San Dieguito Lagoon

WATERSHED EXPLORERS

Contents

SAN DIEGUITO LAGOON WATERSHED EXPLORERS

OVERVIEW

Led by the San Dieguito River Park, students engage in several activity stations to learn about the importance and diversity of the lagoon. Activities include an interactive Ranger-led hike along the Lagoon Trail, testing water samples at the stormwater treatment ponds, studying skulls of animals found within the park, viewing native plants and learning about their adaptations and use, and creating nature-inspired artwork using materials collected from the lagoon.

Objectives

Students will:

- learn about habitat destruction, degradation, restoration and preservation;
- learn about urban runoff, freshwater and salt water, and the importance of water quality;
- learn about habitat types and how plants and animals have adapted to living at the San Dieguito Lagoon;
- understand their role in keeping the watershed healthy.

California Performance Expectations & Dimensions

Note: This program can assist with meeting the following Performance Expectations and Dimensions from California's Next Generation Science Standards (NGSS).

Grade 5: 5-PS3-1; 5-LS1-1; 5-LS2-1; 5-ESS2-1; 5-ESS2-2; 5-ESS3-1.

Grades 6-8: MS-LS1-4; MS-LS1-5; MS-LS1-6; MS-LS1-7; MS-LS1-8; MS-LS2-1; S-LS2-2; MS-LS2-3; MS-LS2-4; MS-LS2-5; MS-ESS3-1; MS-ESS3-2; MS-ESS3-3; MS-ESS3-4; MS-ESS3-5.

Grades 9-12: HS-LS2-6; HS-LS2-8; HS-LS4-6; HS-ESS2-5; HS-ESS3-1; HS- HS-ESS3-4; HS-ESS3-6.

INTRODUCTION

The San Dieguito River Watershed

When it rains, the falling water runs downhill off the land into nearby creeks, rivers, and lakes. If you were to follow a raindrop from the mountains to the ocean, you would be following the raindrop through a watershed. A watershed is the area of land and waterbodies that collect rainwater. A watershed includes the mountains, valleys, and flatlands, as well as water flowing above ground and underground (groundwater) in creeks, rivers, and aquifers. Most watersheds eventually end at the coast, often at an estuary open to the ocean. Flowing water connects all of the communities in a watershed, and what happens upstream affects those living downstream.

Did you know that you live in a watershed? We all do. Do you know which one you live in? If you live between Julian and Del Mar you probably live in the San Dieguito River Watershed. This watershed starts at Volcan Mountain near Julian and stretches 55 miles through portions of Julian, Wynola, Santa Ysabel, Ramona, Poway, Rancho Bernardo, Escondido, Del Dios, Santa Fe Valley, Rancho Santa Fe, Fairbanks Ranch, San Diego and Del Mar through the San Dieguito Lagoon to the Pacific Ocean.

In terms of land area, the majority of the watershed (79.8%) is within the unincorporated area of San Diego County. The San Dieguito River Watershed is presently divided into vacant/undeveloped (54%), parks/open space (29 %), and urban (18%) land uses. Nearly half of the vacant land area is open to future development, most of which is zoned for residential use. The current watershed population is approximately 125,000; however, this level is projected increase to over 210,000 residents by 2020.

There are several important natural areas within the watershed that sustain a number of threatened and endangered species. Among these are the 92,000-acre San Dieguito River Park Focused Planning Area, the 150-acre San Dieguito Lagoon, and five water storage reservoirs including Lake Hodges, Lake Sutherland, and Lake Poway.

This curriculum focuses on the San Dieguito River Watershed; however, the environmental and water-quality issues found there are pertinent to most coastal California watersheds. Click on this link to find out information on other watersheds in San Diego County. Note: See the watershed map below for the location of these watersheds.


SANTA MARGARITA
SAN JUAN
Rainbow
Camp Pendleton
Fallbrook
Pala
Palomar Mountain
WHITEWATER
CLARK
76
79
SAN LUIS REY
WEST SALTON
Bonsall
Warner Springs
Borrego Springs
Valley Center
Oceanside
Vista
San Marcos
Carlsbad
78
CARLSBAD
Escondido
SAN DIEGUITO
Julian
5
78
ANZA-BORREGO
Ramona
Encinitas
15
Rancho Santa Fe
Cuyamaca
Poway
Del Mar
56
SAN DIEGO
Barona
79
PENASQUITOS
67
Mount Laguna
805
Santee
Lakeside
Descanso
52
La Jolla
Alpine
8
Pine Valley
125
El Cajon
SWEETWATER
163
La Mesa
Rancho San Diego
IMPERIAL
Lemon Grove
PUEBLO
Point Loma
San Diego
Spring Valley
Jamul
94
Coronado
54
Dulzura
National City
OTAY
Boulevard
Chula Vista
Potrero
Campo
Jacumba
Imperial Beach
905
TIJUANA

Importance of Coastal Wetlands

Wetlands are nature's water filtration system. They are made up of low meadow, high marsh, shallow marshlands, and open water. As the river flows in, and as rains wash storm water through a wetland area, the roots of many wetland plants and microbes act to filter and absorb pollutants. They also slow the water's velocity so that heavy metal toxins can settle into the sediment layers rather than be carried to the ocean.

The natural processes of tidal action and river flows meet in a coastal lagoon at San Dieguito Lagoon. These natural lagoon cycles make the water cleaner for people at the beach, and help keep pollutants out of the food chain we share with fish and animals. Wetlands contribute to a healthy ecosystem.

The San Dieguito Lagoon

The San Dieguito Lagoon is the "gateway" to the San Dieguito River Park. It has vital importance for the ecology of the region - for birds as a stop on the Pacific Flyway, as nesting and foraging areas for endangered species, and as a fish hatchery. The San Dieguito coastal area is also a significant scenic resource for residents and visitors in Solana Beach, Del Mar, and San Diego.

The San Dieguito Lagoon was once the largest of the six San Diego coastal lagoons, and has the largest watershed. The marsh area alone is believed to have been over 600 acres, while the entire lagoon probably covered 1,000 acres. Over the years, the lagoon was subjected to major filling activities and lost over half of its marshes as a result of development projects including Highway 101, Jimmy Durante Boulevard, residential housing, the Del Mar Fairgrounds and a World War II airport. Two large dams were constructed upstream on the San Dieguito River, greatly reducing freshwater inflows. The result of all these activities was year-round closure of the lagoon mouth beginning in the 1940s. Only large winter floods or bulldozers opened the mouth periodically.

Restoration of the San Dieguito coastal wetlands has been a stated goal of the Cities of Del Mar and San Diego, and the organizers of the San Dieguito River Park for almost two decades. In 1983, the California Department of Fish and Game created a tidal basin in a 70-acre area of the southern lagoon funded in part by a $1.3 million grant from the California Coastal Conservancy. In addition, the lagoon mouth was reopened, restoring tidal influence, at least temporarily, to the entire coastal wetland. The ultimate restoration goal, as stated in the San

Dieguito Lagoon Resource Enhancement Program (adopted in 1979) and the San Dieguito River Park Concept Plan (adopted in 1994), is to restore what remains of the historically significant San Dieguito Lagoon system.

San Dieguito Lagoon Wetland Restoration Project

Southern California Edison Company (SCE) is the majority owner and operator of the San Onofre Nuclear Generating Station (SONGS). The California Coastal Commission (CCC) issued a Coastal Development Permit for the construction of SONGS Units 2 & 3 with the condition that SCE fund the independent evaluation of the impacts of SONGS on the marine environment. The Coastal Development Permit (Permit) further requires that SCE mitigate any significant adverse impacts.

The CCC determined that SONGS adversely impacted statewide fish stocks and required SCE to mitigate those losses. As partial satisfaction of the mitigation requirements, SCE was required to create or substantially restore at least 150 acres of wetlands in Southern California. After considering the results of a site-selection study that included an evaluation of eight potential sites throughout Southern California, the CCC concluded that the San Dieguito Lagoon offered the best opportunity for achieving the full objectives set forth in the Permit.[1]

This $93 million project completed in 2010, preserves, improves, and creates a variety of habitats to increase and maintain fish and wildlife and ensure the protection of endangered species. Project objectives are that the wetland project design ensure adequate tidal and riverine flushing and circulation to support a diversity of biological resources while maintaining the appearance of a natural wetland ecosystem. Public access, including the Coast to Crest Trail and use areas, such as the Birdwing Open Air Classroom, are sited in a manner that do not interfere with the naturally functioning ecosystem or the open space character of the western San Dieguito River Valley.

Habitats being restored include non-tidal wetlands such as riparian scrub and freshwater marsh, coastal sage scrub, native grasslands, chaparral, and salt marsh transition. In addition, there are several on-going projects to remove invasive, non-native species from the surrounding wetland areas, restore historic riparian corridors, and create habitat for threatened and endangered wildlife.

[1] http://marinemitigation.msi.ucsb.edu/documents/wetland/sce_reports/san_dieguito-lagoon-final-restoration-plan_112005.pdf

Habitats of the San Dieguito Lagoon

Chaparral

Chaparral is California's most common plant community, found in every county in the state. It is characterized by mild, wet winters and hot, dry summers (called a Mediterranean climate and found in only a few places on Earth). The average annual rainfall can vary between 9 and 30 inches, usually increasing with elevation. Most plants are dense, woody, evergreen shrubs with thick, leathery leaves to hold in moisture. Plants in this community are also adapted to dry-season fires, and the ability to regenerate from a stump after fire is a characteristic of chaparral plants. A noteworthy species that makes this habitat its home is the endangered Quino Checkerspot Butterfly.

Coastal Sage Scrub Habitat

Coastal sage scrub is a dry habitat found on south and west facing slopes and flatlands, receiving an average of about 10 to 20 inches of rainfall per year. Most plants found in this habitat are drought-resistant, deciduous shrubs. They tend to be low-growing (3-4 feet tall), aromatic and generally soft-leaved shrubs. A noteworthy species that makes this habitat its home is the threatened California Gnatcatcher.

Riparian Habitat

Riparian habitat is a streamside freshwater wetland found along the banks of the creeks throughout the watershed. The fairly consistent water source (above and below ground) supports a dense thicket of vegetation that's typically taller and lusher than those in the drier chaparral or coastal sage scrub habitats. Flowing streams (sometimes seasonal) and drainages create washes that support trees and smaller herb-like plants. Cool, shaded, and wet riparian habitat attracts many species. Noteworthy endangered species that make this habitat their home are Least Bell's Vireo, Southwestern Willow Flycatcher, and Arroyo Southwestern Toad.

Salt Marsh Habitat

A salt marsh is a low-lying coastal area periodically flooded by salt water from ocean tides. At low tide mudflats are exposed on the upper edges of the salt marsh. Salt water, along with consistently mild temperatures, sustains low-growing, succulent, salt-tolerant plants (called halophytes). The dominant plant here is Pickleweed. Within the salt marsh are tidal creeks and mudflats that are submerged and exposed twice a day as the tide rises and falls. Noteworthy

endangered species that make the salt marsh their home are the Belding's Savannah Sparrow and Ridgway's Rail.

Water Quality

Human population growth and development throughout San Diego County has led to significant habitat loss and a reduction in watershed ecosystem services. As water flows through our neighborhoods, it picks up pollution from yards (fertilizers and pesticides), streets (oil and grease), and walkways (trash and pet poop), and carries the pollutants throughout the watershed.

Today's polluted water no longer encounters the cleaning services that wetlands used to provide. Over the past 200 years, nearly 85% of Southern California's wetlands have been destroyed. With fewer wetlands, the job for those that remain is bigger and more challenging. Too much pollution and trash can overwhelm wetlands' cleansing abilities and destroy their usefulness. This disrupts the lives of the plants and animals living there, and ultimately affects the health of habitats throughout the watershed.

Ecosystem health is crucial to ecosystem services. Scientists and technicians use different tests to measure a watershed's health, just like doctors use different tests to measure your health. One way to determine the health of a watershed is to monitor the water quality.

Almost everything we do affects water quality. When the physical, chemical and biological components of water are altered, it causes the watershed to become unhealthy. There are a number of different measureable characteristics of water that can give us clues to a watershed's health including ambient measurements (temperature, pH and dissolved oxygen) and pollutants (nitrate and phosphate). As you visit the different sites included in this program, you will observe and record these measurements to determine water quality and overall health of the San Dieguito Watershed.

Since everyone lives in a watershed, everyone affects the quality of the water. We all have a responsibility to protect our limited freshwater resources and the ecosystem services they provide. By caring for and protecting our watershed, we're helping care for the ocean as well. It's critical that we keep the water in our watersheds flowing clean and healthy.

ACTIVITIES

1. San Dieguito Lagoon Walk (90 minutes)

Students will go on a Ranger-led hike along the Lagoon Trail. Along the trail they will learn about the natural history of the lagoon and its ecological importance. They will discuss topics such as native and non-native plants, ethnobotany, aquatic life, birds, urban run off, and restoration.

2. Water Quality Testing (30 minutes)

Students will learn about different factors that affect water quality and the health of our watershed. Working in small groups, students will collect and test water samples for dissolved oxygen, nitrates, phosphates and pH and rank the water quality on site.

3. Skulls & Wildlife Adaptations (15 minutes)

Students will observe 15 different animal skulls and try to identify which species they belong to. They will learn about the special adaptations and characteristics of these animals and how these attributes help them to better survive in the watershed.

4. Plant Adaptations (15 minutes)

Students will observe several plant displays and learn about the adaptations and special traits that different plants have that allow them to survive in the lagoon environment. In addition, they will be introduced to specific plants collected from the lagoon and learn how they have been used by humans in the past.

5. Art of Nature (25 minutes)

Students use different specimens collected from the Lagoon to create artwork that expresses their individual nature experience. Taking inspiration from the environment, they will reflect on their surroundings forming a closer connection to the natural world.

Pre- and Post-Field Trip Watershed Activities

Excellent pre-and post-field trip watershed activities were developed by the San Elijo Lagoon Conservancy for its education program. These activities can be adapted for use in the Watershed Explorers Program and are found at:

Grade 5:
http://www.sanelijo.org/sites/sanelijo.org/files/Publications/TGwater-wetlandsv07.pdf

http://www.sanelijo.org/sites/sanelijo.org/files/Publications/TGwetlandsv04.pdf

Grades 6-8:
http://www.sanelijo.org/sites/sanelijo.org/files/images/education/Biodiversity_MS_Teacher%20Guide.pdf

VOCABULARY

biodiversity: the number and variety of organisms (plants, animals and others) found within a specified geographic region.

chaparral: a habitat with dense, small evergreen shrubs that grow where summers are hot and dry and winters are cool and moist.

coastal sage scrub: a habitat on drier coastal slopes that consists of drought-resistant, deciduous shrubs and other plants.

disturbance: temporary change in environmental conditions that causes a pronounced change in an ecosystem.

ecosystem: all the living and nonliving things that interact in an area; within each ecosystem is one or more habitats.

ecosystem services: the benefits that ecosystems provide humans, from the air, clean water and food to breaking down waste and building soils to beauty, recreation and comfort/inspiration.

endangered: at risk or in danger of becoming extinct.

environment: all the living and nonliving things that surround and affect an organism.

erosion: the process by which wind, water, or other means wears away land.

estuary: a place where fresh water from rivers meets salt water from the ocean.

habitat: a specific type of environment inhabited by particular animal and/or plant species; a place where an animal or plant lives.
nitrates: nutrients needed by all aquatic plants and animals that come from decomposing dead plants and animals and the excretions of living animals.

non-native species: species that have been introduced into new areas that have not historically been part of their native range.

organism: a living thing, such as an animal, plant, alga, bacterium, or fungus.

Pacific Flyway: a north-south route, extending from Alaska to Patagonia, that is used by migrating birds.

pH: a measurement of the acidic or basic quality of water.

phosphates: nutrients needed for plant and animal growth that can come from several sources including human and animal waste, industrial pollution, and agricultural runoff.

plant community: a collection or association of plant species within a designated geographical unit, which forms a relatively uniform patch, distinguishable from neighboring patches of different vegetation types.

pollution: the presence or introduction into the environment of a substance (pollutant), usually produced by humans, that causes harm to a natural environment.

restoration: restoring to its natural form.

species: a group of the same type of living organisms that can mate and produce (reproduce) other living organisms of the same kind.

threatened: at risk of becoming endangered, leading to extinction.

water quality: a measure of several factors (e.g., dissolved oxygen, nitrates, phosphates, and pH) in water relating to a particular purpose of the water (e.g., drinking).

watershed: an area of land that drains the rain falling onto it (or water flowing through it) into a common body of water, such as a creek or stream, which flows into a larger body of water, such as a river or lake, which and eventually flows into an estuary and out to the ocean

REFERENCES & SUGGESTED READINGS

General

San Dieguito River Park: http://www.sdrp.org

Calflora: Information on wild California plant species, searchable by county, plant community (habitat), common name or scientific name, resulting in maps, photos, and some basic information: www.calflora.org/

San Diego County Plant Atlas, San Diego Natural History Museum (includes a Google Earth Plug In): http://sdplantatlas.org. Also interactive plant search map: http://sdplantatlas.org/SDMapBoxQuery_VE.aspx Schoenherr, A.A. (1992).

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San Dieguito Lagoon Interpretive Walk: http://www.delmartimes.net/news/2011/nov/16/san-dieguito-lagoon-restoration-project-dedicated/

Southern California Edison Wetland Restoration Plan at the San Dieguito Lagoon:http://marinemitigation.msi.ucsb.edu/documents/wetland/sce_reports/san_dieguito-lagoon-final-restoration-plan_112005.pdf

San Dieguito Watershed

The San Dieguito River Watershed: http://www.projectcleanwater.org/ndex.php?option=com_content&view=article&id=36&Itemid=45

San Diego Coastkeeper. San Diego Watersheds. Interactive map of water quality along watersheds, including San Dieguito: http://www.sdcoastkeeper.org/learn/swimmable/san-diego-water-quality.html

Water Quality Monitoring

U.S. Environmental Protection Agency (EPA). How's My Waterway? (searchable by location): https://www.epa.gov/waterdata/hows-my-waterway .

Water quality indicators: Biological, chemical and physical parameters. Adapted from Healthy Water, Healthy People: Water Quality Educators Guide (www.projectwet.org). Available at: https://riverxchange.files.wordpress.com/2015/09/water_quality_indicators_final.pdf

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