# Solar Wildlife & Ecosystems Database Research Guidelines

| Questions*† | | | | Data | | |
|---|---|---|---|---|---|---|
| *Question Level* | | *Priority Question** | *Example Questions currently being investigated†* | *Potential Responses of Interest* | *Response Data Types* | *Predictor Data Types* |
| Umbrella Question | **Ecosystem** | **How can PV solar facilities support healthy ecosystems, which include biodiversity, biogeochemistry, hydrology, and other natural resources vital to ecosystem health?** | All (see below) | All (see below) | All (see below) | All (see below) |
| Priority Questions | Wildlife Community | Question 1<br><br>What are the wildlife community-level responses to the stages of a solar facility's lifecycle‡ related to:<br>1. Surrounding landscape characteristics across spatial scales<br>2. On-site characteristics and practices | **What community of birds use solar facilities for foraging and/or nesting? Is this community different from that outside of the solar facility?**<br><br>**How do small mammal communities change in richness after a solar facility is constructed and where can biodiversity be increased through solar facility construction?**<br><br>**What management actions on solar facilities increase pollinator biodiversity? How effective are these actions across different ecoregions?** | 1. **Alpha Diversity** - richness, abundance, and evenness, functional groups<br>2. **Beta diversity** – similarity or dissimilarity indices<br>3. **Intra- and Interspecific interactions** - predator-prey dynamics, competition | **Measured Data**<br>• Species Presence/Absence derived from detections and detection/non-detection data<br>• Species Counts<br>**Detections Data**<br>• Camera Traps<br>• eDNA<br>• Passive Acoustic Recorders<br>• AHDriFT<br>**Detection/Non-detection Data**<br>• Fixed-Time Sampling<br>• Fixed-Area Sampling<br>• Visual Observation<br>• Distance Sampling<br>• Repeat Visits within the Year<br>**Interspecific Interactions**<br>• Isotopic Studies | **Detection Process**<br>• Survey-specific weather<br>• Survey effort<br>• Survey type<br>**Site level**<br>• Weather Data Loggers<br>• Vegetation<br>• Facility Management Characteristics<br>• Facility Physical Characteristics<br>• Facility Siting Characteristics<br>**Landscape level**<br>• Surrounding Habitat Types<br>• Ecoregion |
| | Individuals and Populations | Question 2<br><br>What are the wildlife population-level and individual responses to the stages of a solar facility's lifecycle‡ related to:<br>1. Surrounding landscape characteristics across spatial scales<br>2. On-site characteristics and practices | **What are the fledging success rates for songbird nests in solar facilities? What facility characteristics influence these success rates? What surrounding landscape characteristics and composition influence these rates?**<br><br>**How do different construction methods, like Drive and Crush, alter vegetation communities?** | 1. **Behavior** – foraging, thermoregulation, avoidance/attraction<br>2. **Demography** - emigration, immigration, births, and deaths, age/size structure, sex ratios, Individual growth rate<br>3. **Physiological** – stress hormones, thermoregulation<br>4. **Population genetics** – effective population size, alleles frequencies, maternity/paternity | **Measured Data**<br>• Species Counts<br>• Morphometrics and Individual characteristics<br>• Capture Mark Recapture<br>• Genetic and Isotopic Studies<br>**Species Counts**<br>• Fixed-Time Sampling<br>• Fixed-Area Sampling<br>• Visual Observation<br>• Distance Sampling<br>• Repeat Visits within the Year<br>**Morphometrics/Individual Data**<br>• Sex<br>• Age/size and shape<br>• Stress Hormones<br>**Genetic and Isotopic Studies**<br>• eDNA<br>• Individual genetics expression (Microsatellites, snps) | **Detection Process**<br>• Survey-specific weather<br>• Survey effort<br>• Survey type<br>**Site Level**<br>• Vegetation<br>• Facility Management Characteristics<br>• Facility Physical Characteristics<br>• Facility Siting Characteristics<br>**Landscape Level**<br>• Landscape Composition<br>• Landscape Configuration<br>• Ecoregion |
| | Connectivity and Metapopulations | Question 3<br><br>Can solar facilities influence landscape connectivity at various spatial scales and across species groups? | **How does solar facility placement alter bobcat movements?**<br><br>**What facility configurations can increase permeability for migratory big game?** | 1. **Space Use** – home range, movement and migration patterns, habitat use<br>2. **Meta-population genetics** – gene flow, migration rates, inbreeding (Fst) | **Measured Data**<br>• Individual Tracking<br>• Gene Flow<br>**Individual Tracking**<br>• GPS Collars<br>• Telemetry<br>• Capture-Mark-Recapture<br>**Gene Flow**<br>• eDNA<br>• Morphometrics and Individual Data | **Site Level**<br>• Vegetation<br>• Facility Management Characteristics<br>• Facility Physical Characteristics<br>• Facility Siting Characteristics<br>**Landscape level**<br>• Landscape Composition<br>• Patch Connectivity and Isolation |

***These questions are the incorporate Technical Advisory Group review of a list of 15 candidate research questions. Each question covers a range of priority topics as identified through interest surveys.**
**†Example questions are more specific and sourced from active or past data collections**
**‡Our definition on the stages of solar development includes siting and environmental review, site preparation and construction, facility operation and management, and decommissioning**