Citizen Science-based Colonial Waterbird Monitoring
2014 Nesting Summary

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PROGRAM SUMMARY

The San Francisco Bay Bird Observatory (SFBBO) is a nonprofit organization dedicated to the conservation of birds and their habitats through science and outreach. The Colonial Waterbird Program is one of SFBBO's long-standing citizen science programs, initiated in 1982, and utilizes trained volunteers and staff to monitor waterbird nesting sites in the San Francisco Bay. The program has engaged over a hundred volunteers in waterbird nest-monitoring activities, and has exposed hundreds of local community members to the presence of these birds, and their needs for protection and management. Trained volunteers independently collect observational data on nesting colony status, timing of breeding, numbers of active nests observed, waterbird behavior, and evidence of nest predation or human disturbance at selected colonies each year. They also assist SFBBO staff in conducting annual walkthrough counts of all known California Gull colonies in the South Bay, which enables comparison of colony size changes over time. This information is shared with landowners, resource agencies, and other conservation organizations such as the Audubon Society and contributes to the conservation and management of these species. In addition to monitoring colonies, many citizen scientists in the program help SFBBO develop relationships with landowners and communities living near the colonies they study and lead presentations and bird viewings to share these birds with the public.

INTRODUCTION

Colonial waterbirds are essential components of wetland and aquatic habitats across the globe (Hoffmann et al. 1996). These species play key roles within their ecosystem, require specific habitat types and qualities in order to survive, and thereby can be viewed as biological indicators of environmental health and function (Kushlan 1993). In densely inhabited areas like the San Francisco Bay (MTC-ABAG 2013), human encroachment and habitat degradation and conversion are a few of the many factors that affect wetland habitats (Lotze et al. 2006) and therefore colonial waterbird populations.

Colonial waterbirds are attractive candidates for citizen science monitoring. In addition to their ecological value, they are conspicuous and intriguing animals, especially when aggregated in large breeding groups (Parnell et al. 1988). These species typically attract public interest and appreciation. This research program benefits not only the integrity of wetland ecosystems, but also encourages the public sentiment that fuels many of these conservation efforts.

Since colonial waterbird colonies can be comprised of several species utilizing a large geographic area, significant changes within these populations may not be detectable for many years by standard research methods. Funding and personnel limitations by research groups may prohibit professional-level monitoring at the required scale. Citizen science initiatives are excellent methods for contributing to long-term, geographically vast research goals at low cost (Dickinson et al. 2010; Cooper et al. 2014). Furthermore, citizen science studies provide opportunities for public involvement which in turn foster local stewardship and environmental appreciation.

Since 1982, SFBBO has annually recruited and trained volunteers to monitor nesting waterbirds including herons, egrets, cormorants, gulls, and terns, in the San Francisco Bay. The Colonial Waterbird Program emphasizes community engagement and volunteerism in order to: 1) increase monitoring capacity across a large geographic area in a cost-effective manner, and 2) generate public interest in

protecting and restoring waterbirds and their habitats. Many of the colonies monitored by SFBBO volunteers would not otherwise be tracked.

In this report, we summarize results from SFBBO's citizen science-based waterbird monitoring program in 2014. We also compile limited nesting information provided to SFBBO by agencies monitoring other waterbird colonies in the San Francisco Bay.

SURVEY METHODS

Study area and focal species:

SFBBO biologists and volunteers monitored active waterbird nesting colonies in the San Francisco Bay from February to August 2014. Most colonies monitored ringed South San Francisco Bay, but we also report on several colonies in the Central and North Bay and at other locations within Santa Clara, San Mateo, Alameda, and Contra Costa Counties. Colonies were located on public and private lands and were either detected opportunistically or visited with the existing knowledge of nesting activity. The Audubon Canyon Ranch manages a similar citizen science program that targets herons and egrets in North and Central Bay locations as does Point Blue Conservation Science (formerly PRBO), which centers on San Joaquin Valley locations. The results from those additional programs are not presented here.

SFBBO focused principally on colonies of California Gull (*Larus californicus*), Forster's Tern (*Sterna forsteri*), Caspian Tern (*Hydroprogne caspia*), California Least Tern (*S. antillarum browni*), Great Blue Heron (*Ardea herodias*), Great Egret (*A. alba*), Snowy Egret (*Egretta thula*), and Double-crested Cormorant (*Phalacrocorax auritus*). Additionally, we monitored American Avocet (*Recurvirostra americana*), Black-necked Stilt (*Himantopus mexicanus*), Black Skimmer (*Rynchops niger*), and Black-crowned Night Heron (*Nycticorax nycticorax*) when nesting with other species of interest.

California Gull walkthrough counts:

SFBBO biologists led one walkthrough survey of all known South Bay California Gull colonies (see Tables 1 and 2 for colonies) from May 9-16, 2014. Trained volunteers accompanied SFBBO staff on these surveys. Observer-teams systematically walked through the colonies tallying all nests present and re-sighted band combinations whenever possible. Over a thousand gull adults and chicks were marked with field-readable bands from 2008-2010 as part of an effort to track gull movement and colony re-distribution associated with the South Bay Salt Pond Restoration Project. There was particular interest in understanding where gulls displaced from their primary colony at Alviso pond A6 would go following the conversion of that site to tidal action in December 2010 (see Robinson-Nilsen and Demers 2010, Schacter et al. 2008 for details).

In this report, we provide the total number of active nests encountered at each gull colony. We excluded empty or depredated nest cups from these estimates. We also refer to the number of breeding gulls in a given area, which represents the nest count multiplied by two. Double-crested Cormorant and Caspian Tern nesting adults were also observed within some California Gull colonies. To minimize the potential for opportunistic gull predation on these species due to human disturbance, these particular areas were avoided during walkthrough counts. For cormorants and terns, nest numbers are represented as the total number of observed adults divided by two.

Observational study of other nesting colonial waterbirds:

SFBBO staff developed monitoring protocols and volunteer training curricula. These observational study methods have remained largely unchanged since the program's initiation in 1982. Volunteers receive training in waterbird identification, natural history, proper "etiquette" around nesting birds, and observational study methods through a standardized protocol. Volunteers are assigned one or more colonies to monitor during the nesting season and are asked to visit their assigned waterbird site(s) once during each established three-day monitoring window.

In 2014, heron colonies were visited on eight occasions from February 1 to July 7, while cormorant colonies were visited on eight occasions from March 1 to August 4, and gull and tern colonies were visited on six occasions from May 3 to August 4. On each visit, volunteers used binoculars and spotting scopes to estimate the number of adult birds, nests, and chicks present. They also noted nesting behaviors, such as incubation, nest-building and courtship displays, and any evidence of human disturbance or predation. In this report, **we provide the peak number of nests observed per species for each colony** monitored by SFBBO.

Agency data:

To provide a more complete picture of waterbird monitoring efforts throughout the San Francisco Bay, SFBBO has traditionally compiled and reported nesting data from other agencies in this annual summary. SFBBO no longer reports on these data, with the exception of tern colony and plover nesting information from the East Bay Regional Parks District (EBRPD; D. Riensche) and the U.S. Fish and Wildlife Service (USFWS; S. Euing). EBRPD and USFWS use alternative monitoring methods and, as a result, these data represent the total number of nests counted throughout the season.

2014 SURVEY RESULTS AND DISCUSSION

California Gull walkthrough counts:

In 2014, SFBBO documented ten active California Gull colonies in the South San Francisco Bay. Colonies were located at Alviso ponds A9/A10/A11/A14 and A5, Mountain View pond A1, Mowry ponds M1/M2, M3 and M4/M5, Moffett pond B2, Coyote Hills ponds N2A/N3A/N4AB and N6/N7, and the Mountain View/Palo Alto Flood Control Channel (Tables 1-2, Figs. 1-4). Colonies ranged in size from a low of 80 individuals at Moffett B2 to a high of 14,414 at Alviso A9/A10/A11/A14. The Palo Alto Flood Control Channel colony was nearly as large, with an estimated 14,264 individuals. Two other California Gull colonies outside of the South Bay, Alcatraz and Agua Vista, were also monitored (Fig. 1, Appendix 1).

Altogether, there were an estimated 53,024 California Gulls breeding in the South Bay in 2014, a small decrease (<1%) from the 53,458 estimated in 2013 (Table 2). Although we observed no increase in breeding gulls between 2013 and 2014 across all colonies combined, we did observe fluctuations in the size of individual colonies at some locations. For example, in the Mowry complex, the M4/M5 colony grew by 6% (3408 to 3616 nests) from 2013 to 2014 (Fig. 3), and in the Coyote Hills complex, the N6/N7 colony grew by 14% (6914 to 7864 nests). The largest two colonies (A9/A10/A11/A14 and the Palo Alto Flood Control Channel) remained stable, with less than 1% change from 2013 to 2014 (Fig. 4).

Although the colony within the Palo Alto Flood Control Channel did not change substantially over the past year, it is notable that this colony has increased dramatically in size in recent years, from 206 individuals in 2007 to over 14,000 in 2014. The current colony size is nearly 30 times as large as that observed in 2007.

30 years of California Gull population change:

Over the last 30 years, SFBBO's Colonial Waterbird Program has documented a nearly exponential increase in the number of California Gulls nesting in the San Francisco Bay, from fewer than 20 gulls in 1980 to just over 53,000 gulls in 2014 (Fig. 2, see also Strong et al. 2004, Ackerman et al. 2013, and Burns et al. 2014). The fluctuation in size and location of active gull colonies over the study period (Table 2) is likely due to a suite of changing environmental and demographic factors. Gulls' use of landfills and other sources of anthropogenic food in the South Bay may be a major contributing factor to such rapid growth (Ackerman et al. 2006), though the recent implementation of gull abatement programs at several area landfills appears to be reducing gull access to this food source (Donehower and Tokatlian 2012; Tokatlian et al. 2013) and may affect gull numbers over the long-term. The restoration actions of the South Bay Salt Pond Restoration Project have begun and will likely continue to affect the availability of nesting habitat for gulls.

There is also a growing concern among many land managers and conservationists that the overabundance of California Gulls in the Bay will impede some goals of the South Bay Salt Pond Restoration Project, particularly the ability of the project to support target levels of other ground-nesting waterbird populations with reduced pond acreage. As some gull nesting areas within ponds are restored to tidal action, displaced gulls may seek new nesting sites elsewhere, potentially impacting Western Snowy Plovers (*Charadrius nivosus nivosus*), Forster's Terns, or other sensitive waterbird species. California Gulls initiate nests before some other nesting waterbird species (Ackerman et al. 2009) and may exclude them from historical nesting areas (Strong et al. 2004). They are also well-documented predators of waterbird nests and chicks (Robinson-Nilsen et al. 2011; Demers and Robinson-Nilsen 2012; Ackerman et al. 2013).

In December 2010, Alviso pond A6 was restored to tidal action as part of the South Bay Salt Pond Restoration Project. Since this site was formerly home to the largest California Gull colony in the Bay (23,108 gulls in 2010, Table 2), it provides an opportunity to study gull response and colony redistribution as a result of changing habitat conditions. In 2008, a multi-year project was initiated by SFBBO and the U.S. Geological Survey to trap and band California Gulls nesting at pond A6. After this pond was converted to tidal habitat, adult gulls banded in A6 were re-sighted at Coyote Hills and neighboring Alviso colonies (Ackerman et al. 2013), with 42% of re-sightings through 2013 occurring in adjacent Alviso ponds. Banded California Gulls continue to be documented opportunistically during field surveys and colony censuses throughout the Bay. The subsequent band re-sighting data gathered through this project, as well as from other long-term banding efforts (Schacter et al. 2008 and Ackerman et al. 2013) provide useful information regarding gull dispersal as a result of the A6 breach and the potential impact of encroachment into breeding areas for other sensitive species.

Given the size and geographic proximity of the affected A6 gull colony to other waterbird nesting habitat, there is an urgent need to protect rare species, such as the Western Snowy Plover, against potential gull impacts. In response, SFBBO in partnership with the U.S. Fish and Wildlife Service initiated intensive surveys of South Bay ponds and pursued selective, nonlethal gull hazing during the gull nest initiation stage in 2011 and 2012. The U.S. Fish and Wildlife Service led gull hazing efforts in 2013 and

2014, and SFBBO and the U.S. Fish and Wildlife Service will team up again in 2015 to carry out gull hazing at priority locations. To date, gulls have been successfully deterred from nesting in designated ecologically sensitive areas. Ongoing monitoring, hazing and evaluation of other actions will be required over the long-term to limit gull impacts to sensitive species.

Findings for other nesting colonial waterbirds:

In 2014, SFBBO volunteers monitored 70 waterbird colonies (Tables 1, 3, Figs. 1, 5) using observational methods. Waterbirds nested in a range of habitats, from salt ponds and levees to parks and residential areas. Colonies varied in size and some colonies supported multiple species (Tables 1, 3). Some colony sites were not accessible this season due to restoration, levee maintenance or access difficulties, and therefore were not surveyed – many of these sites likely had nesting activity in 2014, but they were not part of our survey efforts. These areas include Dumbarton N1/2/3 (access issues), ELER E8A/9 (access), Guadalupe Slough, Elmwood Correctional Facility, Calaveras Reservoir, and Quarry Lakes.

With the exception of California Gull colonies, the nesting sites monitored by SFBBO (named in Tables 1 and 3) should not be viewed as a comprehensive list of all active waterbird colonies in the region, nor should the peak nest numbers observed be used for Bay-wide population-level trend analyses. More intensive nest-monitoring, a strategic sampling approach, and a broader geographic scope would be better-suited to such goals. While SFBBO volunteers visited some colonies that were also surveyed by other agencies, the data collected by the different entities should not be directly compared due to the difference in monitoring methods used.

While the biased sampling scheme (toward known, occupied, and accessible sites), low frequency of colony visits, and observational methods used as part of the Colonial Waterbird Program have their limitations, these data have many values, nonetheless. For example, the existing program provides essential data that serves as a valuable starting point for the development of more comprehensive regional efforts to track population sizes and trends on a larger scale. For example, some of SFBBO's Colonial Waterbird Program data were previously incorporated into a San Francisco Bay heron and egret atlas by Kelly et al. (2007). In addition, SFBBO has partnered with the U.S. Fish and Wildlife Service in their effort to understand and manage the relationship between double-crested cormorants (DCCO) and special status fish species along the Pacific Flyway. To contribute to this effort, SFBBO volunteers collected seasonal, observational DCCO data at the Steinberger Slough PG&E power tower colony. SFBBO staff members collected DCCO colony walkthrough data at the Alviso A9/10/A11/A14 levee colony.

In the future, we hope to incorporate more habitat characterization elements into the protocol. For example, many heron and egret rookeries are located in urban greenspaces (e.g., parks, residential areas, and athletic fields), and many waterbird nests are located on artificial structures, such as blinds and power towers, and in invasive or ornamental vegetation (e.g., Eucalyptus trees). Training citizen scientists to collect some additional information on site characteristics and nesting substrate could heighten our understanding of waterbird use of these highly modified landscapes and features.

In addition, SFBBO has consistently monitored many sites for 20-30 years (see Llagas Creek example, Appendix II), which provides a detailed account of activity within and around these localized populations. For example, areas adjacent to the Llagas Creek heronry in the city of Morgan Hill experienced high levels of human disturbance for several years as a result of residential development. While there are no direct observations of detrimental effects from construction activity on the active

heron colony, certain changes have been seen in the size and species composition of the colony since the start of development in 2003. This may be related to increased human disturbance in the area, or to other factors such as the difference in tolerance or habituation to disturbances between species, or the response to different types of disturbances between species, as noted in Carney and Sydeman (1999).

Focusing on these long term sites, in addition to urban habitat characterization and documenting breeding responses to habitat changes would greatly increase our understanding of waterbird ecology and would further assist resource managers in making well informed decisions related to valuable breeding locations throughout the San Francisco Bay.

Agency data:

We did not include data from other agencies, with the exception of those included in Table 4. Due to the different monitoring methods used, we advise against direct comparisons of agency nest numbers with SFBBO nest numbers.

RESEARCH AND MANAGEMENT RECOMMENDATIONS

1. Regulatory agencies, such as the U.S. Fish and Wildlife Service and California Department of Fish and Wildlife, should **work directly with private landowners to protect colonies on privately-owned land**. In the case of wading birds, Kelly et al. (2007) urged prioritized protection for larger, more stable colonies of 20 or more nests, and especially for those with 100 or more nests. Since many small colonies (5-50 active nests) exist in the South Bay, and small colonies can be more vulnerable to human disturbance and abandonment than larger colonies, protection and management efforts should take these factors into consideration (Kelly et al. 2007).

2. It remains largely unknown what factors, or interaction of factors, are influencing the rapid population growth of California Gulls in San Francisco Bay. No systematic study of California Gull reproductive success has been conducted – as a result, **we recommend a comprehensive study of California Gull demographics in San Francisco Bay**. Enhanced monitoring of gull nest success, breeding site fidelity/movement, chick survival, and adult and chick diets (to assess use and importance of "natural" vs. landfill-derived food items) could be especially informative (Burns et al. 2014).

3. There were no known instances of California Gulls successfully nesting in new sensitive habitats in 2014. Presumably, this was due to the intensive surveys and hazing activities led by the U.S. Fish and Wildlife Service, with SFBBO support (methods used in 2014 followed those of Robinson-Nilsen and Demers 2012). In the future, without these activities, gulls will likely colonize Western Snowy Plover or other sensitive waterbird nesting habitat, such as the newly-created islands at Alviso pond A16. Therefore, **we strongly recommend the continuation of this hazing regime in 2015.**

4. Decreases in the number of California Gulls using the Newby Island Landfill have been recorded in response to on-site abatement programs. Controlling access to anthropogenic food sources may affect the location and size of active gull colonies and, over time, could reduce the number

of nesting California Gulls in the San Francisco Bay. **We recommend the implementation of gull abatement programs at other refuse management locations.**

5. Continued monitoring of South Bay waterbirds, from broad topics of study to focused, localized populations will be crucial as the South Bay Salt Pond Restoration Project looks toward its Phase Two actions. This includes construction activity near or at waterbird colony sites and conversion of some habitats currently supporting breeding waterbirds to tidal marsh. We believe that the combined efforts of professional scientists and citizen scientists alike are needed in this endeavor. However, **we advise against direct comparisons of waterbird nesting data collected using different methods and encourage future collaboration and communication** among different entities collecting these data in the South Bay.

6. The scientific and social benefits that these educational opportunities provide, not only to our research but also to our citizens, are still not fully understood (Jordan et al. 2012). **We encourage community engagement in ecological research** and recommend that scientists work to develop multi-disciplinary measures of success for such programs.

COMMUNITY OUTREACH THROUGH CITIZEN SCIENCE

Since the establishment of SFBBO's Colonial Waterbird Program in the early 1980s, hundreds of citizen scientists have helped carry out this research to help us better understand how birds in the Bay Area are doing. Each nesting season, around 50 new and veteran volunteers receive the Colonial Waterbird Program Volunteer Manual and then attend a special training and orientation with SFBBO staff. At this meeting, staff give volunteers an overview of SFBBO and the Colonial Waterbird Program, highlight the results from the previous season's efforts, go over monitoring protocols, answer questions, lead the group through a troubleshooting discussion to address common issues in the field, invite veteran volunteers to share their experiences, and connect volunteers with one another. Then, the volunteers spend one or two mornings each month (from February through August) monitoring their colony. Volunteers observe breeding activity, count birds, nests, and chicks, and record environmental conditions and human impacts. The commitment of this strong network of volunteers has produced a valuable, long-term dataset that helps land managers, organizations, and the public make informed decisions to conserve birds.

In addition to providing valuable scientific data, SFBBO's Colonial Waterbird Program is one of the strongest parts of SFBBO's Outreach Program. By engaging people from the community in our avian research, we build their awareness about birds and conservation and nurture their understanding of and appreciation for science. In turn, we believe our volunteers carry their experiences and passion for birds, conservation, and science into the wider community.

Recently, we channeled our volunteers' expression of passion and experience into new avenues of action by adding several initiatives to the Colonial Waterbird Program. These new components augment the ways volunteers in the program support each other, grow our scientific reach, educate the community, and impact bird conservation. These changes came about in response to ideas from some of our most active volunteers and from feedback that we collected from the group through a survey in late 2013. We are excited about the direction our volunteers are helping SFBBO take the Colonial Waterbird Program and are very grateful for their energy and dedication. Each of these new components is described briefly below.

In 2014, 59 SFBBO volunteers contributed 904 volunteer hours to the Colonial Waterbird Program (up from 616 in 2013). If valued at a rate of $15 per hour, this amounts to $13,560 in donated labor. Levels of volunteer participation in the Colonial Waterbird Program doubled from 2012 to 2013, and continued to increase substantially in 2014. Many Colonial Waterbird Program volunteers are long-term participants and supporters, highlighting the interest in and value of this citizen science program.

MENTORING

To give new volunteers an opportunity to learn from our veteran citizen scientists, we launched a Mentoring Program. In 2014, six veteran volunteers served as mentors in the field and helped a number of our new recruits come up to speed. This effort has been a big success, as evidenced by this season-end comment from one of our newest volunteers: *"It has been a total delight to meet, work with, and get to know [the veteran volunteers at my site, who are]- kind, knowledgeable, easy to talk to, and generous with their expertise. I look forward to continued friendships and birding adventures with them."*

CASE HISTORIES

Two of the citizen scientists in our Mentoring Program volunteered almost every week throughout 2014 to compile "case histories" on all of the Colonial Waterbird Program sites that have been monitored regularly. These volunteers collected and updated information that will help future volunteers and staff who are new to the program become oriented, by providing access and location information for each colony, volunteer history, site longevity, and peak nest counts. These reports will help streamline the training process and provide useful information that can be included in reports and presentations to land managers and the public.

SCOUTING

We also started a Scouting Program to give a core group of volunteers the chance to scout dormant colony sites and check tips about potential new colonies. This year, 14 volunteers scouted 15 potential sites in addition to their normal monitoring activities, which led to the addition of one new colony to our regular program (Redwood Shores Nob Hill Market). The other 14 colonies were found to be inactive. Sites scouted included: Bayside Park (Bayside Fields) in Burlingame, Coyote Creek Lagoon in Fremont, Coyote Creek Tree in Milpitas (near CCFS), Oyster Cove Pier in San Francisco, Redwood City Cargill Plant by Bayfront Park in Menlo Park, San Felipe Lake in Gilroy, Vasona Reservoir Island in Los Gatos, Calaveras Reservoir in Livermore, Palo Alto Duck Pond in Palo Alto, Vasona County Park North in Los Gatos, Palace of Fine Arts in San Francisco, Marlin Pound Park in Livermore, and Veterans Hospital in Livermore.

DATA ENTRY

In 2014, SFBBO gave citizen scientists in the Colonial Waterbird Program the opportunity to become an even more integral part of the scientific process by training five volunteers to enter Colonial Waterbird data into the database. This helped SFBBO biologists save time and gave volunteers a chance to work with the data they helped collect in the field.

HIGH SCHOOL OUTREACH

In 2014, SFBBO included our first high school group in the Colonial Waterbird Program. Throughout the season, eight students from Cupertino's Homestead High School co-monitored the Vasona Park colony in Los Gatos. In addition to attending our January training and orientation, the students and their adult chaperone received training from one of our biologists in the field and also worked with one of our veteran citizen scientists who co-monitored the site with them. We hope to expand the number of youth who participate in this program by inviting more high school groups and family groups to participate as citizen scientists in 2015.

AMBASSADOR PROGRAM

In 2013, we piloted a new Ambassador Program to give our citizen scientists the opportunity to share their bird colonies with the community. These activities also helped SFBBO develop and grow partnerships with other organizations, agencies, and the public. In 2013 we piloted three presentations, bird viewings, and corporate lunch n' learns in Alameda, Livermore, and Redwood City. We built upon these successes in 2014 and expanded the program to include the following Ambassador Program activities.

1. Community Partnerships

Our Colonial Waterbird volunteers helped SFBBO share our data in 2014 with more land managers and others working to conserve Bay Area birds. In addition to writing this Annual Report, throughout the season SFBBO staff wrote and shared several mini-reports on specific colonies in response to requests from people in the community, including the Santa Clara Valley Audubon Society, park managers at Lake Cunningham Regional Park, the Sequoia Audubon Society, and the San Francisco Water District. These requests for information grew from relationships that were developed and nurtured by our volunteers as they worked in the field, and with their help we plan to build on this process and provide more site-specific information for people in the community in 2015.

2. Birds in Your Neighborhood Events

In 2014, SFBBO staff and Colonial Waterbird Program citizen scientists also engaged the public through five, free *"Birds in Your Neighborhood"* events:

- In April and May, we offered two bird viewings to introduce local citizens to the Great Blue Herons that nest at Sycamore Grove Park in Livermore, in partnership with the Livermore Area Recreation and Park District.

- In April we were also invited, along with our partners at the Sequoia Audubon Society, by the Seaport Center to participate in their corporate Earth Day Fair in Redwood City. At our booth we talked to the employees that work in that business park about a large colony of herons and egrets that nest in trees outside their offices near the port in Redwood City.

- In May, SFBBO staff and volunteers gave a presentation at the Bay Farm Island Library and offered a bird viewing to teach people about the egrets that nest in a residential neighborhood in Alameda.

- In June, we offered a bird viewing to members of Environmental Volunteers to show them the egrets and herons that nest on three islands at Lakeshore Park in Newark.

Our Colonial Waterbird Program volunteers were responsible for developing the relationships with the community that led to all of these programs, and they are helping SFBBO add more *"Birds in Your Neighborhood"* activities in San Francisco, Los Gatos, Pleasanton, Mountain View, and San Jose in 2015.

3. Special Events

In addition to creating new outreach opportunities built around the Colonial Waterbird colonies, SFBBO also engaged Colonial Waterbird Program volunteers in other SFBBO outreach efforts. For instance, three Colonial Waterbird Program volunteers led hands-on activities with staff at the Fremont Nature Center Open House in Fremont in March and at the Wildlife Center of Silicon Valley's Walk on the Wildside event in San Jose in November.

In June, a Colonial Waterbird Program volunteer worked with staff to create SFBBO's first *Family Science Night*, which we offered to almost 100 participants at the Fremont Main Library. In addition to the volunteer who led the program, four more Colonial Waterbird citizen scientists led hands-on activities that evening.

The *Family Science Night* program led to an invitation from Environmental Volunteers to offer a *Women in Science* event in Palo Alto in November to inspire 3rd-5th grade girls to pursue science. Two of our Colonial Waterbird Program citizen scientists volunteered at the event and led hands-on activities and served on a panel to answer the girls' questions about what it is like to be a scientist.

Thanks to our volunteers, both events were free, popular, and successful and we are making plans to offer more *Family Science Nights* and *Women in Science* events powered by our citizen scientists at locations around the Bay Area in 2015.

4. Fundraising

Seven participants in our Colonial Waterbird Program also helped us conduct fundraising in 2014 to benefit the program in 2015. One volunteer organized our monthly membership renewal mailings, and the others took leadership roles in our California Fall Challenge by serving as judges for our Click Off photo contest, leading guided birding trips, donating silent auction prizes, and organizing fundraising teams.

In addition, one Colonial Waterbird volunteer illustrated the connection between outreach and fundraising when he staffed an SFBBO table at the Patagonia store in Palo Alto in August to pass out information about our organization and share his experience as a citizen scientist. His efforts furthered our relationship with the company and helped SFBBO successfully compete for an Environmental Grant from Patagonia to support the Colonial Waterbird Program in 2015.

Our citizen science volunteers have been instrumental in helping SFBBO grow the Colonial Waterbird Program. From collecting data and strengthening the field training program to educating the public and raising funds, these volunteers continue to be an invaluable asset that allows SFBBO to reach our mission to conserve birds and their habitats through science and outreach.

NEXT STEPS

Moving forward, we aim to continue utilizing the unique values of this citizen science program. We envision the future of the Colonial Waterbird Program to have a predominantly outreach/educational objective while maintaining a strong scientific foundation, ensuring the collection of meaningful data. Citizen science experiences may have deeper and more positively significant socioecological impacts than are currently recognized, that affect not only the quality of scientific studies but also the function of members within their social community (Jordan et al. 2012).

The nature of this program, and much of our organization as a whole, is rooted in community involvement. As in 2014, next year we will continue to expand the community outreach component of our Colonial Waterbird Program, using the activity of colony monitoring as a vehicle for providing beneficial outreach and educational opportunities, thereby strengthening the community of which we are a part.

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LITERATURE CITED

Ackerman, J. T., J. Y. Takekawa, C. Strong, N. Athearn, and A. Rex. 2006. California Gull distribution, abundance, and predation on waterbird eggs and chicks in South San Francisco Bay. Final report. U.S. Geological Survey, Western Ecological Research Center, Davis and Vallejo, CA.

Ackerman, J. T., C. A. Eagles-Smith, J. Y. Takekawa, J. Bluso-Demers, D. Tsao, and D. LeFer. 2009. California Gull movements in relation to nesting waterbirds and landfills: implications for the South Bay Salt Pond Restoration Project. Data summary. U.S. Geological Survey, Western Ecological Research Center, Davis, CA.

Ackerman, J. T., M. P. Herzog, G. Herring, C. A. Hartman, J. Bluso-Demers, and C. Robinson-Nilsen. 2013. Impact of salt pond restoration on California Gull displacement and predation on breeding waterbirds. U.S. Geological Survey Report prepared for the South Bay Salt Pond Restoration Project and Resources Legacy Fund.

Burns, C.E., J.T. Ackerman, N. Washburn, J. Bluso-Demers, C. Robinson-Nilsen, and C. Strong. Three decades of California Gull population growth and ecological impacts in the San Francisco Bay Estuary. Studies of Western Birds. Submitted.

Carney, K. M. and W. J. Sydeman. 1999. A review of human disturbance effects on nesting colonial waterbirds. Waterbirds: The International Journal of Waterbird Biology 22(1): 68-79.

Cooper, C.B., J. Shirk, B. Zuckerberg. 2014. *The Invisible Prevalence of Citizen Science in Global Research: Migratory Birds and Climate Change*. PLoS ONE 9(9): e106508. This is the one we cited in the Climate Change article in the Winter 2014 BBR.

Demers, S.A., C.W. Robinson-Nilsen. 2012. Monitoring Western Snowy Plover nests with remote surveillance systems in San Francisco Bay, California. Journal of Fish and Wildlife Management 3:123-32.

Dickinson, J. L., B. Zuckerberg, and D. N. Bonter. 2010. Citizen science as an ecological research tool: challenges and benefits. Annual Review of Ecology, Evolution and Systematics 41: 149-172.

Donehower, C. and K. Tokatlian. 2012. Gull abatement surveys report, Newby Island Landfill, 2007-2012. Unpublished report. San Francisco Bay Bird Observatory, Milpitas, CA.

Hoffmann, L., H. Hafner, and T. Salathé. 1996. The contribution of colonial waterbird research to wetland conservation in the Mediterranean region. Colonial Waterbirds 19: 12-30.

Jordan, R. C., H. L. Ballard and T. B. Phillips. 2012. Key issues and new approaches for evaluating citizen-science learning outcomes. Frontiers in Ecology and the Environment 10: 307–309.

Kelly, J. P., K. Ettiene, C. M. Strong, M. McCaustland, and M. L Parkes. 2007. Status, trends and implications for the conservation of heron and egret nesting colonies in the San Francisco Bay Area. Waterbirds 30: 455-478.

Kushlan, J. A. 1993. Colonial waterbirds as bioindicators of environmental change. Colonial Waterbirds 16: 223-25.

Lotze, H. K., H. S. Lenihan, B. J. Bourque, R. H. Bradbury, R. G. Cooke, M. C. Kay, S. M. Kidwell, M. X. Kirby, C. H. Peterson, and J. B. C. Jackson. 2006. Depletion, degradation, and recovery potential of estuaries and coastal seas. Science 312: 1806-1809.

MTC-ABAG. 2013. Bay area census: selected census data from the San Francisco Bay Area. Provided by the Metropolitan Transportation Commission and Association of Bay Area Governments, Oakland, CA. Available: http://www.bayareacensus.ca.gov/.

Parnell, J. F., D. G. Ainley, H. Blokpoel, B. Cain, T. W. Custer, J. L. Dusi, S. Kress, J. A. Kushlan, W. E. Southern, L. E. Stenzel, and B. C. Thompson. 1988. Colonial waterbird management in North America. Colonial Waterbirds 11: 129-169.

Robinson-Nilsen, C., and J. Demers. 2010. Banding and re-sighting California Gulls in the South San Francisco Bay, 2010. Unpublished report. San Francisco Bay Bird Observatory, Milpitas, CA.

Robinson-Nilsen, C., and J. Demers. 2012. California Gull breeding surveys and hazing project, 2012. Unpublished report. San Francisco Bay Bird Observatory, Milpitas, CA.

Robinson-Nilsen, C., J. Demers and C. Strong. 2011. Western Snowy Plover numbers, nesting success, fledging success and avian predator surveys in the San Francisco Bay, 2011. Unpublished report. San Francisco Bay Bird Observatory, Milpitas, CA.

Schacter, C. C. Robinson, and J. Demers. 2008. Banding California Gulls in the South San Francisco Bay. Unpublished report. San Francisco Bay Bird Observatory, Milpitas, CA.

Strong, C. M., L. B. Spear, T. P. Ryan, and R. E. Dakin. 2004. Forster's Tern, Caspian Tern, and California Gull colonies in the San Francisco Bay: habitat use, numbers, and trends, 1982-2003. Waterbirds 27: 411-423.

Tokatlian, K., C. Donehower, and J. Scullen. 2013. Gull abatement surveys report, Newby Island Landfill, 2007-2013. Unpublished report. San Francisco Bay Bird Obseratory, Milpitas, CA.

Table 1. Nests observed within American Avocet (AMAV), Black-necked Stilt (BNST), California Gull (CAGU), Caspian Tern (CATE), Forster's Tern (FOTE), Least Tern (LETE), and Black Skimmer (BLSK) colonies monitored in 2014 as part of SFBBO's citizen science-based Colonial Waterbird Program in the San Francisco Bay, CA. Nest counts represent the peak number of active nests observed during the breeding season from levees or areas adjacent to colonies (observations) or the total nests found on a single walkthrough of the colony led by SFBBO staff in May (walkthrough). Walkthrough surveys targeted CAGU peak nesting season, so CATE numbers calculated during walkthrough surveys may underestimate peak nest abundance. Dashes (-) indicate that no nesting birds were reported.

Site	Landowner/ operator	Pond/tower	AMAV	BNST	CAGU	CATE	FOTE	LETE	BLSK	Method	Map ID
Agua Vista	other	n/a	-	-	-	1	-	-	-	observations	1
Alcatraz	NPS	n/a	-	-	24	-	-	-	-	walkthrough	3
Alviso	DESFBNWR	A5/A7/A8	20	-	138	-	-	-	-	walkthrough (CAGU), observations (AMAV)	145
Alviso	DESFBNWR	A9/A10/A11/A14	-	-	7207	20*	-	-	-	walkthrough	146
Alviso	DESFBNWR	A12	-	-	-	-	-	-	-	observations	9
Belmont Slough	other	n/a	-	-	-	-	-	-	-	observations	14
Charleston Slough Island	other	n/a	-	-	-	-	-	-	-	observations	136
Coyote Hills	DESFBNWR	N2A/N3A/N4A	-	-	2957	75*	-	-	-	walkthrough	18
Coyote Hills	DESFBNWR	N6/N7	-	-	3932	-	-	-	-	walkthrough	147
Eden Landing	CDFG	Turk	-	-	-	-	-	-	-	observations	93
Hayward Shoreline	other	n/a	112	3	-	-	280	-	11	observations	33
Moffett	DESFBNWR	A2W	2	-	-	-	163	-	1	observations	46
Moffett	DESFBNWR	A3W	-	-	-	-	-	-	-	observations	148
Moffett	DESFBNWR	A2E	8	-	27	-	60	-	-	observations	104
Moffett	DESFBNWR	AB1	-	-	-	-	-	-	-	observations	149
Moffett	DESFBNWR	AB2	6	-	40	-	4	-	-	walkthrough (CAGU), observations (AMAV)	150
Mountain View	DESFBNWR	A1 NW Island	-	-	202	-	-	-	-	walkthrough	50
Mountain View	DESFBNWR	A1 SE Island	-	-	-	-	-	-	-	observations	50
Mountain View - Palo Alto Flood Control Channel	other	n/a	-	-	7132	-	-	-	-	walkthrough	51
Mowry	DESFBNWR	M1/M2	-	-	657	-	-	-	-	walkthrough	54
Mowry	DESFBNWR	M3	-	-	2439	-	-	-	-	walkthrough	151

Table 1, continued.

Site	Landowner/ operator	Pond/tower	AMAV	BNST	CAGU	CATE	FOTE	LETE	BLSK	Method	Map ID
Mowry	DESFBNWR	M4/M5	-	-	1808	-	-	-	-	walkthrough	53
Mundy Marsh	other	n/a	-	-	-	-	-	-	-	observations	55
New Chicago Marsh	DESFBNWR	n/a	29	30	-	-	156	-	-	observations	56
Redwood Shores Water Treatment Plant	other	n/a	-	-	-	-	-	-	-	observations	152
Redwood Shores, Nob Hill Market		n/a	7	1	-	-	-	-	1	observations	142
TOTAL			**184**	**34**	**26563**	**96**	**663**	**0**	**12**		

*Number of nests estimated from adult counts, calculated as the number of adults surveyed divided by two.

Table 2. Number of breeding adult California Gulls by colony in the South San Francisco Bay from 1980-2014. Estimates were generated by doubling nest counts obtained from walkthrough surveys in late spring, except where otherwise noted. Dashes (-) indicate that colonies were not surveyed.

Year	Alviso A6	Newark	Alviso A9/A10/A11/A14	Mountain View A1	Mowry M4/M5	Mowry M1/M2	Mowry M3	Moffett B2	Alameda NAS	Brooks Island	Coyote Hills N3A/N4AB	Coyote Hills N6/N7	Palo Alto Flood Control Channel	Alviso A5	Alviso A5/A7	A3W Boardwalk	South Bay Total
1980	24	-	-	0	-	-	-	0	0	0	0	-	-	-	-	-	**24**
1981	60	-	-	0	-	-	-	0	0	0	0	-	-	-	-	-	**60**
1982	412	-	434	0	-	0	-	0	0	0	0	-	-	-	-	-	**846**
1983	1342	46	-	0	-	0	-	0	0	0	0	-	-	-	-	-	**1388**
1984	2000	44	150	0	-	0	-	0	0	0	0	-	-	-	-	-	**2194**
1985	3000	554	374	0	-	0	-	0	0	0	0	-	-	-	-	-	**3928**
1986	3000	398	97	0	-	0	-	0	0	0	0	-	-	-	-	-	**3495**
1987	4000	22	100	0	-	0	-	0	0	0	0	-	-	-	-	-	**4122**
1988	4600	30	180	0	-	0	-	0	0	0	0	-	-	-	-	-	**4810**
1989	5310	0	434	0	-	0	-	0	0	0	0	-	-	-	-	-	**5744**
1990	7600	0	122	2	-	0	-	0	0	0	0	-	-	-	-	-	**7724**
1991	5250	0	0	0	-	0	-	0	0	0	0	-	-	-	-	-	**5250**
1992	5500	0	200	0	-	1294	-	0	0	0	0	-	-	-	-	-	**6994**
1993	6912	0	234	200	-	415	-	82	6	0	0	-	-	-	-	-	**7849**
1994	9000	0	300	350	-	1540	-	556	20	0	0	-	-	-	-	-	**11766**
1995	7236	0	4	74	-	2009	-	300	100	0	0	-	-	-	-	-	**9723**
1996	6558	0	1410	0	-	174	-	282	200	0	0	-	-	-	-	-	**8624**
1997	6256	0	1722	164	-	3000	-	1000	200	0	0	-	-	-	-	-	**12342**
1998	6562	0	1628	0	-	480	-	400	200	-	0	-	-	-	-	-	**9270**
1999	9380	0	2117	145	-	475	-	248	50	-	0	-	-	-	-	-	**12415**
2000	11482	0	1986	0	-	2526	-	254	80	10	0	-	-	-	-	-	**16338**
2001	11216	0	3056	278	-	1824	-	624	-	-	0	-	-	-	-	-	**16998**
2002	11302	0	3590	510	-	3120	-	712	-	486	0	-	-	-	-	-	**19720**
2003	13644	0	1010	862	-	4310	-	384	-	896	0	-	-	-	-	-	**21106**
2004	8600	0	1047	321	-	2233	-	219	0	270	0	-	0	-	-	-	**12690**
2005	18418	-	426	1664	-	3044	-	830	-	800	5370	-	-	-	-	-	**30552**

Year	Alviso A6	Newark	Alviso A9/A10/AII/A14	Mountain View A1	Mowry M4/M5	Mowry M1/M2	Mowry M3	Moffett B2	Alameda NAS	Brooks Island	Coyote Hills N3A/N4AB	Coyote Hills N6/N7	Palo Alto Flood Control Channel	Alviso A5	Alviso A5/A7	A3W Boardwalk	South Bay Total
2006	19456[A]	0	234[A]	380	-	5068[A]	-	374	0[A]	-	7442	-	-	84	-	-	**33038**
2007	24696	-	0	92	-	7384	-	-	105	-	4384	-	206	-	-	-	**36867**
2008	26366[B]	-	0	616	5934	8224	-	-	135	-	4952	-	690	30	-	-	**46947**
2009	24190	0	0	446	3640	8842	-	8	87	1577	4944	-	1164	110	-	-	**45008**
2010	23108	0	0	428	4780	6020	-	20	54	-	6594	2506	1704	174	716	-	**46104**
2011	0	0	11956	390	6068	4164	-	112	0	-	6394	4110	4478	156	0	2	**37830**
2012	0	0	18328	422	4414	1770	3700	122	-	-	7248	6738	9200	230	0	0	**52172**
2013	0	-	15900	270	3408	1260	5078	120	0	-	6256	6914	14014	238	0	-	**53458**
2014	0	-	14414	404	3616	1314	4878	80	0	-	5914	7864	14264	276	0	0	**53024**

[A]Count is from a single flight over the colony and is likely conservative.

[B]USGS contributed supplemental information about this colony.

Table 3. Peak nests observed for Double-crested Cormorant (DCCO), Great Blue Heron (GBHE), Great Egret (GREG), Snowy Egret (SNEG), and Black-crowned Night Heron (BCNH) colonies monitored in 2014. Dashes (-) indicate that no nesting birds were reported. Walkthrough surveys at A9/A10/A11/A14 and N2A/N3A/N4A targeted CAGU peak nesting season, so DCCO numbers calculated during walkthrough surveys may underestimate peak nest abundance. DCCO areas were not walked through to prevent destruction and disturbance of DCCO and CATE nests.

Site	Landowner/ operator	Pond/tower	DCCO	GBHE	GREG	SNEG	BCNH	Method	Map ID
Almaden Lake	other	n/a	-	-	10	7	4	observations	4
Alviso	DESFBNWR	A9/A10/A11/A14	160*	-	-	-	-	walkthrough	146
Artesian Slough	DESFBNWR	n/a	-	-	-	-	-	boat	101
Bacon Island		n/a	4	14	-	-	-	observations	144
Bay Farm Island - Alameda	other	n/a	-	-	15	18	-	observations	13
Chesapeak-Saginaw / Redwood City Harbor	other	n/a	-	-	4	16	25	observations	140
Coyote Hills	DESFBNWR	N2A/N3A/N4A	40*	-	-	-	-	walkthrough	18
Coyote Parkway Lakes	other	n/a	-	-	-	-	-	observations	19
Coyote Ranch Road	other	n/a	-	9	-	-	-	observations	130
Don Castro	other	n/a	-	9	-	-	-	observations	21
Dumbarton	DESFBNWR	PG&E towers	75	-	-	-	-	observations	88
Eden Landing	CDFW	Heron House	-	8	-	-	-	observations	25
Grant Lake	other	n/a	-	2	-	-	-	observations	30
Hayward Shoreline	other	n/a	-	-	-	-	-	observations	33
Lake Chabot	other	n/a	-	-	-	-	-	observations	34
Lake Cunningham	other	n/a	-	-	-	-	5	observations	35
Lake Elizabeth[A]	other	n/a	-	-	4	2	28	observations	37
Lake Merced Mesa	other	n/a	58	8	-	-	-	observations	39
Lake Merced - North	other	n/a	43	1	-	-	-	observations	38
Lake Merced - South	other	n/a	43	-	-	-	-	observations	40
Lake Merced - Boat Dock	other	n/a	-	1	-	-	-	observations	143
Lake Merritt	other	n/a	117	-	-	-	-	observations	41
Lakeshore Park Newark	other	n/a	-	15	12	74	33	observations	42
Livermore VA Hospital	other	n/a	-	8	-	-	-	observations	44
Llagas Creek, Morgan Hill	other	n/a	-	5	14	-	-	observations	45

Table 3, continued.

Site	Landowner/ operator	Pond/tower	DCCO	GBHE	GREG	SNEG	BCNH	Method	Map ID
Los Gatos Creek Park		n/a	-	-	-	6	19	observations	102
Moffett	DESFBNWR	Towers in A2W	18	-	-	-	-	observations	46
Moffett	DESFBNWR	Towers in A3N	13	-	-	-	-	observations	103
Moffett	DESFBNWR	Towers in A2E	18	-	-	-	-	observations	104
Moffett	DESFBNWR	Towers in B2	-	-	-	-	-	observations	48
Moffett	DESFBNWR	Towers in B1	3	-	-	-	-	observations	47
Ovation Court	other	n/a	-	31	-	-	-	observations	57
Palace of Fine Arts	other	n/a	-	2	-	-	-	observations	111
Palo Alto Baylands Duck Pond	other	n/a	-	-	-	-	-	observations	59
Pescadero Marsh	other	n/a	5	22	-	-	-	observations	113
Purissima Canyon		n/a	-	1	-	-	-	observations	n/a[B]
Redwood Shores Sewage Plant	other	n/a	-	-	-	-	-	observations	152
Ruus Park	other	n/a	-	-	28	28	-	observations	63
Shadow Cliffs	other	n/a	23	14	4	-	-	observations	64
Shorebird Way	other	n/a	-	-	36	41	-	observations	65
Steinberger Slough	other	n/a	164	3	-	-	-	observations	66
Stow Lake	other	n/a	-	3	-	-	-	observations	67
Sunol Water Temple	other	n/a	-	18	-	-	-	observations	129
Vasona County Park	other	n/a	-	9	1	-	-	observations	68
TOTAL			**784**	**183**	**128**	**192**	**114**		

[A] Volunteer conducted "beaks only" counts at this site. Lack of nest numbers observed does not necessarily indicate a lack of nesting activity.

[B] Site on private property, location not shared at owner's request.

Table 4. Total number of nests reported for selected Forster's Tern (FOTE) and Least Tern (LETE) colonies monitored by other agencies in the San Francisco Bay, CA, 2014. Agencies included the U.S. Fish and Wildlife Service (USFWS) and the East Bay Regional Parks District (EBRPD).

Site	Landowner/operator	Pond/tower	FOTE	LETE	Surveyor
Alameda Point	other	n/a	-	341	USFWS
Hayward Shoreline	other	n/a	-	85	EBRPD

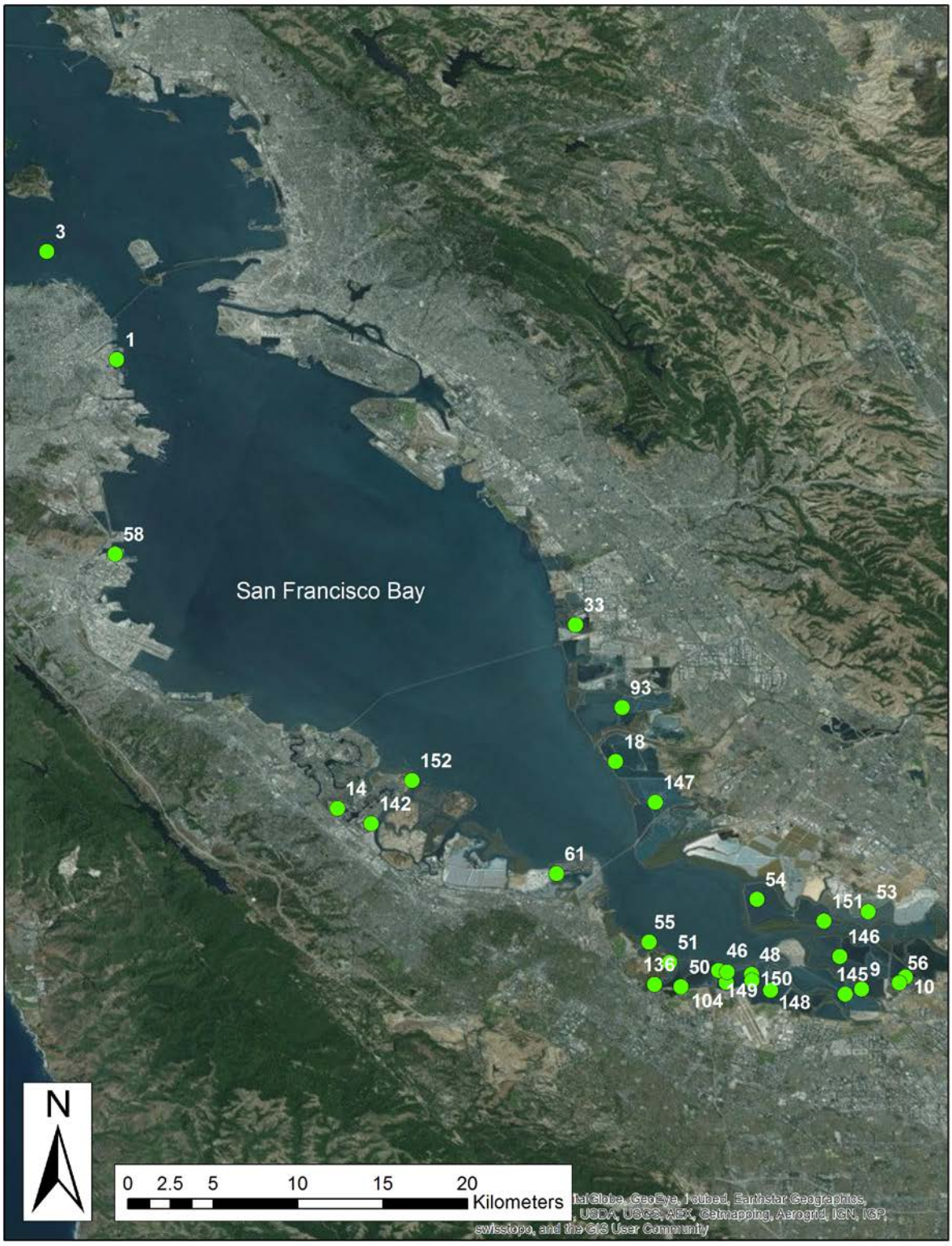


Figure 1. Locations of gull and tern colonies monitored in 2014 as part of SFBBO's citizen science-based Colonial Waterbird Program in the San Francisco Bay, CA. Labels correspond to the Map ID listed in Table 1.

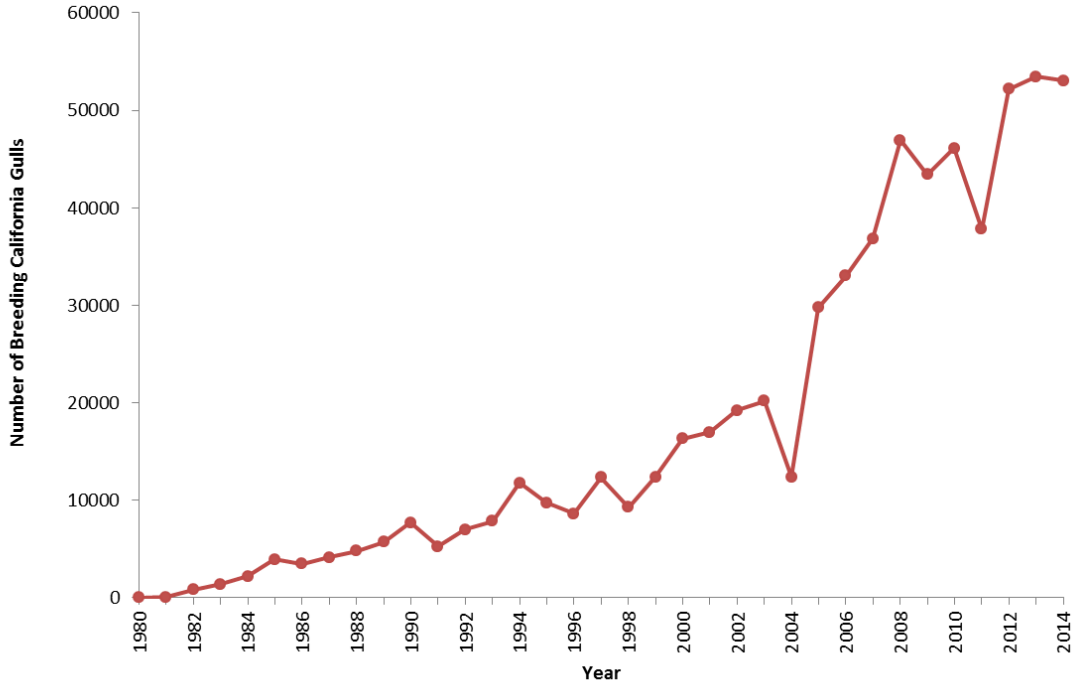


Figure 2. Estimated number of breeding California Gulls in the South San Francisco Bay, CA from 1980-2014.

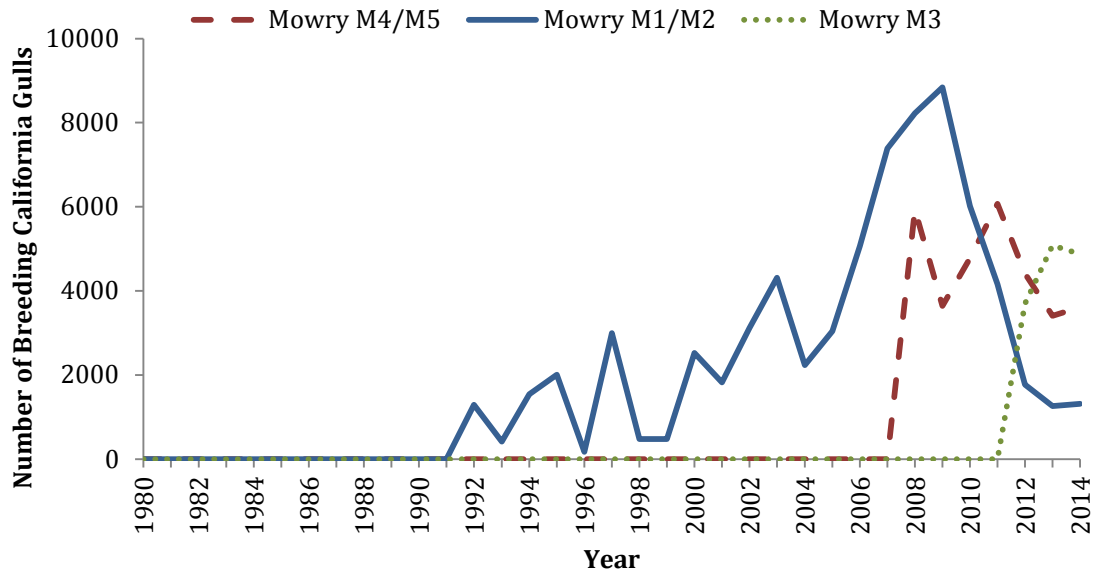


Figure 3. Estimated number of breeding California Gulls within the Mowry pond complex, South San Francisco Bay, CA from 1980-2014.

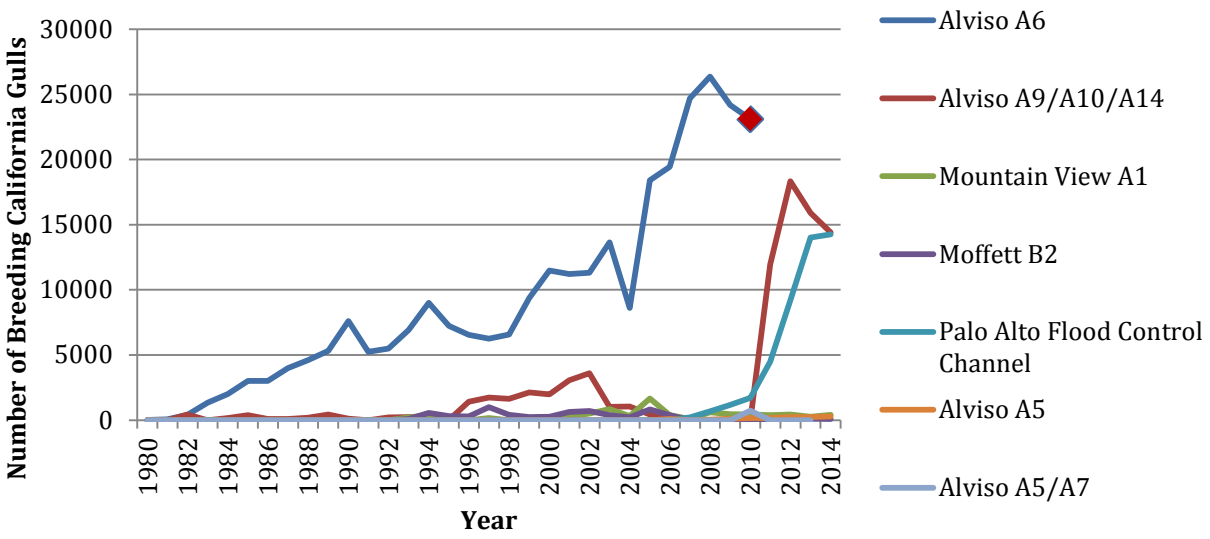


Figure 4. Estimated number of breeding California Gulls within Alviso and Mountain View ponds, South San Francisco Bay, CA from 1980-2014. Pond A6 was breached and opened to tidal activity as part of planned restoration activities in 2010.

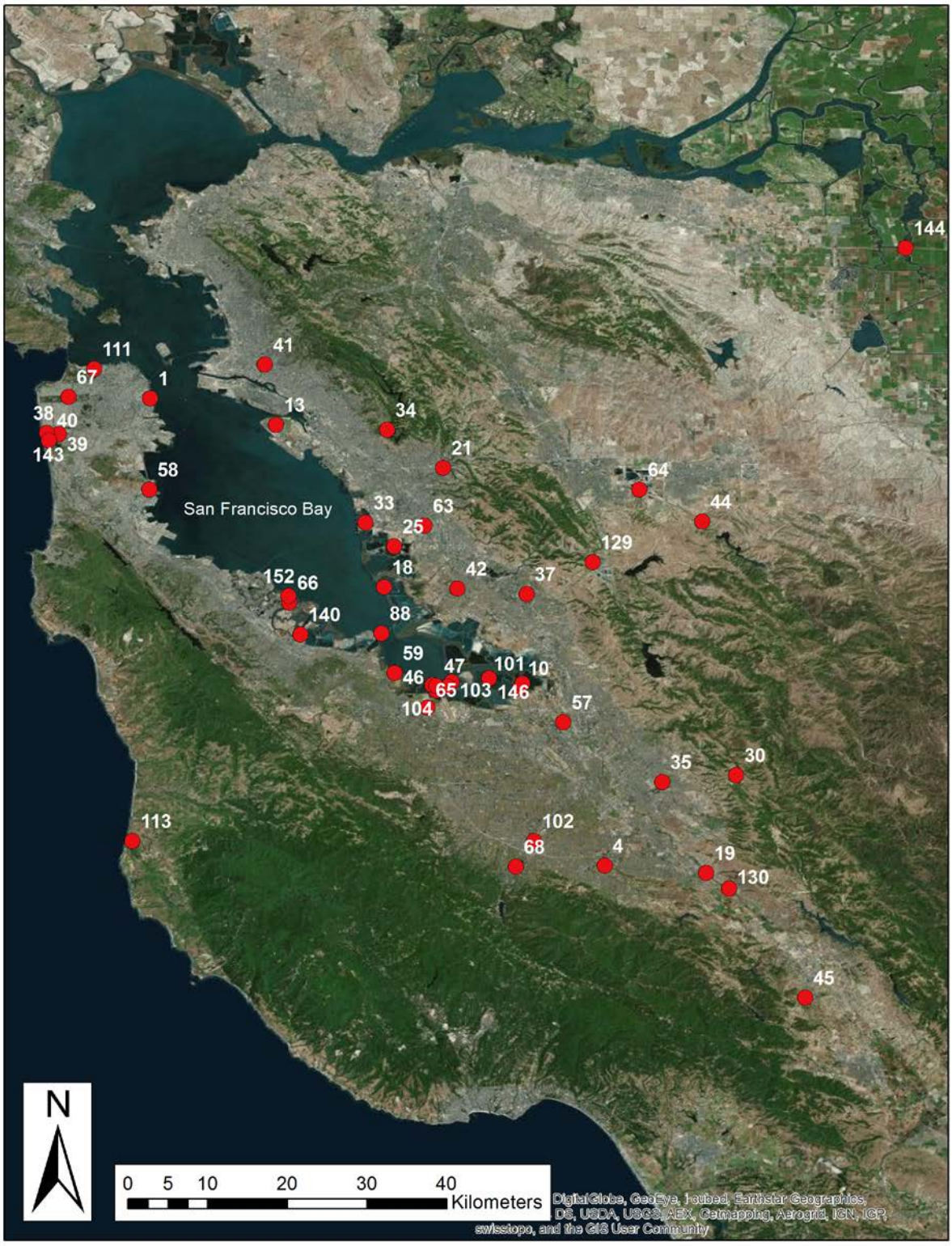
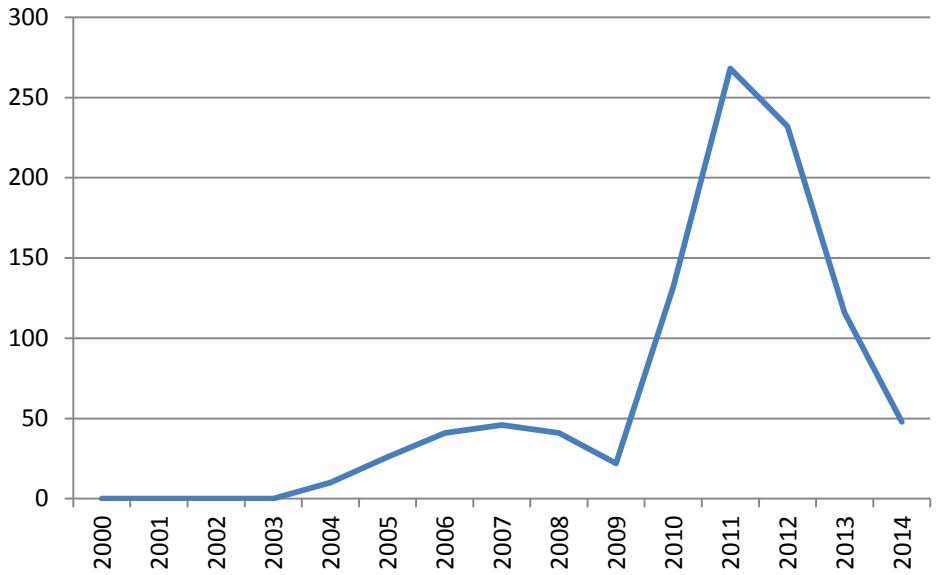


Figure 5. Locations of heron, egret and cormorant colonies monitored in 2014 as part of SFBBO's citizen science-based Colonial Waterbird Program in the San Francisco Bay, CA. Labels correspond to the Map ID listed in Table 3.

Appendix 1. Colony Profile: Alcatraz California Gulls 2000-2014. Number of breeding adults surveyed at Alcatraz from 2000-2014.



Appendix II. Colony Profile: Llagas Creek, Morgan Hill, CA

Species Monitored: Great Blue Heron and Great Egret

Dates Monitored: 1993-2014

Site Description: The colony is in a large *Eucalyptus* tree near the intersection of Watsonville Road and Santa Theresa Ave in the city of Morgan Hill. The only water in the immediate vicinity is the small Llagas Creek. It is believed that this colony has been active since the 1970s.

Colony Coordinates: 37.090864 -121.644832

Conservation Concerns: In 2003, the development of a residential area began in the parcel of land directly adjacent to the Llagas Creek heronry. Construction activity continued in this area until this individual building's completion in 2006. The remaining complex homes continue to be developed.

Peak number of active nests observed for Great Blue Heron and Great Egret at Llagas Creek, Morgan Hill, CA from 1993-2014.