SANTA CLARA ISLAND

FOR THE TEACHER

Discipline
People & The Sea

Themes
Evolution

Key Concept
The isolation, limited space and fragile ecology which make islands unique often accentuate the problems of development and human-caused changes on islands.

Synopsis
Students role-play as land planners to experience the potential conflicts of island development.

Science Processing Skills
communicating, comparing, organizing, relating, inferring, applying

Social Skills
Checking for understanding

Vocabulary
relic endemic
pristine introduced
exotic feral
insular habitat bio-diversity

Materials
- Six sheets of butcher paper, approximately 25" x 50"
- Six sets of crayons or color pens

INTRODUCTION

Santa Clara Island, an imaginary private island located 25 miles off the California coast, is the last pristine island ecosystem remaining in California. Like most other oceanic islands, Santa Clara Island provides a home for endemic plants and animals found no where else on earth. Invasive exotic plants (weeds) and feral animals have not yet been introduced to Santa Clara Island, unlike virtually every other oceanic island.

The island's owner, Mrs. Jones, whose family has held title to the island for over 200 years, has reluctantly decided to sell Santa Clara Island because of financial problems. Mrs. Jones wants to sell the island to someone who will give her the best price, yet also use the island wisely.

Because of its pristine condition and sensitive environmental concerns, several conservation organizations have expressed the need to keep the island off-limits to all people. The Galapagos Islands illustrate some of the problems which can develop when the unique bio-diversity which has survived for thousands of years is threatened with human habitation. With the establishment of an organized tourism industry on the Galapagos in 1970, the islands, within two short decades, are now faced with a myriad of environmental disasters.

According to scientific experts, the problem with this particular kind of development is not so much the controlled tourism itself, but rather the growth of human settlement and all that accompanies it. Some examples of problems include the introduction of domesticated animals. Due to recently arrived feral goats and pigs, the native iguana population has virtually disappeared from some islands and is considered endangered. Not only did the iguanas have to compete for food-native shrubs and plants-but the goats and pigs also ate their eggs. Of the 14 sub-species of giant tortoises, three are now extinct as are 180 species of plants and three species of marine birds. Black coral, once abundant, has practically disappeared. Beaches that were once popular nesting sites for sea turtles and birds have disappeared, their sands taken for making cement for construction in the urban areas. Unique hardwood trees have been cut to near extinction, and raw sewage has fouled pristine bays and coastlines.

Unfortunately, Santa Clara Island is too expensive for anyone to buy for preservation without some sort of development strategy. Other groups have expressed interest in the island for exclusive housing, agriculture, various business ventures, and even waste disposal. To determine the best course of action, Mrs. Jones has assembled a board of representative groups interested in acquiring the island. Mrs. Jones will then follow the board's recommendation for "developing" the island.

The groups submitting the proposals represent government, business, agriculture, recreation, education and conservation. The six groups are instructed by the board to submit proposals illustrating their planned development of the island, indicating, if pertinent, the location of buildings or facilities for water supplies, sewage treatment, power, housing, land transportation, island access, schools, stores, hospitals, etc..

The board wants the successful proposal to demonstrate wise-use of the island property, with modest profit if possible, for the benefit of the public, while preserving Santa Clara Island's insular habitat and endemic species in perpetuity.

THROUGH
THE ACTIVITIES

Prepare students for the activity by narrating the story background and defining the vocabulary words.

Break class into six student groups. Create heterogeneous groups that combine LEP students with English-proficient students and/or allow students with varying academic abilities to choose a task that is more verbal or artistic. Explain that this will be a cooperative activity, with each student evaluated by the results of their group's plan for the island. It will be in each student's best interest to participate as much as possible in the planning and presenting of their island proposal.

Each group receives an identical island outline (see illustrated example) on same-sized poster paper and a selection of crayons or colored felt pens to illustrate their island development plans. To track individual participation in the island development phase of this activity, you can have each student within a group choose a different colored crayon or marker. Have the student sign the back of his/her island map with their marker and use only their marker when drawing on the map.

Assign each group a different development topic from this list.

Agriculture	Education	Business
Government	Conservation	Recreation

Instruct the group members to cooperate in designing their island map from the perspective of their development topic. For example, the group with the agriculture topic will develop the island based on an agrarian economy (ranching, farming, mariculture). Likewise, the education group will develop their island for an economy based on education programs (school, camp, institute); the business group for a business economy (service, retail financial, industrial, etc.), the government group for a governmental enterprise (prison, military base, mint, etc.), the recreation group for a tourism or sports economy,

and the conservation group for an economy based on the island's preservation (wildlife preserve, park, etc.).

Give the groups 30 minutes or more to plan and illustrate their island maps. Circulate among groups to encourage everyone's participation. Ask each group to develop the island for self-sufficiency as much as possible. Mention that water, sewage, power, refuse, housing and transportation need to be worked into each plan that includes human habitation. Stress the notion of efficiency and practicality. The objective is to "develop" the island in the most ecologically sound and economically feasible way according to the given perspective.

After planning and illustrating their islands, each group will select three spokespersons. Two spokespersons will act as the "presentation team" and one will sit on the "judging committee". The judging committee will have a minimum of nine members on it. One teacher and six students from the participating class and two additional guest judges (teachers or students) from outside the class.

Each presentation team will outline their group's island proposal to the class and the judging committee. The team tries to convince the judging committee that their island proposal is the "best". For this exercise, "best" is the most practical and imaginative plan that is both economically and environmentally sound.

Santa Clara Island Rules of Order:

- Presentation Teams have a time limit of 3 minutes for the presentation and 5 minutes (or more if time permits) for questions.

- Each judge is allowed to ask the presenting group one question only.

- Group members should be encouraged to discuss their potential question before deciding on the one that their judge representative will ask.

- The presenting group's answer must come from the presentation team, not from fellow group members in the audience.

- Display the group's island map after each presentation.

- After the final presentation, the judging committee will meet outside the classroom to discuss the merits of each proposal.

- A spokesperson for the judging committee (or the teacher) should tell the entire class why the winning proposal was chosen. Allow time for discussion of the benefits and deficits of each proposal.

Discussion Questions:
Why was the chosen development plan thought to be the best one for Santa Clara Island? Do you agree/disagree? Which one would you have chosen? Why?

Make a class list of the things that were liked/disliked about each development plan. What do developers need to do (or not do) to make development in a wild area acceptable to your class?

Are there any local development projects that have problems or issues similar to those discussed in class?

Assessment
Participation in all planning, illustrating and presenting activities
Teacher observation of participation
Evidence of work on the Santa Clara Island Map (colored markers)

BEYOND THE ACTIVITIES

Earth is really a great big island in a sea of space, complete with all of the concerns and conflicts experienced on Santa Clara Island. As the world gets more and more crowded, we will have less land to live on and less water and other resources to use. Have students design an "Earth For The 21st Century" which represents the "worst case scenario" for runaway development (rampant pollution, over-population, competition for resources, etc.). Have students design a "best case scenario" for the most environmentally conscientious development of the Earth and its resources. In what direction do the students think the Earth is headed? What can we do to improve the quality of life on Earth today?

Have student pairs or small groups choose one current social or environmental issue that concerns them. Have them develop a strategy for addressing this problem. A letter campaign to a political figure, starting a local boycott, volunteering for a local cause or need, starting a clean-up or recycling program, raising funds to help a social cause, writing letters to local newspapers, etc. Have students share their various project ideas with the class. Ask students to pick one or more ideas to work on as a class project. Form committees to work on various jobs that might be needed. Try to get other classes involved with your effort.

Adapted from an activity by Larry Hurst, Catalina Island Marine Institute.

ISLAND SELLING POINTS

Write your comments in the boxes below	YES or NO	Didn't Say
Is there abundant food at a reasonable distance?		
Is it an isolated island protected from predators?		
Is it a refuge, or is human impact kept at a minimum in another way?		
Is there enough space and available materials for a rookery?		
Do other members of the species nest there?		
Is it within the birds' migratory range?		
Are there any additional appealing features?		
What are the disadvantages?		

ISLAND ROCK ADVANCE ORGANIZER

	Seabird and Island Clues from "Island Rock"	Characteristics and Natural History of "Your" Seabird
location of island where bird breeds		
length of migration in miles and days		
migration route		
number of eggs laid		
type of nest		
preferred food		
how captures prey		

Island Fact Sheet

Long Island

Long Island in southeastern New York extends about 120 miles east from the mouth of the Hudson River into the Atlantic Ocean. It is separated from the rest of New York and the Connecticut shore by Long Island Sound—a partially enclosed inlet of the Atlantic Ocean. The sound is 90 miles long and 20 miles across at its widest point. Long Island has a population of 6,861,475 and has experienced enormous urban and suburban growth since World War II. Agriculture and fishing are still important to the area and many tourists are attracted by the magnificent beaches.

The waters are warmed and enriched by the major current systems of the North Atlantic, which sweep past this portion of coast. The fertile waters teem with plankton, which in turn supports huge populations of small fishes that provide an abundant food supply for birds. However, islands and shorelines in this area such as Cape Cod, Nantucket, Martha's Vineyard, and Long Island appear to be too heavily settled to be significant havens for wildlife, although here and there a few pockets of original habitat remain. Although the marine life in Long Island Sound near the shoreline has suffered because of pollution, flounder, smelt, porgy, clams, and mussels can still be found.

Long Island has a moderate climate, with four well-defined seasons and a great diversity of weather over short periods of time. Hurricanes sometimes strike the shore, usually during August or September. In January the temperature averages 30 degrees Fahrenheit and in July the temperature averages 74 degrees.

Island Fact Sheet

Hawaiian Islands

The Hawaiian Islands are the most isolated major island group in the world. The island chain consists of low coralline islets in the north and eight major volcanic islands in the south. The landscape ranges from snow-covered mountain tops to shoreline desert, and from bog and rain forest to new lava flows. Hawaii includes about 130 islands spread out over approximately 1,600 miles in the mid-Pacific Ocean astride the Tropic of Cancer. The point closest to the mainland United States is about 2,091 miles southwest of San Francisco. Only eight of the islands are considered to be large enough for people to live on, and only seven are regularly inhabited. The state has 750 miles of coastline. It can be divided into three groups of islands: coral and sand islets in the northwest, rocky islets in the center, and the eight larger islands in the southeast. The approximately 124 islets have a combined area of about three square miles.

Hawaii has mild temperatures throughout the year with little difference between the hottest and coolest months and between day and night. Honolulu has a normal daily temperature of 72 degrees Fahrenheit in January and 80 degrees in July. This climate is due to the effects of the northeast trade winds, which blow across the islands almost continuously during the summer. Three times as much rain falls on the islands as on the adjacent sea.

More than 40% of the state is covered with forests and almost 1,400 species of flowering plants grow there. Because of its isolation, few land mammals have come to Hawaii through natural dispersal. Although there were a number of marine mammals such as seals in the islands, a small bat was the only land mammal when the Polynesians arrived. They brought with them dogs, pigs, and rats. Cats, horses, cattle, goats, and sheep were brought to the islands by Europeans.

The resident population of the state is 1,108,229, an increase of about 15% since 1980 census. Due to the growth in population and in the economy, and the increased use of limited environmental resources, there has been a loss or degradation of resources—especially on Oahu, where residential and economic growth are the greatest. Environmental concerns are an important part of the Hawaii State Plan, a statewide land-use and greenbelt program.

Island Fact Sheet

Channel Islands

The eight Channel Islands lie between 25-90 miles off the Southern California coast in the Pacific Ocean. Santa Catalina is the best known of this group and is the only island with a substantial permanent population, which is concentrated in Avalon, its only town. Catalina, along with Anacapa, San Miguel, Santa Barbara, Santa Cruz, San Clemente, San Nicolas, and Santa Rosa are all part of the Channel Island National Marine Sanctuary.
Much of the shoreline of the islands is characterized by sheer cliffs pitted with caves. Arch rocks, pinnacles of volcanic rock, and quiet coves are common.

Before the appearance of the Europeans, almost all of the Channel Islands were inhabited by the Chumash Indians. They hunted seals and sea lions, ate abalone and other shellfish, and were expert seamen. The book *Island of the Blue Dolphins* is written about these people. In the early 1800s, the Chumash Indians were moved from their islands to the coastal missions, and hunters, settlers, and ranchers moved in. Sheep ranching quickly became the primary economy of the islands with the exception of some fishing camps. For the most part, the Channel Islands today are preserved in the same natural rugged condition as they have been for thousands of years with very limited development.

The Channel Island National Marine Sanctuary was established in 1980 and is the largest marine protected area in the United States. Many of the world's whale species, such as the gray, humpback, blue, fin, and sei whales, regularly migrate through it. Because many communities fear the possible or perceived effects of restrictions, most marine protected areas allow continued access to the natural marine resources for recreational and commercial purposes. However, many of the features for which the areas were protected in the first place are beginning to degrade in quality. Kelp forests and populations of the black abalone have declined sharply in recent years. Pressures imposed by continuing human activities are intensifying the effects of natural environmental stresses on these species.

Island Fact Sheet

New Zealand

New Zealand is the most physically isolated of the advanced industrialized countries in the world. Its nearest neighbor, Australia, is approximately 1,200 miles to the northwest. The country is about the size of Colorado. It comprises two main islands, the North Island and the South Island, and numerous smaller islands.

The two major islands of New Zealand, which are separated by the narrow Cook Strait, could be considered separate continents. The North Island and the northwest corner of the South Island are on the same continental plate as India and Australia, while the South Island is on the Pacific plate. New Zealand is very mountainous, with only about 30% of the land flat or rolling. The North Island, shaped by internal volcanic activity, has regions of boiling mud and steam.

The climate throughout the country is mild and comfortable. The seasons in New Zealand are the opposite of ours: January and February are the middle of their summer, and July is wintertime and the islands' coldest month. Westerly winds from the Tasman Sea bring frequent rain.

A Polynesian people, the Maoris, reached the islands about 900. The Dutch were the first Europeans to arrive, in 1642, but the area remained relatively unknown until the arrival of Capt. James Cook in 1769. New Zealand was part of the British Empire until 1947 when it became independent.

About 84% of the country's native plants are found nowhere else in the world. Because New Zealand became isolated from other continents before mammals as we know them had evolved, their usual niches were filled by flightless birds, large insects, and other creatures. Before the arrival of the Maoris, the only land animals were birds, lizards, frogs and two species of bats. One of the flightless birds, the moa, must have been very impressive—it was twice as tall as a man. (Most of the flightless birds were hunted to extinction by people and the predators people introduced.) The Maoris brought dogs and rats, and the Europeans brought deer, goats, rabbits, possum, and other small animals.

About 74% of the people live on the North Island, where most of the industry is located. Only 25% of the population live on the South Island, which is thought of as the "country."

Island Fact Sheet

Galapagos Islands

Thirteen large volcanic islands, six smaller islands, and more than 40 islets make up the Galapagos Islands in the Pacific Ocean. They straddle the equator about 600 miles off the coast of South America and belong to Ecuador. They have a total area of 3,029 square miles and a population of 9,243. The Galapagos have unique animal species and distinctive varieties of species not found elsewhere. Best known are the giant land tortoise, which may reach 500 pounds; the flightless cormorant; and the marine iguana, which goes into the ocean to feed on seaweed. Because the Galapagos Islands are surrounded by thousands of miles of open ocean, few terrestrial plants and animals from the mainland found their way there. For seabirds, however, these isolated islands are the perfect breeding spot. There are 19 resident species of seabirds, five of which occur no where else in the world. There may be as many as three-quarters of a million seabirds in the Galapagos.

Since the islands are distant from any other land mass, their climate is largely determined by the ocean currents surrounding them. The cold Peru Current gives these equatorial islands a relatively cool, dry climate. The coastal zones are dry, but the mountains receive heavy rainfall. In some years, however, the flow of warm waters around the islands is much greater than normal, called an El Niño year, which makes the climate unpredictable, especially in the lowlands. Seabirds, which depend on productive cooler water to provide their food, may desert their nests or young because they can't find enough food to support them.

The most famous visitor to the Galapagos was Charles Darwin aboard the ship HMS *Beagle*. Darwin collected many plants and animals and observed their natural history. His theories ultimately changed scientific thinking about the evolution of life. The islands still continue to provide scientists with information about the ecological factors that shape evolution.

Pirates brought the first goats to the islands and killed tortoises for food as early as the 1600s. Fur seals were exploited and nearly driven to extinction by hunters during the 1800s. Settlers brought domestic plants and animals, some of which went wild and killed or competed with the native organisms. Española is one of only six main islands to be free of introduced species, but the Galapagos islanders are working towards eradicating them on more islands. The islands have been protected as an international refuge since 1959 and recognized as one of the world's most significant natural areas. About 20,000 tourists visit the Galapagos Islands each year, and there are strict rules to ensure that visitors don't destroy the very wildlife they came to see.

Island Fact Sheet

Farallon Islands

The Farallon Islands are three groups of seven small rocky islands 27 miles west of San Francisco—nearly straight out from the Golden Gate Bridge—and mark the city's western boundary. The southeast Farallon group is the largest part of the 100-acre wildlife refuge. Islands such as these are rare along the west coast of North America and are of very great importance to the marine mammals and seabirds that feed and breed in the eastern Pacific Ocean.

The impact of people on the islands' wildlife has been disastrous, particularly for seabirds and mammals. During the early 1900s, fur seals, elephant seals, and sea otters were hunted to virtual extinction on the islands. When tens of thousands of emigrants came to San Francisco after news of the discovery of gold, there was great need for fresh food. There were lots of seabird eggs on the Farallons and in two days in 1853 one boatload of people gathered 120,000 eggs. As a result, the murre population was almost decimated. Fortunately, in 1909, the islands were proclaimed a bird reserve. In 1969 the Farallon Islands became a National Wildlife Refuge and, in 1982, the waters around the islands were made a National Marine Sanctuary.

Whales, dolphins, and porpoises, including several endangered species, move through the water around the Farallons during their winter and spring migrations. The California sea lion and northern elephant seal populations are growing steadily, and the largest California community of harbor seals lives within the sanctuary. The Farallons are also a major feeding ground for Great White Sharks. Except for Alaska, the Farallons contain the largest seabird rookery on the west coast. Over 300,000 birds are found on these islands in the breeding season, representing 12 of the 16 species that breed on the west coast. The breeding animals are relatively safe from interference by people because the island's steep granite cliffs keep boats from docking. People who do visit have to be transferred from their boats to shore by a large boom.

The waters around the Farallons are extremely cold—ocean water off the Farallons is colder than off Vancouver Island in Canada. The area is exceptionally productive due to the prevailing winds and currents that result in a regular seasonal upwelling of nutrient rich waters. These nutrients support the growth of phytoplankton, which in turn nourishes the rest of the food chain, from zooplankton to fish to birds and marine mammals.