



SCIENCE

Trading Acres

by Chris Lawrence

Overview

Students will:

- Learn about the functions of vernal pool.
- Examine and analyze a map and an environmental impact report
- Determine the impact of big box store development on seasonal wetlands.

Terrain Article: "Walton's Woods," Summer 2005, page 6.

Introduction

If you walk through a California grassland in the late summer, you will be surrounded by dry, brown grasses. But if you walk through the same grassland in the late winter or early spring, you will notice pools of water dotting the landscape. These pools, which almost magically appear and disappear with the seasons, are called vernal pools. Vernal pools are also called ephemeral or seasonal wetlands.



Vernal pools appear when grassland depressions are filled with winter and spring rains. The soil underlying a vernal pool is very hard and compact, and made of a substance that expands when wet. Until these little soil particles expand and cement together, water filters through the vernal pool, recharging the groundwater underneath. This slow percolation of water to the aquifer helps clean the water of contaminants.

Vernal pools also help decrease the scope of flooding. Because vernal pools are depressions in the surface of the soil, they act like holding tanks for rising water.

Life exists here year round. It's easy to see the vibrancy in the rainy season when these pools are teeming with life.

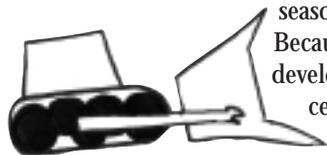
Vernal pools appear right at the time of mating and spawning. Migrating birds stop by during their long winter trek to feed, crustaceans mate, amphibians spawn, and wildflowers bloom. Yet when the vernal pools vanish in the dry season, the lifecycle continues. Seeds brought by migrating birds, as well as larva and eggs, lie in wait for the next spring rain. The plant and animal species in vernal pools are adapted to life in an environment of extremes: months of flooding followed by desert-like conditions.



Vernal pools are complex ecosystems that contribute to California's rich biodiversity. Some are 10 acres or larger, while others are the size of a kitchen table. Their placement affects the migration patterns of birds and species that prey on birds. California vernal pools sustain some 200 plant species, about half of which live only here.

California's vernal pools qualify as some of the most threatened ecosystems in the world. Over two-thirds have already been destroyed, lost to housing, roads, commercial buildings, and industrial sites. Remaining vernal pools are vanishing quickly. Vernal pools are unique ecosystems, requiring very specific soil composition and water dynamics. Most efforts to reconstruct wetlands in other places have failed.

Some protection exists for wetlands at the federal level, but only if they visibly flow into navigable waterways. But for these seasonal wetlands, or wetlands that flow into smaller rivers and streams, little to no protection exists. Because most people are generally unaware of the importance of these wetlands, permits for development are approved quickly. Big box stores like Wal-Mart have developed many of their retail centers on wetlands.



CA SCIENCE CONTENT STANDARDS GRADES 9-12: Investigation and Experimentation: 1. Scientific progress is made by asking meaningful questions and conducting careful investigations. 1H. Read and interpret topographic and geologic maps. 1K. Recognize the cumulative nature of scientific evidence. 1L. Analyze situations and solve problems that require combining and applying concepts from more than one area of science. Ecology: 6. Stability in an ecosystem is a balance between competing effects. 6B. Students know how to analyze changes in an ecosystem resulting from changes in human activity



Seasons and Reasons

Introduction Activity

In this warm up activity, students will respond to images of the same vernal pool area in its wet and dry seasons.

Teacher Directions

1. Write on a chalkboard, overhead, or piece of butcher paper the following questions. Take notes on student responses.

- Name some different habitats.
- What do they do?
- What do we do when we are in these places?
- Are these habitats considered beautiful?
- Are they equally important?



A typical inhabitant of California vernal pools, this fairy shrimp nauplius larva is about 7 hours old. By the time it is an adult, it will measure 10-44 mm long. In order to mate, fairy shrimp often travel from one vernal pool to the other by hitching a ride on animals that stop by the pool for a drink.

2. Download the images “Wet Vernal Pool” and “Dry Vernal Pool” from www.ecologycenter.org/tfs/images.

3. Place the dry vernal pool image on an overhead projector. Ask students to write or call out responses to these questions:

- What do you see?
- What plants or animals do you think live here?
- What do you think the ground feels like?
- What predators may live here?
- What animal do you think is at the top of the food chain?
- Does this look like a good place to build? Why?
- If you built a large retail center here, what would be gained? What would be lost?

4. Place the wet vernal pool image on an overhead projector. Ask students to write or call out responses to these questions:

- What do you see?
- What plants or animals do you think live here?
- What do you think the ground feels like?
- How do you think this habit affects humans?
- What predators may live here?
- What animal do you think is at the top of the food chain?
- Where does the water come from? Where does it go?
- Does this look like a good place to build? Why?
- If you built a large retail center here, what would be gained? What would be lost?

5. Inform the students that the two photographs were of the same place: a seasonal wetland near Auburn, California that was slated for development.

Glossary of Terms

Vernal Pool: A type of isolated ephemeral wetland. During the spring, temporary pools form in depressions in the soil. When wet, the soil particles at the bottom of the pool cement together to create a nearly impenetrable layer. The pool retains water until the sun dries it up. Vernal pools are home to many species, including rare and endangered species microscopic in size.

100-Year Flood: A flood which occurs every 100 years. The watermarks from such a flood are used to indicate the maximum level of flooding to be expected only once in a hundred year period. A community uses these marks in its floodplain management regulations.

Watershed: A region of land where water flows into a specified body a body of water, such as a river, a lake, sea or ocean.

Biodiversity: The number and variety of life in all its forms.

Habitat Fragmentation: The process whereby a large patch of habitat is broken down into many smaller patches of habitat.

Hydrology: A field of study concerned with the distribution and circulation of surface water, as well as water dynamics below the ground and in the atmosphere.

Impervious/Impermeable Surfaces: Surfaces that prevent water from entering the underlying soil, such as constructed surfaces like concrete.

Floodplain: Low lands that adjoin the channel of a river, stream, watercourse, ocean, lake, or other body of water, which have been or may be inundated by flood water, and those other areas subject to flooding.



Big Box Impact

In this exercise, students will determine the impact that accompanies the development of a big box store by analysing a map and public hearing notice.

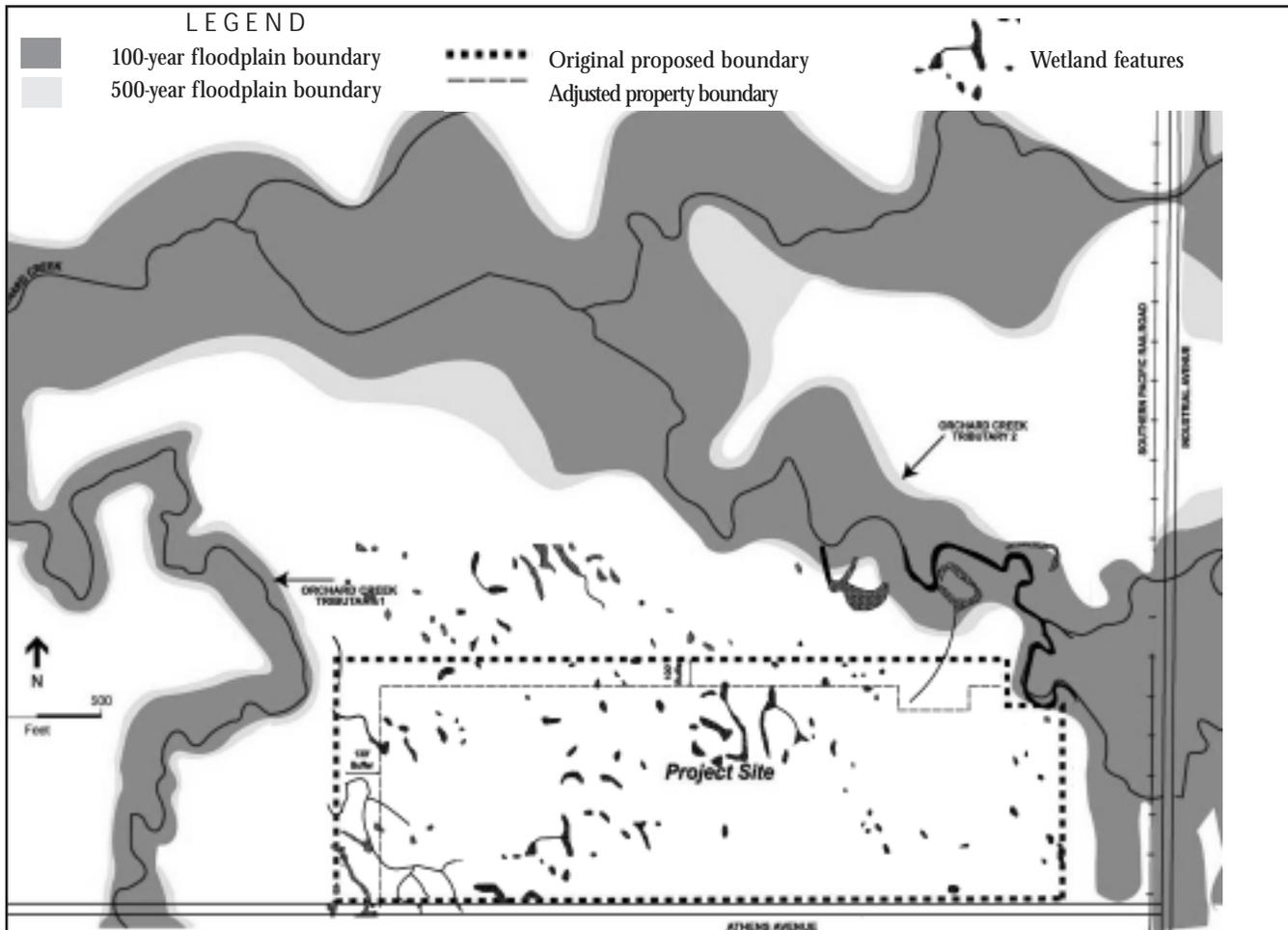
Teacher Directions

1. Assign students into groups of four. Give each group a copy of Handout A and Handout B. Review the legend.
2. Ask students to examine Handout A and answer the questions at right.

3. Ask students to examine Handout B and answer the questions beside the public notice.

NOTE: The map (Handout A) depicts land slated for development in Placer County, California. Both the map and notice (Handout B) pertain to the ephemeral wetlands they viewed in "Reasons and Seasons," page 7. In actuality, the land was developed with large buildings and parking lots, but the business was not a Wal-Mart. The project details in the notice are true to the actual development.

Handout A



QUESTIONS

1. Estimate the square footage of wetland (not including floodplains) that will be lost if this big box store is built.
2. Estimate the square footage of the 100-year floodplain. How much of the proposed development will be on this floodplain?
3. Predict what will happen to the big box store if the 100-year flood occurs.
4. During the wet season, predict what will happen to precipitation that falls on this area once it is developed.
5. Predict what will happen to the plant and animal life that call this habitat home if this big box store is built.
6. What is the environmental impact of such large areas of impervious surfaces?
7. How are wetlands connected to the floodplain through pervious and impervious surfaces?
8. How do many impervious surfaces affect the local watershed and aquatic habitats?



Handout B

Below is a notification for a public hearing regarding the development of the land depicted in Handout A. In this case, a public hearing is called because the proposed development requires new “zoning.” Land is zoned for particular uses, such as residential, commercial, industrial, agriculture, etc. When land is proposed to be used in a different way than it was used before, a public hearing must be held. New Wal-mart developments often arouse very strong opinions in the communities in which Wal-mart plans to build. Some people love them; some people hate them. A public hearing allows all parties, including the developer, to have their say before the construction begins. After hearing all the sides of the argument, the city council decides whether the proposed development will proceed.

Topic: Proposed Development of a Wal-Mart Super Center in Auburn

A future hearing will be set to discuss the merits of the project. The Placer County Planning Department has released a Draft Environmental Impact Report (EIR) for the Wal-Mart Super Center project in North Auburn. There will be a one month review period for the draft EIR.

Public hearing : Jan 26, 2 p.m.

Location: Placer County Planning Commission Hearing Room

Purpose: to discuss Wal-Mart Super Center project EIR

Significant environmental effects anticipated:

- * Transportation and Circulation
- * Air Quality
- * Biological Resources: Hydrology and Water Quality
- * Cumulative Impacts

Project details include:

- * Single-story, 224,000 sq. ft. Wal-Mart, consisting of a main structure and an attached 24,304 sq. ft. fenced outdoor garden center.
- * Site would include 2,155 parking spaces for customers and employees.
- * Proposed location on 49 acres of land between Rocklin Ave and Industrial Ave.

Our Concerns: The actual site of the proposed project is 49 acres. Other than the buffer zones surrounding the site, almost the entire 49 acres would be covered with impervious surfaces (actual store, parking lot, other structures). At least 1.57 acres of vernal pools would be filled.

From the Draft EIR:

“Vernal Pool habitat can be found in a scattered distribution throughout the proposed project site. Vernal pools are a special type of wetland; they are shallow pools with an impermeable substrata underneath (e.g. clay, hardpan). The impermeable substrata slows the percolation of the rainwater that fills these pools. The pools are typically filled during the winter and slowly dry up during the spring. Vernal pools are biologically diverse and are known as sensitive habitats regulated (protected) at the federal, state, and local levels.”

QUESTIONS

1. How many acres of impervious surface will be constructed?
2. What are the environmental impacts anticipated?
3. Why do you think these topics are listed?
4. What would the impact be on the larger ecological system with many such developments?
5. Why should we be concerned about the destruction of the vernal pools?
6. After looking at both the handouts, would you support this development? Why or why not?