Acorn Woodpecker (*Melanerpes formicivorus*)

Conservation Status—The acorn woodpecker is listed as an ISSSSP Sensitive Species in Washington, and is an Oregon Conservation Strategy Species (ODFW 2006). The species has no special federal status. Threats to the continuing viability of this species in the Willamette Valley include the loss of large Oregon white oaks and competition from European starlings for tree cavities (ODFW 2006).

Distribution—The geographic range of the acorn woodpecker extends from southern Washington, through western Oregon and California (west of the Sierra Range), New Mexico, Texas, and further south through Mexico and Central America (Koenig et al. 1995). The species is currently a locally common, year-round resident of the Rogue and Umpqua Valleys; a less common resident of the Willamette Valley (Simmons 2003). The present distribution in the Northwest represents a recent range expansion. Acorn woodpeckers were rare north of Eugene, Oregon during the 1940's (Gabrielson and Jewett 1940) and were not regularly observed in Washington until 1995 (Simmons 2003). Koenig and Haydock (1999) suggest that the geographic distribution of acorn woodpeckers is strongly influenced by the local diversity of *Quercus* species: fewer oak species increases the annual probability of acorn crop failure and the subsequent decrease in acorn woodpecker fitness.

Ecology—In Oregon, the species is closely associated with *Quercus* woodlands, ponderosa pine/oak savannas, tanoak woodlands, and southwest mixed conifer/hardwood communities (Simmons 2003). Johnson and Rosenberg (2006) found that the basal area of Oregon white oaks was almost twice as great in stands containing acorn caches created by acorn woodpeckers called granaries (50.1 m^2/ha, SE =4.1 m^2/ha) than stands that did not (27.2 m^2/ha, SE= 3.0 m^2/ha). Eight occupied stands in Benton County, Oregon had a mean tree density of 264 trees/ha (107 trees/ac) and a mean tree diameter at breast height (dbh) of 48.8 cm (19.2 in; Doerge 1978). Stands used by acorn woodpeckers often have less understory shrub cover than unused stands (Hooge 1999, Johnson and Rosenberg 2006).

As the name suggests, the diet of the acorn woodpeckers includes a large proportion of mast, but also contains a significant amount of insects during spring and summer (MacRoberts and MacRoberts 1976). Unlike most other woodpeckers, the acorn woodpecker primarily forages on insects by pursuing them in flight (MacRoberts and MacRoberts 1976). All members of an acorn woodpecker colony participate in collecting acorns and storing them in communal granaries—trees or other wood structures in which acorns (sometimes thousands of them) are fitted into individually drilled holes. Granaries are an important resource for acorn woodpecker colonies, sometimes containing all the available food to supply a colony during winter months. On average, acorn woodpecker colonies in Benton County, Oregon were found to contain 75.2

granaries (Doerge 1978). Acorn productivity is highly cyclical and synchronous within *Quercus* species, a phenomenon that leads to regular failures of mast crops (Peter and Harrington 2009), and imposes limits on the size and distribution of acorn woodpecker populations (Koening and Haydock 1999).

Acorn woodpeckers usually excavate nest cavities in dead branches of live trees (Koenig et al. 1995). Acorn woodpecker territories contain significantly larger numbers of dead limbs than are available in unoccupied areas (Doerge 1978). Tree species commonly used for nesting in Oregon and/or California include Oregon white oak (*Quercus garryanna*), valley oak (*Quercus lobata*), California sycamore (*Plantanus racemosa*), Douglas-fir (*Pseudotsuga menziesii*) and black cottonwood (*Populus trichocarpa*; Hooge et al. 1999, Simmons 2003). The average diameter of nest trees in a coastal California study was 98.3 cm dbh (38.7 in); range 35.6-254.6 cm dbh (14.0-100.2 in; Hooge et al. 1999). The mean outside diameter of the branch at the nest hole was estimated to be 31 cm (12.2 in); range 13.1-144.0 cm (5.2-56.7 in; Hooge et al. 1999). Hooge et al. (1999) reported that mean nest height was 8.3 m (27.2 ft); range 2.3-18 m (7.5-59.0 ft). A single nest cavity may simultaneously contain eggs from multiple female breeders (MacRoberts and MacRoberts 1976). Nest cavities are often used for several years (Koenig et al. 1995). Tree cavities are also used for communal roosting (MacRoberts and MacRoberts 1976), which would seem to be an essential behavior for surviving the winter climate in Oregon.

Acorn woodpeckers live in colonies consisting of breeding individuals and non-breeding helpers (Koenig et al. 1995). Doerge (1978) found that in Benton County, Oregon the average colony size was composed of 4.25 individuals (range 2-8 individuals, n = 8 colonies). Colonies are generally larger in other areas of the species geographic range. Colonies are typically composed of 1-7 breeding males, 1-3 breeding females, and as many as 10 non-breeding helpers (Koenig and Mumme 1987). The small colony sizes observed by Doerge (1978) may reflect the low diversity of true oaks and marginal habitat capability for acorn woodpeckers in the Willamette Valley. Helpers will attempt to seek breeding positions among groups outside of their natal colony. Competition among females is particularly fierce and can lead to violent power-struggles (Koenig et al 2000). In coastal California, estimated dispersal distances range from 0.53–9.57 km (0.33-5.94 mi) for females and 0.22–2.90 km (0.14-1.80 mi) for males (Koenig et al. 2000).

The mean territory size at a site in coastal California (containing multiple territories) was 6.0 ha, range 3.5-9.0 ha (mean 14.8 ac, range 8.7-22.2; MacRoberts and MacRoberts 1976). At the same site, Hooge (1995) estimated that mean home range was 5.5 ± 2.0 SD ha (13.6 ± 4.9 SD ac) for male breeders, 4.9 ± 2.32 ha (12.1 ± 5.7 ac) for female breeders, 13.2 ± 7.6 ha (32.6 ± 18.8 ac) for non-breeding males and 89.3 ± 56.9 ha (220.6 ± 140.5 ac) for non-breeding females. The large variation in home range size between breeding and non-breeding individuals is primarily due to extra-territorial explorations by non-breeders for breeding position vacancies among outside colonies (Hooge 1995). In contrast, Doerge (1978) reported that the mean home range of acorn woodpeckers among Willamette Valley sites was only 0.69 ha (1.7 ac). Koenig et al. (1995) noted that territory and home range sizes are highly variable for the species and are affected by the spatial pattern of habitat patches.

Habitat Management/Restoration —Few other vertebrates are as closely associated with oak woodlands in the Willamette Valley as the acorn woodpecker. Preserving large-diameter oaks and ensuring the growth of replacement trees are crucial to survival of acorn woodpecker

colonies. Tree competition has a pronounced affect on mast crops (Peter and Harrington 2002), and thus influences fall/winter food availability for acorn woodpeckers. As the crowns of individual oaks are shaded by their cohorts or are over-topped by conifers, acorn production decreases. Maintaining adequate spacing between oaks so that the full crown of each tree is exposed to the sun will maximize the mast productivity of the stand. Peter and Harrington (2002) found that tree crown shape was a useful predictor of acorn productivity: trees having full, "mushroom-shaped" crowns were 6 times more likely to be in the highest acorn productivity class than suppressed, "vase-shaped" trees. Prescribed burns conducted to reduce understory shrub cover were found to have a positive, although delayed (6-10 years) effect on acorn productivity (Peter and Harrington 2002). Acorn production is also influenced by tree age. Production is rare in trees <20 years of age, but increases steadily until trees are 60-80 years, then plateaus until trees reach an advanced age (>180 years; Peters and Harrington 2002).

Nest trees, roosting cavities, and granaries are critical elements of acorn woodpecker habitat. Land managers should ensure that these essential sites are identified and protected in occupied territories before conducting tree harvest and stand thinning operations. Additional large (>35 in dbh) oaks should be maintained or recruited as future replacements for nest trees and granaries. Research suggests that live trees with dead, large-diameter (>12 in) branches are especially valuable components of nest habitat.

Habitat managers also should provide sufficient space for acorn woodpeckers to conduct their various life requisite activities. Colonies have been reported to use home ranges smaller than 2 ac, but most research indicates that breeding members of a colony typically defend territories ranging in area between 8-22 ac.

In the Willamette Valley, acorn woodpeckers are distributed in widely-dispersed groups, many of which likely are isolated from one another due to the significant loss of oak woodland habitat (less than 7% of its former extent; ODFW 2006). Habitat managers should insure that restoration projects designed to create habitat for acorn woodpeckers in areas unoccupied by the species are located within range of dispersal (females <6 mi; males <2 mi) from an existing group to maximize the probability that the newly created habitat is colonized.

Non-Habitat Limiting Factors—We failed to find research that investigated the effects of disease, predation, competition, or other limits to acorn woodpecker populations. However, Koening et al. (1995) hypothesizes that predation is probably the greatest cause of mortality in adults. Acorn woodpeckers have been observed protecting eggs, tree cavities, and food resources from numerous other avian and mammalian species, but apparently are nearly always successful defending against predators and competitors by mobbing the intruder (MacRoberts and MacRoberts 1976). Intraspecific competition for nest sites and deliberate destruction of eggs by conspecifics are major causes of egg mortality (Koening and Mumme 1987).

Literature Cited—

Devine, W.D. and C.A. Harrington. 2006. Changes in Oregon white oak (*Quercus garryanna* Dougl. Ex Hook.) following release from overtopping conifers. Trees 20:747-756.

Doerge, K.F. 1978. Aspects of the geographic ecology of the acorn woodpecker (*Melanerpes formicivorus*). M.S. Thesis. Oregon State University. Corvallis, OR.

Dudley, J. and V. Saab. 2003. A field protocol to monitor cavity-nesting birds. USDA Forest Service Rocky Mountain Research Station Research Paper RMRS-RP-44. Bozeman, MT.

Gabrielson, I.N. and S.G. Jewett. 1940. Birds of Oregon. Oregon State College, Corvallis, OR. [Reprinted in 1970 under the title Birds of the Pacific Northwest by Dover Publications].

Hooge, P. N., M. T. Stanback, and W. D. Koenig. 1999. Nest-site selection in the acorn woodpecker. The Auk 116:45-54.

Jobanek, G.A. 1994. Some thoughts on acorn woodpeckers in Oregon. Oregon Birds 20:124-127.

Koenig, W. D., and J. Haydock. 1999. Oaks, acorns, and the geographical ecology of acorn woodpeckers. Journal of Biogeography 26:159-165.

Koenig, W. D., P. N. Hooge, M. T. Stanback, and J. Haydock. 2000. Natal dispersal in the cooperative breeding acorn woodpecker. The Condor 102:492-502.

Koenig, W. D. and R. L. Mumme. 1987. Population ecology of the cooperatively breeding Acorn Woodpecker. Princeton Univ. Press, Princeton, NJ.

Koenig, W.D., P.B. Stacey, M.T. Stanback, and R.L. Mumme. 1995. Acorn woodpecker (Melanerpes formicivorus). In The Birds of North America, No. 194 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

MacRoberts, M. H., and B. R. MacRoberts. 1976. Social organization and behavior of the acorn woodpecker in central coastal California. Ornithol. Monogr. No. 21. 115pp.

ODFW [Oregon Department of Fish and Wildlife]. 2006. Oregon conservation strategy. Oregon Department of Fish and Wildlife. Salem, OR.

Peter, D. and C. Harrington. 2002. Site and tree factors in Oregon white oak acorn production in Western Washington and Oregon. Northwest Science 7: 189-201.

Peter, D. H. and C. A. Harrington. 2009. Synchronicity and geographic variation in Oregon white oak acorn production in the Pacific Northwest. Northwest Science 83:117-130.

Simmons, J. 2003. Acorn woodpecker (*Melanerpes formicivorus*). Pp. 352-353. *In*, D. B. Marshall, M.G. Hunter, and A.L. Contreras. Birds of Oregon: A General Reference. Oregon State University Press, Corvallis, OR.

Swearingen, E. M. 1977. Group size, sex ratio, reproductive success, and territory size in acorn woodpeckers. West. Birds 8:21-24.