



GGRF Investment in Desert Lands

Possibility of Sequestering Carbon and Achieving Multiple Co-Benefits in California's Second Largest Land Type.



California's deserts are home to a unique and varied collection of habitats that support a large diversity of wildlife. California deserts account for 29 million acres, or 28% of California's landmass¹. They are largely unpopulated, unfragmented by development, and are of global significance, as they represents perhaps the largest intact ecosystem in the US outside of Alaska. Investments in the conservation of California's deserts through the GGRF is a great opportunity for the state to sequester high levels of carbon and make California climate resilient.

Desert Vegetation Sequesters Carbon

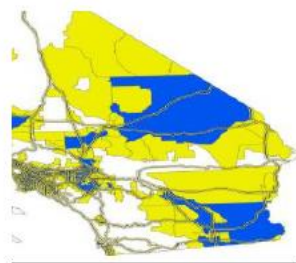
Carbon is sequestered in the desert through its deep root vegetation respiring calcium carbonate (Caliche). Caliche is a large sink of carbon, globally equal to that of the atmosphere, and the vegetation². Comparing the two landscapes, California forests have up to 12kg/m² of aboveground stored organic carbon³, while California desert soils have up to 8.3 kg/m² of buried inorganic carbon⁴. The net uptake of carbon in the Mojave Desert ranged from 102 - 127 g/m² annually during a three year period (equivalent to 0.46-0.57 tons/acre)⁵. Since deserts are such a large land mass in California and they sequester a significant amount of carbon, a substantial portion of the Cap and Trade Revenue for natural and working land carbon sequestration should be allocated to deserts.

Recently, the rate of carbon sequestration was shown to increase as the level of atmospheric CO² increases⁶. This means California deserts could play a major role in absorption of increased atmospheric CO² resulting from future emissions.

CO² is released from desert soils when the land is disturbed. Unfortunately, while California deserts are one of our more intact ecosystems, desert landscapes have been destroyed by development, mining, off-

highway vehicle use, and other land-disturbance activities. Once these disturbances happen it takes millenniums for the desert carbon sink to regenerate.

Opportunity to Invest in Disadvantaged Communities



California deserts are home to disadvantage communities. SB 535 requires that 25% of GGRF go to disadvantaged communities and 10% of those funds must be spent in disadvantaged communities. In October 2014, CalEPA identified disadvantaged communities as those in the top 25th percentile of cumulative CalEnviroScreen scores. CalEPA's disadvantaged communities map (blue in the left image) shows that the desert region of California is a location of disproportionate amount of Disadvantaged Communities.

¹ Desert Landscape, Mojave Desert Land Trust. (2015). <http://www.mojavedesertlandtrust.org/landscape.php>.

² Allen, M.F., G. D. Jenerette, and L.S. Santiago. 2013. Carbon balance in California Deserts: Impacts of widespread solar power generation. Energy Research and Development Division. Final Project Report. <http://www.energy.ca.gov/2014publications/CEC-500-2014-063/CEC-500-2014-063.pdf>

³ Battles, J.J. et al. 2014. California forest and rangeland greenhouse gas inventory development. Final Report, California Air Resources Board Agreement 10-778.

⁴ Schlesinger, W.H. (1985). The formation of caliche in soils of the Mojave desert, California. *Geochimica et Cosmochimica Acta* 49: 57-66.

⁵ Wohlfahrt, G. et al (2008). Large annual net ecosystem CO₂ uptake of a Mojave Desert ecosystem. *Global Change Biology*. Vol. 14, Issue 7, pp. 1475-1487.

⁶ Evans, R.D. et al. (2014). Greater ecosystem carbon in the Mojave Desert after ten years exposure to elevated CO₂. *Nature Climate Change* Vol. 4, pp. 394-497.

Co-benefits of Desert GGRF Investments

Conservation and restoration of California's intact desert lands under GGRF can **lessen the effects of climate change** while providing significant **co-benefits** to human health and wildlife.

Climate Change Adaptation

Climate change is already impacting desert ecosystems. Average daily temperatures have been increasing over the past decade and precipitation patterns are changing. In response to climate change impacts, wildlife species will move to higher elevations and latitudes to avoid extreme heat and drought. Protecting intact desert lands will allow for overall landscape connectivity and intactness and allow wildlife the ability to move in response to climate change.

Public Health

Once desert land is disturbed, the exposed soil is easily stirred up by strong desert winds creating public health issues for surrounding communities. In fact, many desert soils that have been intact and stabilized for thousands of years can release harmful fungal spores that have resulted in outbreaks of respiratory illness referred to as "valley fever". Investing in desert land protection will increase public health for desert communities.

Water Conservation

California streams and their floodplains provide critical wildlife habitat and a foundation for much of the desert's biotic diversity. Dry washes in the Sonoran desert represent less than 5% of the land area but support 90% of its bird life⁷. These desert riparian areas are of conservation concern due to their ability to provide critical habitat for endangered breeding bird species such as Southwestern Willow Flycatchers, Western Yellow-Billed Cuckoos, and Least Bell's Vireos.

Where 20% of the water table has dropped in the Mojave, over 95% of the riparian forest has died because of an invasive plant species reaching deeper in the water table⁸. Water deficit in the Mojave will reach 57,200-79,600 feet by 2020⁹. Land acquisition focusing on conservation of water is needed in the Mojave to protect what is left of the area's water.



Desert Tortoise

Courtesy U.S. Fish and Wildlife Service

Preserving Wildlife Habitat

California deserts support an abundance of wildlife biodiversity. Many desert wildlife species are endemic – found in the California desert and nowhere else. Due to food and water resources being scarce in the desert, species require an expansive habitat to roam and find what they need for survival. Particularly, the desert is home to the federally threatened **Desert Tortoise**.

Investing in desert conservation for its GHG sequestration benefit also has the co-benefit of helping fund California's State Wildlife Action Plan's (SWAP) strategies for its 2025 goals. Focused on climate change adaptation, the plan includes the goal of increasing habitat and areas of native species dominance by 5% and acquiring 1,000 desert acres. The SWAP is not budgeted for implementation through another source, so GGRF investment is a perfect opportunity to cover the cost.

⁷ State Wildlife Action Plan 2015 Update; page: 5.6-22; <https://www.wildlife.ca.gov/SWAP/Final>

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