1. Developing fire management strategies in support of adaptive management 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 major biogeographic regions, the Ranch is one of the most diverse landscapes in California.

In June 2008 the Tejon Ranch Company and a consortium of environmental organizations signed the historic “Tejon Ranch Conservation and Land Use Agreement,” which provided for the protection of up to 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, non-profit 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.” By any standard, the Tejon Ranch Conservation and Land Use 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 with The Nature Conservancy, Audubon California, Sequoia Riverlands Trust, and Sierra Business Council, to develop conservation strategies for the southern Sierra Nevada region including Tejon Ranch.

One of the major obligations of the Conservancy is the creation and adoption of a Ranch-wide Management Plan (RWMP) for the conserved lands on Tejon Ranch. The RWMP must assess current conditions and evaluate potential adaptive management actions to maintain and enhance conservation values, particularly in light of anticipated changes in land uses and climate in the region. Fire is an important ecological process that may drive the composition and structure of the various ecological systems present on Tejon Ranch, and can be influenced in various ways by land uses, land management practices, and climate. Thus, developing a better understanding of the ecological role of fire, the implications of changing land uses and climate to fire ecology, and potential fire management strategies will be a key consideration in the RWMP.

The Conservancy is seeking research assistance through a Bren MESM group project to help increase its understanding of the fire ecology of Tejon Ranch, assess potential fire management strategies and their risk to surrounding residential developments, and evaluate how local fire risk abatement policies may influence fire management decisions. 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 pre-European contact fire regimes in the various ecological systems on Tejon Ranch? How have current fire regimes departed from these pre-contact conditions and how might key focal species be affected by these changes? What factors (e.g., ignition sources, land management practices, fuel loads) are currently driving fire regimes in the region? How might changes in climate and regional land use patterns affect future fire regimes? What are the key uncertainties in our understanding of the fire ecology on Tejon Ranch?
2. What specific land management practices might be employed to manage fire regimes on Tejon Ranch? What are the potential costs of these management actions to the Conservancy?

3. How might potential fire management strategies affect fire risk to future development projects contemplated at Tejon Ranch? How well are County fuel management policies expected to ameliorate such risk, particularly in light of changing climates?

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. 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 California State Park and a UC Natural Reserve are being considered for portions of the Ranch. A public access program is being implemented by the Conservancy.

Conservationists are increasingly focusing attention on managing to maintain natural ecological processes within conserved lands, particularly landscapes of the scale of Tejon Ranch. Fire regimes in the Tejon Ranch region are naturally diverse due to topographic and climate variations, and have been modified by existing land management practices on the Ranch and in the surrounding region. The anticipated changing land use patterns on and around Tejon Ranch, as well as climate changes already underway, are expected to further modify fire regimes from their natural range of variability, but in ways that are unclear. Only by developing a sound science-based understanding of these issues can the Conservancy develop a sound and effective RWMP. 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, students will be part of a larger suite of applied conservation planning and management activities. They will be focused on a specific element of the land use agreement – development of an element of the RWMP – but will experience firsthand the interplay of science, management, policy, and stakeholder processes in the implementation of the conservation and land use agreement and regional conservation actions.

Background information

The idea of funding a Bren Group Project to support the baseline assessment for the RWMP evolved out of discussions between the Conservancy’s Conservation Science Director Mike White and Frank Davis, who is a member of the Conservancy’s Board of Directors. This project follows and builds upon two previous Bren MESM projects, Development of conceptual models and ecological baselines to support monitoring and adaptive management of Tejon Ranch, California (2010) and Assessment of management and monitoring strategies in support of adaptive management of oak woodlands at Tejon Ranch, California (2011).

The group would work closely with Mike White, who has been involved in conservation planning for the Ranch for many years. The Conservancy has not had adequate resources available to conduct field studies or data analysis to support development of the RWMP. Thus students will be engaged at the early stages of the baseline conditions assessment, assessment of management opportunities and development of monitoring programs for this regionally significant resource on Tejon Ranch.

Stakeholders

The primary stakeholders will be the staff and Directors of the Conservancy, the Tejon Ranch Company (the landowner), 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, UC Natural Reserve System, California Dept. of Parks and Recreation, California Department of Fish and Game, 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 student 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 2011 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 and 2011 Bren project teams. Examples of available GIS data include recent, 1m color orthophotography, digital soils and topographic data, vegetation data, roads and fencelines, fire history, and rare species occurrences. These data will be supplemented by the students with other relevant regional data sets as necessary. Students will tour the Ranch with MW and FD in Spring 2011.

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 2011.

3. Fire Ecology Synthesis. Literature on pre-contact fire regimes will be reviewed and summarized in Spring and Summer 2011. Regional fire and land cover data will be analyzed to assess drivers of fire regimes in the Tejon Ranch region.

4. Conceptual Model Development. Using the Bren 2009 conceptual models as a starting point, students will divide the Ranch into major ecological systems for conceptual modeling of fire ecology under existing conditions in Fall 2011. These models will illustrate the role of fire in the system, the natural fire regime characteristic of the system, and ecological consequences to key focal species of departures from natural fire regimes. In Fall 2011 students will model potential mid-century fire regimes reflecting anticipated climate and land use changes, and incorporate these results into the conceptual models.

5. Identify Fire Management Options. Winter 2012 students will identify potential fire management strategies on Tejon Ranch to maintain or restore natural fire regimes, and assess their effectiveness and potential costs. Students will also assess any potential risk to future developments proposed at Tejon Ranch of these fire management strategies, and the effectiveness of County fuel management policies in ameliorating such risk.

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


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 2011.
Fig 1. Tejon Ranch location map

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