can significantly change river and stream ecosystems (Lesson 5).

Science and Engineering Practices (SEPs)	Suggestions for Using EEI to Support SEPs	Disciplinary Core Ideas (DCIs)	Suggestions for Using EEI to Support DCIs	Crosscutting Concepts (CCs)	Suggestions for Using EEI to Support CCs
Developing and using models (MS-ESS2-1)	Use the unit to have students review and discuss a model of the Sacramento-San Joaquin Delta (Lesson 1). Students build a physical model and study a pictorial model to help support the concept of sedimentation (Lesson 2). Have students use multiple models to understand the processes of erosion and deposition (Lesson 4). Have students review two data models and eight riparian habitat models as they learn that changes in the flow of rivers and streams can influence ecosystems (Lesson 5).	**ESS3.C: Human Impacts on Earth's Systems:** - 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) - Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise (MS-ESS3-4)	Use the unit to have students study the importance of rivers and streams to human communities, historically and in the modern era (Lessons 1 and 3). Have Students consider that there are consequences of human communities depending on the dynamic nature of rivers and on altering the natural flow of rivers, and that those consequences can be beneficial and harmful to both riparian ecosystems and humans (Lessons 4 and 5).	**Cause and Effect** **(MS-ESS3-3, MS-ESS3-4)**	Use the unit to have students study the causal effects of designs to alter river systems using dams, levees, and irrigation (Lessons 1, 4, and 5). Have students study past events to predict the effects of changes within river systems, and the impact those effects may have on both human and natural environments (Lessons 2, 4, and 5).
Engaging in argument from evidence (MS-ESS3-4)	Use the unit to have students gather evidence that supports the claim that rivers bring important benefits and real challenges to humans and human communities (Lessons 1-4). Have students use their knowledge to critique different flood control measures on three separate California rivers (Lesson 5).	**ETS1.A: Defining and Delimiting Engineering Problems:** 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)	Use the unit to have students consider the constraints of design solutions as they pertain to location and the local landforms (Lesson 4). Have students evaluate three design solutions and their impacts on river systems in California, and make conclusions on the effects those designs have on people and natural environments (Lesson 5).		**Influence of engineering, technology, and science on society and the natural world (MS-ESS3-3, MS-ESS3-4, MS-ETS1-1)** Use the unit to have students study how humans are using science and technology (for example, the construction of hydroelectric dams, monitoring river flows and specie populations), how the technologies used in the past have affected river systems, and how humans can make decisions based on science to meet their needs and the needs of living and non-living systems.