COMMUNITY FORUM

QUESTIONS AND ANSWERS

CATALINA ISLAND CONSERVANCY™

Dear Catalina Island Community and Forum Participants,

Thank you for submitting your questions about the Catalina Island Restoration Plan, both prior to and during the Community Forum held on January 31, 2024. It is our steadfast commitment to address each query comprehensively, drawing upon scientific knowledge and providing relevant source material wherever feasible.

The volume of inquiries received was substantial, numbering in the hundreds, with several addressing similar themes. To streamline our responses and avoid duplication, we have combined inquiries where appropriate. Our aim is to furnish you with thorough and informative responses that address the spectrum of your questions.

Thank you for your continued interest and support in this critical endeavor.

Warm regards,

Whitney Latorre

Whitney Latorre
President & CEO, Catalina Island Conservancy

CATALINA ISLAND CONSERVANCY™

Answering Your Questions

Mule Deer Eradication and Alternatives 7
Deer Health & Population 12
Recreational Hunting 13
Community, Stakeholder, and Tribal Outreach 16
Legal and Permitting 19
Fire Management 21
Tourism Impact 22
Bison Health, Population and Management 23
Works Cited 24

*As we learn new content, some answers may change.

Island Restoration

1. **What does "restoration" mean?**

   "Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed." As explained by the Society for Ecological Restoration, "the goal of ecological restoration is to return a degraded ecosystem to its historic trajectory, not its historic condition." The Catalina Island Conservancy recognizes this and, with its Catalina Island Restoration Project, intends to "create the conditions needed for recovery so the plants, animals, and microorganisms can carry out the work of recovery themselves" on Catalina (Society for Ecological Restoration).

2. **What happens if Catalina is not restored, is it critical, and what are the expected outcomes? What are the expected impacts of climate change and weather fluctuations on restoration?**

   The restoration of Catalina Island is critical for the future of the Island's ecology. This is made even more crucial as the effects of climate change and uncertain weather patterns become more apparent. For the ecosystem to be as resilient as possible, it is important to ensure that all of Catalina's biodiversity is represented on the genetic, species, and landscape scale (Oliver, et al., 2015). Without restoration, Catalina Island is at risk of having the functions its ecosystem provides altered or deteriorated. The functions and services Catalina's plants provide include water capture, soil retention, and climate regulation, which are not only vital for Catalina's native flora and fauna, but also its human inhabitants and visitors (Carpenter, Bennet, & Peterson, 2006). Native plants on Catalina Island act as natural protectors against drought, fire, and erosion. Without them, the island becomes more vulnerable to all types of natural disasters.

3. **Didn't Catalina recover after the removal of goats and pigs? How has nonnative herbivory affected rare plants? What are the areas of greatest concern in terms of flora/fauna being threatened on Catalina?**

   Yes, the removal of livestock and feral animals from Catalina in the past has helped put the Island on a trajectory of recovery (Knapp, 2014). The Conservancy has documented passive revegetation in areas of the Island, but the species growing are deer-resistant species common across southern California, not Catalina and Channel Island endemic species that are necessary to represent Catalina's full biodiversity. Island varieties of plants have reduced defenses to herbivory compared to their mainland relatives because they have evolved without the presence of herbivores (Salladay & Ramirez, 2018). For these reasons, the continued presence of nonnative mule deer on Catalina represents a significant threat to the native plants and animals that rely upon these plant species for food and habitat. While mule deer are present, the vegetation will only consist of a few species rather than the full spectrum of plants needed to protect the Island.

4. **What were the dominant vegetation conditions before nonnative herbivores arrived?**

   The presence of nonnative herbivores on Catalina undoubtedly altered the vegetation communities on the Island (Knapp, 2014). From early descriptions of the Island, it is

expected that oak woodlands were even more predominant than have been in recent history where they cover about 25% of the Island (Knapp, 2002). According to early botanist and Avalon resident Blanche Trask, in 1897 the uplands of the Island looked "as though visited by a light snow-storm, for there will be thousands of white lilacs (*Ceanothus cuneatus*) in bloom, with now and then a slope over which a lavender veil seems thrown – the orchardlike trees of another 'lilac' – a lavender one this time (*Ceanothus arboreus*) a rare form, found only here and on Santa Cruz Island," suggesting that species now considered rare were more prevalent (Trask, 1897). More recently, research has been conducted to determine potential natural vegetation communities across the Island, which will help guide restoration efforts in the future (Longore, Noujdina, & Dixon, 2018).

5. **What makes a species native or invasive? How are the fox and bald eagle native but the deer aren't?**

   According to National Park Service definitions, native species are "all organisms that have occurred, now occur, or may occur as a result of natural processes," such as the bald eagle (*Haliaeetus leucocephalus*) on Catalina, which naturally spread to the island on its own. Nonnative species are "plants and animals living in areas where they don't naturally exist," and invasive species are specifically "a nonnative species that causes harm to the environment, economy, or human, animal, or plant health" (National Park Service, 2022). Additionally, an endemic species is a native species whose range or distribution is restricted to a single, discrete area. It is important to note that even benign nonnative species have the capability of becoming invasive, such as the Mediterranean broom (*Genista linifolia*), which started as a few ornamental plants in Avalon but has now colonized large portions of watersheds and outcompeted native shrubs.

   The Island fox (*Urocyon littoralis*) is recognized by the National Park Service as the largest native mammal on the Channel Islands, with six of the eight islands having a separate endemic subspecies such as the Catalina Island fox (*U. l. catalinae*) (National Park Service, 2023). The accepted theory is that foxes floated on debris during storms across a much narrower channel during the last Ice Age. Recent archeological work has found evidence that the foxes arrived on the northern Channel Islands about 6,000 years ago, suggesting that humans may have brought them over (National Park Service, 2023). In either case, the Island fox has existed on the Islands for thousands of years and does not "cause harm to the environment, economy, or human, animal, or plant health" that defines invasive species.

   The mule deer (*Odocoileus hemionus*) are considered invasive on Catalina because they were introduced by humans for hunting in 1929 and, since then, there have been multiple accounts of and studies of their harm to Catalina's environment. Research shows they reduce the resilience of native shrub communities (Ramirez, Pratt, Jacobsen, & Davis, 2012) and threaten endemic and rare plant species (Knapp, 2014), including the federally threatened island rush-rose (*Crocanthemum greenei*) (Dvorak & Catalano, 2016). On other islands, these impacts have been shown to have further cascading effects such as deer presence negatively impacting the abundance of bird species on the San Juan Islands (Martin, Arcese, & Scheerder, 2011) and lowering species density and abundance of insects

on Haida Gwaii (Allombert, Stockton, & Martin, 2005). Further, management recommendations for both the endemic Catalina California quail (*Callipepla californica catalinensis*) and the endemic Catalina Hutton's vireo (*Vireo huttoni unitti*) recognize the invasive mule deer as a threat due to the habitat destruction they cause and suggest their removal from the Island (Shuford & Gardali, 2008).

6. Are there any current plans for other invasive animals, like cats, on the Island?

No, there are no plans to remove other invasive animals like cats. While cats pose a significant threat to seabirds and endemic mammals, the source population cannot be controlled by the Conservancy, so the feasibility of controlling feral cats on the Island remains limited to education and spaying/neutering. The mule deer cause much more destruction to the Island's ecosystem, so their removal from Catalina is a vital step in restoring the Island – an an impactful and permanent solution since mule deer cannot reinvade the Island from across the Channel.

7. What is the plan for restoration on the Island for the next five years?

The removal of the mule deer from Catalina is just the first step in an ambitious plan to restore large portions of the Island to native habitat. Currently, the Conservancy is limited to out-plantings in cages and fences that are necessary to protect them from mule deer. With the mule deer population removed, the Conservancy will be able to carry out a comprehensive Habitat Restoration Plan through a data-driven approach to reduce areas of invasive annual grasses and seed those with native species to enhance floral and animal diversity, reduce the risk of wildfires, improve water quality, and reduce erosion.

8. What are the plans for endemic species reintroduction/enhancement, and are there native seed collection projects or schedules?

Catalina Island is home to nine endemic species and subspecies of plants, including the Catalina Island dudleya (*Dudleya virens subsp. hassei*), Catalina Island mountain mahogany (*Cercocarpus traskiae*), Santa Catalina Island bush-mallow (*Malacothamnus fasciculatus var. catalinensis*), Santa Catalina Island ironwood (*Lyonothamnus floribundus subsp. floribundus*), Trask's yerba santa (*Eriodictyon traskiae subsp. traskiae*), Santa Catalina Island manzanita (*Arctostaphylos catalinae*), Santa Catalina Island buckwheat (*Eriogonum giganteum var. giganteum*), Santa Catalina Island bedstraw (G*alium catalinense subsp. catalinense*), and Santa Catalina Island popcorn flower (*Cryptantha catalinensis*). The Restoration Project will allow for passive restoration of these populations to occur across the Island, as well as active restoration by seeding and planting them on the landscape. The collection, mass production, and spreading of native seeds will be an integral, active part of the restoration plan. The restoration of these native plants will also have a positive effect on Catalina's 50+ endemic animal species that rely on vegetation for forage and habitat.

9. Has the Conservancy considered the unintended consequences of restoration such as the need to water out-plantings and the management of invasive plants post-ungulate removal?

The Restoration Project is intended to help support a more resilient ecosystem that is less reliant on human intervention such as watering. Out-plantings of young plants that are grown in the nursery require regular watering for about two years. However, the Restoration Project will allow the Conservancy to spread native plant seeds onto sites that will not require regular watering since the plants are developing completely in the wild.

The Conservancy has an ongoing Catalina Habitat Improvement and Restoration Program (CHIRP) that focuses on invasive plant removal. The program will continue and expand, with its priorities being informed by long-term monitoring of vegetation changes following removal of nonnative ungulates.

10. Can you provide an overview and status of the restoration project?

More information on the Catalina Island Restoration Project can be found at our website, which includes multiple resources made available to the public such as a recording of the Community Forum, a collection of scientific research supporting the project, letters of support from conservation experts, an FAQ page, and the presentation given to the Avalon City Council.

The Conservancy is currently awaiting approval of a Scientific Collecting Permit from the California Department of Fish and Wildlife for the deer removal aspect of the project.

Mule Deer Eradication and Alternatives

1. **What are the alternatives to eradication? Why can't you just fence, relocate, or sterilize the deer? Can you explain efforts already implemented to control the deer populations and how they have failed?**

   The Conservancy has attempted and investigated several alternatives to address the mule deer issue on the Island, including fencing, relocation, sterilization, and lethal removal. Eradication through aerial sharpshooting has been found to be the most efficient, effective, and humane option. The alternatives have proven to either not fully remove the negative impact of the mule deer, not be feasible due to the population size and terrain, or not be humane for the animal.

   Fencing: Fencing the deer into a contained area is not sustainable due to the likely scenario that the fence would fail or be breached and allow the mule deer to reinvade areas from which they'd been previously removed, Keeping all of the deer contained to a smaller area of the Island would result in more dense populations and more death due to starvation and thirst.

   Moving Deer: Translocation has been attempted on Catalina and other islands, but it is not feasible with the current population size and Island terrain, not optimal for the animal's welfare, nor is it likely to be legally permitted. In 1948, there was an attempt to capture all the deer on the Island, which was estimated at about 2,000 at the time, but only 150 were caught and 110 made it to the mainland (Long Beach Telegram, 1948). It was not reported how many survived after being introduced to natural predators, mainland diseases and human interactions. Capture and release methods in general have an equal or worse welfare rating prior to death than shooting, and the welfare impact is only made worse by transportation (Sharp & Saunders, 2011). This is because chemical immobilization, capture, and relocation can induce what's known as capture myopathy, a non-infectious disease characterized by muscle damage from extreme exertion, struggle, or stress, in deer (Beringer, Hansen, Wilding, Fischer, & Sheriff, 1996).

   Additionally, translocated deer are unaware of their new surroundings, including the locations of resources and the presence of predators and traffic – two factors that Catalina mule deer are completely naïve to (Pennsylvania Game Commission). For example, just 15% of translocated mule deer from Angel Island, CA survived after the first year, with malnutrition, vehicle accidents, and predators being contributing factors (O'Bryan & McCullough, 1985). Researchers have gone as far to say, "The principal reason for translocating deer from metropolitan preserves to rural locations is to reduce local abundance without killing deer. The reality of this choice is that translocation may result in the deaths of more than 50% of these deer during the first-year post-release." (Jones & Witham, 1990).

   Sterilization: Fertility control of the mule deer population through surgical sterilization or immunocontraception has not been attempted on Catalina as it is not considered a feasible option to control the population. Both methods would require the immobilization and capture of every mule deer on the Island, which has been shown to be unachievable (Long

Beach Telegram, 1948), to cause capture myopathy (Pennsylvania Game Commission), and to be insufficient at reducing deer populations without the help of periodic culling (Raiho, Hooten, Bates, & Hobbs, 2015) (Boulanger & Curtis, 2016).

2. **Did the Conservancy consider the humaneness of these options in the decision-making process? Has a wildlife biologist, zoologist, or veterinarian been included in the planning?**

After conducting research and consulting with other island managers, the Conservancy has found aerial hunting to be the most humane and effective solution to this problem. As noted in published studies, "Helicopter-based shooting of vertebrate pest animals has been an effective management tool since the 1960s ... and is considered a humane control method for pigs and deer. The two primary determinants of good welfare being reduced duration and intensity of animal suffering," (Cox, et al., 2023).The public can read further scientific evidence that supports this decision on the Restoration Project website as well as listen to experts share their experience on similar projects in the Community Forum recording.

This decision was made following the international consensus principles for ethical wildlife control laid out by experts from the British Columbia Society for the Prevention of Cruelty to Animals, the Centre for Compassionate Conservation, the Animal Welfare Science and Bioethics Centre, the Detroit Zoological Society, the Canadian Federation of Humane Societies, the Wildlife Protection Department of the Humane Society of the United States, RSPCA UK Wildlife Department, and RSPCA Australia as recommended by animal welfare groups consulted early in the planning process (Dubois, et al., 2017).

The humaneness of aerial and ground shooting over methods that require capture is reiterated in the report, "A model for assessing the relative humaneness of pest animal control methods." This report found both aerial and ground shooting to have an equal or better welfare rating than trapping methods and notes that "the humaneness of trapping is highly dependent on how the subsequent stages (i.e. holding in the yards, drafting, shooting or transport) are conducted. The cumulative effects of these stages will compound welfare impact," (Sharp & Saunders, 2011). Based on these findings, alternatives such as relocation and sterilization that require prolonged or repeated trapping would earn an overall welfare rating that is worse than shooting. Finally, the American Veterinary Medical Association lists gunshot as "acceptable with conditions for euthanasia of free-ranging, captured, or confined wildlife" in their guidelines for the euthanasia of animals (American Veterinary Medical Association, 2020).

The Conservancy has consulted with its own wildlife biologists, wildlife biologists from other organizations, wildlife veterinarians such as Dr. Winston Vickers, who was a panelist at the Community Forum, and the American Association of Wildlife Veterinarians, which supports the Restoration Project. Additionally, the nonprofit organization contracted to complete the removal, White Buffalo Inc., is led by Dr. Anthony DeNicola, who has a Ph.D.

in wildlife ecology and is a Certified Wildlife Biologist by the Wildlife Society. White Buffalo also employs veterinarians.

3. Can you provide an overview of the outcomes of other island eradications projects?

An expansive summary of deer removal efforts like that proposed for the Catalina Island Restoration Project can be found on the Database of Island Invasive Species Eradications website. This research has found that of the 1,550 eradication attempts across 998 islands worldwide, 88% have been successful, with 300 of these efforts occurring on inhabited islands with a success rate of 82% (Spatz, et al., 2022).

A review of this data has found that 596 populations of 236 native island species benefited from invasive eradications on 181 islands (Jones, et al., 2016). Specific examples of these benefits include the passive recovery of native flora on Santa Rosa in the Channel Islands after mule deer and elk were removed (McEachern, Atwater, Collins, Faulkner, & Richards, 2016), with 36 endemic and/or rare taxa increasing in area and 38 taxa increasing in abundance as well as substantial biodiversity gains (Thomson, et al., 2022).

On San Clemente in the Channel Islands, the eradication of introduced ungulates made possible the recovery of endemic island flora and fauna, with five species including the San Clemente Island lotus (*Acmispon dendroides* var. *traskiae*), San Clemente Island paintbrush (*Castilleja grisea*), San Clemente Island bush-mallow (*Malacothamnus clementinus*), San Clemente Island larkspur (*Delphinium variegatum* ssp. *kinkiense*), and the San Clemente Bell's sparrow (*Artemisiopiza belli clementeae*) declared fully recovered in 2023 and no longer in need of Endangered Species Act protection (U. S. Fish and Wildlife Service, 2023). Lastly, new occurrences of species previously thought extirpated or extinct were discovered after goats were eradicated from Guadeloupe Island in Mexico (Luna-Mendoza, et al., 2019).

4. How many eradication projects used helicopter sharpshooting on populated islands?

Aerial shooting was used successfully and safely on several inhabited islands, including but not limited to Lord Howe Island (Parkes, Macdonald, & Leaman, 2002), Dirk Hartog Island (Heriot, Asher, Williams, & Moro, 2019), and Kangaroo Island (Cox, et al., 2023) in Australia; Sidney Island and Haida Gwaii in Canada; Guadalupe Island (Luna-Mendoza, et al., 2019) in Mexico; Floreana Island and Isabela Island (Ruiz-Ballesteros & del Campo Tejedor, 2022) in Ecuador; Trinidade Island (da Silva & Alves, 2011) in Brazil, and the goat eradication on Catalina Island.

5. Has the Conservancy done a cost analysis of the alternatives to current plans? What are the projected costs and provisions for cost overruns? Given the recent experience with similar methodology on Sidney Island in Canada, is this realistic? Wouldn't the money be better spent on the invasive plant issue?

All options were analyzed from multiple perspectives relying on our Island partners, previous experience from removing goats and pigs, and thoughts from community leaders. The option to use the helicopter for the work in the Interior was chosen as the most

beneficial because it is the most humane and most likely to succeed. Sidney Island is using a similar methodology and has had great success.

The effort to remove deer is being privately funded, and in the long run will free up resources that the Conservancy currently has tied up in maintaining fences and managing the deer's effects on the island. This will allow us to reallocate resources to improving recreational and educational opportunities to the community and broader LA County. For example, the Conservancy spends over $100,000 on removing invasive plants every year. The Restoration Project will allow more recruitment of native species, which will aid in making the ecosystem more resilient and better combat invasive plant species, making the program more successful in the long run with fewer resources.

6. **How long will the Restoration Project take place?**

   The Catalina Island Restoration Project is a multi-year endeavor with active restoration work planned for over a decade into the future. However, removal of the mule deer will most likely take two to three years to complete, with the helicopter phase lasting about two months. At the Community Forum, Kate Faulkner, retired Chief of Natural Resources Management for Channel Island National Park, described how 90% of the mule deer on Santa Rosa were removed within two months by White Buffalo Inc.

7. **Are all the expert panelists (at the Community Forum on Jan. 31) in agreement with the eradication plan?**

   The Conservancy cannot speak on behalf of the expert panelists, but viewers are welcome to listen to what they had to say by viewing the online recording. We also have a wide range of letters of support from leaders in the scientific community that can be reviewed here (click on the logos to view the letter).

8. **What skillset do the professional hunters from White Buffalo bring in their strategy to eliminate deer?**

   White Buffalo Inc. is led by Dr. Anthony DeNicola, who has a Ph.D. in wildlife ecology and is a Certified Wildlife Biologist by the Wildlife Society, and it employs veterinarians on staff. White Buffalo Inc.'s extensive experience, as well as several testimonials from partners who have worked with them in the past (Robyn Shea, the Lead Research Station Specialist at the Santa Rosa Island Research Station; Morgan Ball, the Executive Director of Wildlands Conservation Science; Katrina Olthof, the Conservation Program Manager of Wildlands Conservation Science, and Scott Morrison, the Director of Conservation for The Nature Conservancy in California) are available online.

9. **Are the weapons to be used for eradication legal in California? How will stray bullets be dealt with?**

   Both the Scientific Collecting Permit application and the contract with White Buffalo Inc. state that only California legal firearms will be used for the eradication work. It is also specified that lead-free ammunition be used to avoid negative impacts on other wildlife. The risk of stray bullets affecting people is minimal, as White Buffalo Inc. will practice regular safety protocols and not actively work when people are in the area. The fire risk of

stray bullets is also minimal, as research shows that less than 0.2% of human caused wildfires were caused by firearms (Short & Finney, 2022).

10. Can you comment on the ecological benefits or drawbacks of the return of nutrients to the island by letting culled deer lie? Is it possible to give the deer meat to the public instead?

The primary reasoning for not retrieving the carcasses is the health and safety of the crew, as the rough and steep terrain of Catalina Island provides limited areas for a helicopter to land or for crew to exit and enter a helicopter safely. Additionally, the remains of deer in remote locations are expected to provide a positive impact to the ecosystem, increasing nutrient availability to plants, arthropods, and scavengers (van Klink, van Laar-Wiersma, Vorst, & Smit, 2020). This phenomenon has been specifically documented on islands in the Gulf of California, where carrion was found to increase productivity and the abundance of invertebrates and their predators (Barton, 2015). Research has found that scavenger populations, such as the Catalina Island fox, bald eagle (*Haliaeetus leucocephalus*), and raven (*Corvus corax*), found on Catalina Island, are helpful in mitigating the impact of sudden introductions of carrion biomass into a system after mass mortality events (Barton, Reboldi, Bonat, Mateo-Tomas, & Newsome, 2023; Baruzzi, Barton, Cove, & Lashley, 2022).

Ungulate carcasses have been left to be recycled during eradication projects on other Channel Islands and mainland projects in Pinnacles National Monument and Point Reyes National Seashore. This approach has also been the standard for all the control and eradication efforts in Hawaii and throughout the Galapagos Islands. Additionally, 200-300 deer carcasses are left on Catalina Island by hunters every year.

11. With the new Avalon Municipal Code in place, what is the plan to eradicate deer from town?

The Conservancy will work with City leaders and other stakeholders on how to move forward. Eliminating deer is in the best interest of the Island, but the question is how to do this in a way that minimizes impacts on businesses and the community.

Deer Health & Population

1. **How many deer are there on Catalina and how is that determined?**

   Spotlight surveys are often used to determine deer population estimates and is the methodology used on Catalina Island in recent research conducted from 2012 to 2021. This study estimated that mule deer population ranged in size from a high of 3,285 in 2012 to a low of 1,225 deer in 2015, with a mean of 1,981 deer (Stapp, Hamblen, Duncan, & King, 2022).

2. **Are the deer on the Island in poor health?**

   The mule deer on Catalina are the victims of irregular water availability, which causes their population to experience boom and bust cycles. The past two winters have been wetter than average, supporting more forage for deer and ensuring the population will rise. Unfortunately, Catalina Island is not guaranteed that precipitation every year and has experienced significant drought in the recent past. Although the deer population may seem to be booming now, in future dry years their food supply can rapidly dwindle, leading to significant mortality rates. In contrast, mule deer on the mainland can have extensive home ranges of up to 34,220 acres and migrate based on rainfall patterns (Innes, 2013).

3. **Don't the deer on Catalina provide a secure population safe from Chronic Wasting Disease?**

   Chronic Wasting Disease (CWD) has not been detected in California (California Department of Fish and Wildlife). The mule deer on Catalina are not a viable source population for the mainland due to the disease risks involved in translocations. Researchers have expanded on this, stating that "The 'rescue,' rehabilitation and release of wild animals are highly risky activities from disease and other perspectives. There is little evidence to justify this activity either from an ethical or an ecological perspective. Many released animals will die, and wild populations will not benefit from this practice, but are more likely to suffer problems such as disturbance, territorial aggression, genetic pollution and introductions of disease. (Kock, Woodford, & Rossiter, 2010).

4. **How does fencing put up for feral animal control in the past impact the movement of the deer population?**

   The feral animal fencing put up during removal of goats and pigs does not control mule deer movement. These fences are not tall enough to block mule deer, which can jump upwards of eight feet. This is why the deer-specific fencing at the exclosures is much taller than the feral animal fencing used for the previous removals. Conservancy staff struggle with the maintenance of deer fencing throughout the Island and at times have had to neglect over half of the fencing due to lack of resources. In addition, deer occasionally get caught in fencing, causing them to suffer and die.

Recreational Hunting

1. **Can you provide an overview of the historical and current management of deer through hunting?**

   Deer hunting has occurred nearly every year since 1949 and ever since, there have been issues with overpopulation (Knapp, Ecosystem Restoration on Santa Catalina Island: A Review of Potential Approaches and the Promise of Bottom-Up Invader Management, 2014). For the first hunting season, a total of 477 deer were taken, although authorities were hoping for 1,250 (Palm Springs Desert Sun, 1950).

   The Conservancy was one of the first hunting operations to encourage antlerless hunts (Longhurst, Leopold, & Dasmann, 1952), and ask for a higher ratio (60:40) of does to bucks (Associated Press, 2014). The challenge was always the push-pull between wanting a higher doe to buck ratio and attracting hunters to the Island. The deer hunting program was managed by California until 1982. Before 1998, hunters would have to visit the Long Beach Fish and Game office to get tags specifically for Catalina Island. Deer take remained very low under this program.

   The Conservancy entered a Private Lands Management (PLM) program agreement in 1998 with the California Department of Fish and Wildlife.

   The PLM program was still relatively new, having been signed into law in 1983 (California Department of Fish and Wildlife, 2024). The Conservancy hoped to increase hunting to reduce deer populations. Between 1998-2001, the Conservancy worked with a contractor to guide hunts in the Interior, but the contractor did not harvest deer at numbers that the Conservancy hoped for to reduce deer populations (Table 1). In 2003, a more productive outfitter was found, and deer take increased dramatically. From 2007-2008, the Conservancy subsidized hunting on the Island, but it was very costly and not very effective at increasing the take to what was needed. In 2008, the Conservancy formalized their relationship with Wildlife West, which proved to be an excellent outfitter.

   Since the PLM agreement, the Conservancy has worked to make the hunting program more accessible. It has petitioned many times to expand the hunting program to the point where it is now the longest hunting season in the state. To increase local hunters, the Conservancy paid to have staff trained as hunter safety educators and provided free hunter safety training to locals on Island. To make it more affordable, the first tag to all locals is free. Most people coming to the Island from the mainland go with a guide rather than going out by themselves. The Conservancy provided Wildlife West use of its volunteer camp to host its hunting operation more effectively, but at the cost of using it for other groups. People often choose to go with the guide since it includes lodging, food, and transportation. Hunters who prefer not using a guide will use the Wildland Express Shuttle or ebikes and purchase a hotel or campsite.

2. **What is the Catalina Island Conservancy's stance on recreational hunting for wildlife management?**

First, it's helpful to know that the Catalina Island Conservancy does not own or manage the deer on Catalina Island; the California Department of Fish and Wildlife (CDFW) is the owner and oversees their care. Together with CDFW we have welcomed recreational hunting on the Island for more than 25 years. The agency provides us with up to 500 tags a year, which we administer during the longest hunting season in California (July-December).

The Conservancy has welcomed the recreational hunting community to help reduce the size of the mule deer on the Island for nearly two decades through a Private Lands Management program (PLM). Previously, CDFW ran its own program to allow for hunting. Since the Conservancy started the PLM program on Island, the number of deer taken each year has significantly increased through free tags to residents, providing hunter safety training, the hiring of experienced guides, and expanding the hunting season to the six-month period.

Unfortunately, these numbers and take do not make a difference on the effect of the deer on the environment and have ultimately failed much like most Islands.

3. **Why can't hunters control the deer population?**

   Recreational hunting has been shown to be ineffective at controlling deer populations. A study found that even when 93% of harvest objectives were met, deer density, vegetation abundance, and vegetation growth did not vary significantly between control experimental sites (Simard, Dussault, Huot, & Côté, 2013). The deer tend to bounce back at such a significant rate that hunting makes almost no difference in the long run.

4. **Can't the Conservancy expand access and relax regulations for hunting on the Island? It's not practical to hunt on foot, wouldn't having trucks available to rent help increase hunting access and success?**

   As far as relaxing regulations, we already make substantial accommodations for hunting. We have the longest hunting season (July-December) in the state; expanding it more would mean hunters killing pregnant deer or mothers with fawns. Also, hunters tend to prefer bucks, which isn't ideal for controlling deer populations. Catalina, in fact, was the first place in the state to offer an antlerless hunt to control deer populations. Even with a massive amount of effort and reallocation of resources away from our Conservation and Education programs, the effects on the deer population would be minimal and would negatively impact the experience for the vast majority of those who recreate on the Island – hikers, bikers, birders, and those on EcoTours. Hunters make up 0.04% of Catalina's tourism annually.

   As far as trucks go, they are at a premium on the Island and letting hunters drive trucks would prove a major liability for the Conservancy since all roads are private and driving conditions can be dangerous. We already allow hunters to use our bus service, and guided hunts are available through Wildlife West. The Conservancy faces a lot of challenges on an Island. Our fleet of vehicles needed for our Rangers, Facilities, Education, and Conservation teams are already maxed out and our mechanics struggle to stay on top of maintaining these vehicles.

5. **How many deer are culled annually through your hunting program?**

Roughly 200-300 deer are culled annually through the PLM program.

6. **What is the future of hunting on Catalina? What are the dates for next season?**

   The future of hunting on the Island is still being considered. The Conservancy will need to determine whether to have another hunting season.

7. **Did the landowners of Santa Rosa Island appeal to hunters for their assistance in bringing the population to zero as necessary to the overall health of that island? In other words, was it represented as being necessary?**

   Yes, it was deemed necessary. The hunters were tasked to reduce populations of deer but were unable to succeed with recreational hunters alone. This led to a period in which deer were culled after the hunting season without any harvesting occurring, which resulted in more deer deaths.

8. **Why have you limited hunting licenses to 500 in the past?**

   We rarely exceed 500 tags, so it hasn't been necessary to increase the number. We did exceed in 2007 and 2008 and asked CDFW for more tags because we subsidized hunting those years by reallocating our trail and conservation teams to guide hunts to reduce deer after the Island Fire. Even then, far fewer deer were taken than needed.

9. **If there are 2,000 deer and only 30% must be hunted to arrive at population control per Dr. Vickers, why are you not taking steps to increase the hunting tags issued? It's only 250-ish more deer that would need to be hunted.**

   Limiting the growth of deer populations can require at least 60% of the deer be removed annually in many scenarios (Human Wildlife Conflicts Working Group, 2018). However, because of Catalina's rugged terrain recreational hunters will never be able to reach that number. Additionally, deer have learned to go to Avalon during the hunting season, making many inaccessible to hunting. During the Community Forum, Dr. Vickers stated that recreational hunting would not control Catalina's deer population.

10. **There are articles chronicling situations like Catalina's with multiple species being impacted where all species have been successfully integrated or sustained in a harmonious ecosystem. How was this accomplished in those locations and why aren't they being explored in this case, especially with Catalina hunters so willing to continue hunting the deer to a reasonable/sustainable number?**

    We're not sure which studies the author of this question is referring to, but we do know that the existence of mule deer on Catalina Island is having a negative effect on all of the other animals on the Island by eating the food sources upon which they depend. Islands are unique ecosystems, so invasive species have an outsized impact compared to those situations on the mainland. As stated in previous answers, hunting will never control deer populations unless we pair it with annual helicopter aerial kills which would not be financially sustainable.

Community, Stakeholder, and Tribal Outreach

1. **How can the community get involved in restoration efforts?**

   The Conservancy has a volunteer department that is happy to have more hands to help in the native plant nursery, at beach clean ups, and more. Please see the volunteer page for more information.

2. **What engagement with locals, stakeholders, and national advocacy groups has the Conservancy done? Do you feel that you should have attempted communication with the local community sooner?**

   In 2022 and extending into mid-2023, the Conservancy spoke to at least 70 community leaders in Avalon to receive their feedback on the deer removal proposal. Most individuals were neutral or supportive with a minority opposing.

   On May 27, 2023, the Conservancy hosted all six of the Tongva-Gabrielino tribes on the Island to discuss the mule deer issue and the creation of an ongoing community collaborative. The Conservancy also provided the full details of the deer removal plan to the tribes at a meeting on October 23, 2023.

   The Conservancy hosted two advisory council meetings on June 16 and July 28, 2023. Invitees included representatives from Southern California Edison, Catalina Island Company, Wrigley Institute of Environmental Studies, Catalina Island Tourism Authority, as well as the local veterinarian, the mayor of Avalon, city manager, local hunters, and the local hunting guide. The first advisory committee meeting was focused on describing the threat the mule deer posed to the Island and a site visit to Whites Restoration Areas. The second meeting involved a discussion of the potential solutions to this challenge, during which the Conservancy received suggestions and thoughts on the plan.

   Following this public outreach, the Los Angeles Times published a story about the planned deer removal on October 1, 2023. The Conservancy also posted FAQs on its website, which contained information about the entire Catalina Island Restoration Project and set up an email to receive comments from the public.

   On October 17, 2023, the Conservancy presented details about the Catalina Island Restoration Project, including the planned deer removal, to the Avalon City Council during the City Council's regularly scheduled public meeting. Conservancy staff listened to public comments about the proposal before the Conservancy's presentation. Unfortunately, most attendees critical of the plan left before the Conservancy's presentation.

   To further engage with the public, the Conservancy began offering free tours of the Whites Restoration Areas. These tours provide more information on the damage deer cause in the Interior and are an opportunity to directly ask Conservancy staff questions. Four to six tours per week were offered starting in November 2023 through January 2024 and were advertised in The Islander, on Facebook and Instagram, at the City Council meeting on October 17, and through posters on a Community Board. By the beginning of February, 30 residents had gone on the tour, including 13 people who participated in a special Rotary Club outing in October.

Also, the Conservancy was interviewed by various media outlets to answer questions on the Catalina Island Restoration Project, including the deer removal proposal. These media outlets include The New York Times, Los Angeles Times, LAist, KABC7, KNBC Digital, The Catalina Islander, KTLA, GearJunkie, Fox News online, Wide Open Spaces, local radio station KISL, CBS National News, the London Times, among others. On December 13, 2023, the Conservancy's Dr. Lauren Dennhardt, Senior Director of Conservation, and Makenzie Henk, Wildlife Conservation Manager, attended a California Fish and Game Commission meeting to provide additional information on the Restoration Project during open public comment. Other commenters included Naomi Fraga with California Botanic Garden, Dr. Winston Vickers at UC Davis, and Travis Brooks, a restoration ecologist with Land IQ.

On January 31, 2024, the Conservancy hosted a Community Forum. To make the event as inclusive as possible, both an in-person and online option were available, and the event was translated into Spanish. We brought in an independent moderator to ask questions. Questions from the public were provided ahead of time via the registration process and the presenters answered most of those questions using their presentations. The moderator collected additional audience questions to be answered as well. We posted a video of the Forum online. After the Community Forum, we answered every question submitted either during registration or on cards. The result is this Q&A.

3. How can the Conservancy understand how the locals feel regarding the issues involved, when none of the Conservancy Board, biologists, or employees live full-time in Avalon?

4. Most Conservancy staff (70-80%) live on Island. All the Conservancy biologists live full-time in Middle Ranch or Avalon, and many live with families. Our decisions aren't made lightly, but in the best interest of the Island and future generations.

5. Can the Conservancy find common ground with residents on management methods? Will there be mediation with locals and their inclusion in decision-making?

   We are actively listening to residents and taking their comments and suggestions into consideration. We are clear around the fact that the Island's future depends on removing the deer, but opportunities for further discussions around methodologies and timing are still very much available.

6. Is the Conservancy concerned with the community's lack of trust and the petition regarding deer management?

We are very much aware of the public's distrust of the Conservancy, based, in large part, on actions that were taken by many individuals who are no longer associated with the agency. We follow all the commentary on social media and have seen the petition. We understand that removing the deer is a difficult option for many who have grown up on Island. But the circumstances of modern life and global scientific principles have brought us to the realization that this course of action is necessary to protect the Island we all love so dearly.

7. **Will full-time Islanders be allowed to create a civilian oversight committee for the deer project that is granted decision-making authority over the deer?**

   The only authority over the mule deer is the California Department of Fish and Wildlife, which has jurisdiction over the deer and must make decisions regarding wildlife based on science. Public opinion is considered while ensuring that any permit is based on best practices in wildlife biology and consistent with the actions authorized and directed by CDFW.

8. **Why are you now doing a community forum, after an application to CDFW has already been made?**

   The Conservancy has heard the various questions, comments, and concerns from the public over the last few months, as well as the public's desire to hear external opinions on the Restoration Project. The Community Forum was an opportunity for the public to have experts from outside the Conservancy answer their questions. Submitting a permit application is the first step in a long process and the permit application can be altered throughout the review process.

9. **Where can the public access the independently verifiable scientific research & data supporting the Restoration Project?**

   Please feel free to view the "Science, Data, and Methodologies" section of the Catalina Island Restoration Project website.

10. **Why are you restricting other attendees from viewing questions that are sent?**

    Attendees and those who were not able to attend are welcome to hear the questions asked at the forum by watching the Community Forum recording. This document contains a complete list of questions the Conservancy received (where repetitive, we condensed similar questions into one).

11. **Does the Conservancy provide residents environmental education initiatives?**

    Yes, the Conservancy has provided both adult and youth educational programming for decades. We provide field trips and educational opportunities for youth.

12. **What engagement with tribal communities has the Conservancy done?**

    On May 27, 2023, The Conservancy hosted all six of the Tongva-Gabrielino tribes on Island to discuss the mule deer issue and the creation of an ongoing community collaborative. The Conservancy also provided the full details of the deer removal plan to the tribes at an additional meeting on October 23, 2023. We continue to engage our tribal partners on this plan along with the broader Island Restoration project.

13. **Where can we send follow-up letters of support?**

    Letters of support and other comments can be directed to comments@catalinaconservancy.org.

Legal and Permitting

1. **Why is CDFW involved with nonnative animals on a mostly private island? Who owns the deer?**

   The mule deer on Catalina Island are under the jurisdiction of the California Department of Fish and Wildlife.

2. **What is the status of the permit application? Is it CEQA compliant?**

   The permit application is still being reviewed by CDFW. CDFW will comply will all laws, including CEQA, before it takes any final action on the Conservancy's permit application.

3. **Does CDFW support the plan to remove the deer?**

   CDFW supports the broader Island Restoration strategy and is reviewing the deer elimination portion of the Restoration Project.

4. **If CDFW continues to deny the Conservancy a permit to kill all the deer, what are they going to do?**

   CDFW denied depredation permits in the past because it was the wrong type of permit to address the issue. In 2016, the Scientific Collecting Permit was denied because CDFW requested a much broader Island Restoration strategy. The Catalina Island Conservancy has put substantial resources into developing an Island-wide restoration plan that will begin with removal of the mule deer. The Conservancy recognizes removing the mule deer as a top priority in ensuring a more sustainable Catalina and will continue to work towards this goal through legal and permitted avenues. If CDFW denies the permit application, the Conservancy will evaluate next steps at that time.

5. **Do we have an idea of how much money will be saved by state and federal taxpayers when deer are removed and endangered species are ultimately delisted?**

   There is not a specific number, but currently the Catalina Island Conservancy relies on federal funding to keep these rare plants on life support until the deer are removed. As mentioned earlier, once resources are freed up there will be more opportunities for educational programing, recreational opportunities, and workforce development.

6. **Per CDFW observations and reports, hasn't it been documented that most of the damage seen in the Interior was caused by animals that are not deer and that have already been eradicated?**

   This question is referring to a report from 2007 following a one-day tour right after the Island Fire. In response to this, the Conservancy has provided additional evidence in the form of exclosures and peer-reviewed literature (Dvorak & Catalano, 2016; Salladay & Ramirez, 2018) that show the mule deer continue to have a detrimental impact on the landscape. Although CDFW staff were doing their best to understand the landscape, their observations in 2007 were not enough to fully evaluate the negative impacts that deer are causing on Catalina.

7. **Why hasn't the Conservancy complied with CDFW recommendations? What has changed since the last depredation permit application was denied, that makes it appropriate for CDFW to approve now? How is a Scientific Collecting Permit appropriate for the proposed removal?**

   The Conservancy is not applying for a depredation permit. Catalina Island has always been in a challenging situation because the mule deer are invasive on the Island, but native on the mainland, making the depredation permit the wrong permit for the job. Instead, the Conservancy has applied for a Scientific Collecting Permit, which CDFW has determined is the correct permit for us to pursue. In response to past CDFW recommendations, the Conservancy expanded hunting opportunities, built many exclosures to demonstrate the damage, and provided peer-reviewed studies (Dvorak & Catalano, 2016; Salladay & Ramirez, 2018) on the damage deer pose on the landscape.

8. **You were granted the land "to ensure that most of Catalina's wildlands and wildlife would be protected." How is the plan in compliance with the latter part of that sentence?**

   It is always a difficult decision to eliminate an invasive species, but the Conservancy is a steward of all wildlife unique to the island such as the Catalina Hutton's Vireo, the endemics bees, the Catalina Island fox, and Catalina Island shrew. Because deer have decimated the entire ecosystem, once they are removed, it will allow many other forms of native wildlife to flourish as demonstrated on other Islands (Jones, et al., 2016).

Fire Management

1. **How does the removal of the deer impact fire resilience?**

   Removing the deer will allow native, more fire-resilient vegetation to proliferate, which will help reduce the frequency and speed of fires. The larger Island Restoration Project cannot proceed while deer are present on the Island. Once we can proceed with their removal, we'll be able to reduce invasive annual grasslands and seed with natives.

2. **Does the Conservancy have plans for fire prevention and control?**

   The Conservancy partners with LA County fire each year to maintain fire breaks and roads on the Island. Additionally, vegetation is culled from roadsides annually to help firefighters. We currently are training staff in S-130 and S-190 firefighting to help with firefighting operations on the Island.

3. **Is there a role for targeted grazing to reduce fire load and nonnative grasses while improving habitat?**

   Targeted grazing can be a great tool on the mainland, but because of our unique vegetation, it is not ideal for the Island. Instead, we will be relying on mechanical and chemical control methods.

4. **How is prescribed fire being incorporated into restoration, and what plant communities are being selected?**

   We have ongoing discussions with LA County Fire about prescribed fire in the future. LA County Fire is interested from a fire-prevention standpoint, while the Conservancy would like to target plant communities that would respond effectively to fire. We cannot use prescribed fire while mule deer are present since they would selectively browse the unique plants found on Catalina Island and leave behind a much more limited species profile.

Tourism Impact

1. **Has the Conservancy considered the impacts of eradication on tourism and the economy?**

   Yes. We believe that ultimately the Conservancy's plans will create the opportunity for expanded tourism down the road – mostly in the Interior – that will more than make up for any loss of tourism and/or revenue we may experience now. Ultimately, most of the operations will occur in the Interior of the Island where most tourists don't visit.

2. **Do tourism and recreational activities on the Island impact conservation efforts?**

   Tourism and recreation always have some effect on conservation, but Catalina Island is committed to being the ambassador to the Channel Islands by inviting hikers, bikers, and tourists to enjoy the Interior. We try to balance this through fewer restrictions on our two-wheel drive roads, and we only allow hiking from our four-wheel drive roads. We also educate our guests and visitors on not bringing invasive species into the Interior and keeping dogs on leash.

3. **Is there a balance between conservation efforts and tourism?**

   That is always being assessed, as stated in the previous questions, it is important to make sure the land is accessible while also being protected.

4. **Is there any data to show whether any tourists come to the island to see deer? Does the Conservancy understand that the plants are not what the visitors come to see? What are they basing this assumption of visitor increase on?**

   No, we don't have data on how many visitors come to the Island to see deer, but they are unlikely a large draw for the Island since deer are found throughout California. The Conservancy has committed itself to finding ways to provide more access to the Interior for recreational activities. This promises to bring in more visitors than ever. Hunters comprise a very small portion of Interior visitors, while recreational trends are pointing to more hiking and biking being popular. In the end, losing a six-month hunting season will make many more visitors comfortable visiting the Interior and increase tourism. In the past 20 years, 250-400 people from out of town have come to hunt the Island each year, which is minor compared to the 900 bikers, 14,961 hikers, 45,316 campers, and 57,425 people who took vehicle tours in 2022. In total, hunters comprise no more than 0.04% of Catalina's 1,000,000 visitors each year.

Bison Health, Population and Management

1. **What is the status, population size, and care of the bison herd.**

   There are fewer than 90 bison on the Island, and they are not reproducing. In the last 20 years, the Conservancy repatriated many bison to the Rose Bud Reservation and administered birth control to the remaining herd.

2. **How do bison and deer compare in terms of impacts on the island ecology and management strategies? What evidence is there to justify keeping bison and eradicating deer?**

   Bison and mule deer are both nonnative animals on Catalina Island. However, their degree of invasiveness is very different due to their distinct behavior. Bison are herd animals, grazers (preferring grasses), and reproduce at a slower rate. In contrast, mule deer are largely solitary, browsers (preferring shrubs and forbs), and reproduce at a much quicker rate. These factors influence how these two different nonnative animals can be managed.

   The rapid reproduction rate of deer is why culling, sterilization, and other partial methods are not a viable solution. After culling events, deer herds can quickly rebound to their original population size, or higher, causing continued ecological harm and loss of life for the deer population. Full removal, or eradication, does not allow the population to rebound, ensuring that the ecological damage is addressed and limiting the number of animals that die in the long run.

3. **What is the acceptable bison population number?**

   The acceptable number of bison is reexamined every year, and the Conservancy always considers the conservation of the Island, cultural impacts, safety, and resources.

4. **What are the plans for bison after addressing the deer issue, including potential introduction of calves or pregnant females?**

   There is currently no plan to bring more bison to the Island.

5. **What are the economic implications of bison population changes?**

   This is unknown. In total, 57,425 people attended tours in 2022 and some may have gone on those tours to see bison. This accounts for 5.7% of tourism on the Island overall.

Works Cited

Allombert, S., Stockton, S., & Martin, J.-L. (2005). A Natural Experiment on the Impact of Overabundant Deer on Forest Invertebrates. *Conservation Biology, 19*(6), 1917-1929.

American Veterinary Medical Association. (2020). *Guidelines.* Schaumburg, IL: American Veterinary Medical Association.

Associated Press. (2014). Hunters will thin Catalina mule deer herd. *Victorville Daily Press*.

Barton, P. S. (2015). The Role of Carrion in Ecosystems. In M. E. Benbow, J. K. Tomberlin, & A. M. Tarone (Eds.), *Carrion Ecology, Evolution, and Their Applications* (pp. 273-290). Boca Raton, Florida: CRC Press.

Barton, P. S., Reboldi, A., Bonat, S., Mateo-Tomas, P., & Newsome, T. M. (2023). Barton, Philip S., et al. "Climate-driven animal mass mortality events: is there a role for scavengers? *Environmental Conservation, 50*(1).

Baruzzi, C., Barton, B. T., Cove, M. V., & Lashley, M. A. (2022). Mass mortality events and declining obligate scavengers in the Anthropocene: Social feeders may be critical. *Biological Conservation, 269*.

Beringer, J., Hansen, L. P., Wilding, W., Fischer, J., & Sheriff, S. L. (1996). Factors Affecting Capture Myopathy in White-Tailed Deer. *The Journal of Wildlife Management, 60*(2), 373-380.

Boulanger, J. R., & Curtis, P. D. (2016). Efficacy of surgical sterilization for managing overabundant suburban white-tailed deer. *Wildlife Society Bulletin, 40*(40), 727-735.

California Department of Fish and Wildlife. (2024). *Private Land Management (PLM)*. Retrieved from https://wildlife.ca.gov/Hunting/PLM

California Department of Fish and Wildlife. (n.d.). *Chronic Wasting Disease Surveillance*. Retrieved from California Department of Fish and Wildlife: https://wildlife.ca.gov/Conservation/Laboratories/Wildlife-Health/Monitoring/CWD#591962498-i-harvested-an-animal-out-of-state-and-it-tested-positive-what-should-i-do

Carpenter, S. R., Bennet, E. M., & Peterson, G. D. (2006). Scenarios for Ecosystem Services: An Overview. *Ecology and Society, 11*(1).

Cox, T. E., Paine, D., O'Dwyer-Hall, E., Matthews, R., Blumson, T., Florance, B., . . . Page, B. (2023). Thermal aerial culling for the control of vertebrate pest poopulations. *Scientific Reports, 13*(1).

da Silva, N. G., & Alves, R. J. (2011). The eradication of feral goats and its impact on plant biodiversity - a milestone in the history of Trindade Island, Brazi. *Rodriguésia, 62*(3), 717-719.

Dubois, S., Fenwick, N., Ryan, E. A., Baker, L., Baker, S. E., Beausoleil, N. J., . . . Fraser, D. (2017). International consensus principles for ethical wildlife control. *Conservation Biology, 31*(4), 753-760.

Dvorak, T. M., & Catalano, A. E. (2016). Exclusion of introduced deer increases size and seed production success in an island-endemic plant species. *Ecology and Evolution, 6*(2), 544-551.

Heriot, S., Asher, J., Williams, M. R., & Moro, D. (2019). The eradication of ungulates (sheep and goats) from Dirk Hartog Island, Shark Bay World Heritage Area, Australia. *Biological Invasions, 21*(5), 1789-1805.

Human Wildlife Conflicts Working Group. (2018). *Methods for Managing Deer in Populated Areas.* The Assocation of Fish and Wildlife Agencies.

Innes, R. J. (2013). *Odocoileus hemionus*. (U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory) Retrieved from Fire Effects Information System: https://www.fs.usda.gov/database/feis/animals/mammal/odhe/all.html

Jones, H. P., Holmes, N. D., Butchart, S. H., Tershy, B. R., Kappes, P. J., Corkey, I., . . . Croll, D. A. (2016). Invasive mammal eradication on islands results in substantial conservation gains. *Proceedings of the National Academy of Sciences, 113*(15), 4033-4038.

Jones, J. M., & Witham, J. H. (1990). Survival of Black-Tailed Deer Following Relocation in California. *Wildlife Society Bulletin, 18*(4), 434-441.

Knapp, D. A. (2002). The Status of Island Scrub Oak (Quercus pacifica) on Catalina Island, California. *Proceedings of the Fifth Symposium on Oak Woodlands: Oaks in California''s Challenging Landscape. Gen. Tech. Rep. PSW-GTR-184*, (pp. 827-828).

Knapp, D. A. (2014). Ecosystem Restoration on Santa Catalina Island: A Review of Potential Approaches and the Promise of Bottom-Up Invader Management. *Monographs of the Western North American Naturalist, 7*(1), 421-434.

Kock, R. A., Woodford, M. H., & Rossiter, P. B. (2010). Disease risks associated with translocation. *Revue scientifique et technique, 29*(2), 329.

Long Beach Telegram. (1948). Island Deer Transplanted to Mainland. *Long Beach Telegram*.

Longhurst, W., Leopold, A. S., & Dasmann, R. F. (1952). A survey of California deer herds: Their ranges and management problems. *State of California, Department of Fish and Game, Bureau of Game Conservation*.

Longore, T., Noujdina, N., & Dixon, P. J. (2018). Landscape modeling of the potential natural vegetation of Santa Catalina Island, California. *Western North American Naturalist, 78*(4), 617-632.

Luna-Mendoza, L., Aguirre-Munoz, A., Hernandez-Montoya, J. C., Torres-Aguilar, M., Garcia-Carreon, J. S., Puebla-Hernandez, O., . . . Mendez-Sanchez, F. (2019). Ten years after feral goat eradication: the active restoration on Guadalupe Island, Mexico. *Island invasives: scaling up to meet the challenge* (pp. 571-575). Gland, Switzerland: IUCN.

Martin, T. G., Arcese, P., & Scheerder, N. (2011). Browsing down our natural heritage: Deer impacts on vegetation structure and songbird populations across an island archipelago. *Biological Conservation, 144*(1), 459-469.

McEachern, K., Atwater, T., Collins, P. W., Faulkner, K., & Richards, D. V. (2016). Managed Island Ecosystems. In H. Mooney, & E. Zavaleta, *Ecosystems of California* (pp. 755-778). Oakland: University of California Press.

McRae, B. H., Hall, S. A., Beier, P., & Theobald, D. M. (2012). Where to Restore Ecological Connectivity? Detecting Barriers and Quantifying Restoration Benefits. *PLoS One, 7*(12).

National Park Service. (2022, February 28). *What Are Invasive Species?* Retrieved from National Park Service: https://www.nps.gov/subjects/invasive/what-are-invasive-species.htm

National Park Service. (2023, June 13). *Island Fox*. Retrieved from National Park Service: https://www.nps.gov/chis/learn/nature/island-fox.htm

O'Bryan, M. K., & McCullough, D. R. (1985). Survival of Black-Tailed Deer Following Relocation in California. *The Journal of Wildlife Management, 49*(1), 115-119.

Oliver, T. H., Heard, M. S., Isaac, N. J., Roy, D. B., Procter, D., Eigenbrod, F., . . . Bullock, J. M. (2015). Biodiversity and resilience of ecosystem functions. *Trends in Ecology & Evolution, 30*(11), 673-684.

Palm Springs Desert Sun. (1950). Plenty of deer on Catalina. *Palm Springs Desert Sun*.

Parkes, J. P., Macdonald, N., & Leaman, G. (2002). An attempt to eradicate feral goats from Lord Howe Island. *Turning the tide: the eradication of invasive species* (pp. 233-239). Gland, Switzerland and Cambridge, UK: IUCN SSC Invasive Species Specialist Group.

Pennsylvania Game Commission. (n.d.). *Capture Myopathy*. Retrieved from Pennsylvania Game Commission: https://www.pgc.pa.gov/Wildlife/WildlifeHealth/Pages/CaptureMyopathy.aspx

Raiho, A. M., Hooten, M. B., Bates, S., & Hobbs, N. T. (2015). Forecasting the Effects of Fertility Control on Overabundant Ungulates: White-Tailed Deer in the National Capital Region. *PLoS One, 10*(12).

Ramirez, A. R., Pratt, R. B., Jacobsen, A. L., & Davis, S. D. (2012). Exotic deer diminish post-fire resilience of native shrub communities on Santa Catalina Island, southern California. *Plant Ecology, 213*, 1037-1047.

Ruiz-Ballesteros, E., & del Campo Tejedor, A. (2022). Eradicate to Construct Nature. Goats, Rats, and Humans in Floreana (Galapagos Islands). *Ethnos*.

Salladay, R. A., & Ramirez, A. R. (2018). Reduced Defenses and Increased Herbivore Preference of Island Chaparral Shrubs Compared to Mainland Relatives. *Western North American Naturalist, 78*(4), 768-776.

Seagle, S. W., & Close, J. D. (1996). Modeling white-tailed deer Odocoileus virginianus population control by contraception. *Biological Conservation, 76*(1), 87-91.

Sharp, T., & Saunders, G. (2011). *A model for assessing the relative humaneness of pest animal control methods.* Canberra, ACT: Australian Government Department of Agriculture, Fisheries and Forestry.

Short, K. C., & Finney, M. A. (2022). Agency records of wildfires caused by firearms use in the United States. *Fire Safety Journal, 131*.

Shuford, W. D., & Gardali, T. (Eds.). (2008). *California Bird Species of Special Concern Book.* Western Field Ornithologists, California Department of Fish and Game.

Simard, M. A., Dussault, C., Huot, J., & Côté, S. D. (2013). Is hunting an effective tool to control overabundant deer? A test using an experimental approach. *The Journal of Wildlife Management, 77*(2), 254-269.

Society for Ecological Restoration. (n.d.). *What is Ecological Restoration?* Retrieved from Society for Ecological Restoration - Restoration Resource Center: https://ser-rrc.org/what-is-ecological-restoration/

Spatz, D. R., Holmes, N. D., Will, D. J., Hein, S., Carter, Z. T., Fewster, R. M., . . . Russel, J. C. (2022). The global contribution of invasive vertebrate eradication as a key island restoration tool. *Scientific Reports, 12*(1).

Stapp, P., Hamblen, E., Duncan, C. L., & King, J. L. (2022). Status of the Introduced Mule Deer Population on Catalina Island, California, Based on Annual Spotlight Counts. *Proceedings of the Vertebrate Pest Conference*, *30.*

Thomson, D. M., McEachern, K. A., Schultz, E. L., Niessen, K., Wilken, D., Chess, . . . Tucker, A. (2022). Diverse Native Island Flora shows Rapid Initial Passive Recovery after Exotic Herbivore Removal on Santa Rosa Island, California. *Biological Invasions*, 1635-1649.

Trask, B. (1897). The Heart of Catalina. In C. F. Lummis (Ed.), *The Land of Sunshine* (Vol. VII, pp. 153-160). Los Angeles, CA: Land of Sunshine Publishing Co.

U. S. Fish and Wildlife Service. (2023, January 24). Five Species on San Clemente Island Declared Fully Recovered. Naval Base Coronado, California.

van Klink, R., van Laar-Wiersma, J., Vorst, O., & Smit, C. (2020). Rewilding with large herbivores: Positive direct and delayed effects of carrion on plant and arthropod communities. *PLoS One, 15*(1).