LAND COVER, FLORAL RESOURCES, AND THE SOCIOECOLOGICAL DIMENSIONS OF APICULTURE

PROJECT SUMMARY

Floral resources are necessary for honey bee health and the viability of apiculture. Their availability is determined in part by land cover via microclimate, vegetation, and the timing of flowering. However, economic and social factors also modify the availability and access to floral resources. Landscape structure, land management practices, and the turnover in surrounding land cover types can also impact the quantity and quality of honey bee forage. **The objective of this proposed research is to characterize how socioecological factors can shape variability in honey bee floral resource abundance and quality across land covers.** Characterizing this variability is recognized as an important step toward understanding bee decline. Mixed methods will be used to characterize the range of socioecological influences on forage for apiaries across land covers in central-eastern Kentucky.

For a set of apiaries, pollen foraged by honey bees will be collected and assessed through multivariate techniques to track seasonal variability in plant composition and the protein content of pollen. Grounded theory will be used to develop beekeeper perspectives about the variability in floral resources due to social and economic factors. By characterizing the interaction of bees and beekeepers in their socioecological context, this research advances knowledge by documenting how spatial and temporal heterogeneity in access to floral resources fosters more wide-ranging conditions under which apiculture unfolds. Statistical mapping through ordination will facilitate interpretation of the relationships among apiary sites, plant forage diversity, microclimate, and the amino acid content of pollen. Multiplicative regression models will be constructed to relate pollen characteristics to landscape fragmentation indices and microclimate. Interviews and focus groups will be deployed to solicit beekeeper knowledge about the variability they experience in the ecological and social factors that impinge upon forage.

The **intellectual merit** of this research draws from its focus on characterizing the variability under which apiculture unfolds. While forage and microclimate are recognized as important causal factors in bee decline, mechanistic and experimental studies of it often seek to reduce or eliminate this heterogeneity. When land cover is considered at all, it is a coarse category, as in the generalized and largely untested assumption that bees in urban settings fare better given their anthropogenic climates and diverse humanized flora. Even less has been formally stated about the social and economic contingencies that shape the contrasts in floral resources as a function of land cover. How land cover determines forage beyond these largely ecologically-focused binary rural-urban distinctions has implications for how to conceive landscape strategies to promote the welfare of pollinators. Understanding variability is a key aspect of adaptive approaches to resource management, and this research is the first to formalize it in the context of beekeeping. It advances knowledge about the social and ecological conditions in which a critical ecosystem service is performed.

For **broader impacts**, this study promotes citizen science by involving beekeepers in pollen data collection and interviewing. Focus groups at beekeeping conferences and workshops will promote a two-way exchange of information about land cover, climate change and forage issues. Funds are requested to train student beekeepers; to support graduate and undergraduate student assistants; to develop educational resources for the beekeeping public in the form of an online pollen identification guide; to produce and disseminate plant forage lists and maps of apiary forage zones for participating beekeepers. This research also utilizes existing NSF infrastructure provided by an NSF EPSCoR award to the University of Kentucky.