



The Case for Quail Reintroduction, Section 1: Benefits
Articulating the benefits, outcomes, and long-term strategy for a
sustainable reintroduction plan for California Quail in the Presidio

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Section I:

Benefits of a California Quail Reintroduction

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History of the Project

SFEI has worked with the Presidio Trust on two previous phases of the urban quail project. Phase I and II of SFEI's work with the Presidio provided compelling evidence that a reintroduced population would likely persist for some time, given the park's low extinction probability. Phase II also supported the need for a translocation effort for quail, given that the Presidio has a low chance of natural colonization as quail are unlikely to cross the Golden Gate, and given isolation from source populations of quail in wildland areas to the south of San Francisco (Iknayan et al. 2022). Based on analyses of urban quail populations throughout the state, these initial two phases provided a suite of management recommendations to improve a park's support of quail: improvement of the surrounding urban matrix, removal of impervious surfaces within the park, increases in shrub cover, and promoting the presence of coyotes – for their deterrence of mesopredators. The Presidio has become more supportive for quail since their extirpation: habitat restoration has increased the park's overall shrub cover, coyotes have returned to the park, and the new habitat bridge has increased both the park's connectivity and overall habitat area.

To go from the foundational information provided during the first two phases to an active reintroduction program requires first generating support and enthusiasm, as well as overcoming skepticism, among the key stakeholders to ensure success. In this report, we articulate why reintroduction makes sense, what it could achieve, and what the likely outcomes will be. We describe the potential benefits of a reintroduction program which include: mental and physical health benefits to residents and visitors, increased community engagement, increased investment in conservation through volunteerism, fundraising, and visitation, and benefits to the Presidio's ecosystem and urban conservation as a whole. We also present a summary of the methods and approaches through which the benefits of the quail reintroduction program can be quantified. In Section II, we present a population viability analysis of a quail reintroduction in the Presidio and formal recommendations resulting from the analysis.

Benefits to Residents:

Mental Health and Well-being Benefits

Sense of Place

Native species can be critical ecosystem features that contribute to a sense of place for both residents and visitors in natural spaces. Sense of place is the combination of all place-based experiences (including sights, stories, feelings, and concepts) through which a person's sense of identity and belonging becomes attached to the local environment (*adapted from* Ryfield et al., 2019, *citing* Van Noy, 2003). Sense of place is increasingly considered as a cultural ecosystem service (Williams and Kitchen 2012; Hausmann et al. 2016), which can be provided to people as they participate in activities within an ecosystem, such as swimming, walking, or bird watching. Sense of place is also one of the critical dimensions of human well-being (Russell et al. 2013) in which contact with nature and wildlife provides an irreplaceable enhancement to quality of life (Maller et al. 2006; Abraham et al. 2010; Russell et al. 2013). Additionally, sense of place is linked to many facets of psychological and physiological health and well-being (Williams and Kitchen 2012; Hausmann et al. 2016) such as lower stress and anxiety (Leather et al. 1998; Lohr and Pearson-Mims 2006), improvements in mood (Maller et al. 2006), and promotion of physical healing and recovery (Ulrich 1984). These effects can be found regardless of socioeconomic status (Williams and Kitchen 2012) and can be particularly important for urban residents, who are more isolated from natural experiences (Cox et al. 2018).

In addition to the general contributions of native species to a sense of place, there is evidence that avian species are particularly important in maintaining local residents' connection to their natural environment. Human encounters with birds are overwhelmingly positive (Methorst et al. 2020), and it is expected that encounters with newly reintroduced quail would have the same positive reception. Avian richness can foster strong place attachment (Fuller et al. 2007), and studies of urban residents in Australia and Canada have shown that perceived bird diversity and species richness are strong predictors of residents' satisfaction with their neighborhood (Luck et al. 2011; Hepburn et al. 2021).

The qualities and characteristics of California quail indicate that, if reintroduced, it would likely maintain and enhance a sense of place for visitors to the Presidio. Species are likely to become a component of sense of place if: (i) the species is native and endemic to the natural environment; (ii) it has been embraced or endeared by residents through social and historical processes; and (iii) visitors and residents have the opportunity to experience and interact with it (Horwitz et al. 2001; Forristal et al. 2014). California quail meet all three of these criteria: they are a charismatic, native species that are highly visible and vocal (Calkins et al. 2014). Further, as the state bird of California, the quail has been embraced by both residents and visitors as a hallmark of natural spaces in the state. Charismatic species, relative to less visible wildlife, are

more likely to elicit a sense of attachment (Martín-López et al. 2007; Kaltenborn et al. 2020), bolster well-being (Bryce et al. 2016), and raise levels of self-satisfaction in people (McGinlay et al. 2017). Watching birds—particularly bird species that are well-known, recognizable, and attractive—also engenders stronger connections to nature (Cox and Gaston 2015; Cox and Gaston 2016; Brock et al. 2017). Encounters with urban wildlife in “backyard” settings can be equally as beneficial for human well-being as sightings of exotic or rare wildlife (Curtin 2009), underscoring the potential value of San Francisco residents interacting with quail in an urban park such as the Presidio.

Restorativeness and Other Emotional Benefits

Quail, if reintroduced, are likely to provide mental health benefits beyond the enhanced place attachment and sense of place discussed above. Surroundings with more bird species are linked to tangible mental health benefits for visitors to urban green spaces (Fuller et al. 2007; Cox et al. 2017). Bird song is a particularly important contributor to the *restorative potential* of urban natural environments (Alvarsson et al. 2010; Ratcliffe et al. 2013; Ratcliffe et al. 2016). Restorativeness, critical to human mental health, is the potential of a place to replenish the mental bandwidth required to direct or sustain attention, emotional connection, or engagement over an extended period (Kaplan and Kaplan 1989; Ratcliffe et al. 2013). Exposure to natural sounds, including bird song, can evoke faster recovery from stressful events (Alvarsson et al. 2010; Medvedev et al. 2015). While perceptions of bird sounds are a strong driver of feelings of restorativeness, this effect can vary by bird species (Ratcliffe et al. 2013). Bird sounds that are more associated with natural areas, rather than species that are encountered in the day-to-day urban environment, tend to be more restorative (Ratcliffe et al. 2013; Ratcliffe et al. 2016), which makes quail a good candidate for restorative potential if reintroduced and observed in the Presidio.

Avian richness, diversity, and abundance can also have tangible benefits for park users' overall emotional well-being. Greater perceived avian species richness and overall biodiversity are linked to greater happiness in park users (Cameron et al. 2020), and perceived bird abundance is associated with reduced levels of stress, anxiety, and depression (Cox et al. 2017). Notably, park users' perceptions of biodiversity may not be consistent with true species richness or diversity (Cameron et al. 2020). However, we would reasonably expect California quail—a bird that is highly social and vocal, active during the day, and rears young in large groups (Calkins et al. 2014)—to enhance perceptions of biodiversity in residents and visitors to the Presidio.

Benefits to the Place

Conservation Engagement Through Reintroductions

Community involvement is an important aspect of reintroductions, both in generating support for the project and in the reintroduction's ability to increase local conservation engagement. Local engagement and participation in reintroduction projects are important to the project's success, and pushback can occur when community stakeholders are not involved in the reintroduction (Coz & Young, 2020, see box 1.1: *Benefits of Community Engagement*).

There have been several instances of successful urban reintroductions with extensive community support (van Heezik and Seddon 2018; Mata et al. 2020). Reintroduction of quail, a publicly well-loved species, is likely to have high levels of community support. With community support of reintroductions comes conservation engagement which can provide a larger volunteer workforce and more engaged citizen scientists. The urban reintroduction of the Peregrine Falcon, for example, led to increased interest in falcon conservation (Holroyd & Bird, 2012). The reintroduction of quail is also likely to increase public engagement in environmental and wildlife conservation—iconic bird species are often valued by the public specifically because they attract interest in conservation issues (Ainsworth et al. 2018). With early, thoughtful community engagement, reintroduction of quail in the Presidio, will likely increase regional interest in environmental conservation.

Investment in Conservation: volunteerism, fundraising, and park visitation

The Presidio can also reasonably expect a greater amount of engagement through volunteerism associated with a quail reintroduction program: conservation of charismatic species is a strong motivator for volunteers (Campbell and Smith 2006; Lorimer 2009), and single-species conservation programs draw the majority of volunteers (Lorimer 2009). A positive feedback loop further exists between volunteering and conservation. Volunteers tend to develop a deeper attachment to the local natural environment (Ryan et al. 2001), and they reap the same emotional and physical benefits that a stronger sense of place tends to manifest (Husk et al. 2016 May 21). In turn, this increased attachment drives an increased investment in protecting the local environment (Andersson et al. 2007; Brehm et al. 2013).

Box 1.1. Benefits of Community Engagement: Lessons from Beaver Reintroduction in Scotland



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Other urban and semi-urban reintroductions can offer a blueprint for best practices in community engagement. In one case study, the Eurasian Beaver (ecosystem engineers which majorly modify the landscape) was reintroduced to three towns in Northern Ireland in 2008 after being extinct for 400 years. In the town of Knapdale, the reintroduction was planned, science-led, with a prepared public narrative established prior to the release of beavers. In the other two towns, Tayside and Highlands, beaver release was unplanned or illegal without prior narrative development or engagement. A scientific study of these reintroductions interviewed several residents and local experts; one such interviewee provided this statement on the different reintroductions:

“Knapdale was essentially a scientific-led project that was kind of well-researched. It had that stakeholder buy-in. And, you know, it kind of involved the community [...]. Whereas in Tayside, it almost feels that one day landowners woke up and... beavers were back, there'd been no consultation, there'd been no engagement and I guess landowners, land managers were just left to deal with the issue with very little support, guidance, even funding to do that.” (Coz and Young 2020).

The reintroduction of beavers in Knapdale was successful because of early, planned community engagement. Key elements of this early, extensive planning process included an **assessment of reintroduction feasibility**, an **acknowledgement of local knowledge and social context** for wild beavers, and **community surveys** assessing local desirability. The **first reintroductions occurred in small numbers**, so the initial presence of the beaver was not overwhelming to landowners. Conversely, the unsuccessful reintroductions in Tayside and Highlands were strongly influenced by unplanned and poorly managed community engagement.

The addition of quail to the Presidio is also likely to promote increased visitation and willingness for visitors to spend greater amounts of money. Wildlife viewing of charismatic species is a primary driver of park visitation (Kerley et al. 2003; Lindsey et al. 2007; Di Minin et al. 2013), with more biodiverse parks attracting a greater number of visitors (Arbieu et al. 2018). Greater bird richness is a factor in a visitor's choice of destination (Naidoo & Adamowicz, 2005; Steffens, 1999), monetary investment in conservation, and activities in conserved spaces. For instance, greater avian species richness is correlated with a willingness to pay higher dollar values for birding trips (Lee et al. 2010; Kolstoe and Cameron 2017).

As a visible, iconic wildlife species, reintroduced California quail could aid campaigns to enhance conservation donations, recreational payments, and real estate purchases in the

Presidio. Willingness to contribute financially to wildlife conservation increases with biodiversity (Martín-López et al. 2007), and native bird richness (Yao et al. 2014). Further, both iconic (Loomis and Ekstrand 1997) and charismatic species (Wilson and Tisdell 2004; Martín-López et al. 2007) tend to attract more conservation funds. Messaging around quail and conservation would likely be most effective at enhancing investment from groups already engaged with the Presidio through bird walks or frequent recreational use. Community engagement with native species and wildlife can also result in increased investment in conservation and public open spaces. Individuals who self-report high interest in natural spaces and wildlife are also more likely to contribute money to efforts that increase or enhance those green spaces (Caula et al. 2009). When exposed to information about birds and green spaces, these individuals are also more likely to increase their financial contributions (Caula et al. 2009).

Notably, demographics have a strong and varied influence on individual willingness to spend money on conservation activities. Independent professionals, managers, and teachers tend to have a higher willingness to pay than employees, workers, and students; a higher income equates to a higher likelihood of contributing financially (Caula et al. 2009). Adults with children are also more likely to contribute money to conservation than those without children (Caula et al. 2009).

Benefits to Ecosystem

The quail reintroduction program offers a unique opportunity to develop several scientifically based monitoring projects in parallel with the reintroduction itself. Galliformes are one of the most well-represented families in reintroduction efforts worldwide (Seddon et al. 2005). However, there is little to no information on the impact on ecosystems of restoring (or removing) Galliformes (World Pheasant Association and IUCN/SSC Re-introduction Specialist Group 2009). All suggested impacts have been hypothetical in nature. However, literature on the life history and habits of ground-dwelling and avian species can shed light on the potential ecosystem benefits of reintroduced quail. Quail, a ground-dwelling granivore, preferentially consumes non-native vegetative species (Mancilla-Leytón et al. 2015). While consumption may support seed dispersal, quail can be effective at eliminating seeds through digestion: only 30-54% of seeds that pass through the gut of the Common quail (*Coturnix coturnix*) typically remain intact (Mancilla-Leytón et al. 2015). Several members of the Galliformes order consume fungi and can spread beneficial spores through scat (Elliott et al. 2019). In addition, the ground foraging behavior exhibited by California quail has a number of potential benefits including improved water penetration, soil aeration, reduction of fire fuel loads, and overall soil health (Elliott et al. 2019). For example, the foraging behavior of the quenda (a ground-dwelling mammal reintroduced to urban parks in Australia) altered leaf litter, reduced fuel loads, and dispersed fungal spores (Ryan et al. 2020; Hopkins et al. 2021). The study developed for the reintroduction of the quenda also provides an excellent example of designing enclosure experiments for measuring the impacts of reintroduced ground-dwelling species. Beyond the direct impacts that quail may have on the ecosystem, there is substantial support that more diverse ecological communities are more resilient to stressors and more likely to be functionally

stable over time, a property known as the “portfolio effect” (Cardinale et al. 2012; Schindler et al. 2015).

Benefits to Urban Conservation

Reintroduction of quail into the Presidio has significant potential to advance the science around urban ecology and conservation in multifaceted ways. Precedents and relevant research for urban reintroductions are scarce. Beyond the reintroductions already performed in the Presidio (e.g., three-spined stickleback fish), there are just 19 well-documented, successful urban animal reintroductions (van Heezik and Seddon 2018; Miskelly 2018; Soorae 2018; Mata et al. 2020; Soorae 2021). Only 11 bird species have been reintroduced in urban areas globally: the peregrine falcon (Barclay and Cade 1983), osprey (Martell et al. 2002), Oriental pied hornbill (Cremedes et al. 2016), and eight endemic bird species in an urban preserve in Wellington, New Zealand (Miskelly 2018). Only four species of ground-dwelling, terrestrial vertebrates have been introduced: quenda (Ryan et al. 2020; Hopkins et al. 2021), kit fox (Bremner-Harrison et al. 2013), the Eurasian red squirrel (Vieira et al. 2015), and the little spotted kiwi (Miskelly 2018). However, there is growing recognition of the value of urban reintroductions (van Heezik and Seddon 2018), and there are a number of planned reintroductions in the works, for example, the European beaver and river vole are planned for reintroduction in London.

Urban reintroductions can provide models for restoring urban greenspaces to promote wildlife (van Heezik and Seddon 2018). Quail are struggling in urban parks in other regions in their range (Soulé et al. 1988; Crooks et al. 2001; Bolger et al. 2002). A reintroduction program offers the unique opportunity to understand the importance of different stressors in urban areas for this species and develop ranked priorities for addressing stressors. For example, this program can offer direct evidence of whether quail populations are food-limited, habitat-limited, or limited by mortality threats, such as predation or vehicle strike. Knowledge of these stressors and their mitigation would also benefit the conservation of other urban species, particularly ground-dwelling animals. Reintroductions into urban greenspaces can also have spillover effects. For example, the kaka parrot forages into residential areas of Wellington adjacent to the urban preserve where it was introduced (Miskelly 2018). Quail spillover would present a unique opportunity to better understand and improve urban connectivity for ground-dwelling species. Current knowledge for this set of species is limited to a handful of studies on European hedgehogs (Braaker et al. 2014; Balbi et al. 2019).

Potential Research Directions

Human dimensions of conservation are a growing area of research interest, and the Presidio has the opportunity to contribute to the current body of knowledge. Few reintroductions of extirpated native species have been carried out in urban environments, and while past research suggests that this practice should enhance sense of place and feelings of connection with nature for urban residents, experimental evidence is still lacking. California quail are a distinctive native species that is easy to observe and has minimal potential for human-wildlife conflict, and, as such, is a good test case. As the Presidio pursues quail reintroduction, there is an opportunity to evaluate the impact of seeing and hearing quail on sense of place for Presidio visitors, residents, and staff. This research could expand knowledge of how the reintroduction of small, charismatic native species in urban parks contributes to their provision of cultural ecosystem services.

The impact of California quail reintroduction on people within and surrounding the Presidio can be measured using both qualitative and quantitative methods (Gould et al. 2015). There are many different approaches available depending on the target audience and amount of time and money available for the investigation. To identify the best approach, it is important to clearly define goals. Engagement with residents or visitors could be used to (i) evaluate the potential benefits of quail reintroduction before it happens, as part of a decision-making process; (ii) understand the impact of quail reintroduction as a before-and-after comparison, to contribute to the scientific understanding of human dimensions of urban reintroductions; or (iii) characterize how benefits are derived in order to effectively plan ongoing management and communications, among other potential goals. The following section gives a non-exhaustive overview of potential approaches that could be used to address one or more of these goals.

Interviews and focus group discussions can be used to qualitatively assess the benefits of quail reintroduction. Specifically, semi-structured interviews with park visitors, park volunteers, residents, or staff conducted before and after reintroduction occurs can be applied to examine human-ecosystem interactions and how they have changed with the reintroduction, as well as perceived mental health and well-being benefits (Gould et al. 2015). In order to best conduct these interviews, they should be conversational, casual, and not contain jargon (Gould et al. 2015).

Quantitative data can be collected through surveys of residents, staff, or park visitors. Using multiple choice or short answer questions, surveys could be used to ask questions such as:

- Whether someone has observed quail in the park and how often
- To what extent people feel a sense of connection to place or personal restoration in the park
- How many visitors come to the Presidio for the purpose of birdwatching
- How interested people are in seeing quail in the park
- To what extent people believe the Presidio is responsible for protecting quail from local extirpation

Different questions will be most appropriate for different audiences and overall goals of engagement.

Map-based surveys and interviews can also be useful in identifying where on the landscape important cultural ecosystem services are provided, and this information can be used to target management or engagement efforts (Plieninger et al. 2012). For example, residents, staff, or visitors might be asked to circle on a map where in the Presidio they go when they want to relax or when they want to experience nature. Ideally, map-based surveys should be combined with narrative data to evaluate how these cultural ecosystem services are delivered by different locations (Ryfield et al. 2012).

Depending on the specific goals of a survey, different approaches will be more or less effective (Table 1.1). For example, to assess the effect quail may have on visitor sense of place pre- and post-reintroduction, intercept surveys may be a suitable approach. Staff could deliver printed questionnaires or conduct in-person surveys at key entrances, exits, and parking lots around the Presidio. Questions about quail reintroduction could be embedded in educational signage via QR codes linked to online forms (easily readable by most smartphones) to collect small amounts of data from many visitors with minimal effort. Online surveys aimed at the Presidio's existing audience could also be embedded in existing newsletters, blogs, and web pages. Surveys intended to reach broader audiences, beyond those individuals already visiting, living, or working in the Presidio, would be the best selection for estimating the effect of quail on new engagement, visitation, or enhanced willingness-to-pay. The survey distribution and delivery method will shape who is able and willing to respond, which will influence the data collected. For example, if only park visitors are surveyed, it will not be possible to understand why some people choose not to visit the park. If a survey is delivered online, those without internet access will be unable to provide their responses. If questions about quail are linked from an educational sign explaining quail reintroduction, respondents are likely to be more interested in quail than the average visitor, which might lead to more positive reported attitudes toward quail. Any of these approaches may be suitable depending on the goals of a survey, but care should be taken to choose the most effective approach for a particular goal.

Table 1.1. Potential methods of delivering a survey to obtain quantitative data on the perceived benefits of quail reintroduction.

Survey Type	Description	Possible Target Audiences	Biases and Challenges	Costs
Mail	Survey questions delivered in mail packet	Presidio residents, broader Presidio mailing list, nearby residents	Response biases towards interest in Presidio, birds, and quail	\$\$\$ (postage, printing, data entry)
Phone	Survey delivered via phone call	Presidio residents or staff, broader Presidio contact list, purchased list of SF resident phone numbers	Biased towards older demographics, households with landlines, people at home during the day. Requires a list of phone numbers	\$\$ (staff time or professional call center)
Online	Online survey delivered via email or website link.	Presidio residents or staff, broader Presidio email list, website visitors	Internet access needed, difficult to determine response rate and non-response bias unless using targeted email list(s)	\$ (webpage or survey design)
In-person intercept	In-person surveyor hands out surveys at discrete location in park	Park visitors	Only captures responses from current Presidio visitors	\$\$ (staff time, printing, data entry)
Online intercept	QR codes and web addresses for surveys can be placed on educational signage, maps, and fliers	Park visitors	Internet access and smart device needed, only captures responses from current Presidio visitors	\$\$ (staff time, website design)

Programmatic Ideas

There are many valuable precedents for tools and programs that could generate – and measure – engagement with a potential California quail reintroduction. Useful both within and outside a traditional scientific study design, these tools can measure levels of community engagement, attitudes about reintroduction, success of outreach materials, and potential ecological impacts of quail.

The Presidio has already developed and participated in multiple community science programs that could facilitate data collection and engagement post-reintroduction. Events like the City Nature Challenge and eBird Christmas Bird Count provide opportunities to have community scientists observe and record quail habits including specific plant use, habitat use, and nesting behavior. Metrics of overall engagement with existing community science programs pre- and post-reintroduction could reveal changes in program participation due to quail. A comparison study design between the Presidio and nearby urban parks, using community-collected ecological data, could also help fill gaps in scientific knowledge about urban quail populations and urban reintroductions more generally.

Box 1.2. Nest Camera Success: Peregrine Falcons on the San Francisco PG&E Building

Another group of commonly implemented engagement programs are camera traps and nest cameras. Online wildlife viewing can create a stronger emotional connection to a species, and conservation in general, than seeing the animal in person (Skibins and Sharp 2019). The PG&E Peregrine Falcon nest camera in San Francisco has generated immense viewership from the community, reaching more than 1.7 million viewers in April 2021 alone (Times-Standard 2021). The increased community attention has helped raise the profile of associated research groups, including the UC Santa Cruz Predatory Bird Research Group, which has partnered with PG&E to monitor nesting falcons since 2004.

“This nest has provided [a] deep connection with the peregrine-recovery story for people around the world,” Zeka Glucs, director of the UC Santa Cruz Predatory Bird Research Group said in a news release. “This nest and its webcam are the No. 1 personal peregrine encounter I hear about when I tell people what I do for a living, or give a presentation at a school or educational event” (Times-Standard 2021).



Credit: Craig Flatten, USFWS. License CC0

Community science and nest camera programs are well-suited to produce easily quantifiable metrics of engagement, viewership, and public perception of reintroduction activities (Correia et al. 2021). Data on internet search frequencies for key terms has been used to quantify community engagement with urban soundscapes, cultural ecosystem services, and iconic species (Ladle et al. 2016). Platforms such as Google Trends can be used to generate time-series datasets of species popularity and cultural relevance (Ladle et al. 2016). Such search term-based tools are well-suited to measure the impact of engagement programs including nest cameras, citizen science events, and social media campaigns.

Conclusion

This report outlines significant evidence that reintroduction of California quail will create direct benefits to the Presidio by increasing conservation engagement and investment, as well as promoting mental health and well-being for residents and visitors. A handful of precedents for urban reintroductions demonstrate that early community engagement and education are essential components of successful reintroduction campaigns. Given these precedents – and the potential for this iconic species to promote overall conservation engagement – next steps towards reintroduction should include plans for proactive community education and create opportunities for community input, when possible. Additionally, the scarcity of precedents for urban reintroductions of extirpated wildlife means this effort presents a unique opportunity to conduct novel research on reintroduction and associated impacts on urban ecosystems, conservation engagement, and sense of place. This report outlines multiple approaches for implementation of these varied research agendas and programmatic ideas. Final selection and development of a methodology for reintroduction and research will need to be guided by clearly defined goals, expected outcomes, and available resources.

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