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EFFECTS OF FORESTED BUFFER WIDTH ON BREEDING BIRD COMMUNITIES IN COASTAL FORESTS OF SOUTHEAST ALASKA WITH A COMPARISON OF AVIAN SAMPLING TECHNIQUES

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AUTHORIZATION TO SUBMIT THESIS

This thesis of Michelle L. Kissling, submitted for the degree of Master of Science with a major in Wildlife Resources and titled "Effects of Forested Buffer Width on Breeding Bird Communities in Coastal Forests of Southeast Alaska with a Comparison of Avian Sampling Techniques," has been reviewed in final form, as indicated by the signatures and dates given below. Permission is now granted to submit final copies to the College of Graduate Studies for approval.

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THESIS ABSTRACT

Forested buffer strips are used to mitigate fragmentation and habitat loss, which can strongly influence bird communities and distribution. In forested landscapes, buffers are used to reduce the impacts of timber harvesting on forest-dwelling species by not only minimizing the effects of fragmentation, but also providing habitat. However, the characteristics of the buffer must be biologically meaningful to the forest-dwelling species that are intended to use them; otherwise, they might offer unsuitable habitat, and therefore further habitat loss. I evaluated bird composition and abundance in four buffer widths of coastal temperate rainforest in Southeast Alaska during 2001 and 2002 breeding seasons. The primary objective of my study was to compare bird composition and density among forested buffer strips of differing widths ($\leq$152 m, 153-304 m, 305-550 m, and control [continuous old-growth forest]) (n=38). My secondary objective was to compare and refine survey techniques typically used to estimate densities of landbirds.

Standard point counts are the most common method used for estimating abundance of birds, but typical analysis methods fail to account for detection probability differences between observers and other factors influencing detectability. I adapted a technique that combines distance sampling and double sampling to allow for estimation of detection probabilities. I applied this method to point count surveys conducted in Southeast Alaska. I compare results from four analysis methods: Single Observer fixed radius plots, Single Observer variable circular plots (SOVCP), Double Observer fixed radius plots, and Paired Observer variable circular plots (POVCP). Prior to adjustment for detectability bias, detection probabilities at the plot center for single observers varied among observers (n=7) for all species: 0.83 – 0.99 for Winter Wren (*Troglodytes troglodytes*), 0.71 – 1.00 for Townsend's Warbler (*Dendroica townsendi*), 0.80 – 0.98 for Pacific-slope Flycatcher (*Empidonax difficilis*), 0.61 – 1.00 for Hermit Thrush (*Catharus guttatus*), and 0.67 – 1.00 for Golden-crowned Kinglet (*Regulus satrapa*). Average detection probabilities for paired observers increased approximately 11% for all species. Standard deviation estimates using POVCP for all five species were less than 0.13 males per hectare. Failure to account for differences in detection probabilities results in biased population estimates which can be substantially below true densities.

After calculating the least biased density estimates for landbirds using the POVCP method, I evaluated buffer effect with hypothesis-based and model-based analyses. I classified 8 species as forest-dwelling birds, 6 species as ubiquitous birds, and 3 species as open-canopy birds. Densities of Red-breasted Sapsuckers (*Sphyrapicus ruber*; P=0.02),

Pacific-slope Flycatchers (*Empidonax difficilis*; P=0.05), and Ruby-crowned Kinglets (*Regulus calendula*; P<0.01) differed significantly among treatment levels (n=4) using hypothesis-based testing. Multiple comparison results suggested buffers ≥304 m in width to maximize densities of Red-breasted Sapsuckers and Pacific-slope Flycatchers. Ruby-crowned Kinglet density was highest in buffers ≤152 m and decreased as buffer width increased, suggesting that this species benefits from increased edge to interior ratio. Model-based methods suggested that densities of three species (Red-breasted Sapsucker, Pacific-slope Flycatcher, and Hermit Thrush [*Catharus guttatus*]) were positively related to buffer width and density of one species (Ruby-crowned Kinglet) was negatively associated with buffer width. Buffer width effects were consistent at the stand and landscape level for all species. Densities of Red-breasted Sapsucker and Hermit Thrush likely reach a fragmentation threshold at the landscape level when densities begin to decline and wide forested buffers become increasingly important features on the landscape. Buffer width was the single best predictor of Pacific-slope Flycatcher density at the stand and landscape level. I recommend retaining forested beach buffers >305 m to support composition and abundance of forest-dwelling birds, particularly for those species that rely on interior forest conditions.