



Volume 24, Number 2

# Sea Otter: A Poster Child for California's Coastal Ocean

By J.A. Estes, U.S. Geological Survey

The eminent ecologist Robert T. Paine once referred to the sea otter as the “poster child” of coastal marine ecology. Indeed, this animal is arguably western North America’s most distinct and well-known icon of the coastal oceans. A stroll through the curio shops along Monterey Bay’s Cannery Row reveals the sea otter’s popularity through various re-creations of its image — postcards, stuffed toys, mobiles, etc. — a bizarre diversity of form and ingenuity. On a more real front, the live sea otter exhibit is the Monterey Bay Aquarium’s most popular and enduring attraction, constantly surrounded by a mass of onlookers who seem never to tire of delighting in this creature’s form and behavior. The opportunity to simply observe wild sea otters is a key draw for central California’s tourist industry.

These modern-day lay perceptions of charm and leisure belie the sea otter’s fascinating if not tumultuous past, and the species’ uncertain future. Sea otters once abounded in coastal waters of the North Pacific Ocean from central Baja California to Japan where they made a living by consuming the region’s rich and productive shellfish resources—abalones, crabs, clams, sea urchins.

The “discovery” of Alaska by Vitus Bering in the mid 1700s set off the Pacific maritime fur trade, a quest for the sea otter’s and northern fur seal’s precious pelts. These riches prompted Russia to claim Alaska and establish permanent outposts for its defense and administration. As fur resources were inevitably overexploited, the fur trade spread southeastward from Alaska into California and Mexico. The waning of these

resources led to “Seward’s Folly” in 1867, the purchase of Alaska from Russia by the United States. Russia was willing to sell because by that time it viewed Alaska as an overused and largely valueless commodity, and the United States was anxious to buy because it perceived Alaska as a source of future riches.

The slaughter of sea otters and fur seals continued. By the early 1900s these animals had become so depleted that an international treaty was signed to prevent their extinction. Many people suspected that sea otters already had gone the way of the proverbial dodo. Although biological extinction was in fact averted by this 11<sup>th</sup> hour conservation measure, sea otters had become so rare that they no longer were functionally significant elements of the coastal oceans. Sea otters had become ecologically extinct.



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The notion of ecological extinction may seem esoteric and unimportant next to the species’ survival, but it isn’t. Sea otters had been abundant prior to the fur trade. Their bodies operate at high metabolic rates and thus they must consume large quantities of prey to survive and reproduce. Shellfish populations that once fueled the otters’ metabolic needs grew rapidly

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# Sea Otter: A Poster Child for

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in their absence. Modern human societies then discovered the abundant shellfish resources and began exploiting them. Various commercial fisheries grew from this newfound bounty, along with unique cultures and economies. Increasing numbers of people came to depend on the shellfisheries for their livelihoods. But trouble was brewing.



FWS Photo

*... the rise in urchin numbers that inevitably followed the sea otter's demise led directly to the wholesale disappearance of kelp forests, ecological processes linked to the kelp forests.*

Otter numbers quickly increased and their geographical range expanded with the protection afforded by international law. As growing otter populations spread back into long-vacant habitats, they again fed on shellfish,

driving shellfish stocks sharply downward. These changes did not go unnoticed. People engaged in the commercial and recreational fisheries that had developed in the sea otter's absence felt the bite of the species' recovery. Bitter disputes repeatedly grew out of the emerging conflicts as the otter's range increased and the species came into contact with various regional fisheries.

The fisheries conflicts, while very real, are only part of the sea otter's story. Sea urchins were among the shellfish species whose numbers had erupted in the otters' absence. Since sea urchins eat kelp and other bottom-living algae, the rise in urchin numbers that inevitably followed the sea otter's demise led directly to the wholesale disappearance of kelp forests, and ecological processes linked to the kelp forests.

Coastal production declined; various finfish species declined; ocean waves and currents increased. The entire web of life in this dynamic zone was fundamentally altered. One recent account showed something in the range of 30% of the species typically found in kelp forest ecosystems disappeared with the deforestation that occurred following the sea otter's demise. Knowledge of these indirect effects did little to lessen the sting of sea otters to fisheries interests, but it helped serve the rallying cry of those wishing to protect and enhance sea otter numbers.

Sea otter populations in California and elsewhere marched steadily upward through the early to middle decades of the 20<sup>th</sup> century. But from early on, it was apparent that the California

sea otter population was not in demographic lockstep with populations elsewhere.

The maximum potential rate of population increase for sea otters was determined to be about 23% per year. Recovering populations in Alaska, Canada, and Washington were growing at this rate, but a retrospective look at the California population indicated a rate of increase of about 4-5% per year. This sluggish intrinsic rate of population growth, combined with a small population size, growing evidence for the cessation of population growth or even a decline, and increased concerns over various threats to the species and its habitat led the U.S. Fish and Wildlife Service to list the California sea otter as a Threatened population under the Endangered Species Act. In the short term, increased attention was given to monitoring—documentation of changes in the distribution and abundance of the living population and a salvage program initiated by the California Department of Fish and Game to look more closely at beach-cast carcasses.

It had become evident by the early 1980s that the California sea otter population was indeed in decline and that substantial numbers of animals were being lost to incidental entanglement in a coastal gill and trammel net fishery for California halibut. The State of California instituted an emergency closure to the fishery and almost immediately thereafter the sea otter population again was on the rise.

By the early 1990s, it seemed that the California sea otter was headed for delisting. The only real questions on peoples' minds at that time were what the delisting criterion should be and how the anticipated shellfishery conflicts should be managed as the growing population spread into southern and northern California.

A focus on these questions didn't last very long. By the mid 1990s there was renewed concern that the California sea otter population had stopped growing, and by the latter part of the 1990s it was evident that the population was again in decline. By this time a great deal of new scientific knowledge had been obtained from studies of sea otters and their coastal ecosystems in California and elsewhere. Of the three potential explanations for long-term population decline (reduced reproduction, redistribution, and elevated mortality), it was now clear that elevated mortality was the singular problem.

Veterinary pathologists with the National Wildlife Health Center in Madison, Wisconsin, began looking carefully at fresh beach-cast carcasses in the early 1990s. Case studies showed

# California's Coastal Ocean

various parasitic infections and other diseases were found to be the direct cause of death in about 40 percent of these animals. Despite this startling discovery, many questions remained (and still remain) unanswered. Are the coastal oceans changing or has disease long been part of the California sea otter's ecology and population biology? There are many reasons to worry that disease might be on the rise but it is also easy to imagine that the apparent change is largely or solely the result of more careful looking.

All we really know are these things: elevated mortality is the problem, infectious disease is an important source of mortality, and the majority of deaths in the population cannot be accounted for. At the same time, the upward march of humanity must be impacting sea otters and their coastal ecosystems in numerous ways.

These findings and realizations have led to renewed interests in the California sea otter and revitalized efforts to understanding mortality at the population level. Due largely to the efforts of Congressman Sam Farr, increased federal funding was obtained about three years ago to begin the necessary studies. The effort is a broad collaboration involving the skills and experience of the central California marine science community, including individuals from the U.S. Geological Survey, the California Department of Fish and Game, the University of California at Santa Cruz and Davis, and the Monterey Bay Aquarium. The focus of this effort is to understand how and why California sea otters are dying at such high rates.

There are essentially two ways of studying death in wild animals—by examining the dead ones and by watching the live ones die. Both ap-

proaches have advantages and drawbacks, and we are thus using both. The California Department of Fish and Game has a lead role in examining the dead ones. Every fresh animal is necropsied and various clinical analyses are conducted by scientists at the UC Davis School of Veterinary Medicine. The database from this effort now spans a twelve-year period and includes necropsy reports from more than 570 fresh carcasses. The U.S. Geological Survey has the lead role in studies of the living population. We are marking individuals with flipper tags, surgically implanted VHF radio transmitters, and archival temperature and time-depth recorders to maintain a close accounting of these living animals.

In addition to cause of death, we are studying reproduction, feeding and diving behavior, movement patterns, social behavior, and various other aspects of this species' natural history. Last autumn we expanded this effort to include the translocated sea otter colony at San Nicolas Island, in the southern California Bight. Comparable data are available from earlier studies of sea otters in central California, done during a time when population numbers were on the rise. We also have similar information from sea otter populations in Washington and Alaska.

The explanation for why California sea otters are not increasing more rapidly will be slow in coming, but we are now firmly on track. Answers to this important and challenging question are inevitably only a matter of time.



Photo: Dr. Randall Davis, Texas A&M University

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## TIDELINE

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Editor: ..... Carmen Minch

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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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Visit our web site, which features past issues of *Tideline*, at <http://desfbay.fws.gov>

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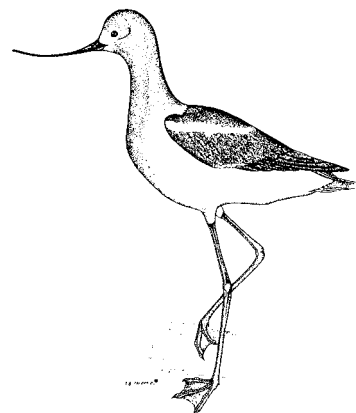
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For a gift membership, call 510-792-0222 ext. 40.

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# Antioch Dunes National Wildlife Refuge Offers Rare Look at Endangered Species

Antioch Dunes National Wildlife Refuge will be conducting guided tours this summer to offer glimpses of endangered species and a unique riverine dune habitat. Antioch Dunes NWR is home to the last remaining natural populations of the endangered Contra Costa wallflower, Antioch Dunes evening primrose, and Lange's metalmark butterfly. It is the only National Wildlife Refuge in the United States created to protect endangered plants and insects.

The Refuge was established in 1980 and was originally open to the public. However several different issues threatened the survival of the fragile habitat and forced the Service to fence the Refuge and close its gates to the public in 1986. Wildfires set unintentionally by day hikers and picnickers along the waterfront threatened to wipe out the endangered butterfly and increased human danger. The final straw was in 1986 when a lost whale named Humphrey swam up the San Joaquin river. This caused hordes of people to rush to the Refuge's river banks, unknowingly trampling the endangered plants on their way.

For the next 17 years, the Refuge was only seen by Refuge staff, volunteers conducting surveys and planting parties, and the occasional school group or organization requesting special tours. Last year, to celebrate the National Wildlife Refuge Centennial, Refuge staff began holding tours on the Refuge that corresponded to peak viewing times of the Contra Costa wallflower, Antioch Dunes evening primrose, and the

Lange's metalmark butterfly. The response has been overwhelming.

This year Antioch Dunes NWR began a docent program designed to lead weekend tours and provide educational tours for interested school groups. Tours are scheduled for the second Saturday of each month through September 2004. June 12 and July 10 will provide general tours about the Refuge while the August 14 tour will spotlight the Lange's metalmark butterfly in flight. Tours begin at 10:00 a.m. Call 510-522-9624 for more information and directions. Additional information can be found in the Summer Activity Schedule beginning on page 8.

FWS Photo



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# Salt Pond Restoration Project Forges Ahead

For the first time in 100 years, many salt evaporation ponds in San Francisco's east and south bay will no longer produce salt. In March, the San Francisco Bay Regional Water Quality Control Board approved the discharge of water from slated former commercial salt ponds into the bay.

"By circulating bay water through the ponds, they will cease making salt and the process of converting ponds into habitat for

major impact to the bay wildlife. Cargill Salt, former owner of the ponds, is continuing to work with the State and the refuge to dilute other salt ponds before connecting them to the bay.

This is the beginning of the largest wetland restoration project in the United States east of the Mississippi River. Last year, Cargill Salt, the State of California, and the U.S. Fish and Wildlife Service came to a historic agreement to transfer 16,500 acres of salt ponds to the public for wetland restoration at \$100 million.

For more information about the project, visit <http://www.southbayrestoration.org>



FWS Photo

shorebirds, ducks, and fish begins," said Don Edwards Refuge Manager Clyde Morris.

Salt pond water will not be discharged into the bay without some dilution. Installation of water control structures in the Alviso ponds, located on the Don Edwards Refuge, began in May. The water control structures, essentially tide gates and pipes, allow the bay water to mix with the pond water, lowering the pond water salinity. The pond water eventually becomes low enough to be released into the bay.

Stopping salt production while biologists and planners undergo a five-year process in developing a long-term management plan is a major step. If these ponds were allowed to continue to produce salt, the salinity levels in those ponds would be too high to be released into the bay without

## Brief History of Salt Production in the San Francisco Bay

The Ohlone Indians and early Spanish settlers harvested salt in the San Francisco Bay simply by scraping salt from shallow pools in the bay. It was not until 1854 when Captain John Johnson created the first man-made salt ponds in the South Bay and began harvesting salt commercially.

Dozens of other salt companies soon followed, filling in and destroying natural wetlands to create a network of levees and ponds that we see today. Eventually, many of these companies were combined into what became known as Leslie Salt Company. Prior to selling the company to Cargill Salt in 1978, Leslie Salt sold 12,000 acres of salt ponds to the U.S. Fish and Wildlife Service to be included into the Don Edwards San Francisco Bay National Wildlife Refuge. Leslie Salt retained the rights to continue making salt on these ponds. In 2003, Cargill sold 16,500 acres of salt ponds and salt-making rights to the State of California and the U.S. Fish and Wildlife Service, of which 9,600 acres went to the Don Edwards Refuge.

The Don Edwards San Francisco Bay National Wildlife Refuge Presents

# Junior Naturalist Summer Day Camp 2004

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? Explore outdoors at the Don Edwards San Francisco Bay National Wildlife Refuge? If so, check out the details below...

- Where:** Don Edwards San Francisco Bay National Wildlife Refuge  
Visitor Center in Fremont (by the Dumbarton Bridge)
- Who:** Students entering 3rd thru 6th grade
- When:** July 7-9 (Wed-Fri), 9 a.m.-2 p.m.
- 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. Applications must be postmarked by **Monday June 7, 2004**. Participants will be notified by mail.

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

----- **Application Form** -----

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Grade Entering in the fall: \_\_\_\_\_ Age \_\_\_\_\_

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!!!**  
**Questions???** Call 510-792-0222 ext. 42

# Summer Activity Schedule

## June

*Sunday, June 6*

### Quacky's Puppet Show

**Environmental Education Center, Alviso**  
10:30 a.m. – 11:30 a.m.

Who's Quacky? What happened to him? First explore Quacky's home in a brief nature walk. Then head back to the Ed Center to watch the puppet show. Quacky has a quirky adventure while on a quest to save his home. Find out what you can do to help him. Good for ages 4 and up. Reservations required, call Laurie at 408-262-5513 ext 102.

### Marsh Mud Mania

**Environmental Education Center, Alviso**  
2:00 p.m. – 3:30 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, gooey 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 408-262-5513.

### Botanical Wanderings

**Visitor Center, Fremont**  
2:00 p.m. – 3:30 p.m.

Discover the diverse summer habitats from the hilltops to the marsh. Use our free plant list to help identify the great variety of plants that thrive in this unique urban refuge. Bring binoculars to get a better look at birds and animals we may encounter on the trail, or borrow a pair of ours. Led by Alvin Dockter.

*Saturday, June 12*

### Canoe the Sloughs

**Newark Slough Boat Launch**  
8:30 a.m. – 11:30 a.m.

Ducks paddle the slough in the winter; humans paddle the slough in the spring and fall. Experience the Refuge from a duck's point of view. Bring your own canoe, paddles, and life vest (mandatory!). Learn about the ecology of the salt marsh, and identify the birds, plants, and mammals of the slough. Meet at the Newark Slough boat launch off of Thornton Avenue. No inflatables please!! RESERVATIONS REQUIRED!! Led by Ed Kantack.

### 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.

### Spring Babies

**Environmental Education Center, Alviso**  
9:00 a.m. - 11:00 a.m.

This is a special time of year. Baby birds are all around. Join Peg Bernucci to learn about birds that live on the Refuge. Are birds good parents? What does it mean to be precocial? Make your own bird identification book, then follow Peg along the boardwalk and see if you can spot the babies. Find out what you can do at home to take care of all the animals that live on the Refuge. Good for ages 5 and up. Reservations required, call Laurie at 408-262-5513 ext 102.

### Changing Seasons

**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.

*Sunday June 13*

### Return of the Terns

**Crab Cove Visitor Center & the Proposed Alameda National Wildlife Refuge, Alameda**  
10:00 a.m. – 2:00 p.m.

East Bay Regional Park District will hold its annual Return of the Terns event at the Crab Cove Visitor Center at Crown Beach. This event includes a slide presentation, vendors, and a chance to visit the California least tern colony at the proposed Alameda NWR. Bus tours will leave Crab Cove on the hour (11 a.m., 12 p.m., & 1 p.m.) led by a U.S. Fish and Wildlife Service Biologist. Recommended for ages 8 and up. Tour reservations are required. Tour fee is \$3. For reservations, call Crab Cove Visitor Center at 510-636-1684 or register on line at [www.ebparks.org](http://www.ebparks.org).

### Salt Pond Tour

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

Learn more about the largest wetland restoration project east of the Mississippi River. View some of the salt ponds recently acquired by the Don Edwards San Francisco Bay National Wildlife Refuge and contrast it to a healthy salt marsh. Geared for adults. RESERVATIONS REQUIRED. Call 510-792-0222 ext. 43 for reservations and directions.

*Saturday, June 19*

### It's Not My Fault!

**Visitor Center, Fremont**  
11:00 a.m. – 12:30 p.m.

The San Francisco Bay region is a complex maze of faults, mountains, and other geologic formations. We will explore the formation of the San Francisco Bay and the hill upon which the Visitor Center sits. Geared toward adults. Led by Matthew Greuel.

### Salt Pond Tour

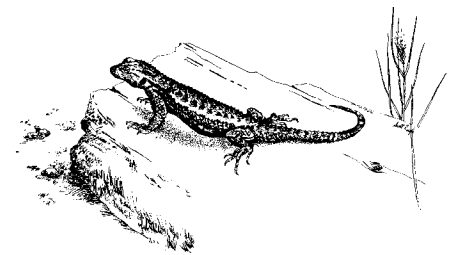
**Meet at Bayfront Park, Menlo Park**  
4:00 p.m. – 6:00 p.m.

Learn more about the largest wetland restoration project east of the Mississippi River. View some of the salt ponds recently acquired by the Don Edwards San Francisco Bay National Wildlife Refuge and contrast it to a healthy salt marsh. Geared for 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. 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 Complex**

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



# Summer Activity Schedule

*Sunday, June 20*

## **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. Led by Pat Anthony.

## **Sunrise Solstice Walk**

**Environmental Education Center, Alviso**  
7:30 a.m. - 9:00 a.m.

Get up early and watch the Refuge wake-up on the longest day of the year. Learn about the Summer Solstice: from science to cultural celebrations. Does the sun really stand still today? This will be a quiet walk so we can enjoy the wildlife. Need a minimum of 5 people. Reservations required, call Laurie at 408-262-5513 ext 102.

## **Bucket Brigade**

**Environmental Education Center, Alviso**  
10:00 a.m. - 11:00 a.m.

Help Laurie water the new native plants in the chemical free gardens. Earn community service credit while doing something to help the Refuge wildlife. New wildlife habitat is continually being created around the Ed Center. This spring new plants were planted and all require water during the hot summer months. Water and buckets provided. Call Laurie at 408-262-5513 ext 102 if you have questions or need directions.

*Saturday, June 26*

## **Refuge Safari**

**Environmental Education Center, Alviso**  
10:00 a.m. - 11:30 a.m.

Join Ed Kantack for an adventure exploring the wild lands around the Refuge. You may set off on a cross country hike or follow the boardwalk through the marsh and over the slough. Be prepared for the unexpected. Geared for ages 7 and up. Call Laurie to make a reservation at 408-262-5513 ext 102.

## **Bats in Alviso?**

**Environmental Education Center, Alviso**  
3:30 p.m. - 5:00 p.m.

That's right! Live bats are at the Ed Center today! Meet a few of those nocturnal flying mammals up close and personal. Join Maggie Hooper from the Bat Conservation Fund as she clears up a few of

the mysteries surrounding bats and their lives. Find out which bats can be found in the Bay Area. All ages welcome. Space is limited. Call Laurie at 408-262-5513 ext 102 to make a reservation.

*July*

*Saturday, July 3*

## **Indoor Fireworks**

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

Join us this holiday weekend for a patriotic version of "Water Wizards". Water does some WEIRD things! Come find out why as you play and experiment with water games that will dazzle your friends. Learn the secret of the magic water jar! Race water around stars and stripes. Create your own indoor fireworks. Take a short hike around the refuge and discover your power over water. Geared for ages 7 and up. Space is limited. RESERVATIONS REQUIRED with Laurie McEwen at 408-262-5513 x 102.

*Saturday, July 10*

## **Summer in 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 native plants and animals found at 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.

## **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.

*Sunday, July 11*

## **Bucket Brigade**

**Environmental Education Center, Alviso**  
10:00 a.m. - 11:00 a.m.

Help Laurie water the new native plants in the chemical free gardens. Earn community service credit while doing something to help the refuge wildlife. New wildlife habitat is continually being created around the Ed Center. This spring new plants were planted and all require water during the hot summer months. Water and buckets provided. Call Laurie at 408-262-5513 ext 102 if you have questions or need directions.

## **Salt Pond Tour**

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

Learn more about the largest wetland restoration project east of the Mississippi River. View some of the salt ponds recently acquired by the Don Edwards San Francisco Bay National Wildlife Refuge and contrast it to a healthy salt marsh. Geared toward adults. RESERVATIONS REQUIRED. Call 510-792-0222 ext. 43 for reservations and directions.

## **Avian Antics**

**Environmental Education Center, Alviso**  
1:30 p.m. - 2:30 p.m.

Join us at the Refuge as we explore the trails and attend a low tide feast. Learn a little bird trivia along the way, like why some birds eat their own feathers or which Refuge bird finds a mate for life? Bring your own binoculars, or borrow a pair of ours! Reservations required. Call 408-262-5513. Subject to cancellation due to weather.

## **Drawbridge**

**Environmental Education Center, Alviso**  
2:00 p.m. - 4:30 p.m.

A Ghost Town In San Francisco Bay? 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 town full of two-fisted rowdies? Join Pat Anthony, our expert on Drawbridge, for a slide presentation followed by a short mini-van excursion along our salt pond levee to view Drawbridge across Coyote Creek. Mini-van excursion subject to weather conditions, rain a few days prior to the event will close the levee road. Program is intended for adults. Space is very limited, RESERVATIONS ARE ESSENTIAL. Call Laurie at 408-262-5513 ext.102 to reserve your space.

**Don Edwards San Francisco Bay National Wildlife Refuge Complex**

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

# Summer Activity Schedule

*Saturday, July 17*

## Refuge Safari

Environmental Education Center, Alviso  
10:00 a.m. - 11:30 a.m.

Join Ed Kantack for an adventure exploring the wild lands around the Refuge. You may set off on a cross country hike or follow the boardwalk through the marsh and over the slough. Be prepared for the unexpected. Geared for ages 7 and up. Call Laurie to make a reservation at 408-262-5513 ext 102.

## Botanical Wanderings

Visitor Center, Fremont  
2:00 p.m. - 3:30 p.m.

Discover the diverse summer habitats from the hilltops to the marsh. Use our free plant list to help identify the great variety of plants that thrive in this unique urban refuge. Bring binoculars to get a better look at birds and animals we may encounter on the trail, or borrow a pair of ours. Led by Alvin Dockter.

## 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 18*

## Sun Day!

Environmental Education Center, Alviso  
1:00 p.m. - 3:00 p.m.

Today we are celebrating the sun, the center of our solar system. Look for solar flares and sunspots on the surface of the sun. Learn to use a sundial, then make one to take home. Discover the importance of the sun to the food chain in the salt marsh. Harness the power of the sun by building your own solar oven. Sample treats baked in our solar oven. Ages 8 and up. Space is limited. RESERVATIONS REQUIRED with Laurie McEwen at 408-262-5513 ext 102.

*Saturday, July 24*

## Bugs in the Garden

Environmental Education Center, Alviso  
10:00 a.m. - 11:30 a.m.

Take a journey through the gardens searching for bugs high and low. Learn cool bug facts and find out how bugs help our gardens. Create some buggy artwork and plant some bug friendly plants to take home. Ages 5 and up. Call Laurie to make a reservation at 408-262-5513 ext 102.

## Salt Pond Tour

Meet at Bayfront Park, Menlo Park  
4:00 p.m. - 6:00 p.m.

Learn more about the largest wetland restoration project east of the Mississippi River. View some of the salt ponds recently acquired by the Don Edwards San Francisco Bay National Wildlife Refuge and contrast it to a healthy salt marsh. Geared for adults. RESERVATIONS REQUIRED. Call 510-792-0222 ext. 43 for reservations and directions.

*Sunday, July 25*

## Salinity Sleuths

Environmental Education Center, Alviso  
2:30 p.m. - 4:00 p.m.

Step into the shoes of a scientist and strap on our field detective packs for a hands-on investigation where we will collect water samples, use plant clues, and do some sleuthing around to answer the question "How salty is it?" You will need to bring along keen senses of taste, smell and sight to determine which plants and animals live in the Refuge's salty habitats! Reservations required. Call 408-262-5513.

# August

*Saturday, August 7*

## Botanical Wanderings

Visitor Center, Fremont  
2:00 p.m. - 3:30 p.m.

Discover the diverse summer habitats from the hilltops to the marsh. Use our free plant list to help identify the great variety of plants that thrive in this unique urban refuge. Bring binoculars to get a better look at birds and animals we may encounter on the trail, or borrow a pair of ours. Led by Alvin Dockter.

*Sunday, August 8*

## Critter Café

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

Mud and water are pretty boring stuff, right? No way! Come take a closer look at some of the tiny, wiggly, squiggly creatures we'll find in samples of mud and water from marshes at the Don Edwards San Francisco Bay National Wildlife Refuge. Learn about macroinvertebrates and plankton - the tasty treats that shorebirds are eating at our five-star marsh 'cafes' at the Refuge. Reservations required. Call 408-262-5513.

*Saturday, August 14*

## Bursting with Butterflies

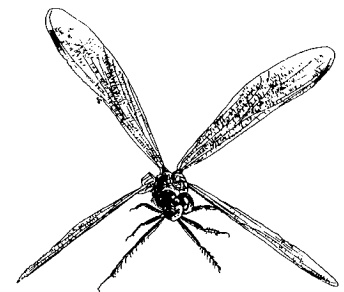
Antioch Dunes NWR, Antioch  
10:00 a.m. - 11:00 a.m.

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 endangered Lange's metalmark butterfly, as well as other butterflies and native plants. 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.

## Bucket Brigade

Environmental Education Center, Alviso  
10:00 a.m. - 11:00 a.m.

Help Laurie water the new native plants in the chemical free gardens. Earn community service credit while doing something to help the refuge wildlife. New wildlife habitat is continually being created around the Ed Center. This spring new plants were planted and all require water during the hot summer months. Water and buckets provided. Call Laurie at 408-262-5513 ext 102 if you have questions or need directions.



**Don Edwards San Francisco Bay National Wildlife Refuge Complex**

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# Summer Activity Schedule

## Canoe the Sloughs

**Newark Slough Boat Launch**  
12:30 p.m. – 3:30 p.m.

Ducks paddle the slough in the winter; humans paddle the slough in the spring and fall. Experience the Refuge from a duck's point of view. Bring your own canoe, paddles, and life vest (mandatory!). Learn about the ecology of the salt marsh, and identify the birds, plants, and mammals of the slough. Meet at the Newark Slough boat launch off of Thornton Avenue. No inflatables please!! RESERVATIONS REQUIRED!! Led by Ed Kantack.

## 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 15*

## Salt Pond Tour

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

Learn more about the largest wetland restoration project east of the Mississippi River. View some of the salt ponds recently acquired by the Don Edwards San Francisco Bay National Wildlife Refuge and contrast it to a healthy salt marsh. Geared for adults. RESERVATIONS REQUIRED. Call 510-792-0222 ext. 43 for reservations and directions.

*Saturday, August 21*

## Lazy Days of Summer

**Environmental Education Center, Alviso**  
10:00 a.m. - 11:30 a.m.

Take an easy wander around the Refuge with Ed Kantack to see what's happening in the heat of summer. Is everything chillin' in the shade? Find out what's cool and what's not. Geared for ages 7 and up. Call Laurie to make a reservation at 408-262-5513 ext 102.

## Reptilian Revelry

**Environmental Education Center, Alviso**  
12:00 p.m. – 3:00 p.m. **Animals on Display**  
1:00 p.m. - 1:30 p.m. **Herp Presentation**  
2:00 p.m. – 3:00 p.m. **Reptile Hike**

The Bay Area Amphibian and Reptile Association will bring a few of their scaly friends to visit the Refuge in Alviso. Find out what makes these cold-blooded critters so interesting; meet them up close and personal. **Herp presentation at 1 p.m.** – Don't know what a Herp is? Come find out! Join a Herp enthusiast for a walk around the Ed Center looking for resident reptiles. All ages welcome. Reservation required for the presentation and walk. Call Laurie at 408-262-5513, ext. 102.

*Sunday, August 22*

## Slough Who?

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

Who...who...who 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 and search for owl clues, and get a chance to dissect owl pellets to discover exactly who that owl ate! Reservations required. Call 408-262-5513.

*Saturday, August 28*

## Salt Pond Tour

**Meet at Bayfront Park, Menlo Park**  
4:00 p.m. – 6:00 p.m.

Learn more about the largest wetland restoration project east of the Mississippi River. View some of the salt ponds recently acquired by the Don Edwards San Francisco Bay National Wildlife Refuge and contrast it to a healthy salt marsh. Geared for adults. RESERVATIONS REQUIRED. Call 510-792-0222 ext. 43 for reservations and directions.

*Sunday, August 29*

## It's Not My Fault!

**Visitor Center, Fremont**  
11:00 a.m. – 12:30 p.m.

The San Francisco Bay region is a complex maze of faults, mountains, and other geologic formations. We will explore the formation of the San Francisco Bay and the hill upon which the Visitor Center sits. Geared toward adults.

## Quacky's Puppet Show

**Environmental Education Center, Alviso**  
10:30 a.m. - 11:30 a.m.

Who's Quacky? What happened to him? First explore Quacky's home in a brief nature walk, and then come back to the Ed Center to watch the puppet show. Quacky has a quirky adventure while on a quest to save his home. Find out what you can do to help him. Good for ages 4 and up. Reservations required, call Laurie at 408-262-5513 ext 102.

## Drawbridge

**Environmental Education Center, Alviso**  
2:00 p.m. - 4:30 p.m.

A Ghost Town In San Francisco Bay? 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 town full of two-fisted rowdies? Join Pat Anthony, our expert on Drawbridge, for a slide presentation followed by a short mini-van excursion along our salt pond levee to view Drawbridge across Coyote Creek. Mini-van excursion subject to weather conditions, rain a few days prior to the event will close the levee road. Program is intended for adults. Space is very limited, RESERVATIONS ARE ESSENTIAL. Call Laurie at 408-262-5513 ext.102 to reserve your space.

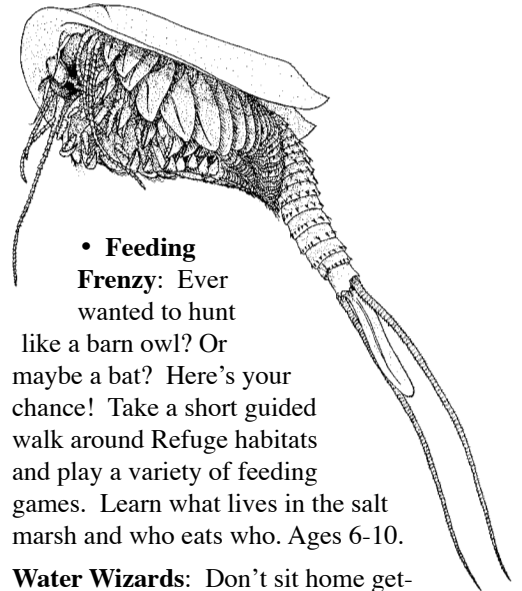


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# Ed Center Outings Now Available!

Looking for something fun to do with your group or organization? Or maybe you'd like to schedule enrichment outings for your club or association? Our trained staff will provide a free program for kids and adults alike at the Don Edwards San Francisco Bay National Wildlife Refuge's Environmental Center in Alviso. See below for a list of programs. To schedule an Ed Center Outing, call Laurie at the EEC at 408-252-5513 ext. 102. Minimum group size is five participants, while maximum varies by program.



• **Feeding Frenzy:** Ever wanted to hunt

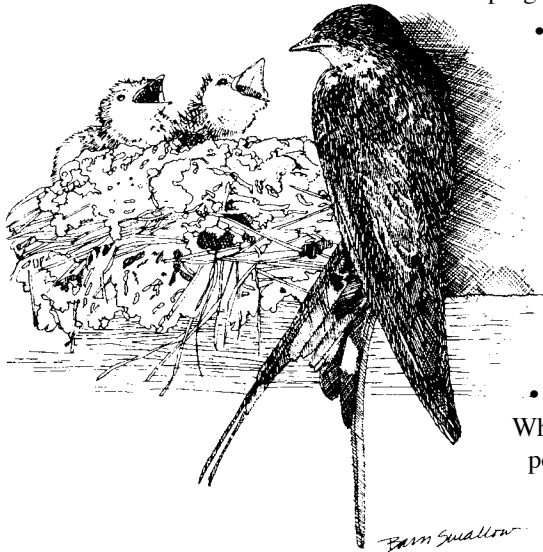
like a barn owl? Or maybe a bat? Here's your chance! Take a short guided walk around Refuge habitats and play a variety of feeding games. Learn what lives in the salt marsh and who eats who. Ages 6-10.

• **Water Wizards:** Don't sit home getting bored...come play with the magic water jar! Or how about water fireworks displays? Water does some WEIRD things! Come find out why as you play and experiment with water games! Ages 7 and up.

• **Slough Who:** Whoo...whoo...whoo did that owl eat? Come solve the mystery of who ate whom and learn a bit about these nocturnal predators. We will hike the habitats, search for owl clues, and get a chance to dissect owl pellets, discovering who that owl ate! Ages 7 and up.

• **Nature Detectives:** Do you have what it takes to become a nature detective? Join us for a fun program designed to sharpen your powers of observation and deduction. Learn to tell stories by reading animal tracks. Make your own Backyard Trackers Field Guide to take home. Take a short stroll around the Refuge looking for animal tracks (weather permitting). Great for ages 8-10.

• **Salinity Sleuths:** Step into the shoes of a scientist and strap on our field detective packs for a hands-on investigation where we will collect water samples, use plant clues, and do some sleuthing around to answer the question "How salty is it?" Ages 9 and up.



• **A Hike and a Movie:** Enjoy a guided walk around the Refuge, then watch a video such as *Kids by the Bay* and *Secrets of the Bay*, *Returning Home* (Refuge success story about reintroducing the common murre to Devil's Slide Rock) and other nature-friendly films. Ages 4 and up.

• **Quacky's Puppet Show:** Who's Quacky? What happened to him? First, explore Quacky's home in a brief nature walk, then come back to the Ed Center to watch

the puppet show. Quacky has a quirky adventure while on a quest to save his home. Find out what you can do to help him. Ages 4 and up.

• **Beginning Birdwatching:** Learn about the feathered flyers found in the habitats of San Francisco Bay. Create a personalized bird identification booklet to use as we look for birds along the salt marsh trails. Ages 5 and up.

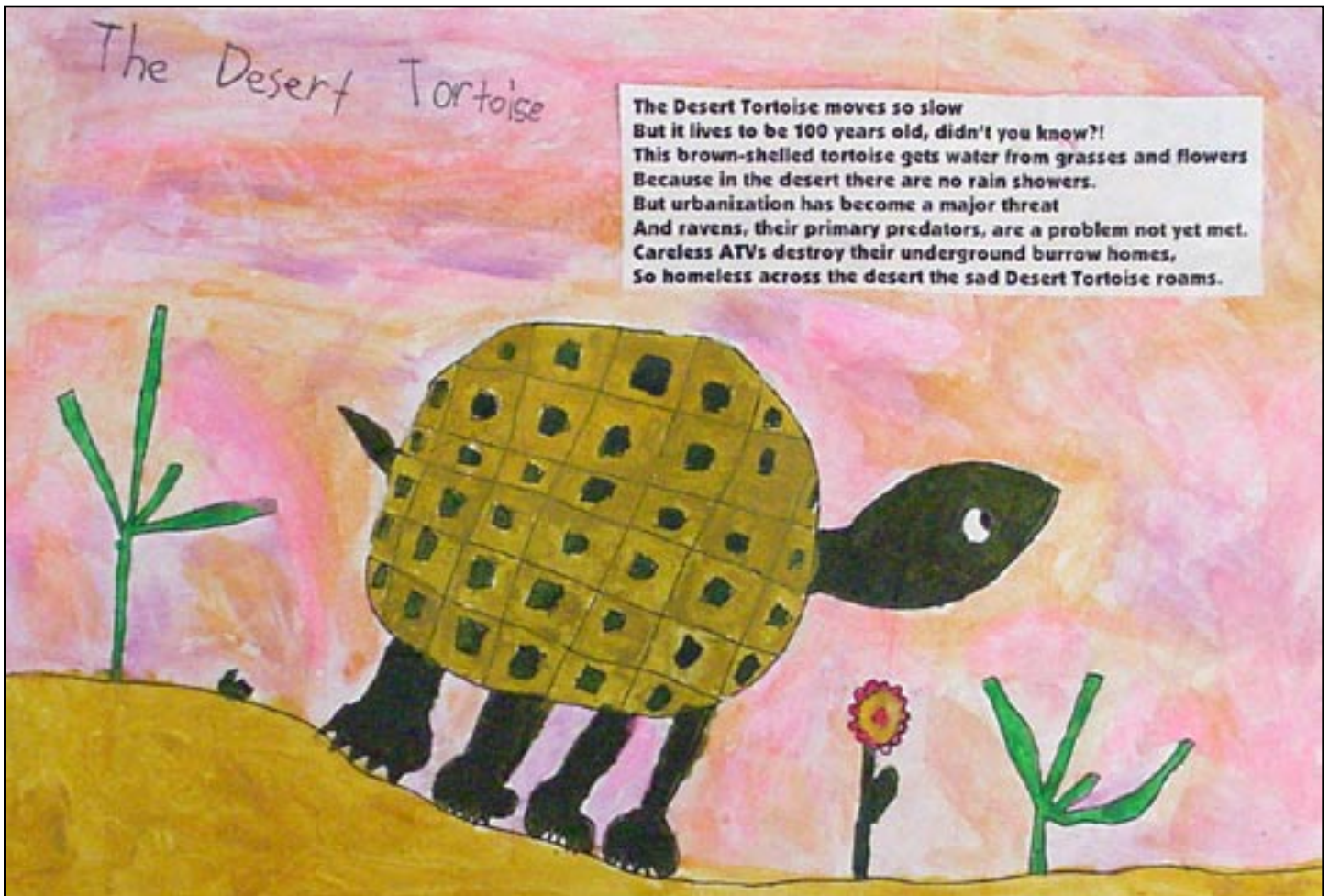
• **Critter Café:** Mud and water are pretty boring stuff, right? No way! Take a closer look at some of the tiny creatures we'll dig up in samples of mud and water from the marshes at the National Wildlife Refuge. Learn about the tasty treats that shorebirds are eating at our five-star marsh "cafes" at the Refuge. Ages 5 and up.

• **Water Art:** Create three different crafts related to water. Take them home for your own or give to a friend for a gift. Make a shark print or a crayon resist underwater scene. Ages 5 and up.



# Congratulations endangered species poster contest participants!

Thank you to our generous sponsors



**Congratulations to second grader, Ryan Lovejoy, from Leitch Elementary for winning the Best in Show in the Don Edwards San Francisco Bay National Wildlife Refuge 22nd Annual Endangered Species Poster Contest!**

*The Don Edwards San Francisco Bay National Wildlife Refuge thanks the Aquarium of the Bay, California Academy of Sciences, Chabot Space & Science Center, Children's Discovery Museum, Coyote Point Museum, Lindsay Wildlife Museum, Monterey Bay Aquarium, Oakland Museum of California, Oakland Zoo, San Francisco Zoo, and the San Jose Tech Museum for their generous donations to the Endangered Species Awareness Program.*

The Don Edwards San Francisco Bay National Wildlife Refuge would also like to thank BFI and Starbucks for their generous donation to the Annual Earth Day Cleanup!

# Field Trips to the Refuge

**FREE** field trip programs are offered at two sites at the Don Edwards San Francisco Bay National Wildlife Refuge. 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.

Educators and Youth Group Leaders conduct their own field trips after attending a Field Trip Orientation Workshop. The Orientation Workshops provide the information you need to design and conduct your own field trip. Adult volunteers must also be recruited to lead the activities at the different learning stations and to chaperone the rotation groups of students. We provide easy to follow "scripts" for each station, but both "leaders" and "chaperones" are strongly encouraged to attend a Field Trip Orientation Workshop.



*There are no field trip orientations scheduled for summer 2004. We will announce fall 2004 field trip orientations in the next edition of Tideline.*

## Field Trips at the Visitor Center in Fremont

**Wetland Roundup** - Investigate creatures of the mud flats, the plankton and other creatures in the slough, and the pickleweed in the salt marsh. This field trip is designed for grades K-6, for up to 65 students. Wetland Roundup is offered Tuesday-Friday.

**Trekking the Refuge** - Trek the 1-mile Tidelands Trail, and learn about the natural history of the Refuge! Explore the pickleweed in the salt marsh, the brine shrimp in the salt pond, and the plankton 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. Trekking the Refuge is offered Tuesday through Friday.

**\*\*\*PLEASE NOTE\*\*\***

**Reservations for Fall 2004 field trips will begin on THURSDAY, SEPTEMBER 9th from 4:00 p.m. - 5:00 p.m.. Call the education staff at 510-792-0222 to reserve a Trekking the Refuge or a Wetland Round-Up field trip at the Visitor Center in Fremont. For more information, contact the environmental education staff at 510-792-0222 ext 42 or 36, or email inquiries to [ken\\_clarkson@fws.gov](mailto:ken_clarkson@fws.gov).**

## Field Trip Orientation Dates at the Visitor Center in Fremont

Attention Educators and Youth Group Leaders: It is our policy that you must attend every 2 years.

## Wetland Round-Up Field Trip Orientations at the Visitor Center in Fremont

There are no field trip orientations scheduled for summer 2004. We will announce fall

2004 field trip orientations in the next edition of *Tideline*.

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

There are no field trip orientations scheduled for summer 2004. We will announce fall 2004 field trip orientations in the next edition of *Tideline*.

## Field Trips at the Environmental Education Center in Alviso

**Wetland Round-Up Field Trips** - Investigate the butterflies in the butterfly garden, taste pickleweed in the salt marsh, or discover the creatures that live in the slough water. This field trip program is designed for up to 65 students in grades K-6. This field trip is offered Monday - Thursday.

**\*\*\*PLEASE NOTE\*\*\***

**Reservations for Fall 2004 field trips will begin on THURSDAY, SEPTEMBER 9th from 4:00 p.m. - 5:00 p.m.. Call the education staff at 408-262-5513 to reserve a Wetland Round-Up field trip at the Environmental Education Center in Alviso. For more information call Genie Moore, Environmental Education Specialist, at 408-262-5513 x100 or email her at [genie\\_moore@fws.gov](mailto:genie_moore@fws.gov).**

**The 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

# Field Trips to the Refuge

## 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 equipment such as dip nets, magnifying lenses and bug boxes that you will need to take a close look at salt marsh plants, brine shrimp, and birds! The back pack is suitable for up to six people, ages kindergarten - adults. There are also group packs available for 12 - 24 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 10:00 a.m. - 5:00 p.m. For questions or to reserve a group pack please call 510-792-0222. The Environmental Education Center is open Saturday and Sunday from 10:00 a.m. - 5:00 p.m. For questions please call 408-262-5513.

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, field trip orientation workshop 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.

**Reservations for the Slow the Flow program are on a first come basis. Reservations are still available for the spring! To schedule a field trip or a presentation, or to sign up for a field trip orientation workshop, please call the education staff at (408) 262-5513 ext 104 or email inquiries to [sfbay\\_slowflow@yahoo.com](mailto:sfbay_slowflow@yahoo.com)**

## Field Trip Orientation Workshop Dates at the Environmental Education Center in Alviso

Attention Educators and Youth Group Leaders: Call to reserve a place for yourself and any interested adult volunteers planning to lead activities on your field trip. It is our policy that you must attend every 2 years. Call the education staff at 408-262-5513.

## Wetland Round-Up Field Trip Orientations at the Visitor Center in Alviso

There are no field trip orientations scheduled for summer 2004. We will announce fall 2004 field trip orientations in the next edition of *Tideline*.

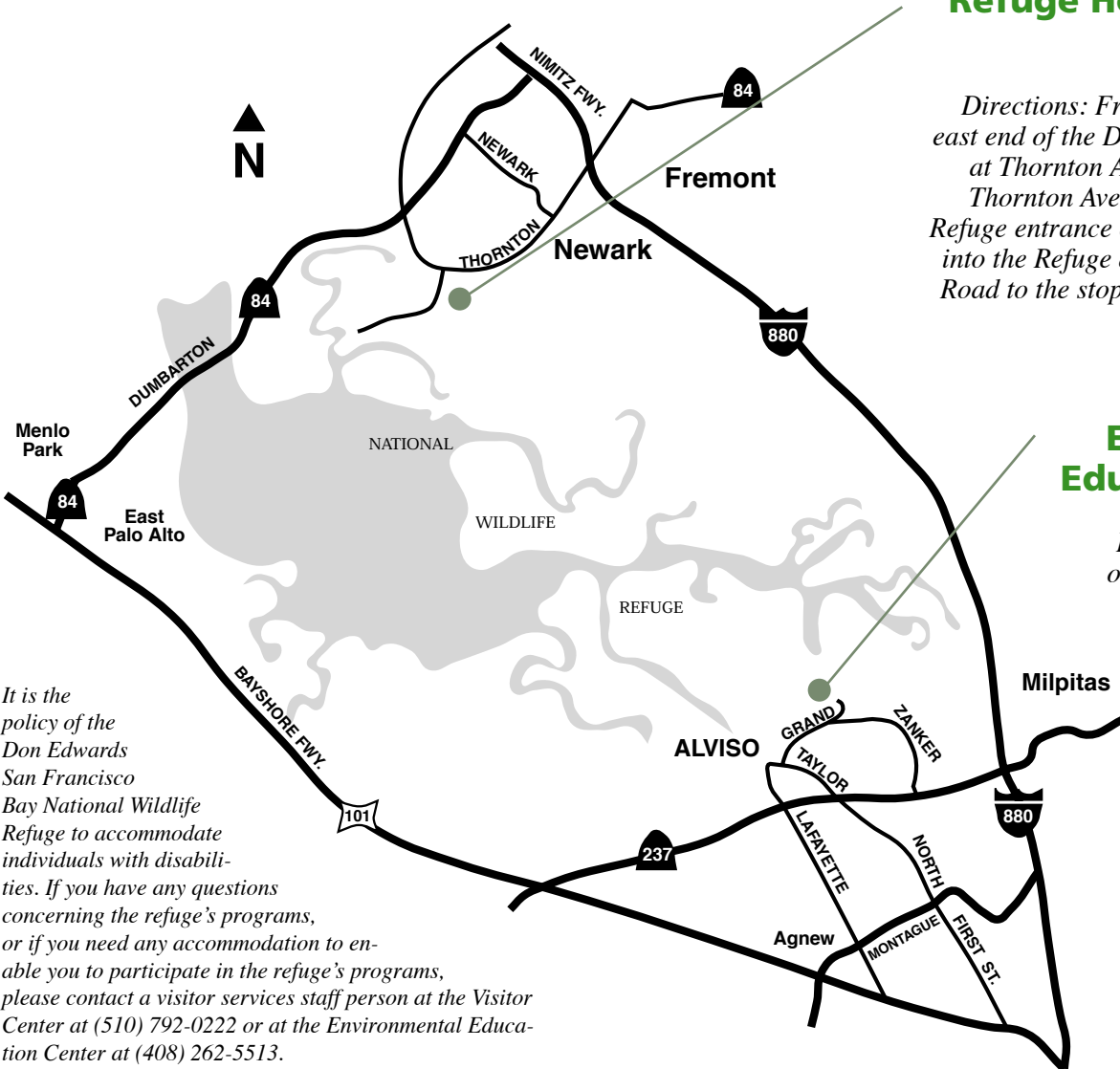
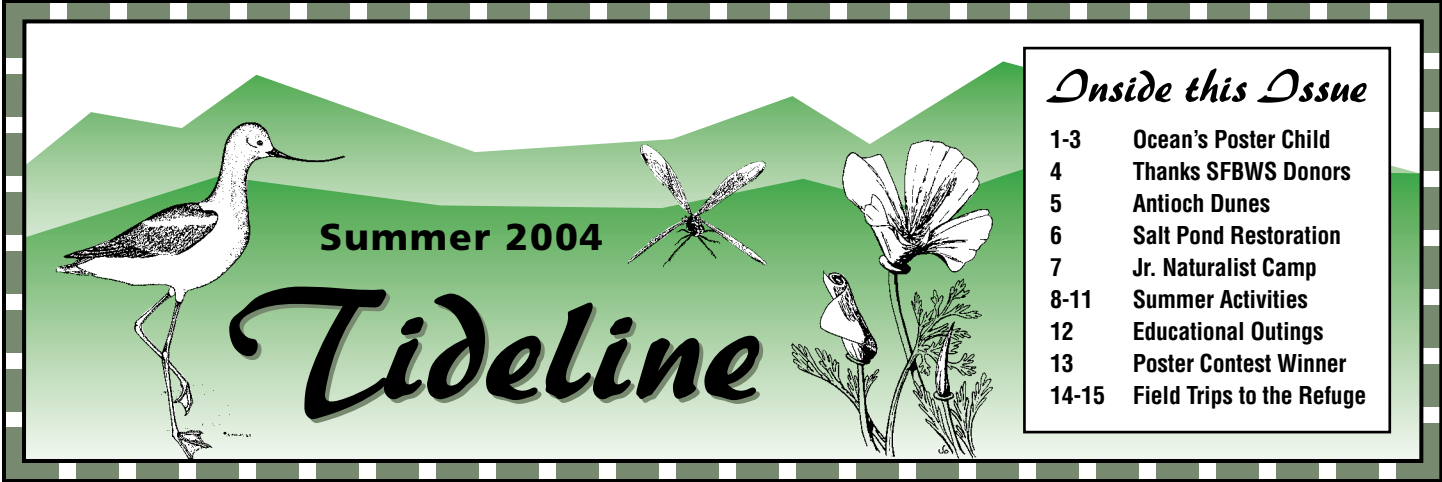
## Slow the Flow Field Trip Orientation Workshops

Field Trip Orientations are scheduled on an as needed basis on weekdays, 4:00 p.m. to 6:30 p.m.



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  
 OFFICIAL BUSINESS  
 PENALTY FOR PRIVATE USE, \$300

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 Permit No. G-77



**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 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.