Executive Summary

Wild Pig Management at the Jack and Laura Dangermond Preserve
Bren School of Environmental Science & Management
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By:
Peter Omasta
Shuhan Song
Benson Truong
AJ Zekanoski

Faculty Advisors:
Kelly Caylor
Chris Costello

Environmental Significance

The expansion of wild pigs (*Sus scrofa*) into nearly every region in California presents a difficult conservation problem for land managers. Wild pigs are considered an environmental issue because their foraging behavior preys on many wildlife species and alters native ecosystems in both coastal and inland areas. Pig populations continue to grow with no signs of slowing and it has fallen onto land managers to find ways to reduce their negative impacts. This challenge is made more difficult by the limited amount of resources that conservation organizations typically have to use on invasive species management. The management of wild pigs on the Jack and Laura Dangermond Preserve (referred to as 'the Preserve' or 'Dangermond') by The Nature Conservancy (TNC) exemplifies the issue well. If TNC is to achieve its goal of conservation and stewardship of natural resources, the threat posed by wild pigs must be quantified so that effective management strategies can be developed and implemented. Our two research objectives are to initiate studies on the wild pig population by estimating abundance and distribution, and to assist TNC in the selection of different wild pig management approaches that achieve their conservation goals with the most efficient use of resources on the Preserve.

Group findings

Analysis of ~400,000 camera trap photos taken in 2013 and 2014 gave an estimated wild pig population density of roughly 2 pigs/km^2 in the Dangermond Preserve. The species tends to cluster in the southern area of the Preserve where there is an abundance of freshwater and food resources in nearby wetland habitats. In terms of management strategies, total eradication is not cost effective for Dangermond given the low density of wild pigs. Targeted removal would take a large, annual, and intense hunting effort to lower the population of pigs, and not to mention pigs can adapt to hunting efforts fairly quickly. Alternatively, fencing off priority areas for protection

from wild pigs is more effective. After talking with TNC, we analyzed the fencing cost of four areas: an oakwood land area, a large coastal area, and two smaller coastal dune areas. We recommend our client to strengthen their monitoring network on the preserve, such as implementing more camera traps or VHF collaring that can collect more data or track pig movement. Lastly, given wild pigs can move easily in and out of the Preserve, it would be beneficial for Dangermond to collaborate with nearby landowners, especially Hollister Ranch and Vandenberg Air Force Base, for a regional management plan.

There were two primary objectives for The Nature Conservancy's pig management at the Preserve with this project. The first objective was to analyze a historical dataset of camera trap photos to generate a population estimate of wild pigs at the Preserve. Although feral pigs have been known to inhabit areas of the Preserve, this objective was necessary because the true abundance of wild pigs at Dangermond had not yet been estimated. Our second objective was to provide TNC with three cost analysis models illustrating different possible management approaches and the tradeoffs between them. We then use the results of our analysis to make a management recommendation that is most appropriate to counter the wild pig threat at Dangermond.

Our approach to the first objective was driven by data collected during a previous wildlife camera trap survey at the Preserve. From 2013 to 2014, 38 camera stations collected about 400,000 photos from different locations across the preserve. Our team then used Microsoft's `MegaDetector` machine learning software to isolate photos that contained likely images of humans, animals, and vehicles. The photos were then pared down to find those that only contained images of pigs using `Timelapse2`. From the remaining photos, N-mixture analysis allowed us to generate a population estimate of wild pigs at the Preserve.

The second objective was to provide TNC with quasi cost benefit analyses (CBA) of three different conservation strategies for wild pig management. The three strategies were defined by the following:

1. Fencing of various high-priority areas around the Preserve to exclude pigs from sensitive habitat.
2. Active management/reduction of the wild pig population through limited fencing of high-priority areas and the implementation of a hunting/trapping program.
3. Total eradication of wild pigs at the Preserve by total perimeter and zone fencing followed by lethal control by hunting, trapping, and other removal methods.

Early on we recognized that the 'benefit' portion of the CBA was hard to quantify with an actual number, so the benefit in these scenarios is marked as area conserved. The analysis is referred to as a cost analysis at times because the benefits are only defined through the area protected. These CBAs were informed by our pig population estimate, interviews with local experts, the Dangermond Integrated Resource Management Plan, and literature reviews of prior pig management activities.

Recommendations

The results of our cost analysis led us to recommend a management strategy combining aspects of scenarios 1 and 2. At low density, exclusion fencing is the most cost effective management tactic to reduce damages from wild pigs. Additionally, a more robust monitoring network across the preserve would allow TNC to track changes in pig abundance and movements. For these reasons, we recommend TNC install pig exclusion fencing around ecologically sensitive high-priority areas and implement a monitoring program made up of no less than 30 wildlife camera traps. These actions are in line with TNC's objectives for wild pig management and set them up for future success in their goals for the Jack and Laura Dangermond Preserve.