Community Mapping and Community Survey
Upper Newport Bay

Summary of Activity: Identify and map several different ecological communities at Upper Newport Bay. Observe and record physical and biological characteristics of each community.

Skills to be Developed

1. Knowledgebase. Develop and enhance the student understandings of landscape ecology, estuary operations, tides and tidal influences, fresh water biology and salt water biology.
2. Empirical science. Identification of distinct ecological communities at Upper Newport Bay. Listing of physical and biological characteristics of each community. Identification of dominant plants in each community. Identification of birds present and associated with each community.
3. Situational awareness. Students translate observations of the varied landscape in the field to create a map of ecological communities. Students are challenged to identify the principle influences from the physical settings associated with each community.

What Students will Turn in for Credit: 1) Map of ecological communities at Upper Newport Bay; 2) Tables of field observations; and 3) Quiz.

ESTUARY

Upper Newport Bay is one of the few remaining estuaries in Southern California. An ***estuary*** is an embayment along the coast of an ocean, with a generally steady supply of freshwater washed down from rivers. An estuary is a sort of mixing zone where water from the sea and water from the land meet each other. For example, San Francisco Bay is a large estuary, receiving sea water from the Pacific Ocean, and freshwater from the Sacramento River. Upper Newport Bay is an estuary too. It receives sea water input on one end, and freshwater mainly from San Diego Creek on the other.

The water environments in Upper Newport Bay are always changing. For example, during a flood tide (when the tide is coming in), sea water pushes into the bay, raises the water level and salinity, and changes the water temperature. During ebb tide, sea water retreats, the water level and salinity are lowered, and water temperature changes again. Tides strongly influence activity in the estuary. Each day, the bay experiences two high tides and two low tides. While sea water is continually moving in and out of the bay, freshwater flow plays an important role too.

During the ebb and flow of tides, freshwater is steadily being added to the bay from San Diego Creek. At low tides, open channels of the estuary are more heavily influenced by freshwater than by sea water, and vice versa during high tide. In addition, there can be periods of high freshwater flow (usually as a result of winter storms), which can exert even stronger freshwater influences. The zone where these two water resources meet and mix is called the Null Zone. It consists of brackish water — less salty than sea water, and more salty than freshwater. The ocean and San Diego Creek contribute more than just water to the bay. Nutrients and sediments are added too.

Nutrients are imported by flood tides and freshwater flow. In the bay rapid plant growth is made possible because new supplies of nutrients are imported every day. However, too many nutrients can be unhealthy for the bay's ecology (eutrophication and oxygen depletion).

Sediments from upland areas are eroded during storms, and are carried to and deposited in the bay by San Diego Creek. Over the years, sediment deposition has steadily filled-in the bay resulting in broad, shallow mudflats and marsh areas. It is normal for estuaries to gradually fill-in with sediments, but recent human activity around Upper Newport Bay has rapidly accelerated sediment in-flow. Periodic dredging (about every 8-10 years) at selected parts of the bay is necessary to remove accumulated sediments and restore desirable tidal water flow in the bay.

ECOLOGICAL COMMUNITIES

An ecological community can be defined as: *an easily recognizable geographic area that has a somewhat unique assemblage of plants and animals*. Basically, it looks different from its surroundings. The bay is painted with a multi-colored, checkerboard of ecological communities. As we walk along, we will pass through several different communities. The recognition of these patterns of communities is the foundation of the practice of "landscape ecology." Why are there different communities?

The lives of all species of organisms are ultimately controlled by the state of their surrounding physical environment. For example, some plants can live in oxygen-free soil that is submerged under water, a condition that would suffocate the roots of most other plants. A few other species of plants can survive nicely with just a few inches of intermittent rainfall each year, while most other species would quickly dry out. Soil too dry and salty for most plants proves stressful but survivable for certain salt-tolerant grasses. You will quickly observe that the physical environment of Upper Newport Bay is not homogeneous. There are areas of wet soils and dry soils, salty and unsalty soils, tidal flats and hillsides. Taken together, the physical factors of the bay's environment lay the foundation for the establishment of different assemblages of organisms who self-organize into different parts of the bay. And it is largely the special adaptations that these creatures successfully employ that continue to enchant inquisitive biologists.

There are at least seven major community types in, and surrounding the bay. They include the following:

1) Coastal Sage Scrub - A dry, drought-tolerant upland community that consists of short grasses, and low-lying shrubs. This community generally is found along the bluffs and hillsides which surround the bay. This community has many plants which are drought-deciduous (they lose their leaves after prolonged periods without rain).

2) Riparian / Woodland - Streamside community; associated with surface freshwater (ponds, creeks) or high water tables. Soils are moist all year long. Dominant plants are deep-rooted trees, and tall, bushy shrubs. Many plants in this community are seasonally-deciduous, and lose their leaves in fall and winter - regardless of rainfall patterns.

3) Freshwater/Brackish Water Marsh - Marshy, flat area, saturated soils (not just moist) or intermittently submerged with freshwater or brackish water. Soils are muddy from freshwater. Soil is depleted of oxygen due to vigorous bacterial decomposition of accumulated organic debris. Vegetation consists mainly of tall (6-10 ft.) grasses. These grasses will turn brown in winter.

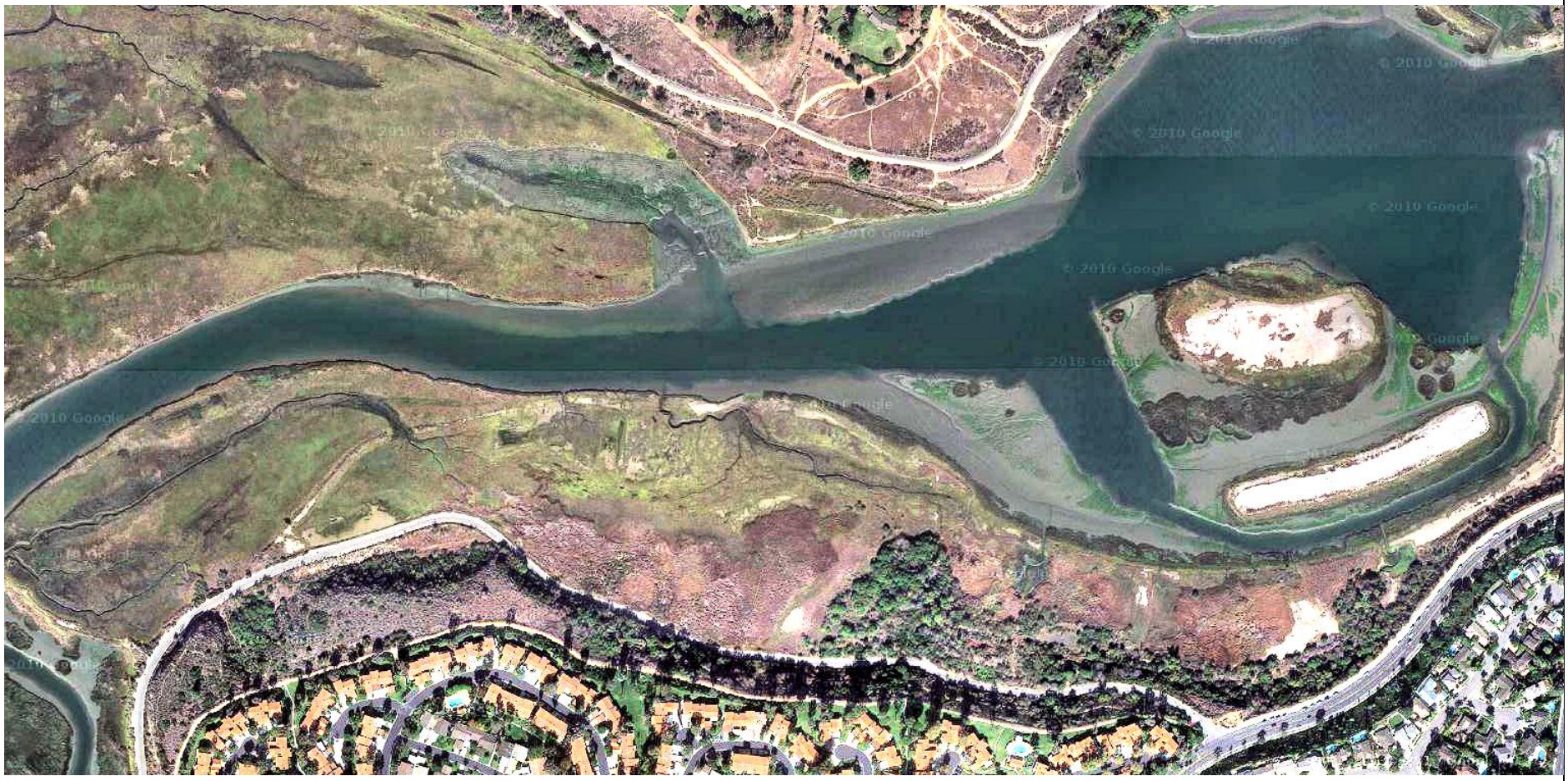
4) Salt Barren - very infrequently submerged by salty tidal waters. Little flushing by freshwater. These areas might be flooded by sea water a few times in winter. During the remainder of the year, the sea water evaporates, leaving the salts behind. Therefore, the soils here are extremely salty. In fact, you usually can see white salt deposits on the ground. This community is dominated by succulents and short, salt-tolerant grasses.

5) Salt Marsh - Marshy, flat area very frequently (daily) submerged by salty tidal waters. Soil is muddy from salt water. Soil is depleted of oxygen due to vigorous bacterial decomposition of accumulated organic debris. Salt doesn't build up because of frequent tidal flushing. At low tide the salt marsh is seen to border the mudflat and deeper, water-filled channels. This community consists mainly of medium-height (1-3 ft.) grasses. These grasses will turn brown in winter.

6) Open Channel - These are deep (3-8') channels through which tidal water and freshwater flow. They are nearly always filled with water (even at low tide), and possess a mud bottom covered with organic debris and green algae.

7) Mudflat - Broad, flat, muddy areas completely covered during high tide, and exposed during low tide. A slimy green alga sometimes covers the mudflat.

Community Mapping and Community Survey
Upper Newport Bay



COMMUNITY NAME: Riparian / Woodland

OBSERVATION CATEGORY	**FIELD OBSERVATIONS** (Note: be informative; provide details)
General Description	
Elevation and Topography	
Exposure to Tidal Influence	
Soil Moisture Content	
Main Source of Soil Moisture	
Salt Content of Soil	
Oxygen Content of Soil	
Dominant Plants	
Observed Birds and other Animals	
NOTES:	

COMMUNITY NAME: Salt Barren

OBSERVATION CATEGORY	**FIELD OBSERVATIONS** (Note: be informative; provide details)
General Description	
Elevation and Topography	
Exposure to Tidal Influence	
Soil Moisture Content	
Main Source of Soil Moisture	
Salt Content of Soil	
Oxygen Content of Soil	
Dominant Plants	
Observed Birds and other Animals	
NOTES:	

COMMUNITY NAME: Fresh Water Marsh

OBSERVATION CATEGORY	**FIELD OBSERVATIONS** (Note: be informative; provide details)
General Description	
Elevation and Topography	
Exposure to Tidal Influence	
Soil Moisture Content	
Main Source of Soil Moisture	
Salt Content of Soil	
Oxygen Content of Soil	
Dominant Plants	
Observed Birds and other Animals	
NOTES:	

COMMUNITY NAME: Salt Marsh

OBSERVATION CATEGORY	**FIELD OBSERVATIONS** (Note: be informative; provide details)
General Description	
Elevation and Topography	
Exposure to Tidal Influence	
Soil Moisture Content	
Main Source of Soil Moisture	
Salt Content of Soil	
Oxygen Content of Soil	
Dominant Plants	
Observed Birds and other Animals	
NOTES:	

COMMUNITY NAME:_____

OBSERVATION CATEGORY	**FIELD OBSERVATIONS** (Note: be informative; provide details)
General Description	
Elevation and Topography	
Exposure to Tidal Influence	
Soil Moisture Content	
Main Source of Soil Moisture	
Salt Content of Soil	
Oxygen Content of Soil	
Dominant Plants	
Observed Birds and other Animals	
NOTES:	

COMMUNITY NAME:_____

OBSERVATION CATEGORY	**FIELD OBSERVATIONS** (Note: be informative; provide details)
General Description	
Elevation and Topography	
Exposure to Tidal Influence	
Soil Moisture Content	
Main Source of Soil Moisture	
Salt Content of Soil	
Oxygen Content of Soil	
Dominant Plants	
Observed Birds and other Animals	
NOTES:	