

**Summary Report of Avian Surveys Conducted in 2008 at
Dilapidated Piers and Other Structures along the Port of San
Francisco's Southern Waterfront Properties**



Golden Gate Audubon Society
and
San Francisco Bay Bird Observatory

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Abstract

Golden Gate Audubon partnered with San Francisco Bird Observatory, San Francisco Baykeeper, and the Port of San Francisco to conduct surveys of birds using dilapidated piers and wharves in 8 areas along San Francisco's southern waterfront from June through August 2008. Observers recorded 2828 total birds consisting of 25 species. We confirmed that two species (Caspian Tern and Western Gull) nest on Piers 60 & 64, near Agua Vista Park. Based on our findings, we conclude that the southern waterfront is an important area for nesting and roosting birds. We recommend that the Port of San Francisco schedule any construction, rehabilitation, or removal of pier structures to occur outside the bird breeding season (March 1 through August 31 each year). We also recommend that redevelopment activities along the southern waterfront include measures to avoid and minimize impacts to birds and other wildlife in the area.

Acknowledgments

The data summarized in this report could not have been gathered without the field volunteers. Observers for the 2008 Southern Waterfront Survey were: Regina Anavy; Eddie Bartley; Richard Dreschler; Charles Hibbard; Julia Hicks; Lynn Strandberg; Donna Nicoletti; Mary Lynn Shimek; and Noreen Weeden.

San Francisco Baykeeper provided one of its boats and volunteer skipper Philip Kipper, and their staff including Deb Self and Sara Aminzadeh, which allowed for teams to survey many areas that were not accessible by land.

Additional thanks to the Port of San Francisco for its assistance in completing this study.

Cover photo: Caspian Terns at Pier 70, San Francisco, California. ©Eddie Bartley.
All other photos by Noreen Weeden.

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EXECUTIVE SUMMARY

In response to concerns about potential impacts to birds from the Port of San Francisco's plan to demolish several derelict piers along San Francisco's southern waterfront, the Golden Gate Audubon Society cooperated with the San Francisco Bay Bird Observatory, San Francisco Baykeeper, and the Port of San Francisco to conduct 12 surveys at 8 areas along the waterfront from June through August 2008.

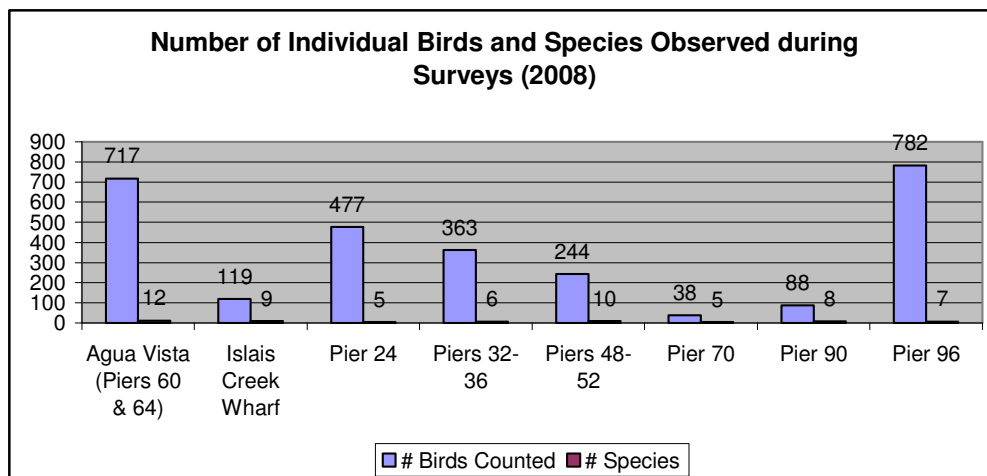
Findings

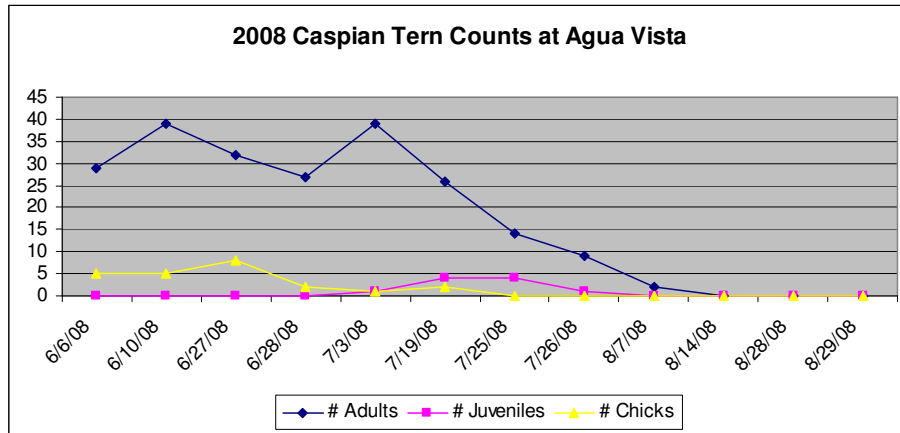
Observers recorded 2828 birds comprised of 25 species using the structures within the Survey Area, including two nesting species (Caspian Tern and Western Gull). Western Gulls and Double-crested Cormorants were the first and second most abundant species detected, respectively.

We reconfirmed that Caspian Terns successfully nest on the dilapidated piers adjacent to Agua Vista Park (specifically, Piers 60 & 64, just north of Pier 70). We also confirmed that Western Gulls nest at each of the piers surveyed, most notably at Pier 24, Piers 32& 36, and Pier 96 (also known as Heron's Head Park).

Our surveys and personal observations indicate that Piers 60 & 64 (near Agua Vista Park) are among the most important along the waterfront. The site hosted the second-most birds of any of those in the survey (observers recorded slightly more birds at Pier 96, which is Heron's Head Park). In addition to providing the only nesting site for Caspian Terns, the Agua Vista site hosted the most Caspian Terns, Elegant Terns, and Double-crested Cormorants there.

Survey Area





Recommendations

Our findings support the conclusion that the southern waterfront is an important area for Bay Area birds and people who enjoy observing them. In the summer, the area hosts several species of nesting and roosting birds. Data collected by other projects show that the area provides habitat to even more species during the fall, winter, and spring months, when hundreds of thousands of birds migrate through and over-winter in the San Francisco Bay.

Our data indicate that Piers 60 & 64 at Agua Vista Park are particularly important. Piers 60 & 64 supported the second-highest abundance of birds, the highest number of species, and provide the only nesting site for Caspian Terns in San Francisco. If these structures are demolished or allowed to further disintegrate before alternative habitat can be provided, we may lose nesting Caspian Terns in San Francisco.

While redevelopment in the area may bring many benefits to the City of San Francisco and its residents, it will have a negative impact on many birds that use the area unless measures are taken to minimize and mitigate the impacts. We recommend that the Port and the City incorporate the following measures into any redevelopment plans for the area:

- provide alternative habitat for areas that now provide bird habitat, such as dilapidated piers currently slated for demolition;
- provide protected areas for birds and other native wildlife that are not accessible to dogs or other disturbances;
- reduce the amount of glass used in new buildings along the waterfront, which contribute to injuries and deaths as a result of collisions;
- reduce nighttime lighting along the waterfront, especially near nesting birds;
- implement a trash management plan to reduce food waste that increases the presence of mammalian and avian predators;
- support the monitoring of birds and other wildlife in the area;
- support outreach and education opportunities to educate visitors to the area and improve their enjoyment of San Francisco's natural resources.

For more information about Golden Gate Audubon's Southern Waterfront Campaign, please contact Mike Lynes, Conservation Director, at (510) 843-6551 or at mlynes@goldengateaudubon.org.

INTRODUCTION

San Francisco's southern waterfront is undergoing radical changes with a renewed surge of redevelopment in the Mission Bay area and along the piers and wharves that line the shoreline. While redevelopment in the area carries promise for potential benefits for San Francisco's residents and economy, it also introduces potential impacts to native birds that use structures along the waterfront for roosting and nesting. To ascertain which species were using dilapidated structures along the waterfront, Golden Gate Audubon Society, in cooperation with the San Francisco Bird Observatory, the Port of San Francisco, and San Francisco Baykeeper, initiated surveys of several structures slated for demolition by the Port. This report summarizes data gathered during the months of June, July and August 2008.

Our data confirm the presence of nesting birds, including the Caspian Tern and Western Gull, and that at least 29 species use the structures during the summer months. Based on these findings and personal observations, we offer the Port several recommendations to minimize impacts on birds that will result from a demolition of dilapidated piers and other structures along the waterfront.

Background of the Survey Area

On February 12, 2007, the Facilities Assessment Team from the Port of San Francisco published *Condemned Piers, Wharves and Aprons Scheduled for Demolition* to prepare for, prioritize and schedule future demolition projects.¹ The facilities on the list no longer fulfill any operation or functional need and are posted as unsafe for occupancy and have been barricaded to prevent access.



Moreover, the Southern Waterfront along San Francisco Bay is now planned as part of the 13-mile publicly accessible Blue Greenway, which links open spaces and creates recreational spaces and green infrastructure.² These projects promise to change the face of the waterfront in the hope of increasing use and access by residents of San Francisco.

In 2008, San Francisco voters approved the \$185 million Clean and Safe Neighborhood Parks GO bond.³ This bond includes funding for removal of the dilapidated structures at

¹ <http://www.ci.sf.ca.us/site/uploadedfiles/Item%2010a%20Attachment%20Table.pdf>

² <http://www.bluegreenway.org/Overview.html>

³ http://www.sfgov.org/site/recpark_page.asp?id=64140

Piers 34 and 36, Blue Greenway trails improvements along the southern waterfront including a Bayfront Park at Mission Bay (Pier 54), a new major park at Pier 70, removal of dilapidated structures at Islais Creek, and improvements at Heron's Head Park.⁴

Initiation of the Southern Waterfront Surveys

After consulting with Port staff, the Golden Gate Audubon Society (GGAS) initiated a survey of the piers in 2007 to identify any nesting and roosting birds, any special-status species using these structures, and any physical features that birds use on Port property that may be selectively preserved. San Francisco Bay Bird Observatory (SFBBO) had already been conducting a colonial water bird survey near Agua Vista Park. GGAS and SFBBO cooperated to expand their joint monitoring and data collection efforts starting in 2007.⁵ In 2007, survey teams documented that Caspian Terns nest at the Agua Vista site and that Western Gulls nest at Agua Vista and several other sites along the waterfront.

Based on findings in the 2007 report, GGAS concluded that additional surveys would improve our knowledge of bird use of the piers and other structures along the waterfront. To further incentivize volunteers to survey the area, Golden Gate Audubon and San Francisco Bay Bird Observatory conducted the Urban Waterfront Bird Challenge in 2008. Participants compete to view and document birds at these sites. The Challenge was sponsored by the Port of San Francisco, which provided gas for boats provided by San Francisco Baykeeper.

General Findings

Over the course of 12 surveys that lasted approximately 2 hours each, surveyors recorded 2828 birds comprised of 25 species using the structures within the Survey Area. Over the two years of the study, surveyors have observed at least 29 bird species using the structures. In 2008, Western Gulls were the most abundant species making use of the piers. Double-crested Cormorants were also observed roosting, but not nesting, at each structure surveyed. Caspian Terns were limited to the piers 60 & 64 at the Agua Vista site.

We reconfirmed that Caspian Terns successfully nest on the dilapidated piers adjacent to Agua Vista Park (specifically, Piers 60 & 64, just north of Pier 70). We also confirmed that Western Gulls nest at each of the piers surveyed, most notably at Pier 24, Piers 32 & 36, and Pier 96 (also known as Heron's Head Park).

The Agua Vista site (Piers 60 & 64) appears to be one of the most important of the dilapidated structures along the waterfront. The site hosted the second-most birds of any of those in the survey (observers recorded slightly more birds at Pier 96, which is Heron's Head Park). In addition to providing the only nesting site for Caspian Terns, the Agua Vista site hosted the most Caspian Terns, Elegant Terns, and Double-crested Cormorants there.

⁴ <http://www.sfgov.org/site/uploadedfiles/port/meetings/supporting/2007/Item10aParksandOpenSpaceProjects.pdf>

⁵ The report for the 2007 Southern Waterfront Survey is available at <http://www.goldengateaudubon.org/PDFs/GGASWaterfrontBirdSurvey2007.pdf>

General Recommendations

It is the exclusion of human activity at these dilapidated structures that makes them attractive for nesting birds. The destruction of the piers without providing alternative habitat free from disturbance by humans may contribute to the decline of the diversity and abundance of birds that we observe along the southern waterfront.

We are particularly concerned about the fate of Caspian Terns that nest on dilapidated pier structures adjacent to Agua Vista Park. This is the only nesting colony in San Francisco. Once the piers at Agua Vista are destroyed, Caspian Terns will lack nesting habitat along the waterfront. We strongly recommend that the Port of San Francisco erect alternate habitat for the Caspian Terns before destroying the Agua Vista piers.

Finally, it is clear that the southern waterfront is an important area for Bay Area birds and people who enjoy observing them. Development along the southern waterfront should consider the birds and other wildlife in the area and ensure that measures are taken to minimize or mitigate impacts to them. Specifically, buildings that use a lot of glass may increase bird injuries and fatalities due to collisions; night-time lights may disrupt breeding and roosting behavior; and poor management of trash, particularly food waste, will contribute to the increase in rats, raccoons, crows, ravens, and other predators that can have severe negative impacts on bird populations, particularly nesting birds.

Redevelopment of the southern waterfront offers an opportunity for the City of San Francisco and the Port to recreate a zone of the city that has, in many places, fallen to blight. Projects such as the Blue Greenway are intended to encourage San Franciscans to get outdoors and enjoy new facilities along their waterfront. We urge the City and the Port to consider the inherent value of birds and other wildlife as part of San Franciscans' outdoor experience. By studying, planning for, and mitigating negative environmental impacts that arise from redevelopment, we can ensure that the waterfront remains a vital area to be used and enjoyed by both humans and wildlife.



Caspian Tern

SURVEY AREA

On February 12, 2007, the Facilities Assessment Team from the Port of San Francisco published a list titled “Condemned Piers, Wharves and Aprons Scheduled for Demolition” to prepare for, prioritize and schedule future demolition projects (staff report to the Port Commission). The piers that are slated for demolition once funding becomes available are listed below:

- Pier 24 adjacent to the Bay Bridge support pier – removal of this left-over piece of Pier 24, which should have been removed along with the original demolition of the pier, is a requirement of Bay Conservation and Development Commission (BCDC).
- Pier 36 and the marginal wharf between Piers 32 and 36 – Plans to construct the planned Brannan Street Wharf require removal of this pier. Removal is included in Bay Conservation & Development Commission’s (BCDC) special area plan.
- Pier 52, former railroad barge loading facility (potentially historic)
- Pier 60, former Carmen’s Restaurant, adjacent to Pier 64
- Pier 70 – Wharfs 7 and 8 at the pier
- Islais Creek wharf west of Third St. (excluding the historic Copra Crane)
- Pier 90 Grain Terminal Apron
- Pier 96 Lash Barge Finger Pier

Golden Gate Audubon assessed the accessibility and priority of the piers slated for destruction and conducted surveys at Piers 24, 36, 64, 96, the wharf near Islais Creek, and the Lash Lighter Pier across from Heron’s Head Park.

The Urban Waterfront Bird Challenge enabled volunteers from Golden Gate Audubon and SFBBO to view and document birds from the San Francisco Bay perspective. The Port of San Francisco sponsored the event and the San Francisco Baykeeper provided an in kind donation of their boat and a skipper. The boats allowed volunteers to see the end of Piers 24, 36, 42, 52, which would not have been otherwise observable from land.

Figure 1. Survey Area



METHODS

The southern waterfront surveys were intended to collect data regarding the presence and species richness of bird species, the presence of nesting bird species, and whether birds used the dilapidated piers for roosting or other behaviors.

Survey Technique

Volunteers conducted 12 surveys (4 per month) during the months of June, July and August 2008. Surveys lasted approximately 2 hours and were conducted at 8 discrete sites along San Francisco's southern waterfront. Specifically, survey teams visited piers identified by the Port of San Francisco for demolition or removal. The study sites were: Pier 24, Piers 32 & 36, Piers 48 & 52, Piers 60 & 65 (adjacent to Agua Vista Park), Pier 90, Pier 96 (at Heron's Head Park), and the Islais Creek wharf (at Third Street). Survey teams intermittently recorded observations of birds at Pier 70.

Surveyors observed birds using binoculars and a spotting scope. All birds observed using the piers were identified to species and age, where possible. Surveyors made additional notes about other birds, marine mammals, and events observed during the surveys.

Three of four surveys each month were conducted on foot (June 6, June 10, June 28, July 3, July 19, July 26, August 7, August 14, and August 28). Survey teams visited the waterfront nearest each dilapidated pier and observed and recorded birds using the piers and general area around the piers.

Surveys from boats were conducted once per month (June 27, July 25, and August 19). Boat surveys departed from Gas House Cove in Fort Mason and took the water route south along San Francisco Bay. Boat surveys were made possible by San Francisco Baykeeper.

Survey times included mornings, afternoons, weekdays, weekends, high tides, and low tides. Monitoring did not include night roosting.

Data Collection and Presentation

Data were recorded on standardized data forms. A copy of the data form is attached hereto as Appendix B. Surveyors recorded the date, beginning and end times, the tide (low, high, incoming), wind speed and direction, cloud cover, temperature, bird species, location observed, number of birds observed, age of birds (adult, juvenile, nestling, fledgling), number of nests observed, bird behavior (nesting, roosting, feeding, etc.), and bird flying overhead but not using the piers). Observers also made notes about marine mammals and disturbances in the area of the piers.

Data were entered into a Microsoft Excel spreadsheet. Summaries and charts were produced using Excel tools. A copy of our data spreadsheet is available upon request.

RESULTS

Observers counted a total of 2828 birds of 29 species and confirmed that at least 2 species (Caspian Tern and Western Gull) nest on the dilapidated pier structures in the Survey Area.

Species Richness

During the 2008 surveys, observers recorded 25 bird species within the Study Area. Over the course of the 2007-2008 surveys, observers have recorded a total of 29 species using the dilapidated piers.

In 2008, surveyors recorded 12 species not observed during the 2007 surveys: American Kestrel, Black-crowned Night Heron, Brandt's Cormorant, Brown Pelican, California Gull, Clark's Grebe, Common Murre, Common Raven, European Starling, Great Blue Heron, and Killdeer. Five species observed in 2007 were not observed during the 2008 surveys: Black Skimmer, Glaucous-winged Gull, Herring Gull, Mallard, and Red-shouldered Hawk. (See Table 1, below)

The Agua Vista site (Piers 60 & 64) had the highest richness of species overall (12 species). Piers 48 & 52 had the second highest with 10. Islais Creek wharf and Pier 90 had 9 and 8 respectively.

The Agua Vista site (Piers 60 and 64) had the highest number of nesting species (2): Caspian Tern and Western Gull. No data were gathered on breeding chronology, predation, disturbance, or productivity.

Figure 2. Total Number of Species Observed Using the Dilapidated Piers along San Francisco's Southern Waterfront (2008)

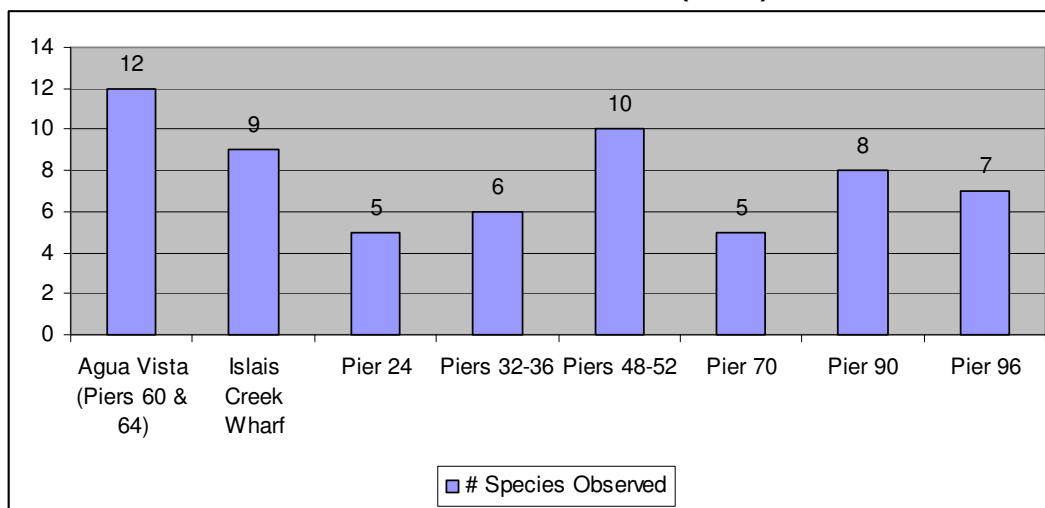


Table 1. Species Observed During the 2008 Southern Waterfront Survey

Birds in bold were confirmed to nest in the Survey Area during 2008.

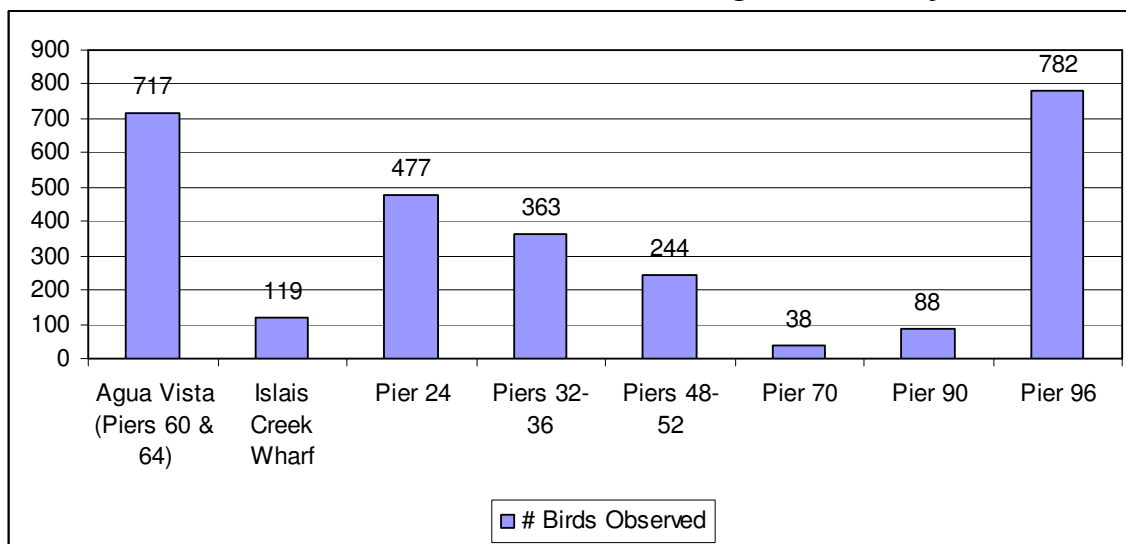
25 Species Observed During 2008 Survey	29 Species Observed During 2007 & 2008 Combined
American Crow * American Kestrel+ Barn Swallow * Black-crowned Night Heron+ Black Oystercatcher * Brandt's Cormorant+ Brown Pelican+ California Gull+ Caspian Tern * Clark's Grebe+ Common Murre+ Common Raven+ Double-crested Cormorant * Elegant Tern * European Starling+ Forster's Tern * Great Blue Heron+ Great Egret+ Heerman's Gull * Killdeer+ Rock Pigeon Snowy Egret * Western Grebe Western Gull *	American Crow * American Kestrel+ Barn Swallow * Black-crowned Night Heron Black Oystercatcher * Black Skimmer * Brandt's Cormorant Brown Pelican+ California Gull+ Caspian Tern * Clark's Grebe+ Common Murre+ Common Raven Double-crested Cormorant * Elegant Tern * European Starling+ Forster's Tern * Glaucous-winged Gull * Great Blue Heron+ Great Egret Heerman's Gull * Herring Gull * Killdeer+ Mallard * Red-shouldered Hawk * # Rock Pigeon Snowy Egret * Western Grebe * Western Gull *
+Indicates that the bird species was first observed in 2008 (i.e., not observed during 2007 surveys) *Indicates bird species protected by the International Migratory Bird Treaty Act (MBTA), 16 U.S.C. §§ 703-712, which prohibits the killing of all migratory birds or the taking of migratory bird feathers, parts, eggs, or nests. # indicates the bird species is protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).	

Abundance of Species Observed in the Survey Area

Over the course of 12 surveys, observers recorded a total of 2828 birds using the dilapidated piers: 2608 adult birds; 141 juveniles; and 79 chicks. This number does not include birds observed flying overhead or not using the area around the piers.

Observers recorded the most birds at Pier 96 (782), Agua Vista (717), and Pier 24 (477). Pier 70 was not visited during each survey, so it does not offer an accurate reflection of the possible abundance of birds relative to other sites (Figure 3).

Figure 3. Total Number of Birds Observed at Dilapidated Piers along San Francisco's Southern Waterfront during 2008 Surveys



Caspian Tern Abundance & Nesting at Agua Vista (Piers 60-64)

On June 10, 2008, the first day of our survey, observers recorded 39 adults, 5 chicks and 2 nests at the Agua Vista site (Figure 4). Bird Research Northwest, Inc. estimated that the dilapidated piers adjacent to Agua Vista Park (Pier 60 and 64 in this survey) were home to a Caspian Tern colony of 40 breeding pairs in 2008.⁶ Survey teams continued to record the presence of adult and juvenile Caspian Terns at the Agua Vista site through the first week of August, with no detections on our last three survey dates (August 14, 22, and 29) (Figure 4).

Table 2. Number of Nests, Adults, and Young Counted at Piers 60 & 64 (2007-2008)

Year	# Nests Counted	# Adults Counted	# Young Counted
2006	11	181	42
2007	10	570	69
2008	2	217	33

⁶ Bird Research Northwest (May 1, 2009), http://www.birdresearchnw.org/CEDocuments/Downloads_GetFile.aspx?id=311338&fd=0.

Figure 4. Number of Caspian Tern Adults, Juveniles, and Chicks Observed in 2008 at Piers 60 & 64 on San Francisco's Southern Waterfront

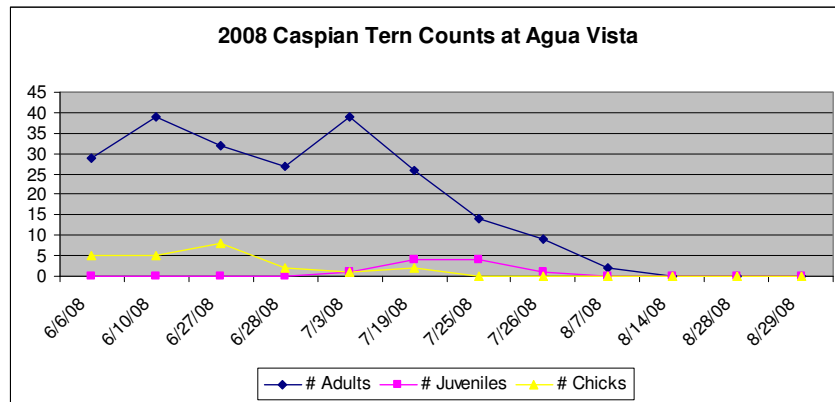


Figure 5. Number of Caspian Tern Adults, Chicks, and Nests Observed in 2007 at Piers 60 & 64 on San Francisco's Southern Waterfront⁷

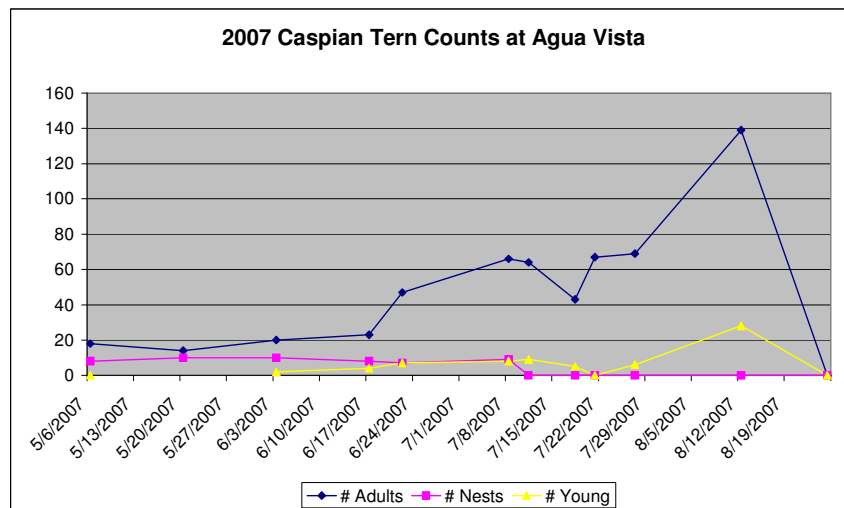
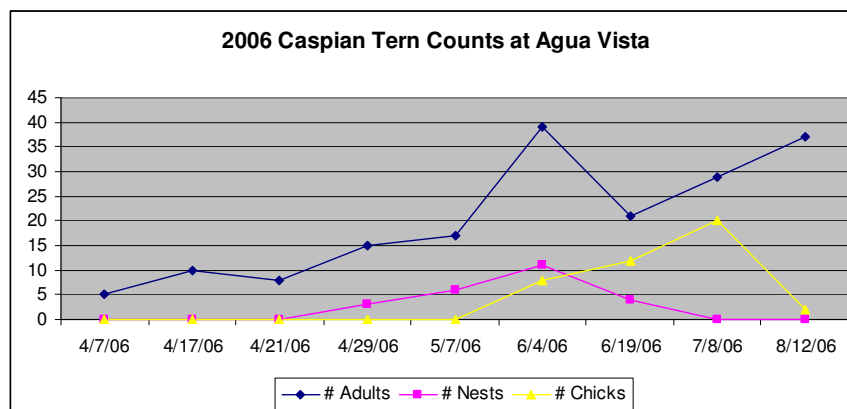


Figure 6. Number of Caspian Tern Adults, Nests, and Chicks Counted in 2006 at Piers 60 & 64 on San Francisco's Southern Waterfront



⁷ <http://www.goldengateaudubon.org/PDFs/GGASWaterfrontBirdSurvey2007.pdf>

Western Gull Abundance & Nesting on the Southern Waterfront

In 2008, observers recorded 1773 Western Gulls (1592 adults, 126 juveniles, and 55 chicks) in the Survey Area. We recorded the highest number of adult Western Gulls at Pier 96 (552 adults), Pier 24 (320), and Piers 32-36 (239), and Pier 48-52 (189).

We recorded the highest number of observed Western Gull chicks and juveniles at Pier 24 (81), Piers 32-36 (42), and Pier 96 (42). Our highest counts for active nests were at Pier 96 (16), Piers 32-36 (15), and Pier 90 (8).

We reconfirmed the existence of a Western Gull colony at Piers 60 and 64 at Agua Vista Park. Bird Research Northwest also confirmed the existence of the Agua Vista Western Gull colony, but did not estimate its size.⁸

Figure 7. Number of Western Gull Adults, Young (Juveniles + Chicks), and Nests in 2008

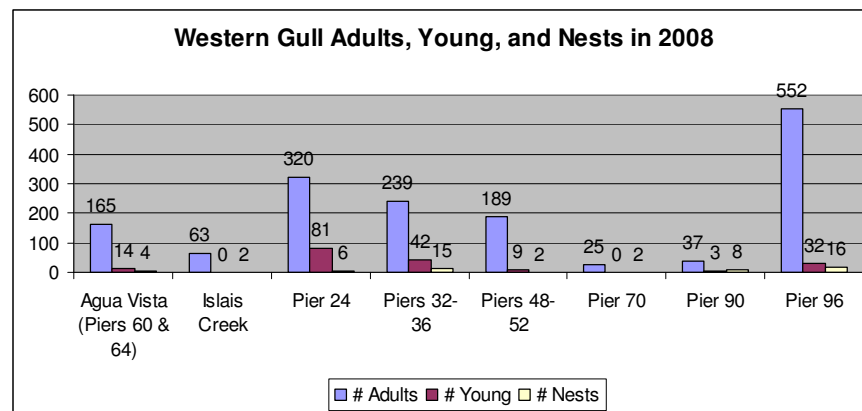
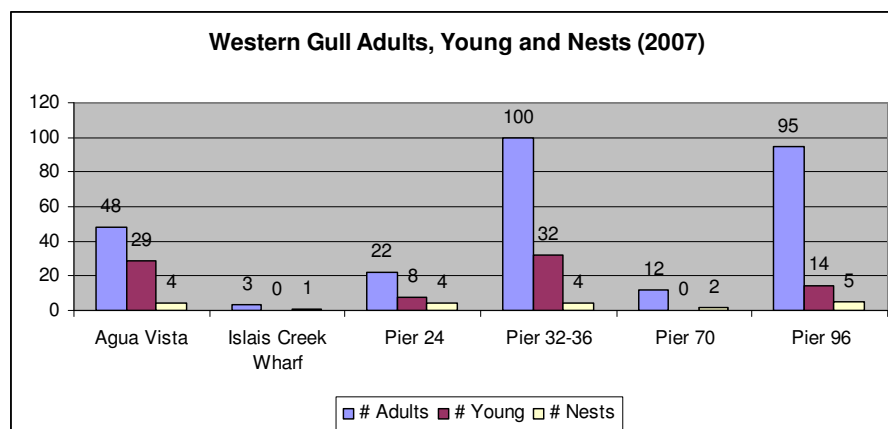


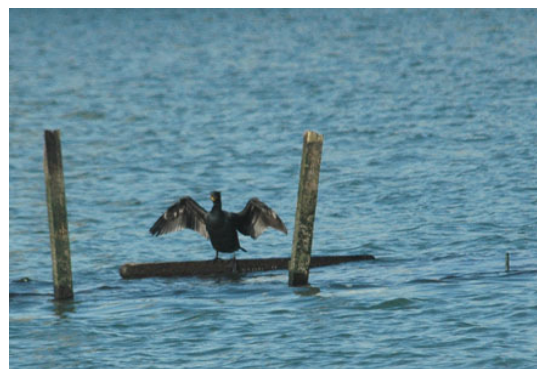
Figure 8. Number of Western Gull Adults, Young (Juveniles + Chicks), and Nests Observed in 2007



⁸ http://www.birdresearchnw.org/CEDocuments/Downloads_GetFile.aspx?id=311338&fd=0.

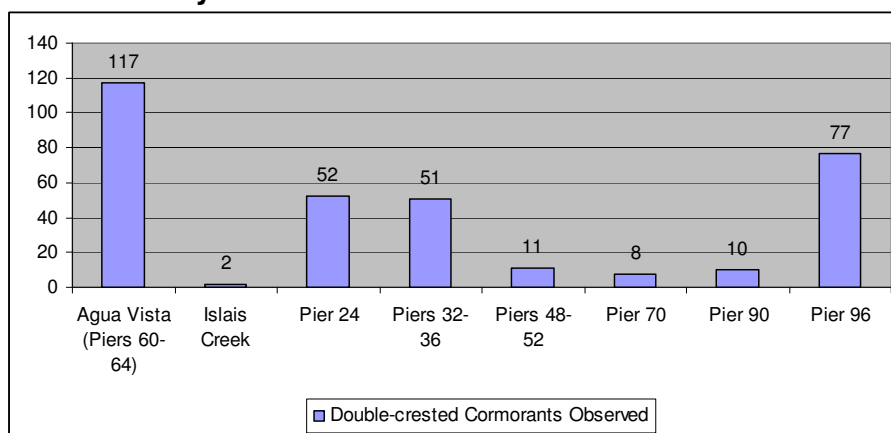
Double-crested Cormorant Abundance

Double-crested Cormorants were the second-most abundant species recorded in the Study Area during the 2008 surveys. In total, observers recorded 328 Double-crested cormorants in the Survey Area during the Survey Period. Double-crested cormorants were most abundant at the Aqua Vista site (Piers 60 and 64), with a total of 117 observed during the surveys. Surveyors did not record any observations of juvenile cormorants in the Survey Area.



Double-crested Cormorant at Pier 96

Figure 9. Number of Double-crested Cormorants Observed Roosting on Dilapidated Piers on San Francisco's Southern Waterfront during the 2008 Survey



Other Observations:

Elegant Tern. Surveyors recorded a total of 117 Elegant Tern observations, all at the Aqua Vista site (specifically, Pier 60), over four dates (July 25 and 26, August 7 and 14).

Brown Pelican. Brown Pelicans were observed perched at Piers 32-36 and Pier 70. Brown Pelicans were frequently observed flying overhead throughout the Survey Area.

Black Oystercatcher. Black Oystercatchers were observed at Piers 70 and 96. Black Oystercatchers appear to be breeding in or near the Survey Area since two adults and one juvenile were recorded on the July 19, 2008 survey at Pier 96 (also known as Heron's Head Park).

Common Murre. On July 25, 2008 a Common Murre was seen in the San Francisco Bay from the Baykeeper boat trip in the Pier 70 area.

Killdeer. On June 10, 2008, an observer recorded 3 killdeer at the Islais Creek wharf, including one sitting on an active nest and a chick.

Harbor Seal. On August 28, 2008 a Harbor Seal was observed swimming up the creek and under the 3rd Street Bridge.

DISCUSSION

Limitations on Data Presented in this Survey

To provide appropriate context for the results presented above, we acknowledge several limitations inherent in the data collected during the 2007 and 2008 surveys:

First, survey dates and techniques were not standardized over both years. Surveys were not time-limited and were sometimes conducted differently (e.g., by land or by boat). Consequently, we do not believe that comparing results from one year to another provides useful information. Rather, data gathered from each year provides information about bird use at the survey sites during that specific year.

Second, surveys were intended to provide a general indication of the number, species, age, and nesting status of birds on the dilapidated piers along the southern waterfront. They were not intended to gather data to assess the population size, breeding chronology, and breeding productivity of birds using the waterfront structures.

Third, particularly in 2008, surveys were not initiated before or during the peak of the bird breeding season. For example, in 2008, our first survey was conducted on June 6, 2008, well after the peak of the Caspian Tern breeding season. Data collected by Bird Research Northwest at Brooks Island in San Francisco Bay indicate that the colony size at Brooks Island was largest in mid- to late May 2008.⁹ This further limits inferences that may be drawn from our counts regarding the number of nests or chicks at the site.

To the extent that species abundance or species richness is represented in this report, it is intended to merely provide a general picture of bird use of the southern waterfront piers. The conclusions in this report are not intended to represent actual abundance, species richness, species diversity, or reproductive success of birds observed in the survey.

Species Richness

We do not believe that comparisons between the species richness observed in 2007 and 2008 are useful. Rather, we note that over the previous two years of the survey, observers have recorded 29 species that use the dilapidated piers in the Survey Area. This number excludes birds that were flying over the survey area or were using areas adjacent to the piers and other structures. Based on our records and personal observations, we believe that the diversity of species using the southern waterfront area is much greater than reflected in the survey data.

Starting in 2010, survey teams will not only record birds using the dilapidated piers in the Survey Area, but will also keep bird lists of birds observed in the general waterfront area during the time of the survey. This will provide further information about the overall

⁹ <http://www.birdresearchnw.org/Project-Info/Project-Data/Caspian-Tern-Data/Brooks-Island-Tern-Data/default.aspx>

diversity of bird species in the area, which may be useful for planners and regulators during the redevelopment process.

Finally, we note that the diversity of seabirds and shorebirds in the San Francisco Bay is much lower in the late spring and summer months (specifically March through August), than during the autumn, winter and early spring, when many species make use of the Bay as a migratory stopover on the Pacific Flyway or for over-wintering habitat.¹⁰ We anticipate that a much greater diversity and abundance of species would be recorded using the dilapidated piers during the autumn and winter months.

Species Abundance

Because of the limitations of the data, we do not believe that our surveys provide a complete picture of the abundance of birds that use the dilapidated piers. However, we believe that data provide an indication of the minimum number of birds, bird species, and active nests at each of the site.

In both years (and in 2006, for which we have anecdotal data), Piers 60 & 64 at the Agua Vista site provided the only nesting habitat on the southern waterfront for Caspian Terns. Consequently, Caspian Terns used the area in the greatest numbers.

Moreover, data from 2007 and 2008 indicate that Western Gulls heavily use Pier 96 (Heron's Head Park), Piers 32 & 36, Pier 24, and the Piers 60 & 64. In both years, Western Gulls nested at each of the piers surveyed.

Overall, the available abundance data reinforce the importance of the Agua Vista site (Piers 60 & 64) to several species of birds on the southern waterfront. In particular, Piers 60 & 64 were heavily used by Caspian Terns (roosting and nesting), Western Gulls (roosting and nesting), Double-crested Cormorants (roosting), Forster's Tern (roosting), and Elegant Tern (roosting).

Finally, the abundance of shorebirds, seabirds, and waterfowl in San Francisco greatly increases in the autumn (generally starting in September) and continues through the spring. We believe that additional surveys should be conducted along the southern waterfront during the fall and winter months to better estimate species richness and abundance at these sites throughout the year.

Caspian Tern Breeding Chronology

Because our surveys did not begin until June in either 2007 or 2008, our information about the beginning of the bird breeding season on the dilapidated piers is limited. We know from the SFBBO data gathered in 2006 that Caspian Terns are present at Agua Vista by at least early April (Figure 6). According to Bird Research Northwest, Inc., which monitors Caspian Tern colony on Brooks Island approximately 9.5 miles from

¹⁰ Stenzel, Lynn E., C. M. Hickey, J. E. Kjelson, and G. W. Page. 2002. *Abundance And Distribution Of Shorebirds In The San Francisco Area*, Western Birds 33: 69-98

Agua Vista, Caspian Terns return to the island by early- to late-March and commence nest-building mid-March to mid-April.¹¹

Our surveys do capture the mid- to late-portion of the bird breeding season on the piers. Data for 2006, 2007, and 2008 indicate that Caspian Terns use the Agua Vista site until at least mid-August. In 2007, Caspian Terns were still present on August 12, but were absent by August 25. In 2008, the last Caspian Tern was observed on August 7 and none were using the pier on subsequent surveys on August 14, August 28, or August 29.

Based on this data, we conclude that the Agua Vista piers should be treated as breeding habitat for the Caspian Tern from at least March 1 through August 31 of each year. This conforms to breeding season estimates for Caspian Terns in other published materials.¹² In general, the span of March 1 through August 31 should be considered as the breeding season for any species observed along the southern waterfront.

The March 1 through August 31 breeding season applies to Western Gulls,¹³ Black Oystercatchers,¹⁴ and others species likely to breed along the waterfront. We recommend that the bird breeding season be considered in all redevelopment plans along the waterfront and that measures are implemented to avoid or mitigate for any negative impacts to birds caused by redevelopment activities.

¹¹ See <http://www.birdresearchnw.org/Project-Info/Project-Data/Caspian-Tern-Data/Brooks-Island-Tern-Data/297750.aspx>

¹² Cuthbert, Francesca J. and Linda R. Wires. 1999. *Caspian Tern (Sterna caspia)*, *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology: <http://bna.birds.cornell.edu/bna/species/403>

¹³ Pierotti, Raymond J. and Cynthia A. Annett. 1995. *Western Gull (Larus occidentalis)*, *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/174>

¹⁴ Andres, Brad A. and Gary A. Falxa. 1995. *Black Oystercatcher (Haematopus bachmani)*, *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/155>

CONCLUSIONS & RECOMMENDATION

The 2008 San Francisco Southern Waterfront Survey confirmed the existence of nesting colonies of Caspian Terns and Western Gulls on dilapidated piers marked for destruction by the Port of San Francisco. The survey data also indicate that the piers continue to provide important roosting and nesting habitat for other species, particularly from March through the end of August each year.

The recommendations offered below are derived from our own data, unrecorded observations, and research of relevant literature. They are not intended to be comprehensive and we strongly recommend that the Port develop its own management plan to protect the breeding birds of the southern waterfront, especially before the demolition of the waterfront's piers and wharves results in the loss of species such as the Caspian Tern from San Francisco's shoreline.

Recommendations to Protect San Francisco's Only Breeding Population of Caspian Terns

Given the importance of the Agua Vista site to the Caspian Terns that breed there, we strongly recommend that the U.S. Fish & Wildlife Service and the Port of San Francisco take actions to ensure the continued viability of the tern colony in San Francisco. Several alternatives are discussed below.

1. Create Alternate Nesting Habitat on the Southern Waterfront

The U.S. Fish & Wildlife Service, the U.S. Army Corps of Engineers, the Port of San Francisco, the Bay Conservation & Development Commission (BCDC), and the California Dept. of Parks could cooperate to locate potential sites and to create alternate habitat for the Caspian Terns to replace the piers at Agua Vista site. Replacement structures such as new island or a floating barge will not only provide habitat for the Caspian Terns, it will also provide an opportunity for San Franciscans to view an active bird colony. Like the Agua Vista piers, the new habitat could also provide a destination site that would draw visitors to the area.

Offshore Barges

Researchers have demonstrated that Caspian Terns will nest on barges or "rafts" of material if other habitat is unavailable.¹⁵ In the Columbia River estuary, wildlife managers used a barge to provide temporary alternative nesting habitat for a colony of Caspian Terns. The barge was anchored about 100 meters from shore and measured 24.4 x 12.2 meters, with its deck about 2 meters above the water.¹⁶ The barge was covered with sand, the Caspian Tern's preferred nesting substrate, and further improved to optimize its value to nesting terns. Finally, Caspian Terns were lured to the site by

¹⁵ See, e.g., Collis, K., D.D. Roby, C.W. Thompson, D.E. Lyons, and M. Tirhi. 2002. Barges as temporary breeding sites for Caspian terns: Assessing potential sites for colony restoration. *Wildlife Society Bulletin* 30:1140–1149, at p. 4,7 (http://www.birdresearchnw.org/CEDocuments/Downloads_GetFile.aspx?id=284031&fd=0)

¹⁶ *Id.* at 4.

decoys and Caspian Tern recordings, and by the unavailability of alternate nesting sites. Ultimately, Caspian Terns initiated breeding on the barge.¹⁷

We believe that a barge similar to the one constructed in the Columbia River study could be positioned at Pier 70, just north of where the Caspian Terns now breed adjacent to Agua Vista Park. Alternately, Heron's Head Park or Candlestick Point State Recreation Area may provide suitable sites.

Any barge used as a replacement for the Agua Vista piers would need to be carefully considered and managed to avoid potential problems for the Caspian Terns, including attracting too many gulls (which may compete for the nests or prey upon tern nests) or exposing the terns to too much disturbance from human activities.¹⁸

New Fill Islands in the Bay

Caspian Terns have regularly nested on dredge spoil islands in the Columbia River estuary in Washington.¹⁹ To replace the Agua Vista piers, wildlife managers in San Francisco could opt to create a new fill island somewhere along the southern waterfront to provide alternative habitat for the Caspian Terns.

The island would need to be off limits to disturbances by dogs, feral cats and other mammals, humans, and human activities including fishing, kayaking, fireworks, canoeing, or jet skiing. These disturbances have significant negative impacts on nesting birds.

We acknowledge that the feasibility of such a project is unknown, particularly given the potential permitting problems and overall costs. However, we note that an off-shore island is planned as mitigation for the new eastern span of the Bay Bridge.²⁰ We do believe there are ample sites for such an island, however, including offshore near the Candlestick Point State Recreation Area or adjacent to Pier 70, which is undergoing significant redevelopment and will include a waterfront park.

Constructed Floating Islands in the Bay

Recently constructed floating islands have been installed at Duchy Lake in the Summer Lake Wildlife Refuge, Oregon. Caspian Terns took to the floating island and nested successfully. This is a relatively new model for wildlife habitat and bioremediation which warrants further research.²¹

This island would also need to be off limits to disturbances by humans, pets and predators.

¹⁷ *Ibid.*

¹⁸ See *id.*, at p. 7; see also Cuthbert et al., *supra*, Caspian Tern (*Sterna caspia*), The Birds of North America Online, <http://bna.birds.cornell.edu/bna/species/403>

¹⁹ *Id.* at p. 1

²⁰ CalTrans (2003), SFOBB Shorebird Mitigation Planning, presentation (http://biomitigation.org/reports/files/Interagency_Mtg_11-5-03_shorebirds_0_131e.pdf)

²¹ See <http://www.birdresearchnw.org/Feature-Story/348002.aspx>

The permitting, costs, any maintenance and life span and product end of life options would need to be evaluated.

2. Avoid Creating Disturbances during the Bird Breeding Season

The Caspian Tern's breeding season along San Francisco's southern waterfront should be considered to extend from approximately March 1 through August 31 of each year. Studies indicate that Caspian Terns may be highly susceptible to disturbance from human activities.²² Therefore, Golden Gate Audubon recommends that the Port of San Francisco avoid construction activities, including the destruction of any derelict piers or wharves, during this period. To the extent that such activities are necessary, we urge the project leaders to consider potential impacts on the Caspian Terns and other breeding birds of the waterfront and to avoid and mitigate for impacts to the fullest extent practicable.

3. Continue to Monitor Breeding Birds on the Waterfront

We strongly encourage the Port of San Francisco to continue to consider the impact of pier removal projects on local birds, especially nesting birds like the Caspian Tern and the Western Gull. Many bird species have already lost much of their historic breeding habitat, and the loss of habitat has contributed to significant declines for many bird species in North America. The Caspian Tern is already a species of concern in other parts of North America, particularly because of a lack of quality breeding habitat. We believe that the Port of San Francisco and wildlife managers should work together in the San Francisco Bay to avoid a similar level of threat to the terns here.

Recommendations for Improved Data Collection

The quality and quantity of data gathered during this survey could be greatly improved by recruiting additional volunteer observers, additional training of volunteers, standardizing survey days and times, and expanding the period of the survey. In 2008, Golden Gate Audubon did not conduct its first survey until June 6, well after the initiation of the Caspian Tern breeding season. According to data collected by Bird Research Northwest, seasonal colony attendance at the Brooks Island colony commences in March and peaks in mid-to late May.²³ Unfortunately, we were again unable to initiate the survey until June in 2009. However, we will plan to initiate our 2010 Southern Waterfront survey in early May 2010 to better capture the breeding season.

Second, during subsequent years of this study, we intend to better coordinate with San Francisco Bay Bird Observatory and Bird Research Northwest, Inc., to the extent practicable, to best supplement their efforts in this area.

Third, we will reevaluate our data collection method to ensure that all birds and marine mammals using the area are at least recorded and are quantified to the extent practicable.

²² Cuthbert et al., *supra*, Caspian Tern (*Sterna caspia*), The Birds of North America Online, <http://bna.birds.cornell.edu/bna/species/403>

²³ <http://www.birdresearchnw.org/Project-Info/Project-Data/Caspian-Tern-Data/Brooks-Island-Tern-Data/default.aspx>

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Appendix A – Data Form

San Francisco Southern Waterfront Bird Survey - Summer, 2008
Golden Gate Audubon & San Francisco Bay Bird Observatory

Date:	Tide:	Low ()	High ()	Incoming ()	Outgoing ()			
Begin Time:	Wind Speed	Beaufort	0 1	2 3	4 5	Recorder: Name		
End Time:	Wind	Direction	N S	E W				
	Cloud Cover	Clear ()	Cloudy ()	Partly Cloudy ()		Name		
	Temperature	degrees F:						
		Pier 96	Pier 90	Islais Creek Wharf	Pier 64	Pier 60	Pier 52	Pier 36-32
Most Common Species	Herons Head Park pier to left only	Islais Creek Channel (SE section)	3rd Street Bridge	2hr parking sign Terry Francois Blvd	25MPH sign Terry Francois Blvd	Building #209 Terry Francois Blvd	Brannan/Embarcadero	Harrison/Embarcadero
	Count	Count	Count	Count	Count	Count	Count	Count
Red-throated Loon								
Pacific Loon								
Common Loon								
Horned Grebe								
Eared Grebe								
Pied-billed Grebe								
Western Grebe								
Clark's Grebe								
Brown Pelican								
Brandt's Cormorant								
Pelagic Cormorant								
Double Crested Cormorant								
Great Blue Heron								
Great Egret								
Black Crowned Night Heron								
Canada Goose								

San Francisco Southern Waterfront Bird Survey - Summer, 2008
Golden Gate Audubon & San Francisco Bay Bird Observatory

	Pier 96	Pier 90	Islais Creek Wharf	Pier 64	Pier 60	Pier 52	Pier 36-32	Pier 24
Most Common Species	Herons Head Park pier to left only	Islais Creek Channel (SE section)	3rd Street Bridge	2hr parking sign Terry Francois Blvd	25MPH sign Terry Francois Blvd	Building #209 Terry Francois Blvd	Brannan/ Embarca dero	Harrison/ Embarca dero
	Count	Count	Count	Count	Count	Count	Count	Count
Mallard								
Surf Scoter								
Black Scoter								
White-Winged Scoter								
Black Oystercatcher								
California Gull								
Heerman's Gull								
Herring Gull								
Mew Gull								
Ring-billed Gull								
Western Gull								
Unknown Gull species								
Least Tern								
Caspian Tern								
Elegant Tern								
Common Tern								
Forster's Tern								
Black Skimmer								
Common Raven								
Rock Pigeon								
Barn Swallow								

San Francisco Southern Waterfront Bird Survey - Summer, 2008
Golden Gate Audubon & San Francisco Bay Bird Observatory

NOTES

1. Indicate **Overhead (OH)** only for *raptors*, *terns*, *brown pelicans*, *gulls* flying over pier areas. Do not count other species flying overhead.
2. Circle number of chicks or juvenile birds
3. Record any additional species on blank lines at end of table
4. Note any disturbances by other birds, mammals, or people. Describe the disturbance in comments
5. List roosting or nesting activities.

Comments/Other observations:
