Introduction

Wild Pigs

Wild pigs (Sus scrofa) are an invasive species that occur across the United States and in 56 of California's 58 counties. As their range continues to expand, impacts from wild pig populations are also growing. Wild pigs are known to consume many different species of plants and animals and have profound effects on the landscape through their deleterious foraging practices, known as rooting. Wild pig populations are not expected to decline without intervention as their populations have the potential to triple every year under optimal conditions (Barrett, 1978).



Tejon Ranch

Tejon Ranch is one of the most ecologically significant and special places in California. The Ranch is comprised of 240,000 acres of preserved native grasslands, pine forests, oak woodlands, and Joshua tree wilderness. A unique agreement between the Tejon Ranch Company (TRC) and five conservation organizations protects 90% of Ranch property from all future development. This agreement created the Tejon Ranch Conservancy, a non-profit organization tasked with managing and conserving the natural resources on the Ranch. Ranch personnel believe wild pigs were established on Tejon Ranch after the release of domestic pigs in the 1980s. Since then, the population has grown and is estimated to be between 1,000 and 4,000 pigs across the Ranch.

Economic Effects

Benefits

- ~\$1 million annual revenue to California Dept. of Fish and Wildlife (CDFW), comprising 4.5% of CDFW's \$24.5 million hunting tag revenue
- Hunting programs are important sources of revenue for private landowners and California's hunting industry.

Costs

- ~\$28 million in CA damage to agriculture, rangeland, developed land (USDA APHIS Wildlife Services, limited estimate)
- 30 diseases and 37 parasites transmissible to people, domestic animals, and livestock.
- Tejon Ranch's agriculture program is vulnerable to these risks



Ecological Effects

Damage

Wild pigs negatively affect other wildli in three main ways: direct predation, competition for food and habitat, and destruction of habitat. Wild pigs direc prey on a number of animals includin grasshoppers, salamanders, frogs, fish, snakes, turtles, and ground-nesting bin (Seward et al., 2004). Wild pigs can als stress sensitive plant and animal specie through rooting, particularly in riparia areas (Jolley et al., 2010).

A number of these adverse impacts a likely occurring on Tejon Ranch. Evidence of rooting activity has been observed on the Ranch. Blue, valley, a black oak woodlands support diverse wildlife communities on the Ranch.



Policy

Wild pigs are classified as a big game species in California, Hawaii, and Florida. This status creates unique challenges for managing populations and mitigating damage. In California, wild pigs are managed by CDFW.

Wild pigs can be harvested through three methods:

- 1. Recreational Hunting: harvesting wild pigs for sport
- 2. Depredation Permitting: expands control options to include targeted strategies such as night hunting and trapping. Requires a permit from CDFW.
- 3. Encounter Law: allows landowners to kill wild pigs causing damage to their property.



For more information: http://www2.bren.ucsb.edu/~chanchos/ Contact: chanchos@lists.bren.ucsb.edu

Developing a Wild Pig Management Strategy for Tejon Ranch

Jocelyn Christie, Emily DeMarco, Elizabeth Hiroyasu, Adam Kreger, Maxwell Ludington





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| ng | | Distant A. Vissera |
| 1. | Photo. A. Kreger | |
| irds | Viral & Bacterial Diseases Carried by Wild Pigs | |
| | | |
| | Anthrax | infections |
| 105 | Bovine Herpes virus | Parainfluenza virus |
| an | Bovine tuberculosis | Pasteurellosis |
| | Brucellosis | Pestvirus infections |
| are | Classical Swine Fever (hog cholera) | Plague |
| 1 | Coronaviral infections | Pseudorabies |
| and | Encephalomyocarditis | Rabbit hemorrhagic disease |
| | Erysipelothrix infections | Rinderpest |
| | Foot-and-mouth disease | San Miguel sea lion virus |
| | Helicobacteria | Salmonellosis |
| | Influenza A | Swinepox |
| | Letpospirosis | Swine vesicular disease |
| と変換 | Louping-ill virus | Vesicular stomatitis |
| | Malignant catarrhal fever | Vesicular swine virus |
| | Menangle virus | Yersiniosis |





Management Strategies

A number of options exist to manage wild pig damage. These strategies can be generally grouped into three categories: eradication, population control, and exclusion.

. Eradication

- . Lethal Control
- Targeted hunting
- Trapping
- Snaring
- Lethal Toxicants
- . Non-Lethal Control

Management Recommendations

We have developed a series of recommendations for the Tejon Ranch Conservancy to manage the wild pig population on Tejon Ranch. We recognize that any management regime adopted requires a working, collaborative relationship between the Conservancy, Tejon Ranch Company, and CDFW.

Recommendation One: Identify priority habitats

We recommend that the Conservancy identify and classify primary and secondary priority areas for protection from wild pig damage. The Conservancy should also identify quantitative damage reduction objectives to guide their wild pig management program.

Recommendation Two: Conduct monitoring

We recommend that the Conservancy continue a monitoring program that establishes indices of wild pig abundances and wild pig damage. This monitoring program should occur throughout the year in order to document any effects of seasonality.

Recommendation Three: Implement pig damage controls

We recommend that the Conservancy adopt a strategy that is a combination of targeted hunting, depredation trapping, and exclusion fencing. Adopting a targeted hunting program and a night hunting program to supplement the current hunting program on the ranch can help to reduce population densities. Exclusion fencing should be erected around the highest priority areas. A depredation effort should be implemented in secondary priority areas to reduce pig damage. The hunting program can be adjusted to be more targeted, and be used as a wild pig control method as well.

Recommendation Four: Pig action network

Wild pigs impact lands across the state without regard to property boundaries. The Conservancy should partner with other affected landowners to collaboratively work together to reduce the impacts of wild pigs. The pig action network can also lobby to change the status of wild pigs from a big game species to a nuisance species, which would reduce some management challenges that exist within the current legal framework.





Acknowledgements:

Bren School of Environmental Science & Management: Naomi Tague, Frank Davis, Bruce Kendall Tejon Ranch Conservancy: Michael White, Tom Maloney, Jennifer Browne Tejon Ranch Company

Faculty Advisor: Naomi Tague

Client: Tejon Ranch Conservancy

· Aerial Gunning

 Contraceptive Vaccines • Exclusion Fencing









Correlation of Riparian Damage and Pig Abundance



Regression analysis of riparian pig activity index and damaged area shows a significant correlation $(R^2 = 0.68, p = 9.162 \times 10^{-5}).$



A cost benefit analysis was conducted to establish the relative costs and benefits of each management strategy available to the Ranch. In this analysis, we focused on three main management strategies: hunting, depredation, and exclusion fencing. We treated hunting as a baseline estimate because it is a reserved right for the Tejon Ranch Company. The other options are assumed to take place in conjunction with hunting efforts. For depredation and fencing we made assumptions about the success rate of each method, the cost associated with implementing each method, and how much each method could improve the value of the land or habitat. In our analysis, we found that if the value of the land can be increased by up to \$500, a hunting program should take place on the land. If the value of the land or habitat can be increased by up to \$3,100, then a depredation program should be added. Finally, in highest value lands, where the value can be increased by over \$3,100, the area should be fenced and excluded from pigs entirely. The cost benefit framework created in this analysis can be adjusted to reflect changes in management strategies.





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Pilot Monitoring Study





We conducted a pilot monitoring study in the summer 2013 and refined a monitoring strategy to be implemented throughout the year on the Ranch. We monitored riparian and terrestrial zones using camera traps and 10m x 10m damage plots to estimate indices of abundance and damage.

In the terrestrial areas, a multiple regression was used to examine the relationships between pig abundance and elevation, distance to a stream, distance to an alternative water source, and other mammal activity. Our analysis revealed a statistically significant relationship between pig abundance and elevation. Analysis of Variance (ANOVA) was used to examine the relationship between damage and different habitat types that were sampled (grassland, savannah, woodland, chaparral, and conifer).

We found that there was a statistically significant difference between damage caused in different habitat types. It is important to note, however, that our pilot study was limited to the dry summer months and conducting these studies in all seasons to establish the seasonal relationships between pig damage and habitat type should be prioritized. In the riparian zones, we found a statistically significant relationship between pig abundance and damage. This has important implications for management because damage is much easier to monitor than pigs themselves. If this relationship can be seasonally linked to other habitats, then the Conservancy can use damage plots to estimate the pig population on the Ranch.

Cost Benefit Analysis