August 28, 2015

Shelby Livingston
Cap and Trade Auction Proceeds Branch Chief
Air Resources Board
California Environmental Protection Agency
1001 I Street
Sacramento, CA 95814

**RE: Draft Cap and Trade Auction Proceeds Triennial Investment Plan**

Dear Ms. Livingston,

On behalf of Defenders of Wildlife (Defenders) and our more than one million members and supporters, I am writing to request that intact desert land be included as a resource in the natural and working lands section of the cap and trade proceeds investment plan update. Defenders strongly supports the state's commitment to the conservation and restoration of natural and working lands for their greenhouse gas (GHG) reduction benefits as well as their numerous co-benefits to humans and wildlife. Investments put towards forests, wetlands, rangeland, agricultural lands, and urban greening not only help us meet our climate goals but also make California a better place for us all to live now and well into the future.

We do believe, however, that the natural and working lands sector of the cap and trade investment plan is missing a significant opportunity by not including desert conservation and restoration as resource with significant GHG sequestration and mitigation benefits. The updated investment plan should include deserts so they may be recognized for their GHG benefits and have the potential for funding through the Greenhouse Gas Reduction Fund. Defenders wishes to submit the following comments in support of such a proposal.

## Carbon Sequestration Benefits in the Desert

California's deserts are home to a unique and varied collection of habitats that support a large diversity of wildlife. The three main deserts in the state are the Mojave Desert, the Colorado Desert, and the Great Basin desert. Collectively, they account for 29 million acres, or 28% of California's landmass, with elevations ranging from 250 feet below sea level to nearly 12,000 feet[1]. The California deserts are largely unpopulated and still unfragmented by development, the California desert is of global significance, as it represents perhaps the largest intact ecosystem in the US outside of Alaska.

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

California's deserts currently store large amounts of carbon buried as caliche, or calcium carbonate, in the soil. Disturbance of the fragile desert soil results in the fragmentation and exposure of caliche to the atmosphere. This exposure releases carbon, adding to GHG emissions. Additionally, recent studies in the southwestern U.S. show that deserts may represent a larger carbon sink than was previously thought.[2]

Carbon is stored in desert soil once it is sequestered by vegetation. Despite common assumptions, California's deserts support an abundant variety of plants, all of which actively sequester carbon. Multiple studies have calculated the potential of carbon sequestration in desert soil, including the Center for Conservation Biology at the University of California, Riverside ("Center"). In a report prepared by the Center for the California Energy Commission, carbon dioxide is fixed and stored in desert soil at an annual rate of 60 - 600g/$m^2$, (equivalent to 0.25 - 2.5 tons/acre) dependent upon the particular ecosystem[3]. This is equivalent to rangelands which are currently listed in the cap and trade investment plan. In a different study, net uptake of carbon in the Mojave Desert ranged from 102 - 127 g/$m^2$ annually during a three year period (equivalent to 0.46-0.57 tons/acre)[4]. Recently, the rate of carbon sequestration was shown to increase as the level of atmospheric $CO^2$ increases,[5] meaning that deserts like the Mojave could play a major role in absorption of increased atmospheric $CO^2$ resulting from current emissions.

Unfortunately, while the California deserts are one of our more intact ecosystems, the desert landscape has been destroyed by development, mining, off-highway vehicle use, and other land-disturbance activities. These activities continue to expand across the desert landscape, resulting in large amounts of carbon released into our atmosphere from the disturbed desert soils.
It is also important to note that a significant amount of carbon has been released into the atmosphere due to land use practices that lead to desertification or increasingly arid and degraded landscapes. Historically, global desertification caused by human action has led to approximately 20-30 Petagrams (Pg), or 20-30 billion metric tons, of carbon released into the atmosphere[6]. A shift away from land use practices that lead to desertification would allow for significant sequestration of soil organic carbon. In addition to soil organic carbon, inorganic carbon sequestration occurs in desert ecosystems through the formation of secondary carbonates.[7]

The estimates of carbon sequestration are indicative of what may be possible under ideal conditions. Realization of this potential, however, requires a vigorous and coordinated effort towards desertification control, restoration of degraded ecosystems, protection of intact desert lands, and adoption of resource management plans for land uses on arid lands. Carbon is being cycled in

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[2] 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.

[3] *Carbon Balance in California Deserts: Impacts of widespread Solar Power Generation*, Center for Conservation Biology, University of California, Riverside. (2013). p.11, http://www.energy.ca.gov/2014publications/CEC-500-2014-063/CEC-500-2014-063.pdf

[4] 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.

[5] 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.

[6] Lal, R. (2004) Carbon Sequestration in Dryland Ecosystems. *Environmental Management* Vol. 33 No. 4, pp. 528-544

[7] Monger, H. C., and R. A. Gallegos. (2000). Biotic and abiotic processes and rates of pedogenic carbonate accumulation in the southwestern United States. *Relationship to atmospheric CO2 sequestration*. pp. 273–290 *in* R. Lal, J. M. Kimble, H. Eswaran, and B. A. Stewart. Eds, *Global climate change and pedogenic carbonates*. CRC/Lewis Publishers, Boca Raton, Florida.

complex ways through desert vegetation and that cycle is lost from areas stripped of vegetation. The protection of native riparian desert woodland and vegetation types is important to guard buried inorganic soil carbon stocks and carbon sequestration capacity. Additionally, biological soil crusts can also sequester substantial amounts of carbon. The carbon can accumulate in the microbial biomass, ultimately adding soil organic matter to the system.

**Co-benefits of California's Deserts**

In addition to GHG sequestration, conservation and restoration of California's intact desert lands provide significant co-benefits to human health, plants, and wildlife.

Benefits to 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"[8]. By investing in desert land protection, we are investing in increased public health for desert communities as well.

Benefits to Biological Soil Crusts: Biological soil crusts are considered to be the fertile mantle of desert landscapes. The microbial communities within soil crusts are especially crucial to the ecological functioning of desert ecosystems. The crusts harbor diverse taxa including mosses, lichens, fungi, green algae, diatoms, and cyanobacteria that bind together mineral soil particles into water and wind stable aggregates at the soils surface. This crust is vital because it prevents erosion in sparsely vegetated landscapes. In addition, their contribution to soil fertility is essential. Some crust microbes are capable of converting atmospheric nitrogen to ammonium, an essential but limited nutrient in desert systems. Thus, crusts represent an important nitrogen source for associated vascular plant communities or oil food webs.[9]

Benefits to Plant Diversity: The California desert supports a high level of plant biodiversity – it is home to the oldest vascular plants in California such as the creosote bush and the bristlecone pine, and the shortest-lived plants such as the ephemeral summer annuals that can germinate and produce viable seed in just three weeks. A mid-elevation eastern Mojave Desert alluvial fan has 90-120 plant species per 2.5 acres which is comparable to the primeval coastal redwood forest of northwest California (90-125 plant species per 2.5 acres)[10]. At present, approximately 2,450 native plant species have been documented in the California desert, representing 38% of the state's entire native flora. About 350 species (15%) are listed by the California Native Plant Society as threatened, endangered, or of special concern.

The California desert remains relatively unexplored – many desert mountain ranges remain virtually uncollected and most have fewer than 250 herbarium records. Those records are restricted primarily to roadside collection during spring and early summer. We have only scratched the surface in our

[8] Scientific name for disease is Coccidioidomycosis. It is a disease endemic to arid regions in the western hemisphere, and is caused by the soil-dwelling fungus *Coccidioides immitis*. For more information see: Kolivras, K.N. et al. (2001) Environmental Variability and coccidioidomycosis (valley fever). *Aerobiologia*. Vol. 17, Issue 1, pp. 31-42.

[9] Pietrasiak, N. and J. R. Johansen. (2014). Microbiotic Soil Crust Communities: A Critical Component of California's Deserts. *Fremontia, Journal of the California Native Plant Society*. Vol. 42, No. 1, pp. 18-19.

[10] Andre, J. (2014) Floristic Discovery in the California Desert. University of California, Natural Reserve System. http://www.ucnrs.org/floristic-discovery-in-the-california-desert.html.

understanding of the desert flora. Prominent researcher and botanist, James Andre, estimates that 10% of the California desert flora remains undescribed.

Benefits to Microphyll Woodland: Streams are rarely perennial in the California deserts but they provide all of the same ecosystem services despite their episodic nature. Streams and their floodplains provide not only critical wildlife habitat, but also a foundation for much of the desert's biotic diversity. In some areas that are dominated by desert pavement, nearly all wildlife habitat is found along streams, even in the smallest channels. Larger ephemeral streams support stands of palo verde, ironwood and smoketree that provide shade and habitat for many desert species. These desert riparian areas are of conservation concern due to their rarity as well as 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. Dry washes in the Sonoran desert represent less than 5% of the land area but support 90% of its bird life. In fact, The National Audubon Society has recognized Desert Microphyll Woodland as an Important Bird Area.

Benefits to Wildlife**:** Contrary to popular belief, the California deserts support an abundance of wildlife biodiversity. Similar to desert plants, many desert wildlife species are endemic – found in the California desert and nowhere else. Due to the fact that food and water resources are scarce, species require large expanses of habitat to roam and find what they need for survival. Of particular interest, the desert is home to the federally threatened desert tortoise, the Mohave ground squirrel, desert bighorn sheep, golden eagle, multiple species of pup fish, Mojave fringe-toed lizard, flat-tailed horned lizard and many other species of importance to the state of California. An investment in protection of intact desert lands would provide important co-benefits to wildlife in addition to the carbon sequestration benefits.

Benefits to 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.

**Greenhouse Gas Reduction Fund Proposal**

Defenders of Wildlife requests that deserts be included in the cap and trade proceeds investment plan as an additional natural land capable of sequestering and storing carbon. By doing so, conservation and restoration projects that focus on carbon sequestration enhancement will be eligible for grants under the Greenhouse Gas Reduction Fund (GGRF). We believe the California Department of Fish and Wildlife would be the most appropriate department to oversee such a program as it already administers the wetlands and watersheds program. This could reduce administrative costs and time.

We recommend that investment projects should include a component further expanding the level of knowledge regarding the carbon sequestration benefits of desert conservation projects similar to what has been done for high mountain meadow projects. While there is clear scientific evidence of the carbon sequestration benefit of protection and restoring desert lands, it would be prudent to use these projects as an opportunity to increase the level of scientific knowledge regarding sequestration.

A deserts program should be funded at similar levels as other natural and working lands GHG sequestration programs. Based on allocations to these programs over the last two years, we believe a desert program should receive no less than $50 million from the GGRF to fund restoration projects and additional administrative costs during its first year of operation. The following are potential investment projects that would provide direct greenhouse gas mitigation benefits:

- **Conservation easements:** Conservation easements protect intact desert land, soil and plants so that they can continue to sequester and store carbon. Easements could protect our most critical habitat from potential development, an increasingly necessary need as we look to the desert for community expansion and renewable energy siting.
- **Protection of all microphyll woodland habitat in CA deserts:** Microphyll woodland, as described above, provides direct carbon sequestration benefit as well as multiple co-benefits to wildlife. Areas containing microphyll woodland should be protected and restored for the greatest GHG sequestration benefits and co-benefits.
- **Change grazing practices:** Grazing on desert soils releases carbon from soils into the atmosphere. Grazing also hinders the ability of desert plants to sequester carbon.
- **Closure of OHV illegal routes:** Illegal OHV use disturbs desert soils which releases stored carbon into the atmosphere. Enforcement of OHV closures and off-limits areas will help ensure intact desert lands are not disrupted by OHV use.
- **DRECP implementation:** The Desert Renewable Energy Conservation Plan aims to design and implement a desert-wide, scientifically-based conservation strategy to protect intact desert lands and species habitat. This plan is moving forward in two phases. Phase 1 which is currently underway consists of the BLM finalizing the public lands portion of the conservation strategy including the designation of Areas of Critical Environmental Concern and National Conservation Lands. This plan, once approved, will require significant resources for implementation and enforcement. Phase 2 of the DRECP aims to bring private lands into alignment with the overarching conservation strategy for the DRECP. This will require coordination and collaboration among state and federal agencies, and counties; and may involve acquiring land for conservation or placing easement on private lands.
- **Salton Sea restoration projects:** The Salton Sea will be the site of extensive restoration activities in response to the impacts to the Sea from the Quantification Settlement Agreement and water transfer. Some of these projects will involve protecting existing desert landscapes around the Sea from development.

Innovative greenhouse gas sequestration and emissions reduction projects for desert lands provide a significant leadership opportunity for California. Deserts take up a significant portion of California as well as the world. The conservation and restoration of these areas can help us meet our climate goals while also supporting significant co-benefits to humans, plants, and animals. Defenders encourages the State of California to lead in providing funding to protect our desert lands as a part of the state's comprehensive greenhouse gas reduction strategy.

Sincerely,

Kim Delfino
California Program Director