FRIENDS OF THE LA RIVER

SOURCE TO SEA
Watershed Education Program

THE LOS ANGELES RIVER ROVER
FoLAR's MOBILE VISITOR AND EDUCATION CENTER

Standards Connections & Summary
Middle School: Grades 6-8
Human Impact on the Los Angeles River: Past, Present, and Future

Lessons Summary: Human Impact
(Varies with grade level)

	Lesson #1 In-class, teacher led	Lesson #2 River Rover Visit, FoLAR led	Lesson #3 In-class, teacher led
Objective	**An Introduction to the LA River** Students understand the history of the River, and that humans and nature are interconnected. By understanding the past, humans have the ability to change the present and future of their environment.	**Past, Present, and Future of the LA River** Students will compare the states of the River in the past and the present, learn about the LA Watershed, and design a future River.	**Biodiversity** Students will be able to explain and illustrate the interconnected relationship between living organisms in the River habitat.

Activities	• Powerpoint presentation which provides visual aids • Introduction to Indigenous people of LA • Discuss why the concrete was covered in concrete	River Rover Stations : Each class will rotate through 3 stations/mini-lessons in small groups in and outside the River Rover. Stations call on prior knowledge from Lesson 1. Each class takes approx. 1 hour to rotate through all three stations. Lessons discuss: • Historic flooding and channelization of the River • Endangered and threatened animals • Human impact on biodiversity • How the LA River gets water • The LA River watershed -- with interactive 3D model • Future of the River • Art as activism	Powerpoint presentation which provides visual aids • Native v. non-native plants discussion and game • Biodiversity discussion • Overview of plants and animals found in the River • Overview of food chains and food webs • Discussion of how plants, animals, and humans are all interconnected Optional activity: Web of Life

	Field Trip: Lewis MacAdams Riverfront Park
Objective	Students will be able to apply concepts to real world situations by experiencing investigation of the riparian habitat of the LA River. Students will be offered skills to help them engage with nature and develop wonder and curiosity of their environment in order to help them think like scientists.

Activities	The goal of the activities is to help promote: • Investigation of the River through touch, sight, and sound • A curious mindset • Thinking like a scientist by making observations, formulating questions, and collecting and analyzing data • Use of language of the discipline to actively engage with the nature around them • Synthesis of material from lessons #1 - 3 Rotation through learning stations *Nature Walk*: Students will go on a guided walk along the River and learn naturalist skills. As we explore the River, they will make nature observations that will help them identify the various plants and animals we come across and understand their role in the ecosystem. *Filtration Station*: Students collaborate to construct filtration systems using permeable and impermeable materials.They will test and evaluate the effectiveness of their design and compare it to the filtration occuring in concrete and natural bottom areas. *Macroinvertebrate Collection*: Students will collect water samples and identify the various macroinvertebrates they collect. They will discuss why macroinvertebrates serve as indicator species and how they help determine the water quality of the LA River.

	Optional: Design Challenge Extenstion
Objective	Students will be able to design a solution to a current problem in the Los Angeles River. Optional activity: Ss will be able to build a model of a system that solves a current problem in the Los Angeles River.
Activities	Design solutions for factors affecting River habitat health. Solutions can be realistic or fantasy based. Can be specific to Lewis MacAdams Riverfront Park (site of field trip). For example: • Air pollution from freeway • Urban/community runoff • Impacts of a concrete city Optional activity: Classes are encouraged to make models of the solutions out of unconventional, household materials. Students pledge to help the River.

Standards Abbreviations Key

California State Standards Abbreviations	Next Generation Science Standards Abbreviations (NGSS)
• SS: Social Studies • LS: Life Sciences • SM: Scientific Method • ES: Earth Science	• ESS: Earth and Space Sciences • LS: Life Sciences • ETS: Engineering and Design • PE: Performance Expectations • DCI: Disciplinary Core Ideas • CC: Crosscutting Concepts
California Common Core State Standards Abbreviations (CCSS) ▪ L: Language Standards ▪ RI: Reading Standards for Informational Text ▪ SL: Speaking and Listening Standards ▪ W: Writing Standards	

NGSS: General Concepts Covered in Lessons (L) #1-3 Students (Ss)

Across grade levels
Possible applications in lessons are italicized.

Science and Engineering Practices	Cross Cutting Concepts (CC)
Make observations (first hand or from media) to construct an evidence-based account for natural phenomena. • *Ss use visual aids/photographs to depict natural events around the River.* Use tools and materials provided to design a device that solves a specific problem. • *In L#3, Ss design a solution to a problem affecting the River habitat.*	**Cause and Effect** Simple tests can be designed to gather evidence to support or refute student ideas about causes. • *Ss predict the state of biodiversity and the web of life in the present, and the causes of change in them.* Cause and effect relationships are routinely identified and used to explain change.

Scientists use different ways to study the world.

- *Ss think like a scientist depending on the activity: biologist, anthropologist…*

Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). Construct an argument with evidence to support a claim.

- *Ss compare man made "solutions" to floods and pollution. Ss will compare the current construction to what improvements can be made by humans: porous stones, less concrete, protected habitat, community access.*

Scientists search for cause and effect relationships to explain natural events.

- *Heavy rainy seasons caused the River channel to overflow, which damaged surrounding communities.*
- *Biodiversity decreased when the River was channelized in the late 1930s. No native fish live in the River today. Native species now compete with non-native and invasive species for habitat.*

Energy and Matter

Matter is transported into, out of, and within systems.

- *Systems: food web, habitat around the River and within.*

Patterns

Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Patterns of change can be used to make predictions.

- *Ss predict the level of biodiversity in the River habitat today based on prior knowledge and L#1.*

Influence of Engineering…and the Natural World

People depend on various technologies in their lives; human life would be very different without technology.

- *Los Angeles was established because of the River's resources. Urban development began on the riverbanks, which left businesses and residents susceptible to flooding. The Army Corps of Engineers channelized the River for flood control.*

Every human-made product is designed by applying some knowledge of the natural world and is built by using materials derived from the natural world.

- *Native plants and soil act as a natural filtration systems. On the field trip, Ss create a model of a filtration system through the lens of engineers. Ss will also see a newly designed channel that uses native plants and soil to filter city water before it meets the River.*

Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.

	Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. • *Angelenos saw the River as a nuisance and demanded a solution. Fredrick L. Olmsted proposed a design similar to what the Army Corps has proposed for the future River. In the late 1930s, Olmsted's plan was rejected for plans to straighten and concretize the River. In L#3, students will design a solution to issues around the River today: runoff, air pollution, and habitat destruction. On the field trip, Ss will create models of filtration systems using trial and error.*

NGSS Connections by Grade Level

Grade	CA Content Standards	NGSS - Grades 6-8
6	**SS 6.1.2** Identify the locations of human communities …and describe how humans adapted to a variety of environments. **SS 6.2.1** Locate and describe the major river systems and discuss the physical settings that supported…early civilizations. **SS 6.1.3** Discuss the climatic changes and human modifications of the physical environment… **ES 6.5.b.** Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. **ES 6.5.e.** Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.	**MS-LS2-5.** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* *[Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution* constraints could include scientific, economic, and social considerations.] **MS-LS1-5.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] **MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental

		impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include… pollution (such as of the air, water, or land).] (L#3)
7	**SS 7.6.1** Study the geography of Europe and the Eurasian landmass, including its location, topography, waterways, vegetation, and climate and their relationship to ways of life in Medieval Europe. **SS 7.7.1** Study the locations, landforms, and climates of Mexico, Central America, and South America and their effects on Mayan, Aztec, and Incan economies, trade, and development of urban societies. **LS 7.3.e.** Students know that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.	**MS-LS2-5.** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* *[Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution* constraints could include scientific, economic, and social considerations.] **MS-LS1-5.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] **MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include… pollution (such as of the air, water, or land).] (L#3)

8	**SS 8.8.4** Examine the importance of the great rivers and the struggle over water rights. **SS 8.12.1** Trace patterns of agricultural and industrial development as they relate to climate, use of natural resources, markets, and trade and locate such development on a map. **SS 8.12.2** Identify the reasons for the development of federal Indian policy and the wars with American Indians and their relationship to agricultural development and industrialization. **PS 5.e** Students know how to determine whether a solution is acidic, basic, or neutral.	**MS-LS2-5.** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* *[Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution* constraints could include scientific, economic, and social considerations.] **MS-LS1-5.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] **MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include… pollution (such as of the air, water, or land).] (L#3)

CCSS : Grades 6-8

CCSS Abbreviation	Grade 6	Grade 7	Grade 8
RI _.1	(RI.6.8.1) Cite specific textual evidence to support analysis of science and technical texts.	Analyze the interactions between individuals, events, and ideas in a text (e.g., how ideas influence individuals or events, or how individuals influence ideas or events)	Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

RI _.3	Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).	Analyze the interactions between individuals, events, and ideas in a text (e.g., how ideas influence individuals or events, or how individuals influence ideas or events).	Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).
RI _.7	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.		
W_.8	Gather relevant information from multiple print and digital sources … and quote or paraphrase the data and conclusions of others…		
W 6-8.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.		
SL _.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
SL_.4	Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.	Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
SL_.5	Include multimedia components (e.g., graphics, images, music, sound) and	Include multimedia components and visual displays in presentations to clarify	Include multimedia components and visual displays in presentations to clarify

	visual displays in presentations to clarify information.	claims and findings and emphasize salient points.	claims and findings and emphasize salient points.

California's Environmental Principles and Concepts

California's Environmental Principles and Concepts (EP&C's) examine the interactions and interdependence of human societies and natural systems, and are the foundation of the environmental content taught in the EEI Curriculum. Approved in 2004, these 5 principles and fourteen supporting concepts were developed by more than one hundred scientists and technical experts. By law, the EP&C's must be addressed in all future California textbooks and instructional materials adopted by the state.

Principle I. People Depend on Natural Systems
The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

Concept A. Students need to know that the goods produced by natural systems are essential to human life and to the functioning of our economies & cultures.
Concept B. Students need to know that the ecosystem services provided by natural systems are essential to human life and to the functioning of our economies and cultures.
Concept C. Students need to know that the quality, quantity, and reliability of the goods and ecosystem services provided by natural systems are directly affected by the health of those systems.

Principle II. People Influence Natural Systems
The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

Concept A. Students need to know that direct and indirect changes to natural systems due to the growth of human populations and their consumption rates influence the geographic extent, composition, biological diversity, and viability of natural systems.
Concept B. Students need to know that methods used to extract, harvest, transport, and consume natural resources influence the geographic extent, composition, biological diversity, and viability of natural systems.
Concept C. Students need to know that the expansion and operation of human communities influences the geographic extent, composition, biological diversity, and viability of natural systems.
Concept D. Students need to know that the legal, economic, and political systems that govern the use and management of natural systems directly influence the geographic extent, composition, biological diversity, and viability of natural systems.

Principle III. Natural Systems Change in Ways that People Benefit from and can Influence
Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

Concept A. Students need to know that natural systems proceed through cycles and processes that are required for their functioning.
Concept B. Students need to know that human practices depend upon and benefit from the cycles and processes that operate within natural systems.
Concept C. Students need to know that human practices can alter the cycles and processes that operate within natural systems.

Principle IV. There are no Permanent or Impermeable Boundaries that Prevent Matter from Flowing Between Systems
The exchange of matter between natural systems and human societies affects the long-term functioning of both.

Concept A. Students need to know that the effects of human activities on natural systems are directly related to the quantities of resources consumed and to the quantity and characteristics of the resulting byproducts.
Concept B. Students need to know that the byproducts of human activity are not readily prevented from entering natural systems and may be beneficial, neutral, or detrimental in their effect.
Concept C. Students need to know that the capacity of natural systems to adjust to human-caused alterations depends on the nature of the system as well as the scope, scale, and duration of the activity and the nature of its byproducts.

Principle V. Decisions Affecting Resources and Natural Systems are Complex and Involve Many Factors
Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

Concept A. Students need to know the spectrum of what is considered in making decisions about resources and natural systems and how those factors influence decisions.
Concept B. Students need to know the process of making decisions about resources and natural systems, and how the assessment of social, economic, political, and environmental factors has changed over time.