Hahamongna–Gabrielino Trail Field Trip *Evidence of Water, Fire & Humans in the Landscape*	
Short Descriptions	This is an inquiry-based field trip where students will explore geomorphology, and the effects of fires, water and humans on a watershed and landscape.
Related Standards (NGSS)	**MS-ESS2-2:** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. **MS-ESS2-4:** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. **MS-ESS3-4:** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. Besides these Earth Sciences standards, the trip also incorporates Native American Indigenous history.
Learning Outcomes	By the end of the field trip, students will be able to: 1. select appropriate supplies ("10 essentials") to bring on a future hike with their families 2. explain how a landscape has changed over time both from natural phenomena and human activities 3. describe erosion and deposition 4. practice and value "Leave No Trace" etiquette when visiting the outdoors
Duration	3.5 hrs
# students	~10 to 40
Location	Arroyo Seco/Gabrielino Trail (first 1.3 miles): **https://goo.gl/maps/Kz7AvVw5pkfJiny7A**

Materials and Equipment	● Pencil/eraser for each student ● Field guide for each student (attached) ● Laminated poster-sized printout of trail map ● Laminated printout of the photos (aerial photo of headworks before the Station Fire, photos of a few areas before and after a fire) ● Mini whiteboard / whiteboard marker ● Nametags for each student ● Several clear jars, non-glass (for small groups of ~3-6 students, # of jars depends on # of students) for "erosion/deposition" activity ● 2 buckets and string/rope for "Just Passing Through" activity ● Snacks & Trash bag ● Optional: Other guides or local birds / plants
Accessibility	This trip includes walking on uneven surfaces. The main trail is generally wheelchair accessible, but does not go down to the river. The game "Just Passing Through" requires crawling, walking, and holding items. This trip also includes visual and tactile observations.
Safety Awareness	Mountain bikers (and occasionally equestrians) share the San Gabrielino trail with hikers and they can be very fast. The San Gabrielino trail is also quite popular and can often be crowded. Other potential hazards include: ● uneven ground, potential trip hazards & slippery rocks near water ● stream-related safety (near water) ● poisonous & sharp plants ● wildlife (includes rattlesnakes, mountain lions)
GO-Outdoors Missions	At GO-Outdoors, we emphasize the following missions ● Instructor/Caltech volunteer will incorporate 10 Essentials of hiking and Leave No Trace etiquette into the trip and encourage students that they can do these things themselves, to make these concepts approachable. ● We are looking forward to tailor our trips to student interests. At the start of each of our trips, we will ask each

	student to share what they hope to learn and we will try to incorporate them into the field trip. ● All of our field trips will feature a safety scavenger hunt, “Escape from Danger”, in the booklet that will raise students’ awareness on hazardous plants and wildlife in nature to build confidence in exploring the outdoors..

Field trip activities

The best time for this field trip is in the evening. The following schedule is based on a fieldtrip between 3:00 - 6:30pm.

3:00pm -- **Introduction (15 mins)**

Students meet at JPL parking lot **(Stop 1 in the field guide)**. There should be plenty of space for parking here. Do not enter JPL. The San Gabrielino trail begins just north of this parking lot. (https://www.google.com/maps/place/JPL+Parking+Lot+Entrance/@34.2029938,-118.168572,17z/data=!3m1!4b1!4m5!3m4!1s0x80c2c264f77f86cb:0xc329cfa1945d077b!8m2!3d34.2030017!4d-118.1663808)

- Icebreaker activities as students arrive in the area. GO-Outdoors can provide nametags for participating students.
- Once all students have arrived, hand out the field trip guide booklet and discuss safety and guidelines for the hike. Discuss the **“Escape from Danger”** scavenger hunt activity where students can check a box when they find and identify certain plants and wildlife (e.g., poison oak) while maintaining a safe distance from them.
- Discuss the **history of the trail and the river**, comparing those documented by Tongva and the modern history. Tongva, the indigeneous people to this area called the area “Hahamongna”, which means “land of flowing water”. In contrast, the Spanish settlers called this area “Gabrielino” after the San Gabriel Mission. The stream in this area is called “Arroyo Seco” which means dry river in Spanish. This contradiction points out one of the themes for the field trip -- the landscape evolves through time.
    - At this point, we can also discuss how to read a map, i.e.
        - Which direction is north?
        - Which way does the stream flow based on the map?
- Describe the goal of the field trip, which is to visit the watershed of the Arroyo Seco, and find evidence for what forces can create and destroy its features.

(8 mins) Hike to the Stone bridge **(Stop 2 in the field guide)**

3:30pm -- **Erosion and Human impacts (20 mins)**

- **Activity: "Arriving" mindfulness.** Ask the students to spend about 6 mins making a soundmap. To start, mark "X" in the center of a blank piece of paper representing where we are sitting. Then, as we hear a sound, we can mark their locations on the paper. The locations should represent the direction and distances of that sound. For more detailed example, you can refer to the following resource: https://newsociety.com/blogs/news/mapping-the-sounds-of-nature
- **Activity: Leave No Trace Ethics "Okay/No Way!" game.** Explain the seven principles of "Leave No Trace" ethics to follow when being outdoors (refer to the last page in the field guide). Throughout different scenarios, the students are asked to shout out "OK" or "No Way!" based on these "Leave No Trace" principles. For example, the students should shout out "No Way!" for stomping on a plant and "OK" for picking up trash.
- **Activity: erosion / deposition.** Explore the stream and collect some pebbles, large & small, and sand –put them into a jar, and add water until full (in small groups). Shake up the jars and see what falls to the bottom (large pebbles) and what falls to the top (sand, then fine silt etc). Discuss how water uses gravity (potential energy) to flow and transport/move sediment (kinetic energy!). More water or a steeper slope can move larger sediment—more energy! Have students draw in the grain sizes in their jar "experiments" in their field guides (gravel, then sand, then silt) and answer which grain size needs the most energy to move (gravel). Sketch a watershed on the whiteboard, and discuss what grain size sediment may end up where within the watershed (based on slope). Where do you think we are in the watershed now? (Arroyo Seco in this area is a bedrock stream in many places). Where were we when we started our hike, near JPL? (JPL/area downstream is built on an alluvial fan, where sediment loads are deposited as the stream exits the steep mountains and comes to flatter ground). At the end, return the pebbles & water to the stream to emphasize the "Leave No Trace" principles.

(16 mins) Hike to the Arroyo Seco Headworks **(Stop 3 in the field guide)**

4:15pm -- **Erosion and Fire (40 mins)**

The activity at this stop is designated to teach the students **scientific inquiry** through a demonstration. The students are asked to make a sequence of observations trying to come up with a geomorphic history of the area.

- **Prelude: Think Pair Share.** The students are asked to observe the dry channel in front of them and compare the dry channel with the river they see at stop 2 at the Stone bridge.
- **Inquiry stage 1: Make some observations of the cobbles in the dry channel.** The students are asked to make observations and discuss their findings with a partner before sharing with the group. Here are some questions that can be helpful for them:
    - What is the average grain size of the sediments in the area?
    - Is there any water?
    - Make some hypotheses on what transported the cobbles to this dry channel.
- **Inquiry stage 2: "Just Passing Through" game.** This game explores the concept of erosion and slope stability as impacted by the fire. The students are going to act out the roles of water flowing through the sloped landscape. Caltech volunteers and teachers are going to act as trees. As water travels down the slope, they can pick up soils/rocks that are in the way. Meanwhile, as water travels close to the trees, the trees are going to try to touch them. If the water is touched by a tree, they will need to go around the tree once before continuing downward. This reflects how trees slow down erosion. We will play this game twice, with a huge fire that burned down the whole forest during the second trial ("barren slope"), which means that the trees can no longer catch water and the students will be able to move much faster downslope. For more detailed instruction, refer to the attached materials.
- **Inquiry stage 3: Explore the destroyed Headworks.** Look at the log jam within the headworks, the torn apart structure, sand covering the concrete dam part of the structure, and the stream banks around it covered in cobbles. The students will be asked to come up with a story of what happened here in small groups. Each group takes turns to share their story.
- **Inquiry stage 4: Share the true story of the Headworks.** Share photos of the streams before and after a fire (see photos in the materials attached). Tell the story of how the Station Fire happened in 2009 burning a large area several miles upstream from here, resulting in a huge debris flow when the next big rainstorm came. The debris flow destroyed a lot of the infrastructure like the Headworks here that humans had built to control sediment deposition and erosion from the stream as it

enters their town (Pasadena/Altadena!). The flood deposited a lot of debris, changing the stream morphology, cutting off the abandoned channel from water by depositing a whole bunch of sediment that blocked/turned the river's flow. That was why we were able to walk along the cobble-filled dry channel—it is the dry bottom of an abandoned riverbed!

(16-20 mins) Hike to the picnic area **(Stop 4 in the field guide)** or the area just past Angeles National Forest sign / bridge **(Stop 5 in the field guide)**. This picnic spot can be a good location for snack break.

5:00pm -- **Erosion and Tectonics (20 mins)**

- **Activity: Observing the slickensides.** During the hike between Stop 3 and Stop 4 or 5, there are large boulders on the right-handed side of the trail that have evidence of fault movement. There, you will be able to see slickensides - a laminated and polished surface caused by frictional movement between rocks from different sides of a fault. Here, we can explore the effect of tectonics on erosion through the following questions:
    - What are different types of faults? Strike-slip, reverse, normal.
    - How do you think the fault relates to the grain sizes of sediments observed in a nearby stream? Uplift can change the slope, which affects the erosion and deposition of sediment
    - How are the mountains formed? Through tectonic forces that move the faults. These mountains then subsequently give the water the energy to flow and move sediments through gravitational force.

- **Activity: Ten essentials for outdoors.** Pick 5 items from a pile that you would definitely bring with you on the hike (pile can includes a few non-essential items; e.g., rubber duck)
- Ask the students to ask any other question! We can explore and answer some of those during our hike out on the way back. Caltech volunteers will also bring along some other field guides (e.g., birds, trees, etc.) for the students to check them out and check them out during the snack break.

(35-40 mins) Hike back to the Stone bridge **(Stop 2 in the field guide)**.

6:05pm -- **Debriefing (15 mins)**

- **Activity: "Exiting" mindfulness.** Find somewhere peaceful along the hike back or at the Stone bridge and ask the students to once again make a soundmap. The students can compare how nature differs between early afternoon and evening or whether the hike makes them more aware of their surroundings.

- **Activity: Debriefing with "Rose/Thorn".** Ask the students to share their favorite and their least favorite things from the trip. We can also hand out the pre/post-trip surveys here or at the parking lot so that the organizers can have some feedback on how the trip went.

(8 min) Hike back to the parking lot **(Stop 1 in the field guide)**.

6:30pm -- Parents pick students up and depart.

Optional extension activities

- Literary/narrative relevance in Native American stories/creation stories: http://socalstorytelling.blogspot.com/2012/11/the-tongva-people.html

Instructor support

About the Arroyo Seco Watershed:

- https://www.arroyoseco.org/ASWRFSVolI.pdf
  Human history in this area can be found under the topic "Landscape Change Through Time". The indigeneous history is labeled "Pre European Settlement" in classic erasure-language style..!):

About the headworks and the flood destruction that we will explore during the field trip:

- https://ww5.cityofpasadena.net/wp-content/uploads/sites/56/2017/08/Initial-Study.pdf

Vocabulary terms:

Watershed: Land that separates waters flowing to different rivers or seas.

River channel: The carved path where a river currently flows or once flowed.
Sediment: solid material (particles, like sand, gravel, boulders) that is moved and deposited in a new location.

Erosion: The action of surface processes that remove sediment, soil and rock from one location on Earth's surface and transports it to another location.
Deposition: The action of adding sediment, soil and rock to a landform.
Debris flow: A moving mass of loose mud, rock, and water that travels down a slope due to gravity.

Common misconceptions about the concepts

- Rivers all flow south
- Streams are just water flowing (without any sediments)
- Human activities cannot affect geologic processes
- Floods are rare/atypical (not normal fluvial processes)
- There is no connection between surface water & groundwater
- Students may think that geologic processes all happen rapidly (including tectonics—e.g., rifting would rip them away from the USA…) OR tectonic movements are imperceptible on human timescales
- Parts of California will break off and fall into the ocean.

Opportunities to engage students in planning

- Bring along some local field guides so that students can look up plants/animals they find that they are interested in
- Answering unanswered questions on the walk back from the trip—follow-up with any that cannot be answered right then!

Provided Handouts/Materials

At the end of this field guide, we are providing the following handouts and materials:

- Details about the activity "Just Passing Through" from Project WET
- Trail map, to print as a poster
- Aerial image of the headworks before the fire, to print
- Photos before and after forest fire, to print
- Pre/Post trip survey, to print for each student
- "Hahamongna Field Trip Guide" booklet to print and assemble for each student

Field Trip Materials

Just Passing Through

2nd

Plants and soils slow me down, and lakes, ponds and wetlands can hold me—but only for a while. Wherever I am, I'm just passing through. What am I?

- **Grade Level**
  Upper Elementary, Middle School
- **Subject Areas**
  Earth Science, Environmental Science, Ecology
- **Duration**
  Preparation time: Part I: 30 minutes; Part II: completed in Part I; Part III: 20 minutes
  Activity time: Part I: 20 minutes; Part II: 20 minutes; Part III: 30 minutes
- **Setting**
  Large space
- **Skills**
  Analyzing information (comparing and contrasting); Interpreting (relating, summarizing); Applying (designing)
- **Charting the Course**
  "The Thunderstorm" is included in Part I to begin the simulation. In "Get the Ground Water Picture," students are introduced to how water moves through soil. Students explore the role of their schoolyard in a watershed in "Rainy-Day Hike." In "Color Me a Watershed," students learn how changes to a watershed affect stream discharge. In "Sum of the Parts," students recognize how surface runoff and ground water can transport both point and nonpoint source pollutants.
- **Vocabulary**
  anaerobic, aerobic, organic, wetlands, erosion, sediment, Best Management Practices, vegetation, floodplain, delta, watershed manager, nonpoint source pollution, catch basin, riparian

Summary

In a whole-body activity, students investigate how vegetation affects the movement of water over land surfaces.

Objectives

Students will:

- compare the rates at which water flows down slopes with and without plant cover.
- identify Best Management Practices that can be used to reduce erosion.

Materials

Warm Up

- *Copies or overhead transparencies of* ***Slope Comparison*** *or*
- *Copies or overhead transparencies of photographs of hillsides with and without plant cover*

Part I

- *Yarn or rope* (the length of the playing field)

Part III

- *Tray of soil*
- *Container of water* (to be poured on tray of soil)
- *Planting pot containing only soil*
- *Container of water, including shredded paper*

Making Connections

Children have observed how water flows downhill and how it often transports litter or sediment. When watering plants, students have seen how soil and plant matter absorb and hold water. Understanding how vegetation affects water's movement across and through a site promotes student appreciation of the relationship between water quality and landscape.

Background

As it flows over and through soil, water filters through spaces among particles, and around plant roots and vegetative matter. This process slows the movement of water. Sediment (soil and other natural materials carried by water) may be removed from the water as it is captured and stored by vegetation, lakes, ponds and wetlands. Vegetation also helps to hold soil in place. When vegetation is removed (by human or natural causes), soil particles are more likely to be dislodged and carried away by water. This is called erosion.

Soil being carried by water is a natural, ongoing process. Erosion has occurred since water appeared on the planet. (Consider the formation of the Grand Canyon or the gradual leveling of the Appalachian Mountains.) When soil and organic matter are carried by water from one location to another, the destination site may be enriched and its surface area increased (e.g., the floodplain of a river or delta). However, the effects of erosion are not always desirable. Erosion of topsoil decreases the fertility of soil, and sediment build-up in streams and lakes can harm aquatic life.

Ensuring that the condition of a land area does not promote deleterious erosion and other water resource problems involves the use of Best Management Practices (BMPs). Watershed managers rely on BMPs that reduce erosion and diffuse, or nonpoint source (NPS), pollution problems. (According to the U.S. Environmental Protection Agency [EPA], NPS pollution is "caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters and ground waters.") BMPs that prevent erosion include: landscaping areas to promote plant cover; replanting areas cleared by logging; monitoring water that enters and leaves cut areas; building terraces, catch basins, and natural filters to mitigate sediment deposition in lakes, streams, etc.; and leaving a green or planted zone in riparian areas.

Procedure

▼ *Warm Up*

- Show students the pictures on ***Slope Comparison*** or other pictures of hillsides that are covered with vegetation. What do they think would happen to the water?
- Now, show photographs of hillsides with barren slopes. How would rainfall affect these areas, compared to the previous sites?

▼ *The Activity*

Part I

1. **Inform students they are going to act out the role of water as it flows through a site (down a slope and into a stream). Arrange the playing field according to the diagram *Slope with Plant Cover*.** Lay yarn or a piece of rope down the middle portion of the field to indicate the stream. (A section of the yarn can be crumpled up to represent rapids.) Have half of the class assemble at one end of the playing field. These students represent "raindrops." The remaining students represent "vegetation" and should position themselves somewhere between the raindrops and the stream.
2. **To begin, have students participate in *Part I* of the activity, "The Thunderstorm." At the height of the storm, raindrops move into the site and take the most direct route to the stream (walking swiftly).** This represents water falling on and flowing over the land's surface.

Slope with Plant Cover

Raindrops

When raindrops are tagged by vegetation, they circle around the vegetation 5 times to simulate water percolating into the ground.

Then they crawl to the stream to represent water moving underground.

Vegetation

Vegetation can pivot on one foot to tag water droplets. This action represents the droplet being absorbed by soil. When raindrops reach the stream, they stand up and walk the length of the yarn.

When they encounter rapids, they somersault or spin.

Barren Slope

Raindrops
When raindrops encounter small rocks, they jump over them, and continue to skip toward the stream.

Rocks
When raindrops reach the stream, they stand up and walk the length of the yarn. When they encounter rapids, they somersault or spin.

3. **Vegetation on the slope slows the flow of water. To show this, students representing vegetation try to tag the raindrops. Vegetation must keep one foot in place, but can pivot and stretch their arms (representing roots trapping water).**
4. **If a raindrop is tagged, the student simulates filtering into the ground by circling five times around the vegetation. To represent water moving underground toward the stream and passing through spaces among soil particles, raindrops should crawl toward the yarn.** (In reality, this process can take many days, weeks or months, depending on rock material and gradient.) Raindrops cannot be tagged a second time.
5. **Once raindrops reach the stream, they stand up and walk the length of the yarn.** If they encounter rapids, they can spin about or do forward rolls to represent water spilling over rocks. At the end of the stream, they should wait for the rest of the raindrops.
6. **Record the time it takes all the raindrops to pass through the site.** Students can exchange roles and repeat the simulation.
7. **Discuss the results of the activity. Ask students to describe water's movement.** Help students to understand how vegetation slows the rate of flow, which allows time for water to percolate into the soil.

Part II

1. **Ask students how the results of the activity will differ when vegetation is removed. Have students perform the second version of the activity. (See diagram, *Barren Slope*.) Half of the class simulates raindrops and the other half represents "small rocks."** Students representing small rocks should sit or lie down, curling themselves into tight balls. When raindrops move near a rock, they can walk around or jump over it, continuing to flow down the slope.
2. **Compare the time required for raindrops to flow through sites with and without plant cover. Discuss the implications of water racing down a barren slope.**

Part III

1. **Prior to the third simulation, demonstrate what happens when raindrops dislodge and transport soil and other materials.** Sprinkle water on a tray of soil to demonstrate how falling and flowing water can loosen soil and other materials (e.g., pieces of wood, decaying matter and litter). Water can transport the loosened soil great distances. Help students to recognize how soil acts like a filter. Pour water containing shredded paper (representing sediment) into a pot of soil and note the water that drains out the bottom. Students should see that most of the sediment has been removed.
2. **Set up the playing field as in *Part I*. As raindrops flow through the site, they pick up sediment (pebbles, twigs, dead leaves or other biodegradable items scattered by the instructor). If tagged, raindrops percolate or filter into the ground. They drop all the tokens they have collected (symbolizing soil filtering raindrops and removing sediment).** Once raindrops are tagged, they circle five times around vegetation and crawl to the stream. (They do not pick up any more sediment.) Remind students about gravity; raindrops must keep moving as they bend down to collect materials.
3. **After raindrops make it through the site, have them count the number of items that they are still holding.**
4. **Arrange the activity as in *Part II* and have raindrops flow through the site, picking up sediment.** At the conclusion, students should find that a larger amount of sediment has been collected by the raindrops than in the previous simulation.
5. **Discuss problems associated with erosion and unchecked transport of sediment. Introduce Best Management Practices that can be used to control erosion.** Remind students that erosion is a natural process (necessary for adding minerals to streams and creating landscapes). However, because a large amount of sediment is being removed within a short period of time, this simulation (***Part III***, step **4**) represents erosion that could be harmful.

Children running down a slope.

▼ *Wrap Up*

Have students inventory their school grounds or community, looking for land areas that compare to those demonstrated in the activity. During a rainfall, students can observe the area's runoff and the amount of sediment carried by the water. Students can plant trees or landscape a garden to improve an area that has erosion problems.

▼ Project WET Reading Corner

Burnie Griffin. 2007. *Tracking Trash: Flotsam, Jetsam, and the Science of Ocean Motion.* Boston, MA: Houghton Mifflin Books for Children.

Learn how man's trash ends up in the oceans and follow it as it's picked up and transported by the currents.

Prager, Ellen J. 2006. *Sand.* Washington DC: National Geographic Children's Books.

Describes the formation of sand from materials, such as coral, rock or crystals, and shows how erosion can move it through water, wind and ice.

Stewart, Melissa. 2004. *Down to Earth.* Minneapolis, MN: Compass Point Books.

Introduces students to the components of soil, patterns of change and erosion.

Stille, Darlene R. 2005. *Erosion: How Land Forms, How It Changes.* Mankato, MN: Compass Point Books.

Learn about erosion and its effects not from natural but also manmade sources.

Wermund, Jerry. 2003. *Earthscapes: Landforms Sculpted by Water, Wind, and Ice.* Buda, TX: Rockon Publishing.

Author Jerry Wermund uses poetic descriptions of landforms, such as glaciers, canyons and alluvial fans, as well as the forces that shape them.

Assessment

Have students:

- demonstrate how water flows down a slope and into a stream (***Part I***).
- compare water's movement through sites that have and that lack plant cover (***Part II***, step 2 and ***Part III***, steps 4 and 5).
- inventory their school grounds or community to assess areas likely to have erosion problems (***Wrap Up***).
- design a landscape using BMPs to control erosion (***Wrap Up***).

Extensions

How does a lake affect the movement of water through a site? Make the playing field similar to that in ***Part I***, but add a lake (a large circle of yarn or rope at the end of the stream). Have raindrops move through the playing field. When a student enters the lake, he or she cannot leave until four more raindrops enter the area. (They can stand in line and make a "wave," moving their arms up and down in a waving motion.) How did the lake affect the rate of water movement? Students may respond that after moving quickly through the stream, they were slowed by the lake.

To introduce how lakes can be affected by surrounding areas with and without plant cover, try the following. Show students a clear glass of water and pour in some sand or soil. Note how materials begin to settle out. Explain that this happens when water is standing in a lake as well. Arrange the playing field as in ***Part II*** and have raindrops pick up sediment as they move toward the stream. When a student enters the lake, he or she waits for the fifth student to enter. Raindrops discard their sediment before leaving the lake. Discuss how a lake could be affected by an accumulation of sediment. (If stream sediment continues to be deposited in the lake, over time the lake could become shallow or even fill. High levels of sediment can adversely affect aquatic plants and animals.) What could be done to decrease the quantity of sediment flowing into the lake? Students may want to repeat this simulation, but with a playing field similar to that in ***Part I*** (site with plant cover) and compare sediment levels.

Teacher Resources

Journals

Coffey, Patrick and Steve Mattox. 2006. "Take a Tumble: Weathering and Erosion Using a Rock Tumbler." *Science Scope*, 29 (6), 33-37.

Holiday, Susan. 2003. "A Native Species Restoration Project." *Science Scope*, 27 (2), 24-27.

Kennedy, Ann, Tamil L. Stubbs, and Jeremy C. Hansen. 2006. "This Land Is Your Land." *Science and Children*, 44 (4), 22-26.

Mamo, Martha, Timothy Kettler, and Dann Hussman. 2005. "Learning Style Responses to an Online Soil Erosion Lesson." *Journal of Natural Resources and Life Sciences Education*, 34, 44-48.

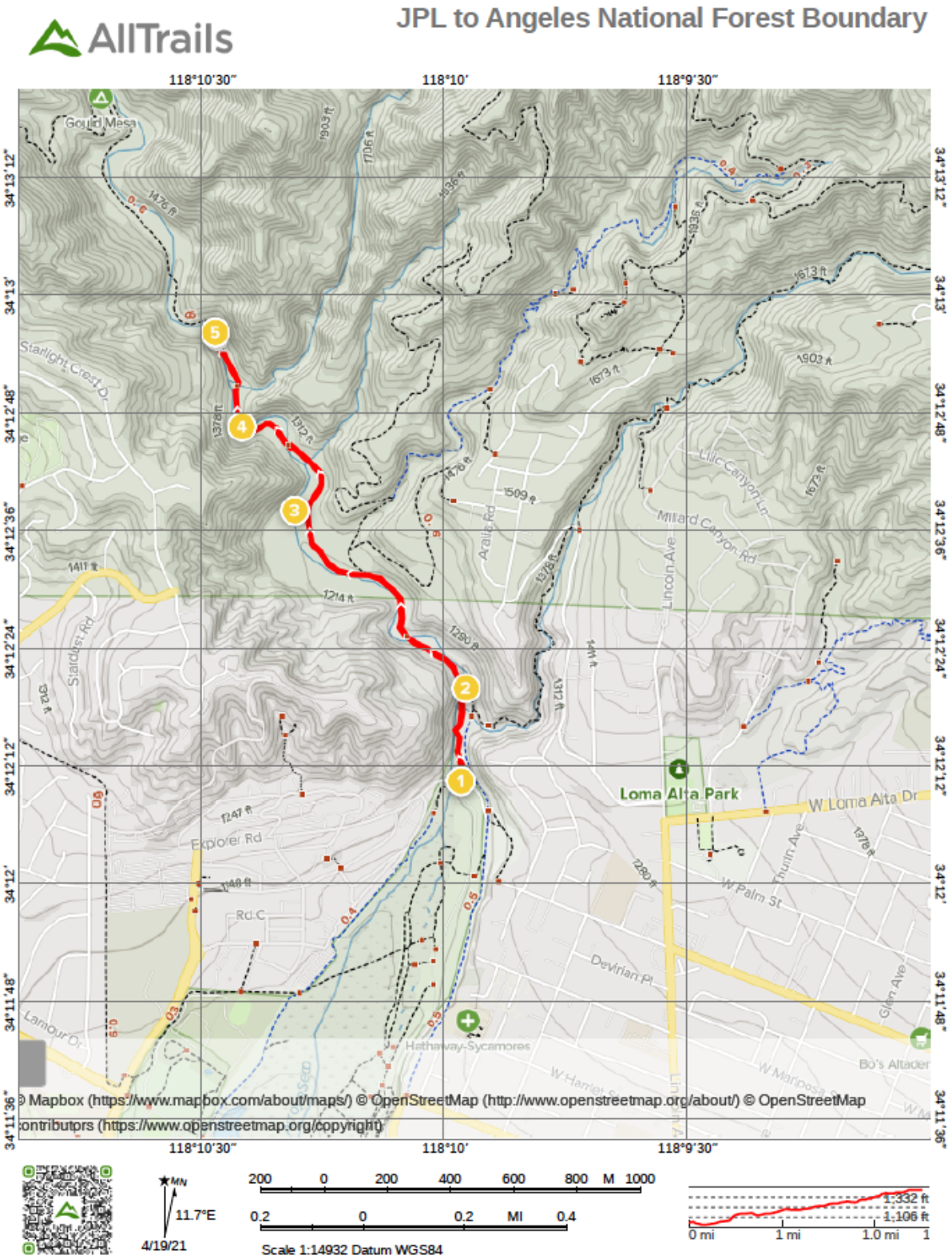
Monnes, Colleen. 2004. "The Strongest Mountain." *Science and Children*, 42 (2), 35-37.

Smith, Rebecca. 2007. "Saving the Dust Bowl: 'Big Hugh' Bennett's Triumph over Tragedy." *History Teacher*, 41 (1), 65-95.

Websites

United States Environmental Protection Agency. What is Nonpoint Source Pollution? This site provides definitions for Point and Nonpoint Source Pollution. http://water.epa.gov/polwaste/nps/whatis.cfm. Accessed March 19, 2011.

Trail Map


AllTrails
JPL to Angeles National Forest Boundary
118°10'30"
118°10'
118°9'30"
34°13'12"
34°13'
34°12'48"
34°12'36"
34°12'24"
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34°12'
34°11'48"
34°11'36"
Gould Mesa
Starlight Crest Dr
Stardust Rd
Explorer Rd
Rd C
Lamour Dr
Araiz Rd
Lincoln Ave
Millard Canyon Rd
Lilac Canyon Ln
Loma Alta Park
W Loma Alta Dr
W Palm St
Thurin Ave
Glen Ave
Devirian Pl
Hathaway-Sycamores
Bo's Altadena
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© Mapbox (https://www.mapbox.com/about/maps/) © OpenStreetMap (http://www.openstreetmap.org/about/) © OpenStreetMap
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11.7°E
4/19/21
200 0 200 400 600 800 M 1000
0.2 0 0.2 MI 0.4
Scale 1:14932 Datum WGS84
1,332 ft
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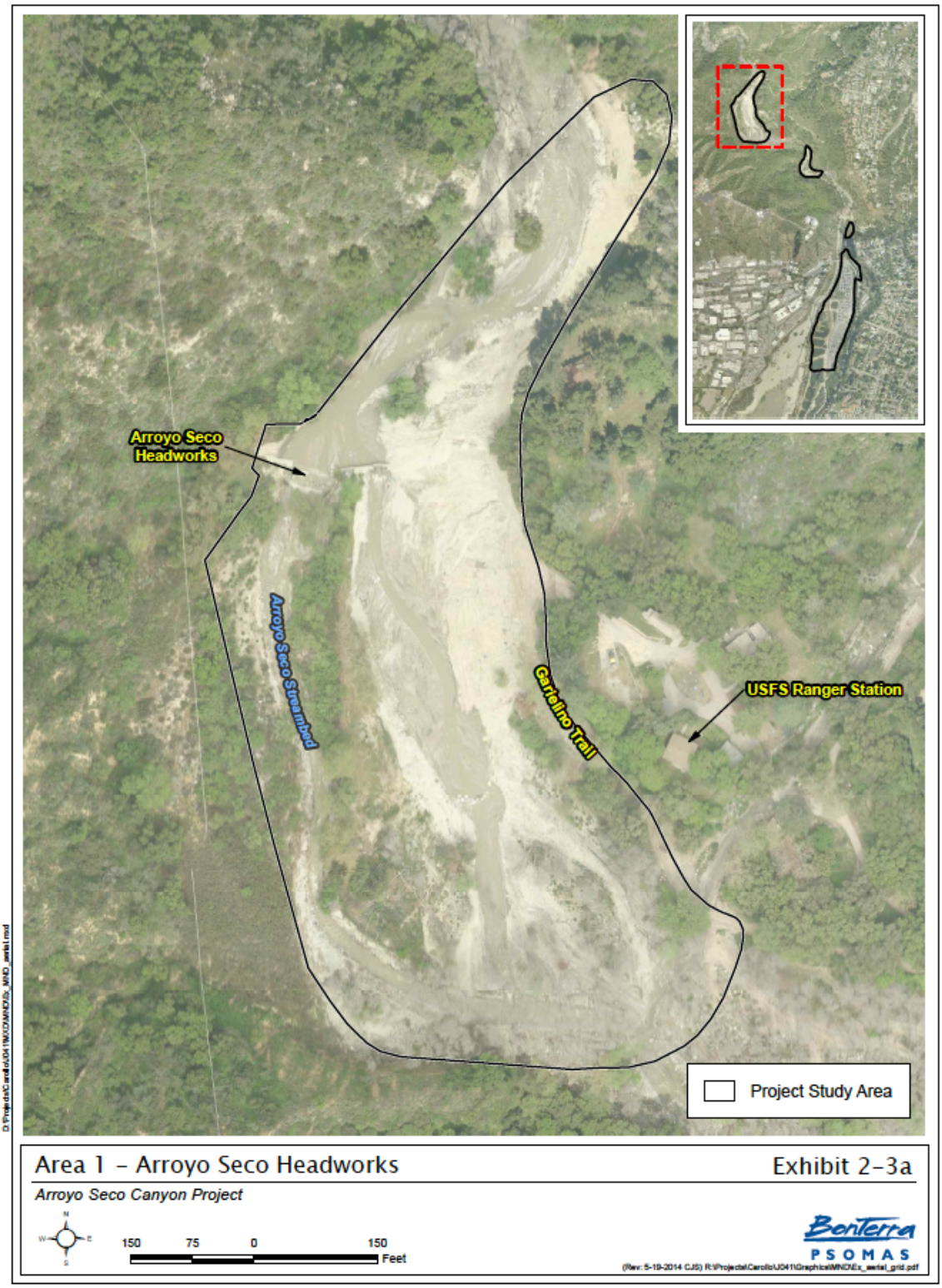
1.0 mi

Aerial image of the headworks before the fire



Photos before and after forest fire

Before 2020 Bobcat Fire

After 2020 Bobcat Fire

El Capitan Creek before fire

El Capitan Creek after fire

Pre/Post trip survey

Date:	How much did you know **before** the lesson?				**How much did you know right now** after the lesson?				How much did you **like** learning about each topic?		
	Nothing (1)	A little (2)	Some (3)	A lot (4)	Nothing (1)	A little (2)	Some (3)	A lot (4)	Dislike	Like	Love!
Sediment, erosion, deposition and transport											
How water can impact a landscape											
How fire can impact a landscape											
How humans can impact a landscape											
How to Leave No Trace on a hike											

Date:	How much did you know **before** the lesson?				**How much did you know right now** after the lesson?				How much did you **like** learning about each topic?		
	Nothing (1)	A little (2)	Some (3)	A lot (4)	Nothing (1)	A little (2)	Some (3)	A lot (4)	Dislike	Like	Love!
Sediment, erosion, deposition, and transport											
How water can impact a landscape											
How fire can impact a landscape											
How humans can impact a landscape											
How to Leave No Trace on a hike											

Field Trip Booklet

Hahamongna Field Trip Guide

GO Outdoors + STARS

Name: _____

Name _____

Address _____

Date _____

Notes _____

_____

_____

_____

_____

_____

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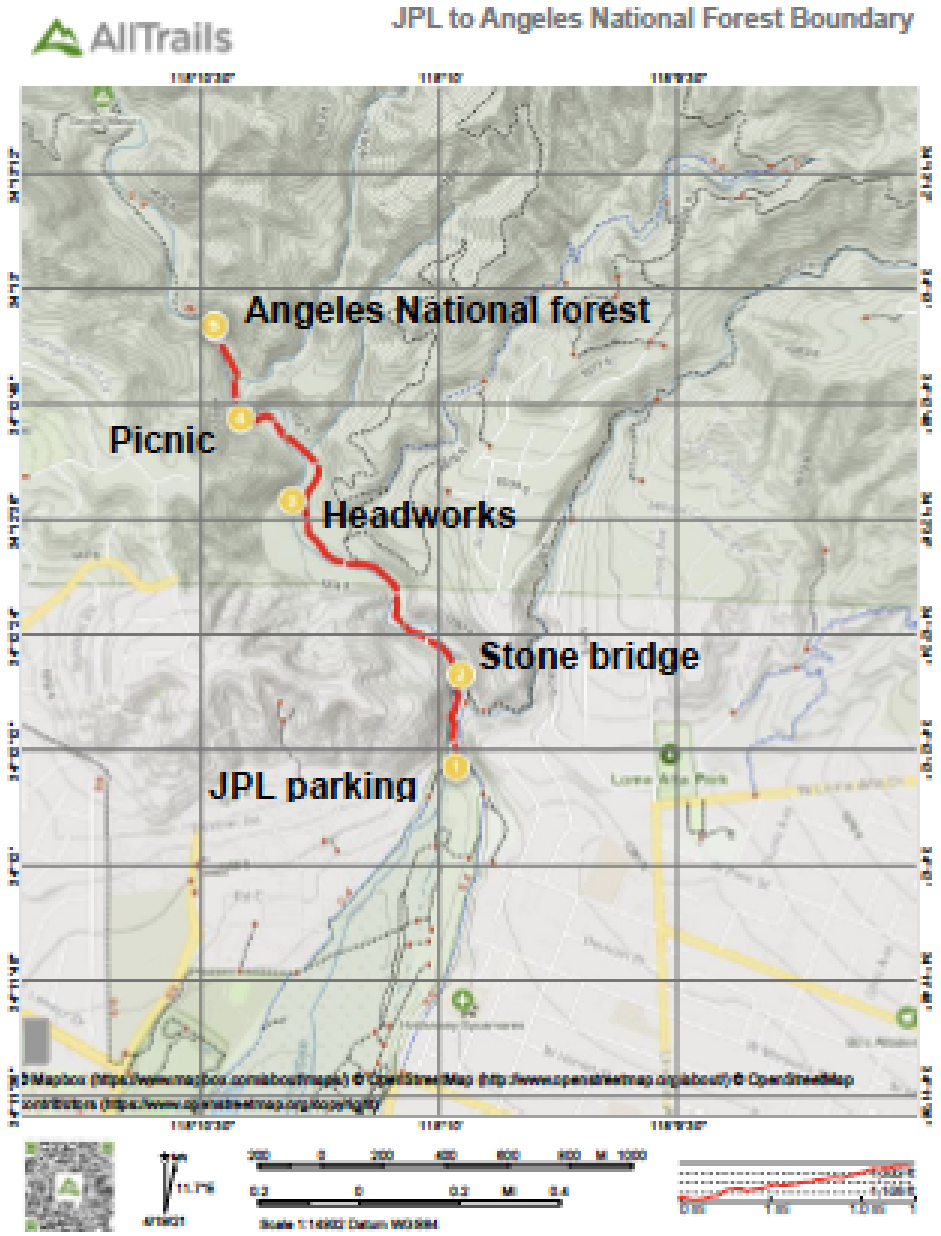
STOPS ALONG HIKE

**Miles from parking lot*

1. **JPL parking lot**: 0 miles
2. **Stone bridge**: 0.25 miles
3. **Headworks ruins**: 0.8 miles
4. **Picnic area**: 1 mile
5. **Angeles National Forest sign**: 1.25 miles



Hahamog'na: "Flowing water, fruitful valley"

"We kind of see the land with different eyes. Because of the history that is attached to a particular landscape. Even when that landscape has changed dramatically, you know, we still know what was underneath that."

— **Craig Torres, Tongva educator & artist**

What might be missing from a map?

→*Maps are usually flat representations of space.*
→They miss things that can't be captured in 2-D, like stories told aloud.

The Tongva Peoples are a collection of tribes native to Tovaangar. One major village, Hahamongna, was originally here where we are starting our hike. Tongva peoples were re-named Gabrieliño, from forced assimilation by the San Gabriel mission.

Map from the L.A. Times (Sean Greene and Thomas Curwen), based on work from the Early California Cultural Atlas and Early California Population Project.

LA Times | Finding Tovaangar

Settlers exploited Tongva villages' people and resources to build eventual cities. This example is from 1850.

- **What do you notice that is a resource or a reminder of Tongva culture on today's hike?**
- **What do you notice about the names "Arroyo Seco" and "Gabrieliño Trail"**
- Tongva people live all around greater Los Angeles today, and work hard to sustain and revitalize their language and culture.
  - Huutokre – *"I see you."*
  - Miire 'eyoomar' – *"We are going."*

https://arcg.is/mLH1r, https://arcg.is/0ibzCe, and https://arcg.is/1iW8f00 are ESRI story maps—interactive maps that reveal a lot more than 2-D maps! Visit them for more info!

Soundscape: Draw “you” at the center of this page. Listen to your surroundings, and draw symbols that you invent for whatever sounds you hear around you.

Escape from danger!!!

Check the box for each hazard you are able to avoid on the hike

Poisonous Plants (Don't Touch These!!!)

Poison Oak ☐ Safe distance = 3 ft

Stingy Nettle ☐ Safe distance = 3 ft

Poodle-dog Bush ☐ Safe distance = 3 ft

Poison oak and *poodle-dog bush* can cause rashes hours to days after direct contact. While poison oak leaves are green in the image above, they can also be red, orange or yellow. *Stingy Nettle* can cause rashes seconds to minutes after direct contact. Please be aware of your surroundings and avoid touching these plants.

Spikey Plants (Be Careful)

Yucca ☐ Safe distance = 3 ft

Black Berry ☐ Safe distance = 3 ft

Cacti ☐ Safe distance = 3 ft

Thistles ☐ Safe distance = 3 ft

Above are images of just a few of the many plants with sharp appendages that can pierce skin. As you hike through bushy areas, look out for plants with spikey features to avoid injury.

Wildlife Safety

Adult Rattlesnake ☐ Safe distance = 20 ft

The venom of a rattlesnake bite can send you to the hospital. Baby rattlesnakes pose more threat than the adults because they don't send out a warning rattle sound and have less control over the amount of venom they release.

Baby rattlesnake ☐ Safe distance = 20 ft

Garter Snake ☐ Safe distance = 20 ft

Garter snakes can excrete a foul smelling substance from their skin if they feel threatened. While they are not necessarily poisonous, we should avoid touching them.

Skunk ☐ Safe distance = 20 ft

Skunks spray a foul odor if they feel threatened. The odor can last several weeks and cause temporary blindness in extreme cases.

Coyote ☐
Safe distance = 100 ft

Predators such as coyotes, mountain lions, bears and bobcats rarely attack humans, but when they do, they have been known to cause serious harm with their sharp teeth and claws. You will not be able to outrun these animals, so it is best to get as big as possible and make loud noises if you spot one of them while hiking

Bobcat ☐
Safe distance = 100 ft

Deer ☐
Safe distance = 100 ft

While deer aren't predators, they have sharp hooves and antlers and can harm human if they choose to. It has been reported that deer kill more people every year than bears and mountain lions combined.

Grey Fox ☐
Safe distance = 100 ft

Grey foxes often avoid people, yet they have been known to attack people when they are rabid.

Horned Lizard ☐
Safe distance = 20 ft

Horned lizards can shoot a stream of blood out of their eyes as a defense mechanism.

Scorpion ☐
Safe distance = 20 ft

Bee ☐
Safe distance = 20 ft

Spider ☐
Safe distance = 5 ft

Insects like and arachnids can sting and bite. While some are more venomous than others, it is best to avoid contact with them all together.

Crawdad ☐
Safe distance = 5 ft

Crawdads have sharp pinchers that can break skin. If spotted, please avoid picking them up.

Geese ☐
Safe distance = 20 ft

Geese can be extremely territorial and aggressive. If you spot them, it is best to keep your distance.

Rodents ☐
Safe distance = 20 ft

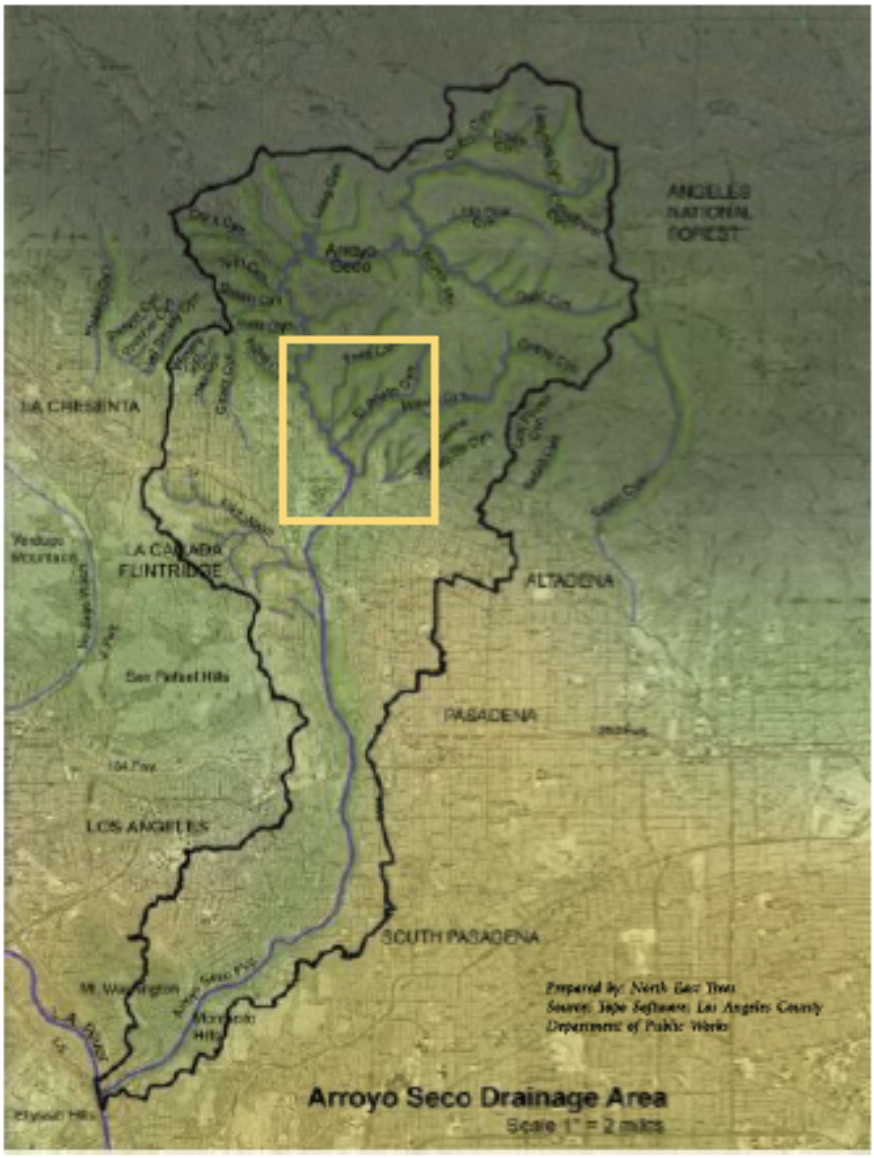
Raccoons ☐
Safe distance = 30 ft

Mammals such as rodents and raccoons can carry fleas and diseases. Please refrain from touching them.

Draw your “sediment erosion and deposition” jar experiment. Label the grain sizes (silt, gravel, sand).

Which grain size needs the most energy to move?

MAP OF ARROYO SECO DRAINAGE AREA



Vocabulary terms:

Watershed: Land that separates waters flowing to different rivers or seas.

River channel: The carved path where a river currently flows or once flowed.

Sediment: solid material (particles, like sand, gravel, boulders) that is moved and deposited in a new location.

Erosion: The action of surface processes that remove sediment, soil and rock from one location on Earth's surface and transports it to another location.

Deposition: The action of adding sediment, soil and rock to a landform.

Debris flow: A moving mass of loose mud, rock, and water that travels down a slope due to gravity.

THE TEN ESSENTIALS

For safety, survival, and basic comfort

1. Navigation: map, compass, GPS
2. Sun protection: sunscreen, chapstick, sunglasses **3. Warm clothing:** jacket, pants, etc.
4. Light: headlamp/ flashlight, batteries
5. First-aid supplies
6. Fire: matches or lighter
7. Repair kit and tools
8. Food
9. Water
10. Emergency shelter: tent, tarp, reflective blanket

GEOLOGISTS' TOOLBOX

Geologists' supplies in addition to the Ten Essentials

1. Notebook, pen, pencils and paper
2. Measuring tape / ruler
3. Hand lens
4. Hammer

LEAVE NO TRACE

Seven principles to follow when hiking

1. Plan ahead and prepare
2. Travel and camp on durable surfaces
3. Dispose of waste properly
4. Leave what you find
5. Minimize campfire impacts
6. Respect wildlife
7. Be considerate of other visitors

Source: REI.