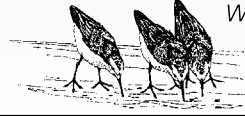


Summer 2005

Tideline

San Francisco Bay National
Wildlife Refuge Complex



Volume 25, Number 2

Dungeness Crabs: Crustacean Mascots of the San Francisco Bay

By Carmen Minch

Those walking along San Francisco's famed Jefferson Street near Pier 39, otherwise known as Fisherman's Wharf, are bombarded with a plethora of visual stimuli. As a major tourist attraction, the sight of boutiques peddling commemorative shot glasses and T-shirts is no surprise. As one ventures farther down the street, it becomes apparent that if there were a crustacean mascot for San Francisco, it would be the Dungeness crab. Indeed, crabs adorn many a restaurant on the Wharf, and a large crab sculpture takes center stage in the plaza at Pier 39.

Crab shacks and steaming cauldrons perennially line Taylor Street, hawking local crab and other seafood relatives. What few may realize is that none of these crabs were caught in the San Francisco Bay, but rather, outside the golden gate in the Pacific Ocean.

Dungeness crab (*Cancer magister*), also known as the market crab, is the most abundant crab in California. Named after the town Dungeness in the State of Washington (the town is now known as Old Town), Dungeness crabs are found in the Pacific waters from Alaska to Baja California. However, they are rarely seen south of Santa Barbara, California.

Crabs are curious-looking creatures. With jointed, spindly legs, and a segmented body, they are distant cousins of spiders and insects. Crabs belong to the phylum Arthropoda and the subphylum Crustacea. Crustaceans are primarily aquatic and characterized by having a tough exoskeleton, two pairs of antennae, and mouth parts called mandibles.



Most crustaceans have a well-developed sense of taste. Taste receptors are located in the mandibles and also on the antennae and the legs. They also have sensory hairs on the legs to detect movement in the air and water.

The exoskeleton shell, ideal for protecting the crab from the elements and predators, also prevents the crab from increasing in size. Imagine being encased in a medieval suit of armor as a toddler, or a wet suit made of neoprene. As you increase in size and reach maturity, the suit, which is of finite size, will hamper your development - thus, the plight of the crab.

Fortunately, nature devised a solution for this predicament. To accommodate growth, crabs shed their entire shell, or molt, once a year. Prior to the molt, crabs begin producing a new shell that has not yet hardened. The crab's tissues takes in water and increase in size. The

Continued page 2

Dungeness Crabs: Crustacean

existing shell then splits at the junction of the carapace (the shell that covers the fused head and thorax) and the abdomen, creating a small slit. The soft-shelled crab backs out of the old shell through the slit. Without its calcified armor, the crab is vulnerable to predators and retreats to a safe place while it undergoes rapid growth and waits for the new shell to harden. The size of the crab will be fixed until its next molt. Dungeness crabs molt on average six times during their first year. Six more molts are needed in their second year to reach sexual maturity.

Not only does molting allow the crab to grow, it allows the restoration of any missing limbs.

Not all is lost should a crab happen to have its leg amputated. It simply waits for the next molt to rejuvenate the leg. The rejuvenated leg is considerably smaller than the original leg creating an odd, lopsided look.

It should ease the minds of even the vainest crabs that the leg will reach normal size after successive molts.

Several other crab species reside in the San Francisco Bay and are collectively known as "rock crabs." These are the yellow crab (*Cancer anthonyi*), the rock crab (*Cancer antennarius*), the red crab (*Cancer productus*), and the slender crab (*Cancer gracilis*).

Because the Dungeness crab is larger and meatier than the rest of these can-croid crabs, it has grown to be a huge fishery.

Since the bays are an important nursery ground for Dungeness crabs, it is illegal to catch any Dungeness crabs in the San Francisco and San Pablo Bays, and in all sloughs and estuaries between the Golden Gate Bridge and the Carquinez Bridge. It was discovered that Dungeness crabs in the San Francisco Bay molt more frequently, and therefore, grow much faster than crabs that are reared in the ocean.

Female Dungeness crabs, distinguished from the male crabs by a "U"-shaped abdomen rather than a "V", can carry anywhere from 500,000 to 2 million eggs after mating.

Although eggs hatch in nearshore coastal waters in November to February, the crabs will return to the bay between April and June after various larval stages and metamorphosis.

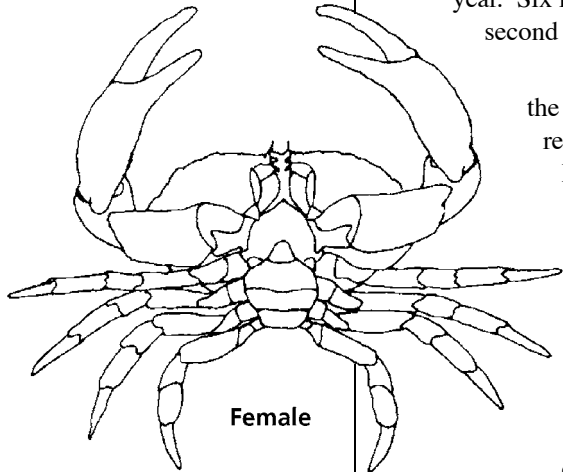
Crab larvae look suspiciously like shrimp and are extremely sensitive to ocean depth, salinity levels, and temperatures. They are planktonic, drifting organisms that travel wherever the ocean currents take them. The last larval stage before metamorphosis is called the megalop stage. It is during this stage when the crab larvae develop claws and can swim. The larvae and megalops are an important food source for several other marine animals such as larger crabs, octopi, coho and Chinook salmon, sea otters, and flatfishes. As many as 28 different fish prey on these young crabs. In turn, Dungeness crabs prey on clams, fish, other crustaceans, and other bottom-dwelling organisms on the ocean floor. Being opportunistic feeders, it is also common for Dungeness crabs in all age groups to engage in cannibalism.

Megalops morph into juvenile crabs in April and June and enter the San Francisco Bay in large numbers. In fact, most of the Dungeness crabs found in the San Francisco Bay are juveniles. More crabs are found in the north bay than in the south bay. To protect themselves from predators, crabs dig themselves into the bay floor with their legs or claws and bury themselves from view. After spending one year in the San Francisco Bay, the crabs return to the ocean to mate.

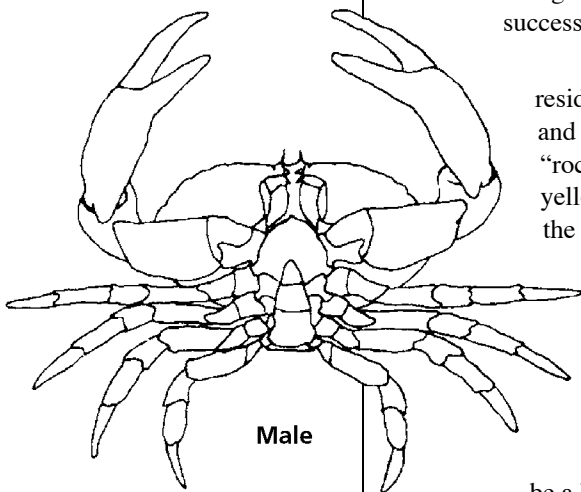
On average, two million pounds of Dungeness crabs are landed annually from the Central California (San Francisco, Monterey and Avila-Morro Bay regions) fishery alone. In the 1956-1957 season, 8.4 million pounds of crabs were landed. The number of crabs caught in the following years steeply declined, and in 1961-1962, only 710,000 pounds of crabs were caught. This steep decline generated much interest in researching this fishery and the life history of the Dungeness crab.

The exact reason for the decline is unknown. It is believed that warmer ocean temperatures may have had the greatest impact on crab populations. Other factors that could have impacted the Dungeness crab population were the effects of pollution in the San Francisco Bay and the predation of crab eggs by nemertean worms.

The sharp decline in Dungeness crab



Female



Male

Mascots of the San Francisco Bay

landings and the concern of illegal take of small crabs prompted the California Fish and Game Commission to prohibit catching Dungeness crabs in the San Francisco Bay in 1978.

Crabbing for other cancrivora crabs in the Bay is allowed as long as the crabs meet size limits. For information regarding crabbing in the San Francisco Bay, you can call log on to <http://www.dfg.ca.gov/mrd/oceanfish2005.pdf>.

There are steep fines for possessing Dungeness crabs in the San Francisco and San Pablo bays, and it is wise to learn how to distinguish this crab from the other “rock crabs.” Distinguishing between the Dungeness crab from other “rock crabs” is not as difficult as one might think. Dungeness crabs have white-tipped pincers on the claws while almost all the other crabs in the bay have black-tipped pincers.

The slender crab may be the only one easily confused with a young Dungeness crab. Both have white-tipped pincers on the claws. However, Dungeness crabs have claws that are prominently sawtoothed, with more than a dozen teeth along the edges of the claws. Slender crabs have claws that are sharp-edged, with two or three prominent teeth. In addition, the last three joints of the walking legs of Dungeness crabs have hairs. Slender crabs have no hairs on the last three joints of the walking legs.

The Dungeness crab can bring to mind several meanings for several people: an

Rock crab have dark pincers instead of the light pincers of the dungeness.



economically important fishery; a delicacy for many cultures; or a species having significant impact on the food web and the natural world. Responsible management of this species can benefit those who depend on the crab for their livelihood and those who have developed a taste for this crustacean. Research on this species can provide insight into the ever-changing environment, which can benefit all of us.

Besides, San Francisco’s Fisherman’s Wharf just wouldn’t be the same without the charismatic Dungeness crab.

Carmen Minch is an Outdoor Recreation Planner and a Refuge Officer for the San Francisco Bay National Wildlife Refuge Complex.

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San Francisco Bay National Wildlife Refuge Complex

Founded in 1974 and administered by the U.S. Fish and Wildlife Service, Don Edwards San Francisco Bay National Wildlife Refuge exists to preserve wildlife habitat, protect threatened and endangered species, protect migratory birds, and provide opportunities for nature study. Six additional refuges are managed from the headquarters located in Fremont: San Pablo Bay NWR, Antioch Dunes NWR, Salinas River NWR, Ellicott Slough NWR, Marin Islands NWR, and Farallon NWR.

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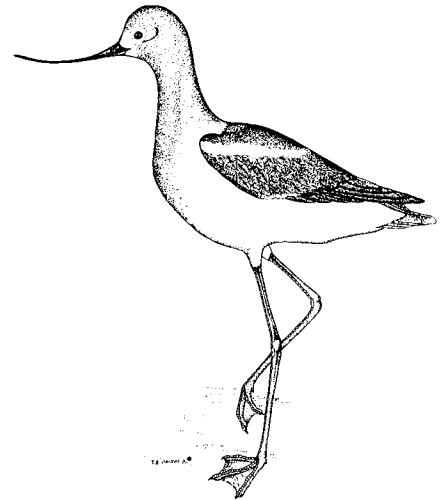
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Help Us Help the Refuge

Mail your donation to: **San Francisco Bay Wildlife Society, P.O. Box 234, Newark, CA 94560.** You may also fax your membership donation using a Visa or MasterCard number to (510) 792-5828.

For a gift membership, call 510-792-0222 ext. 40.

San Francisco Bay Wildlife Society is a nonprofit 501(c)(3) organization which raises money and awareness for the San Francisco Bay National Wildlife Refuge Complex.

YES! *I want to support San Francisco Bay Wildlife Society and its programs with my membership. My dues include a subscription to Tideline and 15% discount at the Don Edwards SF Bay National Wildlife Refuge bookstore. Enclosed is my contribution of:*

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Check Visa or MasterCard # _____ Exp. Date _____

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Name _____

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The Don Edwards San Francisco Bay National Wildlife Refuge Presents

Junior Naturalist Summer Day Camp 2005

Hey kids! Would you like to step into the shoes of a naturalist and join us for an adventure to explore the wetlands of the San Francisco Bay? Meet new friends? Spend a week outdoors at the Don Edwards San Francisco Bay National Wildlife Refuge? If so, check out all of the details below...

- Where:** Don Edwards San Francisco Bay National Wildlife Refuge
Visitor Center in Fremont (by the Dumbarton Bridge)
- Who:** Students entering 3rd, 4th, 5th, and 6th grade
- When:** July 26th - 29th, Tuesday - Friday, 9:00 am - 3:00 pm
- Cost:** FREE!!!!

How to Apply: Fill out the form below. Applicants will be accepted on a first-come basis; however, first-time participants will be given priority. In addition, please write a letter (one page or less) telling us why you would like to participate in our program. Applicants must be able to attend all sessions. Junior Naturalists will need to bring their own lunch, water bottle, daypack, outdoor clothing, sturdy footwear, and sun screen. **Application deadline is 5:00 pm on Friday June 24th, 2005.** Participants will be notified by mail.

Please send your letter and application to: **The Junior Naturalist Program**
P.O. Box 524
Newark, CA 94560

Registration Form

Name: _____

Address: _____

Phone Number: _____

Grade Entering in the fall: _____

Birth Date: _____ Have you participated in the program before? _____

Parent/Guardian Name: _____

Parent/Guardian Signature: _____

Don't forget to write a letter about why you want to participate!!!

The Devil's Slide Rock Murre Cam Is Here!

By *Gerry McChesney*

For nearly 10 years, biologists from the Common Murre Restoration Project stood with high-powered spotting scopes off Highway 1, diligently observing and recording the bustling

noticeable impact from these events was the loss of the Devil's Slide Rock murre colony, which contained as many as 3,000 murre in the early 1980s but was extirpated in 1986.

The Common Murre Restoration Project began its efforts to restore the Devil's Slide Rock colony in 1996. The project is a collaborative effort that includes several partner groups, including USFWS-San Francisco Bay NWRC, Humboldt State University, National Audubon Society, California Department of Fish and Game, the National Oceanic and Atmospheric Administration, and others. The technique used to restore the colony is known as "social attraction," and employs the use of murre decoys, a sound system that broadcasts murre calls, and mirrors.

The social attraction efforts resulted in immediate success. The project's goal was to have 100 breeding pairs on the rock by 2006. The project reached that goal in only four years! In 2004, 190 pairs bred, almost double the ten-year goal! As of April 2005, we are already counting over 450 murre on the rock with three weeks to go before egg-laying even begins.

With increases in breeding murre pairs comes another challenge: how to monitor them all. High-powered spotting scopes are used 1,000 feet away on the mainland. As we decrease the number of decoys and near the point where we will no longer deploy social attraction equipment, we want to make sure the murre continue to breed and behave normally on their own. Following every site in a crowded murre colony has become almost impossible from so far away. Enter the two remote video cameras. Since the cameras were installed right next to the colony, only a few feet away from the closest birds, we are able to obtain high quality, close-up views of almost every nest site on the rock. We expect this to increase our monitoring abilities and efficiency dramatically, provide great views of eggs and chicks, and even allow us to identify fish brought in to feed the young. The public can now see these same things from shore at the Point Montara Lighthouse Hostel and at home using a computer.

The cameras work by sending signals from a transmitter on the rock to two receivers on the mainland. One is on a portable receiving system that we use at our usual monitoring locations

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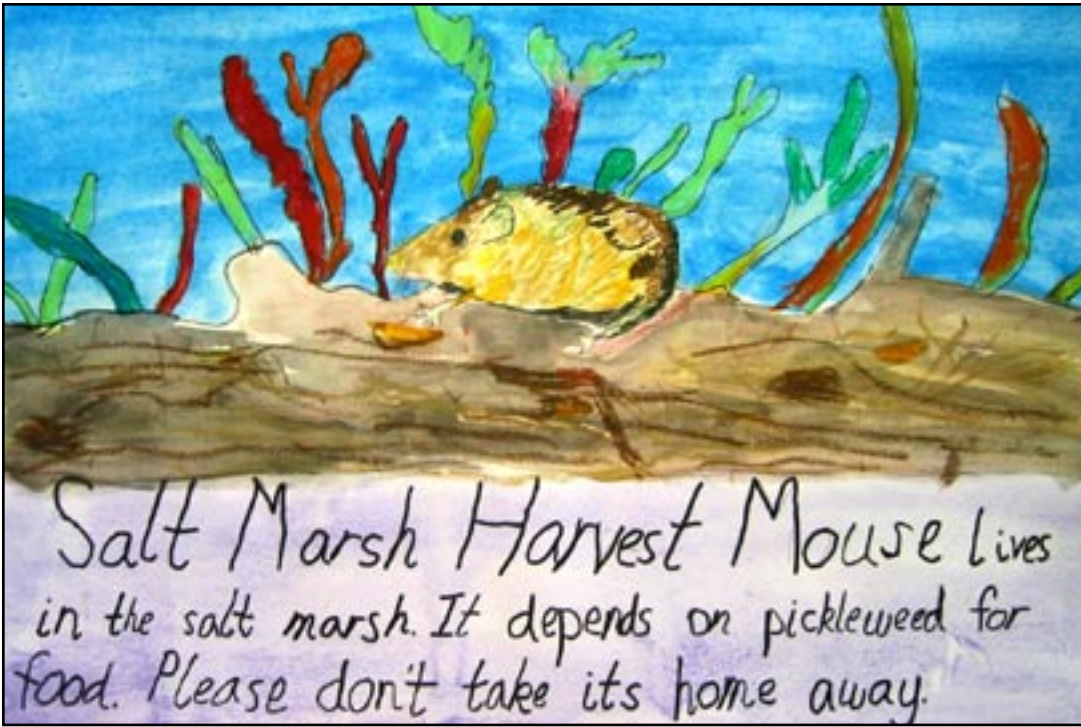
Top: Newly installed video camera and Common Murre decoys on Devil's Slide Rock.

Above: Picture of Common Murres, Brandt's Cormorants, and guano-covered decoys taken with the remote video system on Devil's Slide Rock.

activity 1,000 feet away on Devil's Slide Rock in San Mateo County. As the seabird breeding colony grew, it became difficult for biologists to assess the number of murre on the rock, and the behavior they were exhibiting.

On February 4th, 2005, two remote video cameras were installed on Devil's Slide Rock, home of our seabird restoration site. The cameras enabled us to monitor the breeding success and behavior of the common murre that are nesting in ever-growing numbers on the rock. Not only do the cameras allow biologists to monitor the murre, they allow the general public to see live video of these birds nesting and interacting with one another! There are two ways to see this incredible video. The Point Montara Lighthouse Hostel in coastal San Mateo County hosts a television that offers high-definition video. If a trip to the hostel is not feasible, you can view murre through the new murre web cam, available online from your own computer.

The Common Murre Restoration Project is a well-known success story among seabird biologists. It was established in 1995 to restore murre breeding populations in central California that were impacted by human-caused sources including oil spills and drowning by gill-nets used to catch halibut and other fish. The most



*The Don Edwards San Francisco Bay National Wildlife Refuge would like to thank all those who entered the **23rd Annual Endangered Species Poster Contest!** Congratulations to **1st Grader Jenny Chiu** from Ardenwood Elementary who took home **Best in Show** (above). All entries will be on display at the Visitor Center in Fremont until May 29th.*

The Devil's Slide Rock Murre Cam Is Here! *from previous page*

along Highway 1 just south of Pacifica. The other is placed at the Point Montara Lighthouse Hostel about three miles south, but still within sight, of Devil's Slide Rock. The video signal is carried to a computer, where the cameras can be controlled using special software. The portable system allows us to look at the birds through our scopes the way we're used to, while using the cameras to get a closer look. The receiver at the Hostel provides an internet connection that allows us to view murre from our office computers and makes it available on the world wide web.

The National Audubon Society has made it possible for anyone to watch breeding murre, Brandt's Cormorants, and other seabirds on this successful restoration site right from their own computer! The web cam is available either through the Refuge Complex's Common Murre Restoration Project (<http://sfbayrefuges.fws.gov/murre/murrehome.htm>) or the National Audubon Society's Project Puffin (<http://www.projectpuffin.org/common-murre.html>) web page.

As an added bonus, we also installed a new interpretive display at the Point Montara Lighthouse Hostel, complete with an LCD TV screen featuring high-quality live video and audio of Devil's Slide Rock. The display also contains information about the Project, the video system, and the seabirds you can see on the rock. The Hostel is located along Highway 1 at 16th Street in Montara (between Pacifica and Half Moon Bay) and is open to the public daily from 7:30-10:00AM and 4:30-9:30PM, or call the Hostel at (650)728-7177 for more information.

We are indebted to Chris and Janice Bauman of the Point Montara Lighthouse Hostel for allowing us to install our receiving system and for all of their additional cooperation, support and enthusiasm, and to the National Audubon Society for hosting our web cam. We also thank SeeMore Wildlife Systems for all of their extra efforts making our video system work.

Gerry McChesney is a biologist at the San Francisco Bay National Wildlife Refuge Complex and head of the Common Murre Restoration Project.

The Don Edwards San Francisco Bay National Wildlife Refuge would like to thank all contributors to the 23rd Annual Endangered Species Poster Contest!

Wildlife Stewards

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Lawrence Hall of Science

Lindsay Wildlife Museum

The San Francisco Zoo

The Tech Museum of Innovation in San Jose

Special thanks to Linda and Virgil Patterson for their help in judging and Bay Frames of Newark for the fine job they did in framing our Best In Show poster.



The Don Edwards San Francisco
Bay National Wildlife Refuge
would like to thank Wildlife
Stewards, BFI and Starbucks for
their generous donation for our
annual Earth Day Cleanup!



Nearly 200 wonderful posters migrated to the Environmental Education Center for the 2005 International Migratory Bird Day Poster Contest. Above is the Best In Show created by Sunny Chiu from Ardenwood School. Congratulations Sunny! All entries will be on display at the EEC until May 31. Great job everyone!

Special thanks to Bay Frame, Happy Hollow Park & Zoo, Santa Clara Valley Audubon Society, San Francisco Bay Bird Observatory, and the Wild Bird Center of Los Gatos for their generous contributions to International Migratory Bird Day 2005.

Mapping the Marsh

By Ken Clarkson

"I know what that is. That's doggie dookie!" shouts Timothy as the slide flashes on the screen. He is actually partially correct. It is a slide of common gray fox scat, a fellow member of the Canine family. We are working on our search image training as part of a predator monitoring project involving the *NatureMapping* program at the Don Edwards San Francisco Bay National Wildlife Refuge. Three months later Timothy is standing on a levee in the middle of a salt marsh looking at a fox track. He is holding a Palm Pilot with an attached GPS unit. He taps the icon on the screen showing a silhouette of a dog, representing the Canid family. He scrolls down the list until he finds the common gray fox, tap. He holds the unit up to the sky while dancing in a circle. "Position Acquired" reads the screen. He runs off down the trail to catch up with the rest of his tracking team.

These fifth grade students from the East Palo Alto Charter School in the City of East Palo Alto are participating in a pilot program with the refuge to study urban predators in the salt marsh and report their data to refuge biologists.

The East Palo Alto Charter School lies on the border of an urban-wildlands interface. The habitats of the South San Francisco Bay, salt marsh, slough, mudflats, and bay, are adjacent to the eastern border of the school. An urban landscape lies to the west. This ecotone provides a potential freeway for urban predators to infiltrate the sensitive ecosystem of the salt marsh and threaten endangered species such as the California clapper rail, a bird that only lives in the salt marshes of the San Francisco Bay. Urban landscapes support expanding populations of predators such as feral cats, striped skunks, raccoons, opossums, dogs, red foxes, common ravens and American crows.

The students are using methodology based on the national *NatureMapping* Program, which trains citizens to identify species and report locations of sightings. The students are using a variety of techniques to identify predators on trails of the salt marsh. They record live sightings of predators during monthly hikes. Because many of the mammalian predators are nocturnal, the students also use tracking techniques to identify these animals. They identify, measure, and photograph tracks, scats and sign. They record their data using handheld Palm Pilots with attached GPS units equipped with *Cybertracker* software. This icon-driven software was originally

developed for illiterate South African Bushmen trackers. Tap on the animal track icon to enter footprint measurements. Tap on the carcass icon to enter kill site data. And yes, tap on the dookie icon to enter scat data. *Cybertracker* has been called a "Game Boy for young trackers."

Each month, a group of 20 local volunteer trackers from the Institute of Nature Awareness help train students in tracking and software use. Field equipment and field guides are purchased with funds from the Nature of Learning Grant, a grant which encourages educators to use refuges as outdoor classrooms.

After the hike, we download the data from the Palm Pilots onto a laptop computer. The data is compiled onto a computerized map, which is then projected onto a screen in the classroom for discussion. The goal of this project is to provide valuable data to help conserve endangered salt marsh species. The project also provides these 5th graders with information to educate their community about threats caused by urban predators. This in turn will encourage people to make changes to help protect their local resources. Their work will provide information at a regional and state scale through the *NatureMapping* Program. These young trackers will be added to a growing number of students involved in working with professionals in scientific field investigation.

For a demonstration of this program, join Ken Clarkson and East Palo Alto Charter School fifth graders on June 4 at 10 a.m. at the refuge Visitor Center in Fremont. SPACE IS LIMITED. Call 510-792-0222 ext. 43 for reservations. See page 10 for more information.

For more information on how to participate in the *NatureMapping* Program, visit <http://www.fish.washington.edu/naturemapping/>

For more information on Cybertracking, visit <http://www.cybertrackerworld.com>

Ken Clarkson is the Environmental Education Specialist at the Don Edwards San Francisco Bay National Wildlife Refuge



These fifth grade students from the East Palo Alto Charter School in the City of East Palo Alto are participating in a pilot program with the refuge to study urban predators in the salt marsh and report their data to refuge biologists.

Summer Activity Schedule

June

Saturday, June 4

Cybertracking the Marsh

Meet at Visitor Center Auditorium, Fremont
10:00 a.m. – 12:00 p.m.

Join a special World Environment Day event! Hike the refuge trails while mapping the wildlife of the marsh at the Don Edwards Visitor Center in Fremont. Fifth grade students will lead the hike that demonstrates the Cybertracker software data collection program that uses Palm Pilots and GPS units to collect wildlife data. Following the hike we will regroup to hotsync the computers and view the data on digital maps. This program is being conducted with the national NatureMapping program, which trains citizens to report locations of wildlife. All ages welcome. Space is limited to 30 people! Call 510-792-0222 ext. 43 for reservations.

Sunday, June 5

Salt Pond Tour

Meet at Bayfront Park, Menlo Park
1:00 p.m. – 3:00 p.m.

Did you know that the largest tidal wetland restoration project on the West Coast is happening right here in San Francisco Bay? Hear more about this project and view some of the salt ponds recently acquired by the Don Edwards San Francisco Bay National Wildlife Refuge. Geared toward adults. RESERVATIONS REQUIRED. Call 510-792-0222 ext. 43 for reservations and directions.

Saturday, June 11

Family Bird Walk

Visitor Center, Fremont
10:00 a.m. - 12:00 p.m.

Let family walks become a shared time of nature learning. We'll begin by helping kids create their personal birdwatching field guides, then head out onto the trails to find those birds. Learn about the salt marsh habitat along the way. A limited number of binoculars are available to borrow. Recommended for children ages 5-10. RESERVATIONS REQUIRED. Call 510-792-0222. Led by Eileen McLaughlin.

A Trip Back in Time

Visitor Center, Fremont
10:30 a.m. - 12:00 p.m.

Revive the vanishing knowledge of the history of the Don Edwards San Francisco Bay National Wildlife Refuge grounds by strolling the trails with docent Ray Studer. Ray spent most of 2004 researching the on-site salt production, railroads and homes that were located on the refuge grounds until the 1950's. Using a collection of old photographs, the last vestiges of a way of life can be traced back to the 1850's that led to the construction of the town of Newark in 1876.

Exploring the Dunes

Antioch Dunes NWR, Antioch
10:00 a.m. – 11:00 a.m.

Did you know there's a National Wildlife Refuge in Antioch? Here's your chance to explore this refuge that is usually closed to the public. This guided tour (1-1.5 mile) will focus on the wonders of Antioch Dunes National Wildlife Refuge. Wear sturdy shoes for the sandy hike along the dunes. All ages welcome. No reservations required. No facilities. Contact 510-521-9624 for additional information and directions.

Slough Whoo?

Environmental Education Center, Alviso
2:00 p.m. – 3:30 p.m.

Whoo...whoo..whoo did that owl eat? Bet you can find out! Come solve the mystery of who ate whom and learn a bit about these nocturnal predators. We will watch a slide show and see lots of owls, hike the habitats to search for owl clues, and get a chance to dissect owl pellets to discover exactly who that owl ate! Reservations required. Call Tina at 408-262-5513 x104.

Sunday, June 12

South Bay Salt Pond Restoration Presentation

Visitor Center Auditorium, Fremont
1:00 p.m. – 2:00 p.m.

The South Bay Restoration Project will transform South San Francisco Bay in the next few decades. How will this affect habitat, wildlife, and wildlife-oriented recreation? In this slide presentation, learn about the project, the

role of the Don Edwards San Francisco Bay National Wildlife Refuge, and how you can become involved with the largest tidal wetland restoration project on the West Coast. Geared for ages 12 and older.

Saturday, June 18

The Sol of the Refuge

Environmental Education Center
1:00 p.m. – 3:00 p.m.

The summer sun is calling and it's inviting all who love summer to come explore that big ball of energy in the sky! An affiliate of the Earthsense organization will enlighten the group on solar power, the renewable energy of the future. A high-powered telescope will be set-up for viewing sunspots. You will also get to make and use a solar oven to take home. Reservations required. Call Tina at 408-262-5513 x104.

Salt Pond Tour

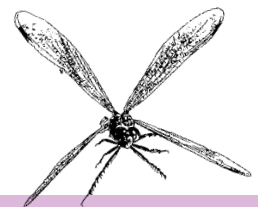
Meet at Bayfront Park, Menlo Park
1:00 p.m. – 3:00 p.m.

Did you know that the largest tidal wetland restoration project on the West Coast is happening right here in San Francisco Bay? Hear more about this project and view some of the salt ponds recently acquired by the Don Edwards San Francisco Bay National Wildlife Refuge. Geared toward adults. RESERVATIONS REQUIRED. Call 510-792-0222 ext. 43 for reservations and directions.

Twilight Marsh Walk

Visitor Center, Fremont
7:30 p.m. – 9:00 p.m.

Experience the salt marsh at twilight on an easy stroll along Tidelands (1 1/3 mile) Trail. At the setting of the sun we will observe the beginning of nature's night shift. Come discover the sights, sounds, and smells of the refuge as night descends. Meet at the observation deck. Not suitable for young children. RESERVATIONS REQUIRED. Call 510-792-0222. Led by Mary and Gene Bobik.



Don Edwards San Francisco Bay National Wildlife Refuge

1 Marshlands Road, Fremont – (510) 792-0222 • 1751 Grand Blvd, Alviso – (408) 262-5513 • <http://desfbay.fws.gov>

Summer Activity Schedule

Sunday, June 19

It's Not My Fault!

Visitor Center, Fremont
11:00 a.m. - 12:00 p.m.

The San Francisco Bay region is a complex maze of faults, mountains, and other geologic formations. During the one-mile hike, we will explore the formation of the San Francisco Bay and the hill upon which the Visitor Center sits. Geared toward adults. Led by Carmen Minch.

Marsh Mud Mania

Environmental Education Center
1:00 p.m. - 2:30 p.m.

What's that wiggling and squiggling? Think that brown stuff is just mud? Think again!!! Come take a slough hike, collect some ooey, goopy mud, and discover which critters the birds find during a low-tide feast. We'll also compare mud creatures from two different habitats to see what they can tell us about the health of these muddy homes. Reservations required. Call Tina at 408-262-5513 x104.

Father's Day Family Bird Walk

Environmental Education Center, Alviso
3:00 p.m. - 4:30 p.m.

Families celebrating Father's Day are invited to join birding enthusiast, Ceal Craig, for an informal stroll along the boardwalk and through various wetland habitats. This is a great time of year to observe baby birds and their attentive parents. Great family outing, suitable for all ages. RESERVATIONS REQUIRED. Call Laurie McEwen at 408-262-5513 ext. 102.

Saturday, June 25

Hawk Walk

Meet at Visitor Center Entrance, Fremont
8:00 a.m. - 10:00 a.m.

Join Laurey Hemenway on a leisurely walk through the refuge and learn to differentiate between the various raptors. Identify other migratory birds in the upland and salt marsh habitats. Wear comfortable shoes and bring a bird book and binoculars. Recommended for ages 8 and up. RESERVATIONS REQUIRED. Call 510-792-0222.

Bike the Bay

Meet at Visitor Center Flagpole, Fremont
10:00 a.m. - 12:00 p.m.

A slow and easy 5-mile bicycle tour of the marshes and salt ponds along dirt levees and trails. Learn about the ecology and history of the salt marshes of San Francisco Bay. Bring helmets (mandatory), bikes with knobby tires, water, and a lunch if you wish to eat with the group at the end of the tour overlooking the marsh. RESERVATIONS REQUIRED. Call 510-792-0222. Led by Norton Bell.

Sunday, June 26

South Bay Salt Pond Restoration Presentation

Environmental Education Center, Alviso
3:00 p.m. - 4:00 p.m.

The South Bay Restoration Project will transform South San Francisco Bay in the next few decades. How will this affect habitat, wildlife, and wildlife-oriented recreation? In this slide presentation, learn about the project, the role of the Don Edwards San Francisco Bay National Wildlife Refuge, and how you can become involved with the largest tidal wetland restoration project on the West Coast. Geared for ages 12 and older.

July

Saturday, July 9

Family Bird Walk

Visitor Center, Fremont
10:00 a.m. - 12:00 p.m.

Let family walks become a shared time of nature learning. We'll begin by helping kids create their personal birdwatching field guides, then head out onto the trails to find those birds. Learn about the salt marsh habitat along the way. A limited number of binoculars are available to borrow. Recommended for children ages 5-10. RESERVATIONS REQUIRED. Call 510-792-0222. Led by Eileen McLaughlin.

Exploring the Dunes

Antioch Dunes NWR, Antioch
10:00 a.m. - 11:00 a.m.

Did you know there's a National Wildlife Ref-

uge in Antioch? Here's your chance to explore this refuge that is usually closed to the public. This guided tour (1-1.5 mile) will focus on the wonders of Antioch Dunes National Wildlife Refuge. Wear sturdy shoes for the sandy hike along the dunes. All ages welcome. No reservations required. No facilities. Contact 510-521-9624 for additional information and directions.

South Bay Salt Pond Restoration Presentation

Visitor Center Auditorium, Fremont
1:00 p.m. - 2:00 p.m.

The South Bay Restoration Project will transform South San Francisco Bay in the next few decades. How will this affect habitat, wildlife, and wildlife-oriented recreation? In this slide presentation, learn about the project, the role of the Don Edwards San Francisco Bay National Wildlife Refuge, and how you can become involved with the largest tidal wetland restoration project on the West Coast. Geared for ages 12 and older.

Sunday, July 10

It's Not My Fault!

Visitor Center, Fremont
11:00 a.m. - 12:00 p.m.

The San Francisco Bay region is a complex maze of faults, mountains, and other geologic formations. During the one-mile hike we will explore the formation of the San Francisco Bay and the hill upon which the Visitor Center sits. Geared toward adults. Led by Carmen Minch.

Saturday, July 16

Bike the Bay

Meet at Visitor Center Flagpole, Fremont
10:00 a.m. - 12:00 p.m.

A slow and easy 5-mile bicycle tour of the marshes and salt ponds along dirt levees and trails. Learn about the ecology and history of the salt marshes of San Francisco Bay. Bring helmets (mandatory), bikes with knobby tires, water, and a lunch if you wish to eat with the group at the end of the tour overlooking the marsh. RESERVATIONS REQUIRED. Call 510-792-0222. Led by Norton Bell.

Don Edwards San Francisco Bay National Wildlife Refuge

1 Marshlands Road, Fremont - (510) 792-0222 • 1751 Grand Blvd, Alviso - (408) 262-5513 • <http://desfbay.fws.gov>

Summer Activity Schedule

Whose Tern is It?

Environmental Education Center, Alviso
9:30 a.m. - 11:30 a.m.

In this walk with Ed Kantack, discover which terns are visiting the refuge and where they are feeding. Good for ages 9 and up. RESERVATIONS REQUIRED. Call Laurie at 408-262-5513 ext. 102.

Salt Pond Tour

Meet at Bayfront Park, Menlo Park
1:00 p.m. - 3:00 p.m.

Did you know that the largest tidal wetland restoration project on the West Coast is happening right here in San Francisco Bay? Hear more about this project and view some of the salt ponds recently acquired by the Don Edwards San Francisco Bay National Wildlife Refuge. Geared toward adults. RESERVATIONS REQUIRED. Call 510-792-0222 ext. 43 for reservations and directions.

Bug Bonanza

Environmental Education Center
2:00 p.m. - 3:30 p.m.

Are you an entomologist at heart? Do you have a weakness for creepy crawlers? Are you curious about what lives under rocks in the backyard, or what is munching on your garden? If a day outside is not complete without a bug-catcher and a magnifying glass, than this is the program for you! Entomologists of all ages will enjoy a presentation with live arthropods, including but not limited to insects, spiders, and millipedes! Come de-bug common myths about arthropods and learn about the roles they play in refuge habitats. You'll even get a chance to handle some of these amazing critters and embark on a scavenger hunt around the refuge. Reservations required due to limited space. Call Tina at 408-262-5513 x104.

Sunday, July 17

South Bay Salt Pond Restoration Presentation

Environmental Education Center, Alviso
3:00 p.m. - 4:00 p.m.

The South Bay Restoration Project will transform South San Francisco Bay in the next few decades. How will this affect habitat, wildlife, and wildlife-oriented recreation? In this slide presentation, learn about the project, the role of the Don Edwards San Francisco Bay

National Wildlife Refuge, and how you can become involved with the largest tidal wetland restoration project on the West Coast. Geared for ages 12 and older.

Saturday, July 23

A Ghost Town in San Francisco Bay?

Visitor Center, Fremont
2:00 p.m. - 3:00 p.m.

That's right! On Station Island nestled in the salt marshes of south San Francisco Bay, the town of Drawbridge once boomed. Was it a quiet, peaceful community of nature lovers, or a rip-roaring gang of two-fisted rowdies? Excellent slide show and presentation. Presented by Pat Anthony.

Zoo Birds!

Happy Hollow Park & Zoo, San Jose
2:30 p.m. - 4:00 p.m.

Interpretive Specialist Laurie McEwen and volunteer Peg Bernucci take "Children's Beginning Birdwatching" on the road. This new children's birdwatching program teaches kids about the wild birds that live at Happy Hollow Park & Zoo. The wild birds found at the zoo are common backyard birds and can be seen at home. Program is free with park admission. Suitable for ages 5 and up. RESERVATIONS REQUIRED. Call Vanessa Rogier at 408-277-3065 to make a reservation.

Twilight Games

Environmental Education Center, Alviso
7:00 p.m. - 9:00 p.m.

Make the most of long summer days by taking a twilight walk around the refuge with stops to play games along the way. "Kids By The Bay" will be shown in the auditorium following the walk. Find out how you can take care of wildlife starting in your own backyard. Games suitable for ages 5 and up, all ages welcome. RESERVATIONS REQUIRED. Please call Laurie McEwen at 408-262-5513 ext. 102.

Sunday, July 24

Salt Pond Tour

Meet at Bayfront Park, Menlo Park
1:00 p.m. - 3:00 p.m.

Did you know that the largest tidal wetland restoration project on the West Coast is hap-

pening right here in San Francisco Bay? Hear more about this project and view some of the salt ponds recently acquired by the Don Edwards San Francisco Bay National Wildlife Refuge. Geared toward adults. RESERVATIONS REQUIRED. Call 510-792-0222 ext. 43 for reservations and directions.

Adult Beginning Birdwatching

Environmental Education Center, Alviso
3:00 p.m. - 4:30 p.m.

Can you tell an avocet from a black necked stilt? If not, join birding enthusiast, Ceal Craig, for a beginning birdwatching program and get to know the most common refuge visitors. Start with an indoor slide show for tips on how to identify species, then borrow a pair of binoculars and take a walk with Ceal to try your new skills. Program intended for adults. RESERVATIONS REQUIRED. Please call Laurie McEwen at 408-262-5513 ext. 102.

Thursday, July 28

Stroll Through History

Environmental Education Center, Alviso
7:00 p.m. - 9:00 p.m.

Take a walk through time with Laurie along the loop trail. How did New Chicago Marsh get its name? Hear about the rise and fall of Drawbridge, our local ghost town. See how we are impacting wetlands around the bay today and learn about the salt pond restoration project. Enjoy a short video about Drawbridge following the walk. Program intended for adults. RESERVATIONS REQUIRED. Call Laurie McEwen at 408-262-5513 ext. 102.

Saturday, July 30

A Trip Back in Time

Visitor Center, Fremont
10:30 a.m. - 12:00 p.m.

Revive the vanishing knowledge of the history of the Don Edwards San Francisco Bay National Wildlife Refuge grounds by strolling the trails with docent Ray Studer. Ray spent most of 2004 researching the on-site salt production, railroads and homes that were located on the refuge grounds until the 1950's. Using a collection of old photographs, the last vestiges of a way of life can be traced back to the 1850's that led to the construction of the town of Newark in 1876.

Don Edwards San Francisco Bay National Wildlife Refuge

1 Marshlands Road, Fremont - (510) 792-0222 • 1751 Grand Blvd, Alviso - (408) 262-5513 • <http://desfbay.fws.gov>

Summer Activity Schedule

Twilight Marsh Walk

Visitor Center, Fremont
7:30 p.m. – 9:00 p.m.

Experience the salt marsh at twilight on an easy stroll along Tidelands (1 1/3 mile) Trail. At the setting of the sun we will observe the beginning of nature's night shift. Come discover the sights, sounds, and smells of the refuge as night descends. Not suitable for young children. RESERVATIONS REQUIRED. Call 510-792-0222. Led by Mary and Gene Bobik.

Sunday, July 31

Water Games

Environmental Education Center, Alviso
3:00 p.m. – 4:30 p.m.

Water is cool, especially on hot summer afternoons! Come on down to the Education Center and learn some interesting water facts. Find out "Who Dirtied the Bay", test your water conservation skills in "Water Races", help water some thirsty plants, see who's the best shot with a water bottle, discover what happens in your watershed when it rains, and make a water cycle memento to take home. Suitable for ages 8 and up. RESERVATIONS REQUIRED. Call Laurie McEwen at 408-262-5513 ext. 102.

August

Saturday, August 6

Family Bird Walk

Visitor Center, Fremont
10:00 a.m. - 12:00 p.m.

Let family walks become a shared time of nature learning. We'll begin by helping kids create their personal birdwatching field guides, then head out onto the trails to find those birds. Learn about the salt marsh habitat along the way. A limited number of binoculars are available to borrow. Recommended for children ages 5-10. RESERVATIONS REQUIRED. Call 510-792-0222. Led by Eileen McLaughlin.

Watershed Diorama Rama!

Environmental Education Center, Alviso
2:00 p.m. - 4:00 p.m.

Imagine what your city would look like if you were a giant. What might you see? Come explore a watershed with a hands-on demonstration of an amazingly detailed and functioning South Bay watershed diorama. It is sure to dazzle and educate visitors of all ages. Learn what a watershed is and see how important our actions are towards maintaining healthy south bay habitats! Create your own 3-D watershed model out of recycled materials to take home. Reservations required. Call Tina at 408-262-5513 x104.

Sunday, August 7

South Bay Salt Pond Restoration Presentation

Visitor Center Auditorium, Fremont
1:00 p.m. – 2:00 p.m.

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Drawbridge

Environmental Education Center, Alviso
1:30 p.m. – 4:00 p.m.

A ghost town in San Francisco Bay? That's right! Nestled on an island in the salt marshes of south San Francisco Bay, the town of Drawbridge once boomed. Was it a quiet, peaceful town full of nature lovers, or a rip-roaring town full of two-fisted rowdies? Find out at this program, led by Pat Anthony our Drawbridge expert. A slide show is followed by a short mini-van excursion to view Drawbridge across Coyote Creek. Program intended for adults. Space is very limited. RESERVATIONS ARE ESSENTIAL. Call Laurie McEwen at 408-262-5513 ext. 102.

Saturday, August 13

Exploring the Dunes

Antioch Dunes NWR, Antioch
10:00 a.m. – 11:00 a.m.

Did you know there's a National Wildlife Refuge in Antioch? Here's your chance to explore this refuge that is usually closed to the public. This guided tour (1-1.5 mile) will focus on the wonders of Antioch Dunes National Wildlife Refuge. Wear sturdy shoes for the sandy hike along the dunes. All ages welcome. No reservations required. No facilities. Contact 510-521-9624 for additional information and directions.

Salt Pond Tour

Meet at Bayfront Park, Menlo Park
1:00 p.m. – 3:00 p.m.

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Saturday, August 20

Native Species Day at the Environmental Education Center

Survival Tactics of Native Plants
Environmental Education Center, Alviso
10:30 a.m. – 12:00 p.m.

California native plants do some amazing things to survive. Join Laurie and native plant specialist, June Smith, for an informative walk around the Education Center investigating plant adaptations. All participants can make a leaf rubbing, or plant some seeds to take home. Suitable for ages 8 and up. RESERVATIONS REQUIRED. Call Laurie McEwen at 408-262-5513 ext. 102.

Adult Beginning Birdwatching

Environmental Education Center, Alviso
2:00 p.m. – 3:30 p.m.

Join birding enthusiast, Ceal Craig, for a beginning birdwatching program and get to know the most common refuge visitors. Start

Don Edwards San Francisco Bay National Wildlife Refuge

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Summer Activity Schedule

with an indoor slide show for tips on identifying birds. Then, borrow a pair of binoculars and take a walk with Ceal to try your new skills. Program intended for adults. RESERVATIONS REQUIRED. Please call Laurie McEwen at 408-262-5513 ext. 102.

Live Animal Show!

Environmental Education Center, Alviso
4:00 p.m. – 5:30 p.m.

Meet live California native animals in person when Zoo To You presents their “California Natives” program. Animals for the show will be selected on the day of the event; no specific animal species is guaranteed. However, you are guaranteed to learn fascinating facts about animals you probably never appreciated before. Visitors are not allowed to touch the animals. Find out what you can do at home to help native animals. Suitable for all ages. Space is limited. RESERVATIONS REQUIRED. Please call Laurie McEwen at 408-262-5513 ext. 102.

Native Species Scavenger Hunt

Environmental Education Center, Alviso
5:30 p.m. - 6:30 p.m.

The refuge is a mosaic of different habitats, each habitat supporting an array of wildlife unique to the South Bay. Come enjoy the outdoors as we embark on a scavenger hunt exploring refuge habitats. Get up close and personal with the salt marsh, sloughs, and salt ponds on our short and easy trek. Binoculars and I.D. charts in hand, we will try to identify native plants and animals. Reservations required. Call Tina at 408-262-5513 ext.104.

Twilight Marsh Walk

Visitor Center, Fremont
7:00 p.m. – 8:30 p.m.

Experience the salt marsh at twilight on an easy stroll along Tidelands (1 1/3 mile) Trail. At the setting of the sun we will observe the beginning of nature's night shift. Come discover the sights, sounds, and smells of the refuge as night descends. Not suitable for young children. RESERVATIONS REQUIRED. Call 510-792-0222. Led by Mary and Gene Bobik.

Sunday, August 21

Salt Pond Tour

Meet at Bayfront Park, Menlo Park
1:00 p.m. – 3:00 p.m.

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Saturday, August 27

Hawk Walk

Meet at Visitor Center Entrance, Fremont
8:00 a.m. - 10:00 a.m.

Join Laurey Hemenway on a leisurely walk through the refuge and learn to differentiate between the various raptors. Identify other migratory birds in the upland and salt marsh habitats. Wear comfortable shoes and bring a bird book and binoculars. Recommended for ages 8 and up. RESERVATIONS REQUIRED. Call 510-792-0222.

A Trip Back in Time

Visitor Center, Fremont
10:30 a.m. - 12:00 p.m.

Revive the vanishing knowledge of the history of the Don Edwards San Francisco Bay National Wildlife Refuge grounds by strolling the trails with docent Ray Studer. Ray spent most of 2004 researching the on-site salt production, railroads and homes that were located on the refuge grounds until the 1950's. Using a collection of old photographs, the last vestiges of a way of life can be traced back to the 1850's that led to the construction of the town of Newark in 1876.



South Bay Salt Pond Restoration Presentation

Environmental Education Center, Alviso
3:00 p.m. – 4:00 p.m.

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Sunday, August 28

Community Service Day

Environmental Education Center, Alviso
10:00 a.m. – 12:00 p.m.

Do you need to fulfill community service requirements? Is your scout group looking to earn a service badge? Do you just want to pitch in and help restore native habitat? Come help us remove invasive non-native plants from our chemical-free demonstration gardens. Bring your own gloves or borrow a pair of ours. Tools and drinking water provided. Dress in layers, long pants and long-sleeved shirts over T-shirts recommended. Be prepared to get dirty and wet. Recommended for ages 9 and up. RESERVATIONS REQUIRED. Call Laurie McEwen at 408-262-5513 ext.102.

South Bay Salt Pond Restoration Presentation

Visitor Center Auditorium, Fremont
1:00 p.m. – 2:00 p.m.

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Field Trips to the Refuge

General Education Program Information

We offer FREE field trip programs at two sites at the Don Edwards San Francisco Bay National Wildlife Refuge. Wetland Round-Up and Trekking the Refuge field trip programs are offered at the Visitor Center in Fremont, and Wetland Round-Up and Slow the Flow are offered at the Environmental Education Center in Alviso. These programs actively involve teachers, adult volunteers, and students in investigating the diverse habitats and wildlife at the Refuge. The hands-on, small-group activities are designed to teach basic ecological concepts and to introduce endangered species, migratory birds, and wetland habitats to the students. All programs have been correlated to the appropriate State of California Education Standards.

For more information about field trips at the Don Edwards San Francisco Bay National Wildlife Refuge, call Ken at 510-792-0222 in Fremont, or Genie Moore at 408-262-5513 in Alviso.

Wetland Round-Up field trips are designed for K-6 grade for up to 65 students. Fall 2005 field trips will be offered from October – December 2005. *Reservations for Fall field trips begin on Monday, September 12th between 4:00 p.m. and 5:00 p.m.* Call Ken Clarkson at 510-792-0222 to make a reservation in Fremont, and call Genie Moore at 408-262-5513 to make a reservation in Alviso.

Wetland Round – Up Field Trip Orientations will be announced in the Fall.

Trekking the Refuge Field Trip

Trek the one-mile Tidelands Trail and learn about the natural history of the Refuge! Explore pickleweed in the salt marsh, brine shrimp in the salt pond, and creatures in the slough. Available only at the Visitor Center in Fremont, Trekking the Refuge Field trip is designed for grades 3-6, for up to 36 students. The Trekking the Refuge field trips will be offered in June and July.

Trekking the Refuge Field Trip Orientations at the Visitor Center in Fremont

4:00 p.m. – 8:00 p.m.

Tuesday, June 14th, 2005

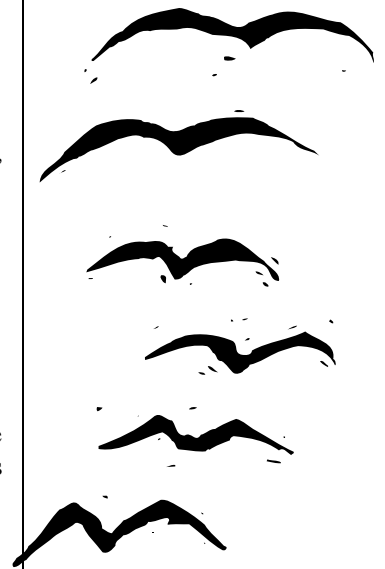
Slow the Flow Program

Slow the Flow provides an experiential learning environment for students and educators to explore the topics of water use, wastewater treatment, and habitat preservation. Activities and presentations focus on the relationship between personal habits and their effects on local habitats. **Slow the Flow** is an environmental education program offered at no cost through the cooperating efforts of the City of San Jose, U.S. Fish and Wildlife Service, and the San Francisco Bay Wildlife Society. The program offers field trips at the refuge, classroom presentations, and outreach presentations.

Programs are geared for 5th – 12th grades, although a modified field trip is available for college groups. Educators are also encouraged to contact us to discuss options for customizing field trip and presentation activities and schedules. **Slow the Flow** programs are available to educators and groups located in San Jose, Alviso, Milpitas, Santa Clara, Saratoga, Monte Sereno, Los Gatos, Campbell, and Cupertino.

Slow the Flow Programs are available throughout the year in Alviso.

Reservations for the **Slow the Flow** program are on a first-come basis. Call Tina Simmons, the Slow the Flow Program Coordinator at 408-262-5513 ext 104 to schedule a field trip or presentation. Summer presentations and field trips are still available.



Free Discovery Packs available at the Visitor Center and Environmental Education Center!

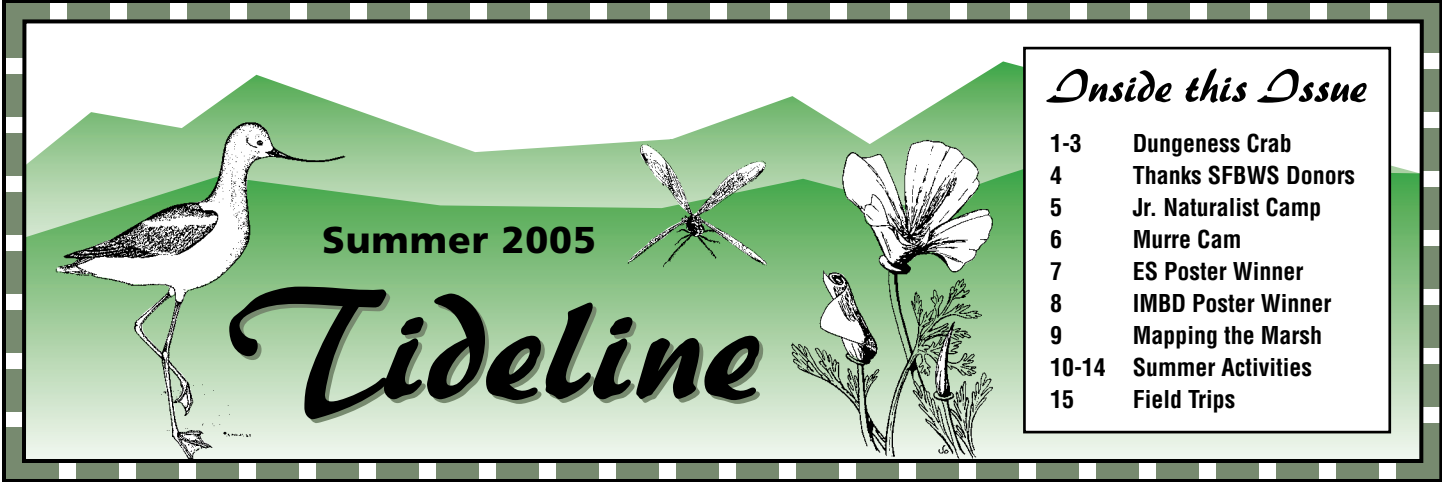
Explore the salt marshes, salt ponds, and the birds of the refuge with your family or small youth group! The Discovery Pack includes an activity booklet, and all of the equipment you will need, such as dip nets, magnifying lenses and bug boxes, to take a close look at the salt marsh plants, the brine shrimp, and the birds. The back pack is suitable for up to six people, ages kindergarten - adults. There are also group packs available for 12 - 24 (only at the Visitor Center, please call in advance if you would like a group pack). You can check out the Discovery Packs free of charge at the Visitor Center in Fremont or the Environmental Education Center in Alviso. The Visitor Center is open Tuesday - Sunday from 10 - 5. For questions or to reserve a group pack please call 510-792-0222. The Environmental Education Center is open Saturday and Sunday from 10 - 5. For questions please call 408-262-5513.

UNITED STATES
DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE
DON EDWARDS SAN FRANCISCO BAY
NATIONAL WILDLIFE REFUGE
P.O. BOX 524
NEWARK, CALIFORNIA 94560

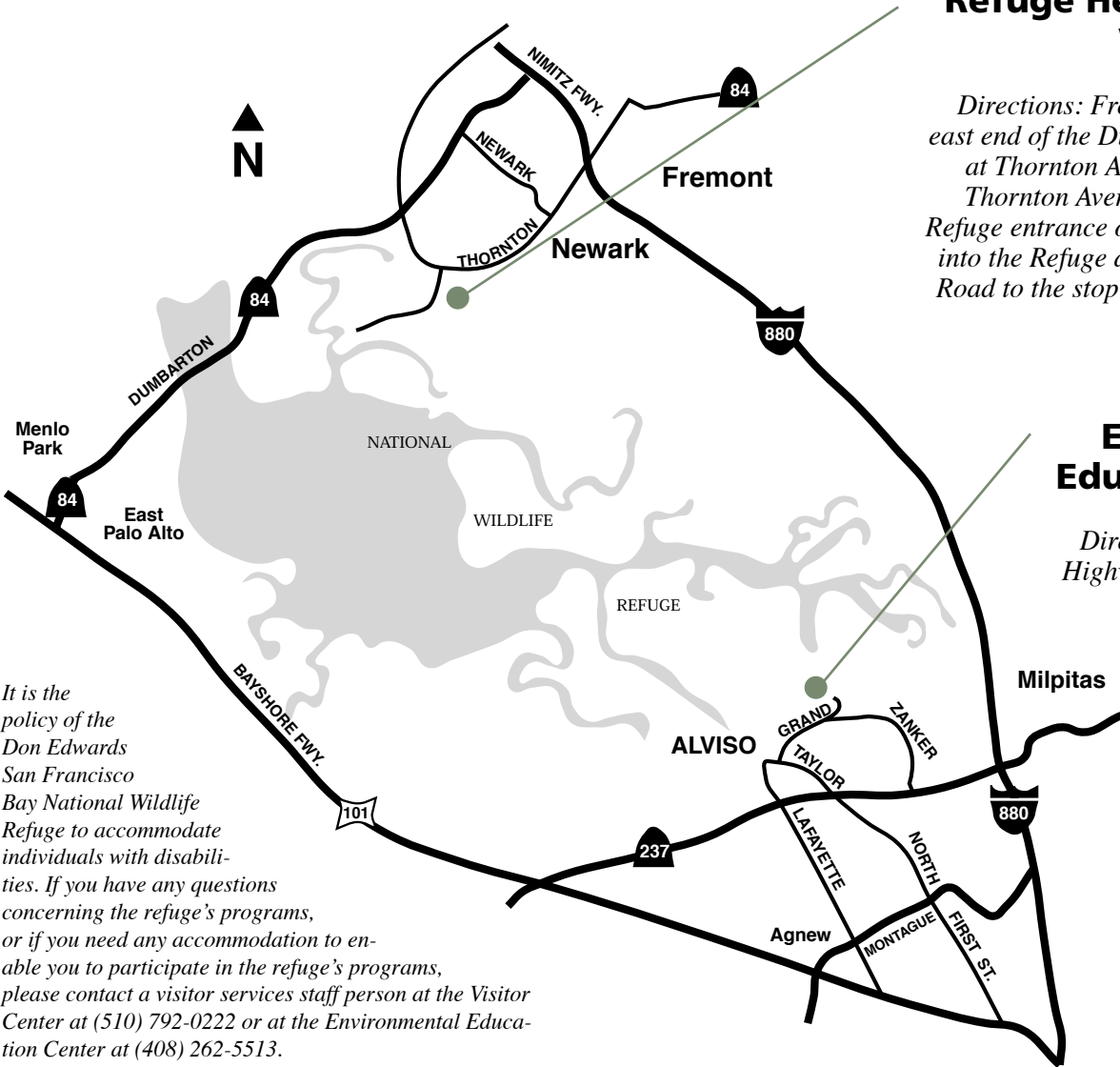
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Refuge Headquarters & Visitor Center

(510) 792-0222
Directions: From Highway 84 (at the east end of the Dumbarton Bridge), exit at Thornton Avenue. Travel south on Thornton Avenue for 0.8 miles to the Refuge entrance on the right. Turn right into the Refuge and follow Marshlands Road to the stop sign. Turn left into the parking lot.

Refuge Environmental Education Center

(408) 262-5513
Directions: From I-880 or Highway 101, exit on Highway 237 toward Mountain View/Alviso. Turn north onto Zanker Road. Continue on Zanker Road to the Environmental Education Center entrance road (a sharp right turn at Grand Blvd.) The distance from 237 to the entrance road is 2.1 miles.

It is the policy of the Don Edwards San Francisco Bay National Wildlife Refuge to accommodate individuals with disabilities. If you have any questions concerning the refuge's programs, or if you need any accommodation to enable you to participate in the refuge's programs, please contact a visitor services staff person at the Visitor Center at (510) 792-0222 or at the Environmental Education Center at (408) 262-5513.