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The Hair of the Dog that Bit You: Using Special Events to Help Understand and Manage Their Impacts—A Case Study of Crissy Field, Golden Gate National Recreation Area

Introduction

Though recreational activities have occurred along the San Francisco Bay waterfront at Crissy Field for over two centuries, dynamic changes, resulting in the restoration of natural processes, recently provided managers of the Golden Gate National Recreation Area (GGNRA) with an opportunity to re-evaluate the size, duration, and frequency of recreational activities allowed on-site. Paramount among concerns was the impact of large special events that had occurred historically along the Golden Gate Promenade, the main pedestrian and bicycle thoroughfare along the Crissy Field waterfront. Park managers were concerned that these special-event activities might conflict with the activities of other park users, as well as adversely affect resources. With the reintroduction of a 23-acre protected saltwater marsh on the site of a formerly paved event venue directly to the south of the promenade, and the establishment of a wildlife protection zone along the dunes and beach directly to its north, managers recognized the need to re-evaluate the scope of special events and to develop a policy that provided for the maximum amount of recreational use while protecting the area's newly restored natural systems.

Toward this end, the park's Office of Special Park Uses (OSPU), the office responsible for managing all GGNRA special-use permits, began revising the standard operating procedure (SOP) for special events at Crissy Field. Understanding that political sensitivities and realities ruled out any cancellation of historically occurring athletic events along the promenade to conduct an impact study, OSPU staff developed an innovative and cost-effective plan to complete such studies on the largest of these activities, the annual Bridge

to Bridge Run.

The OSPU response, metaphorically similar to the belief from American folk culture that applying a few hairs from the dog that has bitten you to your wound would prevent evil consequences, is a management tool worthy of note. In order to provide data for the required SOP, OSPU staff employed non-traditional means to gain vital scientific documentation on the impacts of athletic events on the area's wildlife and vegetation *from the events themselves*. With this information, OSPU staff gathered

essential baseline information for the park and avoided potential political difficulties that may have arisen had the promenade been closed to events for a period of study. Simultaneously, they field-tested a management innovation that can be adapted and used Servicewide at little direct cost to the National Park Service (NPS).

Site History

Crissy Field has a rich and long-standing cultural and natural history. Prior to Spanish, Mexican, and American habitation at the adjacent Presidio of San Francisco, the area today known as Crissy Field was formerly a vast tidal marsh that supported Native American tribal groups, including Ohlone and Coastal Miwok peoples. Following colonization by Spain in 1776, the Crissy Field vicinity became a strategic military site and the gateway between supply ships and the growing Presidio of San Francisco for Spanish, Mexican, and American administrations (Toogood 1980; Thompson and Woodbridge 1992). In addition to providing access, the wetland also represented an area of potential growth within the geographic boundary of the Presidio.

The wetlands at the northern border of the Presidio and the San Francisco Bay were first filled systematically to provide for the construction of the 1915 Panama Pacific Exposition. The U.S. Army provided the land for the exposition, and it was subsequently filled by

dredging and used as an airstrip. Following the exposition the Army retained the airstrip, and named it Crissy Field in honor of Major Dana Crissy (Thompson and Woodbridge 1992).

In the 1920s, Crissy Field served as the only Army Air Service coast defense station in the western United States and figured prominently in the pioneering events of U.S. military aviation. Improvements and flights continued; by 1960, the Army had further extended the airfield to provide for larger and more powerful aircraft. Though restricted exclusively to helicopter landings in 1974, repair of the existing airplane runways continued into the 1990s (Thompson and Woodbridge 1992).

Despite maintenance efforts, Crissy Field fell into a state of disrepair. As one park document described in 1999:

Only one third of the 100-acre site was available for use. Much of the area was a jumble of asphalt, open space created by building demolition, hard-packed earth, deteriorated paths and weeds, with almost 30 acres fenced off. Crissy Field's natural and cultural features lay dormant, difficult for the public to enjoy (GGNRA 1999).

Prior to the period of Spanish colonization, the sand dunes adjacent to the waterfront at Crissy Field were part of an extensive and balanced ecosystem highlighted by a vast dune field edged by lush salt marshes and lagoons. Presently, this area supports the only native fore-dune community in San Francisco (GGNRA 1999). It also supports a

variety of recreational activities. According to GGNRA documents: Over the years, Crissy Field has been a much loved park destination—popular for jogging, cycling, dog walking, picnicking and boardsailing. Park visitors marvel at the beauty of the setting and the breathtaking views, dramatic weather and natural features. Perhaps above all, Crissy Field provides a welcome respite from nearby urban life (GGNRA 1999).

Recreation activities, especially athletic events, have a long history at Crissy Field. In 1876, to celebrate the nation's centennial, thousands of San Franciscans flocked to the area to watch a mock battle where the cannons of Fort Point and Alcatraz Island fired at whitewashed rocks along the Marin Headlands and a target ship moored offshore from Crissy Field. Following its closure in the 1880s, Fort Point became a popular recreation and picnic area, and many visitors would travel by carriage to the fort through Crissy Field along the same course as the present-day Golden Gate Promenade. Though no specific reports documenting Army recreation on the site were uncovered by the author, several post beautification engineering reports proposed that the area be filled in for recreational use and drill by Army soldiers (Thompson and Woodbridge 1992).

By the 1970s and 1980s organized recreational activities became increasingly popular in the San Francisco Bay Area, and, through agreements with the Army and the GGNRA, the Golden Gate Prom-

nade began hosting a number of athletic events, including the San Francisco Marathon, the Escape from Alcatraz Triathlon, and the Bridge to Bridge Run.

Monitoring Recreational Impacts

Impacts of recreational activities. The field of recreation ecology, which emerged in the mid-1960s, studies the impacts of recreational activities, such as athletic events, on the vegetation, wildlife, and natural systems of the immediate ecosystem (Liddle 1991; Hammitt and Cole 1999). Though initial studies focused on the effects of recreation on vegetation, recent studies broadened the scope to include impacts on wildlife (Knight and Cole 1995). These studies demonstrate that the growth of recreational impacts pose a significant threat to landscapes and ecosystems (Cole and Landres 1996).

In addition, other research demonstrates a direct application to units of the National Park System. Sellars (1997) illustrates how NPS natural resource management was employed historically to serve tourism and recreation. Manning (1998) uses multiple examples to demonstrate that the resource and social impacts caused by recreationists are a growing management issue for the NPS. Some researchers, such as Leung and Marion (1999) recommend employing spatial strategies to manage recreational impacts in national parks, while others focus on other visitor management strategies (Chavez 1997; Jakes et al. 1990).

However, as Lowry (1994) noted, visitors to parks—especially national parks in the United States and Canada—are “seeking increasingly diverse forms of recreation.” In direct proportion with this trend, large recreational activities with the potential for major impacts continue to increase in number, especially in the immediate vicinity of large urban areas. Recent studies examining the economic impact of athletic and sporting events on urban parks show a significant financial gain for surrounding businesses when such activities occur (Crompton and Lee 2000). Thus, as Moore and Barthlow (1998) proffered recently, managers of multiple-use trails such as the Golden Gate Promenade are challenged by many duties to protect natural resources, provide recreational experiences, and maintain safety.

Description of event. The Bridge to Bridge Run—beginning at the San Francisco Bay Bridge on the city’s northeast side and traversing along the waterfront to the Golden Gate Bridge on its northwest side—is a 12-km road race that annually draws over 10,000 entrants (KNBR 1999). According to NPS documents, it has been permitted in the park since 1976 and “is the largest and oldest race that runs through the GGNRA” (Higgins-Evenson 2000).

The race’s course traditionally follows the San Francisco waterfront and enters GGNRA property at Crissy Field approximately 5.4 km into the event. Prior to entering the

Golden Gate Promenade at Crissy Field, runners are presented with the option to make a left turn and complete a shorter distance (7 km) to the finish or continue along the Golden Gate Promenade to Fort Point and then along other roadways to the finish line at the Presidio’s Main Post. According to projections from the event coordinator, West End Management, following a traditional 9:00 AM start, runner impact at Crissy Field begins at 9:18 AM and continues to 10:38 AM (West End Management 2000).

Establishing a plan for vegetation and wildlife studies. In order for the Bridge to Bridge Run to receive approval through the park’s National Environmental Protection Act (NEPA) review process, park management required that impacts on vegetation and wildlife be monitored along the Golden Gate Promenade at Crissy Field during the event.

In March 2000, OSPU staff began negotiating with Bridge to Bridge event managers for formal vegetation and wildlife monitoring studies after (a) recognizing the value of detailed scientific studies, (b) understanding the unavailability of NPS staff to complete such studies, (c) realizing the potential for political repercussions from the city of San Francisco if the activity were denied, and (d) being directed by park management to secure the studies. The OSPU solution was to require the studies as a condition of the Bridge to Bridge special-use permit, and the event organizers agreed to fund monitoring

studies performed by plant ecologists and wildlife biologists.

Monitoring Recreational Impacts on Vegetation

Prior studies. The impacts of recreational activities on vegetation have been studied extensively since the early 1960s, and it is widely accepted that vegetation is susceptible to damage from a variety of recreational uses—especially trampling (Hammitt and Cole 1999). Studies show that the effects of trampling are both direct and indirect. When vegetation is trampled from recreational activity, most species directly demonstrate reduced abundance, height, vigor, and reproductive capacity (Hammitt and Cole 1998). Likewise, they also are indirectly affected by soil changes—particularly soil compaction, which increases the resistance of the soil to the plant's root penetration, reduces macropores and soil aeration, and reduces water infiltration rates (Hammitt and Cole 1998).

Along the Golden Gate Promenade, vegetation is protected on the south side by a low fence two feet in height, and along the north side by a similar fence as well as standard bollard and cable at a height of three feet. Despite these fences, park managers harbored legitimate concerns that many of the event's ten thousand runners might seek to leap the small fences in order to pass other runners if congestion occurred at this portion of the route.

Directly adjacent to both sides of the promenade are extensive areas of native plant revegetation, begun in the fall of 1998. According to data in the park's restoration database (as of 2000), a total of 64,154 native plants from 70 species were propagated in park nurseries and planted at Crissy Field through a high-profile public volunteer program launched in October 1998 (GGNRA 2000d). Approximately 15 yards south of the promenade is the marsh, bordered by tidal wetlands. According to one study, since the wetlands "are very sandy and lack the silt strata that allow marsh vegetation to return with the tides," low-growing pickleweed (*Salicornia virginica*) and salt grass (*Distichlis spicata*) were planted in and around the tidal wetlands to help other species take hold and grow (Gemmill 2000).

The area between this tidal wetland area and the promenade is marsh upland habitat. The plants in this environment differ from those in the wetland area. Species planted include deerweed (*Lotus scoparius*), sticky monkey flower (*Mimulus aurantiacus*), seaside daisy (*Erigeron glaucus*), mock heather (*Ericameria ericoides*), yarrow (*Achillea millefolium*), silver lupine (*Lupinus chamissonis*), beach strawberry (*Fragaria chiloensis*), beach sagewort (*Artemisia pycnocephala*), coffeeberry (*Rhamnus californica*), toyon (*Heteromeles arbutifolia*), coyote bush (*Bacharis piluris*), and coast buckwheat (*Eriogonum latifolium*).

These species from the coastal scrub and dune communities are especially sensitive to the impacts of trampling for several reasons. Liddle (1991) established the four biological features of small size, morphology, anatomy, and survival strategies as best promoting resistance and recovery from trampling. Applying Liddle's model to the native vegetation along the promenade in the marsh upland habitat, one can note that the majority of native species do not appear in low-growing forms, but in larger, shrub-like forms.

In addition, the morphological characteristics of several of these species—including deerweed, toyon, coffeeberry, and coyote bush—make them more susceptible and apt to incur fatal and irreversible damage when trampled. Location of the vegetative bud or the persistent stem apex of plants is critical to plant survival. Plants are more tolerant of trampling when their buds and meristems contact the surface of the soil and are protected by folding leaves (Liddle 1991). However, of the species planted along the promenade, few meet this condition. The more prominent plants, including coyote bush, deerweed, coffeeberry, and toyon are woody stemmed plants with their buds over 25 cm above soil level (phanerophytes), or above ground but below 25 cm (chamaephytes).

Similarly, the anatomy of the vegetation surrounding the promenade is less tolerant than that of other species. Most of the species have

hollow or larger-celled stems. Studies show that plants with small-celled (<0.1 mm) stems withstand greater compression without distortion than larger-stemmed plants (Hammitt and Cole 1998). Also, since many of the plants possess lignified tissues, this lack of flexibility of leaves, branches, and stems leaves these plants more rigid and easily damaged by trampling (Hammitt and Cole 1998). Thus the majority of plants bordering the promenade are also more susceptible to life-threatening damage due to their size, morphology, and anatomical structure.

Scope of study. Prior to the day of the event, Lew Stringer, a professional naturalist and employee of the park's cooperating association, the Golden Gate National Parks Association (GGNPA), completed a detailed assessment of the event and its possible impacts on the adjacent plant communities. In addition, he initiated qualitative observations of the vegetative areas, including the fenced restoration areas on both sides of the promenade. Stringer also established monitoring positions for himself and his assistant, Betsey Eagon, at the "east and west ends of the north marsh upland along the promenade" (Stringer 2000). Stringer chose this area because it seemed "most likely to experience disturbance" since the height and location of the fence allowed for easy jumping by event participants (Stringer 2000).

Observations. At 9:15 AM on Sunday, October 1, 2000, Stringer

and Eagon recorded the first event participants along the Golden Gate Promenade. At approximately 9:25 AM, as the mass of runners arrived, Stringer observed that they were “tightly spaced along the promenade” (Stringer 2000).

Stringer and Eagon noted two disturbances during the event. The first occurred when a pedestrian photographing the event entered one of the closed restoration areas. “Betsey and I observed a photographer jump the two foot fence and enter the north marsh upland,” Stringer noted (Stringer 2000). He also observed that:

While he [the photographer] was on the footbridge, a group of spectators jumped the ropes at the south end of the path leading onto the footbridge, and began to follow him. I informed them that the area was closed to the public (Stringer 2000).

In addition, Stringer noted damage to 2 sq m of unfenced dune grass (*Leymus pacificus*) near the parking area adjacent to the eastern end of the promenade. “However,” Stringer noted, “because the plant is rhizomatous it will probably recover” (Stringer 2000).

These two incidents represented the only impacts noted by Stringer and Eagon. The fenced restoration areas remained undamaged, and park management gained highly valuable insight into the impacts of large athletic events along the Golden Gate Promenade. “Overall the event went well,” Stringer noted in his report. “Careful qualitative observations

were made of vegetated areas before and after the event,” he recorded, “and there was no notable damage done to plants within the fenced restoration areas” (Stringer 2000).

Study costs. Stringer and Eagon performed on-site observations over a period of three days, and worked eight hours for a total cost of \$520. The study was funded by the permittee in accordance with the conditions of the special-use permit, and NPS incurred no direct costs.

Monitoring Recreational Impacts on Wildlife

Prior studies. The impacts of recreational activities on wildlife have been studied less extensively in comparison to vegetation, but it is now widely accepted that wildlife, like vegetation, is susceptible to impacts from a variety of recreational uses. In a seminal 1934 address to the American Society of Mammalogists, George M. Wright emphasized the need for managing impacts of tourism and recreation on wildlife, arguing that it was “undeniable that failure to maintain the natural status of national parks fauna in spite of the presence of large numbers of visitors would also be failure of the whole national parks idea” (Wright 1934). According to studies by Knight and Cole (1995), wildlife response is affected by six general factors of recreational activity: the type of activity, behavior of recreationists, the predictability of events and behaviors, the frequency and magnitude of activities, and the timing and location

of the activities (Knight and Cole 1995; Hammitt and Cole 1998).

At Crissy Field, the wildlife most overwhelmingly encountered is avian. Species observed include brown pelicans, double-crested cormorants, great egrets, great blue herons, snowy egrets, five species of gulls (western, glaucous-winged, California, ring-billed, and Heermann), elegant terns, black-bellied plovers, killdeers, willets, sanderlings, three species of sand pipers (western, least, and pectoral) and dunlins (Evans 2000a). With the exception of small animals adapted to the urban interface, such as skunks and raccoons, the site is dominated by the shorebirds—especially along the beach on the north side of the promenade and the wetland and marsh area to the south. In response to this high visitation by shorebirds, GGNRA established measures on-site to protect them.

Concerned about the possibility of recreational impacts on avian species, and in the interest of standardizing avian studies, the park developed the guideline *Avian Monitoring Objectives for Crissy Field* (GGNRA 2000a). This document recommends three measures of use: abundance (number of individuals), richness (number of species), and diversity (GGNRA 2000a; Evans 2000a).

Directly to the north and south of the promenade, special restrictions have been made to accommodate wildlife. To the south, the large tidal marsh is fenced and posted as an area closed to all human and pet access.

In addition to these restrictions, both the park's 1994 general management plan amendment and the *1996 Environmental Assessment for Crissy Field* called for the establishment of a wildlife protection area for the benefit of the site's bird species. Codified in the park's compendium amendment to the Code of Federal Regulations, this area's boundaries extend for several hundred yards from the southern border of the promenade to the north (GGNRA 2000b). This area is critical to many avian species. "The water and piers provide vital habitat for large concentrations of water birds, including grebes, cormorants, and terns. Reduced disturbance along the beach will provide a safer refuge for shorebirds such as willets and sanderlings," notes a fact sheet produced by the park (GGNRA 2000c). People are allowed to enter the wildlife protection area on foot, but pets (even on leash) are not allowed, nor is boating (GGNRA 2000c).

The establishment of the wildlife protection area is consistent with the findings of recreation ecologists. Studies show that the effects of recreation disturbance on wildlife are both direct and indirect. Harassment from humans and pets is a textbook example of a direct impact (Cole and Landres 1995). Though intentional harassment is certainly a concern, recent studies have shown that the major impact of recreational activities occurs when people unknowingly and unintentionally stress wildlife by disrupting their normal behavior

patterns of feeding, nesting, and sheltering (O'Shea 1995; Hammitt and Cole 1998).

Scope of study. In consultation with NPS staff, Avocet Research Associates (AVA) designed a study to meet five key park goals. First, the study would compile existing data on avian use of the site during large special events. Such a study had never been performed. Second, the study would conduct three surveys to document avian use immediately prior to the event. This would set up a baseline against which data from surveys done during and following the event could be compared. Third, the study would observe incidents of disturbance, or lack thereof, that occurred during the event. Fourth, AVA staff would observe the timing and extent of avian re-use of the site following the event, in order to identify any longer-lasting effects of the special event. Lastly, AVA would prepare a memorandum for the park summarizing the findings of the event's impacts (Evans 2000a).

Observations. Staff from the AVA censused the tidal wetland area immediately adjacent to the promenade twenty, eighteen, eleven, four, and one day(s) prior to the event, on the event day, and the day following the event (Evans 2000b). They counted birds in the tidal wetland area only, and recorded all individuals and species that used the site during a 60-minute period, for a total coverage of five hours during rising and falling tides. On the day of the event, one AVA staff member re-

corded observations for 190 minutes, and on the subsequent day another took observations for 120 minutes and finished a complete bird count.

During the seven site visits constituting the study, AVA staff counted 20 species of water birds in the tidal marsh, with the number of species ranging from 3 to 17 and the number of individuals from 6 to 273 (Evans 2000b). In addition, they used a species diversity index to indicate species diversity. Of particular note on the day of the event, the AVA associate observed that a flock of twelve shorebirds entered the western tidal wetland area during the event. In addition, this associate also noted that three species, all Adreids, departed during the race. These included three great egrets, three great blue herons, and two snowy egrets. They concluded that:

By each measure it appears that use of the site did not decrease as a result of the increase in human foot traffic around the marsh on October 1....

Measures that consider the avian community as a whole (abundance, richness, diversity) showed no decrease in bird use due to the increase in human use. The increases shown in all three measures are probably the result of seasonal changes in avian distribution rather than any changes in human use of the site.

Based on the observations reported here, it appears that although intense human use the paths surrounding the wetland did not limit use of the site by small shorebirds, cormorants, or gulls, it did cause large waders (egrets and herons) to abandon the area (Evans

2000b).

Study costs. Charging costs at \$150 per hour, AVA calculated the total cost of the study at \$2,500. This projection was based on the cost of three surveys totaling eight hours prior to the event, one survey during the event, data compilation and analysis, and memorandum preparation. The study was funded by the permittee in accordance with the conditions of the special-use permit, and NPS incurred no direct costs.

Management Implications

As a result of these studies, park management benefited directly and indirectly from the “hair of the dog” innovation fashioned by OSPU. Most notably, the park received two detailed studies of the impact of this athletic event on the site’s vegetation and wildlife. Due to increased workload and reduced staffing, it would have been impossible for park staff to take on these projects. Thus, at no direct cost to GGNRA, these valuable studies were completed by recognized subject-matter experts.

In addition, the park gained valuable insight into the impacts of recreational activities on park resources. Prior to this incident, there had been no substantive study of these effects. The findings have already proved valuable to park management by helping guide the formulation of the SOP for special events and filming on Crissy Field. The studies have also provided helpful information for the GGNRA Division of Natural Re-

source Management, the group responsible for managing and studying vegetation and wildlife within the park. Following this successful pilot program, OSPU has continued to require similar impact studies for all large athletic events proposed for the Golden Gate Promenade and Crissy Field. This will enable the park to observe the long- and short-term effects of events on the site’s resources.

Indirectly, the park fostered a sense of resource stewardship among the event’s managers and sponsors. Through several site visits, discussions of park resource management concerns with Natural Resource and OSPU staff, and direct contact with the observing specialists, the event managers became more aware of resource management issues at the site.

Event managers also gained substantive information about the site’s resources to better serve their future marketing campaigns for the event. By noting in marketing information that a percentage of the participant’s entry fee goes toward vegetation and wildlife studies, the event managers can potentially capitalize positively on the permit conditions, perhaps leading to greater financial support for (and return from) the event.

Additionally, by accommodating the event, the park avoided the potential for negative press coverage surrounding the denial of a popular and long-standing activity, reserved precious political capital, and strengthened the relationship with the city of San Francisco. The park also sent an important message to the

leaders of the San Francisco Bay Area event-management community: NPS is serious about protecting the natural resources of the park—especially the recently restored Crissy Field area—and is willing to apply the “hair of the dog” and use special events as a tool to help study their impacts.

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