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Renewable Energy Development on Department of Defense Installations in the Desert Southwest: Identifying Impacts to Species at Risk – Conference Poster

Renewable Energy Development on Department of Defense Installations in the Desert Southwest: Identifying Impacts to Species at Risk

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Introduction/Methods

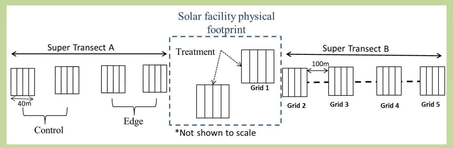
Background

Biodiversity is extremely high in the Mohave and Sonoran Deserts, and is subject to potential conflicts with land use such as solar and other energy development. As part of the Net Zero Energy concept put forth by our military installations, solar energy development is gaining considerable ground as part of installation land use, yet there is an absence of information on potential wildlife interactions. Future ESA listing of sensitive species caused by habitat degradation may impact mission implementation with a need to comply with Federal regulations. We designed a study to assess the extent of disturbance that solar development may pose on the surrounding landscape. We implemented this study at three military installations in the southwestern U.S.

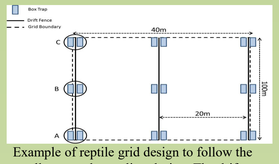
Overview of each military installation within our study area of the Desert Southwest (A). Solar arrays are depicted in black hash line for Yuma Proving Ground (B), Davis-Monthan Air Force Base (C) and Edwards Air Force Base (D). Trapping occurred within the general areas depicted by the yellow hash line in 2014-2015.

Objectives/Methods

1. Quantify differences in reptile and small mammal diversity and abundance between solar development sites and un-impacted sites on DoD installations
    - Pool data between two super-transects to generate species diversity indices, species richness, and relative abundance estimates using mark-recapture methods



Schematic of sampling design for small mammals in proximity to solar development. Blue hashed line (encompassing "treatment") represents the solar facility as outlined by a physical fence barrier, black hashed line represents super-transects and boxes represent grids.



Example of reptile grid design to follow the small mammal sampling design. The drift fence was staked for support with the bottom piled with dirt to prevent movement under the fence line. Box traps were paired into trap stations A, B, and C. (Figure not to scale)

2. Identify the spatial extent of solar development impacts on wildlife communities
    - Calculate changes across each super-transect to the treatment estimates
    - Compare rate of change across this gradient
    - Identify the extent of impact as defined by the "edge"

3. Evaluate the mitigation value of "soft-footprint" solar development when compared to standard "hard-footprint" development
    - Identify installations with different solar construction and maintenance
    - Evaluate species diversity and abundance based on the physical construction of each solar facility

4. Provide management recommendations to mitigate and monitor impacts of current and future solar development projects on DoD installations in the Desert Southwest
    - Develop a set of data-driven management recommendations

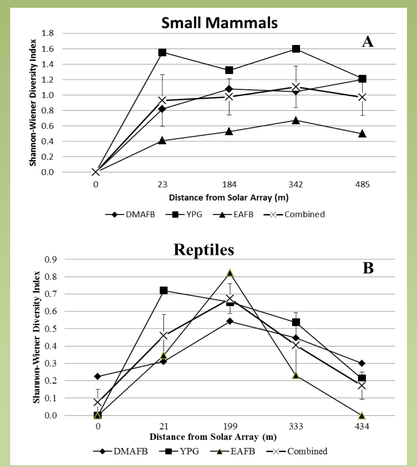
Results

Objective #1 – Quantify differences in abundance between developed and un-impacted sites

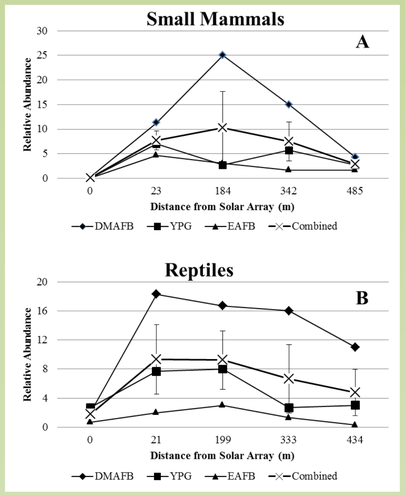
- *Reptiles*
    - Of 267 total captures, 16 individuals were captured within solar arrays
    - DMAFB – highest diversity
    - YPG – highest abundance
- *Mammals*
    - Of 264 total captures, 1 individual was captured on DMAFB solar array

Objective #2 – Identify the spatial extent of solar development impacts

- Diversity of small mammal species using the Shannon-Wiener Diversity Index resulted in indices of H = 1.21, 1.77, and 0.52



- Relative abundance for each installation was highest at DMAFB and lowest at EAFB.



Objective #3 – Evaluate the mitigation value of "soft-footprint" solar development

- A combined total of 17 individuals were captured within the solar arrays (1 mammal; 16 reptiles)
- Only intermediate type of footprint captured any individuals within the solar array

Discussion

Objective #1

- Solar arrays in this study have been established for several years (or multiple species generations), yet these areas have not been recolonized. This suggests that solar development removes an area's potential habitat for small mammals and reptiles.

Objective #2

- Bell-shaped pattern of species richness, diversity, and abundance across each of the three installations with the solar array at one end and the control area at the other end.
- Highest recorded measurements at intermediate distances. This may be a result of displacement and subsequent dispersal of these communities to the immediately surrounding landscape.
- Disturbance from construction may have altered the carrying capacity in the adjacent landscape.

Objective #3

- Results contradict previously held perceptions of "soft-footprint" design and potential benefits for at-risk species.
- It is possible that due to the construction of solar arrays in these environments, the disturbance and displacement effects may be permanent regardless of the surface maintenance.

Objective #4

- Several unique situations possibly impacted the level of disturbance that the presence and operations of a solar array might have on the surrounding landscape, ultimately affecting potential monitoring and mitigation strategies.
    - Extreme drought
    - Unexpected scavengers (ravens)
    - Habitat alteration beyond the physical footprint

Management Recommendations

1. Prioritize proposed development of solar arrays towards disturbed or previously disturbed areas.
2. Conduct initial survey on proposed development sites to identify any potential at-risk species.
3. If at-risk species are identified, monitor the immediate and adjacent areas to determine if any mitigation measures are warranted.
4. Have a wildlife biologist document any active burrows within the proposed solar development area, and relocate individuals found.
5. Install low to the ground openings to allow wildlife to move through the fence.