# Partial Cutting and Bats: A Pilot Study

MARK PERDUE AND J. DOUGLAS STEVENTON

## ABSTRACT

We conducted a preliminary study of bat presence and activity, using ultrasonic detectors, in two intensities of partial cutting compared to clearcuts and uncut forest. The study was conducted in coast-interior transitional forests at the Date Creek silvicultural systems research site in northwestern British Columbia. The presence of bats in the study area was confirmed, and bat use (indexed by number and length of detections) of partial-cut treatments was at least as great as for the uncut forest. Bats were also detected in clearcuts, but at a lower rate. We tentatively conclude that the creation of openings in dense forest favours bat travel and foraging. Studies of roost-site requirements in relation to partial cutting are needed.

## INTRODUCTION

Partial cutting is often advocated as a means of maintaining habitat for forest-dwelling wildlife while allowing extraction of timber. We examined the influence of two intensities of partial cutting on bat use of forest stands as compared to their use of uncut forest and clearcuts. The expectation was that partial cutting would maintain or, by the creation of canopy openings, actually improve travel and foraging potential for bats.

The objectives of this pilot study were (1) to determine if bats are present in the treatment units, (2) to conduct a preliminary assessment of bat activity in partial-cut treatments versus uncut and clearcut treatments, and (3) to assess priorities for further study of bats and the effects of partial cutting.

## MATERIALS AND METHODS

The study was conducted from May to August 1995 at the Date Creek silvicultural systems study site in northwestern British Columbia (55° 22′N, 127° 50′W). These forests are transitional in climate, flora and fauna being between coast and interior types, and are in the moist-cold Interior Cedar-Hemlock biogeoclimatic subzone (Meidinger and Pojar 1991).

Four harvest treatments were applied to various sites in the fall and winter of 1992–93: (1) clearcutting with retention of scattered deciduous trees, (2) a heavy removal partial cut (approximately 60% of stand volume removed) using a combination of openings (0.1 to 0.5 ha) with single-tree to small-group selection, (3) a light removal partial cut (approximately 30% of stand volume removed) as either single stems or small groups, and (4) no harvesting. There were four replicates (each approximately 20 ha in size) of each treatment in a randomized block design across four site/age combinations: mesic, 350-year-old forest; mesic, 140-year-old forest; mesic-submesic, 140-year-old forest; and mesic-subhygric, 140-year-old forest. The treatments created distinct differences in stand density and degree of canopy removal (Figure 1).

We examined bat activity using ultrasonic detectors (Ultra Sound Advice, S-25), focusing on bat use of forest openings in the four treatments. The question we examined was: is the probability of hearing a bat, or the length of time bats were heard, influenced by size of opening or density of openings created by the treatments?

From air photos, four canopy openings were randomly selected for sampling in each treatment unit (a total of 64 sample points). For clearcuts (one large opening), or if distinct openings were not available in the uncut treatments, random sample points were used. The selected sample sites were sampled in random order (only during good weather) between late May and early August.

Ultrasonic detector microphones were located in the centre of the opening, mounted pointing vertically, 1 m above the ground. Using a timer and tape-recorder, detectors monitored bat echolocation calls for 50 minutes, 25 minutes before and after official twilight. The two parameters of bat use we analyzed were (1) the number of 50-minute samples with bat detection (presence/absence), and (2) the total length of time that bats were heard (activity) on the four, 50-minute tapes from each treatment unit. We were not able to distinguish between bat species, but we believe most or all were *Myotis* spp.

Due to the data significantly contradicting the assumptions for ANOVA, we examined the influence of treatments on the number and length of

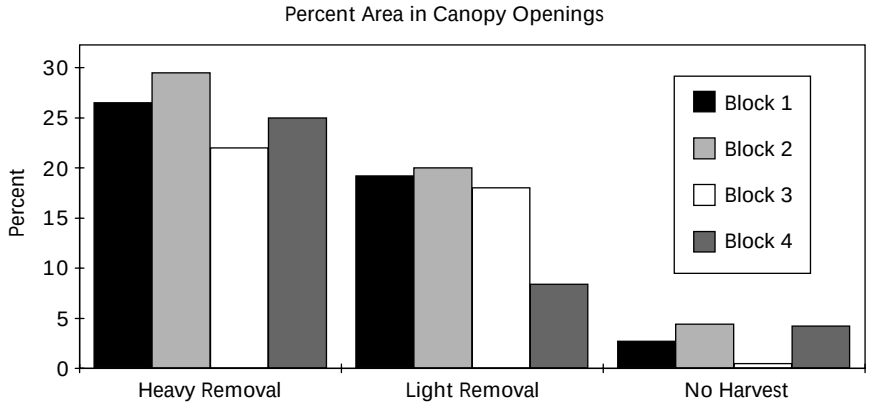


FIGURE 1 *Area (%) in canopy openings by harvest treatment and block (ecosystem/age combinations).*

detections using Friedman's non-parametric test for randomized blocks (Sokal and Rohlf 1981). This method tests for consistent ranking of treatments among experimental blocks. The influence of individual opening size and weather variables on the length of time that bats were heard, and on the probability of detecting a bat, were examined by regression and logistic regression. For this pilot study we used $p < 0.10$ as our criterion for significance.

## RESULTS

Bats were detected in all treatments. Although the total number of samples with a detection varied by treatment (Figure 2), the ranking of treatments was not consistent across blocks ($p = 0.437$). Thus, we cannot conclude that treatment affected simple presence or absence of bats. Bat activity as indexed by length of detections (Figure 3), in contrast to presence or absence, was significantly different between treatments ($p = 0.086$). The order of the treatments (greatest use to lightest use) based on mean rank was: heavy removal, light removal, uncut, and clearcut.

None of the variables examined by logistic regression or standard regression (opening size, opening perimeter, temperature, humidity, individual bat detector) showed a significant relationship ($p > 0.10$) to either the probability of detecting bats, or the length of time that bats were heard. The proportion of detections with "feeding buzzes" showed the same pattern as for length of detections, but the sample size was too limited for statistical analysis.

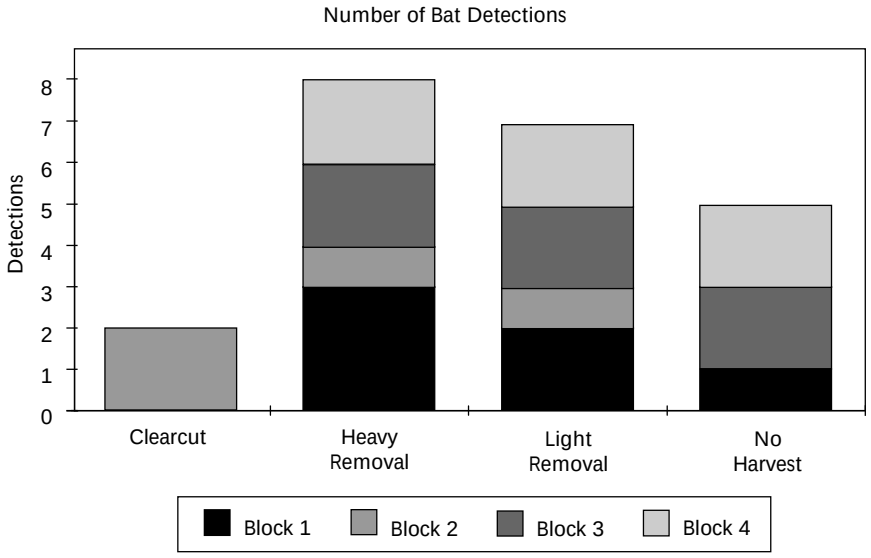


FIGURE 2 *Number of 50-minute samples with a bat detection by harvest treatment and block (ecosystem/age combinations). Friedman's randomized block design test of treatment differences p = 0.437.*

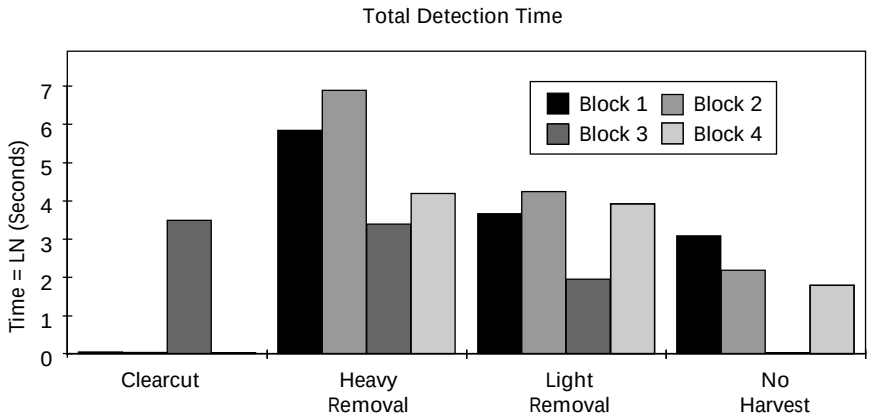


FIGURE 3 *The total length of time that bats were detected by harvest treatment and block (ecosystem/age combinations). For illustration, time is presented as the natural log of total time (seconds). Friedman's randomized block design test of treatment differences p = 0.086.*

## DISCUSSION

The creation of canopy openings by partial cutting appears to favour bat foraging and travel as indexed by the length of time that bats were heard. We conclude that the partial cuts were at least as suitable as uncut forest or clearcuts. We suggest that the highest priority for further study is to determine species-specific roosting requirements. Partial cutting, while apparently maintaining or improving foraging habitat, reduces the abundance of potential roosting structures, such as snags.

## LITERATURE CITED

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Sokal, R.R. and F.J. Rohlf. 1981. Biometry (2nd ed.). W.H. Freeman and Company, New York, N.Y.