



## Impacts of Large Scale Solar PV Facilities on Adjacent Desert Plant Communities

### Introduction and goal

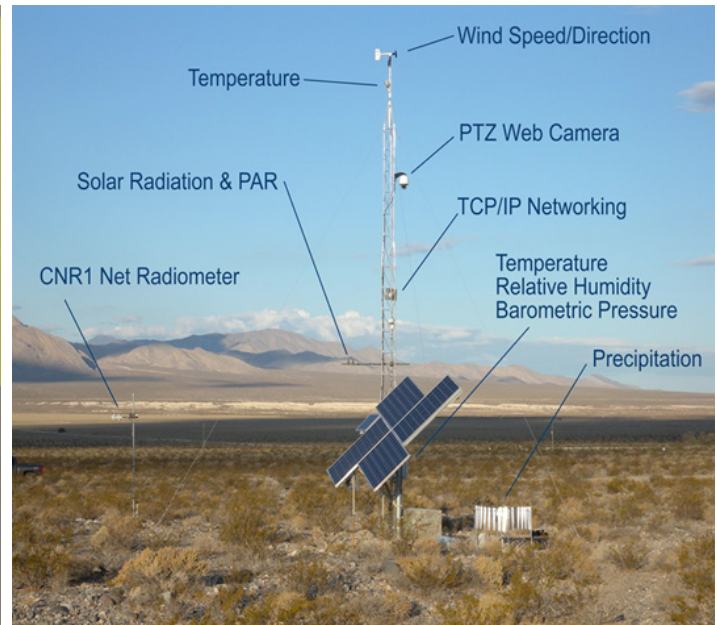
Construction of solar energy collection facilities will lead to fragmentation of the landscape and alteration of energy balances and microclimates within the operational grounds of the facility, impacting wind and thermal patterns in adjacent plant communities. Fragmentation has been shown to alter fluxes of radiation, momentum, water, and nutrients across the landscape. Such changes will, in turn, alter evapotranspiration and erosion-dust generation (impacting water use for dust removal from panels and mirrors), water availability, as well as overall health and productivity at the plant and community levels.

We asked the question “Do large scale solar facilities alter the microclimate and surface hydrology of desert ecosystems”? To answer this question we installed;

- Three 10 m meteorological towers in close association to a 1.5 km<sup>2</sup> solar photovoltaic (PV) facility located in Eldorado Valley, NV. These towers are located south of the facility, just north of the facility and 2.3 km north in a well-established creosote-bursage plant community.
- We collect continuous data on air temperature, relative humidity, wind speed, rainfall, photosynthetically active radiation (PAR), net radiation, soil heat flux, soil temperature, soil water content and soil salinity.
- We also installed 24 mini towers on a 300 m grid spacing associated with tower 2 to monitor air temperature at 0.1, 1, 2 and 3 m above the soil surface, within an area adjacent to the PV facility.
- Finally, we established 10 monitoring locations on a line gradient with 100 m spacing beginning at tower 2 to assess changes in the soil water balance associated with creosote bushes in and outside of washes and how this might lead to shifts in plant water status.

### Where does this research fit within the NEXUS project?

State and federal agencies that permit and regulate solar development are faced with the challenge of trying to assess the environmental impact of large scale solar facilities prior to approval. Little is currently known about the direct and indirect effects of large scale solar facilities on desert ecosystems. This research will lead to a better understanding of the environmental impact of solar plant development and will aid in the development of mitigation strategies. This is one of the research strategies under Objective 2 of the NEXUS Research (Goal 1): Understand environmental impacts of solar energy projects.



### Why is this research important and what knowledge gap does it fill?

Solar facilities represent large scale disturbance. Currently little information is available on how large scale solar facilities influence adjacent plant communities. We don't know how extensive the zone of influence is within adjacent plant communities, the level of stress plants are subjected to and what this might mean in terms of overall habitat health.

### What is the originality of the approach?

We are unaware of any published work that has addressed this issue. Long term monitoring sites are needed to address the uncertainties associated with ecological impacts.

### How is the new NEXUS equipment being used now, and in the future?

The tower system will be part of permanent infrastructure dedicated to solar environment research. The towers will also be part of a state wide system that monitors climate. The towers will also be leveraged by multiple investigators in future competitive research proposals.

### Key results to date

The large scale solar facility in Eldorado Valley impacts desert plant microclimate and hydrology by:

1. Altering turbulence which creates greater mixing and movement of air and vapor in the adjacent plant community.
2. Altering thermal patterns in the adjacent plant community.
3. Altering surface hydrology which impacts water balances and plant water status.

### Future plans

We will continue to monitor and analyze data from the three towers, 24 mini-towers, NDVI sensors and soil and plant monitoring locations along the 1000 m gradient. We are currently developing a proposal that will combine heat transfer modeling with remote sensing and field scale measurements to better understand the long term impact of PV facilities on desert ecosystems with emphasis on how future facilities might be designed to minimize environmental impact.

### Contact us

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