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## SURVIVORSHIP OF PILEATED WOODPECKERS IN NORTHEASTERN OREGON

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Abstract.-Knowledge of the survival of the Pileated Woodpecker (*Dryocopus pileatus*) is essential in managing viable populations of the species. In eight study areas in northeastern Oregon, survivorship of adult Pileated Woodpeckers was 0.60 after 6 mo, 0.47 after 12 mo, and 0.35 after 18 mo. Of three juveniles radio-tagged in late summer or fall, two survived to breed the next year. Of 13 juveniles radio-tagged as nestlings, 23-54% survived 3.5 mo. In these populations adult mortality exceeded recruitment of young into the breeding population. Survival may have been influenced by transmitter attachments, habitat quality, or annual variability in predation.

### **SUPERVIVENCIA DE DRYOCOPUS PILEATUS EN EL NORESTE DE OREGON**

Sinopsis.-El tener conocimientos sobre la supervivencia del carpintero *Dryocopus pileatus* es esencial para manejar poblaciones viables de esta especie. En ocho áreas de estudio en el noreste de Oregon se encontró una supervivencia de 0.60 luego de los seis meses, 0.47 luego de los 12 meses y de 0.35 luego de los 18 meses. Dos de tres juveniles, a los que se le colocaron radiotransmisores, sobrevivieron hasta reproducirse el próximo año. De 13 juveniles que se les colocaron radio transmisores como pollos en el nido, de 23-54% de éstos sobrevivieron 3.5 meses. En la población estudiada la mortalidad de los adultos excede el reclutamiento de jóvenes en la población. No obstante, la supervivencia puede haber sido influenciada por los transmisores, la calidad del habitat o la variabilidad anual en la tasa de depredación.

The Pileated Woodpecker (*Dryocopus pileatus*) is a species of concern to forest managers in the western United States because of its association with older forests (McClelland 1977; Mellen et al. 1992; Bull and Jackson 1995). The National Forest Management Act of 1976 mandates that viable populations of all vertebrate species, including the Pileated Woodpecker, be maintained on federal land (U.S.D.A Forest Service 1978). In the past, management for Pileated Woodpeckers has included retaining dead trees across the landscape (Thomas et al. 1979; Brown 1985) and maintaining 121-ha stands of older forests for breeding pairs. These management recommendations evolved from limited information based on breeding bird surveys and observations. However, there is a need for accurate estimates of survival rates and causes of mortality. The objective of this study was to determine survivorship of adult and juvenile Pileated Woodpeckers in northeastern Oregon.

## METHODS

Pileated Woodpeckers were captured and radio-tagged at nest and roost trees in 1989 and 1990 using nets and barriers covering cavity entrances (see Bull and Pederson 1978; Bull and Cooper 1996). The nests and roosts were located in eight study areas in Union and Wallowa counties in northeastern Oregon during a study of habitat utilization (Bull and

Holthausen 1993). Each study area was 1457-1624 ha in size, in mixed coniferous forests, and at 900-1800 m elevation. The study areas contained a mosaic of uneven-aged stands with a range of timber harvest activity; 30-90% of each study area had been harvested (partial overstory removal or regeneration cuts) in the past 30 yr.

I radio-tagged 23 adults in June 1989, one in July 1998, one in November 1998, and six in May and June 1990. Three juveniles (hatched in May but independent of adults at capture) were radio-tagged in September 1989, December 1989, and August 1990. Each bird was equipped with an 11-g transmitter (3-4% of body mass), lasting 5-6 mo. Each transmitter was attached with a backpack harness made of 6-mm tubular Teflon and in a figure-8 configuration with the loops sewn together over the breast bone. Birds captured in the early summer were recaptured once at roost trees in November and December 1989 or 1990 to replace transmitters. Birds captured in the fall were recaptured at nests the following spring. Transmitters were removed from birds at nest or roost trees after monitoring each individual for 5-12 mo. Each radio-tagged bird was located 2-3 times/week from July through September and once each week from October until March.

Thirteen nestling Pileated Woodpeckers from seven nests were radio-tagged within 1 wk of fledging in 1990 with a 2-g transmitter (1 % of body mass) glued to the skin and feathers on their back. The transmitters lasted 4 wk, so these juveniles were recaptured at roost trees after 3 wk, and a 6-g transmitter (3% of body mass) was attached with a backpack harness. Juveniles were located once a week until mid-October.

Survival was estimated for adult Pileated Woodpeckers using the Kaplan-Meier method with a staggered entry of individuals (cf. Pollock et al. 1989). Sample size limited survival estimates to all adult Pileated Woodpeckers without separating by sex.

## RESULTS

The probability of survival of adult Pileated Woodpeckers was 0.60 after 6 mo, 0.47 at 12 mo, and 0.35 at 18 mo (Fig. 1). Of the 31 adults, 14 were killed during the period they were monitored; the fate of one individual was unknown; and one died when its bill caught under the harness. Of the 14 that were killed, seven died between October and February 4-8 mo after radio-tagging; five died in June within 3 wk of radio-tagging; and two died in July after 12 mo of monitoring. The 5 killed in June comprised 17% of the birds radio-tagged that month, and all were still feeding nestlings when killed. At least five adults were killed by accipiters based on evidence found at a pluck site or under a Northern Goshawk (*Accipiter gentilis*) nest; one carcass was observed being carried by an unidentified hawk; coyote (*Canis latrans*) tracks were found at prey remains of one; and only the radio and intact harness were found in seven cases.

Of the three juveniles captured in late summer or fall (two in 1989 and one in 1990), two survived to breed the following year, and the remains

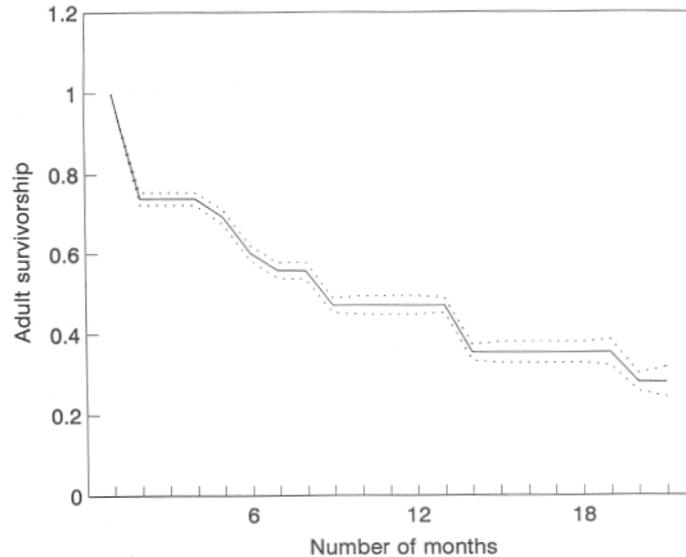


FIGURE 1. Kaplan-Meier survival estimates (95% confidence interval as dotted line), calculated at 1-mo intervals, for 31 adult Pileated Woodpeckers in northeastern Oregon, June 1989-February 1991.

of one were found in December 1990 in a roost tree occupied by three overwintering black bear (*Ursus americanus*) cubs.

Of 13 juveniles radio-tagged as nestlings, four were killed by accipiters based on pluck sites; one was cached under a log; one transmitter was 20 m up in a tree; two transmitters could not be located; one transmitter was found on the ground and one in a roost cavity (either fell off or birds had been killed); and three survived until mid-October. If it is assumed that only three survived, the survivorship is 0.23 for 3.5 mo after fledging. If it is assumed that seven survived (includes two transmitters that may have fallen off and two that could not be located), the survivorship is 0.54.

#### DISCUSSION

Survivorship of adult Pileated Woodpeckers in this study was low compared to survivorship rates of 0.65-0.75 reported by Martin (1995) for woodpeckers, and 0.65 reported by Bull and Meslow (1988) for colorbanded Pileated Woodpeckers. Additional data on survivorship of Pileated Woodpeckers are lacking because of the difficulty in capturing and monitoring a large enough sample size to obtain accurate information. Annual survivorship rates of adult Acorn Woodpeckers (*Melanerpes formicivorus*) ranged from 0.38 to 0.71 depending on the year (Stacey and Taper 1992), while juvenile survivorship was 0-0.64 depending on the year.

Adult survivorship in the present study was lower than that observed between 1975 and 1983 with 28 color-banded birds. In addition, adult survivorship was less than recruitment of young into the breeding population, assuming a nest success of 83% and average brood size (within 1 wk of fledging) of 2.26 (SD = 0.66) as reported by Bull and Meslow (1988). There are several factors that could partially explain the low survival in the present study. Transmitters may have affected survival. Some adults were observed pecking at the harness within a week of attachment, which may have increased their vulnerability to predation. However, researchers conducting a telemetry study on Pileated Woodpeckers on the Olympic Peninsula did not believe transmitters affected survival (C. M. Raley, pers. comm.). A second explanation for the difference in survival estimates may be the variability in habitat quality between the two studies. A higher proportion of all study areas in the present study had been harvested within 30 yr, resulting in less cover in the overstory canopy and fewer large-diameter snags (Bull and Holthausen 1993) than the study area used during 1975-1983 (Bull and Meslow 1988). Vulnerability to predation likely increases as overstory canopy decreases. A third explanation is the variability observed in annual survivorship rates from year to year as reported by Stacey and Taper (1992) for the Acorn Woodpecker. Mortality may be more pronounced one year for Pileated Woodpeckers because alternative prey sources of predators are less available.

Survival rates for species like the Pileated Woodpecker are difficult to obtain because of the challenge of capturing and monitoring a large sample size for a sufficiently long period to obtain an accurate estimate. Additional demographic research on this species in a variety of habitats and geographic locations is warranted to provide managers with information needed to maintain viable populations across landscapes.

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