



California Red-Legged Frogs

California red-legged frogs (CRLF) are a federally threatened species. They are dependent on year-round streams for breeding, foraging, and shelter. However, they are also known to occur in stock ponds and cattle troughs, suggesting these historic ranching features could increase their habitat.

Methods

We developed a hydrological model to predict which streams at the Dangermond Preserve are likely to have year-round flow. Then, we compared CRLF presence points to the locations of year-round streams, stock ponds, and cattle troughs.

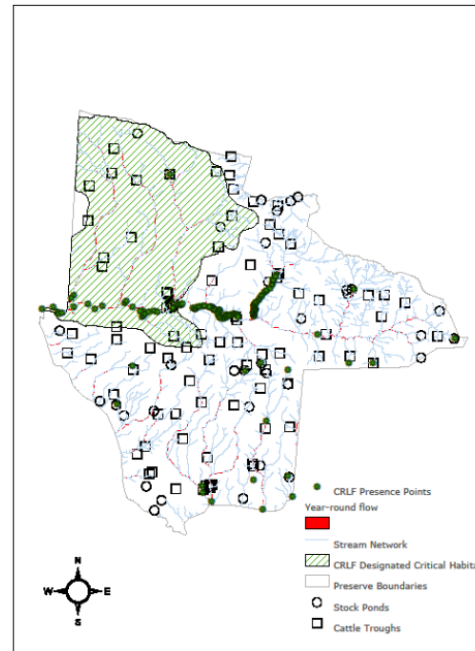


California red-legged frog (*Rana draytonii*).

Results

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

Some CRLF 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.

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 oak 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.

Acknowledgements | References | Contact

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For more information regarding this project please visit our website: dangermondpreserve.weebly.com



Data Sources: Calflora (<https://www.calflora.org/>); WRA Environmental Consultants, 2017; California BCM (Basin Characterization Model) downscaled climate and hydrology-30-year summaries (climate.calcommons.org/); Fairchild Aerial Surveys. UC Santa Barbara Library; Pacific Western Aerial Surveys; Whittier College. January 1938; Pacific Aerial Surveys. Flight USDA-40-06083. Santa Barbara, California; UC Santa Barbara Library; United States Department of Agriculture. January 1978; USDA-FSA Aerial Photography Field Office. Flight 2012204_CALIFORNIA_NAIP_1X0000M_CNIR. Salt Lake City, Utah: USDA-FSA-APFO. May 2012; Wieslander Vegetation Type Mapping Project (<http://vtm.berkeley.edu/>)

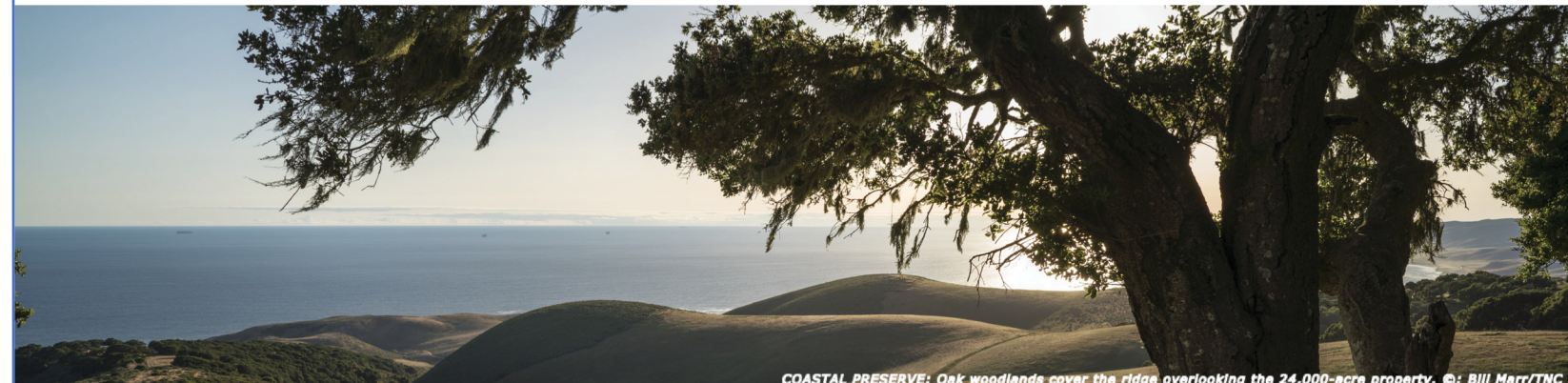
Dangermond Preserve

Integrating Historical Change and Future Projections To Guide Conservation

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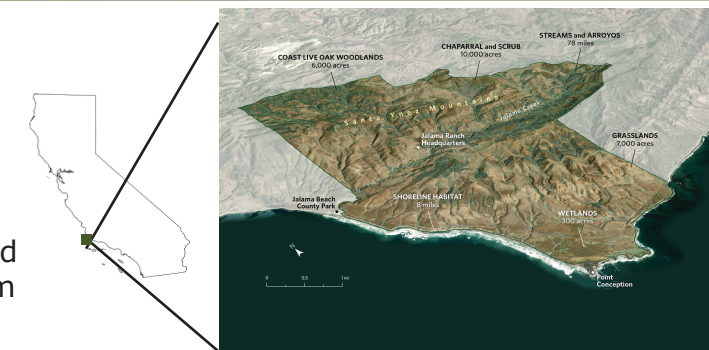
Spring Quarter, 2019



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

Background

The Dangermond Preserve was established by The Nature Conservancy (TNC) 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.

A thorough understanding of the property's history can provide important context for TNC as they assess the present-day state of the preserve. By comparing the extent and structure of natural habitats today to those in the past, we investigate if any broad habitat types have been lost or degraded, necessitating restoration or monitoring. The property's historical land use is also relevant to wildlife conservation. Accordingly, we investigate the effects of ranching infrastructure on the distribution of California red-legged frogs at the preserve. Finally, effective conservation planning also requires the consideration and prediction of likely future conditions. Anticipating the effects of climate change on the distribution of species is necessary for setting realistic conservation goals. Therefore, we model the future habitat suitability for four sensitive plant species at the preserve under two climate warming scenarios.

Objectives

- Identify trends in the extent and structure of habitat types since the 1930s.
- Predict changes in the distribution of sensitive plant species under future climate scenarios.
- Investigate the importance of historic ranching infrastructure for California red-legged frog habitat.

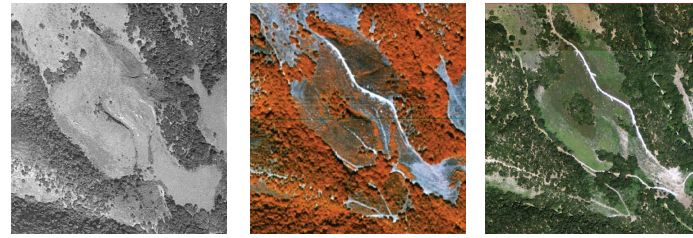


Historical Aerial Imagery & Map Analysis

Habitat diversity allows hundreds of plant and animal species to coexist at the Dangermond Preserve. The three main habitat types are: coast live oak woodland, shrubland (including scrub and chaparral), and grassland.

Methods

We used aerial photographs to identify the frequency of habitat types at 340 random sample points in 1938, 1978, and 2012. We used vegetation maps to calculate percent change in area of habitat types from 1931 to 2015.

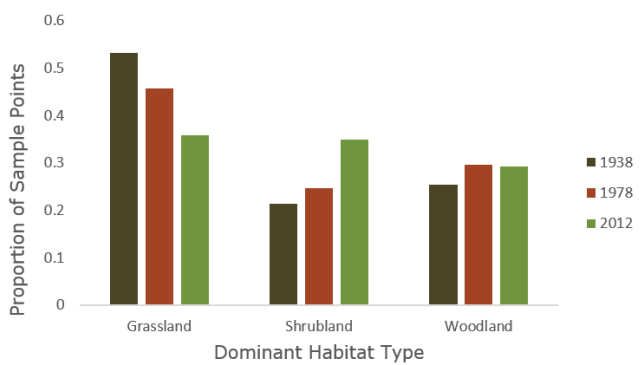


Aerial photos of the same location in 1938, 1978, and 2012.

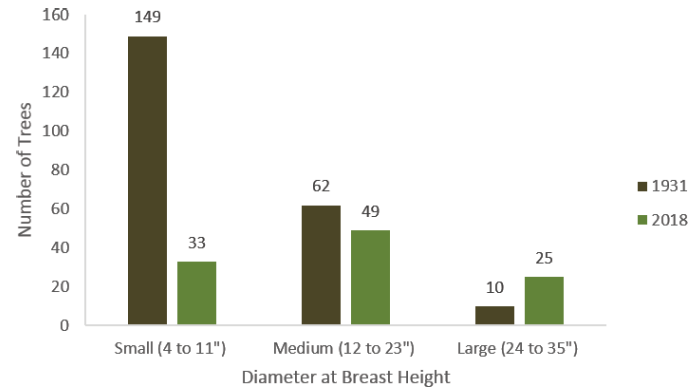
We repeated historical coast live oak field surveys from 1931. At survey plots, we counted the number of trees and measured their diameter at breast height.

Results

Photos and maps show grassland has decreased, while shrubland and woodland have increased. This trend may be driven by historic fire suppression on the property.

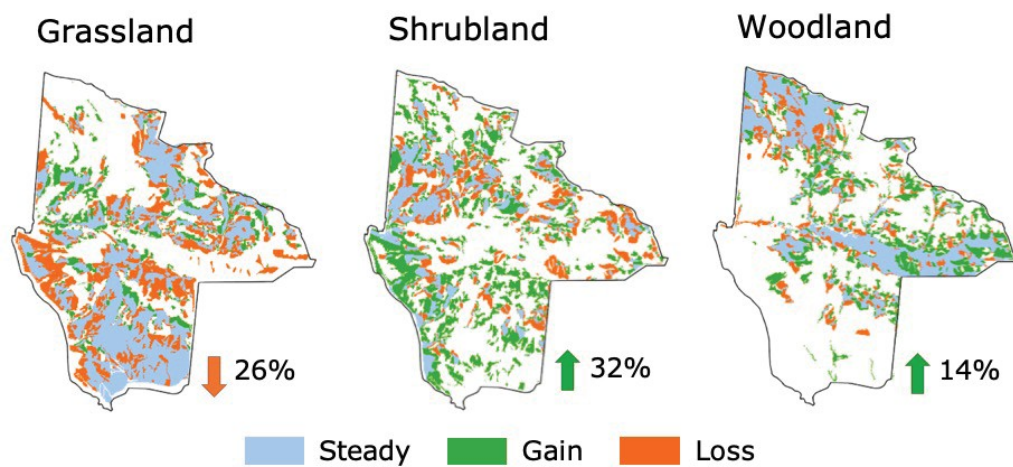


Proportion of total sample points dominated by grassland, shrubland, and woodland over time, according to aerial photos.



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

Although woodland area has increased, there are fewer trees within this area — particularly, fewer small trees. This suggests the oak population is aging, with low establishment and survival of new young oaks. This trend may be driven by historic cattle grazing, deer and rodent herbivory, and/or competition with annual grasses for water.



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



Plant Distributions Under Climate Change

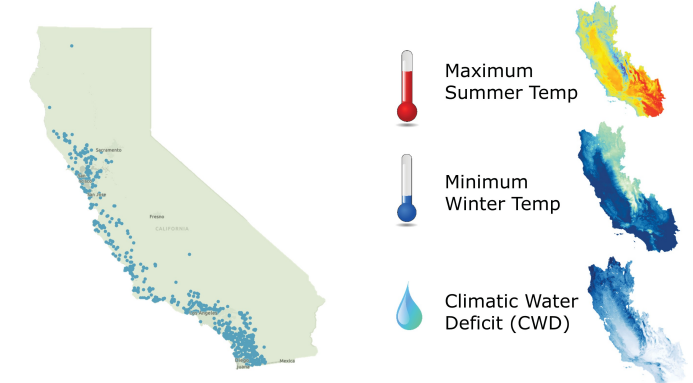
Future climate change may affect habitat suitability for species at the Dangermond Preserve. Anticipating the effects of climate change is necessary for setting realistic conservation goals.

Methods

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





We forecasted the distribution of these species under two future climate scenarios:

1. Warm/wet with +10% precipitation and +2.5° Celsius temperature (emissions peak in 2040)
2. Hot/dry with -20% precipitation and +6.5° Celsius temperature (emissions rise through 2099)



Species Occurrence Points Environmental Characteristics

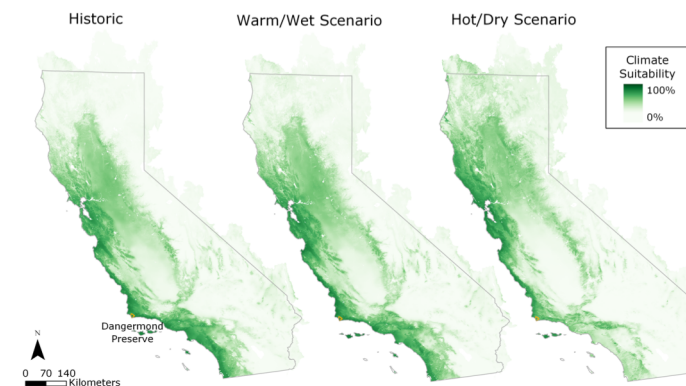
Species distribution models use occurrence information and environmental characteristics to show suitability across a landscape.

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

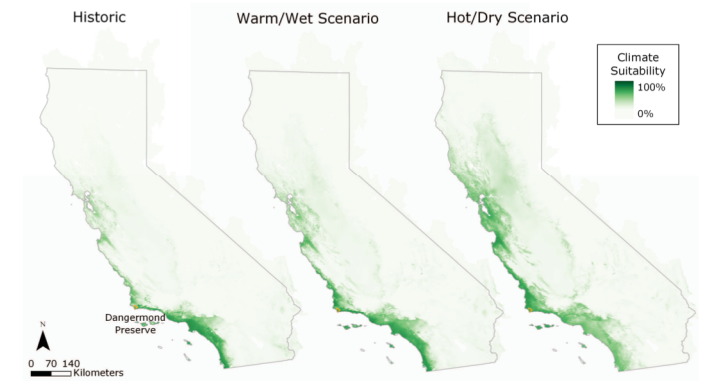
Suitability for four species of interest under projected future warm/wet (center) and hot/dry (right) climates. Photo credits: © 2017 The Water Conservation Garden, ©2004 Kim Cabrera, © 2016 Chris Leslie, © 2016 Fred Bergholz.

Results

Climate forecasting shows that species will respond differently to future climate scenarios. Habitat will likely remain suitable for coast live oak at the Dangermond Preserve in the future. Northern species, like tanoak, and rare species found only in Santa Barbara, like La Purissima manzanita, will likely lose suitable habitat at the preserve. However, habitat suitability for southern species like lemonade berry will likely increase at the preserve.



Coast live oak range remains stable at the preserve under the warm/wet future, but will be at the southern extent of its range under the more severe, hot/dry future.



Lemonade berry range shifts north under both a warm/wet and hot/dry future, and will likely increase at the preserve.