BAT ACTIVITY IN SELECTION HARVESTS AND INTACT FOREST CANOPY GAPS AT INDIANA STATE FORESTS

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ABSTRACT

Introduction

Forest managers often prescribe silvicultural methods based on how effectively they mimic the natural disturbance agents that have historically shaped the forests they manage. On Indiana state forests, selection systems are used on most harvested acreage and appear to structurally mimic the effects of naturally occurring, gap-forming disturbances affecting individual trees, groups, or small patches of trees. Forest bats often forage within canopy gaps and along the edges of openings; however, it is unclear whether bats use harvested stands and canopy gaps in intact forest similarly on Indiana's state forests.

Methods

To determine if gap use by bats was related to harvesting, we compared bat activity within naturally occurring gaps in "intact" forest stands (i.e., >15 years since single-tree selection harvest) with activity in recent (i.e., ≤5 years) selection-harvested stands. We used Anabat SD2 (Titley Scientific, Columbia, MO) acoustic detectors to monitor bat activity in randomly located canopy gaps within 15 paired harvested and intact stands at six state forest properties in southern Indiana from June to August 2012. Two to three sites were selected within each stand and a bat detector was stationed at each site at the edge of a canopy gap, with its microphone elevated 2.5-3 m above the ground and directed into the gap. Detectors within paired stands operated simultaneously and were set to begin each night of sampling 30 minutes before sunset and end 30 minutes after sunrise. All detectors were located >200 m from each other and >100 m from stand edge. Recorded bat calls were identified to species group based on call characteristics by using three automated software packages, EchoClass (U.S. Army Engineer Research and Development Center, Vicksburg, MS), Kaleidoscope (Wildlife Acoustics, Inc., Concord, MA), and BCID (Bat Call Identification, Inc., Kansas City, MO). Call files were classified to the species group agreed upon by at least two of the software packages used. Bat activity was quantified for each species group as the number of survey minutes that included at least one classified call file.

Results and Conclusions

Bat activity in recently harvested stands was greater ($P < 0.05$) for two species groups: *Eptesicus fuscus/Lasionycteris noctivagans/Lasiurus cinereus* (low frequency group) and *Lasiurus borealis/Nycticeius humeralis/Perimyotis subflavus* (mid-frequency group). Activity levels were similar ($P = 0.117$) between stand types for calls characteristic of *Myotis* species. Across selection-harvested stands, the mean number

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of call-minutes per survey hour for low frequency, mid-frequency, and *Myotis* groups was 1.1, 4.0, and 0.7, respectively. Across intact forest stands, the mean number of call-minutes per survey hour for low frequency, mid-frequency, and *Myotis* groups was 0.3, 1.8, and 0.6, respectively. Our results support the use of selection harvesting as a means to improve overall bat foraging activity in mature, intact forest stands, while not adversely affecting the foraging activity of any species group we studied.