Dangermond Preserve

Integrating Historical Change and Future Projections To Guide Conservation

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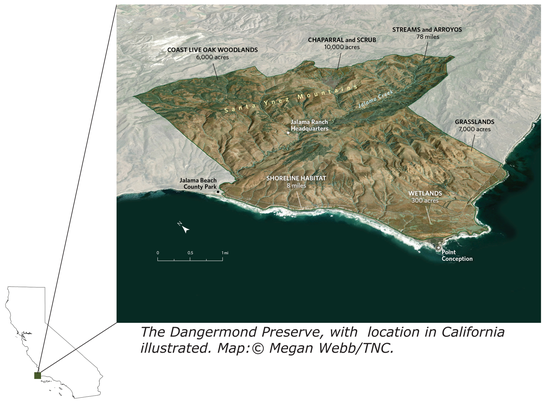
COASTAL PRESERVE: Oak woodlands cover the ridge overlooking the 24,000-acre property. ©: Bill Marr/TNC

Introduction

The Dangermond Preserve was established by The Nature Conservancy in 2017. The 24,000-acre property is located in western Santa Barbara County and was formerly a cattle ranch. As one of the last large, undeveloped coastal properties in southern California, the preserve protects large swaths of important habitat and is home to hundreds of plant and animal species. The purpose of this project is to inform conservation planning at the Dangermond Preserve by studying the property's history and anticipating its future.



The Dangermond Preserve, with location in California illustrated. Map:© Megan Webb/TNC.

Objectives

Identify trends in the extent and structure of habitat types since the 1930s.

Investigate the importance of historic ranching infrastructure for California red-legged frog habitat.

Predict changes in the distribution of sensitive plant species under future climate scenarios.

Recommendations

Monitor native grassland for evidence of shrub encroachment.
Grassland area has declined over time, and today there is very little native grassland at the preserve.

Plant and protect coast live oak to improve young seedling establishment and survival.
Further research is needed to validate that the oak population is aging. If confirmed, oak seedlings and saplings should be planted and protected from cattle and other herbivores with fences.

Anticipate climate change and species range shifts.
TNC should anticipate the potential loss of some species (such as tanoak and La Purisima manzanita) and the increased occurrence of southern or heat-tolerant species (such as lemonade berry).

Conduct a detailed investigation into California red-legged frog habitat.
Jalama Creek habitat is a conservation priority due to year-round flow. However, TNC should investigate the importance of stock ponds and cattle troughs in the frogs' distribution and habitat connectivity across the preserve.

Methodology

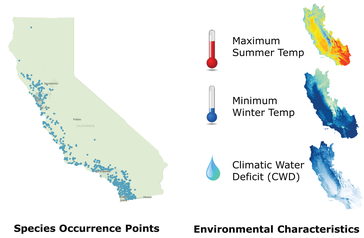
We used aerial photographs to identify the frequency of habitat types at 340 random sample points in 1938, 1978, and 2012.

Aerial photos of the same location in 1938, 1978, and 2012.

We used vegetation maps to calculate percent change in area of habitat types from 1931 to 2015.

We repeated historical coast live oak surveys from 1931. At survey plots, we counted the number of trees and measured their diameter at breast height.

We selected four plant species of conservation interest. We used a statistical program called Maxent to model the relationship between species distribution and climatic conditions across California.



We forecasted the distribution of these species under two future climate scenarios: warm/wet and hot/dry.

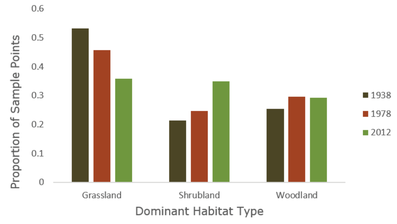
We developed a hydrological model to predict which streams at the Dangermond Preserve are likely to have year-round flow, constituting appropriate habitat for the California red-legged frog.

We compared California red-legged frog presence points to the locations of year-round streams, stock ponds, and cattle troughs.

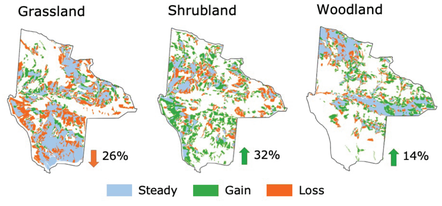
California red-legged frog (Rana draytonii).

Results

Photos and maps show grassland has decreased, while shrubland and woodland have increased.

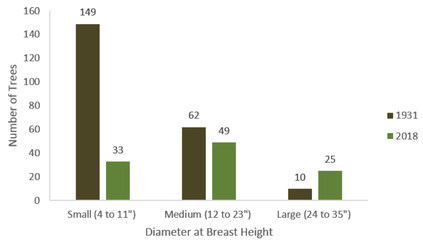


Proportion of total sample points dominated by grassland, shrubland, and woodland over time, according to aerial photos.



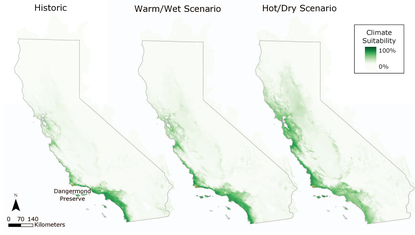
Percent change in habitat area from 1931 to 2015, according to vegetation maps.

Although woodland area has increased, there are fewer trees within this area —particularly, fewer small trees. This suggests the oak population is aging.



Change in number of coast live oak trees across 17 survey plots from 1931 to 2018.

Suitable climatic conditions for lemonade berry across California move northward, and will likely expand at the Preserve.



Lemonade berry range shifts north under both a warm and wet climate future with +10% precipitation and +2.5 celcius temperature, and a more severe, hot and dry climate future with -20% precipitation and +6.5 celcius temperature.

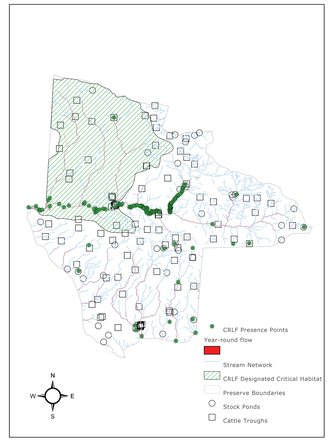
In the future, the Dangermond Preserve will likely not offer suitable conditions for tanoak and La Purisima manzanita, but will still offer suitable conditions for coast live oak.

Species	Warm/Wet Scenario	Hot/Dry Scenario
 **Coast Live Oak** *Quercus agrifolia*	Stable	Less Suitable
 **Tanoak** *Notholithocarpus densiflorus*	Less Suitable	No longer suitable
 **Lemonade berry** *Rhus integrifolia*	More Suitable	More Suitable
 **La Purissima Manzanita** *Arctostaphylos purissima*	Less Suitable	No longer suitable

Suitability for four species of interest under historic (left) and projected future warm-wet (center) and hot-dry (right) climates. Photo credits: © 2017 The Water Conservation Garden, ©2004 Kim Cabrera, © 2016 Chris Leslie, © 2016 Fred Bergholz.

Jalama Creek (the major east-west stream on the property) is predicted to have year-round flow, and most of the California red-legged frog presence points are concentrated there.

Some California red-legged frog presence points are associated with stock ponds and troughs in upper reaches of streams where year-round flow is unlikely.



California red-legged frog presence points relative to modeled year-round streams and artificial water features.

Acknowledgements | References | Contact

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For more information regarding our project and The Dangermond Preserve, please visit our website: dangermondpreserve.weebly.com