Flying under the lidar: Relating forest structure to bat community diversity

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Background/Question/Methods

Studies show that as habitat structural complexity increases, so does animal diversity. Bat wing- and echo-morphology limits where species can forage, as a high degree of specialization is necessary to exploit structurally complex forested areas. This study investigates the extent to which forest structure is related to bat abundance, diversity, and the presence of individual bat species by using light detection and ranging (lidar) coupled with bat acoustics. Lidar allows ecologists to measure structural variables (e.g., mean, maximum, and standard deviation of canopy height, vertical canopy diversity) with increased precision and accuracy at broader spatial scales than previously possible. The study site, Ordway-Swisher Biological Station (OSBS), consists of open-canopy pine savannas, closed-canopy hardwood hammocks, and seasonally wet basin marshes. Lidar data were collected in summer 2014 and analyzed using the USDA program FUSION. K-means clustering was used to segregate 5x5 m rasters across the ~3765 ha OSBS area into six different habitat classes based on the derived canopy metrics. Bat detectors were deployed at 18 different sites over the course of 47 nights to record bat calls. Model selection was used to determine the relationships between bat abundance, diversity, and presence and different canopy and landscape metrics.

Results/Conclusions

Increases in canopy structural clutter between 0 and 12 m. had negative effects on bat abundance and diversity. However, specialist species such as the tricolored bat (*Perimyotis subflavus*) were only negatively affected by increases in canopy structure from 6-12 m. in height. Both site (25 m^2) and landscape (~7.0 km^2) characteristics affected bat abundance, diversity, and species presence. The amount of water present within a 1.5 km radius also

had a negative impact on total abundance and diversity as did the length of service roads within the same buffer.

Lidar-derived forest structure parameters added predictive power to models of bat species occurrence, diversity, and species-specific site utilization. Incorporating lidar into habitat studies and species management allows researchers and managers to better understand nuanced relationships between species and their environment. This study provides an example of how lidar can be incorporated into habitat studies to further elucidate species-habitat relationships.