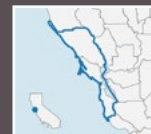


Western Leatherwood

Climate Change Vulnerability
and Adaptation Strategies for the
Golden Gate Biosphere Region



Species Description

Western leatherwood (*Dirca occidentalis*) is a slow-growing endemic shrub found only in the San Francisco Bay region, characterized by flowers that emerge before or with deciduous leaves. It is listed as a rare species by the state of California and exists in relict populations from what was likely a greater abundance and distribution in cooler, wetter paleoclimatic periods. Western leatherwood has a lifespan of approximately 50 years, and is found primarily on cool, north-facing, often shaded slopes and hilltops within mixed evergreen forest, oak woodland, chaparral, and coastal scrub ecosystems in the fog-dominated maritime climate of the Golden Gate Biosphere (GGB) region. It is capable of producing through rhizomes and by self-pollination, but its primary mode of reproduction is open pollination (by bees and hummingbirds), which is associated with higher rates of fruit set and germination.

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Species Vulnerability - Moderate

Sensitivity & Exposure - Moderate

Projected Changes	Trend
Air temperature	▲ Increase
Drought	▲ Increase
Precipitation	▲▼ Varies
Wildfire	▲ Increase
Pathogens	▲ Increase

Potential Impacts:

- Reduced fruit production and species abundance/survival due to warmer temperatures and reduced soil moisture
- Increased drought stress to plants and loss of appropriate mesic habitat due to drought
- Disruption to pollinator-plant interactions, impacting fruit set and species persistence
- Heightened chance of direct mortality and potential spread of pathogens as a result of disturbance events

Non-climate stressors may interact with climate stressors and disturbance regimes:

- *Residential and commercial development* and associated *roads, highways, and trails* lead to the loss and fragmentation of habitats with which western leatherwood is associated
- *Invasive species* such as French broom (*Genista monspessulana*) may alter habitat through direct competition or by increasing the risk of high-intensity fire



Western leatherwood is closely associated with cool, moist climates, suggesting sensitivity to warmer temperatures and reduced soil moisture. It has also been impacted by human activities that fragment and degrade western leatherwood's habitat.

Species Vulnerability - Moderate

Adaptive Capacity - Moderate

Intrinsic factors (i.e., inherent characteristics) that enhance or undermine adaptive capacity:

Enhance:

- Flexible reproductive strategies (i.e., can reproduce through rhizomes, self-pollination, or open pollination)

Undermine:

- Rare species with limited distribution and isolated populations
- Pollinators that have a fairly small foraging radius

Extrinsic factors (i.e., management potential) that enhance or undermine adaptive capacity:

Enhance:

- Well-known among native plant enthusiasts
- Recognized as a rare endemic, which affords it some protection under the California Environmental Quality Act

Undermine:

- Paleoclimate relic whose current distribution represents climate refugia, so management must focus on existing plants and habitat



As a paleoclimatic relict, it is unlikely that refugia exist outside of western leatherwood's current habitat. However, its flexible reproductive strategies are likely to benefit the species given increasing climate stressors and disturbances.



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Adaptation Strategies & Actions

Adaptation strategies can reduce climate change vulnerability of a given ecosystem or species by addressing any or all of the three components of vulnerability (i.e., by reducing sensitivity, reducing exposure, and/or increasing adaptive capacity). The table below presents examples of adaptation strategies and actions, which fall within five categories, or approaches: Resistance/Resilience **(R)**, Acceptance **(A)**, Direct/Response **(D)**, Knowledge **(K)**, and Collaboration **(C)**. *Please note that the strategies and actions provided here should not be considered a checklist or plan, but rather as a set of examples for land managers to consider for further study when developing site- or species-specific actions.*

Adaptation Strategies	Adaptation Actions
Protect and restore existing populations of western leatherwood and suitable habitat	<ul style="list-style-type: none"> • Identify and protect all existing populations (R/K) • Identify occurrences in protected, managed lands and implement a vegetation monitoring and management strategy (R/K) • Preserve and restore suitable habitat within the species range (R)
Ensure pollination and gene flow	<ul style="list-style-type: none"> • Manually assist in cross pollination between separate occurrences (R) • Conduct pollination research and experiment with artificial pollination techniques (K)
Create novel stands in suitable, protected habitat	<ul style="list-style-type: none"> • Provide grants and seed for nurseries to study propagation techniques and develop production programs under stringent pathogen prevention Best Management Practices (BMPs) (K) • Identify protected suitable habitat not already occupied by the species in coastal bay area open space and provide nursery stock for outplanting (R/K)
Understand western leatherwood and its habitat needs	<ul style="list-style-type: none"> • Set up a monitoring program to identify unique occurrences on land that could be set aside for protection (K) • Increase research to better understand the reasons behind range contractions and what habitat conditions are desirable (K)

Adaptation strategies and actions suggested by individual stakeholders (not discussed during the December 2023 adaptation workshop).