AN ABSTRACT OF THE THESIS OF

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Title: Forest and Wildlife Habitat Analysis Using Remote Sensing and Geographic Information Systems

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Forest and wildlife habitat analyses were conducted at the H.J. Andrews Experimental Forest in the Central Cascade Mountains of Oregon using remotely sensed data and a geographic information system (GIS). Landsat Thematic Mapper(TM) data were used to determine forest successional stages, and to analyze the structure of both old and young conifer forests. Two successional stage maps were developed. One was developed from six TM spectral bands alone, and the second was developed from six TM spectral bands and a relative sun incidence band. Including the sun incidence band in the classification improved the mapping accuracy in the two youngest successional stages, but did not improve overall accuracy or accuracy of the two oldest successional stages. Mean spectral values for old-growth and mature stands were compared in seven TM bands and seven band transformations. Differences between mature and old-growth successional stages were greatest for the band ratio of TM 4/5 (P = 0.00005) and the

multiband transformation of wetness (P = 0.00003). The age of young conifer stands had the highest correlation to TM 4/5 values (r = 0.9559) of any of the TM band or band transformations used. TM 4/5 ratio values of poorly regenerated conifer stands were significantly different from well regenerated conifer stands after age 15 (P = 0.0000). TM 4/5 was named a "Successional Stage Index" (SSI) because of its ability to distinguish forest successional stages.

The forest successional stage map was used as input into a vertebrate richness model using GIS. The three variables of 1) successional stage, 2) elevation, and 3) site moisture were used in the GIS to predict the spatial occurrence of small mammal, amphibian, and reptile species based on primary and secondary habitat requirements. These occurrence or habitat maps were overlayed to tally the predicted number of vertebrate at any given point in the study area. Overall, sixty-three and sixty-seven percent of the model predictions for vertebrate occurrence matched the vertebrates that were trapped in the field in eight forested stands. Of the three model variables, site moisture appeared to have the greatest influence on the pattern of high vertebrate richness in all vertebrate classes.