BACK BAY SCIENCE CENTER

Salt Marsh Plant Identification

ACTIVITY: HEARTY HALOPHYES

TIME: 40-50 minutes
GRADE LEVEL: 8th-College
GROUP SIZE: 10-15

Activity at a Glance: Student will utilize the iNaturalist app and a dichotomous key to identify local plant species of the Salt March. They will also learn about biogeography and the ecological impacts of non-native species.

NEXT GENERATION SCIENCE STANDARDS:

PERFORMANCE EXPECTATIONS		
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. **MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.**		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**

Analyzing and Interpreting Data • Analyze and interpret data to provide evidence for phenomena (MS-LS2-1). **Constructing Explanations and Designing Solutions** • Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena (MS-LS4-4). • Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity,	**LS2.A Interdependent Relationships in Ecosystems** • Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with non-living factors (MS-LS2-1). • In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction (MS-LS2-1). • Growth of organisms and population increases are limited by access to resources (MS-LS2-1). **LS4.B: Natural Selection** • Natural selection leads to the predominance of certain traits in a population and the suppression of others (MS-LS4-4). **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)	**Cause and Effect** • Cause and effect relationships may be used to predict phenomena in natural or designed systems (MS-LS2-1, MS-LS4-4). **Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8),(HS-LS4-6)

Ocean Literacy 1: The Earth has one big ocean with many features
G- The ocean is connected to major lakes, watersheds, and waterways because all major watersheds on Earth drain to the ocean. Rivers and streams transport nutrients, salts, sediments, and pollutants from watersheds to coastal estuaries and to the ocean.
Ocean Literacy 2: The ocean and life in the ocean shape the features of Earth
C- Erosion-the wearing away of rock, soil and other biotic and abiotic earth materials-occurs in coastal areas as wind, waves, and currents in rivers and the ocean, and the processes associated with plate tectonics moves sediments. Most beach sand (tiny bits of animals, plants, rocks, and minerals) is eroded from land sources and carried to the coast by rivers; sand is also eroded from coastal sources by surf. Sand is redistributed seasonally by waves and coastal currents.
Ocean Literacy 5: The ocean supports a great diversity of life and ecosystems.
I- Estuaries provide important and productive nursery areas for many marine and aquatic species.
Ocean Literacy 5: The ocean and humans are inextricably interconnected
C- The ocean is a source of inspiration, recreation, rejuvenation, and discovery. It is also an important element in the heritage of many cultures.

BACKGROUND INFORMATION

Southern California has a semi-arid climate. This is like climates found in southwestern areas of other continents including Europe, South America, and Australia. Mild winters with varying amounts of rain and drought-like conditions during the rest of the year are the norm. **Native** plants have developed adaptations to these climate and local soil conditions.

The lack of regular and prolonged rains, accompanied by long periods without water has had an observable impact on the **morphology** of the plants. The prevalent native plant community in the area is **chaparral**, characterized by shrub-like plants. Leaf adaptations such as aromatic oils, hairs, down-turned shape, light undersides, or small size all limit water loss. There are several other biomes as land approaches the water. Stream-side, **riparian** plant communities have more access to water, allowing greater photosynthesis. The plants found here, such as the sycamore, are **hydrophytic** or water-loving. They have adaptations such as large leaves, capable of increased photosynthesis and thus can grow tall. Surrounding the BBSC, there are actually several micro-habitats to be observed. There are **estuary** plants within and along the submerged areas, and **coastal sage scrub** on drier land.

Because there is a mix of up-stream fresh with ocean water, the plant communities that thrive in estuaries have special **adaptations**. There are both seasonal and annual fluctuations in the **salinity** within the estuary. Due to the role of osmosis in water transport within the plant, a high salt content could easily spell doom for a regular plant. The plants that are able to grow and thrive in the salt-saturated, **halophytic** conditions of a salt marsh have a number of survival techniques.

These halophytes, salt lovers, have mechanisms for isolating their salt. Pickleweed has a segmented structure, where the salt can be stored, and separated off from the rest of the plant. Other plants have evolved the ability to isolate the salt in vacuoles or secrete the salt with specialized glands.

Estuary plants play a vital role in the food-web. Plants such as cordgrass stabilize the sediment and provide shelter and food for both land and aquatic animals. The root systems function as filters, able to screen out toxins from the water before it flows to the ocean.

The Coastal Sage Scrub plant community is found in soil that is not submerged. Plants here are generally low-growing with small leaves. The volatile oils in many of the plants, such as Sagebrush and Mulefat retain water, and emit distinctive scents. The flowers on the plants here tend to be small.

There are also plants, such as Buckwheat that use wind-borne pollination.

Although the plants native to our area have successfully adapted to the local climate and soil conditions, humans are having an impact. Heavy watering in summer, as well as fertilizers necessary to keep **non-native** or ornamental plants alive in our dry terrain causes botanical problems. Introduced species can grow larger and out-compete natives for space, water and nutrients due to the changes in the fresh-salt seasonal dynamic and the soil chemistries caused by soil 'amendments'. Because the native plants occupy an important **niche** within the ecosystem, losing them does not mean one less plant. It has a ripple effect on all the plants and animals within the ecosystem. Because of this, there has been a focused effort in many local communities to restore the native plant habitat. In Newport, groups of volunteers regularly clear out the non-natives and re-plant native species.

RESOURCES

http:/era.noaa.gov/information – Estuary Restoration

http://www.coastal.ca.gov/publiced/UNBweb/whyrestore.html

http://www.coastal.ca.gov/publiced/UNBweb/restore.html

http://www.coastal.ca.gov/publiced/UNBweb/owow.html

http://www.calflora.net/bloomingplants/index.html

http://www.ocwatersheds.com - information on local issues and monitoring

TEACHER GUIDE – Plants Survey

ACTIVITY: Plant Morphology

OBJECTIVES:

Students will be able to –

1. Explain that Southern California has specific native plant communities.
2. Demonstrate using a dichotomous key to identify 3 or more plant species.
3. Discover the normal range for common plant species.
4. Recall at least 3 halophytic adaptations of estuary plants.
5. Express the negative impact that non-native and ornamental plant species have on the ecosystem.

MATERIALS:

Observation Worksheets
Dichotomous key
Smart phone or device with the iNaturalist app installed
Vis-a-vis

KEY TERMS:

Adaptation Biome Chaparral Coastal Sage Scrub Drought Estuary Food-Web Halophyte Hydrophyte Micro-habitat Morphology Native Niche Non-Native Ornamental Osmosis Photosynthesis Pollination Riparian Salt Marsh Vacuole