# BACK BAY SCIENCE CENTER

## Plants

Activity – Plant Morphology

### CALIFORNIA STATE CONTENT STANDARDS

**Grades 6 – 8**

6th Gr. Science:
Ecology - 5b, e

7th Gr Science:
Cell Biology – 1b,d
Evolution – 3a
Physical Principles in Living Systems - 6d
Investigation and Experimentation - 7a

**Grades 9 – 12**

Science:
Biology/Life Sciences –
Cell Biology 1f
Ecology 6a, b, d
Evolution – 8a, b

Earth Sciences –
Energy 4b
Biogeochemical Cycles 7a

AP Science - Science Practices SP1.1, 1.2

Earth Science ES 5.3
Life Science LS 3.1, 3.2

EEI P and C: IIa; IV b, c
Ocean Literacy Principles: 1g; 6e
Climate Literacy Principles: 2d

### BACKGROUND INFORMATION

Southern California has a semi-arid climate. This is similar to 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, and 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

EXTENSIONS

1. Write an article for school or local paper on Native vs. NonNative Species.
2. Volunteer for a Restoration project- removing nonnatives, planting natives.
3. Observe the plants at your home. If they're non-natives, consider restoring your garden with native species, which will decrease your water use and expense at home.
4. Survey the plants at your school or in your in your neighborhood. Are they natives or introduced species?
5. Using a map of Upper Newport Bay, draw plants or leaf types in their proper biome.

## TEACHER GUIDE – Plants Population Module

### ACTIVITY: Plant Morphology

## OBJECTIVES:

Students will be able to –

1. Explain that Southern California has specific native plant communities.
2. Identify at least 3 adaptive survival characteristics of plants.
3. Recall at least 3 halophytic adaptations of estuary plants.
4. Express the negative impact that non-native and ornamental plant species have on the ecosystem.

## 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

## MATERIALS:

Observation Worksheets
Hand lenses or Microscopes
Pencils
Crayons or colored pencils
Projecting Microscope
Assorted Coastal Sage Scrub, Chaparral and Ornamental Leaves, to include:
Sycamore, Pickleweed, Saltbush, Cordgrass, Mulefat, Sage, Sagebrush, Buckwheat,

Geranium, Rose