

Curriculum Packet Grades 4-8

Rivers, Creeks, and Neighborhoods





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Introduction to Coastal Cleanup Month

Heal the Bay is an environmental nonprofit dedicated to making California’s coastal waters and watersheds safe, healthy and clean. To fulfill our mission, we use science, education, community action, and advocacy.

The year 2020 is Heal the Bay’s 31st year coordinating Coastal Cleanup Day in Los Angeles. This year we have reimagined our programming as Coastal Cleanup Month instead of Day to celebrate our watersheds and coastline with decentralized cleanups and weekly activities and resources. Grab your family or housemates to clean up your street, park, local shoreline, or anywhere else that you call your happy place! Join Heal the Bay as we come together (at a safe distance) to help protect and clean what we love.

About the grades 4-8 curriculum

Our Rivers, Creeks, and Neighborhoods curriculum aims to incorporate stories, art, reading comprehension, and physical activities to teach kids in grades 4-8 about the value of keeping our local habitats safe, healthy, and clean. In this week’s curriculum, we focus on topics that heavily affect our rivers, creeks, and urban neighborhoods: plastic pollution, water conservation, and climate change. This curriculum is modular and each activity can be performed on its own.



This Rivers, Creeks, and Neighborhoods curriculum educates about fun ecological and physical concepts, while developing critical thinking and social intelligence skills. Each lesson can take between 30-90 minutes with the option for additional exploration, and if applicable, answer sheets are provided on the last page of each activity. Upon completing this curriculum, we invite you to take your student or child to play our rivers, creeks, and neighborhoods cleanup memory game as a warmup activity for their Coastal Cleanup Month cleanup.

Land acknowledgement

We acknowledge the Traditional Owners of this land and recognize their continuing connection to its waters and culture. We pay our respects to their Elders past, present and emerging.

Heal the Bay acknowledges that wherever you are reading this from, you are on land that were stolen from the traditional native inhabitants. The Chumash and the Tongva peoples are the First People of the Channel Islands and Los Angeles County areas. As stewards of our coast we acknowledge the 7,000+ years of regenerative stewardship that came before us. It is important to acknowledge this fact because this is not just about history, extraction-based, settler colonialism is a current and ongoing process. Each of our recognition of this process can prevent further participation in it. We encourage you to explore the native history of the many places you've visited or lived using this interactive map: native-land.ca



Summary of a safe cleanup

You and your household can be the solution to ocean pollution!

Step 1: Before planning your cleanup, be sure and register for Coastal Cleanup Month (CCM) using our Eventbrite page. This helps us collect valuable data about how many individuals participate in our CCM cleanups this year. Thank you so



much for not skipping this step! <https://www.eventbrite.com/e/coastal-cleanup-month-tickets-116467051085>

Step 2: Pick a site - any site! Find a cleanup site that is accessible for you and everyone in your household. Our CCM programming is extremely flexible, allowing your group to choose the dates and times of your cleanup anywhere in Los Angeles County. This week's theme may be mountains and upper watersheds, but you will be helping our planet by cleaning at any location you choose! **Please adhere to [county guidelines and respect closures](#), wear masks, and accommodate for social distancing to reduce the spread of COVID-19.

Step 3: Learn about pollution. Watch our Coastal Cleanup Month safety video prepared by our staff and volunteers, or request a free virtual educational presentation by our Heal the Bay Speakers Bureau before your cleanup. You can watch either from the comfort of your home or at your site prior to your cleanup. Our Speakers Bureau presenter will explain stormwater pollution issues, the effect they have on our oceans, and how to participate in a safe cleanup.

Step 4: Perform your cleanup by yourself or with members of your household! Talk trash about your cleanup on Facebook, Instagram, and Twitter to get your friends excited about this year's effort. Use the hashtags #CoastalCleanupMonth and tag @HealtheBay to stay connected with the countrywide movement! We won't be hosting in person sites this year, so don't forget to take your own bucket, bag, gloves, and refillable water bottle to help reduce the waste!

Take part in community science!

Join the community science movement by tracking the types of litter you and your household finds. This is authentic scientific research! Your data will be used for educational, scientific, and legislative purposes to make Southern California coastal waters healthy and safe. Download the **Clean Swell App offered by the Ocean Conservancy** to enter valuable data on your smartphone or use our downloadable data card and record it with a pencil. After your cleanup we ask that you submit your data via the app or send your data cards to our main office at 1444 9th Street, Santa Monica, CA 90401. **Email Heal the Bay's Beach Programs Manager Emely Garcia (egarcia@healthebay.org) if you have any questions about data collection and submission!**

HABITATS OF OUR CREEKS, RIVERS, AND NEIGHBORHOODS

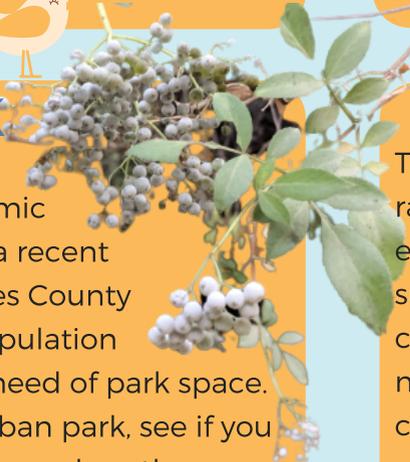


Urban ecosystems such as cities, neighborhoods, and other human-built environments contain a variety of habitats. Interestingly, there are many intersections between the health and well being of humans and natural habitats in these spaces. The presence of spaces in cities that are designated for flora and fauna reduce heat levels, filter pollutants from the air and water, promote natural water conservation, and so much more!



URBAN CITY

Urban development significantly impacts biodiversity. It tends to fragment natural habitats, increase incidents of extreme heat or wildfires, and increase stormwater runoff. Our impacts can be mitigated by planting native drought-resistant vegetation and building wildlife bridges. There are plenty of wild animals that you can befriend in your own yard or window such as the alligator lizard or a house finch!



URBAN PARK

Urban parks have many psychological and economic benefits to humans, and a recent assessment by Los Angeles County found that 50% of our population lives in high to very high need of park space. On your next trip to an urban park, see if you can spot some native trees such as the California walnut, Mexican elderberry tree, or a chaparral honeysuckle!

RIPARIAN

This water-based habitat encompasses the Los Angeles river and its interconnected creeks and freshwater marsh habitats. Despite concrete channelization, there is a large variety of plants and animals that call these areas home. A river visitor is highly likely to see at least one snowy egret or great blue heron, two birds adapted to hunting in shallow water with long legs and necks.



WORKING LAND

These rural habitats including farms, ranches, and forests tend to be irrigated except for the portions dedicated to utilities such as oil wells. Recently, in part due to climate-change-related water pressures, many agricultural working lands have been converted to solar facilities which can be more compatible with the survival of native species such as this burrowing owl.



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WILDLIFE OF OUR CREEKS, RIVERS, AND NEIGHBORHOODS

WESTERN SYCAMORE

This tree grows rapidly, sometimes more than 2 feet per year reaching heights of 100 feet! It has distinctive peeling bark and a sweet odor and have edible, maple-like sap. You'll most likely find them in canyons, floodplains, or along streams in Los Angeles. The sycamore is best know for its fuzzy seed balls that open to disperse seeds like dandelions.



CALIFORNIA BUCKWHEAT

This native flower is a pillar species for local butterflies. In one study, 31 different species of bee were identified visiting this plant. It grows well on dry slopes and canyons, as well as in your home landscaping!



COYOTE

Do you know how fast you can run or how many feet you can jump without your feet touching the ground? These incredible athletes can run 40 mph and jump 13 feet! They are brave, sometimes building their urban dens in the storm drains. They typically eat rodents, reptiles, and fallen fruit rather than pets or trash, despite their bad reputation!



STEELHEAD TROUT

The Arroyo Seco stream, a tributary to the LA River was once the mating grounds and birthplace for steelhead trout. These remarkable fish are adapted to both freshwater and marine environments and they are currently endangered. Each momma Steelhead has an average of 3,500 offspring!



PEACOCK

These colorful birds are one of the largest flying birds on the planet. They were brought to Los Angeles in 1879 from India and have gotten quite comfortable in our neighborhoods. You might know them best for their distinctive mating calls and tail feather displays. This can be observed from June through December.



BALD EAGLE

Bald Eagles used to be widespread across California and they have been reintroduced to the Island of Catalina. DDT contamination of the waters around LA made required excessive human intervention in eagle reintroduction. Today the toxins have decreased to the point that eagles are hatching on their own on the island. Live stream videos of them and their nests have been available online since 2005.



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Rivers, Creeks, and Neighborhoods Activity #1: Let's Make Art!

Introduction: Many types of pollution enter our oceans through runoff starting at our mountain tops and flowing down our watersheds in the form of plastics, chemicals, or bacteria. This causes problems for our physical and mental wellbeing. Pollution is challenging to remove from our oceans, but we can prevent it from entering in the first place! The first step is appreciating the value of our natural areas, especially those natural areas in which we spend the most time: our urban spaces!

The Task: We are creating naturalist field journal entries to reflect on the value of our rivers, creeks, and neighborhoods.

Materials:

- photos of our urban areas and pollution (provided below)
- pencil and paper with the option for additional art supplies such as markers, or colored pencils

Time: 30-60 minutes.

Part 1: Create

A field journal is what professional naturalists and biologists use to record their field experiences and observations in a diary-like format. The journals help individual naturalists grow their skills in animal or plant identification, a process that sometimes has to be completed at home after the observations were recorded. They also provide an invaluable resource to natural history by providing documentations and interpretations of patterns in nature.

Today we are going to act as urban naturists and use our field journals to learn more about our local ecosystems including neighborhoods, streams, and rivers. Although field journals collect some standardized information so that different naturalists can combine and compare their data, every person's field journal will have a unique style and collect unique perspectives.

First, let's take a moment to think about what you find most interesting or pleasant about our riparian (meaning river- and stream-adjacent) and urban ecosystems. Has anyone here seen a picture of our rivers and creeks in Los Angeles, or visited them in-person for a walk, a swim, or to kayak? You can use your memories of our rivers and creeks for inspiration or think about your own neighborhood or yard.

Instructions: This activity involves a walk outside, preferably with a grownup or friend for safety. This activity can also be done using the internet instead of going for a walk.

CREEKS, RIVERS, AND NEIGHBORHOODS



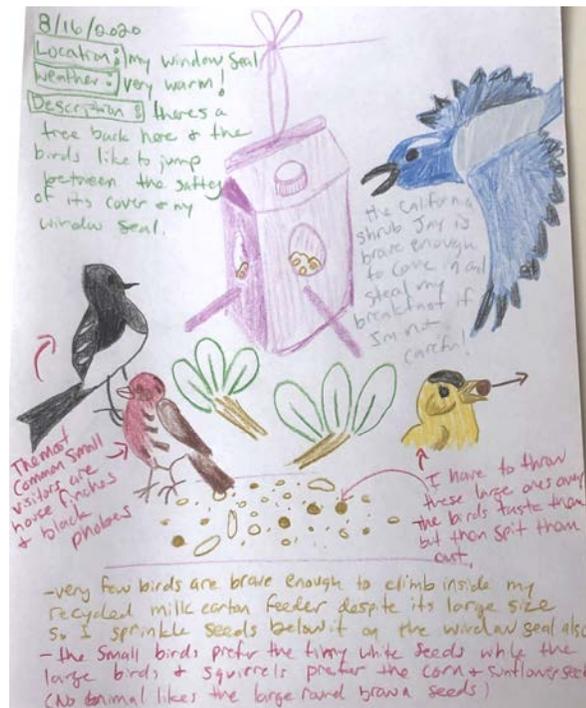
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Step 1: At the beginning of your journal entry, record the date and habitat (i.e. neighborhood, backyard, river, creek). If outside, record the time (in 24-hour format), the nearest address or GPS coordinates, and weather (temperature, cloud cover, wind, rain, ect). A good warmup is to additionally record something you detect for each of your five senses (what you see around you, what you taste/smell in the air, the sounds you hear, and the sensations you feel).

Step 2: Pick a plant or animal in this habitat and observe its behavior or physical characteristics for several minutes. Write down your observations. If using the internet, think of a plant or animal that you know lives in the local habitat you choose, then use the internet to learn 4-8 interesting facts about that plant or animal's natural history or behavior. Write down what you have learned.

Step 3: Draw the plant or animal using as much detail as you prefer in a variety of positions, perspectives, behaviors, or life stages. Study your drawings and find 2-4 observations that are interesting to you and point them out using arrows. For example, an arrow points to a rabbit's tail and says "Rabbits lift these high when frightened to show the bright white hair underneath."

Step 4: Some naturalists have a separate journal at home that they transfer their field entry to in a cleaner fashion. Feel free to rewrite your journal entry if you like. You can take this time to use the internet to answer any questions you thought of during your trip outside such as help finding a species identification.



Example Field Journal Entry:



Part 2: Reflect

Congratulations on your work making a naturalist field journal entry! Now it's time to complete it.

Instructions: Write a freeform journal entry that is 4-6 sentences long that reflects on anything that came to your mind during this activity. You can use the prompts below if desired or talk about something else this activity reminded you of.

1. What are some questions that arose during this activity?
2. Did you enjoy the activity? Why or why not? What did you like most or least and why?
3. What is your favorite thing that you learned today and why?

Part 3: Apply

Instructions: Refer to the photos at the end of this exercise. Some photos highlight the natural beauty of our urban rivers and creeks adjacent to our neighborhoods, while others highlight the problem of pollution that Los Angeles faces. Write a brief journal entry in your field journal entry or separately that considers some of the following questions:

1. What are some similarities between the art you created and the images in these photos? What are some differences?
2. What emotions do you feel when looking at these photographs?
3. Can you think of some ways that the pollution got into the rivers, creeks, and neighborhoods and how to help prevent it from happening?
4. If these photos were shown to you beforehand, would your journal entry have been different? Why or why not?"

Part 4: Research project *advanced activity for 6th grade and above*

Naturalists need to record consistent and thorough data to be taken seriously by other researchers. For this next exercise, repeat parts 1-3 of this exercise 6 more times to collect a week's worth of data.

If you are going outside, try to go to the same location at the same time of day each time so you can compare the data collected from data to day. At the end of the 6th day, write an additional journal entry reflecting on your observations. Look for patterns or surprises that stand out to you and speculate on why they happened.

If you are using the internet, choose plants or animals that are generally found in the same habitats. Write a journal entry summarizing all that you learned about this habitat and its inhabitants throughout this exercise. Pay special attention to potential connections in functions or behavior between organisms that you learned about.



Part 5: Share

Share your art on social media and tag @healthebay and #CoastalCleanupMonth.

For 4th and 5th grades: Submit your art to a local art contest. "Can the Trash!" The Los Angeles County Department of Beaches and Harbors invites local 4th and 5th grade artists to join the fight against ocean pollution with its annual art contest. Winning artwork will be featured on Los Angeles County beach trash barrels next summer. For entry details and a helpful video, visit beaches.lacounty.gov/postercontest.

Evaluation

Pollution can be prevented! List 3 things you already do in your daily life to promote a healthy planet. Now list 3 things that you want to add to your daily routines to continue improving our planet!

Conclusion

Congratulations! You and your student have reflected on the impacts of pollution and explored several achievable solutions. You have also gained a deeper understanding of the emotional benefits of keeping our rivers, creeks, and neighborhoods clean, healthy, and safe. Most importantly, you have learned that humans have the power to change our environment and we have the choice between making negative and positive impacts.

Trashy Photos



CREEKS, RIVERS, AND NEIGHBORHOODS



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Rivers, Creeks, and Neighborhoods Activity #2: Rainwater Capture with TreePeople

Introduction: TreePeople is a non-profit whose mission is to inspire, engage, and support people to take personal responsibility for the urban environment. They're working towards a safe, healthy, and climate-resilient future for Los Angeles. Due to TreePeople's specialization in urban ecosystems, Heal the Bay wanted to share a bit of their work in this curriculum packet. This is simply a preview so please check out more of their excellent activities and resources about trees, water, soil, plants, waste production, community forests, and earth week on their Learn-At-Home site (treepeople.org/learnathome). This preview is modeled after TreePeople's extensive "Rain Garden Project Toolkit" which explores the growing water needs in Los Angeles and the importance of harvesting the rainwater we get.

The Task: Learn the value of collection and infiltration of rainwater and how to design rain collecting infrastructure near your home or local spaces.

Time: 60-90 minutes

Materials: Paper and markers

Part 1: The background: Los Angeles is covered in concrete and asphalt that leave few places where rain can soak into the ground. Instead, water flows across hard surfaces, picking up oil, trash, and pesticides. This polluted runoff flows through streets into storm drains and concrete-lined rivers that subsequently lead to the ocean. As a result, rainfall - a natural resource that could be used to add to local water supplies - is wasted, while our ocean gets polluted. When water instead seeps into healthy soil and then into our groundwater aquifers, microbes in the soil can help filter out pollutants and prevent them from harming our ecosystems. The need to capture rainwater has many benefits including improving the **quantity** of local water available to us as well as the **quality** of environments we interact with.

When it rains, areas covered in concrete receive a lot of water with nowhere to go resulting in accumulation into large pools. Sculpting the land to create a **swale** - shallow trench that looks like a short creek - can help reduce or eliminate flooded areas. When lined with rocks and native plants, swales can make lovely **rain gardens** that redirect water and help it get absorbed into the ground. Many non-native plants require lots of water while **native plants** are adapted to our Mediterranean environment and they can conserve water by going dormant in the absence of rain. Native plants create healthy soil, support local wildlife, and are cheaper to maintain.

Most homes and buildings are designed to direct millions of gallons of rain off the roof through **gutters** and **downspouts** into driveways, streets, and storm drains. Downspouts are the vertical pipes along a building that direct water from gutters on rooftops away from the foundation of buildings. To prevent stormwater runoff, we can use a downspout extension, which is available at



most home improvement stores. These extensions slide into the end of a downspout and allow for the redirection of water away from the building foundation AND away from streets and storm drains, flowing instead into rain gardens and swales.

Instructions: Discuss the following questions with a household member or friend.

1. What should we know about the rain that falls in Los Angeles?
2. Why are outdoor landscapes in Los Angeles a problem?
3. What are downspouts and how do they contribute to stormwater runoff?
4. Why is getting rain water into our aquifers so important?
5. What is an action we can take at home and/or in our community to help redirect the rain and why?

Part 2: Trace the flow of water: In this activity, you will need your paper and makers ready!

1. Choose a site as your model that contains a building or structure. This site can be your home, your school, a shopping center, your favorite pet store, any place that has a building or structure. (note: If you want to, and are able to, complete part 3 “building a rain garden”, you will need to choose a place you are able to modify the landscaping for during this exercise.)
2. Create a map of the site by doing one of the following. Draw it as if north is at the top of the map and south is at the bottom. Include the outlines of major buildings or structures.
 - a. Use an existing map, removing any unnecessary information.
 - b. Download a map from the internet.
 - c. Create your own map using google maps or your imagination.
3. Label your map using 4 main designations:



- a. Existing trees (Draw a filled in circle for the trunk and a dashed line for the drip line - i.e. the approximate to-scale area that the branches reach over the landscape.)
- b. Hardscape (Use diagonal lines to mark the places where water is flooding or running off - i.e. parking lots, walkways, patios, other areas of concrete or asphalt.)
- c. Landscape (Use tiny dots to mark the places that might best be converted into a rain garden with native plants.)



- d. Recreational areas/unused areas (Label each of these areas to avoid or convert with an indication of what they are used for - i.e. playground, soccer area, vacant areas)
4. Using a new color of marker, identify the contouring of the land and mark them with the symbols of your choice. This will be used to determine where water may be diverted and infiltrated.
 - a. Locate the high spots first (i.e. hills or rooftops)
 - b. Locate the low spots (i.e. ditches, swales, areas that tend to puddle or flood)
 - c. Locate the flat areas (i.e. sports fields or grassy areas)
 - d. Locate the downspouts
 5. Draw arrows in a third color that mark the expected flow of water based on the contouring exercise performed above. Use these areas to decide which potential locations can be converted to infiltration swales and/or rain gardens with native plants.
 6. For fun, feel free to draw what a schematic of the swale and/or rain garden of your dreams. Are there any plants that you would want to add? How about California Buckwheat, a staple plant for attracting and supporting local butterflies and bees? If you are looking for multiple benefits, the Catalina Cherry tree offers white flowers, a nice scent, edible cherries, dense shade, and attraction of local birds and butterflies.

Part 3 (Optional): How to Install a Rain Garden

Time: An additional 4-6 hours

Materials: gloves, a shovel, kitchen flour, several bags of mulch (free options exist), optional native plants and/or decorative rocks *(for additional materials and suggestions ask TreePeople for the full rain garden toolkit)*



For more information on this exercise: visit treepeople.org/water

Looking to give your home the green treatment? Installing a rain garden is not only beautiful, but it is also a great way to slow, sink and spread rainwater into the ground. Be part of the movement--recharge LA's groundwater while being a model of green living in



your neighborhood. Rain gardens can easily capture the rain, and once captured, the rain is able to seep through the permeable surfaces you provided instead of flowing across impermeable concrete surfaces to the storm drain system and ultimately the ocean.

1. The first step is to look at your roof and identify the points where the water would flow freely off. Your home or building might already have gutters and drainpipes installed, which would make this step much simpler.
2. Below the drain spout or main location of water flow off of the roof, use a shovel to reshape the ground in a way that will direct the water away from the side of the house, a sidewalk, driveway, or street.
3. Use simple math to determine the size of the rain garden you will build in the spot you directed your water path towards. Estimate the square footage of the building's roof/footprint and insert that value into the equation below which estimates the size of your rain garden based on the frequency and volume of rain events in Los Angeles.

Here's the calculation:

$$\text{Catchment area} \times \text{Rain fall (0.0625)} / \text{Depth of rain garden (.5)} = \text{Size of rain garden}$$

Example for a 400 square foot catchment area:

400 square feet of catchment area x .0625 divided by the rain garden depth of .5 = 50 square feet



How many gallons?

400 square feet x 3/4 inch of rain (.0625 feet) = 25 cubic feet

25 cubic feet x 7.5 gallons = about 187.5 gallons!

That means that a roof of about 400 square feet can capture almost 200 gallons every time it rains an inch! The water can go into a rain garden area that is about 50 sq. feet: 5' X 10' or 7' X 7'

4. Outline the shape of your rain garden with kitchen flour, a substance that will have little impact on the environment, and begin to dig. (Be sure and drink plenty of water and wear sunscreen!)



5. After you have your basin, dig an outlet spout near the edge of your yard to allow overflow to enter the street and storm drains.
6. Place the soil removed for your basin around the edges of your yard to direct additional rainwater towards the basin. These rainwater directing hills are called berms.
7. Once your basin is the right size, you can fill it with beautiful climate appropriate plants and mulch. Plants native to the Mediterranean climate of Southern California will be drought resistant and require less watering than grass or landscaping plants that are adapted to other climates. Native plants are beautiful too, and many can provide us with edible food!

Swales and Rain Garden Examples



Conclusion

Tree people believe in the power of people to make change in their communities. For more detailed instructions for planning and implementing your rain garden project, contact tree people additional resources such as their full 48 page "Rain Garden Toolkit."



Rivers, Creeks, and Neighborhoods Activity #2: Reading Together!

Introduction: Biomimicry is the method by which humans imitate biology to make an invention or to solve a problem. If you've ever had the fortune of becoming familiar with pet geckos, you would know that they often rest in strange positions, sometimes while dangling by a single hand on a flat surface! Scientists used biomimicry to invent human-sized gecko feet that mimic the tiny bristles on the bottom of gecko feet. This invention gives humans the gecko superpower of climbing and hanging on flat surfaces. Nature-based design is similar, but instead of only copying biology, it is inspired by all parts of nature including geology and physics. In this lesson, we will learn about how nature-based design, especially green or vegetated design, can help us reach our sustainability goals and help to build resilience against the harmful effects of climate change. We also help to show you how learning science in school is connected to real changes that you can see in the places that you live.

The Task: Explore the value of problem solving with nature-based design through reading comprehension and reflection.

Time: 30-60 minutes.



Part 1: The reading – Nature-based solutions and climate resilience

There is a myth that Los Angeles city was built in a desert. The word desert has a specific meaning with measurable qualities such as extremely high temperatures and low precipitation. The milder, moister climate of Los Angeles instead fits into the range known as Mediterranean. Although Los Angeles appears dry at some times of the year - the vegetation browns and the creeks dry up - we have an abundance of local water sources.

Much of Los Angeles' history revolves around the myth of the city being located in a desert and therefore dependent on imported water. This myth helped rationalize some very shameful water history of Los Angeles including the theft of water from Owens Valley. Residents of Owens Valley are still fighting for the rights to use their own water a century later.

Even though Los Angeles is not a desert now, climate change increases temperatures and creates unpredictable weather patterns that threaten to transform the city into one in the future. What can Los Angeles do to stop this trend? We can be less wasteful with our local water.

In November 2018, Los Angeles County took a huge step towards supporting solutions to these water problems when they voted for Measure W, also known as the Safe, Clean Water Program. This new law created a tax that provides benefits to landowners that replace their concrete surfaces, with native plants and healthy soil that absorbs water and allows that water to filter down into our groundwater supply.



Concrete surfaces direct rainwater into storm drains which sends the water quickly to the ocean. So much freshwater wasted. In comparison, plants that are native to this Mediterranean climate have evolved to be experts at water capture and conservation. They help gather local water, provide habitats for wildlife, cool our cities, and so much more. Soil is permeable, meaning that it allows extra water to travel into the ground, giving humans the option to store it and use it later, instead of having to import water from far away. By replacing concrete with native plants, humans are performing nature-based design by mimicking nature's way of saving water for a non-rainy day.



Images above: Alternative to concrete that are suggested by Los Angeles County

In addition to encouraging concrete removal, the Safe, Clean Water Program raises money that can be spent on brand new water-conserving infrastructure in our cities throughout Los Angeles County. It is not written in the law that new infrastructure projects use nature-based design, but this is one concept that Heal the Bay and our partnering organizations hope that community members will stand up and demand from their city planners.

Nature-based solutions that can help with water conservation fall along a spectrum based on how many natural elements they have. Experts describe this as a spectrum between “gray” and “green” based on the ratio of concrete to plants involved in the design. Below we will compare two examples: gray stormwater capture and green park restorations.

Some textbooks describe our groundwater stores, also known as aquifers, as large underground caverns full of water. This is similar to the truth, but instead of one big open space like a cave, imagine a big space that is filled with gravel that is loosely packed so water can be stored in all the cracks in between. The water can be sucked out of an aquifer with pumps similar to the way water can be sucked out of a glass full of ice cubes.



A gray nature-based mimic of an aquifer is a stormwater cistern. These often look like giant underground caves made of metal. They will help us store rainwater for future use by humans. There are 12 basins being built under Los Angeles right now, but construction on these important infrastructures are behind schedule by many years! Until these cisterns are built, our stormwater will continue to waste fully go to the ocean via our storm drain system.



Images above: the Rory M Shaw Wetlands Park before (left) and after (right) restoration.

A totally green, highly vegetative, nature-based design for water conservation would be to restore wetland habitats around Los Angeles. Habitat restoration means to restore the natural functions of a habitat. A very important natural function of wetlands is to allow water to seep deep into the ground and replenish our natural groundwater aquifers.

Somewhere in the middle of this green/gray spectrum are concrete infiltration galleries. They catch and store water similar to a cistern, and their bottom is made of porous material that allows the water to seep into our natural aquifers instead of remaining artificially stored. These galleries mimic the porous soil that would normally cover Los Angeles.

Green, vegetative nature-based designs are preferred to gray designs because they provide multiple benefits in addition to the original goal for their creation. Healthy wetlands offer multiple benefits in addition to water conservation. They support microbial communities that help clean pollutants from the air and water, provide flood barriers that can protect human areas, create homes and nurseries for wildlife resilience, help with carbon sequestration to mitigate climate change, provide parks for human recreation, and so much more.

In conclusion, Los Angeles currently imports water instead of using its local water sources. Increased appreciation for our local water was reflected in the county's 2018 vote to pass Measure W: the Safe, Clean Water Program. Now, we must keep the momentum going and spread support to make the Measure W solutions nature-based, especially green, multibenefit nature-based solutions.



Part 2: Vocabulary

Instructions: Find the vocabulary words in the word search to match them with their definitions below.

Note, there are five extra related words to find just for fun! See if you can get them all!

N B U D O M D V W W Q D I L S R N G A L
 G A M U L T I B E N E F I T E T O R Q T
 I M E V E H C R P S X A L S C H I O U V
 C M V N J L U I A W X C T T A R T U I R
 V N P E A S B B M H M O M B V E A N F C
 C P X E A R E A T I R P I E X T V D E N
 F A Y E R R R W E A M T R T U A R W R E
 T O M Q U M B E T M A H M A F W E A M X
 L I I T X G E I T T R W C G N R S T T D
 R T A I J I O A C I B E C I L I N E N M
 B N L L B N N Q B I D N P T A M O R O L
 C L I M A T E O G L S E G I N A C Y H R
 E C N E I L I S E R E T M M T R E S E D
 Y Z X S K E R O T Q B F E K C S O B O K
 N B A W T A T H Z S I O J R I N I K Q W
 R K V Y U J H O A U X J D Y N D U V H Z
 X O D T Z K R E X M E T C J K O M Y I Y
 B J C V C H F Z J N Z U X N H X M U L T
 H E R U T C U R T S A R F N I V M O L T
 N F M D O B H V J D Y M R L L X T Q W U

1. _____ : the long-term pattern of weather in an area.
2. _____ : a region that receives less than 10 inches of rain per year.
3. _____ : a region that experiences warm, wet winters and hot, dry summers.
4. _____ : not allowing passage of fluid through a substance.
5. _____ : allowing fluid passage through a substance.
6. _____ : water held underground in pores and crevices in rock.
7. _____ : prevention of wasteful use of a resource.



8. _____: To imitate or copy.
9. _____: To imitate or copy biological, geological, or physical aspects of nature.
10. _____: Organizational structures and facilities needed for the operation of a society.
11. _____: A man-made structure built to store water.
12. _____: A natural body of permeable rock or sediment that can store water underground.
13. _____: The natural home or habitat for a plant, animal, or other organism.
14. _____: The Process of returning something to its original condition or function.
15. _____: Something that serves more than one purpose or accomplished more than one goal.

Part 3: Describe

Instructions: Discuss your thoughts on the reading using your own words with a household member or friend. Include in your conversation:

- 3 observations that stood out to you from the reading. Reflect on why those ideas were most memorable.
- 3 follow-up questions to the reading. If your household member or friend doesn't know the answers, feel free to ask us with an email (info@healthebay.org) or through social media (@healthebay).

Part 4: Apply

Instructions: Answer the following open-ended questions using 1-2 complete sentences.

1. Based on your personal knowledge, as well as what is written here, what makes Los Angeles different from a desert?
2. Based on your personal knowledge and/or what is written here, how is climate change affecting Los Angeles?
3. Describe how gray and green nature-based solutions are similar, and how they are different. Are they equally beneficial?
4. What are your personal opinions about having less concrete in Los Angeles? Have they changed since reading this essay? Why or why not?
5. Several beneficial functions of healthy wetlands are described here. Can you think of two additional benefits?

Part 5: Invent *advanced activity for 6-8th grades*



This is an opportunity to make a brand new invention using nature-based design! The invention can aim to solve water conservation or a different problem (serious or silly) in your school, home, or community. The invention can be completed as a drawing or a 3D prototype made from repurposed materials.

Making a new invention will likely be easier if you follow the invention process!

1. Identify a problem.
2. Research the problem and brainstorm solutions. It can be fun to talk about ideas with others!
3. Identify a natural process related to the chosen issue.
4. Write out notes of what problem the invention solves and why.
5. Make a list of resources that are necessary to create your invention.
6. Sketch or build the invention.
7. Congratulate yourself and share your hard work with your teacher, friends, household members, or Heal the Bay through social media (@healthebay) or email (info@healthebay.org)!

Conclusion

Congratulations! You have reflected on nature-based infrastructure and landscaping solutions and how they can help Los Angeles conserve its local water sources to rely less heavily on imported water. We hope you will continue to discuss the concepts you have learned here with others to further grow the knowledge of yourself and others in this area and help prepare our communities to build climate resilience! Thank you for participating!

Vocabulary Key:

climate, desert, Mediterranean, impermeable, permeable, groundwater, conservation, mimic, nature-based, infrastructure, cistern, aquifer, habitat, restoration, multibenefit (mitigate, resilience, tax, measureW, water)

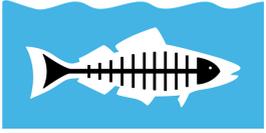
Resources:

Safe, Clean Water Program: <https://safecleanwaterla.org/>

Nature-Based Solutions Best Practices:
<https://drive.google.com/file/d/1j1fFQ3iNU9g0PNQLFxCss5OSdeS0vIP6/view>

Our Water LA: <https://ourwaterla.org/>

Find My Watershed Tool:
<https://healthywatershed.maps.arcgis.com/apps/MapSeries/index.html?appid=70552bdef5f141958e61c7248f2981ca>



RIVERS, CREEKS, AND NEIGHBORHOODS

Cleanup Memory Game

This game requires observation, concentration, and good memory to win. The object of the game is to collect the most matching pairs. It can be played as multi- or single player.

Instructions: Print the following pages and cut out and shuffle the cards. Without looking at the cards, lay them face down in rows forming a large rectangle. The first player chooses a card and turns it over for all to see without disturbing the surrounding face down cards. In a multiplayer game, the next player will then chose their own card to turn over for all to see. When a match is found, the player removes both cards from the playing field and sets them aside. An extra turn is granted for finding card matches. The game continues until all the cards have been matched and set aside!

HEAL THE BAY'S MONTHLY BEACH CLEANUP



NOTHIN' BUT SAND



HOW TO PARTICIPATE IN CLEANUP COMMUNITY SCIENCE



PAPER DATACARD OR THE CLEAN SWELL APP



TWO MAIN TYPES OF TRASH COLLECTED



PPE AND CIGARETTE BUTTS



NAME OF SMALL PLASTIC LITTER



MICROPLASTICS



WHAT TO BRING ON YOUR CLEANUP?



GLOVES, WATER, SUN PROTECTION



WHO CAN MAKE A DIFFERENCE?



ALL OF US!



OUR PROGRAM SUPPORTING CLEANUPS IN YOUR NEIGHBORHOOD, CREEK, OR PARK



ADOPT-A-BEACH (NEIGHBORHOOD, CREEK, OR PARK)



HOW POLLUTION TRAVELS THROUGH LOS ANGELES



STORM DRAINS



HOW ANIMALS CAN BE HARMED BY POLLUTION



ENTRAPMENT OR CONSUMPTION



TYPE OF CLIMATE OF LOS ANGELES



MEDITERRANEAN



HOW TO FIND SAFE SWIMMING HOLES IN LOS ANGELES?



THE RIVER REPORT CARD



HOW TO FIND MY NEAREST RIVER OR CREEK?



USE THE "FIND MY WATERSHED" WIDGET



HOW MANY RIVERS
FLOW THROUGH
LOS ANGELES?

4 RIVERS

IN WHAT YEAR WILL
L.A. RECYCLE 100% OF
IT'S WASTEWATER?

2035

Los Angeles River

Rio Hondo River

San Gabriel River

Santa Clara River

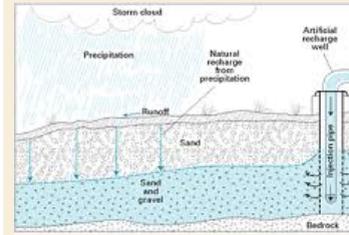


WHAT IS A RAIN
GARDEN?

NATIVE PLANTS PLANTED IN
A DEPRESSION DESIGNED
TO COLLECT RAINWATER

WHAT IS
INFILTRATION?

PROCESS BY WHICH
RAINWATER MOVES
THROUGH SOIL TO THE
GROUNDWATER

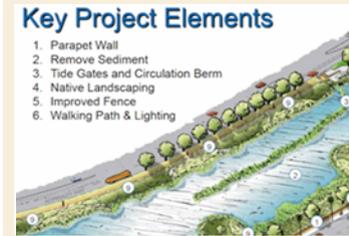


WHAT IS A
NATURE-BASED
SOLUTION?

USING NATURE TO
ADDRESS SOCIETAL
CHALLENGES

WHAT IS A
MULTIBENEFIT
PROJECT?

ONE PLANNED WITH THE
INTENTION OF SOLVING
MULTIPLE PROBLEMS



HOW LONG DOES A
PLASTIC BOTTLE LAST
IN THE OCEAN?

450 YEARS

HOW MANY PLASTIC
UTENSILS ARE THROWN
AWAY EACH YEAR?

40 BILLION PER
YEAR IN THE U.S.

