

Interactions Between Dogs and Wildlife in Parks on the Berkeley Marina

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Abstract As pressure to develop open space in the Bay Area intensifies, it is increasingly important to understand the effects that people and their pets have on the wildlife populations utilizing the few remaining open space habitats. This study evaluates the interactions between off-leash domestic dogs and wildlife in adjacent regional parks (one developed, the other undeveloped) on the Berkeley Marina. Observations were made from two sites on opposite sides of the undeveloped Berkeley Meadow, and from a third site on the border between an off-leash dog zone and a protected wildlife area in the developed César Chávez Park. From each site, data was collected on the numbers of passing people and dogs, on- or off-leash status of dogs, dogs' deviation from the trails, and whether the dogs' activities caused wildlife flushes. Raptor and egret counts were also recorded at each site to approximate the comparative uses of the areas by wildlife. Results showed that César Chávez Park supports fewer raptors and egrets, but hosts more people and dogs, than the Berkeley Meadow. Total dog-induced wildlife flushes per observation period were statistically equivalent in both parks, but there were more flushes per dog in the Meadow and more flushes per unit wildlife in Chávez. Within the Meadow, there were no significant differences in raptor / egret or human / dog activities on the East and West sides. In Chávez, dogs deviated to the protected habitat side of the trail twice as often as to the off-leash dog zone side of the trail. These findings suggest that the Protected Natural Area in Chávez Park is not a viable habitat for wildlife, and that the Berkeley Meadow is better suited to serve as a wildlife refuge prohibited to off-leash dogs.

Introduction

The San Francisco Bay Area, a long-standing zone of rich ecology and high biodiversity, has been suffering accelerated habitat degradation as urban expansion, industrial intensification, and economic growth dominate local development. Many citizen groups and public institutions, however, are working to defend the area's dwindling open spaces, which offer valuable respite and recreation for the dense urban population as well as refuge for wildlife (Gilliam 1969).

Conflicting interests among local stakeholders complicate land management decision-making. The demand for recreational use of Bay frontage land exceeds the availability of open space; large numbers of people flock to newly opened or improved public areas along the shoreline (Delisle 1966 110). Parks in the East Bay, developed by the East Bay Regional Park District (EBRPD) and the City of Berkeley Department of Parks and Waterfront (CBDPW), are likely to draw large quantities of humans and their pets, each individual with a different motivation for visiting the space. Simultaneously, as development pushes wild vegetable and animal populations out of their native habitats, wildlife depends on refuge in parks and protected conservation zones.

In 1966 the Bay Area Conservation and Development Commission (BCDC) prepared a comprehensive land-use plan to develop and maintain the Bay shoreline to enhance its value for Bay Area residents (BCDC 1966). The plan suggests that shoreline developments include both recreational facilities and wildlife conservation areas. It emphasizes the potential of waste-filled lands to serve as wetland and grassland habitat to support existing local wildlife populations (BCDC 1966).

The City of Berkeley diked and filled the area now known as the Berkeley Marina between 1960 and 1983 to create more land for development. After closing, the solid waste-filled land was capped with two feet of foundation soil, one foot of a compacted clay, and one foot of topsoil (LSA 1998). In 1976, the City of Berkeley's Department of Parks and Waterfront resolved that the landfilled plot on the Berkeley Marina will serve as a recreational zone; this eventually became the 90-acre North Waterfront Park, renamed "César Chávez Regional Park" in 1994 (LSA 1998).

Chávez Park was divided into three zones: the Recreational Zone in the non-irrigated Southern part of the park; the non-irrigated Transition Zone in the North; and the irrigated Natural Zone in the West along the shoreline (LSA 1998). In response to the petitioning of a

dog-walkers' group called the Friends of César Chávez Park, in May 2000 the Berkeley City Council designated 17 acres of the Transitional Zone as an Off-Leash Dog Area (henceforth OLDA). The area is to be effective for a one-year trial period; in May 2001 it will be reevaluated. At the time of implementation, the City did not expect that the OLDA would have significant impacts on the natural or social resources of the park (FOCCP 2000). A seven-acre Protected Natural Area (PNA) to the North of the OLDA was designated for wildlife and native plant habitat. The PNA is off-limits to humans and dogs. There is no buffer zone between the OLDA and the PNA. At the time of implementation, the border between the two areas was to be delineated by straw bales placed 25 feet apart and ten informative signs (LSA 1998).

An adjacent plot of landfill, called the Berkeley Meadow, is still generally unmanaged. The Citizens for Eastshore State Park (CESP), a citizens' group formed in the 1980's, was a primary impetus that led to the EBRPD's recent designation of a "future Eastshore State Park" that includes the filled Berkeley Meadow (Shwartz 2000). The specific recreational uses of the site, however, are still undetermined. The EBRPD has hired a planning consultant firm to examine management options for the site; their investigation will include assessments of environmental impacts, public opinions, and economic feasibilities of various possibilities (Neuwirth 2000).

One issue that will not be addressed by the consulting firm's study is the question of whether dogs will be allowed off-leash at the Berkeley Meadow. Though free-running dogs were not seen as much of a problem in the past, growing human populations—and the consequent rise in pet populations—are increasingly impacting the ecological health of the area's few protected open spaces. The subject has become a major source of contention between dog-walkers and wildlife conservationists in the Bay Area. Numerous local studies are now underway to assess the environmental impacts of recreational park use by dogs and humans (Perkins 2000). As the ecological effects of humans and canines increase, the district claims that it is reviewing existing dog laws, and will be coordinating processes to assess and modify the dog ordinances accordingly (Wilson 2000).

While many environmental groups and park managers support the closure of ecologically sensitive zones to off-leash dogs, some animal-rights groups and dog-owners object that dog-exclusive zones and leashing mandates compromise the recreational value that the parks should hold for people and their pets (Fimrite 2000). The subject has become a hot topic in Bay Area

park management; controversies over dog ordinances in Redwood State Park, Fort Funston, Lake Merritt, Point Isabel and Lake Anza are currently in debate (Durgerian 2000).

The EBRPD allows dogs to run free in open space and other undeveloped areas (defined as “un-posted and unpaved trails or open space areas that are separated from developed areas by a distance of at least 100 yards or by fences”), provided they are under the owners’ control at all times (EBRPD 2000). Dogs must be leashed on lawns, in developed zones, and in areas posted for leashing. They are not permitted in wetlands, marsh areas, resource protection areas, nature study zones, or other areas specified by the Board, due to the sensitivity of these habitats and to the presence of endangered or threatened species (EBRPD 2000). The Berkeley Meadow, which fills in the winter with small ponds, has been described as a seasonal wetland (Fujii 2000), but it is also currently considered an undeveloped area by the EBRPD (Tong 2000). The Berkeley Meadow’s status as an off-leash, on-leash, or dog-exclusive zone is thus currently subject to the interpretations of park users.

Methods

Objectives This study was designed to evaluate the potential of the undeveloped Berkeley Meadow to serve as an off-leash dog zone in consideration of current wildlife utility, and to analyze the efficacy of the off-leash dog policy in the neighboring, developed César Chávez Park. These objectives were addressed with the following questions: How do the two parks compare in terms of current use by dogs, people, and wildlife? How many of the dogs are off-leash, and how might this affect the quality of wildlife habitat? How frequently does a dog's presence result in the disturbance of wildlife? How effective is the PNA in César Chávez Park at protecting wildlife habitat? Are there significant differences in the uses of the East and West sides of the Meadow by wildlife, dogs, and people?

The assumption was made that the abundance of raptors and egrets, at the top of the trophic chain, are indicators of the overall wildlife abundance of an area. Data on the quantities and activities of raptors, egrets, dogs, and humans were collected to evaluate the comparative space utilities of the two parks.

Study Sites The study was conducted in the undeveloped Berkeley Meadow of the future Eastshore State Park, as well as in the adjacent, developed César Chávez Park, located on the Berkeley Marina about 400 m from the Meadow. The frequency of dog-induced wildlife

disturbances is contingent upon the abundance of wildlife, so the appraisal of dog-wildlife interactions in both parks includes quantifications of both dog behavior and wildlife presence.

Three observation sites were chosen for data collection: one on the West side of the Berkeley Meadow along the main gravel trail that cuts through the plot, one on the East side of the Meadow along a smaller dirt trail, and one in César Chávez Park along a dirt trail that marks the boundary between the 17-acre OLDA and the 7-acre PNA.

Data Collection Each of the three sites was observed for a 30-minute time slot on days of observation. Data were collected between November 2000 and March 2001. Site order was rotated within the same 2-hour observation time block to minimize variations in dog and wildlife data due to the time of day. Observations of dogs were taken discreetly to diminish the effects of the observer's presence on dog-owner behavior. This was accomplished by displaying the bird-watching materials (binoculars, bird book, bird data sheets) and concealing the dog-data sheets from human park users.

Human and canine park users were observed along 100-meter transects of trail at each of the three sites. Data collected for the quantification of dog activity includes the numbers of people and dogs who pass each site per observation interval, leash status of dogs, frequency of dog deviations from the trails, whether deviations are induced by the dogs themselves or by humans (i.e. throwing a ball), the dog's approximate deviation distance from the trail, vocal control of the dog by the owner (recorded as the number of times the owner calls the dog before the dog returns to the trail), and whether the dog's presence results in a wildlife flush (defined as the displacement of wildlife from its original location in response to a perceived threat by a dog). In César Chávez Park, it was also noted to which side of the trail a dog deviates --to the OLDA or to the PNA.

In addition to exploring the use of the Meadow by dogs and humans, quantification of the use of the space by wildlife was attempted through raptor and egret counts. These animals were chosen because they are generally easy to see, and because they are at the top of the trophic chain. Raptors eat rats, mice, gophers, rabbits, squirrels, small birds, voles, and snakes. Egrets eat frogs, fish, and insects. The presence of raptors and egrets, therefore, may indicate overall wildlife abundance in an area.

Raptors and egrets were counted within a cylinder of sky with a radius of 100 meters, whose axis extends vertically into the sky from the observation site on the ground. To avoid

pseudoreplication of bird counts, multiple individuals were noted only when they appeared together. For example, a harrier that sweeps through the bounds several times during the observation period would be noted each time it passed, but recorded as only one harrier under "Minimum Individuals Present." Bird activity (foraging, roosting, flyover, etc.) was recorded for each predatory bird. Species recorded include Northern Harrier, White-tailed Kite, Red-tailed Hawk, American Kestrel, Owl, Cooper's Hawk, Red-shouldered Hawk, Great Egret, and Snowy Egret. Vultures were not included.

Observations were collected between November 2000 and March 2001. Two volunteers from the Golden Gate Audubon Society helped to collect data between January and March.

Statistics for Data Analysis All statistics were computed using JMP IN software (1996). Unequal variances of data were equalized using either log transformations or Welch ANOVA, in which data are weighted by the reciprocals of estimated variances.

To compare raptor, egret, human and dog activities **between parks**, data from Sites 1 (N=17) and 2 (N=17) were pooled to calculate overall means within the Meadow (N=34). These figures were compared with raptor and egret data from Site 3 in Chávez Park (N=18) using the two-tailed non-paired t-test for differences between means.

To compare raptor, egret, human and dog activities **within the Berkeley Meadow**, data from Site 1 (N=17) were compared with those from Site 2 (N=17) by performing the two-tailed non-paired t-test for differences between means.

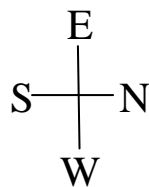
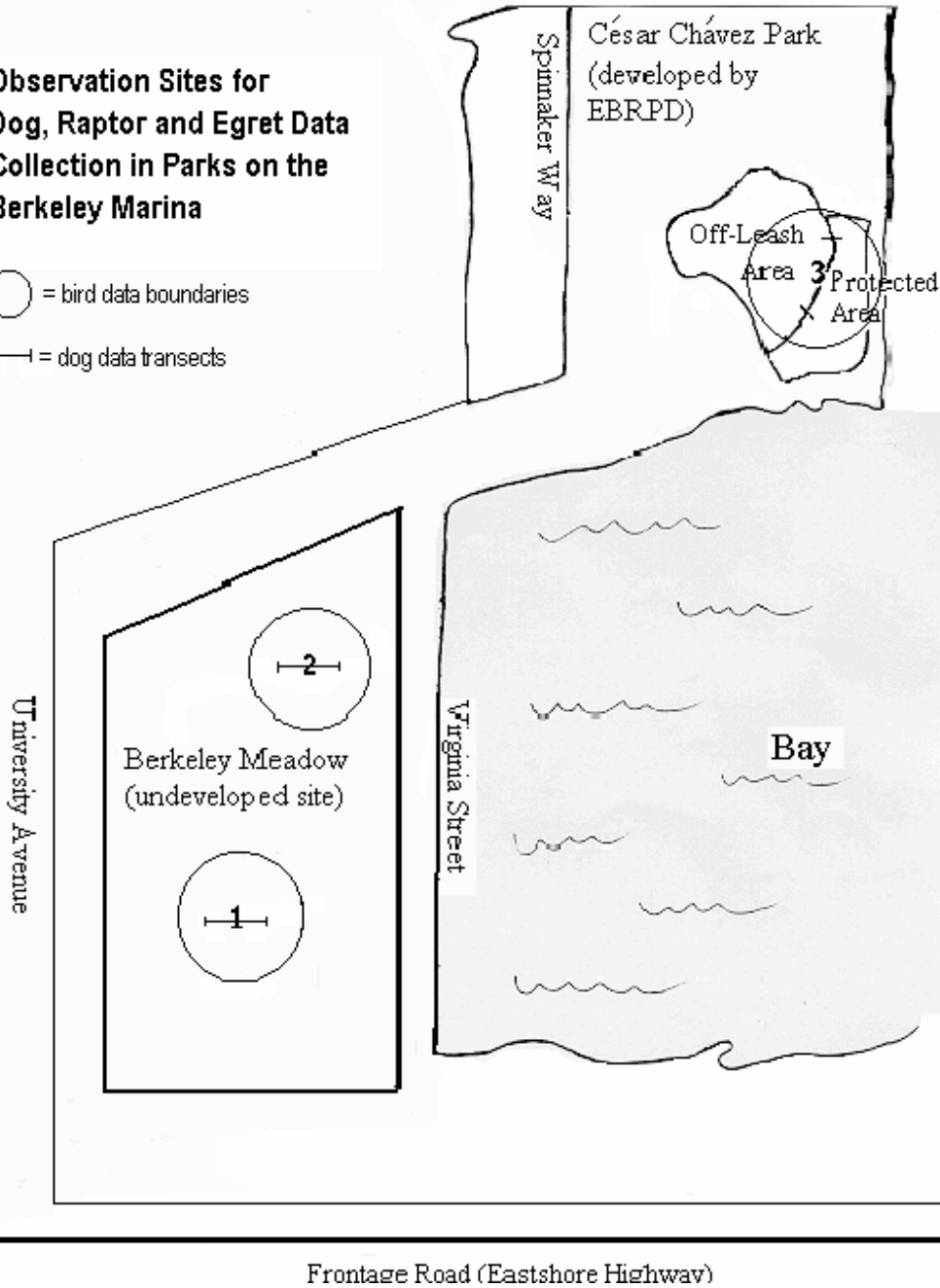
To analyze the data concerning the sides of the trail to which dogs deviate in Chávez Park, only the observations taken by the author (and not the Audubon volunteers) were used. Each dog represented an independent data point. Dogs who deviated to both sides of the trail were excluded from the statistical analysis. The Chi-Square test was used to evaluate the equivalency of frequencies of deviations to the two (protected vs. off-leash) sides of the trail.

Flush frequencies at each site were compared using two-tailed ANOVA.

**Observation Sites for
Dog, Raptor and Egret Data
Collection in Parks on the
Berkeley Marina**

○ = bird data boundaries

— = dog data transects

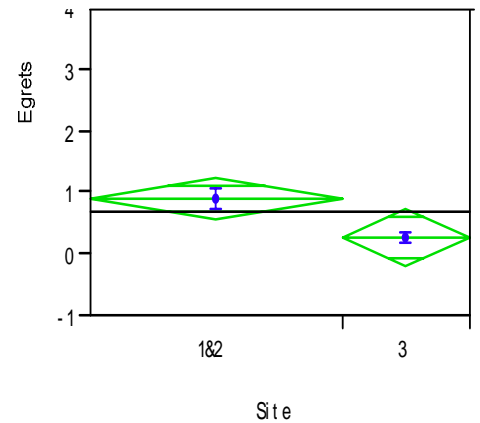
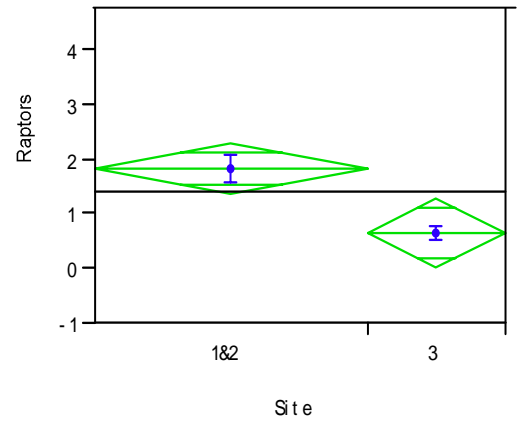


Results

All results were calculated with N=17 samples per site.

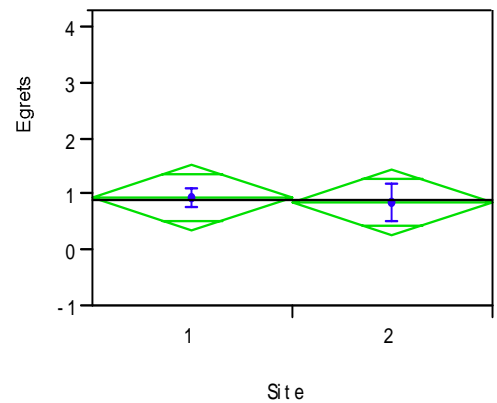
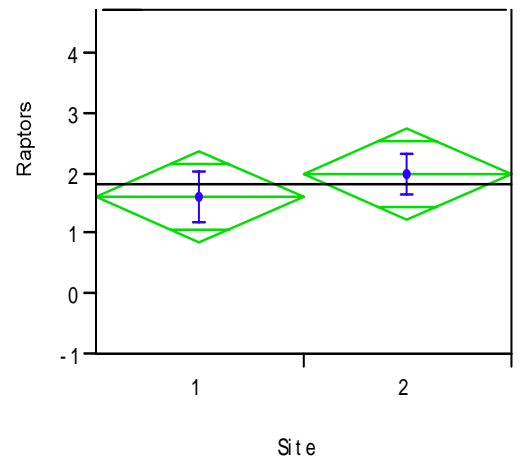
Raptor / Egret Comparisons Between Parks

- The mean raptor count during each 30-minute observation period was three times higher in the Berkeley Meadow (1.8 +/- 0.2 se) than in Chávez Park (0.6 +/- 0.3 se; $p < .01$).
- The same trend held for egrets. The Meadow supports about three times more egrets per observation period (0.9 +/- 0.2 se) than does Chávez Park (0.3 +/- 0.3 se; $p < .05$).



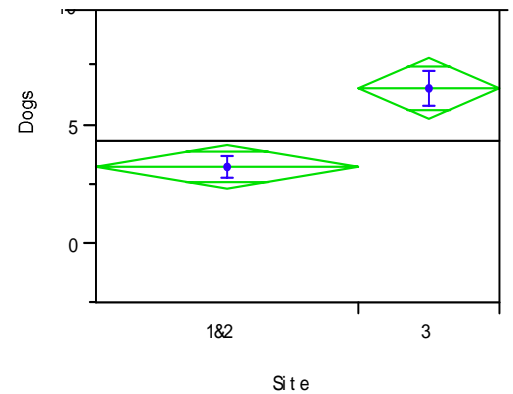
Raptor / Egret Comparisons Within the Meadow

- There was no statistically significant difference in mean raptor counts at Sites 1 (1.6 +/- 0.4 se) and 2 (2.0 +/- 0.4 se; $p > .52$) within the Berkeley Meadow.
- Neither was there a significant difference in egret counts between Sites 1 (0.9 +/- 0.3 se) and 2 (0.9 +/- 0.3 se; $p > .89$).

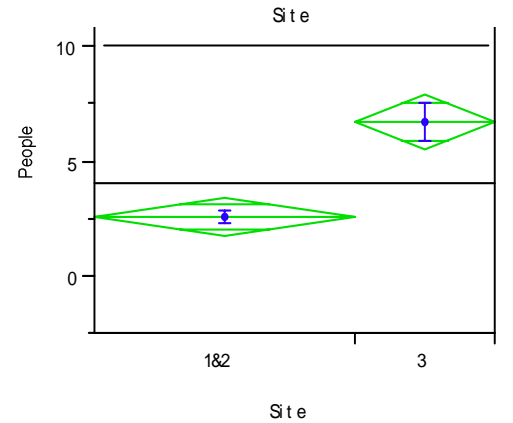


Dog / Human Comparisons Between Parks

- There were twice as many dogs in Chávez Park (6.6 ± 0.7 se) as in the Meadow (3.3 ± 0.5 se; $p < .01$).

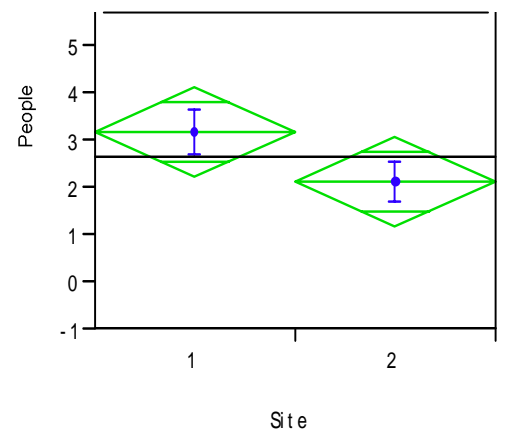


- There were 2.5 times as many people in Chávez Park (6.7 ± 0.5 se) as in the Meadow (2.6 ± 0.6 se; $p < .01$).

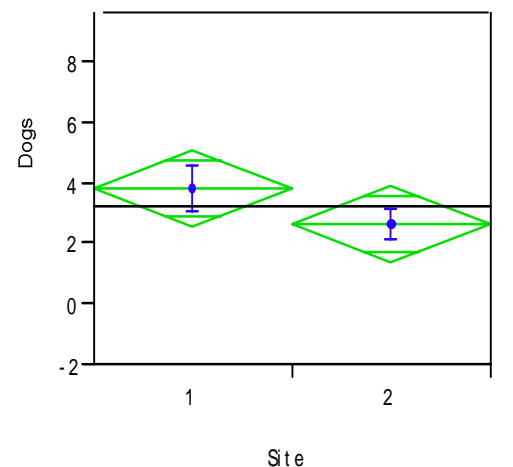


Dog / Human Comparisons Within the Meadow

- There were no statistically significant differences in numbers of people who passed by Site 1 (3.2 ± 0.5 se) and those who passed by Site 2 (2.1 ± 0.5 se; $p > 0.12$).

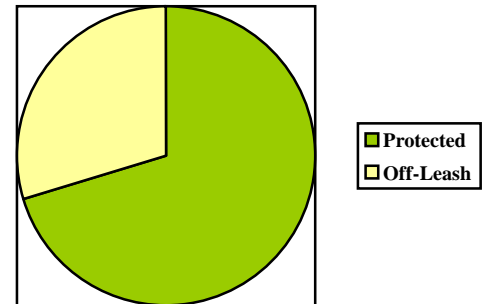


- Neither was there a significant difference in numbers of dogs who passed by Site 1 (3.8 ± 0.7 se) and those who passed by Site 2 (2.7 ± 0.7 se; $p > 0.24$).



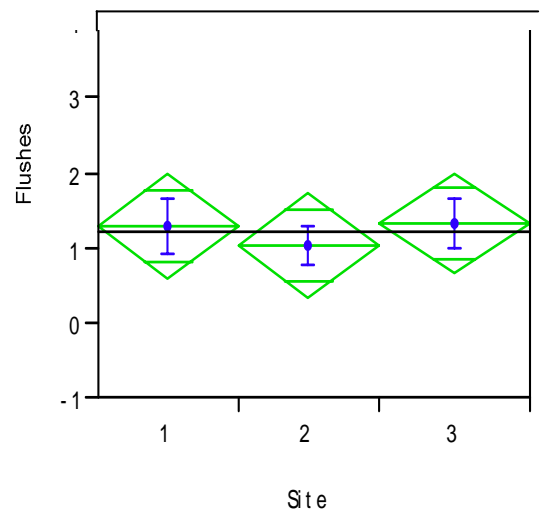
Deviation Sides In Chávez Park

- More than twice as many dogs deviated to the protected side of the trail as to the off-leash side of the trail in Chávez Park. Of 37 one-sided deviations, 11 were to the Off-Leash Dog Area and 26 were to the Protected Natural Area. This is a statistically significant difference ($p < .01$).



Flushes

- There were no statistically significant differences in the mean numbers of total flushes per 30-minute observation interval between sites ($p > .83$).



Discussion

Flushes A wildlife flush is defined for this study as the movement of a wild animal away from its original location in response to a perceived threat by a predator. Existing information suggests that there is a definite relationship between the frequency of dog-induced wildlife flushes and overall wildlife health. One study shows that the behavior of prairie dogs is affected by the presence of domestic dogs (Bekoff 1999). Another investigation shows that dog depredation can have serious detrimental impacts on local concentrated nesting bird populations (Jones & Stokes 1977). A study of the reactions of marmots to various forms of hiking tourism showed that free-running dogs and dogs with long leashes provoked the severest marmot flight reactions (Mainini 1993). Data collected by observational census on bird flushing by dogs at Hoffman Marsh (Soluri 1994), and similar data collection based around tidal patterns in the Point Isabel Regional Shoreline (Gill 1994), indicate that dog-induced shorebird flushes, though infrequent, do occur, and may be detrimental to declining bird populations. A study of dog-induced wildlife disturbances in Colorado concluded that while some dogs go off trail and sometimes disturb wildlife, the damage caused by dogs is small in comparison to that caused by humans recreationally using open space (Bekoff 1997). Moreover, the negative impacts of recurrent flushes on wildlife may include decreased fertility, degraded health, increased stress, inefficient energy expenditure, and lowered capacity to survive and reproduce in a particular habitat.

This study explores the effects of dog density and wildlife abundance on the frequency of dog-induced wildlife flushes. A report prepared for the California Department of Fish and Game found that dog harassment of wildlife is opportunistic, and is associated with the concentration of wildlife in a given area (Jones & Stokes 1977). My results agree with this hypothesis, suggesting that dog-induced wildlife flushes are a function of (a) dog / human densities, and (b) wildlife concentration (as indicated by raptor / egret abundances), among other variables.

Total flushes per observation interval were statistically equivalent at all three sites. In Chávez Park, however, there are at least twice as many people and dogs, and about a third of the wildlife, as were observed in the Berkeley Meadow. Therefore, I extrapolate that more flushes per unit *wildlife* occur in Chávez (most of the few wild animals that utilize the area are disturbed by dogs, but most dogs do not disturb wildlife); and more flushes per unit *dog* occur in the Meadow (many dogs disturb wildlife, but a smaller percentage of wildlife is disturbed by dogs).

If the Meadow were developed to permit off-leash dogs, we could probably expect the densities of dogs and people in the park to increase to levels similar to those in Chávez Park. Since there are about twice as many flushes per dog in the Meadow as in Chávez, and twice as many dogs in Chávez as in the Meadow, doubling the numbers of dogs in the Meadow would probably result in a quadrupling of dog-induced wildlife flushes.

Park management This study was designed to assess the impacts that off-leash domestic dogs have on wildlife in both developed and undeveloped parks on the Berkeley Marina. What emerged, however, is a rough sketch of the complex dynamics affecting wildlife utility of open space, encompassing many more variables than the presence of dogs alone.

The two parks, the Berkeley Meadow and César Chávez, are virtually identical in origin. They both were created out of the mound of landfill that sits in Berkeley's bay water; both were contained and covered with soil between the 1960's and 1980's. Thus, neither area represents endemic wildlife habitat nor hosts healthy populations of native vegetation. The presence of wild animals in these compromised habitats indicates that they have migrated there and have adapted to survive on the resources that currently exist in the parks.

Chávez park is used by many more people and dogs than the unmanaged Meadow; this is probably one factor influencing low wildlife populations. Another probable limit on wildlife abundance in Chávez Park is its lack of vegetative cover. The small Protected Natural Area, which hosts a handful of coyote bushes and knee-high weeds, may provide sparse refuge for some red-winged blackbirds, a whimbrel, and a lone Northern Harrier that forages along the shoreline bordering this section of the park. None of the raptors or egrets whose presences were recorded for this study were seen outside of the designated wildlife area.

The PNA does not appear to be enforced by park management. It borders the high-use OLDA, but there are no physical barriers between the two areas. The signs reading "Leaving Off-Leash Area" and "Entering Protected Area" are very small, widely spaced, faded, and inconspicuous. My data indicates that nearly twice as many dogs deviate to the protected side of the trail than onto the off-leash side. Not once during my observations did an owner demonstrate awareness of the prohibition of dogs and humans in the PNA. It seems to me that this is not because dog owners intentionally disobey the park rule or hold it in contempt; rather it appears that very few park users know that the Northern side of the trail is supposed to be protected.

Within the Berkeley Meadow, the wildlife is noticeably more abundant and active than in Chávez. During observations I have seen a myriad of small birds, jackrabbits, gophers, ground squirrels, voles, frogs, and a snake, in addition to the raptors and egrets I recorded. There are also several encampments of homeless people who appear to reside in the Meadow by night. Bikers, bird-watchers, joggers and dog-walkers navigate the narrow trails that wind through the plot. From my conversations with them it seems that many users of the Berkeley Meadow prefer it to Chávez Park because it has a "wilder" feel, more vegetation and more animals.

Around February, with increased precipitation, depressions in the Meadow began to fill with rain, creating a series of seasonal ponds that attract frogs and the egrets that feed on them. This, along with taller vegetation in the Meadow, probably explains the substantial difference in egret abundances between the two parks. In late January, a community of Great Egrets appeared in the soggy brush of the Meadow; later in the season we began to see yellow-footed Snowy Egrets as well. A large white-tailed kite, which is a California Fully Protected Species (LSA 2001), occupies the Northwest corner of the Meadow. A pair of American Kestrels are sometimes seen roosting in the coyote brush. A handful of Northern Harriers, a California Species of Special Concern (LSA 2001), regularly forage over both the East and West sides of the Meadow. A Cooper's Hawk and a Red-Shouldered Hawk have been seen residing in the trees near the center of the Meadow.

I collected data at two points in the Meadow because I reasoned that if one side was clearly utilized more by wildlife than the other, management should be biased toward the protection of the more wildlife-rich side. The differences between the East and West sides of the Meadow, however, are hard to quantify.

While human, dog, raptor and egret counts at the two sites are statistically equivalent at <95% confidence, the East side (Site 1) showed higher averages of all four variables at <75% confidence. The Northern Harriers were more often seen on the East side of the Meadow. The West side, on the other hand, encompasses the territory of the White-Tailed Kite, which does not seem to cross to the East side frequently. A sacrifice of either side of the Meadow to habitat-destructive management is likely to result in the loss of a significant proportion of the existing wildlife. More research would be necessary to designate an area of the Meadow that is least used by wildlife.

The dog-versus-wildlife controversies that are dividing dog owners and conservationists in the Bay Area seem to indicate a sharp conflict of interest. While 34-41% of the dogs passing through the Meadow caused wildlife flushes, the majority did not; there was a sharp distinction between those pets that were well controlled by their owners and those that were not. In Chávez Park, only 20% of passing dogs caused wildlife flushes, probably as a consequence of less wildlife at that site.

Most of the dog owners I talked with during this study seemed equally concerned with the preservation and welfare of wildlife as with the health and recreation of their pets. Many expressed an appreciation of the "wild" dynamics within the Meadow, often inquiring about the raptors I have seen and sharing their own wildlife observations with me. Some worried that the Meadow would end up as inhospitable to wildlife as Chávez when management plans are implemented; others said that their dogs preferred to roam in the weeds, where animals and heterogeneous terrains entertain them. The vast majority of dog-owners seemed willing to comply with regulations that would protect the integrity of the wildlife habitat, as long as their freedom to enjoy the area would not be too severely impeded.

Limitations A major shortcoming in this study was my inability to conclude what effect the presence of *dogs alone* has had on wildlife populations. I was unable to find quantitative data from public or private sources on the wildlife that inhabited César Chávez Park *before* the dog zone was implemented in May 2000; it seems to me that the data does not exist or is not available to the public. The significantly lower raptor / egret abundance in Chávez (as compared to the Meadow) is probably the result of many management decisions, including the designation of the off-leash dog zone. I cannot, however, estimate the extent to which the presence of dogs has impacted wildlife abundance in the PNA without comparative data from an earlier date.

Likewise, the lack of baseline wildlife abundance data for the Meadow limited my understanding of how wildlife dynamics have changed throughout its history. A man who I frequently met strolling through the plot told me that he's been walking there for 15 years, and he has seen a marked decline in wildlife over that time. Though I cannot conjecture the change in wildlife utility of the Meadow over time from this study, the *current* relative abundance of wildlife in the Meadow as compared to Chávez indicates that it is a significantly more hospitable wildlife habitat. This effect may be a consequence of fewer people and dogs, and more wild (albeit invasive) vegetation, than in the developed park.

It is probable that the raptor counts presented in this study for the Berkeley Meadow are underestimates due to the measures taken to avoid pseudoreplication. In the relatively wildlife-abundant Meadow, unique individuals of a particular species seen at separate times would have been recorded as single animals in the "Minimum Individuals Present" parameter. I doubt, however, that the raptor and egret abundance data from Chávez Park underestimates the true numbers of individuals present, as low wildlife abundance and easy visibility made it easier to distinguish between distinct individuals in that area. As a result, I suspect that the difference in wildlife abundances between Chávez Park and the Meadow is even greater than that indicated by the results presented in this study.

Though I recorded data on the approximate deviation distances of dogs from trails, man vs. dog induction of deviation, and relative vocal control of dogs by owners (determined by the number of calls before dog returns to owner), I did not statistically analyze these data because the parameters were too uncertain. Quantification of dog and owner behaviors proved to be difficult.

Management Recommendations Given the limited scope of this study, I will submit my recommendations for the management of the Berkeley Meadow and for the reevaluations of the Off-Leash Dog Area and the Protected Natural Area in César Chávez Park. Though the two parks are managed by different agencies (Chávez by the City of Berkeley Department of Parks and Waterfront; the Meadow by the EBRPD), the management plans of the two parks could be linked.

The management regime of César Chávez Park is due for reevaluation soon: May 2001 marks the end of the one-year OLDA / PNA trial period, and there is speculation over the possibility of Chávez Park's future integration with Eastshore State Park. Today, the highly visited area serves primarily as a recreational space for humans, their hobbies, and their pets. Whether or not it hosted more wildlife in the past, the Northern side of Chávez Park has little habitat value today. The PNA is poorly enforced, very ineffective, and serves little use to wildlife due to its relatively small size. Additionally, the PNA sees high levels of disturbance by humans and dogs due to the lack of a buffer zone or other conspicuous demarcation between itself and the OLDA. Furthermore, the island biogeographical effect, caused by the protected area's small size and large distance from source wildlife populations, yields very low biological utility (Smith 1998). As the OLDA and the PNA complete their trial year in Chávez Park, I

strongly recommend the acquisition of the PNA for the expansion of the OLDA (with the appropriate considerations for erosion control). I feel that the added benefit of expanded space for off-leash dogs would overshadow the loss of tenuous wildlife cover. The PNA could also be revegetated with robust native plants. This variation in landscape could increase the enjoyment of the park for dogs and their owners. Emphasis on the area's vegetative, rather than wildlife, habitat utility could encourage users of Chávez Park to appreciate the value of restoration without feeling that its success is contingent upon their exclusion.

This concession may ease conflicts between dog-walking and conservationist user groups, if presented in conjunction with the protection of the Berkeley Meadow as wildlife habitat. The area currently provides food and cover to a diverse community of raptors, shorebirds, small birds, rodents, and insects. Bird-watchers and other recreational users enjoy the presence of seasonally fluctuating animal populations. This park may optimize public enjoyment as a wildlife refuge, prohibited to all off-leash dogs (unless there is an effective means of testing and identifying the well-controlled dogs that do not disturb wildlife). Encouragement of the growth of native vegetation could enhance the habitat value of the Meadow.

Additionally, my data shows that 85% of all dogs currently passing through the unmanaged Meadow are off-leash (in comparison with 94% in Chávez). To avoid the further degradation of wildlife health in the Meadow, I recommend the posting of "Dogs On Leash" signs in the interim between the present and the implementation of the final park plan in October 2002. Wildlife data should be collected throughout the process to monitor changes in the use of the area by wildlife, and interim management strategies should be modified as necessary to ensure the integrity of wildlife habitat.

Future studies related to the wildlife dynamics of the two parks could include: the sustained monitoring of animal activities, analysis of the comparative uses of areas of the Meadow by animals, investigation of rodent abundances and behaviors, study of the effects of invasive vegetation on habitat integrity, seasonal biological utility fluctuations within the Meadow, and polling of park users to evaluate public sentiments around issues of wildlife and social conflict.

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