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## Use of Domestic Sheep Carrion by Bald Eagles Wintering in the Willamette Valley, Oregon

### Abstract

Bald eagles (*Haliaeetus leucocephalus*) wintering in the Willamette Valley, Oregon, are known to feed on live domestic sheep, and have been shot or poisoned while feeding in sheep pastures. Our purpose was to help resolve some of the land-use conflicts surrounding wintering eagles in this area by documenting eagle use of domestic sheep. We conducted weekly (December 1986 through March 1987) counts of foraging eagles at primary foraging locations, made observations of eagle-sheep interactions, and examined eagle castings found at night roosts. Bald eagles fed almost exclusively on sheep carrion and afterbirth that were available throughout the study area but were never observed feeding on live sheep. Eagle numbers peaked at 20 birds with subadults outnumbering adults (68.2% vs. 31.8%) and this peak coincided with the lambing period. Primary feeding locations were pastures bordered by tall (>20 m) cottonwoods (*Populus trichocarpa*) and most were within 7 km of night roosts. Adult eagles were observed feeding in pastures at greater distances from roads than subadults. Landowners should be encouraged to place sheep carcasses in remote areas away from nearby roads to allow feeding by eagles of all ages and divert eagle use from areas where they may be killed. This would also provide winter food in an area that once supported a much larger and diverse prey base for this threatened species.

### Introduction

The diet of wintering bald eagles is highly varied and influenced by local and seasonal abundance of prey and weather (McClelland *et al.* 1982, Isaacs and Anthony 1987, Keister *et al.* 1987). Bald eagles are known to feed on cow and deer carrion (Isaacs and Anthony 1987, Isaacs pers. comm.), fish, waterfowl, and small mammals (Hancock 1964, Swisher 1964, Servheen 1975, Stalmaster 1976, Steenhof 1976, Frenzel 1984), domestic chickens and hogs (Southern 1964). Reports of bald eagles feeding on domestic sheep carrion have been limited to the Gulf Islands of British Columbia (Hancock 1964). Agricultural areas where domestic sheep ranching is an important subsistence of local economies offer opportunities to study the importance of sheep carrion as a food base for wintering bald eagles.

In the Willamette Valley, bald eagles have been observed killing live sheep and feeding on sheep carrion (private landowners pers. comm.). Concerns have been expressed over economic

losses associated with eagle depredation on sheep and for the birds' safety; at least six bald eagles have been shot or poisoned during the winters of 1986 and 1987 (G. Anderson, State Game Officer pers. comm.). This study was initiated by the Bureau of Land Management to document bald eagle use of domestic sheep and to help resolve some of the land-use conflicts associated with wintering eagles in this area.

### Study Area

#### Historical Description

Bald eagles were considered common in the Willamette Valley in 1857 (Gabrielson and Jewett 1940). This is consistent with historical descriptions of habitat conditions and food supplies that existed at the time of white settlement. During that period the valley consisted of a mosaic of grasslands, oak savannahs maintained by fire, and conifer forests with natural lakes, ponds and wetlands (Towle 1979, Boyd 1985). This combination of high habitat diversity and mild wet winters once provided eagles with overwintering waterfowl and carrion from abundant populations of white-tailed deer (*Odocoileus virginianus*) and Roosevelt elk (*Cervus elaphus*) (Boyd 1985).

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Population densities of these species greatly exceeded present conditions (Boyd 1985).

Present Conditions

The Willamette Valley is now a mosaic of pastures grazed by domestic sheep and bordered

by cottonwood, Oregon white oak (*Quercus garryana*), incense cedar (*Libocedrus decurrens*) and low-growing shrubs along fence rows. Bald eagles have been observed feeding in the valley and roosting in the Coburg Hills (Figure 1). A small population of bald eagles has been wintering near Brownsville, Oregon, for the past 20

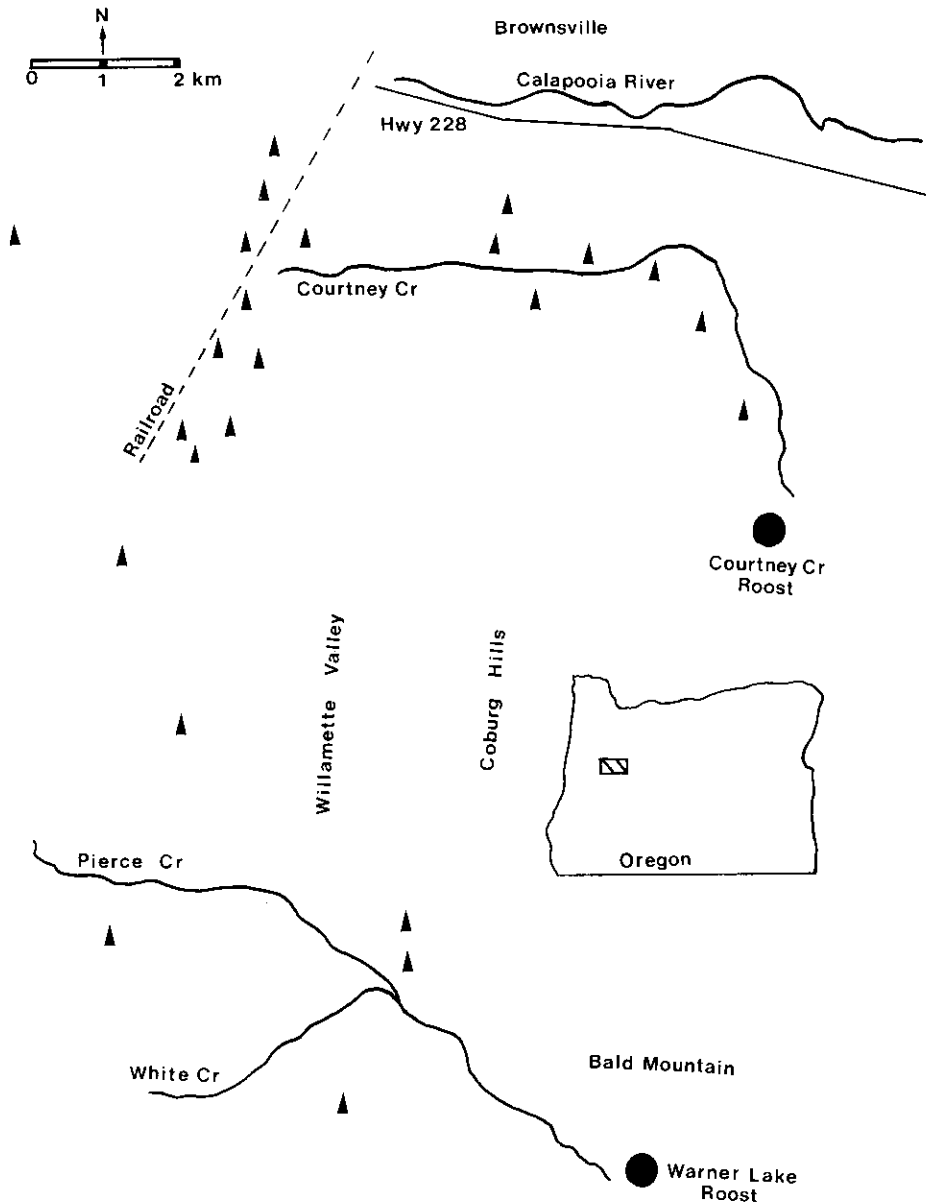


Figure 1. Location of foraging areas (triangles) with at least five bald eagles sightings and roosting (circles) areas in the Willamette Valley, Oregon. Only foraging areas within 11 km of night roosts are shown.

years (local ranchers pers. comm.). Numbers of eagles using this area and their wintering diets have never been described.

### Methods

Observations of bald eagles were made twice each week from December through March 1987 between 0800 and 1630 hours. Two observers searched for bald eagles by travelling all-weather roads within 20 km of known roost sites. Once eagles were located, observers watched them with 10 x binoculars and spotting scopes and recorded information on time of day, flight direction of eagles, behavior (i.e., flying, perched, feeding), distance to nearest road as determined from USGS topographical maps (1:24,000 scale), perch type and species, and prey (live sheep, afterbirth, sheep carrion). Whenever possible, eagles were identified as adults based on white heads and tails or subadults. Numbers of adults and subadults were expressed as the highest of two counts conducted each week.

Additional information on winter diets was obtained by examining the contents of 45 eagle castings collected from the base of roost trees. Brown (1976) indicated that eagle castings provide useful information on dietary habits of eagles but that they are not a quantitative technique for determining prey composition.

### Results

Bald eagles were observed on the study area from 5 December to 25 March (Figure 2). During most of this period, subadults (68.2%) outnumbered adults (31.8%). Eagle numbers fluctuated throughout the observation period and peaked at 20 birds on 4 February. The peak count was followed by a decline in eagle numbers and no eagles were seen after 25 March (Figure 2).

A total of 32 observations of foraging bald eagles was made on the study area. Eagles fed exclusively on sheep carcasses and afterbirth but have also been observed feeding on fish in nearby streams (local ranchers pers. comm.). On five

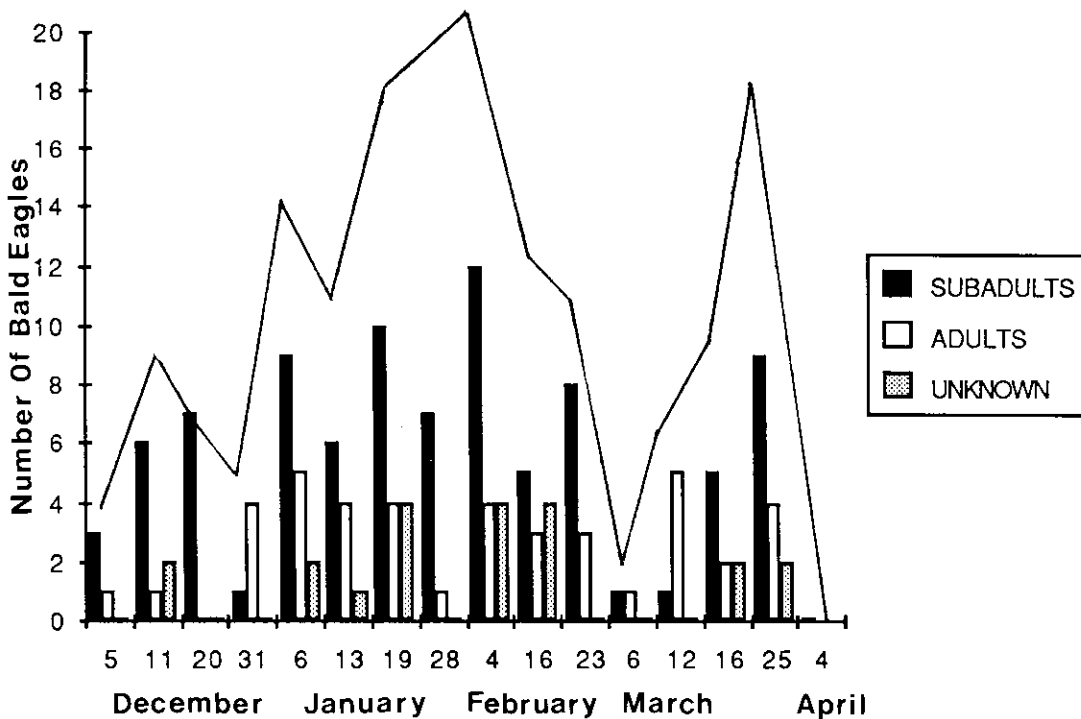


Figure 2. Numbers and age structure of bald eagles obtained from feeding ground counts in the Willamette Valley, Oregon, 1986-87. The line graph represents the highest total count for each week.

occasions, bald eagles were observed perched or feeding within 5 m of live lambs; however, no predation attempts on live lambs were observed.

Analysis of eagle castings indicated that domestic sheep was an important prey item and this is supported by our observations of foraging birds. Of 45 eagle castings collected at roost sites most were sheep remains (93.3%, n = 42) followed by waterfowl (4.4%, n = 2) and small rodents (2.2%, n = 1).

Eagles were most often observed feeding in pastures bordered by tall (>20 m) cottonwoods. Primary feeding areas where eagles were seen at least five times occurred within 6.82 km ± SE = 0.53 km (n = 25) of night roosts and no birds were observed beyond 13 km (see Figure 1). Most sightings of foraging birds occurred within 150 m of roads (Table 1). Because all our surveys were conducted from roads, this result was not surprising. However, only one adult was observed foraging or perched within 50 m of a road and all others occurred beyond this distance. Differences in adult and subadult foraging distances were significant ( $X^2 = 16.3$ ,  $df = 5$ ,  $P < 0.01$ ). This difference suggests that adults were less tolerant of road traffic while feeding and is consistent with other studies (Stalmaster 1976, Isaacs pers. comm.)

TABLE 1. Distance of foraging bald eagles to nearest roads in the Willamette Valley, Oregon.

Distance (m) to nearest road	Subadults		Adults	
	n	%	n	%
<10	13	27.1	0	0
10-50	3	6.3	1	6.7
51-150	20	41.7	6	40.0
151-400	8	16.7	2	13.3
401-800	1	2.1	6	40.0
>800	3	6.3	0	0

## Discussion

Use of the Willamette Valley by bald eagles was related to availability of sheep carrion and after-birth. Peak concentrations of bald eagles coincided with the lambing period (i.e. early to mid-February) and the high proportion of subadults (68.2%) was probably related to an abundant supply of sheep carrion on the study area. Other

studies of wintering eagles in Oregon (Isaacs and Anthony 1987, Isaacs pers. comm., Keister *et al.* 1987) also indicate high concentrations of subadults when the food supply was abundant.

Sheep ranchers in the Willamette Valley typically move their sheep to different pastures before and after the lambing period to prevent overgrazing and starvation. Shifts in the location of preferred foraging and roosting areas of eagles coincided with these movements. Prior to 12 February, for example, sheep were abundant in pastures north and west of the Courtney Creek Roost (see Figure 1). Most foraging and roosting of eagles took place in this area which was near the majority of sheep pastures. However, after 12 February most of the sheep were moved south of this area and closest to the Warner Lake Roost. Foraging and roosting of bald eagles shifted to the Warner Lake Roost area following these sheep movements. Isaacs and Anthony (1987) report similar shifts in foraging locations by wintering eagles that coincided with changes in availability and location of cow carcasses.

Land-use changes have altered the Willamette Valley from a grassland, savannah and riparian mosaic (Towle 1979, Boyd 1985) to primarily an agricultural landscape. Such changes may have caused concomitant shifts in eagle diets. Although sheep carcasses were the major prey item consumed by eagles, dependency on this food base might increase the eagles' vulnerability to changes in agricultural practices. Moreover, past logging in the adjacent hills has reduced roosting habitat; most older-age forest has been removed during the past 50 years. Foraging habitat of bald eagles in the Willamette Valley should be protected from widespread changes in land-use and consideration given to remote areas where the birds can forage without human disturbance. Landowners should be encouraged to place sheep carcasses at least 150 m from nearby roads (1) to allow feeding by eagles of all ages, (2) to divert eagle use away from areas where they may be killed and (3) to provide winter food in an area that once supported a much larger and diverse prey base for this threatened species.

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