



Coyote Brush (*Baccharis pilularis*)

Climate Change Vulnerability Assessment for the Santa Cruz Mountains Climate Adaptation Project

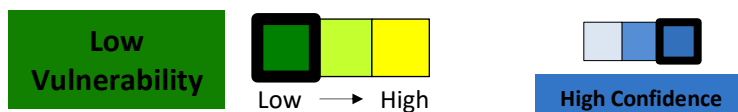
This document represents an initial evaluation of mid-century climate change vulnerability for coyote brush in the Santa Cruz Mountains region based on expert input during an October 2019 vulnerability assessment workshop as well as information in the scientific literature.

Species Description

Coyote brush (*Baccharis pilularis*) is a native evergreen shrub that can range from 0.3–3.7 m (1–12 ft) in height, depending on growth habit¹. It blooms from August to December and produces seed from late fall to early spring¹. Coyote brush requires full sun, and recruitment is low beneath closed shrub canopies¹.

Coyote brush is distributed from Baja California north into Oregon¹, and in the study region it is a characteristic species of northern coastal scrub communities². It is also common on the edge of forests and chaparral shrublands, and in the absence of disturbance (e.g., fire, grazing) will invade adjacent coastal grasslands dominated by annual grasses and forbs^{2–4}.

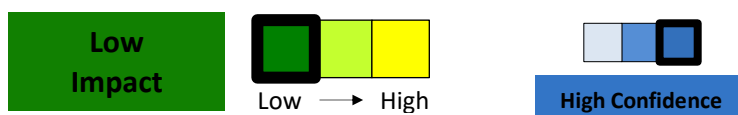
Vulnerability Ranking



Coyote brush is sensitive to climate stressors that impact seedling establishment and survival, including changes in patterns of precipitation, reduced soil moisture, and increased drought. These factors are likely to alter successional dynamics within shrublands and grasslands, driving expansion and contraction of coyote brush relative to adjacent habitats. Because coyote brush can grow under a wide range of conditions and is well-adapted to disturbances, this species has low sensitivity to climate-driven changes in disturbance regimes as well as non-climate stressors in the region.

Coyote brush is widely distributed throughout the study region, where it is often considered a problematic species due to its propensity to encroach into coastal grasslands. As a result, management of this species generally focuses on reducing its presence on the landscape to limit impact on more sensitive habitats.

Sensitivity and Exposure



Sensitivity is a measure of whether and how a species is likely to be affected by a given change in climate and climate-driven factors, changes in disturbance regimes, and non-climate stressors.

Exposure is a measure of how much change in these factors a species is likely to experience.

Sensitivity and future exposure to climate and climate-driven factors

Coyote brush is sensitive to climate stressors that impact seedling establishment and survival, which drives expansion or contraction of this species relative to adjacent habitats.

Climate Stressor	Trend Direction	Projected Future Changes
Precipitation	▲ ▼	<ul style="list-style-type: none"> Shorter winters and longer, drier summers likely, with higher interannual variability^{5,6}
Soil moisture	▼	<ul style="list-style-type: none"> Reduced soil moisture likely due to increased evaporative demand^{5,7}
Drought	▲	<ul style="list-style-type: none"> Increased frequency of drought years, including periods of prolonged and/or severe drought^{5,8}

- Changes in precipitation patterns (e.g., amount and timing), reduced soil moisture, and increased drought** are likely to alter coyote brush survival and recruitment, impacting range expansions and contractions into adjacent habitats^{3,9}. Water availability regulates coyote brush seedling establishment in grasslands^{3,9}, and high spring rainfall, in particular, is associated with recruitment into neighboring grasslands^{4,10}. This suggests that increased annual or spring precipitation could increase the rate of coyote brush spread due to more successful competition with annual grassland plants¹⁰. By contrast, reduced precipitation and increased drought could limit establishment and growth¹¹.

Coyote brush displays high optimization of available water compared to many co-occurring species, allowing it to increase photosynthetic rates during the dry season in order to produce large numbers of flowers and seeds in the fall⁹. There is evidence that coyote brush is able to take up fog water, reducing the rate of water loss and decreasing flammability during the dry summer months¹². Fog water harvest by established shrubs may also facilitate coyote brush seedling establishment⁹. Thus, it is likely that coyote brush will continue to outcompete species that experience greater negative impacts in a warmer, drier future climate, particularly within annual grasslands⁹.

Sensitivity and future exposure to climate-driven changes in disturbance regimes

It is likely that most climate-driven changes in disturbance regimes would benefit coyote brush populations by allowing them to colonize disturbed areas¹¹. However, it is possible that increased wildfire, in combination with reduced precipitation and increased drought, could cause reduced rates of spread¹¹.

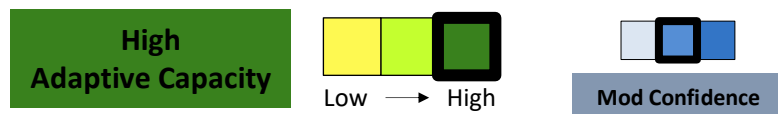
Dependency on habitat and/or other species

Coyote brush can grow under a wide range of conditions, including a variety of soil types and elevations ranging from sea level up to 760 m (2,500 ft)¹. However, this species does depend on full sun for growth and recruitment. As a result, it can eventually be shaded out under closed canopies, particularly in the absence of disturbance^{2,4,13}.

Sensitivity and current exposure to non-climate stressors

Non-climate stressors have a low impact on the climate change sensitivity of coyote brush within the study region.

Adaptive Capacity



Adaptive capacity is the ability of a species to accommodate or cope with climate change impacts with minimal disruption.

Species extent, integrity, connectivity, and dispersal ability



Coyote brush is widely distributed throughout the study region¹¹, where it often expands into coastal grasslands in the absence of disturbances such as fire and livestock grazing². This species produces large numbers of wind-dispersed seeds, which enhances its ability to colonize open areas and spread into grasslands when the soil surface is exposed following the senescence of annual species⁹.

Intraspecific/life history diversity



Coyote brush can grow as both prostrate and erect forms, depending on the environment. These used to be considered two different subspecies, but have since been combined because the two forms intergrade¹³.

Resistance and recovery



Coyote brush can resprout following lower-intensity fire, and established plants are also very tolerant of drought due to the presence of a long taproot¹³ and ability to utilize fog water¹². Due to prolific production of wind-pollinated seeds, coyote brush populations are able to rapidly recover from disturbances¹³. However, recruitment can be limited when the seed density of exotic annual grasses is high, particularly during periods of drought³.

Management potential



Coyote brush is often considered a problematic species due to its propensity to encroach into grasslands. As a result, management of this species generally focuses on reducing its presence on the landscape to limit encroachment into more sensitive habitats such as coastal prairie¹¹. However, coyote brush is sometimes used to provide erosion control in sloping areas^{1,13}. In southern California, it is also being used to facilitate the recovery of diverse native ecosystems in areas previously dominated by invasive grasses^{2,14,15}.

Recommended Citation

EcoAdapt. 2021. Coastal Brush (*Baccharis pilularis*): Climate Change Vulnerability Assessment Summary for the Santa Cruz Mountains Climate Adaptation Project. Version 1.0. EcoAdapt, Bainbridge Island, WA.

Further information on the Santa Cruz Mountains Climate Adaptation Project is available on the project page (<http://ecoadapt.org/programs/awareness-to-action/santa-cruz-mountains>).

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