

## **1. Development of a feral pig management strategy at Tejon Ranch, California**

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**3. Faculty Sponsor:** Frank Davis

## **4. Proposed Project**

### **Problem statement**

The 270,000 acre Tejon Ranch is the largest contiguous private property in California (Figure 1). Located at the confluence of 4 biogeographic regions, the Ranch is one of the most diverse landscapes in California. However, feral pigs became established on the Ranch in the 1990s and, as in many other parts of the U.S., are causing extensive ecological damage.

In June 2008 the Tejon Ranch Company and five major environmental organizations signed the historic “Tejon Ranch Conservation and Land Use Agreement (Agreement),” which provided for the protection of 240,000 acres of the Ranch to permanent conservation while allowing development on 30,000 acres (Figure 2). The Tejon Ranch Conservancy (Conservancy) was created as an independent, nonprofit organization to “preserve, enhance and restore the native biodiversity and ecosystem values of the Tejon Ranch and the Tehachapi Range for the benefit of California’s future generations.” The Agreement provides the Conservancy with the opportunity to enhance conservation values via adaptive management of the Ranch. The Agreement represents one of the most significant and forward looking conservation achievements in a state known for progressive conservation solutions. The Conservancy is also a member of the Southern Sierra Partnership (SSP), a regional environmental partnership between The Nature Conservancy, Audubon California, Sequoia Riverlands Trust, and Sierra Business Council to develop conservation strategies for the southern Sierra Nevada region. In this context, Tejon Ranch can serve as a “test bed” for developing regional conservation management strategies with these partners.

Although some have argued that pigs may play a positive ecological role in California (e.g., serving as the ecological equivalent of grizzly bears), adverse ecological effects of feral pigs are evident in virtually all ecological systems on Tejon Ranch. Developing management strategies to reduce these adverse impacts is crucial to the successful stewardship. However, feral pigs are regulated as a big game species in California, their carcasses provide an important food source for endangered California condors, and they are the primary game species harvested by the Tejon Ranch Company’s Wildlife Management (hunting) Program, which is a retained land use right under the Agreement. Exploring methods of assessing pig abundance and ecological damages, evaluating regulatory and policy considerations for feral pig management, and evaluating management options and targets will be critical to the Conservancy’s stewardship efforts at Tejon Ranch.

The Conservancy is seeking research assistance through a Bren MESM group project to help increase its understanding of the relationship between feral pig abundance and impacts at Tejon Ranch, to evaluate the regulatory and policy framework for managing pigs, and to assess potential cost and benefits of alternative management strategies. This high-profile project will require multiple disciplinary perspectives (resources assessment and management, environmental modeling, policy and economic analysis), analysis and synthesis of existing information, gathering of new field data by paid summer interns, empirical data analysis, and written and visual communication of findings to a diverse audience.

### **Project objectives**

The specific questions to be answered by this project are as follows:

1. What are the types and magnitude of ecological effects (positive and negative) associated with feral pigs? What are the economic and societal impacts of feral pigs in California and Tejon Ranch specifically? What is the regulatory, policy, and land use context of feral pig management in California in general and specifically at Tejon Ranch?

2. What approaches are available to monitor feral pig abundance, distribution, and impacts? How do their practicality, costs, and utility vary?
3. What feral pig management techniques are available to the Conservancy? What have been their practicality, cost, and efficacy in other settings? How do these various management techniques fit within California's regulatory, policy, and land use context, and what constraints exist for feral pig management at Tejon Ranch?

### **Project significance**

Tejon Ranch is one of the most important pieces of private conserved lands in California. This is a complex and important period of transition for Tejon Ranch from its long history of grazing, hunting and farming to conservation management, which will be overseen by the Conservancy. Given their pervasive negative effects at Tejon Ranch, managing feral pigs must be an integral part of the Conservancy's conservation management efforts. A Multispecies Habitat Conservation Plan is now under review that covers 142,000 acres of the Ranch's most diverse biological areas and will provide permits for residential and commercial development adjacent to the Ranch's conserved lands. A major focus of this HCP is conservation and mitigation of impacts to California condors, for which pig carcasses generated by Tejon Ranch's hunting program may be an important food source, and pigs likely adversely affect numerous other species covered by the HCP.

Feral pigs are increasingly recognized as a global threat to natural resources, as well as potential disease vectors to livestock and agricultural products. Hunting feral pigs provides revenue to private landowners and the State of California that can be used to fund conservation and wildlife management activities, but the relationship of revenue to ecosystem services potentially lost to feral pigs has not been documented. Many land managers in California are trying to address feral pig management to protect conservation values but little concrete information is available to assist with these efforts. Unlike many other states in the U.S., California treats feral pigs as a game species rather than a pest species, and California has no feral pig management strategy in place.

Because the Tejon Ranch Company is authorized to manage wildlife resources under a California Private Land Management Program permit, Tejon Ranch provides an opportunity to proactively develop management strategies that may be applicable to other parts of the state. A sound science and policy framework will be essential to making progress on this issue. As a partner in the SSP that is starting to implement conservation actions in the southern Sierra Nevada region, the Conservancy also has the ability to export knowledge to other regional conservation partners. Thus, group project members will be part of a larger suite of applied conservation planning and management activities. They will be focused on a specific element of the Agreement – enhancing conservation values on Tejon Ranch– but will experience firsthand the interplay of science, management, policy, business practices, and stakeholder processes in the implementation of the conservation and land use agreement and regional conservation actions.

### **Background information**

The Conservancy has enjoyed a very successful relationship with the Bren School, which has supported the development of the Conservancy's conservation management planning with three previous Group Projects. Management of feral pigs has emerged as a key issue during this management planning process. The group would work closely with the Conservancy's Director of Conservation Science Mike White (MW), who has been involved in conservation planning and management at the Ranch for many years. The Conservancy does not have adequate resources available to conduct field studies, data analysis and policy evaluations necessary to support development of a comprehensive feral pig management strategy. Thus students will be engaged at the early stages of planning for this critical management issue at Tejon Ranch.

### **Stakeholders**

The primary stakeholders will be the staff and Directors of the Conservancy, the Tejon Ranch Company, and the resource organizations who negotiated the land use agreement (California Audubon, Natural Resources Defense Council, Sierra Club, Endangered Habitats League, Planning and Conservation League). Other

important stakeholders include Tejon Mountain Village, LLC. Centennial, California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, The Nature Conservancy, Audubon California, Sequoia Riverlands Trust, Sierra Business Council, and the citizen's of California that will be investing in conservation efforts at Tejon Ranch and the broader region.

### **Possible approaches, available data, and deliverables**

We envision the following sequence of steps and deliverables to make the scope of the task tractable given time and Group Project capabilities:

1. Student Orientation and Data Transfer. MW and others will provide relevant materials and meet with students to give them an overview of the Ranch, the land use agreement, the RWMP, and ongoing activities. Early Spring 2013 MW and FD will transfer available information and geospatial data to the group. These data will largely be from the Tejon Ranch database developed by the 2010, 2011, and 2012 Bren project teams. Examples of available GIS data include recent, 1m color orthophotography, digital soils and topographic data, vegetation data, springs, roads and fences, livestock water sources, fire history, and rare species occurrences. These data will be supplemented by the students with other relevant data sets as necessary. Students will tour the Ranch with MW and FD in Spring 2013.

2. Goal statement. Based on their understanding of the materials, students will articulate the specific goals of the project to help prioritize data acquisition and analysis. These written documents will be reviewed and approved by FD and MW in Spring 2013.

3. Feral Pig Ecology, Impacts, and Monitoring Synthesis. Literature pig ecology, ecological and societal impacts, and approaches to monitoring abundance and damages will be reviewed and summarized in Spring and Summer 2013. Specific monitoring approaches will proposed for implementation by Bren interns at Tejon Ranch in Summer 2013.

4. Evaluation of Monitoring Information. Following completion of field monitoring during Summer 2013, students will assess the results of the field monitoring, explore the relationship between measures of pig abundance and ecological damage, and evaluate the efficacy of the various monitoring results in Fall 2013.

5. Feral Pig Management Policy Analysis. Winter 2014 students will evaluate attempt to quantify the loss of ecosystem services on Tejon Ranch due to feral pigs, efficacy and costs of feral pig management approaches and the regulatory, policy and land use framework for feral pig management in California to identify opportunities and constraints for pig management at Tejon Ranch. This analysis will consider the revenue generated by Tejon Ranch Company's commercial hunting program relative to the loss of ecosystem services on the Ranch due to pigs; California Department of Fish and Wildlife's regulations and revenue from feral pig hunting in relation to loss of ecosystem services across the state, and the implications of feral pig control to the U.S. Fish and Wildlife Service's Habitat Conservation Plan for development at Tejon Ranch.

**5. Client.** The Tejon Ranch Conservancy: C/o Michael White, Ph.D., Conservation Science Director, PO Box 216, Frazier Park, CA 93225, (661) 248-2400.

**6. Client Commitments.** See attached letter.

**7. Anticipated Financial Needs.** A total budget of \$17,000 is anticipated for the project, and the Tejon Ranch Conservancy has committed to provide \$15,000, assuming \$2,000 will be provided to the group by the Bren School.

Summer internships (2 paid internships, \$15/hr, for 2 summer months)	\$12,000
Travel and other expenses (e.g., mileage, lodging, reproduction)	\$5,000
Total	\$17,000

**8. Internship Opportunities:** 2 summer interns for 2 summer months in 2013.

Fig 1. Tejon Ranch location map

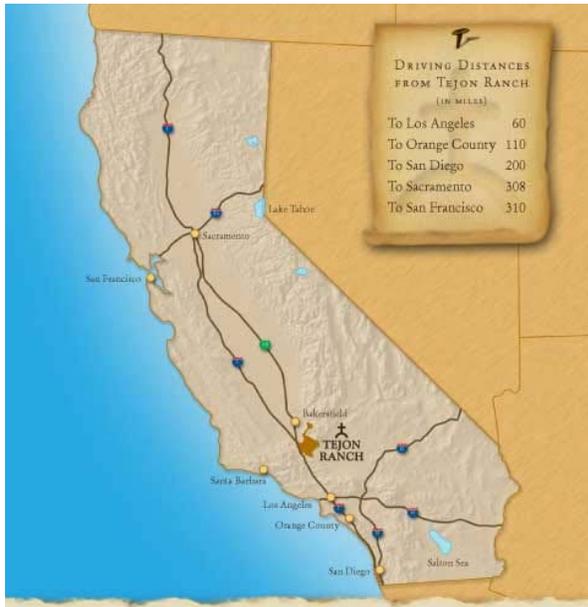


Fig. 2. Tejon Ranch Conservation and Land Use Agreement map.

