

Summary of the  
Occurrence, Population Status, and  
Management of the Western Gull (*Larus occidentalis*)  
on Alcatraz Island

July 7, 2008



*Prepared for:*

National Parks  
Conservation Association



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Alcatraz Island**

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# Table of Contents

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1.0	Introduction.....	1-1
1.1	Historical Context.....	1-2
1.2	Description of Key Management Directives.....	1-3
1.3	Purpose.....	1-5
2.0	Western Gull Status and Life History.....	2-1
2.1	Legal and Conservation Status.....	2-1
2.2	Life History.....	2-1
	2.2.1 Seasonal Patterns.....	2-1
	2.2.2 Habitat Associations.....	2-2
	2.2.3 Threats to the Species.....	2-4
	2.2.4 Nuisance Issues.....	2-4
3.0	Western Gull Distribution and Abundance.....	3-1
3.1	Global.....	3-1
3.2	Regional.....	3-2
3.3	San Francisco Bay Area.....	3-3
3.4	Population Trends.....	3-6
4.0	Western Gulls on Alcatraz Island.....	4-1
4.1	Historical Context.....	4-1
4.2	Recolonization.....	4-1
4.3	Population Trend and Current Status.....	4-1
	4.3.1 Monitoring Efforts and Population Trend.....	4-1
	4.3.2 Nesting Distribution.....	4-2
	4.3.3 Carrying Capacity.....	4-2
	4.3.4 Relative Abundance.....	4-4
	4.3.5 Population Viability.....	4-4
4.4	Current Management and Desired Future Conditions on Alcatraz.....	4-7
	4.4.1 Management Strategy.....	4-7
	4.4.2 Recommendations and Desired Future Conditions.....	4-11
5.0	Literature Cited.....	5-1
6.0	Appendix A. Western Gull Breeding Colonies between Point Arena and Point Sal.....	6-1

# List of Tables and Figures

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## Tables

Table 1. Major Western Gull Breeding Colonies.....	3-2
Table 2. Western Gull Colony Locations in the San Francisco Bay Area.....	3-4
Table 3. Number and Location of Western Gull Nests on Alcatraz from 1990 to 2007.....	4-3

## Figures

Figure 1. Regional Location of Alcatraz Island.....	follows Page 1-1
Figure 2. Distribution of the Western Gull.....	follows Page 3-1
Figure 3. Western Gull Breeding Season Composite Distribution, 1996-2003.....	follows Page 3-2
Figure 4. Western Gull Colony sites along the North and Central California Coast.....	follows Page 3-3
Figure 5. Distribution of Western Gull Breeding Populations in the San Francisco Bay Area.....	follows Page 3-5
Figure 6. Western Gull Composite Population Trend, primarily within the Range of <i>L.o. wymani</i> , 1966-2004.....	follows Page 3-6
Figure 7. Western Gull Survey Areas on Alcatraz Island.....	follows Page 4-2

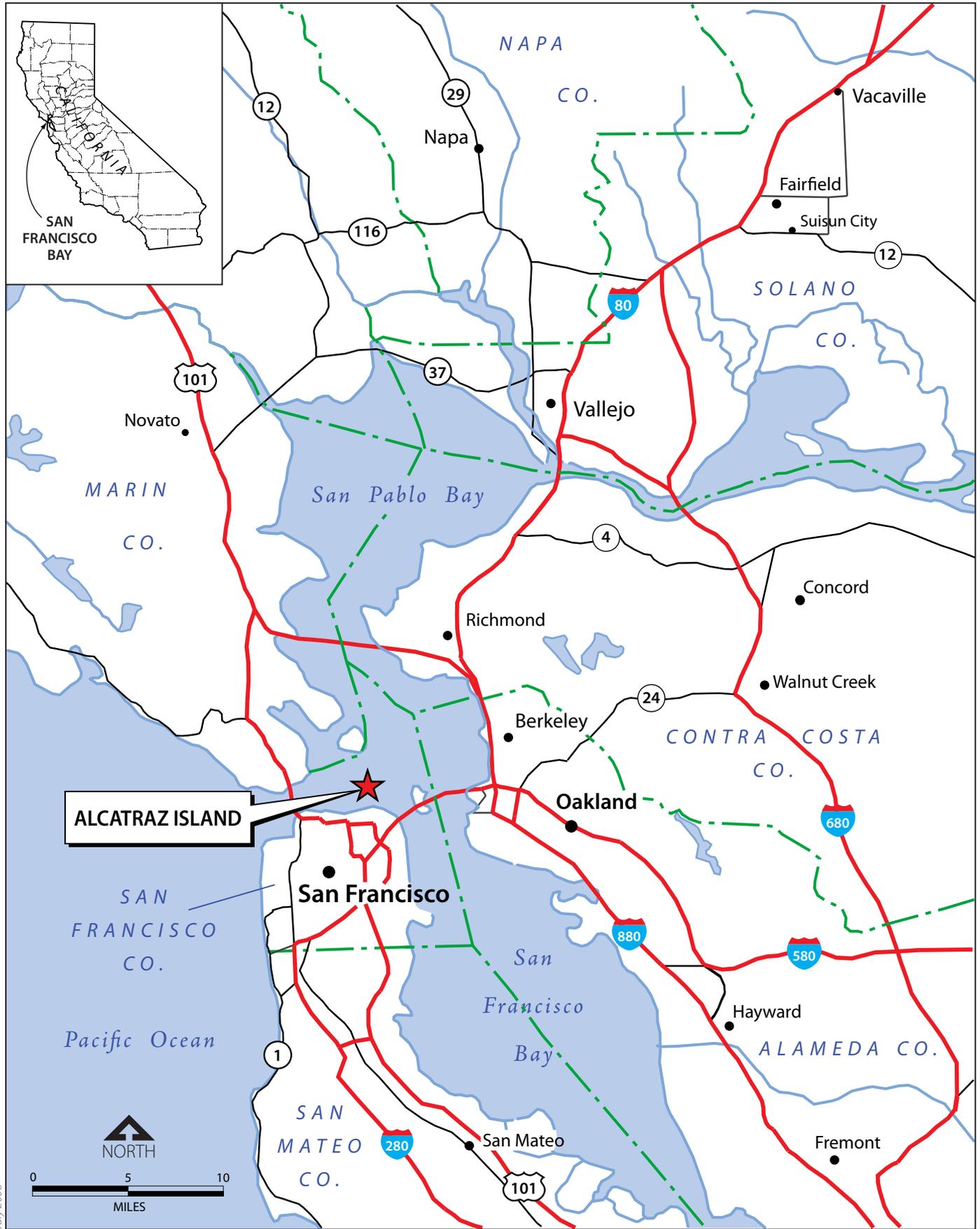
# 1.0 Introduction

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Western gull (*Larus occidentalis*) is a yearlong resident of coastal California, including the San Francisco Bay Area. Nesting mainly on offshore islands, rocky islets, and coastal cliffs, western gulls have historically been subject to substantial human-related disturbances and as a result nesting populations declined during the latter half of the 19<sup>th</sup> century (Pierotti and Annett 1995, Pyle 2001). Since implementation of protections for coastal and offshore island habitats, reductions in pesticide contamination of food resources, and possibly as well as the possible expansion of alternative food resources (e.g., landfills and fish production facilities), western gull populations have rebounded and some formerly occupied areas have been recolonized (Pierotti and Annett 1995).

Among those recolonized sites is Alcatraz Island located in San Francisco Bay (Figure 1). Currently under the jurisdiction of the National Park Service (NPS) and included within the Golden Gate National Recreation Area (GGNRA), Alcatraz has become increasingly important over the last two decades as a breeding site for several colonial seabirds, including the western gull. Today Alcatraz Island supports significant breeding populations of several seabird species and supports the largest western gull breeding colony in the San Francisco Bay area. However, because Alcatraz Island consists mainly of historic structures, trails, gardens, and other related historic features, seabird recolonization has also resulted in conflicts with other NPS management priorities. This has been most pronounced with respect to western gulls. While most of the seabird colonies are located around the perimeter of the island, western gulls nest and roost throughout the entire island including on most of the buildings, walk-ways, and other historic structures and visitor areas. In addition, the rapidly expanding population of western gulls may have detrimental effects on other populations of seabirds nesting on Alcatraz due to predation and competition for nest sites.

Addressing these conflicts has been the subject of various environmental review processes and planning documents, including the Bird Conservation and Management Strategy for Historic Alcatraz Island (GGNPC and NPS 2005), and ongoing discussion between NPS, Golden Gate National Parks Conservancy, Golden Gate Audubon Society, and other park partners. Largely because of their widespread distribution and abundance on Alcatraz, the western gull has become the focal species for ongoing attempts to find appropriate resolution to continuing management conflicts. To provide additional background information for this ongoing discussion, this assessment provides a summary discussion of the population of western gulls on Alcatraz in the context of their regional and global populations, a summary of the issues related to population sustainability, and a summary of related management practices and desired future conditions on Alcatraz.



July 2008

**Figure 1**  
**Regional Location of Alcatraz Island**

## 1.1 Historical Context

Prior to human occupancy that began with its use as a military outpost during the Civil War and was followed by its use as a military prison until the 1930s and a federal penitentiary until 1963, western gulls and other colonial nesting waterbirds occupied the shoreline and interior plains and cliffs of Alcatraz. Western gull and other colonial waterbird populations likely began to decline immediately after initial occupancy of the island and rapidly abandoned the island entirely. Nearly continuous human occupation of Alcatraz until the closure of the federal penitentiary in 1963 transformed the island almost entirely into a constructed or landscaped environment with almost no natural habitat except for its rocky shores. During this period, there are no records of western gull or other colonial waterbirds nesting on Alcatraz. Currently, at least 80 percent of the island consists of prison-related buildings or other hardscape, a portion of which has deteriorated to ruins or rubble. Remaining areas consist of gardens, landscaping, and rocky shoreline (LSA Associates and National Park Service Staff 1993, National Park Service 2001, Bradley 2005).

Alcatraz was largely abandoned following closure of the federal penitentiary in 1963 through the mid-1970s. While there are no reliable records, colonial nesting waterbirds likely began slowly recolonizing the island during this period. NPS initially took over management of the island in 1972 with its designation as a national recreation area. Western gull was first detected nesting on Alcatraz in 1975. Since then, Alcatraz has become increasingly occupied by a growing population of western gulls and several other colonial waterbird species, including Brandt's cormorant (*Phalacrocorax penicillatus*), pelagic cormorant (*Phalacrocorax pelagicus*), pigeon guillemot (*Cepphus columba*), black oystercatcher (*Haematopus bachmani*), black-crowned night heron (*Nycticorax nycticorax*), and snowy egret (*Egretta thula*). The number of western gull nests has gradually increased on Alcatraz each year to its current total of 1,150 active nests in 2007 (Bell 1990, Acosta et al. 2007a).

Because of its cultural history and relatively intact historical features, the primary management focus for Alcatraz by the NPS has been to protect and maintain its cultural resources, which is considered a fundamental resource to NPS and is the primary reason why the island was included in the GGNRA. This concept was initially instituted in 1978 with the listing of Alcatraz Island on the Register of Historic Places, and then further institutionalized in 1986 when the island was declared a National Historic Landmark. Along with these designations, which established the cultural resources-related focus of the NPS' mission on Alcatraz, came the need to protect and maintain the historic environment of the island including the buildings and infrastructure. However, by this time, many of the historic sites (e.g., prison buildings, infrastructure, landscaping) were rapidly deteriorating and restoration actions were planned in order to sustain the integrity of structures and other related sites on the island.

Nesting western gulls, however, had by then established a nesting colony that encompassed a large portion of the island, including the built environment (Bell 1990).

Nesting gulls occupied tops of buildings, edges of walkways, ruin and rubble areas, and other open hardscape areas (e.g., parade grounds), which prevented access for maintenance and restoration work during the breeding season due to environmental laws (e.g., Migratory Bird Treaty Act) that protect nesting birds as well as other NPS natural resources-related directives. Then, with the approval of the Alcatraz Development Concept and Environmental Assessment in 1993, the NPS instituted an interpretive program that substantially increased visitor access to the island to tour historic facilities and view the natural resources of the island. However, the presence of nesting and roosting western gulls in many of the public access areas resulted in regular complaints of aggressive gull behavior, areas closed to public access, and unpleasant odors resulting from extensive guano droppings.

Thus, the stage was set for conflicting management objectives on Alcatraz Island, all influenced by NPS missions for cultural resource protection, natural resource protection, and public access.

Today, the entire 22-acre island is considered a historic property due to its listing on the National Register of Historic Places in 1978 and its subsequent designation as a National Historic Landmark. It is this designation, and because cultural resources are considered a fundamental resource of the island, that drives or influences all island management decisions and is why cultural resources management is the primary focus of Alcatraz. Visitor access, closely tied with cultural resources, is also a very important issue to NPS. In addition to the value of the interpretive program that has been developed, visitor access generates funds through entrance fees that support NPS and Golden Gate National Parks Conservancy (GGNPC) operations.

However, the island is also considered an increasingly important site for nesting colonial waterbirds, and today supports the second largest nesting colony (other than Southeast Farallon Island) of western gulls along the northern and central coast of California. In addition to also being important resource management considerations of NPS, the presence of these nesting birds requires adherence to applicable state and federal environmental laws that protect nest sites and can thus influence the ability to achieve cultural resource management objectives on Alcatraz Island.

## **1.2 Description of Key Management Directives**

Three key management directives were identified in the Bird Conservation and Management Strategy (GGNPC and NPS 2005) that drive management, project, and compliance activities on Alcatraz Island. Their importance and management applicability are based primarily on regulatory requirements and management guidance. They include:

1. **Cultural Resources Management.** With its status as a National Historic Landmark, cultural resources management is the primary focus of Alcatraz Island.

Other management activities, including natural resource management, cannot supersede compliance with the NHL status. Cultural resources management issues include maintaining the structural integrity of buildings and other hardscape, ongoing maintenance of historical facilities, and management of historical grounds.

2. Natural Resources Management (Bird Conservation and Management). Because of the emphasis on addressing issues related to the NHL status, this is considered the secondary focus of Alcatraz Island. State and federal regulations and NPS management documents (e.g., 1980 General Management Plan [NPS 1980], 1993 Development Concept Plan [LSA Associates and National Park Service Staff 1993], 2001 Historic Preservation and Safety Construction Program EIS [NPS 2001], and most recently the Bird Conservation and Management Strategy for Historic Alcatraz Island [GGNPC and NPS 2005]) provide guidance for protecting bird colonies and other natural resources on Alcatraz Island. In the absence of conflict with NHL status, the protection of natural resources is the primary consideration in terms of overall resource management.
3. Access. Access includes visitor access to the island and related interpretive programs, staff access, enforcement access, and concessionaire access. While access onto the island is important for management, maintenance, and visitor services, there is no overriding regulatory requirement that guide this issue. Therefore, it was considered the tertiary focus of Alcatraz Island. However, as noted above, visitor access and interpretive programs have become important elements of the management of Alcatraz and generate funds needed for various NPS and GGNPC operations.

Since recolonization, western gulls have established nest sites throughout much of the island, including in areas used for public access and on important cultural resources (e.g., buildings, walkways, ruins, etc.). While the presence of other seabird colonies also conflicts with management goals, the widespread presence of western gulls throughout the island has resulted in the most significant management conflicts and the inability to fully achieve the NPS missions of cultural resource protection and public access and interpretation. Gulls generally nest between April and August, and sometimes into September. During this period, maintenance or restoration activities must be restricted or postponed to avoid disturbing nesting western gulls. Disturbance leading to nesting failure would constitute a violation of the federal migratory bird treaty act (MBTA) and is inconsistent with the NPS mission of natural resource protection. However, protecting nesting gulls has resulted in a continuing deterioration of cultural features on the island due to the inability to conduct needed work during the dry season (when gulls are nesting), and in some areas has restricted public access and caused a nuisance issue with aggressive gulls.

An additional issue is the potential effect of an increasing western gull population on other waterbird colonies due to increased predation by western gulls and growing competition for nesting space.

While there is some element of prioritization of these three potentially conflicting directives, efforts have been made by NPS and Golden Gate National Parks Conservancy (GGNPC) staff to coordinate and find acceptable compromises that address all of the needs of Alcatraz management. The Alcatraz Bird Conservation and Management Team was established to coordinate management issues. The Team oversees implementation of the Bird Conservation and Management Strategy (GGNPC and NPS 2005) and reviews projects that may affect bird colonies. Several management recommendations in the strategy have been implemented with some success. Still, the conflict with western gull management persists, necessitating a more detailed review of this species before more intensive gull management practices are implemented.

### **1.3 Purpose**

The purpose of this report is to provide a general assessment of the significance of the western gull breeding colony on Alcatraz Island relative to the global, regional, and San Francisco Bay populations and to the extent possible summarize population trends. In addition, this report summarizes issues affecting the sustainability of the western gull population on Alcatraz.

## **2.0 Western Gull Status and Life History**

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This section provides a brief summary of the legal and conservation status of the western gull, and a brief description of relevant life history and other ecological parameters.

### **2.1 Legal and Conservation Status**

The western gull has no special-status either globally or under state or federal statute or regulation. In California, birds and active nests are afforded protection pursuant to California Fish and Game Code 3503 and the federal Migratory Bird Treaty Act (MBTA).

Western gull has no conservation status (e.g., National Audubon Society) that would suggest the species is currently at risk.

The U.S. and Wildlife Service's Seabird Conservation Plan Pacific Region (USFWS 2005) considers the western gull to be at Low Risk using the conservation ranking criteria from The North American Waterbird Conservation Plan (Kushlan et al. 2002).

The NPS considers the western gull a native animal species that likely occupied Alcatraz Island prior to the development of the island.

### **2.2 Life History**

#### **2.2.1 Seasonal Patterns**

Western gulls breed from approximately April through August. Nest building generally occurs from April through May. Western gulls produce only one brood per year, but they will renest if a nest is destroyed or otherwise fails early. The incubation period occurs from approximately May through June and chicks fledge 6-7 weeks after hatching, from approximately mid-July through August (Pierotti and Annett 1995). Males often occupy the nesting sites prior to females arriving, and dependent young may occasionally remain at the nest through September. Thus, nesting western gulls potentially occupy Alcatraz Island from March through September.

Following the breeding season, western gulls disperse from the breeding territory, but generally do not migrate long distances. Most stay in the general region of their breeding area, occupying winter foraging habitats, including offshore areas. Peak spring migration

occurs in March through early April and peak fall migration occurs from mid-August to mid-October (Pierotti and Annett 1995).

## **2.2.2 Habitat Associations**

### **Nesting**

During the breeding season western gulls occupy offshore islands, rocky coastal islets, and coastal cliffs. They also have become habituated to significant levels of human disturbance and will occupy abandoned piers, channel markers, abandoned buildings and other structures, and man-made dikes.

Nests are built on the ground usually in well-drained rocky or sandy sites. Some cover is usually required, either in the form of rocks or vegetation to protect against predators and weather (Pierotti 1981). Western gulls are known to nest solitarily or in small to large colonies and often with other nesting seabird species.

On Alcatraz, nest sites are placed in natural, semi-natural, and artificial/highly disturbed conditions. Western gull nests occur in nearly every area of the island, including along the rocky shoreline, in the rubble of ruined structures, within the vegetation and debris along walkways, and in large open areas within the former prison grounds such as the Parade Grounds and Cistern areas.

### **Foraging**

Foraging generally occurs away from the nesting habitat. Foraging habitat includes offshore waters, intertidal areas, bays, estuaries, harbors, and beaches. Some, however, will forage within the colony taking eggs and young of other seabirds (Pierotti 1976, McChesney and Carter 2008). Western gulls will also forage in refuse dumps and fish processing plants (Pierotti and Annett 1995).

Western gull is a generalist and opportunistic forager and will feed on nearly any edible food that occurs at the sea surface (NOAA 2007). Feeding principally on fish and pelagic invertebrates, it will feed offshore in association with other birds and mammals that concentrate prey, and solitarily in the intertidal zone searching for crabs, bivalves, sea urchins, and gastropods. It will also eat carrion, fish parts, and refuse.

The extent to which nesting western gulls on Alcatraz forage in offshore habitats is unknown; however, presumably, most utilize the fishery and other food resources (both natural and artificial) with the San Francisco Bay area and use offshore feeding areas to a lesser extent than those colonies that occur along the coast or on offshore islands.

### **Predation on other Seabirds**

Included in the western gull diet are eggs and chicks of other seabirds (Pierotti and Annett 1995, Mills et al. 2005). As an opportunistic and generalist feeder, the western gull is likely to exploit prey that is easily available and accessible, and when gull colonies occur in the same area as other seabird colonies, predation by gulls can be potentially detrimental to other seabirds (McChesney and Carter 2008, Keitt et al. 2005, Wanless 1988, Howes and Montevecchi 1993). In fact, there are some data and greater speculation that the expansion in western gull populations in California in recent decades may have resulted in greater predation on smaller seabird species as well as displacement of smaller seabirds from nesting habitat (McChesney and Carter 2008). Western gull is a potential predator of the eggs and chicks of all other waterbirds on Alcatraz.

Efforts to manage gull populations through culling to relieve the predation pressure on other seabirds has had some success (Harris and Wanless 1997, Guillemette and Brousseau 2001, Finney et al. 2003); however, it likely would require an ongoing and intensive culling program in order to achieve and maintain results (Blokpoel et al. 1997). Roth et al. (2000) report that western gull exclusion experiments on Southeast Farallon Island were unsuccessful.

### **Use of landfills**

Western gulls and other gull species are extremely adaptable and have exploited a variety of artificial food resources, including landfills (Mills et al. 2005, Ackerman et al. 2007). Some have suggested that the exploitation of landfills has been a main contributor to the increase in western gull populations in recent decades, including on Southeast Farallon Island (Pyle 2001), and that changes in landfill practices (making less potential food available) may be contributing to the more recent reduction in the Farallon island population (Mills et al. 2005).

However, others have suggested that gulls feeding at landfills have a lower quality diet resulting in shorter breeding lifespans and lowered reproductive success than those that fed on fish (Belant et al. 1993, Annett and Pierotti 1999). Landfills and other artificial food sources may be more important during periods of limited natural food resources, during specific periods of the breeding cycle, or to juvenile or non-breeding birds (Pierotti and Annett 1995). The extent to which artificial food resources have either contributed to expanding populations or as a result of changing practices are contributing to reduced populations is unclear. However, it is notable that while the Southeast Farallon Island population has undergone a steady reduction (although it remains the single largest western gull colony in the range of the species), the Alcatraz Island population, a population with greater accessibility to landfills, has steadily increased. Annett and Pierotti (1999) suggest that a significant number of western gull young born on Alcatraz (mostly females and smaller young that are prevented by their dominant sibling from accompanying parents while foraging on fish) learn to exploit the readily available food resource at landfills. While food may be abundant, nutritional deficiencies

from this artificial food resource lead to smaller clutch sizes, reduced hatching success, and shortened reproductive life-spans.

### **2.2.3 Threats to the Species**

While western gulls are highly adaptable to human-caused changes in the landscape, have a variable and opportunistic diet, and have few predators, the species is nonetheless vulnerable to various threats. Because its distribution is narrow both geographically and ecologically, changes that affect nesting areas or food resources can have a significant affect on the western gull locally and regionally. Among the potential threats to the species are:

- Disturbance of nesting areas. Because the species has a restricted range, disturbance to nesting colonies through human interactions, invasive species, and other factors can have a significant affect on breeding and reproductive potential.
- Disease. Western gull and other colonial nesting species are vulnerable to diseases that can affect entire colonies.
- Oil spills and other contaminants. Oil spills and other contaminants can directly affect individual birds and colonies and indirectly affect food resources for western gull.
- Ocean Currents (ENSO events). Ocean patterns affect available food resources and can influence successful western gull breeding. While western gulls have the ability to switch to alternative food sources (i.e., landfills), these sources are less optimal and are decreasing with changing landfill practices.
- Global Climate Change. Global climate change could also affect food resources for western gulls and other seabirds and the potential rise in sea levels could affect some nesting habitats.

### **2.2.4 Nuisance Issues**

As western gull populations have increased, so have concerns regarding the overabundance of the species locally and the nuisance issues that result. Concerns have been raised regarding damage to buildings, aircraft collisions, and freshwater contamination (Mills et al. 2005). Nuisance issues on Alcatraz include potential damage to historic buildings and disturbance to visitors from proximity to aggressive gulls and strong guano odors.

## 3.0 Western Gull Distribution and Abundance

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This section summarizes the global, regional, and local distribution of western gulls. This information was compiled from the most up-to-date sources available. While data from most of the larger colonies is recent, much of the data from smaller colonies is as much as 15 years old. Thus the entire data set is a combination of early (1990s) and recent (2007) records. While this certainly brings an element of unreliability to the data set, it is assumed for purposes of this report that older sites remain extant with similar abundance, and that the relative contribution of the Alcatraz colony to the local, regional, and global populations described here is reasonably accurate using these data.

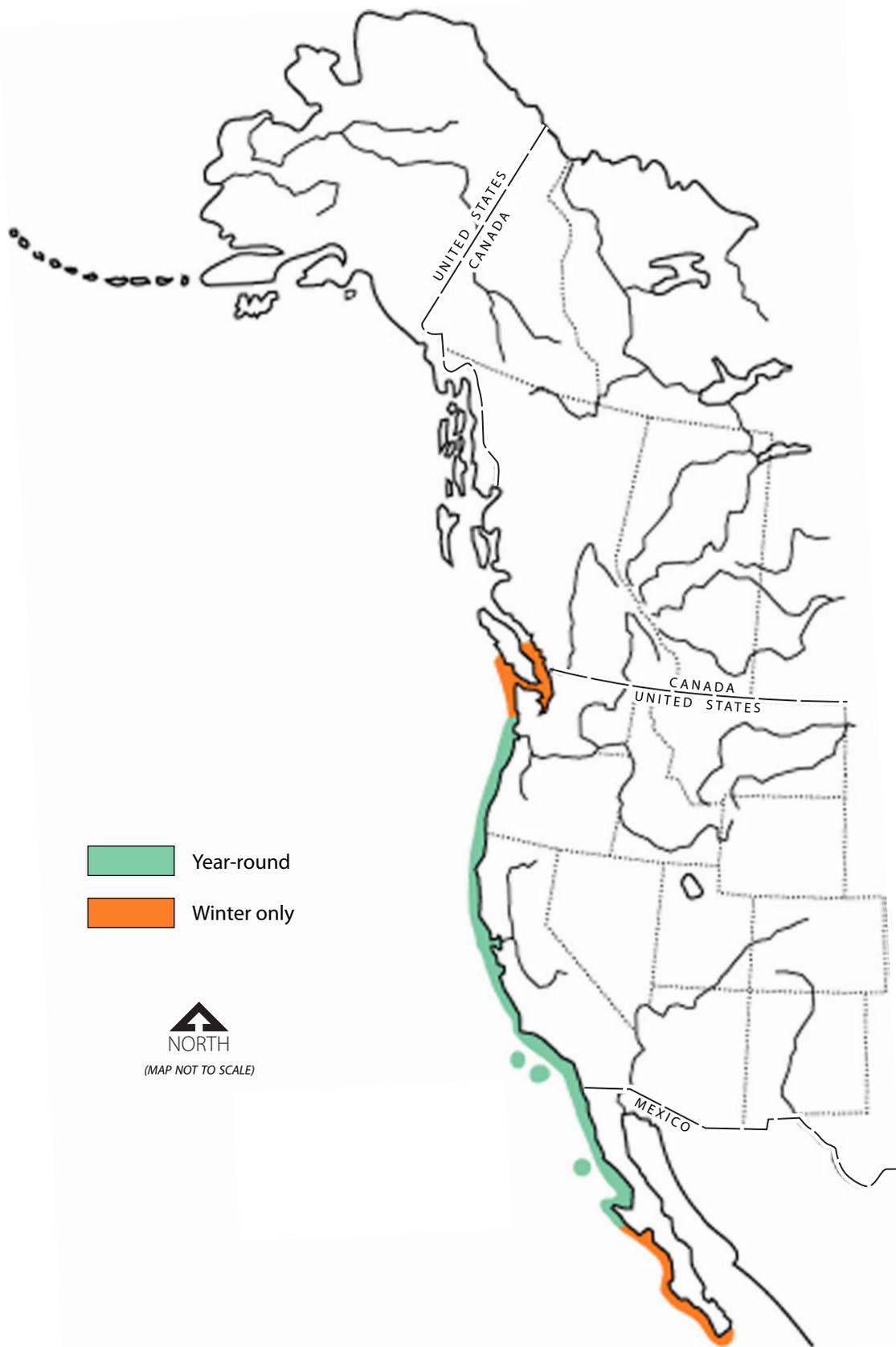
### 3.1 Global

Western gulls breed primarily on offshore islands and rocks, coastal cliffs, and large bays and estuaries from southern Washington State to Santa Margarita Island, Central Baja California (Carter et al. 1992, Pierotti and Annette 1995). The winter range extends the length of the Pacific Coast from Vancouver Island, British Columbia to the tip of Baja California (Figure 2).

The breeding and wintering distribution occurs within a relatively narrow corridor along the Pacific coastline. The few inland breeding sites, such as San Francisco Bay, are associated with large bays or estuaries; and offshore activities during both the breeding and nonbreeding seasons generally remain within 40 km of shore (Gilligan et al. 1994).

There are two recognized subspecies, *L.o. occidentalis* – Central California to Washington; and *L.o. wymani* – Central California to Baja. Extensive hybridization of *L.o. occidentalis* with glaucous-winged gull occurs primarily in Washington State (Speich and Wahl 1989), complicating survey results in that area.

There are minor discrepancies in the literature regarding the size of the global population. Much of this discrepancy can be attributed to uncertainty regarding the population size of *L.o. occidentalis* in Washington due to hybridization with glaucous-winged gulls. Carter et al. (1992) provides the most recent comprehensive survey of seabird colonies, but only for California. Speich and Wahl (1989) catalog seabird data for Washington State. Most other data, including all current data is localized and is presented based on the results of long-term monitoring of important seabird colonies (e.g., Farallon Islands, Ano Nuevo Islands, Channel Islands) or are associated with specific research projects (Martin and Sydeman 1998, McChesney et al. 2005, Mason et al. 2007). Overall, however, the data for western gulls is quite good, albeit outdated in some areas.



SOURCE: Pierotti and Annett 1995.

**Figure 2**  
**Distribution of the Western Gull**

Pierotti and Annett (1995) and The California Current Marine Bird Conservation Plan (Mills et al. 2005) estimate the global population at approximately 40,000 breeding pairs on fewer than 200 colony sites. However, given that there are 184 documented and presumably extant colony locations in northern and central California alone (see Regional below), this is an underestimate of at least the number of colony sites. The National Audubon Society estimates the global population of western gull at 117,000 individuals (<http://web1.audubon.org/waterbirds>).

The North American Waterbird Conservation Plan estimates 77,000 breeders, and the USFWS' Seabird Conservation Plan (USFWS 2005) cite Carter et al. (1992) and Martin and Sydeman (1998) in their estimate of between 80,000 and 126,000 breeding birds.

By any estimate, the total population size of western gull is small relative to most gull and seabird populations and is confined within a relatively narrow geographic and ecological area.

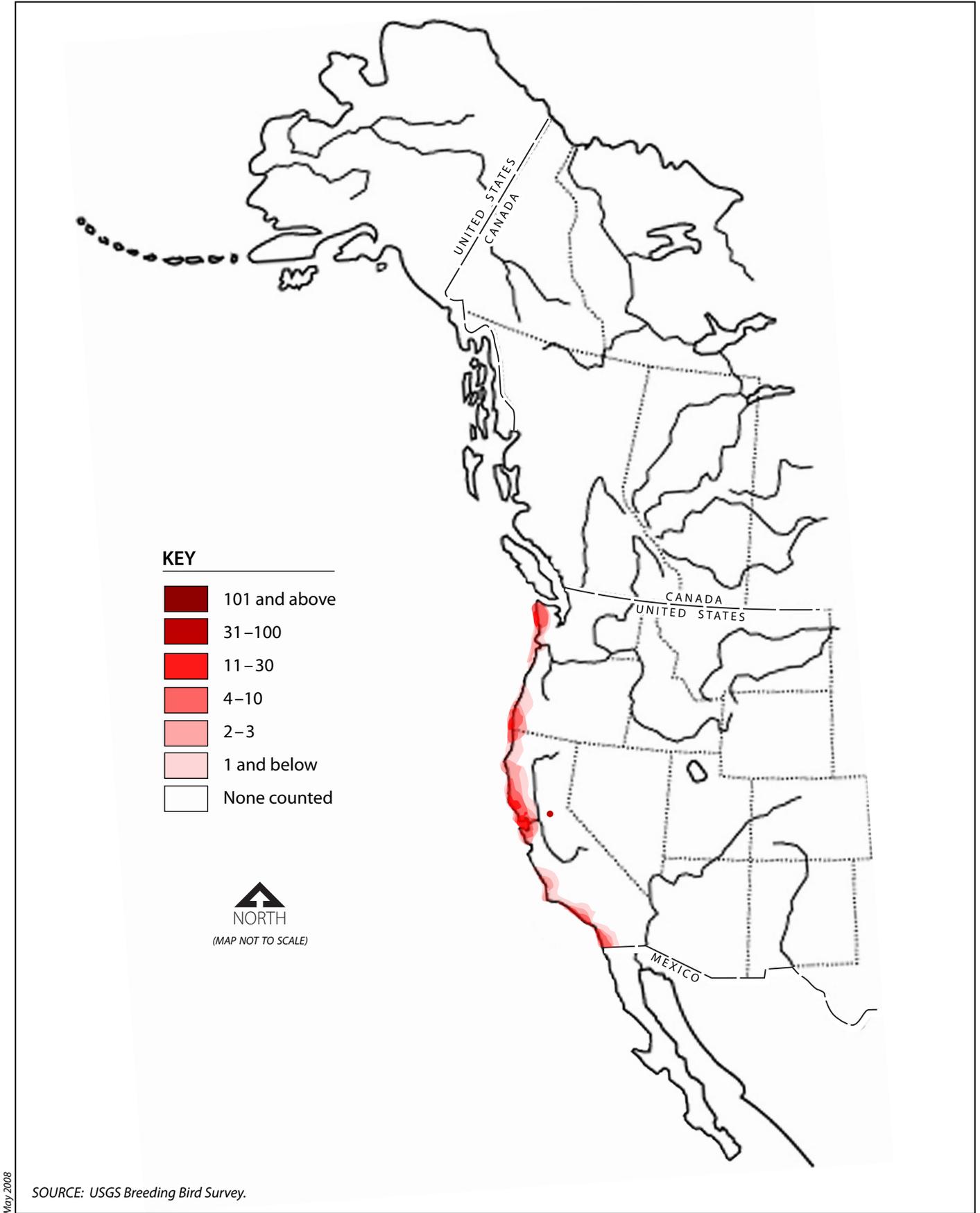
Within the global range, there are several main population centers – which are illustrated on the USGS Breeding Bird Survey (BBS) summer distribution map compilation from 1996-2003 (Figure 3). From north to south, these areas include coastal Washington State, the Oregon-California border, San Francisco Bay Area, and Los Angeles/Channel Islands area. Secondary areas include Morro Bay Area – and north of San Francisco Bay. Mills et al. (2005) report that between 50% and 77% of the global population is found in California. The largest breeding colonies are in Central and Southern California (Table 1). These four sites (Channel Islands, Southeast Farallon Islands, Alcatraz Island, and Ano Nuevo Island) represent over 50% of the global breeding population. The single largest breeding colony is on Southeast Farallon Island (15,852 breeding birds in 2007) (Warzybok and Bradley 2007).

**Table 1. Major Western Gull Breeding Colonies**

Location	Number of Breeding Birds	Census Date and Source
Southeast Farallon Island	15,852	2007 (Warzybok and Bradley 2007)
Channel Islands (8 islands)	27,662	1992 (Carter et al. 1992)
Alcatraz Island	2,300	2007 (Acosta et al. 2007a)
Ana Nuevo Island	2,196	2007 (Lindquist and Thayer 2007)
Total	48,010	

## 3.2 Regional

The regional population is defined here to correspond to the National Oceanic and Atmospheric Administration (NOAA) Biogeographic Assessment off North/Central California (NOAA 2007), which extends from Point Arena, Mendocino County on the



**Figure 3**  
**Western Gull Breeding Season Composite Distribution, 1996-2003,**  
**from USGS Breeding Bird Survey Data**

north to Point Sal, Santa Barbara County on the south. A total of 184 western gull breeding colonies have been identified within this area (Figure 4) ranging in size from 1 breeding bird to 15,852 breeding birds (NOAA 2007, Warzybok and Bradley 2007), with an average colony size of 123 breeding birds. The majority of these data are from Carter et al. (1992); however, several colonies have been more recently surveyed and reported in McChesney et al. 2005, and data from several of the larger breeding colonies (e.g., Southeast Farallon Island, Ano Nuevo Island, Alcatraz Island, Alameda Point) are monitored annually and data are from 2007 (Feeny 2007, Acosta et al. 2007a, Lindquist and Thayer 2007, Warzybok and Bradley 2007).

Appendix A lists each of the 184 colony sites within the region. This database includes a total of 25,287 breeding western gulls within the region. As noted, the accuracy of this estimate is unknown given that many of the known colony sites have not been surveyed since Carter et al. (1992) (McChesney pers. comm.). It is notable that the three largest colonies in the region have each undergone fairly dramatic population changes in recent years. On Ano Nuevo Island, the population has increased substantially, from approximately 1,300 breeding birds in 1998 to nearly 2,200 in 2007 (Lindquist and Thayer 2007). The Alcatraz Island population has also more than doubled from less than 1,000 breeding birds in 1990 to over 2,300 in 2007 (Acosta et al. 2007a).

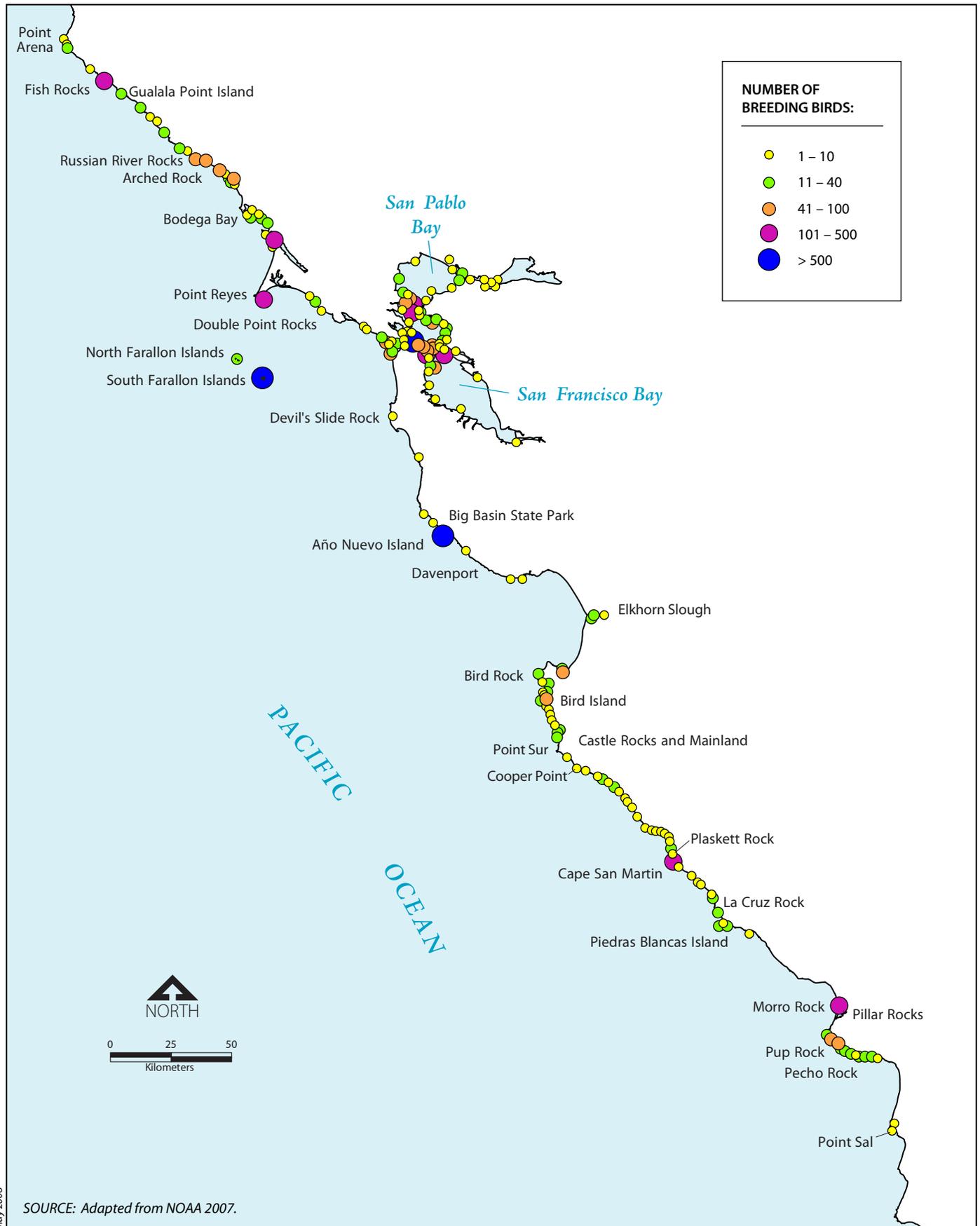
Interestingly, after expanding from a historic population of about 6,000 to more than 25,000 birds by the mid-1980s on Southeast Farallon Island (attributed primarily to protection of the island and possibly to an increase in artificial food resources) (Pyle 2001), researchers have since documented a slow decline in the Southeast Farallon Island population (Warzybok and Bradley 2007). In 2007, there were an estimated 15,852 breeding birds on Southeast Farallon Island.

NOAA (2007) states that western gull has declined in the region from 1985 to 2002; however, the basis for this determination is unclear, although it may be largely due to the reduction on Southeast Farallon Island. With changes to several colony sites using 2007 data and assuming no change in unsurveyed sites, the number of breeding western gulls increased in the region from 22,600 as reported by NOAA (2007) to 25,287 in 2007 (Appendix A).

The extent to which populations can continue to expand within the region is unclear. It appears that most potential breeding sites are currently occupied (NOAA 2007, Figure 4). Some larger islands (e.g., Ano Nuevo Island) likely have the capacity to support increasing populations; however, the majority of other colonies are restricted by available nesting substrate making significant growth less likely.

### **3.3 San Francisco Bay Area**

The San Francisco Bay Area represents a portion of the regional population, as defined above. There are a total of 65 breeding colonies within the San Francisco Bay area from Point Bonita and Seal Rocks on the northern and southern tips of the Golden Gate to

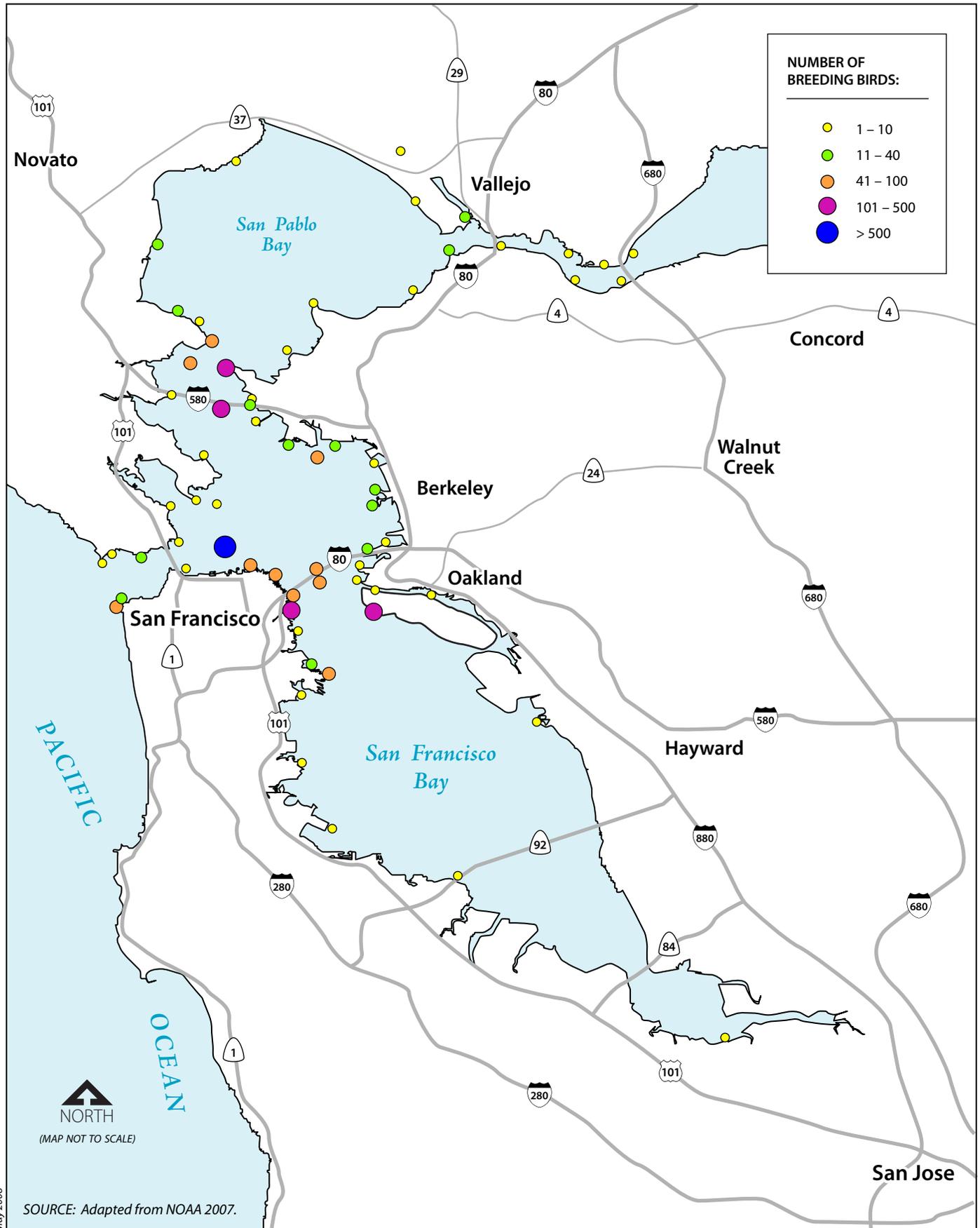


**Figure 4**  
**Western Gull Colony Sites along the North and Central California Coast**

Suisun Point, approximately 36 miles inland (Figure 5). An estimated 4,498 breeding birds may occupy this area (Table 2). As above, much of the data from these colonies is from Carter et al. (1992) and the actual numbers at each site may not be representative. However, these breeding sites are expected to be extant and the data from the largest colonies (Alcatraz Island and Alameda Point) are from 2007. Data were also collected on Red Rock and possibly other locations in the San Francisco Bay area in 2007 (McChesney pers comm.), but the results were not available for this report.

**Table 2. Western gull colony locations in the San Francisco Bay area and most recent census data.**

Location	Number of Breeding Birds
Point Bonita	10
Bonita Cove	6
Point Diablo Bluffs and Needles	34
Yellow Bluff	2
Sausalito Point Area	4
Peninsula Point and Cone Rock	6
Angel Island	6
Bluff Point to Paradise Cay	4
Point San Quentin	6
Marin Islands	64
The Sisters and Point San Pedro	96
Rat Rock	2
Southwest San Pablo Bay Duck Blinds	16
Marin Co. – W. San Pablo Bay Ship Channel	14
Sonoma Co. – W. San Pablo Bay Ship Channel	2
Knight Island	8
Northeast San Pablo Bay Beacon	2
Mare Island Strait	20
Commodore Jones Point to Benicia Point	10
Benicia Point to Army Point	6
Mothball Fleet	10
Suisun Point Area	6
Nevada Dock	2
Eckley to Selby	4
Davis Point Unocal Wharf	22
Hercules Wharf	2
Pinole Point	2
East San Pedro Bay Ship Channel	6
The Brothers	178
Castro Point Area	8
Richmond-San Rafael Bridge	18
Red Rock	384
Standard Oil Long Wharf	6
Richmond Harbor Entrance Channel	12
Brooks Island Area	98
Richmond Inner Harbor	12
Albany Hill Cove	2
Berkeley Yacht Harbor Breakwaters	38
Berkeley Pier	40
Bay Bridge Toll Plaza Point	2



**Figure 5**  
**Distribution of Western Gull Breeding Populations**  
**in the San Francisco Bay Area**

Location	Number of Breeding Birds
San Francisco-Oakland Bay Bridge East	40
Oakland Outer Harbor	8
Oakland Middle Harbor	10
Oakland Inner Harbor	6
Government Island Area	2
Alameda Naval Air Station	210*
Mulford Landing Channel	2
Alviso Plant – Pond A6	4
San Mateo Bridge and PG&E Towers	6
San Francisco Ship Channel	8
Oyster Point Area	2
Double Rock	2
Hunter's Point	50
Lash Lighter Basin	40
Potrero Point	6
San Francisco Piers South	232
San Francisco-Oakland Bay Bridge West	48
Yerba Buena Island	62
Treasure Island	96
San Francisco Piers North	62
Pier 45	66
Alcatraz Island	2,300*
Fort Point Rock to Helmut Rock	6
Lobos Rock and Lands End	14
Seal Rocks	46
Total	4,498

\*data from 2007

These data indicate a total of 4,498 breeding birds in 65 colony sites ranging in size from 2 to 2,300 breeding birds and an average colony size (not including Alcatraz) of 34 breeding birds. Nearly all of the breeding colonies are in the northern portion of the San Francisco Bay and only one site has been reported south of the San Mateo Bridge (Figure 5).

The single largest colony in the San Francisco Bay area is on Alcatraz (See following section).

Other large colonies include Alameda Point, formerly part of the Alameda Naval Air Station and currently included within the Alameda National Wildlife Refuge. In 1990, this colony was considered the second largest in Central and Northern California (Feeney 1994) when it supported a breeding population of 502 western gulls. The breeding population has declined in the last several years from 461 in 2004 to 210 in 2007 (Feeney 2007). The causes for this decline are unknown; however, it corresponds with a rapidly increasing population on nearby Alcatraz.

### 3.4 Population Trends

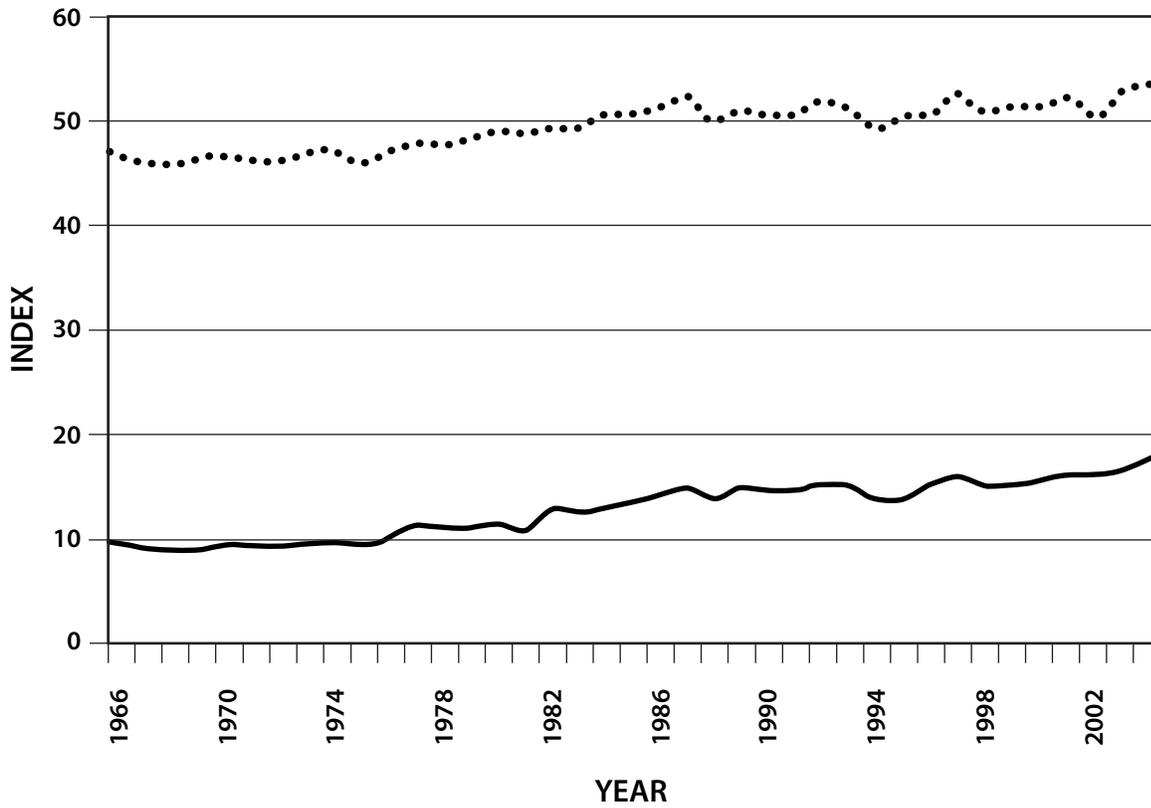
Populations of western gull are regulated primarily by the availability of nesting habitat and natural food sources. Population growth is thus limited by the finite availability of suitable offshore island and coastline habitat, and potentially reduced due to conditions that restrict food resources (e.g., pesticide contamination and other toxins, ocean currents, overfishing, climate change). Pierotti and Annett (1995) and Ainley et al. (1990) consider that population growth is strongly influenced by ENSO (El Niño Southern Oscillation) events (e.g., warm water conditions, reduce upwelling, reduced availability of fish and zooplankton, and reduced food resources for western gull); however, because western gulls are diet generalists and have the ability to exploit other food resources, the effects of ENSO do not appear to be as strong as with most other colonial seabirds (Mills et al. 2005).

Pierotti and Annett (1995) report fairly significant demographic changes since the 1970s, including a decline in Central California (from Point Reyes to Point Concepcion) from approximately 17,000 breeding pairs in the late 1970s to 14,000 pairs in the 1990s. Populations also reportedly declined in the northern portion of the range (north of Point Reyes) during the 1980s. These declines were attributed primarily to ENSO events (Pierotti and Annett (1995)). However, during this same period, populations increased in Southern California (south of Point Concepcion) from about 5,500 pairs to 14,000 pairs (Sowls et al. 1980 in: Pierotti and Annett 1995), attributed at least in part to a reduction in ocean pesticide dumping (Pierotti 1991).

Overall, the global population trend appears to be relatively stable. USGS Breeding Bird Surveys (BBS) (Sauer et al. 2007) suggest that the northern subspecies (*L.o. occidentalis*) may be slightly declining; however, as noted above, hybridization with the Glaucous-winged gull affects accurate counting. BBS surveys (based on a composite index of regional survey reports between 1966 and 2004) suggest that the southern subspecies (*L.o. wymani*) may be slightly increasing (Figure 6). This may be largely due to a reported increase in the Channel Islands population (Mason et al. 2007). Although declines in several seabird species were noted by Mason et al. (2007) off the Southern California coast, they noted increases in several species, including the western gull. Other reported increases include Ano Nuevo Island (Lindquist and Thayer 2007) and Alcatraz Island (Acosta et al. 2007a).

As noted above, NOAA (2007) reports that the regional population may be declining. While this determination appears to be at least somewhat anecdotally-based, annual monitoring at the largest colony in the range of the species, Southwest Farallon Island, indicates a downward trend over the last 10 to 15 years since reaching what was considered to be the species carrying capacity of approximately 25,000 birds (Pierotti and Annett 1995). Still, the data gathered for this report indicate at least the possibility of an increase in the regional population, due mainly to substantial growth on Ano Nuevo and Alcatraz Islands. In the absence of more up-to-date regional census data, it is fair to suggest that the regional population is at least reasonably stable.

### COMPOSITE INDEX 1966-2004



KEY  
..... Median  
———— 2.5% CI

SOURCE: USGS Breeding Bird Survey..

Figure 6  
Western Gull Composite Population Trend,  
primarily within the Range of *L. o. wymani*, 1966-2004

Similarly, the San Francisco Bay area population also appears to reasonably stable. While up-to-date information is lacking from most of the colony sites in the Bay Area, with the significant growth that has occurred at Alcatraz and (other than reported declines at Alameda Point) no reports of colony failure elsewhere in the Bay Area, it is likely that the Bay Area population has expanded in recent years. However, within the Bay Area landscape, Alcatraz Island may be the sole “source” (i.e., self sustaining) population, and thus may also serve as an important source of recruitment into the other Bay Area colonies and assuring their sustainability. (Refer to Section 4.3.5 for a discussion of western gull population viability on Alcatraz Island.)

## 4.0 Western Gulls on Alcatraz Island

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### 4.1 Historical Context

Colonial nesting waterbirds occupied the shoreline and interior plains and cliffs of Alcatraz until the onset of the Civil War when the island was initially transformed into a military outpost. Nesting seabirds likely began to decline immediately following this occupation and were likely entirely decimated as the topography and vegetation on the island was transformed over many subsequent decades. Following the Civil War, Alcatraz was used as a military prison, and in the 1930s turned over the Federal Penitentiary System and used as a civilian prison until 1963. While there is little supportive data from 1963 until the early 1970s, seabirds likely began to slowly reoccupy Alcatraz at some point following its abandonment as a prison (GGNPC and NPS 2005).

### 4.2 Recolonization

Initial recolonization of Alcatraz reportedly included only black-crowned night heron and western gull (NPS 1980 [GMP]). Both species were first detected nesting on the island in 1975. Today, six waterbird species regularly nest on Alcatraz including Brant's cormorant, pelagic cormorant, western gull, California gull (*Larus californicus*), black oystercatcher, and pigeon guillemot (Acosta et al. 2007a). Three additional colonial nesting birds, black-crowned night heron, snowy egret, and great egret (*Ardea alba*) have also occupied the island.

### 4.3 Population Trend and Current Status

Portions of the following analysis were originally prepared as part of the Bird Conservation and Management Strategy for Historic Alcatraz Island (GGNPC and NPS 2005) and are updated here to incorporate additional data gathered since 2004.

#### 4.3.1 Monitoring Efforts and Population Trend

Incidental monitoring began on Alcatraz in the mid-1970s after western gulls and black-crowned night herons were first detected nesting on the island. Following the establishment of the GGNRA, the General Management Plan (GMP) (1980) provided guidance for the protection of the island's rocky cliffs and shoreline for wildlife resources. The Development Concept Plan (DCP) (1993) for Alcatraz included further protection for natural resources by including provisions for maintaining breeding

populations of colonial waterbirds. This was supplemented by the GGNRA Alcatraz Management Plan (1993) that emphasized protection of the island's natural resources and recommended natural resources monitoring and the development of protocols to determine baseline information of key wildlife populations.

Annett and Pierotti (1999) conducted studies of western gull on Alcatraz from 1993 to 1994. They reported approximately 250 pairs in 1983. Monitoring of western gulls officially began in 1990 as a result of the nearly 2-fold increase in the breeding population since the early 1980s (Bell 1990). Monitoring of black-crowned night heron and snowy egret populations also began in 1990 (Hothem and Hatch 2004). While incidental waterbird monitoring occurred since the early 1990s, a comprehensive waterbird monitoring program was established in 1996 in conjunction with PRBO Conservation Science (PRBO), which has continued monitoring through 2007 (Acosta et al. 2007a).

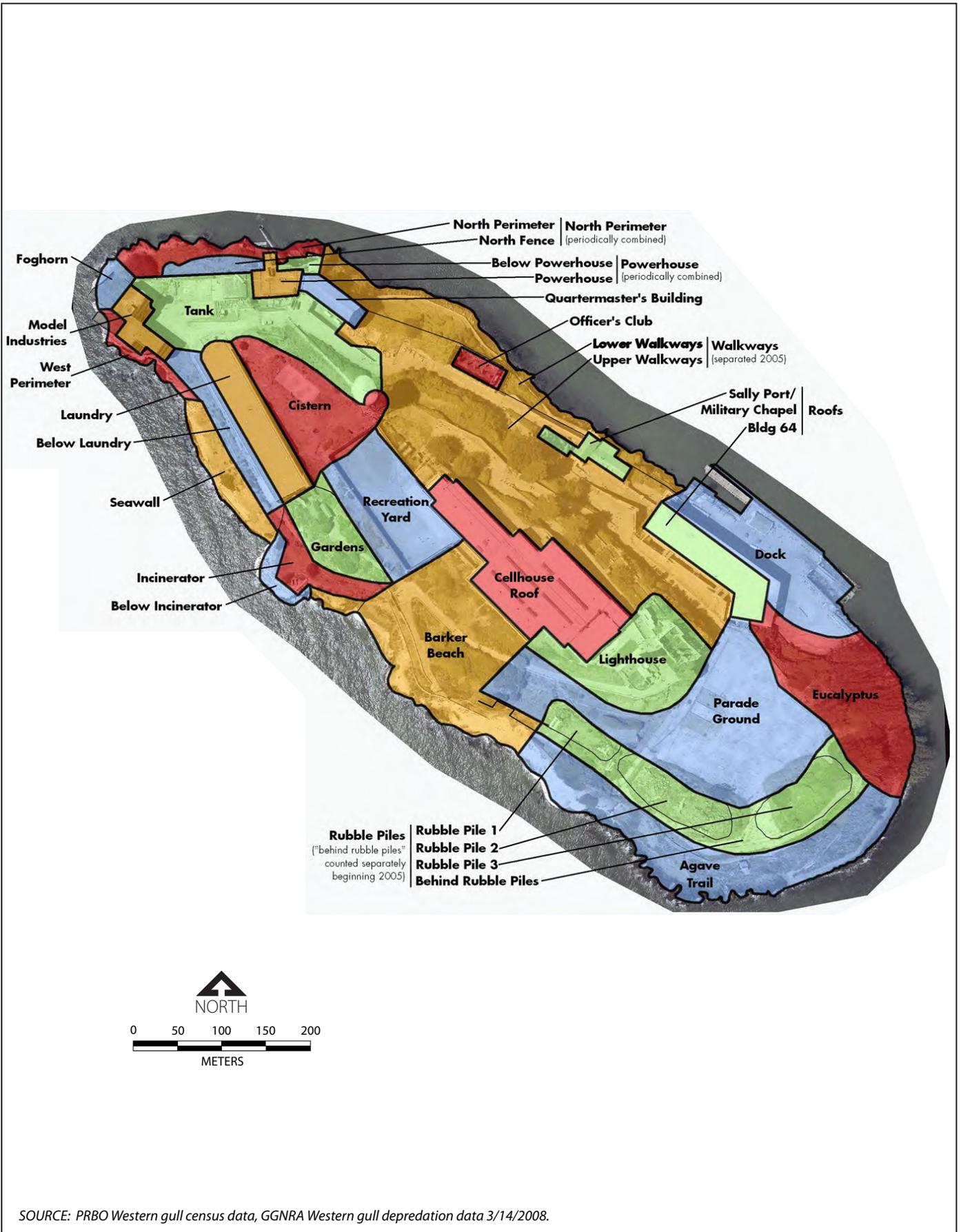
By 1990 there were over 400 pairs of western gulls breeding on Alcatraz. The population remained relatively stable until 1999 when it increased to nearly 700 pairs. The population has continued to increase since 1999, and in 2007 there were 1,150 active western gull nests on Alcatraz, by then the second largest colony in central and northern California (Table 3) (Acosta et al. 2007a). A modification in the census technique was made in 1999 that may in part explain the relatively significant increase between 1998 and 1999 (Merkle pers com.)

### **4.3.2 Nesting Distribution**

Western Gulls nest in and otherwise use most of Alcatraz Island; however, distribution of high density nesting areas has shifted over the years. During 2007, Western Gulls nested in 22 of the 27 survey areas on the island with the largest and most significant populations occurring in the Parade Ground, Rubble Pile, and Cistern areas (Table 3, Figure 7). The nesting population has ranged from a total of 485 active nests in 1990, the first official monitoring year, to 1,150 active nests in 2007 (including 113 depredated nests) (Acosta et al. 2007a) but has consistently used most of the survey areas on the island since 1990 (Table 3). While the population appears very dense and has more than doubled in 17 years of monitoring, based on a review of other nesting Western Gull populations (particularly the Farallon Islands), there remains a reasonable likelihood that the population will continue to increase (see Carrying Capacity below).

### **4.3.3 Carrying Capacity**

While 1,150 active western gull nests is considered a significant regional resource, the potential for continued western gull population increases on Alcatraz is certainly possible, particularly when compared with nesting densities in other populations. Using the Farallon Island as a comparative example, Pierotti and Annett (1995) suggest that the island has reached carrying capacity for western gulls based on a consistent number of



**Figure 7**  
**Western Gull Survey Areas on Alcatraz Island**

**Table 3. Number and location of western gull nests on Alcatraz Island from 1990 to 2007.**

Location	Year																
	90	91	92	93	95	96	97	98	99	00	01	02	03	04	05	06	07
Agave Trail	25	29	16	15	26	27	15	25	47	41	36	32	61	51	58	59	41
Barker Beach	45	34	30	14	26	33	29	26	39	27	29	20	53	43	48	23	55
Below Incinerator									4	2	1	0	1	1	3	2	0
Below Laundry	25	14	18	16	28	21	15	20	23	27	28	31	33	30	33	31	11
Below Pwerhouse	9	10	5	2	6	1	2	9			3	11	8	3	8	0	0
Cellhouse Roof																8	0
Cistem	61	66	57	64	59	54	58	53	78	85	82	106	76	127	136	136	124
Dock	0	2	0	8	2	7	8	12	6	8	9	2	6	8	8	3	3
Eucalyptus									13	21	19	58	32	39	52	41	61
Foghorn	28	21			1	9	11	16	17	16	20	25	31	19	18	18	19
Gardens	22	11	18	4	15	17	8	10	8	10	41	32	21	18	17	15	32
Incinerator	15	18	16	19	21	16	13	12	26	20	0	28	22	24	20	16	9
Laundry	19	15	13	9	22	0	11	18	24	20	19	19	23	14	13	24	19
Lighthouse	13	18	8	8	5	9	20	7	25	24	14	15	48	46	55	10	21
Model Industries	6	3	1	2	5	19	4	3	2					1	6	36	44
North Fence	5	5	6		10	8		7		13	16						0
North Perimeter	28	26	9	3	12	12	10	2	27	8	27	32	38	31	34	34	41
Officer's Club	1	1					8	9	7	7	5	4	4	12	4	4	4
Parade Ground	38	47	42	52	111	117	126	105	159	176	218	156	172	165	217	267	205
Powerhouse	9	5	21	4	5	9	10	6	8	14					19	26	26
Recreation Yard	4	4	4	3	6	5	4	4	16	11	9	8	10	12	13	5	6
Roofs	22	21	21	14	11	15	9	9	13	12	23	23	19	28	25	5	3
Rubble Piles	60	44	45	64	35	38	32	26	52	86	68	122	105	129	104	145	154
Seawall	16	19	9	15	12	5	20	27	16	20	20	19	33	22	24	24	51
Tank	13	15	0	9	16	20	17	12	18	24	32	26	37	29	33	1	0
Walkways	18	21	18	23	23	33	32	21	24	37	50	33	49	45	93	32	107
West Perimeter	3	4	0	0	4	0	15	6	10	5	6	2	6	3	5	4	1
Total	485	453	357	348	461	475	477	445	662	714	775	804	888	900	1128	1096	1150

Totals for 2005, 2006, and 2007 include nest that were depredated (82 in 2005, 127 in 2006, and 113 in 2007)

birds (22,000 to 25,000) between 1959 and 1990. Given breeding densities of approximately 5.0 to 8.2/100 m<sup>2</sup> (Ainley and Boekelheide 1990) on Southeast Farallon Island and the size of Alcatraz Island (8.9 ha), under similar conditions we could expect carrying capacity on Alcatraz to peak at between 4,660 and 5,400 breeding birds, which suggests that Alcatraz is currently between 43% and 49% of capacity. While the two islands are not directly comparable due to the landscape, structures, and activities on Alcatraz, this does suggest that the Alcatraz population has not reached carrying capacity and that it is possible for continued and significant increases in the western gull nesting population (GGNPC and NPS 2005).

#### **4.3.4 Relative Abundance**

Using the estimates of the global, regional, and Bay Area populations from Section 3, the Alcatraz population represents approximately 2 percent of the global western gull population (using the Audubon estimate of 117,000 birds); approximately 10 percent of the regional western gull population (as defined in Section 3); and approximately 51 percent of the San Francisco Bay Area population. Alcatraz Island is currently the second largest western gull colony (outside of Southeast Farallon Island) in the central and northern California coast, and among the largest colonies within the range of the species.

#### **4.3.5 Population Viability**

As the western gull population on Alcatraz continues to grow, conflicts with other management goals have persisted. As suggested above, there is a reasonable likelihood that the gull population will continue to grow and could potentially double its current population size. In the meantime, there is also concern that the increasing gull population could result in detrimental effects to other colonial waterbirds nesting on the island through increased predation and competition for nest sites.

To further address this issue, the Bird Conservation and Management Strategy (GGNPC and NPS 2005) recommended Bird Conservation and Management Action 3. Action 3 would develop a population model for each waterbird species. The models are created using life history or population growth rate data (e.g., reproduction, survival, recruitment, and movement) that is then used to project dynamics and estimate future population size and structure. The models would be used to determine a minimum viable population size (i.e., the smallest possible size at which a biological population can exist without facing extinction from natural disasters or demographic, environmental, or genetic stochasticity) for purposes of establishing a threshold for population viability on the island and ultimately would be used to set optimum population levels for each species to serve as a basis for monitoring and adaptive management. Action 3 recommends a simple numerical model that can be refined over time as data are added. Data would continue to be gathered through demographic studies of each population.

The rationale for developing population models was to find and manage for a stable population equilibrium among all of the species nesting on the island. The following three goals were established:

- Populations of each colonial waterbird species on the island should reach a viable population then persist indefinitely;
- Protection should be afforded to allow those populations to maintain optimal levels for survival;
- If population levels fall below those optimal levels, or show signs of trending downward below minimum optimal levels, management actions should adapt to bolster the population back to optimal levels.

Bird Conservation and Management Action 3 recommends a general approach to developing population models based on the four processes that generally explain population dynamics; 1) adult survival, 2) reproductive success, 3) offspring survival, and 4) net immigration or recruitment into the population. The actual process of model development will require additional research into the complex life histories of each of the species (e.g., age at first breeding, breeding probability, differing survival probabilities among subadult and juvenile birds) and the type and extent of data that are currently available. Mills et al. (2005) provide an excellent summary of demography and population modeling for seabirds and identify seven parameters that should be used in model formulation in order to account for these complexities, including:

- adult survival
- subadult survival
- juvenile survival
- reproductive success per breeder
- probability that an adult that has never bred before breeds in a given year
- probability an experienced adult breeds in a given year, and
- net immigration (immigration – emigration)

Because of ongoing monitoring and related studies of western gulls and other colonial waterbirds on Alcatraz (Annett and Pierroti 1999, Hothem and Hatch 2004, Acosta et al. 2007a), Southeast Farallon Island (Spear et al. 1995, Warzybok and Bradley 2007) and other regional locations (e.g., Alameda Point [Feeney 2007], and Ano Nuevo Island [Lindquist and Thayer 2007]), there may be sufficient data available on several demographic parameters needed to develop a population model for western gull and other species on Alcatraz, including adult survival, reproductive success, and breeding probability. Probably the largest data gaps are net immigration (e.g., the extent to which young birds disperse from and/or are recruited into the breeding population), and survival of offspring (subadult and juvenile survival). Filling these data gaps will require a fairly extensive radio-telemetry or mark-recapture study in order to track the movements and survival of offspring. While mark/recapture data can be collected over time in order to determine movements and estimate survival, the more efficient approach would be to attach radio-transmitters to a sample of nestling birds of each species and then tracking

the movements of each bird. Estimates of recruitment and survival can be gathered significantly more quickly and more accurately using this approach. These data will be essential in the development of population models.

As Action 3 suggests, to successfully manage the colonial waterbird populations on Alcatraz requires modeling that incorporates the needs of all species and ultimately establishes targets that are designed to reach and maintain population equilibrium between the species. Developing and implementing a model for western gulls alone would not necessarily lead to this outcome. However, developing and using models to manage population equilibrium between species has a variety of limitations. For example, maintenance of population equilibrium will likely vary with changing environmental conditions, potentially resulting in a wide range of uncertainty around the model output. Also, because the models will be sensitive to the assumptions used in their construction, revisiting model assumptions, particularly with regard to changing environmental conditions will be essential. This modeling approach can be a useful management tool, but the limitations and uncertainty should be acknowledged and related management decisions made conservatively.

Also, because this approach implies that the western gull population on Alcatraz Island would likely be managed downward, there are both regulatory and political implications that would have to be addressed, as well as effective and appropriate techniques for accomplishing population targets.

Another consideration is whether or not managing for population equilibrium on Alcatraz will in fact successfully address the broader issue of western gull population sustainability in the San Francisco Bay area. While a population model of the Alcatraz colony can provide data to determine a self-sustaining population on Alcatraz, it may not be sufficient to address the contribution of Alcatraz to regional sustainability. Alcatraz is one population within a larger metapopulation of western gulls (e.g., the San Francisco Bay Area population). Metapopulations consist of both source populations and sink populations (i.e., incapable of sustaining their own growth). There are potential implications to limiting or reducing western gull population levels at Alcatraz without consideration of the effects on the metapopulation (Mills et al 2005). In the San Francisco Bay area, Alcatraz may be the only current source population. Thus, it may serve as the source of recruitment into other smaller colony sites in the Bay Area. Managing for a minimal sustainable population size at Alcatraz may help to achieve the desired equilibrium between species on the island, but it may also have implications regarding the future sustainability of the western gull metapopulation as a whole.

To address immediate concerns about the impacts of a growing population of western gulls, the Bird Conservation and Management Strategy also recommended Action 5, which was designed to reduce western gull nesting and roosting in specific areas of the island. While the management strategy also calculated an interim population target of 680 nests (which would allow for a substantial reduction in the 2004 population) based on the mean number of nests over a 10-year (1995-2004) monitoring timeframe, the initial objective was not necessarily to reduce the population of gulls, but rather to keep

gulls from inhabiting areas that are in need of repair, are subject to continued deterioration, or that cause nuisance issues with visitors. Action 5 includes the implementation of gull exclusion and deterrent prescriptions in certain areas of the island, and establishes no-disturbance conservation areas in other areas of the island. While the NPS has not established a target population for the island, they did establish a gull management zone and management actions as recommended in Action 5 have been implemented since 2005 with reasonable success in most areas (seven of nine gull census areas within the gull management zone exhibited a decline in breeding pairs following the implementation of management actions (NPS data). Management actions are ongoing within the gull management zone while the nesting population is allowed to fluctuate naturally outside of the gull management zone. While the number of nesting gulls has been reduced within the management area; the overall gull population has continued to increase on the island as a result of increases in non-management areas (an additional 27% since 2004).

## **4.4 Current Management and Desired Future Conditions on Alcatraz Island**

### **4.4.1 Management Strategy**

The Bird Conservation and Management Strategy (GGNPC and NPS 2005) prescribed a management strategy for Alcatraz Island that sought to achieve a balance between the various interests and that retained a significant and self-sustaining portion of the western gull breeding population. As noted above, this strategy allowed for a substantial potential reduction in the breeding population by establishing an interim population target of 680 nests based on the mean number of nests over a 10-year (1995-2004) monitoring timeframe. This interim target was subject to modification based on the findings of a population model, the development of which was also incorporated into the strategy.

The management strategy has been implemented by park staff, particularly with respect to gull deterrence measures, and has some success in certain areas.

The strategy addressed the following key issues:

- difficulty conducting routine maintenance due to proximity of active bird nests;
- difficulty implementing major maintenance or rehabilitation projects due to proximity of active bird nests;
- negative visitor interactions with Western Gulls; and
- restricted public access due to presence of nesting birds.

An additional issue is the potential detrimental effects on other colonial waterbirds from predation by western gulls and increasing competition for nest sites.

The strategy included the establishment of conservation areas and bird management areas as well as a series of western gull management prescriptions designed to protect nesting gulls or deter gulls from nesting or otherwise using certain areas of the island and thereby reducing potential conflicts.

## **Management Areas**

The management area concept establishes bird conservation areas that emphasize protection of nesting bird colonies by restricting and carefully controlling construction, maintenance, and visitor use activities; and bird management areas that allow much greater flexibility with respect to construction, maintenance, and visitor use activities.

Conservation areas were selected to protect and provide opportunities for expansion of the majority of all nesting bird colonies around the perimeter of the island and significant western gull nesting areas in the interior of the island. The approach was designed to constrain the nesting distribution of the western gull population in specific bird management areas by allowing certain prescribed actions, such as nest removal, nest disturbance, and installation of nesting deterrents. An analysis was initially conducted to determine the extent to which gull nesting areas are protected within the conservation areas and where gulls are “at risk” by virtue of their location within bird management areas. It was determined that up to 70% of the gull population occurred within protected conservation areas, and that this proportion was consistent with protecting the interim target population of 680 nests (It was also expected that at least 10% of the population that occurred in bird management areas would continue to persist). The objective was to ensure protection of the western gull nesting population on the island while addressing the key issues stated above, in particular controlling the gull population in areas where significant conflict occurs with other priority activities.

## **Management Actions**

In addition to establishing management areas on Alcatraz, the Bird Conservation and Management Strategy established the following management prescriptions.

- Western gulls are allowed to nest unimpeded in conservation areas. There are several exceptions to this that are based on planned work areas that overlap with conservation areas, emergencies, ongoing visitor-related conflicts, and detrimental effects on other seabird colonies.
- Western gull management actions can occur within bird management areas as needed and approved by the Alcatraz Management Team. The following actions can be applied only to address demonstrated conflicts between project, maintenance, Garden Conservancy, or visitor services activities and western gulls.
  - Direct Nest Removal. This action is conducted only in areas that are in direct conflict with project, maintenance, or high visitor use areas, and is subject to

the provisions of the MBTA permit. The prescription recommended modifying the USFWS depredation permit from a maximum of 75 nests to a maximum of 150 nests.

- Indirect Nest Removal. This action refers primarily to egg oiling, which prevents eggs from hatching and eventually causes nest abandonment. This action can be conducted in areas of direct or indirect conflict with other activities and is also subject to the provisions of the MBTA permit.
- Direct Disturbance to Active Nests. This action refers to project, maintenance, or visitor use activities that are temporarily in direct conflict with gull nests, but that do not require the actual removal of nests. For example, some maintenance activities occur periodically (e.g., once every 5 or 10 years) and are only occasionally in conflict with active gull nests. During the interim period, gull nesting can continue in these areas. Activities can proceed under these circumstances by actively “shooing” birds away from the nest when necessary to perform the project or maintenance function. This action may result in nest failure through direct disturbance of nest sites and thus is subject to the provisions of the MBTA permit.

To date, NPS staff has preferred to implement the direct or indirect nest removal techniques as described above in cases where the nest is in close proximity to disturbances (Merkle pers com.).

- Indirect Disturbance to Active Nests. Projects may occur in the vicinity of active gull nests, but may not result in direct disturbances to nests. Project or maintenance activities can proceed without consideration of the possible abandonment of nests that result from human presence, noise, or other project-related disturbances. In these situations, some gull nests will continue to be active and will successfully nest, while the disturbance may cause others to abandon their nest. Indirect disturbances that result in nest abandonment are not subject to the provisions of the MBTA permit. The NPS has taken a somewhat different approach with respect to this recommended action. Each activity is assessed in terms of the proximity of nests sites to disturbances and the likelihood of nest failure is evaluated. This information is then used in the project approval process. If it is determined that nest failure could occur, these nests are then potentially subject (upon project approval) to direct or indirect (egg oiling) nest removal techniques, as described above. If it is determined that nest failure is unlikely to occur due to the disturbance, then no action is taken.
- Nesting and Perching Deterrence. This action refers to the installation of devices (e.g., exclusion netting, electronic tracks, cables and wires, bird repellents) or changes in vegetation structure that deter Western Gulls from establishing nests or perching in specific areas for purposes of protecting sensitive cultural resources, and in some high public use areas to reduce

negative human-gull interactions. Changes in vegetation structure refer to either removing or planting vegetation to discourage nesting in areas that conflict with management objectives.

Implementation of any of the actions described above requires review by the Alcatraz Management Team. It also requires careful review and documentation by natural resources staff, and consideration of the provisions of the MBTA permit.

## **Management Actions Implemented to Date**

### **Direct Nest Removal**

As recommended, the number of nests allowed to be removed under the USFWS depredation permit was increased to 150. In 2006, 128 gull nests were removed and in 2007 113 gull nests were removed under the permit. The largest proportion of these were removed from areas adjacent to walkways to reduce negative human-gull interactions.

### **Nesting and Perching Deterrence**

Deterrent devices have been installed at 10 locations on the island. Most are energized or non-energized cables to discourage roosting in key areas to reduce negative human-gull interactions. These measures appear to have been reasonably successful.

### **Other Actions**

NPS and Golden Gate National Parks Conservancy staff have also implemented the following actions:

- In coordination with the National Wildlife Research Center, developed risk assessment procedures to assess the risk of potential pathogens associated with seabird guano and carcasses affecting human health.
- Provided funding to PRBO to continue monitoring populations, nesting distribution, reproductive performance, habitat use, and other related ecological parameters of nesting colonial waterbirds on Alcatraz (Acosta et al. 2007a).
- Provided funding to PRBO to help develop a more rigorous volunteer monitoring program and an external outreach program to kayakers and other groups who might inadvertently impact the seabird colonies. PRBO has developed and is implementing a public outreach program that includes:
  - International migratory bird day celebration
  - Alcatraz seabird docent program
  - On-island tours and presentations
  - Outreach to key user groups and the public

- Provided funding to PRBO to monitor seabird disturbance at special events. Data generated from these studies (Acosta et al 2007b) are used to assess the type and extent of disturbances that breeding seabird colonies can tolerate.
- Formed the Alcatraz Bird Conservation and Management Team to address bird conservation and management issues, oversee implementation of the Bird Conservation and Management Strategy and review of projects that may affect bird colonies.

#### **4.4.2 Recommendations and Desired Future Conditions**

##### **Monitoring**

Monitoring activities should continue as prescribed in the Bird Conservation and Management Strategy (Action 6). Monitoring is required to:

- ensure compliance with the MBTA permit,
- ensure compliance with established population goals,
- assess the possible effect of gull management on other waterbird colonies, and
- assess the effectiveness of management actions

The NPS natural resources staff, in coordination with their partners including GGNPC, PRBO, and the U.S. Geological Survey has an ongoing monitoring program for all colonial waterbirds, including western gulls. This program documents the number, location, and reproductive outcome of all gull nests on the island each year. It also documents the amount of take that occurs each year that is allowed under the MBTA permit. Recommendations for continued monitoring under this strategy include:

- continue annual monitoring of western gulls that includes documentation of the number and location of breeding pairs and the reproductive outcome of each breeding pair to the extent feasible;
- monitor the effectiveness of management actions and specific deterrence prescriptions by documenting the number of gull nests and the extent of gull perching occurring in treated areas over time;
- continue to monitor the removal of nests or other actions that are covered under the MBTA permit, and the result of those actions;
- assess the monitoring results with respect to maintaining western gull population levels as described and implement adaptive management strategies as needed.;
- assess the monitoring results with respect to effects of western gull management on other colonial waterbirds, and implement adaptive management strategies as prescribed in the Bird Conservation and Management Strategy; and
- develop a western gull monitoring plan that incorporates the above recommendations.

## **Population Modeling**

Bird Conservation and Management Action 3 of the Bird Conservation and Management Strategy should be implemented. Population models for each species should be developed and optimal population levels for each waterbird species should be set in order to serve as a basis for monitoring and adaptive management. Prior to the development of population models, additional data on subadult and juvenile survival and recruitment should be gathered. This will require a fairly extensive radio-telemetry or mark-recapture study in order to track the movements and survival of offspring. These data will be essential in the development of population models. This is a key task that should be undertaken immediately and prior to undertaking projects that have potential for substantial effects on nesting western gulls and other waterbird colonies. The results of this effort will guide future monitoring and decision-making and will provide more reliable assurances of maintaining self-sustaining populations on Alcatraz and elsewhere in the San Francisco Bay area.

As noted, it is important that population modeling be conducted for all colonial waterbird species on the island in order to establish goals for population equilibrium and to effectively guide management decisions. However, it is also important to recognize that there is inherent risk in modeling and managing the Alcatraz Island population without consideration of the potential effects on the Bay Area and possibly the regional population of western gulls. The importance of the Alcatraz Island population as a source population for a larger regional area should be explored in greater detail in concert with population modeling and be considered when establishing population levels.

## **Desired Future Conditions**

The following briefly describes some of the considerations in developing the desired future conditions for waterbird populations on Alcatraz Island.

- Maintain self-sustaining waterbird colonies in a population equilibrium. As noted above, achieving and maintaining population equilibrium between the various colonial waterbird species is subject to a variety of natural and management conditions. The sustainability of these colonies is subject to food resource availability, predation, competition, and other natural influences that could affect colony size and production. Species with small population sizes, such as pelagic cormorant and pigeon guillemot, have greater susceptibility to these influences, and may be less likely to be influenced by management activities designed to maintain population levels. Regional populations also should be considered in the management of all of the species inhabiting Alcatraz Island. For some species achieving population goals on Alcatraz may be inconsequential relative to the regional population and efforts to maintain these populations at the expense of other management goals may not be warranted from a regional population perspective. Thus, while maintaining viable and self-sustaining populations of all species should be addressed, it should be done so in the context of the complexities resulting from both biological (locally and regionally), regulatory

constraints, and practical considerations affecting the overall management of Alcatraz Island.

- Control visitor use and access on the island. While visitor access is an essential part of Alcatraz, access into sensitive areas should be carefully controlled. Sensitive breeding areas should be avoided to reduce the potential for nest failures and abandonment. This may require continuing to implement seasonal closures along some walkways and other areas that might otherwise be accessible to visitors.
- Reduce western gull nesting and roosting in areas of high visitor use or areas that require significant maintenance or restoration, while maintaining a sustainable population on the island that continues to function as a source population for the San Francisco Bay area. Unless carefully managed, western gull nesting on Alcatraz could continue to prevent needed maintenance of cultural resource structures and related facilities resulting in continued deterioration of these resources.
- Implement a public interpretive and outreach program that emphasizes the natural history of the island, particularly the nesting waterbird colonies, and helps to reduce inadvertent disturbances to the colonies by the public.
- Continue research exploring the behavior, food habits, and other biological considerations of colonial nesting waterbirds on Alcatraz. For example, investigating the food habits of western gulls would provide information on the use of various potential food sources around the San Francisco Bay and the extent to which they use artificial food sources, such as landfills. In addition, the extent to which western gulls may have learned to exploit refuse on Alcatraz from litter and other debris should be investigated as well as the potential effects of planned food concessionaires on the island.
- Continue with monitoring efforts that allow NPS and partners to make science-based decisions and respond to observed changes with the ability to implement adaptive management strategies as needed. Continue with monitoring efforts that provide essential data on colony size, reproductive output, and over time will provide data that may be useful in assessing the effects of ocean oscillations and climate change.

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## **6.0 Appendix A. Western Gull Breeding Colonies Between Point Arena and Point Sal**

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**Appendix A. Western gull colony locations between Point Arena and Point Sur, California.**

Location	Number of Breeding Birds
Point Arena	4
Sea Lion Rocks	9
Sea Lion Rocks to Arena Cove	16
Triplett Gulch	4
Fish Rocks	170
Gualala Point Island	26
Sea Ranch	16
Black Point to Stewart's Point	6
Stewart's Point to Rocky Point	4
Horseshoe Cove	2
Gerstie Cove to Stillwater Cove	16
Bench Mark 125 to Timber Cove	32
Windermere Point to Jewell Gulch	6
Northwest Cape Rocks	52
Russian Gulch	42
Russian River Rocks	44
Goat Rock to Peaked Hill	6
Arched Rock	34
Peaked Hill	6
Gull Rock	34
Shell-Wright Beach Rocks	88
Duncan Point to Arched Rock	34
Bodega Head	10
Bodega Rock	24
Bodega Harbor	12
Pinnacle Rock	2
Sonoma-Marin County Line	14
Dillon Beach Rocks	32
Tomales Point	6
Bird Rock (Marin Co.)	168
Elephant Rock Complex	8
Point Reyes	178
Point Resistance	8
Millers Point Rocks	30
Double Point Rocks	6
Stinson Beach to Rocky Point	6
Gull Rock Area	6
Muir Beach Headlands to Tennessee Cove	20
Bird Island (Marin Co.)	56
Point Bonita	10
Bonita Cove	6
Point Diablo Bluffs and Needles	34
Yellow Bluff	2
Sausalito Point Area	4
Peninsula Point and Cone Rock	6
Angel Island	6
Bluff Point to Paradise Cay	4

Point San Quentin	6
Marin Islands	64
The Sisters and Point San Pedro	96
Rat Rock	2
Southwest San Pablo Bay Duck Blinds	16
Marin Co. – W. San Pablo Bay Ship Channel	14
Sonoma Co. – W. San Pablo Bay Ship Channel	2
Knight Island	8
Northeast San Pablo Bay Beacon	2
Mare Island Strait	20
Commodore Jones Point to Benicia Point	10
Benicia Point to Army Point	6
Mothball Fleet	10
Suisun Point Area	6
Nevada Dock	2
Eckley to Selby	4
Davis Point Unocal Wharf	22
Hercules Wharf	2
Pinole Point	2
East San Pedro Bay Ship Channel	6
The Brothers	178
Castro Point Area	8
Richmond-San Rafael Bridge	18
Red Rock	384
Standard Oil Long Wharf	6
Richmond Harbor Entrance Channel	12
Brooks Island Area	98
Richmond Inner Harbor	12
Albany Hill Cove	2
Berkeley Yacht Harbor Breakwaters	38
Berkeley Pier	40
Bay Bridge Toll Plaza Point	2
San Francisco-Oakland Bay Bridge East	40
Oakland Outer Harbor	8
Oakland Middle Harbor	10
Oakland Inner Harbor	6
Government Island Area	2
Alameda Naval Air Station	210*
Mulford Landing Channel	2
Alviso Plant – Pond A6	4
San Mateo Bridge and PG&E Towers	6
San Francisco Ship Channel	8
Oyster Point Area	2
Double Rock	2
Hunter's Point	50
Lash Lighter Basin	40
Potrero Point	6
San Francisco Piers South	232
San Francisco-Oakland Bay Bridge West	48
Yerba Buena Island	62
Treasure Island	96
San Francisco Piers North	62
Pier 45	66

Alcatraz Island	2,300*
Fort Point Rock to Helmut Rock	6
Lobos Rock and Lands End	14
Seal Rocks	46
North Farallon Islands	32
South Farallon Islands	15,852*
San Pedro Rock	12
Devil's Slide Rock and Mainland	8
Seal Rock Cliffs	2
Pigeon Point	2
Gazos Creek North	4
Año Nuevo Island	2,196*
Greyhound Rock to El Jarro Point	2
Needle Rock Point to Terrace Point	6
Terrace Point to Point Santa Cruz	2
Elkhorn Slough Salt Ponds	10
Elkhorn Slough Estuarine Reserve	16
Moss Landing Harbor	16
Monterey Harbor	24
Cannery Row	86
Bird Rock (Monterey Co.)	16
North Carmel Bay	6
Pescadero Rocks	20
Guillemot Island Area	30
Pinnacle Point Area	10
Sand Hill Cove	4
Bird Island (Monterey Co.)	90
Yankee Point South	6
Soberanes Point South	1
Kasler Point North	2
Rocky Point	6
Bench Mark-227x	38
Castle Rocks and Mainland	12
Hurricane Point Rocks	14
Molera Rock	8
Cooper Point and islands	1
Wreck Beach South	2
Grimes Point	4
Partington Point	14
Partington Ridge North	7
McWay Rocks	14
Partington Ridge South	8
Anderson Canyon Rocks	2
Burns Creek Rocks	2
Buck Creek	2
Gamboa Point	4
Lopez Point South	2
Rockland Landing North	7

Rockland Landing	6
Kirk Creek to Mill Creek	2
Larus Rock	2
Gorda Area	8
Small Rocks & Mainland N.E. of Plaskett Rock	26
Plaskett Rock	5
Cape San Martin	349
Unnamed Rock	4
Point North of Redwood Gulch	2
Redwood Gulch Rock	2
Seastack South of Redwood Gulch	6
Unmapped Island	3
Ragged Point South	2
3 Rocks	12
La Cruz Rock	18
Piedras Blancas Island	34
Point Piedras Blancas	2
Point San Simeon	10
Morro Rock and Pillar Rock	114
Point Buchon	40
Unnamed Rocks	49
Pup Rock and Adjacent Mainland	44
Lion Rock	24
Diablo Rock & Adjacent Mainland	26
Diablo Canyon Nuclear Power Plant South	28
Double Rock Region	6
Pecho Rock	14
Fossil Point	21
Shell Beach Rocks	18
North Pismo Beach Rocks	10
Mussel Point	7
Point Sal	4

\*2007 data. All other data from Carter et al (1992) and McChesney et al (2005)