RESEARCH INTERESTS – PATRICK A. ZOLLNER

Behavioral Ecology of Ecological Landscapes – Recent advances in landscape-level ecological modeling rely upon a rarely acknowledged and often unappreciated behavioral "standard of plausibility" (1[a]). This reliance can be attributed to our poor understanding, at the landscape-level, of basic behavioral processes such as movement and habitat selection. My research program studies such phenomena, which are of interest to both landscape and behavioral ecology, with the goal of establishing a productive union between these disciplines. My empirical work focuses on how mammals respond to landscape patterns of habitat (4,6,8,10). My theoretical work focuses on spatially-explicit dispersal simulations (5,14,18).

Landscape-Level Perceptual Abilities – The notion of a perceptual range of some sort appears in many spatially-explicit population models. However, we know next to nothing about the abilities of most animals (especially vertebrates) to detect habitat at a distance (1,4). My dissertation research on white-footed mice has documented the extent of these abilities, and demonstrated that perceptual range is sensitive to both ambient illumination (8) and cover type in the matrix (4). I have also measured the perceptual abilities of eastern chipmunks, gray squirrels, and fox squirrels, and found that such abilities are correlated with the tendency of these species to occupy isolated forest fragments (10, 13).

Landscape-Level Search Strategies – Spatially-explicit population models frequently impose rules of movement on simulated animals without considering their efficacy relative to other rules (1,5,14). I devised a computer simulation of an animal leaving a habitat patch in a fragmented/patchy landscape to search for a new patch. I used this model to examine which search strategy maximized the probability of successful dispersal with respect to landscape and behavioral characteristics (5, 14) and to examine the optimal solutions to behavioral trade-offs faced by animals during such movements (18). I have parameterized this model with estimates from my empirical work on small mammals (26). This new application will provide more realistic sensitivity analyses regarding the effects of specific behaviors and their interactions with landscape structure.

Risk of Predation and Other Perceptions – My interests include other aspects of how species use (9,15) and perceive (2,12) the environment around them and the risks it imposes (3,7). Ultimately, all of this work relates back to links between animal behavior and landscape patterns.

Forest Management and Changing Landscapes – Landscapes are significantly changed by human activity and we need to develop a better understanding of the ecological consequences of changes resulting from resource management. I am using LANDIS (a comprehensive simulation model of forest succession) to investigate the influence of different forest management strategies on landscape composition and structure while providing valuable insight into the implications of different management scenarios for the Chequamegon/Nicolet National Forest (16,17,19,20,23,24).

Animal Movements in Complex Landscapes – Little is known about how animals respond to features such as habitat composition, habitat structure, and habitat edges while moving in a landscape. Ongoing empirical investigations research and collaborations will be used to parameterize a simulation of dispersal in more complex landscapes for several model species (eastern chipmunk, American marten, lynx). This new simulation will be linked to output from LANDIS to assess the sensitivity of each model species to alternative land management scenarios and to investigate the sensitivity of dispersal to interactions between landscape characteristics and behavioral characteristics of animals.

Simulating Spatially Explicit Responses to Human Disturbance – As human populations continue to grow animals are increasingly affected by recreating humans and our ability to predict these impacts is limited. Recent collaboration led to me adapting my animal movement simulations to address this phenomenon in a spatially explicit manner to address this gap (21).

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[a]Note numbers refer to papers in my CV