

Tideline



SPRING 2017
Volume 40, Number 1

Antioch Dunes / Don Edwards / Ellicott Slough / Farallon Island / Marin Islands / Salinas River / San Pablo Bay

California Gull Diet, Movements, and Use of Landfills in San Francisco Bay

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The California gull breeding population in San Francisco Bay has increased from just 24 individuals in 1980 to more than 53,000 today (based on annual counts made by the San Francisco Bay Bird Observatory). Expanding gull populations can sometimes be problematic for humans and wildlife, and consequently gulls are often actively managed, employing techniques such as hazing or culling.

Population increases of many gull colonies have been attributed to the availability of food subsidies from human sources, particularly those from landfills. The U.S. Geological Survey recently evaluated the influence of landfills on California gull diet and movements in San Francisco Bay at three of the largest breeding colonies. These breeding colonies comprise nearly 99% of all California gulls nesting in the Bay.

Using radio telemetry, we tracked 108 California gulls (Figure 1), recorded more than 7,000 locations, and obtained more than 1 million detections at automated data logging systems placed at each of the two main landfills in the South Bay (Newby Island Landfill and Tri-Cities Landfill), and the three main breeding colonies at Pond A6, Coyote Hills, and Mowry in 2007 and 2008 (Figure 2).

The vast majority of gulls were located within four miles of landfills throughout the breeding season, with post-breeding gulls located substantially closer to landfills (Figure 2). We discovered gulls were spending 20%-40% of their time each day at landfills.



Figure 1. California gull with an unattached back-pack style radio transmitter shown. California gulls were tracked continuously throughout the spring and summers of 2007 and 2008. Photo: USGS

Gull attendance at landfills increased from 20%-40% of their time each day during the pre-breeding season to 60%-80% of their time each day during breeding. During the breeding season, gulls increased their time at the landfills to 60%-80% each day.

The use of landfills declined during the post-breeding season to less than 20% of their time each day. In addition to the influence of season, the time of day also strongly affected gull attendance at landfills. Not surprisingly, gull use of landfills was highest during the time of day when garbage was being delivered from about 6:00 am

in the morning until 6:00 pm at night. Thereafter, gulls spent 50%-70% of their time at their breeding colonies.

We also sampled gull blood and common food items that gulls might eat at the landfills and within the surrounding wetland habitats to determine gull diet. Using stable isotopes, we found that gulls differed in their foraging strategies, with some gulls using landfills almost exclusively for food and other gulls feeding more often within the managed pond habitats adjacent

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to the Bay.

But in all cases, garbage made up a substantial portion of every gull's diet (Figure 3). We estimated that the proportion of garbage in the diet of gulls was 63%-82% for those gulls that foraged more extensively at landfills. For gulls that fed more within the estuary, the proportion of garbage in the diet of gulls was estimated to be 35%-63%. Diets of gull chicks also varied among foraging strategies, with 14% to 72% of their diets being derived from garbage.

California gulls are known to be voracious predators of other breeding birds in the Bay, and, in another study, we found that gulls were the main predator of Forster's tern and American avocet chicks, and caused 54% and 55% of chick deaths, respectively. Importantly, individual California gulls can specialize on eating waterbird chicks. We have even documented one gull that killed at least 11 Forster's tern chicks during nesting.

These results indicate that landfills play an important role in California gull habitat use and the timing of their movements in the Bay. Whether or not access to garbage at nearby landfills has contributed to the substantial increase in the Bay's California gull population is uncertain, but access to garbage has increased gull populations at several sites throughout the world. Current practices at some South Bay landfills in-

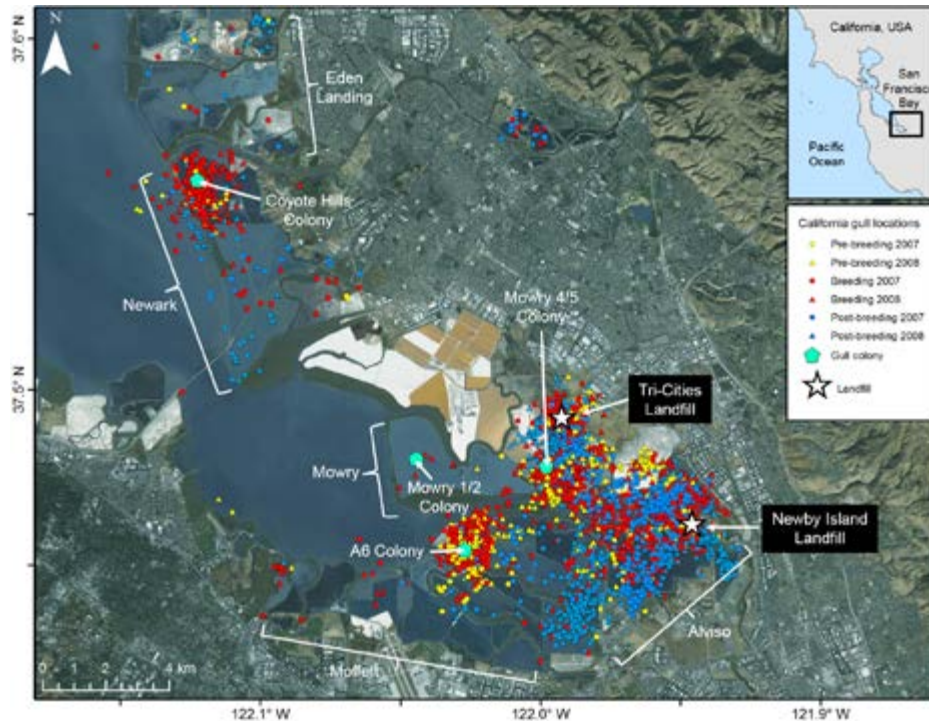


Figure 2. Locations of radio-marked California gulls in south San Francisco Bay, California during pre-breeding (yellow), breeding (red), and post-breeding (blue) in 2007 (circles) and 2008 (triangles). The locations of major urban areas, wetland complexes, gull colonies, and landfills are shown. Photo: USGS

cludes hazing gulls, and has resulted in some success in reducing gull use of landfills.

Although California gulls are native to the western United States, they did not breed in the Bay prior to 1980. The main factor that limits California gull populations throughout their range is the availability of protected nesting habitat near areas with sufficient food supplies. After the creation of artificial salt evaporation ponds in San Francisco Bay from the 1930s through the 1950s, suitable nesting habitat for gulls was readily available in the form of internal salt pond levees and dry salt pond beds. They were also in close proximity to several landfills. In fact, 96% of California gulls that bred in San Francisco Bay nested within former salt ponds.

Therefore, the establishment and rapid growth of California gulls in San Francisco Bay may have been at least partly attributed to the availability of suitable nesting habitat (salt pond system) in close proximity to abundant food resources (garbage at landfills and brine flies and shrimp within salt ponds).

This work was conducted in conjunction with the U.S. Fish and Wildlife Service's Don

Edwards San Francisco Bay National Wildlife Refuge, California Fish and Wildlife's Eden Landing Ecological Reserve, and the South Bay Salt Pond Restoration Project.

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References:

Ackerman, J. T., M. P. Herzog, C. A. Hartman, and G. Herring. 2014a. Forster's tern chick survival in response to a managed relocation of predatory California gulls. *Journal of Wildlife Management* 78:818-829.

Ackerman, J. T., M. P. Herzog, C. A. Hartman, and J. Y. Takekawa. 2014b. Comparative reproductive biology of sympatric species: nest and chick survival of American avocets and black-necked stilts. *Journal of Avian Biology* 45:609-623.

Ackerman, J. T., S. H. Peterson, D. C. Tsao, and J. Y. Takekawa. California gull space use and movements in relation to landfills and breeding colonies. Submitted manuscript.

Peterson, S. H., J. T. Ackerman, and C. A. Eagles-Smith. Mercury contamination and stable isotopes reveal foraging ecology of generalist California gulls. Submitted manuscript.

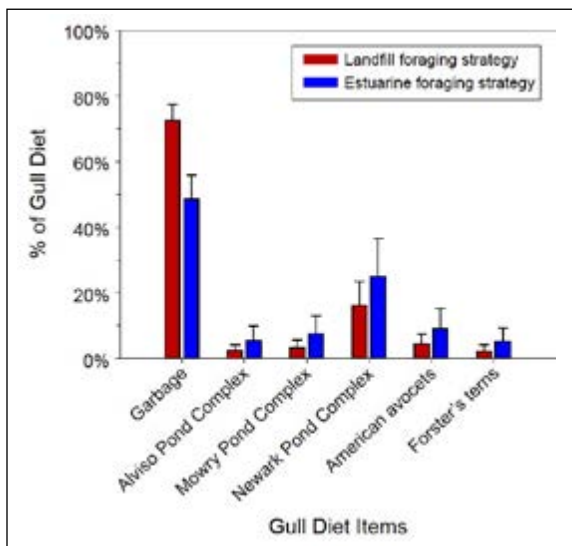


Figure 3. The proportion of diet for breeding California gulls coming from 6 possible prey sources: (1) garbage from landfills, (2) fish and brine shrimp from the Alviso Pond Complex, (3) fish and brine shrimp from the Mowry Pond Complex, (4) fish and brine shrimp from the Newark Pond Complex, (5) American avocet eggs and chicks, and (6) Forster's tern eggs and chicks. Graphic courtesy of USGS

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SPRING 2017
Volume 40, Number 1

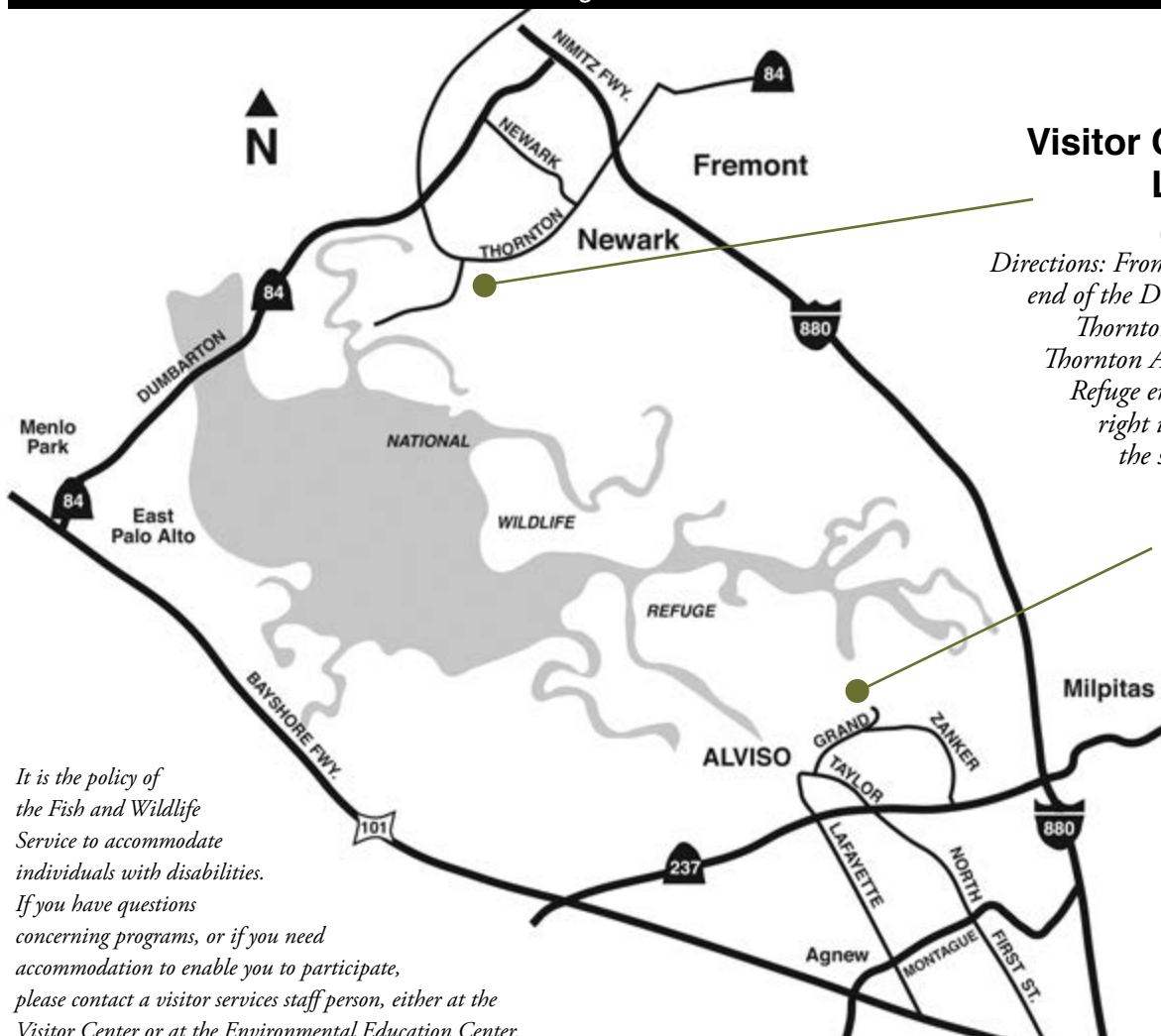
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Visitor Center, Fremont Learning Center

(510) 792-0222 ext. 363
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 the signs to the Visitor Center.

Environmental Education Center, Alviso

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

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