CITY OF OAKLAND

Lake Merritt Canada Goose Management Study

July 2007

Prepared for the City of Oakland

Prepared by Jones & Stokes

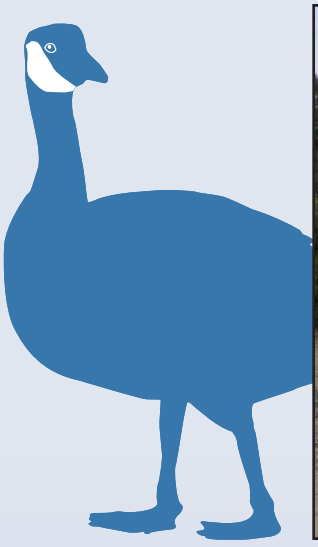
Introduction

The Canada goose population that lives in the parklands surrounding Lake Merritt has grown significantly over the past few decades. Attracted by open expanses of turf grass and the lake's open water, the goose population ranges from 200–400 birds in the winter months to nearly 2,000 in the summer months. The City of Oakland (City) has received many questions and complaints from local citizens regarding the Lake Merritt geese, their abundant droppings, their interference with recreational activities, and their potential impact on water quality and public health. The goal of this brochure is to summarize the Lake Merritt Canada goose situation. This brochure addresses the following topics.

- Lake Merritt snapshot.
- Canada goose profile.
- Geese at Lake Merritt.
- Geese and lake water quality.
- Canada goose management techniques.

The City's goal in developing management strategies for the geese is **to balance the needs of lake and park users with the grazing and habitat needs of the Canada goose population.**

The information provided in this brochure is intended to provide a background and context for public dialogue and input to the planning process. Through such a planning process, the City seeks practical solutions to reduce the impacts of geese on vegetation, other wildlife, water quality, and recreational users.



Lake Merritt Snapshot

In the 1800s, Lake Merritt was a natural tidal slough on the margins of the San Francisco Bay, fed by three creeks that drained the surrounding Oakland hills. Since the lake lies on the Pacific Flyway, its thickly matted marshes teemed with migratory waterfowl. In 1870, Mayor Samuel L. Merritt had the slough declared a Wildfowl Refuge.

Construction of a dam along 12th Street inundated the mud flats previously exposed at low tide. In 1922, Oakland authorities built a small artificial island in the lake to provide nesting sites for waterfowl species; four more islands were constructed in the1950s.

The Lake and Park

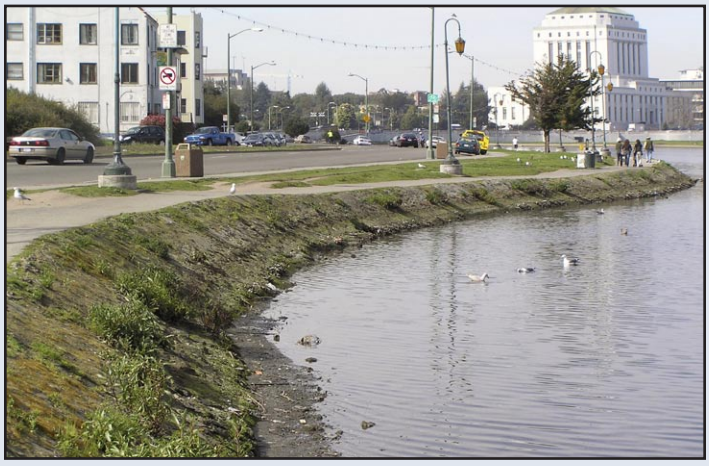
Today, Lake Merritt's estuarine system is a muted tidal system. The lake itself encompasses about 148 acres. Its depth varies depending on tidal flux and rainfall runoff from its 4,670-acre watershed. The average depth of the lake is 7.5 feet, with a tidal range of 1.3 feet. An Alameda County flood control station in the tidal inlet channel controls water levels. The lake's shoreline consists of rock retaining walls, degraded muddy and cobble banks, and sandy beaches. For much of the lake's perimeter, a pedestrian path lines the top of the rock retaining wall. Adjacent parklands encompass a total of 68 acres. Native vegetation was long ago replaced with ornamental turf grasses, shrubs, and trees. In the fall and winter, a log boom is extended across the northeastern arm of the lake to provide a safe harbor for wintering waterfowl.

The Lake Merritt parklands offer a wide range of recreational facilities: lawns, a children's playground, a freshwater pond and aviary, a historic pier at East 18th Street, the El Embarcadero pergola, a bandstand and small beach, lawn bowling greens, Bonsai and Japanese Gardens, and Children's Fairyland. Joggers and walkers fill the pedestrian path along the water. Water-based recreation includes sailing and rowing at the Sailboat House and Municipal Boathouse, home to multiple boating and rowing clubs. The Junior Center for Art & Science and the Rotary Nature Center offer a variety of outdoor education programs to schools and youth groups.

Year-round, the lake is home to many migratory birds, including Canada geese, black-crowned night herons, snowy and great egrets, double-crested cormorants, American coots, western gulls, and mallards. From November through March, the lake hosts a very large population of greater and lesser scaup. Smaller populations of canvasback, bufflehead, and other migratory diving ducks are also present during the cold season. From June through September, the lake's Canada goose population increases tenfold for the summer season.

Refuge Status

The first of such places in California, Lake Merritt was designated as a Wildlife Refuge under the California Wildlife Act (1870). The Act makes it unlawful for any person to take, kill, or destroy any species of waterfowl or wild animal at Lake Merritt. Lake Merritt is also listed in the National Register of Historic Places, and the Lake Merritt Wild Duck Refuge is a National Historic Landmark.



Canada Goose Profile

Canada geese have an extensive distribution, breeding from Alaska's arctic coast, across northern Canada, and throughout the Pacific Northwest and midwestern U.S. In California, the Canada goose was historically a summer migrant only in the Modoc Plateau (the northeastern region of the state), but it has become a permanent resident. The statewide population has steadily increased over the entire length of California since 1984. Canada geese have been breeding in the San Francisco Bay Area since 1959.

The Species

Canada geese exhibit remarkable variation within the species, and can be broadly broken up into two species and multiple subspecies. The primary goose found at Lake Merritt is the Great Basin or western Canada goose (*Branta canadensis moffitti*), one of the larger varieties. Canada geese, depending on subspecies, can range from 2 to 20 pounds in weight and from 22 to 43 inches in length. The sexes are similar, although males are typically slightly larger than females. The head and neck are black with a distinctive white band under the chin. The overall body color is grey-brown, with black tail, legs, and feet. Canada geese are generally rather vocal, and give up to 13 discreet call forms. The most familiar is the nasal *honk* call given by the larger subspecies.

Habitat

Canada geese are adapted to a wide range of habitats, such as open plains, forest, tundra, and inland and coastal marshes, but they also live in a variety of urban landscaped areas and managed refuges. They generally nest near lakes, ponds, or marshy areas, preferentially with an open and unobstructed view of the surrounding areas. They often use the same habitats for molting (feather replacement) and brooding, preferring areas with water bodies large enough to provide refuge when disturbed. The wide expanses of lawn adjacent to Lake Merritt offer ideal habitat for Canada geese.

Diet and Foraging

Canada geese are almost exclusively herbivorous, depending almost entirely on grasses. Their food preferences are largely based on seasonal availability. Post-fledging juveniles and wintering birds rely more on foods higher in carbohydrates, such as seeds, berries, and grains. In the spring, the diet shifts primarily to grasses, sedges, and flowers. The goslings consume grasses almost exclusively. Adults at Lake Merritt have been observed consuming lawn grasses and leguminous plants.

Daily time budgets vary with subspecies, season, and habitat. The bulk of daily activity is devoted to foraging, loafing, and preening. The Lake Merritt population has been observed moving from the islands to adjacent lawn areas during the early morning, returning to the islands at night to roost.

Reproduction

Canada geese typically build nests about 16 to 25 inches wide of vegetation such as plant stems and twigs. The interior is lined with down and feathers. Five to six creamy white eggs are usually laid. The female incubates the eggs for 25–30 days while the male stands guard. Goslings take to the water quickly, and are capable of flight in about 9 weeks. The young remain with the adults until the following spring.

The nesting season is variable across the species' range, but may begin in mid-April in the western U.S. Nests have been observed in April both on the bird islands and on the short bluffs west of the Sailboat House. Adult Canada geese rarely fall prey to predators; most predation is on eggs and fledglings. Both parents vigorously defend their nests and offspring against potential predators, including humans that they perceive as threats.

Migration and Molting

Traditional Canada goose populations are migratory, generally following established waterfowl migration corridors such as the Pacific Flyway. The Bay Area serves as the southern tip of the breeding range. Spring migration is generally in April and May. Fall migration takes place mid-September to mid-November. However, many western populations, such as the resident population at Lake Merritt, are now considered non-migratory, with birds wintering on or near their breeding areas.

Each summer, adult Canada geese undergo a complete replacement of flight feathers, called molting, which takes about a month for most individuals. Many Canada geese perform an annual molt-migration, where birds move from their breeding grounds to gather in large flocks, usually on sheltered lakes. Molting usually takes place from June to August, during which time the geese are flightless. The origin of the molting population that descends on Lake Merritt in late May is unclear. Regional experts believe that the molt-migration flock consists of non-breeding individuals arriving from elsewhere in the Bay Area.

Population and Conservation Status

There has been a general increase in the overall Canada goose population since the 1940s. The local Canada goose population has increased significantly in the past few decades. The current resident Canada goose population within the U.S. on the Pacific Flyway is estimated at 220,000. The U.S. Fish and Wildlife Service estimates that this population will approach 450,000 by 2010.

The Canada goose was classified as a Migratory Game Bird under the Migratory Bird Treaty Act 1916, as amended. One subspecies, the Aleutian Canada goose, was protected under the federal Endangered Species Act, but has recently been delisted. This Aleutian subspecies, which faced extinction in the 1930s, has been restored to sustainable levels and remains a success story to this day.

Sources: Bent 1925; Grinnell and Miller 1944; Johnsgard 1979; Lidicker and McCollum 1979; Bellrose 1980; Banks and Springer 1994; Small 1994; Baicich and Harrison 1997; AOU 1998; Clements 2000; Mowbry et al. 2002.

Dr. Richard Bailey/Lake Merritt Institute

Geese at Lake Merritt

Resident Population

Resident Canada geese are those that nest and reside predominantly in the U.S. and do not exhibit the characteristically long north/south migration patterns. Lake Merritt is home to a resident population of approximately 200–400 Canada geese that remain throughout the year. This resident population generally spends its days grazing on the lawns north of the lake in the Adams Point district. The resident population may also graze in the late evening or early morning hours on the southeastern edges of the lake; along the grassy margin following Lakeshore Avenue north of Wesley Avenue; on the lawns adjacent to the Lakeview Branch public library; and, to a lesser degree, between East 18th and 12th Streets (Figure 1).

Access to freshwater sources also has an impact on where the geese congregate. In addition to gathering on the lawns, the geese can be observed drinking from the McIroy Fountain, storm drain outlet pipes, gutters, and puddles produced by turf irrigation.

Key factors supporting urban Canada goose populations include the following.

- Low abundance of natural predators.
- Temperate climate with healthy breeding habitat conditions.
- Tolerance for urban disturbances and human presence.
- Abundant preferred habitat and alternative food resources (urban/suburban landscaping).
- Absence of waterfowl hunting.
- High production and survival rates in offspring.
- Relatively short migration distances in winter.

Breeding at Lake Merritt

With limited suitable nesting habitat, Lake Merritt is a relatively poor breeding site for Canada geese. Although many pairs of resident Canada geese can be seen engaging in mating behavior in March and April, local naturalists report that only 10–15 breeding pairs are successful each year. These breeding pairs make their nests in small depressions in the ground on the bird islands and on the bluffs along the Glen Echo arm of the lake. The lake's successful pairs have produced over 50 goslings in recent years; however, only five goslings were observed this year. Local reports indicate that young goslings are preyed upon by gulls, egrets, and feral cats, with a survival rate of approximately 70%.

Adult Canada geese lead their goslings to lawns above the lake's ramped retaining walls or beaches to graze. Because the goslings cannot fly, they must walk

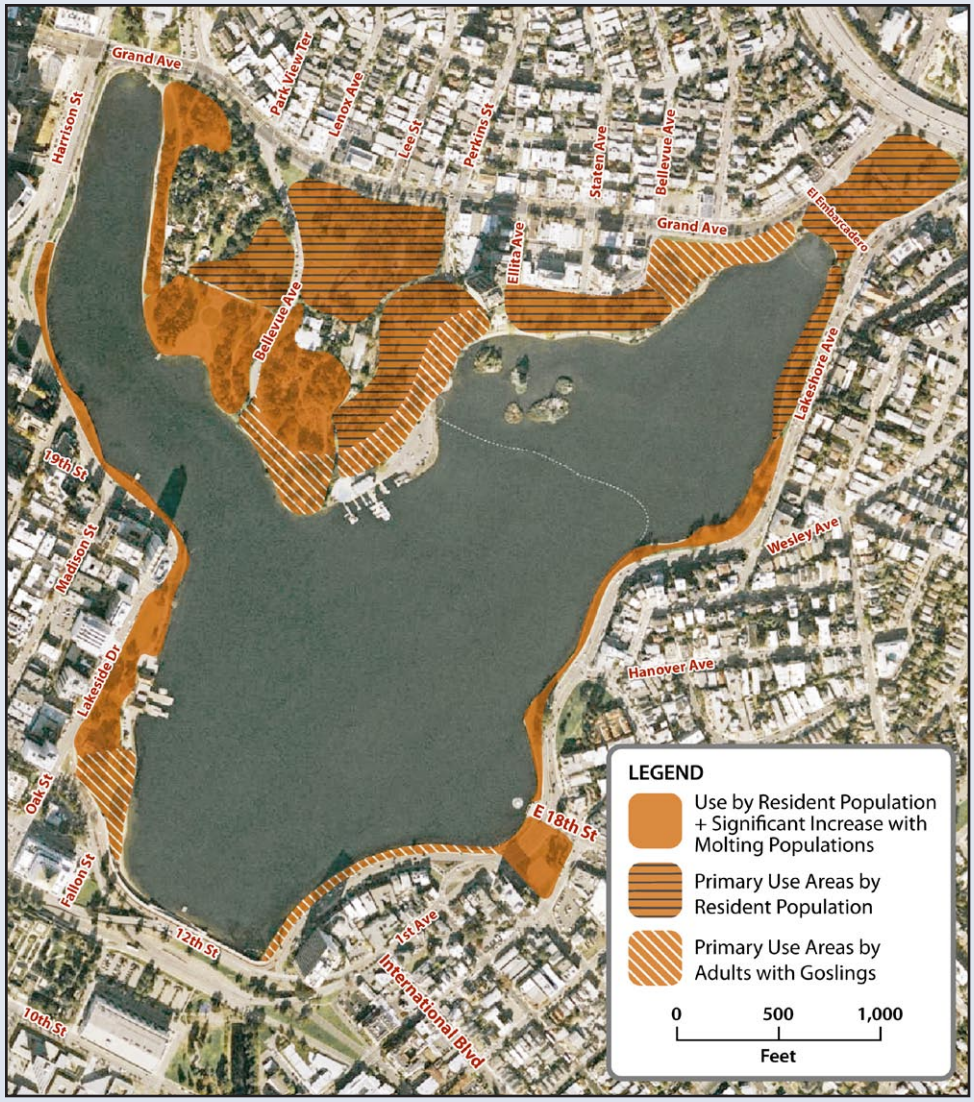


Figure 1. Goose Use Areas

from the lake to grazing areas. Many sections of the lake's retaining walls are too steep for gosling passage, especially when lake levels are lower. Consequently, adults and goslings are generally clustered at the Cameron-Stanford House, upland of the sloping beach area; along Lakeshore Avenue, between East 18th and 12th Streets where the lake's retaining wall is sloped; and on the lawns surrounding the Bandstand beach (Figure 1).

Molting

From June through August, the local Canada goose population increases significantly as regional populations migrate to Lake Merritt for the molting season. The population typically peaks in July, and nearly 2,000 individuals have been reported over the past few years (Figure 2). During their annual molting, Canada Geese must find a 'safe haven' to spend 4–8 weeks. During this time, the geese are flightless and favor areas with wide expanses of lawn for grazing, access to fresh water for drinking and bathing, a clear direct path to a water body for refuge, and lack of predators.

Molting Canada geese tend to graze in large groups; approximately 30–50 geese can be observed moving in flocks across the lawns. They tend to spread out at the lake's perimeter, with the highest concentrations near the Rotary Nature Center and children's playground lawns. Because they are farther from the safety of the lake, the lawns east of Children's Fairyland and/or near the Garden Center do not support many geese in the first few weeks of molting, but these areas are more heavily used later in the summer. Later in the molting season, as their feathers begin to regrow, geese can be found stopping traffic at the El Embarcadero Pergola as they move toward the Lakeview Branch public library lawns, and at East 18th Street, heading to graze on the Athol Park lawn.

Human Interactions

With the recent increases in the local Canada goose population, it is inevitable that conflicts arise in an urban setting. The coincidence of the molting period's high goose population with the summer season's increased park usage intensifies such conflicts. One of the more significant—and obvious—byproducts of goose inhabitation is their waste. Goose droppings that are broadly distributed over turf areas, picnic grounds, bowling greens, beaches, and paths present both aesthetic and hygiene problems for park visitors. Likewise, foraging geese trample lawns, contribute to hardpan conditions in clearings and banks, and can become aggressive when tending nests or goslings.

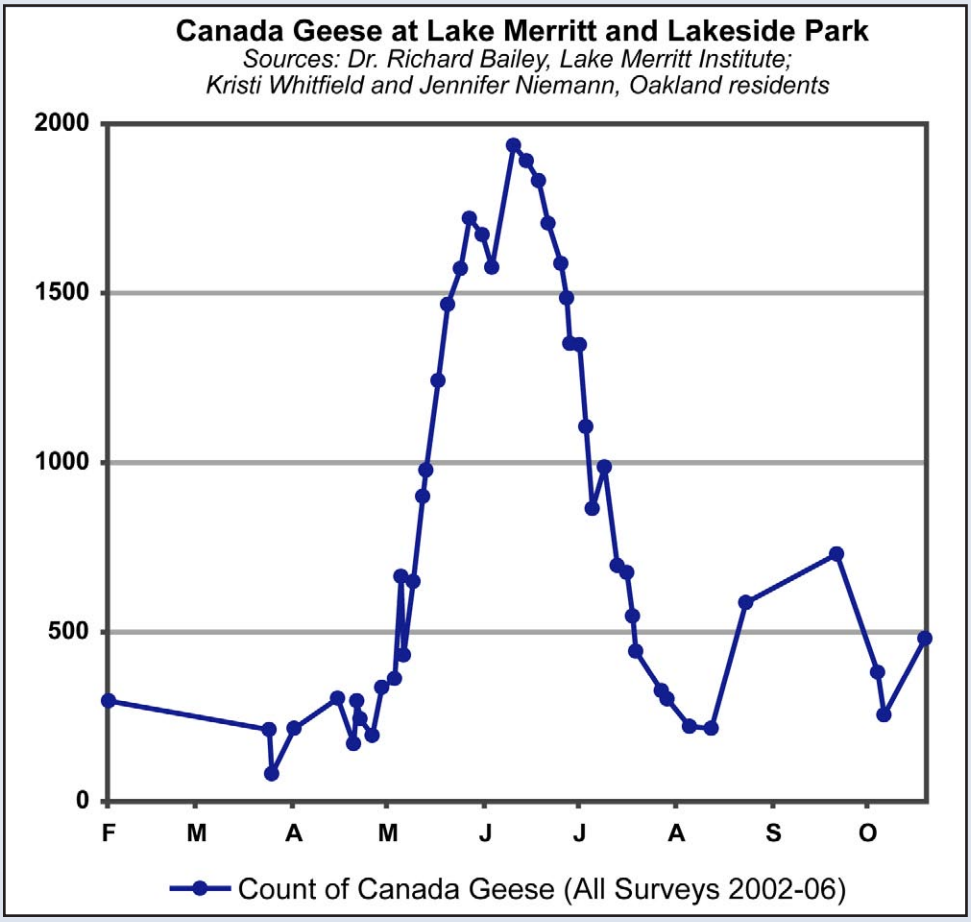


Figure 2. Goose Population Chart

Geese and Lake Water Quality

Goose Waste at Lake Merritt

Waste from Canada geese is generally distributed throughout the lawns north and east of Lake Merritt and in patches along the lakeside paths. The highest concentrations of droppings were observed where geese congregate to forage, loaf, and preen. Droppings were observed along the edges of the paved paths and sidewalks; however, geese primarily defecate on grassy areas. Additionally, high concentrations of goose feces were observed in and around freshwater pools, such as at the McIroy Fountain, leaking sprinklers, or puddles. Goose droppings increase significantly during the summer molting season when the local goose population peaks, with feces distributed across virtually all turf, beach, and other surfaces.

Goose Waste and Water Quality

When deposited, nutrients in Canada goose feces are quickly adsorbed by vegetation in park areas and by algae and sediments in the lake water column. When it rains or when lawns are watered, feces deposited on vegetated areas are trapped and decomposed in the soil, while feces deposited on paved areas are washed to grassy areas, into storm drains that discharge to the lake, or over the paved edge and into the lake. Feces deposited on vegetated areas contribute to further growth of the plants that geese feed on, thus continuing the nutrient cycle. Lake Merritt water quality is most likely influenced where feces are directly input or carried to the lake through surface runoff.

Due to multiple unknowns about the Lake Merritt system, the effect of the local goose population (as distinct from other waterfowl or watershed inputs) on water quality is difficult to evaluate. To confirm the influence of goose waste on water quality, a watershed-wide investigation of nutrient cycling should be conducted.

Nutrients in Estuarine Systems

Nutrient concentrations in estuarine systems are influenced by numerous environmental factors, including incoming watershed and marine sources. Nitrogen is cycled through the environment in

atmospheric gas, in soil, and in living and decaying organisms. Phosphorus is cycled through the environment in living and decaying organisms, through natural rock weathering, and in fertilizers. In estuarine systems such as Lake Merritt, high levels of nitrogen can result in algal and macrophyte blooms, while excess phosphates can lead to eutrophication. Recommended nutrient concentrations in estuaries range from 0.1 to 1.0 milligrams per liter (mg/L) nitrogen and 0.01 to 0.10 mg/L phosphorus.

Canada goose fecal matter is composed of approximately 76% carbon, 4% nitrogen, 1% phosphorus, and other compounds. Water samples from Lake Merritt, tested in the early 1980s, contained 0.5–1.5 mg/L nitrogen and 0.2 mg/L phosphorus. Nutrient concentrations in tidal flows from the Oakland Estuary were significantly lower, while urban runoff concentrations were higher. However, biological (bird populations) and urban stormwater quality factors contributing to nutrient influences in Lake Merritt's watershed have changed since these studies were conducted. In particular, the City has vastly improved the sanitary sewer system to prevent discharges of sewage to the lake. Extensive sampling of nutrients has not been conducted since the 1980s, though regular sampling of dissolved oxygen has occurred for the last few years.

Nutrient Loading from Goose Waste

When Canada geese consume vegetation, it is quickly digested and deposited as manure back onto the land. Goose droppings generally do not contribute new

sources of nutrients to a system; rather, the geese partially digest and return nutrients back into the environment. The average Canada goose defecates 28 times per day. The dry weight of an individual goose dropping is 1.2 to 1.5 grams, equating to about 0.1 pound of waste per day.

Nutrient loading from bird populations varies with species, population density, feeding habits, dilution capacity of the water body, and time of year when birds are present. Research examining the effects of waterfowl waste on water quality indicates that the processes related to nutrient loading are complex and not easily summarized into one clear outcome. Though waterfowl populations may constitute a large contributing factor to nutrient loading in freshwater lakes and estuarine systems, studies have shown that nutrients in waterfowl waste are largely soluble; do not transport from vegetated areas to water bodies; and minimally elevate nutrient or algae levels in receiving water bodies. The general conclusion is that the influence of Canada goose waste on water quality is nominal. However, impacts vary according to specific conditions and physical aspects of the water body.

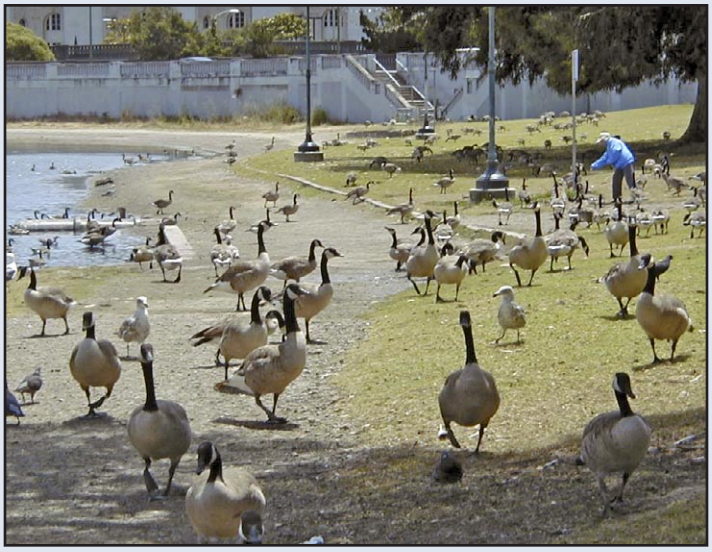
Influence of Goose Waste on Human Health

Pathogens (bacteria, viruses, and parasites that cause disease or illness) are excreted along with nutrients in animal waste. However, not all types of pathogens pose a risk to human health; some only affect wildlife. Although Canada goose feces can contain pathogens that are harmful to humans, the bacteria and virus species that are human pathogens are present in a very small percentage of goose droppings. One study concluded that only 2% of goose feces contain bacteria that are harmful to humans. Consequently, contact with Canada goose feces may pose only a minimal threat of human illness.

The people at most risk of contracting an illness from Canada goose feces are visitors and children who picnic, nap, or play directly on turf covered by droppings. Such activities may result in the unintentional ingestion of goose feces if individuals do not wash before eating; such ingestion can result in exposure to human pathogens. Recreationalists participating in water-contact recreation on Lake Merritt, such as sailing and canoeing, can also be exposed to pathogens in the water.

Treatment for contact with goose droppings is relatively simple. Anyone who comes into contact with goose waste should vigorously wash exposed areas with warm water and soap to reduce the likelihood of infection.

Sources: Kear 1963; Manny et al. 1975; Hussong et al. 1979; Pitt and Bozeman 1979; ACFCWCD & CH2M-Hill 1982; Benton et al. 1983; Bazely and Jefferies 1985; NOAA and EPA 1988; Valiela et al. 1991; Osmond et al. 1995; Scherer et al. 1995; Graczyk et al. 1996; Percell and Goldsborough 1996; Pettigrew et al. 1998; Alderisio and DeLuca 1999; Converse et al. 1999; Kitchell et al. 1999; Fleming et al. 2001; Andersen et al. 2002; Kullas et al. 2002



Dr. Richard Bailey/Lake Merritt Institute

Canada Goose Management Techniques

Lake Merritt's resident Canada goose population (200–400 geese) is of an appropriate size for available nesting, roosting, and foraging habitat on the bird islands and western bluffs. The concentration of resident geese that overwinter at the lakeside parks does not create significant conflicts with human residents. However, the overabundant summer population creates a nuisance situation, affects recreational use of the lakeside parks, and creates a perceived threat to human health and safety. While public attitudes toward the local goose population are widely variable, it is generally recognized that some form of goose management at Lake Merritt is warranted.

There are several existing and assumed factors at Lake Merritt that somewhat limit the City's ability to manage the Canada goose situation.

- The need to avoid disturbing other migratory waterfowl in the wildlife refuge.
- The lake's refuge status requires that only nonlethal control methods be employed.
- Because the problem population is migratory, reproductive control is not appropriate.
- The proximity of residences along the lake's boundaries and abundance of recreational users may limit technique selection.

Because of the species' adaptability, management programs that integrate multiple techniques are the most effective. The management options discussed below are available and appropriate for use at Lake Merritt.

Population Monitoring

One key element of an effective Canada goose management program is monthly monitoring of the local goose population. Once per month, a wildlife biologist or trained volunteer should take a census of the lake's Canada goose population to track its seasonal and annual growth or decline. Monitoring of the population provides a baseline that will inform future adaptive management techniques.

Discontinuance of Feeding

Canada geese are grazers and therefore **do not** need food handouts to sustain themselves. It is difficult to induce Canada geese that have been attracted to an area by food handouts to leave, despite application of time-consuming and expensive control techniques. According to the U.S. Department of Agriculture, cessation of feeding is the most important first step in resolving Canada goose conflicts. The City may enact a municipal ordinance restricting feeding of the geese at Lake Merritt. Educational signage may be installed to remind visitors that geese should not be fed.

Geese Exclusion Areas

In order to balance park visitation and goose needs, the City may establish several *Goose Exclusion Areas* within the lakeside parks (Figure 3). In *Goose Exclusion*

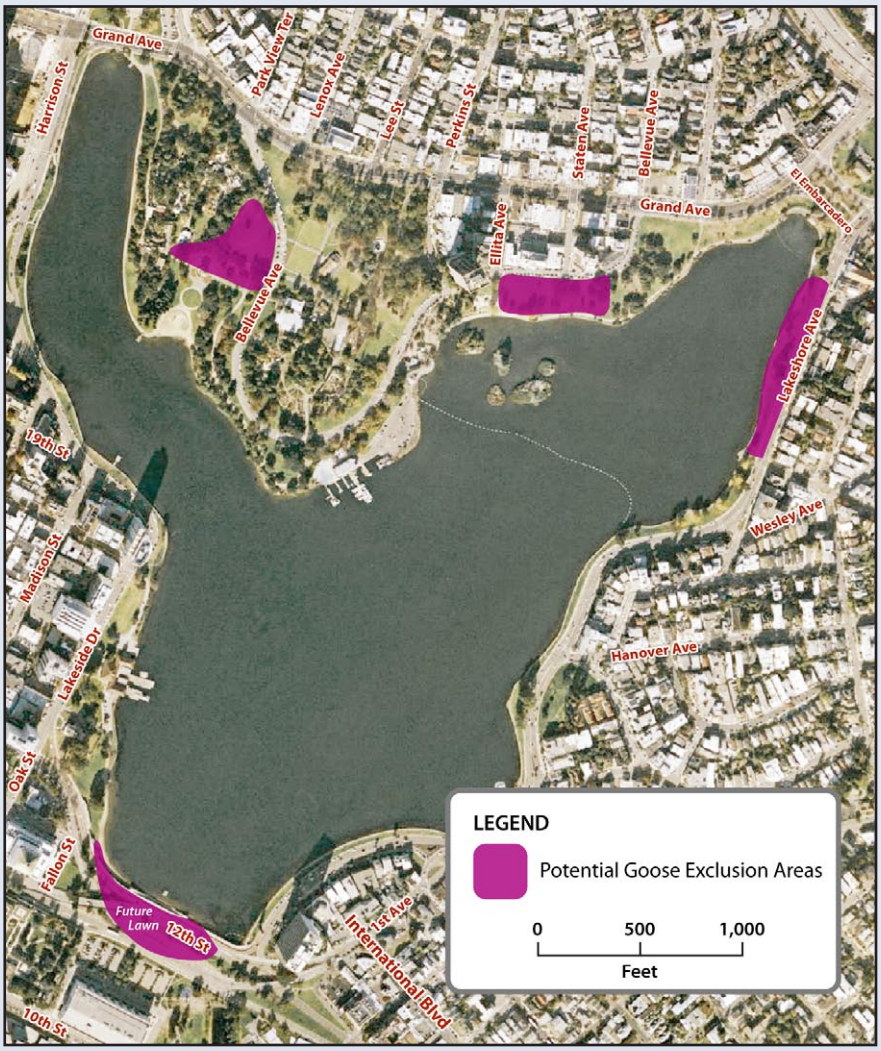


Figure 3. Goose Exclusion Areas

Areas, a combination of site management, habitat modification, barriers, and harassment may be used to discourage goose congregation and allow for an improved recreational experience. However, remaining areas within the lakeside parks may remain fully accessible by the geese.

Waste Collection

The abundance of Canada goose droppings is a key nuisance factor for many Lake Merritt visitors. Widespread goose waste prevents park users from using lakeside paths, picnicking, and other informal recreation. The City may designate use of a small street sweeper to collect goose droppings from the lakeside paths on a weekly or biweekly basis. Alternatively, the NatureSweep machine is a small tractor specifically designed to collect goose waste from lawn surfaces. The City may purchase the NatureSweep machine for use within the lakeside parks during the summer molting season (and possibly year-round). Waste collection would allow the geese continued presence on all surfaces, while also maintaining cleaner paths for walkers and joggers and cleaner turf for families and picnickers.

Long Grass Management

Canada geese prefer to graze on short grass in areas that are open and within sight of a body of water. Habitat modifications to deter Canada geese include alteration of grasses to reduce their habitat and grazing value. The City may opt to plant longer grasses or other groundcover to discourage grazing; however, geese have been observed loafing in long grass areas. The intensity of human trampling at Lake Merritt lawns may preclude the use of less resilient long grasses. Replacing a portion of existing lawns with other groundcover may also reduce their recreational value for humans.

Vegetated Strip

Resident geese have been observed to defecate on the outer edges of the pedestrian path that caps the lake's retaining wall. Planting of a grassy strip where possible between the retaining wall and lakeside path may reduce waste loading on the path and/or direct deposition of goose feces into the lake.

Barriers and Temporary Fencing

When geese are tending goslings or molting, fencing and other barriers can limit their range of movement by prohibiting access to the water body. Perimeter fencing around water bodies can be used during the June–August molting season to discourage geese from congregating on certain lawns. Installation of temporary short fencing along the lake retaining wall may discourage molting populations from congregating within established Goose Exclusion Areas. Fences should be sturdy and firmly affixed to the ground, and should completely encircle the affected area.

Dog Hazing

Dog hazing is a technique used to scare geese from problem sites. It is permissible to harass Canada Geese without a federal or state permit so long as the geese are not touched or handled. Hazing is most effective if implemented before or at the initial stages of use; also, diverting geese from a specific problem site is more successful if the geese are provided with alternative areas for grazing and refuge. The City may conduct hazing during the initial migration of the molting population, to discourage the geese from congregating at Lake Merritt. Trained dogs and their handlers may be distributed across lakeside parks during the June–August molting season. Alternatively, dog hazing may be restricted to the designated *Goose Exclusion Areas*.

Egg Oiling and Addling

Although it is not an immediate concern for the City, strategies to stabilize the resident population may be necessary to consider in the future. Oiling goose eggs prevent gases from diffusing through the outer membranes and pores in the shell, thereby causing the embryo to asphyxiate. Vegetable oil can be applied to goose eggs from a spray bottle several times during the nesting season. Addling involves vigorously shaking eggs until the embryo is destroyed. If the City finds that the resident goose population is increasing, it may seek State permits to implement an egg oiling program. Egg oiling is a humane, ethical, and non-controversial population stabilization technique employed by many urban land managers and implemented in many places by trained community volunteers.

Sources: Smith et al 1999; USDA 2003; GeesePeace 2007

Your Input!

The City has prepared the *Canada Goose Management Study* to understand more about the species, assess the goose situation at Lake Merritt and any conflicts they create, and present a range of management strategies for discussion by the community.

A community meeting will be held at **7 p.m. on Thursday July 26th, 2007** at the Garden Center, 666 Bellevue Ave, Oakland, CA 94610. This meeting will allow the City Council and local residents to discuss the study's findings and the available management options. Following the community meeting, the City Council will define an integrated management program for the lake's Canada goose population.

For further information about this study, please contact Joel Peter, the City's Measure DD Program Manager at jmpeter@oaklandnet.com or (510) 238-7276.

The City's website (http://www.oaklandpw.com/Page794.aspx) also provides a detailed matrix of Canada goose management techniques and a full bibliography of references cited in this study.

Special thanks to the following contacts:
Dr. Richard Bailey—Executive Director, Lake Merritt Institute
Stephanie Benevidez—City Naturalist, City of Oakland
Dr. Jeff Black—Wildlife Professor, Humboldt State University
John Bower—Golden Gate Audubon Society
Susan Hall—City of Fremont, Central Park (Lake Elizabeth)
John Kraus—California Department of Fish and Game
Hillary Powers—Golden Gate Audubon Society
Jan Scott—GooseBusters
Dr. Paul F. Springer—Professor Emeritus, Humboldt State University
Kristi Whitfield—Oakland resident

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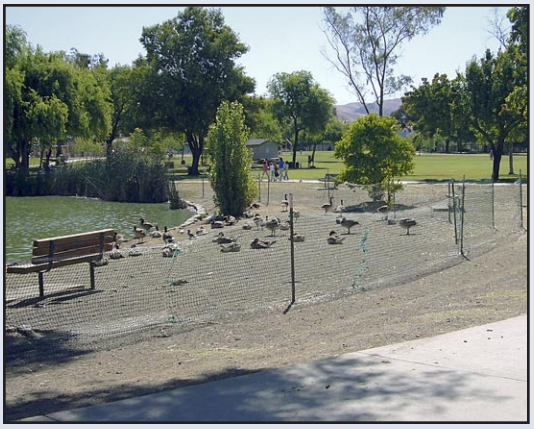
Ingus Silgailis—Principal, NatureSweep Enterprises
Rosalyn Stewart, Jill Sunahara, and Bud Widdowson—Jones & Stokes



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