

## PROJECT BRIEF



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## DEVELOPMENT OF ECOLOGICAL BASELINES AND CONCEPTUAL MODELS TO SUPPORT AN ADAPTIVE MANAGEMENT PLAN FOR TEJON RANCH

### TEJON RANCH PROJECT OVERVIEW

Tejon Ranch is situated at a critical location between large tracts of conserved public and private land at the confluence of four ecological regions. In a landmark conservation agreement signed in 2008, over 178,000 acres of Tejon Ranch were dedicated to permanent conservation through the Tejon Ranch Conservation and Land Use Agreement (the Agreement).

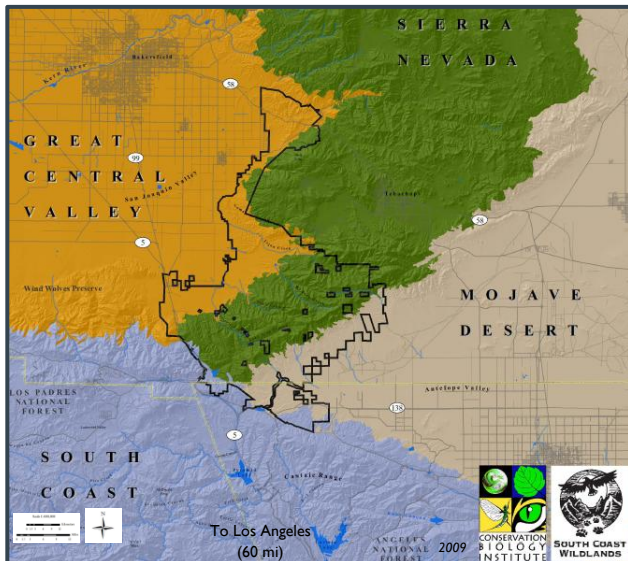


Figure 1: Ecological regions and location of Tejon Ranch

The Agreement fostered the creation of the Tejon Ranch Conservancy (the Conservancy), which must develop a Ranch-Wide Management Plan (RWMP) by 2013 to meet its mission of conserving and enhancing the natural heritage and biodiversity of Tejon Ranch. Adaptive management is referred to as “learning by doing” in which monitoring outcomes inform future management decisions. By applying conservation biology and landscape ecology principles, we have developed adaptive management recommendations and systematically explored the vast lands of Tejon Ranch to document and better understand its unique natural resources.

### PROJECT DELIVERABLES

- Conceptual models & narratives of the Ranch’s eight major vegetation communities
- Descriptions of potential drivers of change, including major environmental stressors
- Societal drivers & stressors conceptual model
- Scientific baselines on community conditions
- Monitoring targets for each of the nine vegetation communities
- Recommendations for future monitoring & management

### PROJECT APPROACH

Our group completed a landscape analysis to identify eight major vegetation communities on the Ranch, created conceptual models, researched environmental processes, and collected scientific baseline information of the conditions and stressors on the Ranch. From this research we also identified management recommendations and priorities. Our conceptual models for each of these communities identify key environmental stressors and processes.



Figure 2: Antelope Valley Grasslands on Tejon Ranch

## KEY VEGETATION COMMUNITIES

- Antelope Valley Grasslands
- Chaparral
- Foothill Blue Oak Woodlands
- Joshua Tree Woodlands
- Montane Mixed Hardwood Forests
- San Joaquin Valley Grasslands
- Valley & Foothill Riparian
- Valley Oak Savannas



Figure 3: Spring wildflowers on Tejon Ranch

## CONCEPTUAL MODELS

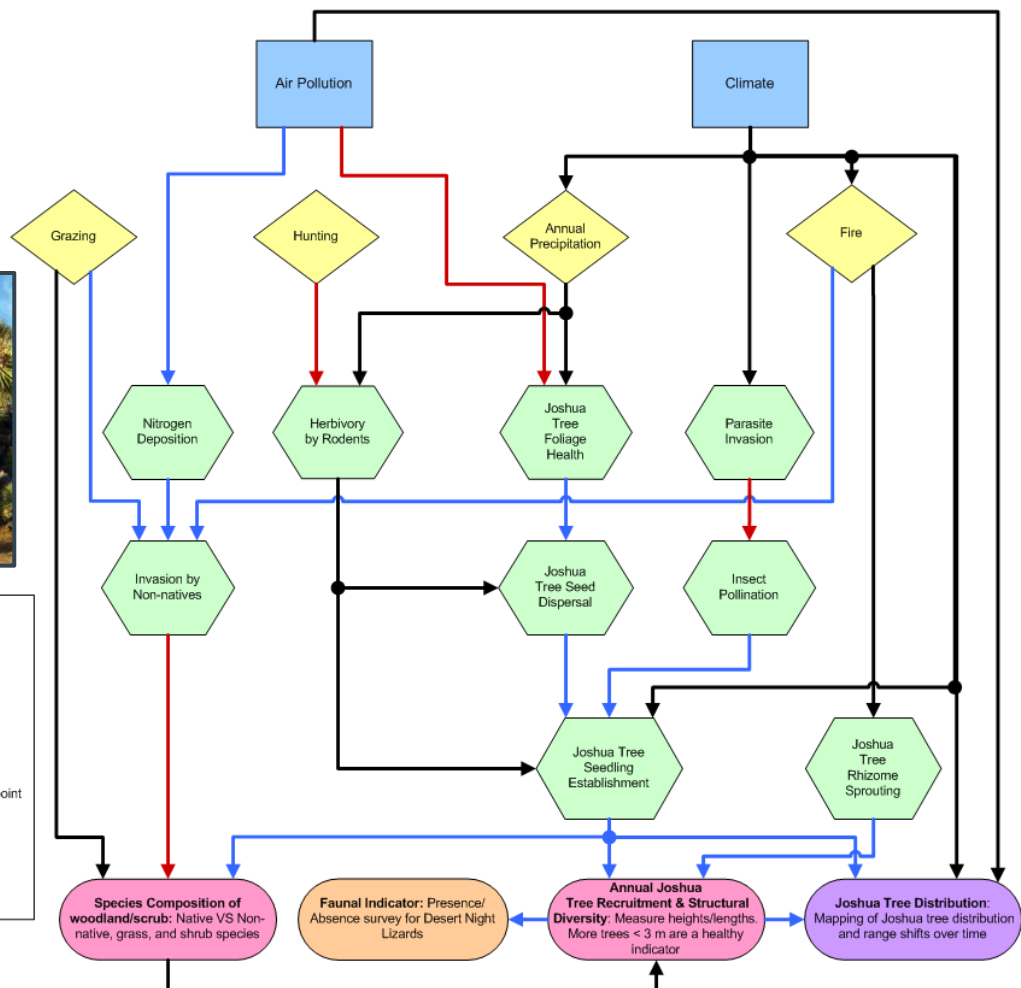
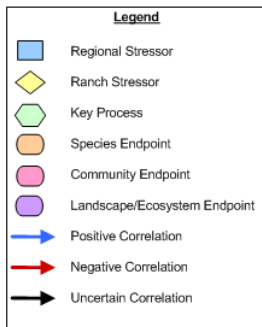
Conceptual models are communication tools that represent the current understanding of the relationships within a system. We developed conceptual models for eight key vegetation communities on the Ranch. Within each conceptual model we illustrate the key stressors, processes, and monitoring endpoints. Below is an example of one of our models, Joshua Tree Woodlands.

## REGIONAL-LEVEL STRESSORS

The top level of our conceptual models, the blue rectangles, represents regional-level environmental stressors, which have impacts both within and outside the Ranch's boundaries. Baseline condition information on regional-level environmental stressors such as air pollution and climate were collected and analyzed. We found that ozone levels annually exceed the state standard in both the Mojave Desert Air Basin and the San Joaquin Valley Air Basin. Particulate matter (PM10) is also in exceedance of the state standard. Climate data was analyzed; however, the results were not statistically significant.

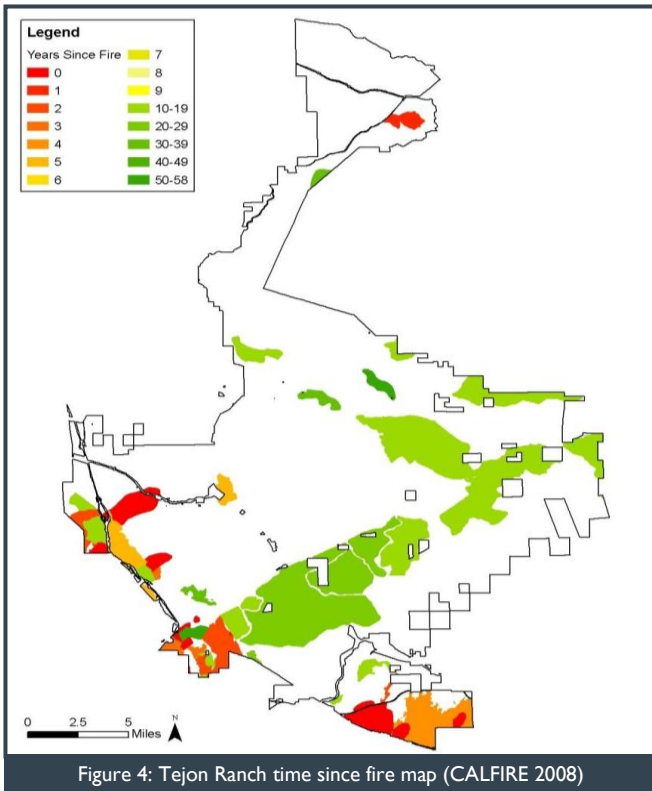
## Joshua Tree Woodland Conceptual Model

(Upper Slope Mojave Scrub & *Yucca brevifolia herbortii*)



## RANCH-LEVEL STRESSORS

The second level in our conceptual models, the yellow diamonds, represents ranch-level environmental stressors, which have more localized effects on the Ranch. We collected baseline information on hunting and fire regimes. Hunting records were acquired from the Tejon Ranch Company and were used to assess the different species and numbers of animals taken per year. Fire data was used to analyze time since fire (Figure 4), fire size distribution, and fire rotation intervals from 1950 to 2008. Our results show that there have been more large fires in the present period of 1980-2008 than the historic period of 1950-1979. This has resulted in a decreased fire rotation interval for the Ranch compared to the past. The other ranch-level stressors we have identified include grazing, hydrology, development and roads.

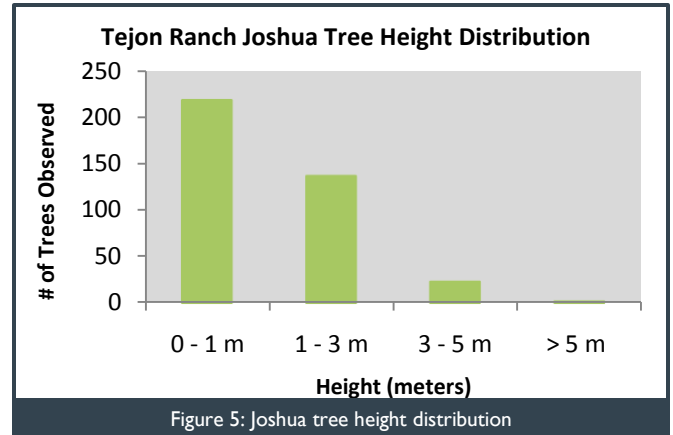


## BASELINE CONDITIONS

After creating conceptual models for the eight major vegetation communities, we performed baseline research on the Joshua Tree Woodlands, Riparian, and Valley Oak Savanna systems. The results for the Joshua tree and riparian communities are discussed in this brief. Our research on all these communities will help inform current and future management actions.

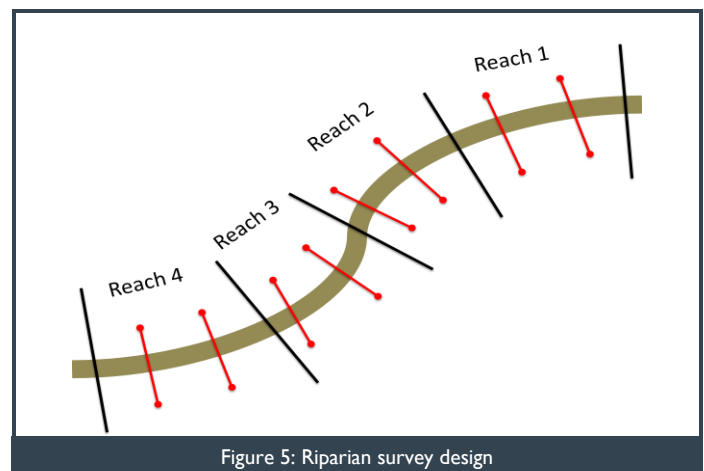
## RESULTS: JOSHUA TREE WOODLANDS

Field surveys and aerial imagery were used to assess the distribution of Joshua trees on the Ranch. By comparing Joshua tree locations in aerial images from 1952 and 2009, we found that the local Joshua tree population is expanding. Joshua tree height was surveyed using belt transects. The large number of trees in the 0 - 1 m range indicates high recruitment.



## RESULTS: RIPARIAN

We developed and implemented an assessment survey to collect baseline data on riparian communities of the Ranch. We selected four streams and divided them into like reaches based on vegetation composition. Two transects (red lines) were sampled within each reach, measuring species cover and structure.



We classified the transects into four groups based on dominant species: (1) canyon live oak and thicket-forming willow; (2) incense cedar forest; (3) alluvial sycamore woodlands; and (4) diverse composition with no dominant species. Based on a multivariate analysis, we found that riparian community composition is most strongly correlated with mean annual precipitation.



Management Concerns	Ranch-Level Stressors				Regional-Level Stressors		
	Grazing	Fire	Hunting	Hydrology	Climate	Air Quality	Development & Roads
Chaparral	●	●	●	●	●	●	●
Joshua Tree Woodlands	●	●	●	●	●	●	●
Montane Mixed Hardwood & Conifer Forest	●	●	●	●	●	●	●
Riparian	●	●	●	●	●	●	●
San Joaquin Valley Grasslands	●	●	●	●	●	●	●
Antelope Valley Grasslands	●	●	●	●	●	●	●
Valley Oak Savanna	●	●	●	●	●	●	●
Foothill Blue Oak Woodlands	●	●	●	●	●	●	●

Figure 6: Management concerns for the eight vegetation communities. Red circles indicate high priority areas, yellow moderate, and green low.

## MANAGEMENT CONCERNS & UNCERTAINTIES

Through constructing conceptual models and characterizing environmental stressors, we identified priority management concerns. The management concerns table in Figure 6 represents the relative magnitude of influence the stressor has within each of our eight vegetation communities. Concerns represent areas in which the Conservancy may need to focus its management and monitoring efforts due to the influence these stressors have in driving change in the vegetation communities. Current monitoring on the Ranch is limited and there are uncertainties about the current conditions. Adaptive management and monitoring of vegetation communities and stressors will be necessary to resolve this uncertainty. The key ranch-level stressors that we identified through this process are grazing and fire. We recommend implementing a grazing assessment method to monitor the impacts of grazing on Ranch communities and the development of an ecologically reasoned fire management plan to help the Conservancy protect and enhance the conserved lands. Climate is also recognized as a major driver of change in vegetation communities, and future management decisions need to reflect the uncertainty surrounding changes in climate.

## CONCLUSION

Our project will help the Tejon Ranch Conservancy with their mission of preserving, enhancing, and restoring the native biodiversity and ecosystem values of the Ranch for the benefit of California's future generations. With an increased understanding of the

conditions on the Ranch, the Conservancy is now better poised to manage the conserved lands. Our management and monitoring recommendations are meant to serve as suggested methods for which the Conservancy can begin to monitor the vegetation communities across the Ranch. The priority recommendations that we identified are opportunities where we see management actions having the strongest impact on Ranch.

As Graham Chisholm, Executive Director of Audubon California put it, "by protecting 90% of the Ranch, not only is this a tremendous victory for our environment, for California, but for Californians of future generations" (Governor's Tejon Ranch Press Conference 8 May 2008). Our group project assists in the conservation and future enhancement of one of California's natural wonders, but has also given us the opportunity to deepen our understanding of the ecological significance of this landscape and the tools to develop management steps for future protection.

## ACKNOWLEDGEMENTS

We would like to thank our project advisor, Frank Davis, for his time and support. We would also like to thank our client, the Tejon Ranch Conservancy, especially Mike White and Tom Maloney.

## REFERENCES

- California Department of Forestry and Fire Protection 2008. Fire and Resource Assessment Program Fire Perimeter Data.
- Conservation Biology Institute and South Coast Wildlands. 2006. Proposed Reserve Design for Tejon Ranch: A Threatened California Legacy.
- "Governor Praises Historic Tejon Ranch Agreement." Tejon Ranch Press Conference. 8 May 2008.

For more information:  
<http://bren.ucsb.edu/~tejon>  
<http://tejonconservancy.org>

