

**Bank Swallow Monitoring at Fort Funston,  
Golden Gate National Recreation Area  
1993-2006**

**National Park Service  
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## ***Introduction***

Historic observations indicate that bank swallows (*Riparia riparia*) have used the cliffs at Fort Funston for breeding since at least 1905 (Laymon et al. 1987). The Fort Funston breeding colony is one of only a few remaining bank swallow colonies in coastal California (Laymon et al. 1987). The bank swallow is listed as a Threatened Species by the State of California. Bank swallows are long distance migrants that overwinter in South America. The birds tend to arrive at Fort Funston in late March or early April and depart for their wintering grounds in early August. The swallows dig burrows for breeding in the soft cliffs at Fort Funston and forage primarily over Lake Merced to the east. The cliffs are subject to rapid erosion from storm events in the winter and spring. In some years with little erosion, bank swallow burrows remain intact and have the potential to be reused for nesting in subsequent years. Winter and spring storms can cause the cliffs to erode several feet, with few to none burrows remaining for potential renesting in some years.

Bank swallows have been monitored at the cliffs at Fort Funston using the same methods from 2000-2006. From 1993-2000, a variety of monitoring protocols were followed to monitor the bank swallows (with the exception of 1997 when the swallows were not monitored). Although different protocols were used for this period 1993-2000, data on number of bank swallow burrows and locations were recorded making the data comparable with the 2000-2006 data. Periodic counts of the number of bank swallow burrows at the colony are also presented for comparison. Photo monitoring of the entire colony was conducted in many of the years, but that data is not analyzed here.

The general objectives of the bank swallow monitoring program at Fort Funston are:

- To determine trends in the bank swallow population by tracking the total number of burrows as an index of the population.
- To monitor the spatial location of bank swallow burrows.
- To record data on various disturbances and potential disturbance factors.

## ***Methods***

The general methods for the bank swallow monitoring program (2000-current) are to have observers count the number of bank swallow burrows in each of four designated areas along the cliffs at Fort Funston (Figure 1). Typically, two observers each make independent counts of the number of burrows observed on the cliffs as they walk the site from north to south, then each observer recounts the burrows as they walk back from south to the north end of the site. The number of burrows is then averaged based on all the counts by each observer on the survey. The observers also record an estimate of the number of bank swallows they see flying in each area only on the first trip through the colony. Although these counts of the swallows do not provide an accurate indicator of relative numbers of bank swallows, they do provide an indication of the use of burrows in an area. Observers also note the presence of other bird species they observe on the site.

On the first pass through the site, from the North End to Panama Point, observers record the frequency of a variety of factors that could affect the bank swallows including people,

**Figure 1. Map of the bank swallow site at Fort Funston. Map indicates the locations of the four designated monitoring areas, as well as the fenced areas indicated by hatched polygons above the cliffs.**



leashed dogs, unleashed dogs, dogs chasing birds, number of birds being chased, hang gliders, vehicles, and horses on a pre-formatted datasheet. Lastly, the observers record any site notes about new burrow locations, landslides, or graffiti, and detail any disturbance events recorded.

In 2000, the site was surveyed very frequently, sometimes with two surveys within a day, but typically once every two days. From 2001 to 2006, the site was typically surveyed every 7-10 days during the breeding season.

### ***Results and Discussion***

The bank swallow colony at Fort Funston has been observed since at least 1905. Records prior to 1993, when routine monitoring was initiated, provide an indication of variation in the size of the colony over time. A study of the Fort Funston colony documented a total of 84 burrows in 1954, 114 in 1955, 157 in 1956, and 196 in 1960 (Cutler 1961).

GGNRA staff counted at least 229 burrows in 1982 and more than 550 in 1989 (GGNRA 2000). In 1987, the California Department of Fish and Game documented 417 burrows at Fort Funston, with 60% (255) of the burrows occupied (Laymon et al. 1987).

Approximately 40 to 60 percent of burrows are actively used for nesting in a given year based on burrow occupancy estimates for bank swallows in the western United States, including data for California and Fort Funston (Laymon et al. 1987, CDFG 1995, Garrison 1999).

The total number of bank swallow burrows observed at the site from 1993-2006 through the NPS monitoring program has ranged from a high of 924 burrows in 1994 to a low of 140 burrows observed in 1998. The number of burrows was high for the years 1993-1996, with total counts above 500 burrows (Table 1). In this period many burrows remained from year to year. Storm events associated with El Nino conditions during the winter of 1997 into 1998 wiped out all the burrows through heavy erosion at the site. The 1998 burrow count of 140 was the low count for this NPS monitoring period, and all the burrows were dug new that year. The 1998 burrow count was still well above the lowest total counts (84 in 1954 and 114 in 1955) for the colony including all years (Cutler 1961). The total number of burrows has showed less variation from 2000-2006 than for the period of 1993-1999, but also lower total numbers than the high counts from 1993-1996. From 2000-2006, the number of burrows ranged from 142 in 2001 (nearly equal to the lowest number recorded for the site) to a high of 255 in 2004 (Table 1). In 2006, all but 5 burrows were wiped out by erosion caused by spring storm events.

Also, the bank swallows have moved locations along the cliffs at Fort Funston over time. From 1993 through 1996 all the nests were north of The Gap (Figure 1, Table 1). After the El Nino event of 1997-98, the bank swallows moved entirely south of The Gap in 1998 and 1999. In 2000 through 2003, the vast majority of the burrows were observed south of Gap in Area 3, with a few burrows observed north of the gap in some of the years. In 2004, there was a shift of part of the colony back to the north end of the site with nearly 40% of the burrows in Area 1 and most of the remaining burrows in Area 3 south of the Gap. In 2005, the majority of the colony was in at the north end of the site in Area 1, with about 40% of the burrows south of the Gap. In 2006, again the major

**Table 1. Total bank swallow burrows north and south of the Gap at the cliffs at Fort Funston by year.**

<b>YEAR</b>	<b>BURROWS NORTH OF THE GAP</b>	<b>BURROWS SOUTH OF THE GAP</b>	<b>TOTAL BURROWS</b>
<b>1993</b>	<b>739</b>	<b>0</b>	<b>739</b>
<b>1994</b>	<b>924</b>	<b>0</b>	<b>924</b>
<b>1995</b>	<b>713</b>	<b>0</b>	<b>713</b>
<b>1996</b>	<b>561</b>	<b>0</b>	<b>561</b>
<b>1997</b>	<b>No data</b>	<b>No data</b>	<b>No data</b>
<b>1998</b>	<b>0</b>	<b>140</b>	<b>140</b>
<b>1999</b>	<b>0</b>	<b>148</b>	<b>148</b>
<b>2000</b>	<b>9</b>	<b>244</b>	<b>253</b>
<b>2001</b>	<b>10</b>	<b>132</b>	<b>142</b>
<b>2002</b>	<b>0</b>	<b>150</b>	<b>150</b>
<b>2003</b>	<b>25</b>	<b>178</b>	<b>203</b>
<b>2004</b>	<b>100</b>	<b>145</b>	<b>255</b>
<b>2005*</b>	<b>154</b>	<b>94</b>	<b>248</b>
<b>2006*</b>	<b>122</b>	<b>107</b>	<b>229</b>

\* In 2005 and 2006, the location of the Gap was potentially misidentified by field crews in a location to the north of the actual location of the Gap. This error did not affect total burrow counts, but would change the burrow numbers classified as north and south of the Gap. This potential error would have meant that for 2005, 25 burrows recorded as south of the Gap would actually have been north of the Gap. For 2005, the total burrows north of the Gap would be 179 and 69 south of the Gap. For 2006, the total burrows north of the Gap would have increased by 101 burrows to a total of 223, with only 6 burrows south of the Gap.

sub-colony was north of the Gap, with a number of burrows noted just south of the Gap in Area 2. Of note are the periodic shifts in bank swallow burrow locations over time, from primarily in the north end from 1993-1997, to primarily south of the Gap from 1998-2003, and both north and south of the Gap in 2004 through 2006. In 2006, it was likely that all the bank swallow breeding activity was north of the Gap, as indicated by the note for Table 1.

The 12-Acre Closure protects the bluffs above Areas 2, 3, and 4, which includes everything south of the Gap to the Beach Access point (Figure 1). The cliffs in Area 3 are relatively high, with bank swallows burrows tending to be high on the cliff well out of reach of disturbance from below on the beach. The bluffs above Area 1 were fenced to protect a habitat restoration area. All of the fenced areas at Fort Funston are in need of maintenance to repair fencing that has been buried by sand movements and fencing that has deteriorated due to weathering. Fence repair is planned to occur in 2007. The Habitat Restoration Area and Erosion Area are not formally closed because they did not go through a rule making process. The cliffs above Area 1 are susceptible from above by access along social trails into the fenced Habitat Restoration Area, and many of the burrows can be reached by climbing small landslides or up on the cliffs from the beach. Only a small number of burrows have been observed in Area 4 south of Panama Point, although none of these have been confirmed as active, and bank swallows have not been

recorded in this area through the monitoring from 2000-2006. Area 4 is not surveyed when the beach is impassable at Panama Point during high tides.

Data on people and dog use of the site is collected from the North End to Panama Point and is only presented from 2000-2006 when we have been collecting data using consistent protocols. Start and end times for these Areas are not recorded so we cannot calculate use rates per unit time. The time spent surveying Areas 1-3 undoubtedly varies with the total number of burrows. In general, there are about 2 people for every dog observed. Over 90% of dogs in all the years were unleashed. Dogs were observed chasing birds during surveys in 4 of the 7 survey years. However, most bank swallow monitoring occurs from May-July when shorebirds are at their lowest abundance of the year, when they have migrated to breeding grounds to the north (GGNRA unpublished data). Examining a subset of the surveys in which shorebirds were noted as present, dogs were observed chasing shorebirds on 9 of 37 (24%) surveys.

A wide array of disturbances to the swallows at Fort Funston have been observed and recorded during monitoring, and/or photo-documented. While bank swallows exhibit some tolerance to disturbance, few colonies are subjected to the intense recreational pressure at Fort Funston. Documented disturbance events at Fort Funston include: cliff-climbing by people and dogs; rescue operations of people and dogs stuck on the cliff face; people and dogs on the bluff edge or in close proximity to active burrows; graffiti carving in the cliff face; aircraft and hang-glider over-flights; and discharge of fireworks within the colony. The potential impacts from such disturbances include: interruption of normal breeding activity, such as feeding of young; crushing of burrows near the top of the cliff face (nests can be located within a foot of the bluff top); casting shadows that may be perceived as predators; accelerating human-caused bluff erosion; and active sloughing and land-slides that may block or crush burrows and the young inside. In addition, common ravens and American kestrels are nest predators that have been frequently observed, and European starlings compete for nesting burrows with the bank swallows at Fort Funston.

**Table 2. Average number of people, leashed dogs, unleashed dogs, dogs chasing birds, and birds chased per survey. Average percentage of unleashed dogs and dogs chasing birds are also presented.**

YEAR	# OF SURVEYS	AVG. # OF PEOPLE	AVG. # OF LEASHED DOGS	AVG. # OF UNLEASHED DOGS	AVG. # DOGS CHASING BIRDS	AVG. # BIRDS CHASED	AVG. % DOGS UNLEASHED	AVERAGE % DOGS CHASING BIRDS	AVERAGE % DOGS CHASING BIRDS SURVEYS WITH SHOREBIRDS PRESENT*
2000	50	25.8	1.2	13.4	0.3	1.3	92	2.1	4.0
2001	20	10.2	0.3	5.4	0.3	7.0	85	2.1	6.0
2002	9	8.6	0.1	4.2	0	0	77	0	0
2003	10	11.1	0.3	5.4	0	0	79	0	0
2004	11	7.0	0.1	4.6	0	0	90	0	0
2005	15	9.3	0.4	4.4	0.2	7.0	79	3.1	9.0
2006	17	10.4	0.4	7.8	0.1	0.6	84	0	0

\* This column is based only on surveys in which shorebirds were observed on the beach.

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