CONSERVING AVIAN DIVERSITY IN THE WILLAMETTE VALLEY'S AGRICULTURAL LANDSCAPE WITH OREGON WHITE OAK TREES

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Large, isolated Oregon white oak trees are iconic landmarks in many agricultural fields of the Willamette Valley. Often retained by landowners for aesthetic or sentimental reasons, many of these large trees are hundreds of years old, predating European settlement of the Valley and thus representing "biological legacies" from historic white oak savanna habitats. The abundance of these trees in the Valley, along with the extent of white oak habitats in general, are declining due to land use practices or the gradual dying of existing of trees (Thysell & Carey 2001). To date, no research has been done to determine wildlife use of these biological legacies, the potential role these trees play in the conservation of the Valley's native wildlife, and how landowner practices can improve their contribution to conservation of biological diversity in agricultural areas.

In this study, we investigated bird use of isolated white oak legacy trees in three different site contexts - croplands, pastures, and oak savanna reserves. We assessed how bird use of these isolated trees differed between agriculturally-situated trees and those situated in reserves. We further assessed the relative importance of four factors thought to affect bird use of these trees: (i) the architecture of the tree itself, (ii) the distance of the tree to the nearest tree or forest patch, (iii) the density of forest vegetation in the landscape surrounding each tree, and (iv) the type of field in which the tree is embedded. We evaluated species-specific responses as well as four community-level responses: (i) the total number of bird species; (ii) the number of native bird species associated with oak savanna; (iii) the number of tree foraging bird species; and (iv) the combined number of aerial- and ground-foraging bird species.

We conducted the study in the southern half of the Willamette Valley, an area extending from Salem in the north to just south of Eugene. In total, we sampled 35 individual white oak trees with 13 trees situated in croplands, 13 in pastures, and 9 in oak savanna reserves. Cropland sites were predominantly grass seed production fields with the main crop species being annual or perennial ryegrass and tall fescue. Four of the cropland sites were nursery operations where small saplings of maple, Douglas fir, and noble fir were grown. Pasture sites were either sheep or cattle grazed with the predominant forage species being perennial ryegrass, tall fescue, orchardgrass, and clover. Savanna reserves consisted of sites that were actively managed to replicate historic oak savanna conditions and were characterized by a diverse understory of grasses and forbs interspersed with shrubs of Himalayan blackberry, poison oak and wild rose.

We surveyed each tree for bird use on five separate occasions during the spring and early summer of 2007. Each survey consisted of a 20 minute observation period in which we recorded all bird species that physically landed on the tree. In an attempt to describe how birds are using individual legacy trees, we documented the primary behavior for each bird detected, recording singing, foraging, perching and nesting behaviors.

For each tree, we measured several structural attributes such as tree height; canopy volume and lichen cover to develop tree size and tree complexity indices to capture variation in tree architecture. To determine the relative isolation of each tree, we used a laser range finder to measure the distance to the nearest tree or forest patch and a geographic information system to calculate the density of forest vegetation in the surrounding landscape at multiple scales ranging from 50 to 5000 meters. We analyzed these data to determine the relative influence of these four explanatory factors – tree architecture, the distance to the nearest tree or patch, forest density in the surrounding landscape, and site type – on bird use of individual legacy oak trees.

We recorded 47 bird species using these individual trees, including a high number of oak savanna-associated species that are priority species for conservation in Oregon such as White-breasted Nuthatch and Chipping Sparrow (Table 1). European Starling (n = 20 sites) was the most frequent species encountered followed by American Robin (n = 18) and American Goldfinch (n = 17). Among oak savanna-associated species, American Goldfinch and Lazuli Bunting (n = 11) were observed at the largest number of sites. Bullock's Oriole (n = 10) was the most frequent tree foraging species. Of the 23 species detected using at least 5 sites, only 8 species occupied a higher proportion of reserve sites than agricultural sites with Lazuli Bunting, Spotted Towhee and House Wren most strongly associated with reserves. The most prominent behavior recorded for birds using these individual trees was perching or roosting (n = 266 observations) followed by foraging (n = 105) and singing (n = 73). Eight species were using these individual trees for nesting including American Goldfinch, American Robin, Cedar Waxwing, European Starling, House Wren, Tree Swallow, Violet-green Swallow, and Western Tanager.

The most important factors for predicting bird use were tree size and forest density in the surrounding landscape. In general, bird use increased with increasing tree size and decreasing forest density. Increasing bird use with increasing tree size suggests that, with all else being equal, larger legacy-type trees provide more and higher quality resources for birds than smaller, younger trees. Increasing bird use of isolated trees with decreasing tree cover suggests that the role of isolated trees as focal habitat structures increases as trees become rarer

on the landscape. For many bird species, particularly tree foraging and tree nesting species, the presence of a single tree in agricultural fields likely provides critical resources necessary for persistence in an otherwise treeless landscape.

Our findings indicate that a high number of bird species use isolated white oak legacy trees in the Willamette Valley. For the majority of the bird species we recorded, the frequency of use of individual oak trees was similar among crop, pasture and reserve sites indicating the potential for agriculturally-situated trees to positively contribute to landscape-level conservation of a wide range of bird species within the Willamette Valley. Landowners wishing to provide habitat for oak savanna-associated birds should focus on conserving existing white oak legacy trees and fostering the recruitment of replacement trees. Due to the long life expectancy of white oak trees (300-500 years), a recruitment interval of every 45 years may be sufficient (Gibbons et al. 2008). However, to reverse the decline in abundance of white oak legacy trees in the Willamette Valley, multiple trees should be planted for every existing legacy tree. Given the rarity of young Oregon White Oak trees in agricultural fields, it would be of great conservation value for landowners to begin planting or protecting seedlings to ensure the legacy of large oak trees.

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References:

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Table 1. Bird species recorded using isolated Oregon white oak legacy trees in the southern half of the Willamette Valley during surveys conducted between 4 June and 29 June, 2007.

Species	No. of sites[a]			Species	No. of sites[a]		
	Ag	*Res*	Total		*Ag*	*Res*	Total
European Starling	16	4	20	American Kestrel	4	0	4
American Robin	15	3	18	Yellow Warbler	1	3	4
American Goldfinch	15	2	17	California Quail	2	1	3
Lazuli Bunting	4	7	11	Mourning Dove	3	0	3
Bullock's Oriole	8	2	10	Dark-eyed Junco	2	0	2
Chipping Sparrow	8	2	10	Hairy Woodpecker	1	1	2
Western Wood-pewee	6	3	9	Red-winged Blackbird	2	0	2
White-breasted Nuthatch	8	0	8	Tree Swallow	2	0	2
White-crowned Sparrow	7	1	8	Turkey Vulture	2	0	2
Black-capped Chickadee	4	3	7	Wilson's Warbler	2	0	2
Black-headed Grosbeak	7	0	7	Acorn Woodpecker	1	0	1
Brewer's Blackbird	7	0	7	Brown-headed Cowbird	1	0	1
Common Yellowthroat	3	4	7	Bushtit	1	0	1
House Finch	7	0	7	Common Raven	1	0	1
Lesser Goldfinch	5	2	7	House Sparrow	1	0	1
Savannah Sparrow	7	0	7	Northern Flicker	1	0	1
Western Scrub Jay	3	3	6	Orange-crowned Warbler	1	0	1
Spotted Towhee	2	4	6	Purple Finch	1	0	1
Cedar Waxwing	5	0	5	Red-breasted Nuthatch	0	1	1
House Wren	1	4	5	Swainson's Thrush	1	0	1
Red-tailed Hawk	5	0	5	Violet-green Swallow	1	0	1
Song Sparrow	4	1	5	Western Bluebird	1	0	1
Western Tanager	4	1	5	Western Kingbird	1	0	1
American Crow	0	4	4				

[a] Number of sites recorded by species. *Ag* = agricultural sites; *Res* = oak savanna reserve sites.