Chapter 6

GENERAL CONCLUSIONS

In this work, I have shown how vegetation structure and composition in the understory of coniferous forests in western Oregon influences food resources for several species of birds. Wilson's, MacGillivray's, and orange-crowned warblers selected habitat patches with a high percent cover of tall deciduous shrubs, and foraged extensively on these species. Swainson's thrush abundance also was associated with deciduous shrub cover. Tall deciduous shrubs, particularly oceanspray, supported greater abundances of arthropod prey than evergreen shrub species. The positive associations among cover of deciduous shrubs, abundance of both foliage-dwelling and aerial arthropod prey, and the abundance of Wilson's warblers, MacGillivray's warblers, and Swainson's thrushes, suggests that abundance of these birds reflects habitat quality (Whitaker et al. 2000, Brush and Stiles 1986). Furthermore, the presence and amount of deciduous vegetation in the forest understory may indicate habitat quality for these bird species. However, more extensive research, based on larger sample sizes than in this study, would be needed to more accurately quantify relationships among bird populations and vegetation characteristics. For example, my data do not allow quantification of the patch size or volume of deciduous vegetation understory required to support sufficient arthropod prey for a pair of breeding warblers. In addition, habitat quality is influenced by other factors besides food resources that influence survival and productivity. Although my study was not designed to measure these parameters, recaptures of some birds on the same sites over several (>2) years and captures of fledglings (unpubl. data) suggest that survival and productivity may have been good at the sites where birds were most abundant.

Of the more than 400 species of vertebrate wildlife in the Pacific Northwest (Johnson and O'Neil 2000), I looked at the ecology and habitat associations of only four. However, my results link the habitat associations of these four species with those

of understory shrub species and arthropods. Understory vegetation provides the foundation for food webs that contribute to diversity at multiple trophic levels in conifer-dominated forests. Based on these results, the following suggestions are aimed at helping managers achieve goals related to the maintenance of biodiversity in managed forests.

- Management of density with pre-commercial and commercial thinning starting early in stand development will promote the retention and growth of understory vegetation. However, the intensity of thinning should vary across the landscape, ranging from no thinning to very heavy thinning. Conifer stands with dense, closed canopies and little understory do provide habitat for some species, and should be retained at various spatial scales.

- Thinning prescriptions should explicitly address goals for understory vegetation structure and composition as well as the traditional attention to overstory characteristics.

- In forests managed under long rotations or an uneven-aged system, group selection or other partial harvests may help maintain understory vegetation by creating gaps in the forest canopy. Allowing shrubs to develop in at least some of these gaps, rather than intensive management for the next cohort of conifer trees, will promote diversity of understory vegetation, arthropods, and songbirds.

- Although I have highlighted the habitat associations of species that are more abundant in young forests that have a well-developed understory, my results in no way suggest that harvesting in old-growth stands should be considered as a strategy for fostering biodiversity! On the contrary, given the scarcity of old-growth conifer forests on the landscape, I do not recommend any harvesting in residual stands to create habitat for species associated with younger forests.