



“Pikas in Peril” Research Project

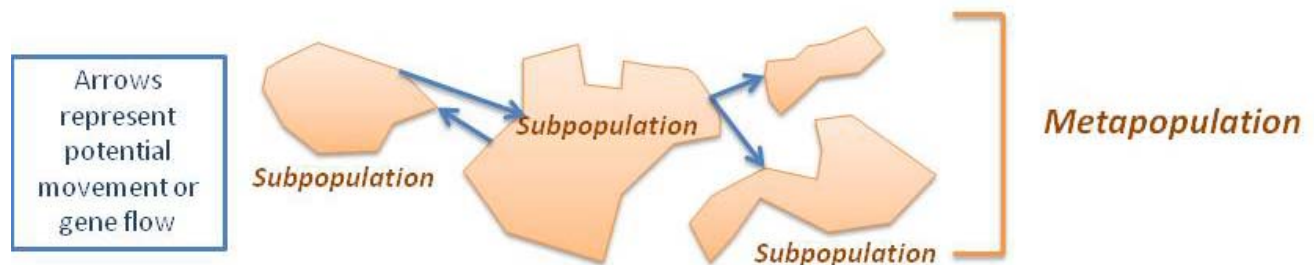
Glossary of terms used in project resource briefs

- **Connectivity** describes the ability of organisms to readily move among patches of habitat.
- The **detection probability** is the probability of detecting a species at a site, given it is present. Many factors can affect the detection probability for a species and survey method, including observer skill, weather, time of day or season, habitat structure (e.g., open meadows vs. shrubby ravines), etc.
- An **environmental gradient** is a gradual change over space or time in abiotic factors such as altitude or temperature. Species occurrence patterns or abundance may change along environmental gradients in a predictive way.
- **Fragmented populations** are populations that are not connected or have limited connectivity. Fragmented populations can be due to patchy distribution of suitable habitat. What constitutes suitable habitat varies from species to species. In the case of pikas, suitable habitats are **talus** (rock debris often found at the base of a cliff or slope; *see photo below left*) and **lava** flows (basalt rock that in its molten form came from volcanoes; *see photo below right*). Pika habitat may be more continuous in a system of extensive lava flows than talus fields on isolated mountain slopes.



- **Gene flow** is the movement of genes between populations via the movement (dispersal) of individuals between populations, followed by successful reproduction of their offspring.
- A geographic information system (**GIS**) is any system that captures, stores, analyzes, manages, and presents data that are linked to location. ArcMap is the GIS software we are using to store, analyze, and present data for each park (e.g., maps of survey results).
- A generalized random tessellation stratified (**GRTS**) survey design provides a means for positioning our pika survey plots so that we obtain well distributed and representative samples across a park or within a specified region of the park. The GRTS approach is referred to as a “spatially-balanced” sampling design because it ensures that plots are optimally located relative to neighboring plots, within the constraints of the size of the total area to be surveyed (the ‘sampling frame’; *see definition on next page*) and the number of plots we plan to survey.
- **Hierarchical models** are statistical models that provide a way of estimating how local variables such as habitat type or elevation affect the presence or absence of pikas at both the local scale and at larger scales (for instance, across several parks or all parks included in this study). Rather than taking a park-by-park modeling approach, hierarchical models allow us to integrate all the information obtained from the “Pikas in Peril” project into a single model while accounting for park-specific differences.

- An **information-theoretic approach** to model selection is a method for comparing the amount of information contained within different models of pika occurrence or any other variable being modeled. This method begins with careful selection of a set of ‘candidate’ models that will be compared. The information in each model is determined by considering both how well the model explains pika occurrence and how complex the model is (how many explanatory variables are included). Better models explain pika occurrence using fewer explanatory variables. The result of an information-theoretic model selection exercise is a weighted ranking of candidate models, from most informative or “best”, to least informative.
- **Landscape genetics** provides information about the interaction between landscape features, gene flow, and the movement of animals or plants. The key components of landscape genetics include detecting geographic areas of sharp genetic change and correlating these discontinuities with landscape and environmental features to infer patterns of animal or plant movement.
- **Logistic regression** is a statistical model used to predict the probability of occurrence of an event (like pika presence) by related observed data (presence, absence) to one or more variables that are presumed to predict the event (like elevation and/or available forage).
- A **population** is a group of organisms of the same species inhabiting a particular area. A **subpopulation** is a geographically isolated group of individuals that experiences limited gene flow with other isolated groups in a particular area. These subpopulations are still collectively considered a single population. A **metapopulation** is a group of geographically distinct subpopulations among which individuals occasionally migrate (move or ‘disperse’). Some or all of these subpopulations typically undergo local extinctions and recolonizations. **Metapopulation structure** considers the relative sizes of subpopulations and the movement among them, as well as the location of occupied patches (*see diagram below*).



- **Microsatellites** are small regions of DNA with short repeating segments (often 2 to 4 base-pairs repeated multiple times). Variability in the number of repeats across multiple regions of DNA can be used to infer relatedness among individuals, as more closely related individuals will have more similar patterns of repeated segments. These measures can also be used to infer gene flow and (meta) population structure.
- **Occupancy** is the probability that a randomly selected site or sampling unit in an area of interest is occupied by a species (i.e., a site that contains at least one individual pika). **Occupancy modeling** is the process of modeling this probability, often based on covariates (e.g., habitat structure, etc.), in order to find which model (or covariates) best explain why certain sites are occupied and others are not. Occupancy models that include habitat covariates provide us with information about **habitat-specific occupancy rates** for the species.
- A **predictive distribution model** is created by combining field data (such as site occupancy measures) with GIS data using a model (in this case, an occupancy model) in order to predict where a species is likely to occur (or not) across an area.
- The **sampling frame** is the mapped area representing a ‘target population’ (in this case, pikas within a park or park sub-region) and is where field surveys are conducted. The sampling frame begins with the mapped potential pika habitat, such as talus or lava flows in each park. Then certain areas are excluded to ensure the safety of field crews (due to their inaccessibility).