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A CONGREGATION OF WINTERING BALD EAGLES

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In 1961, aerial counts of migratory waterfowl were initiated as part of a U.S. Atomic Energy Commission (now Department of Energy) research program designed to investigate waterfowl use of the Hanford reach of the Columbia River. Bald Eagles (*Haliaeetus leucocephalus*) also regularly visit this area in winter months and they were counted along with the waterfowl. The Hanford reach is the last undammed portion of the Columbia River in Washington above Bonneville Dam. The area has been mostly closed to public access until recently and acts as a refugium for wildlife.

The study area extends from the northern boundaries of the city of Richland upstream to the Vernita Bridge, a distance of about 80 km (Fig. 1). Riparian vegetation along the Columbia River is poorly developed. Small shrub willows (*Salix* spp.) provide much of the available cover, but ornamental trees constitute most of the vegetation over 3 meters in height. The trees, mostly white and Lombardy poplars (*Populus alba*; *Populus* sp.), black locust (*Robinia pseudacacia*) and Siberian elm (*Ulmus* sp.), were planted as wind breaks or shade trees prior to the establishment of the Hanford Reservation in 1943.

Census flights were made twice each month during November and December of one calendar year and January and February of the next, including the winters of 1961–1962 through 1969–1970, and from 1974–1975 through 1977–1978. Two observers counted birds

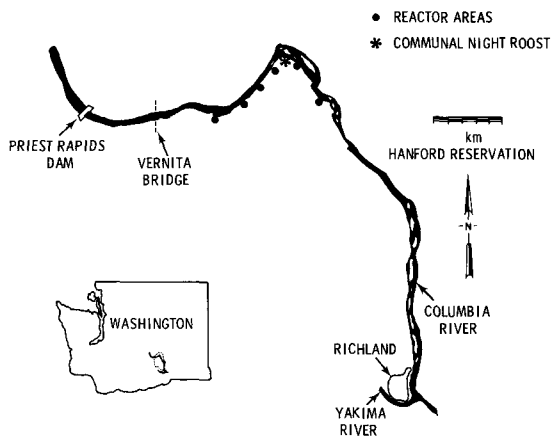

FIGURE 1. The Hanford U.S. Department of Energy Site in southcentral Washington.

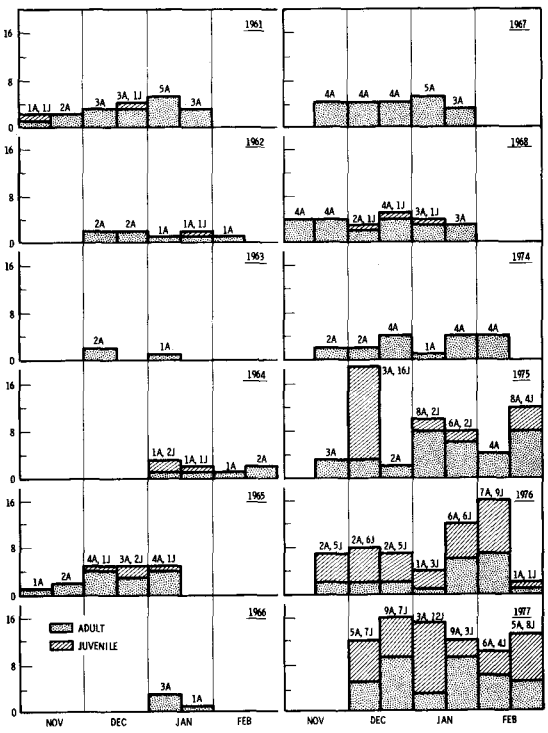

FIGURE 2. Numbers of adult and juvenile Bald Eagles found wintering on the Hanford reach of the Columbia River. Each annual survey spans two calendar years (e.g., winter of 1961 spans 1961–1962).

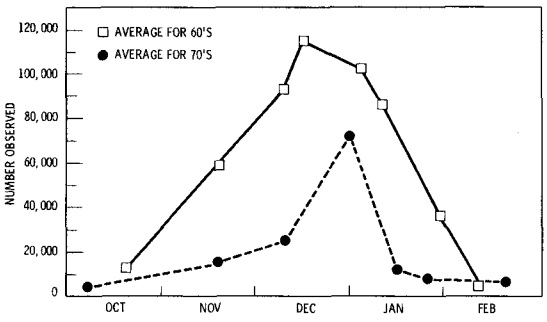

FIGURE 3. Average number of ducks found wintering on the Hanford reach of the Columbia River during the 1960's and 1970's.

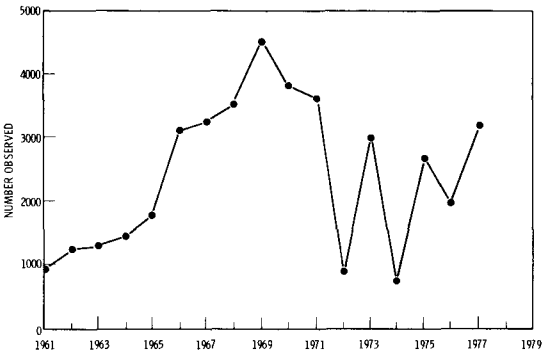

FIGURE 4. Number of chinook salmon redds observed during the fall, in the Hanford reach of the Columbia River, 1961–1977. Data from Watson (1970 and pers. comm.).

from an aircraft flying at a speed from 85–100 mph at an elevation of 50–170 m. Surveys generally were conducted from 07:00–10:00. A communal night roost also was observed periodically from 1974 through 1977 to gain additional data on eagle numbers. Eagles were classified as adults (pure white heads) or subadults. Diet data were obtained by examining prey remains found on the ground at the night roost (Fig. 1), in 1975 and 1976.

RESULTS AND DISCUSSION

The general pattern of use was similar for all years. Eagles usually arrived during mid-November. The earliest recorded arrival date was 29 October 1968. Eagles were most abundant from late November through early February. Wintering populations began to disperse in mid-February and most birds were gone by early March. The latest spring record was 7 April 1976.

In four of the twelve years when surveys were conducted, adult eagles arrived before juveniles (1962, 1965, 1968, 1975; Fig. 2). In the winters of 1963, 1966, 1967 and 1974, only adults were seen. Adults usually stayed longer than juveniles except during the winters of 1975, 1976 and 1977, when both age classes departed almost on the same date. Servheen (1975), in his studies of eagles wintering along the Skagit River, Washington, found that adults and subadults seemed to depart at the same time during the winters of 1974–1975, and 1975–1976, but the adults arrived before subadults. Shea (1973) and Southern (1963) found that subadults arrived before adults. Shea (1973), however, found no difference in departure time between the age groups. Southern (1963) noted that adults departed before subadults. Our observations more closely resemble Servheen's (1975).

Winter use of this section of the Columbia River by Bald Eagles has markedly increased over the past 16 years, particularly since 1975 (Fig. 2). We believe the aerial surveys reflect yearly differences in winter abundance of Bald Eagles accurately, because periodic surveys of the communal roost (Fig. 1) generated similar data. During the 1960's Bald Eagles were not abundant along the Hanford reach; no more than five birds were recorded on any survey from 1961–1968 and during 1963, 1966, and 1967 no juvenile birds were seen. When aerial surveys were resumed in 1974 no more than four adult eagles were recorded on any one survey, but from 1975 to 1977 populations were much higher (Fig. 2).

Perhaps Bald Eagles increased in response to prey availability. Bald Eagle movements have been reported to closely follow the availability of prey (Servheen 1975, Southern 1963, Shea 1973). Spencer (1976:63) stated that "the arrival of northern migrant bald eagles each fall depends, after a nudge from impending winter, on how the 'table is set'." Bald Eagles accompany southward movements of waterfowl upon which they prey or, independent of waterfowl movements, they may head directly to a regularly occurring supply of fish (Spencer 1976).

In 1975 and 1976 we collected castings and food scraps at the communal roost. We found that fish (primarily chinook salmon) comprised 41% of the eagles'

TABLE 1. Foods of Bald Eagles on the Hanford Reservation.

Prey species	Recorded items	Approximate biomass[a] (grams)	Percent biomass
WATERFOWL			
Mallard (*Anas platyrhynchos*)	23	24,219	32
American Wigeon (*A. americana*)	8	7,032	9
Pintail (*A. acuta*)	1	997	1
Green-winged Teal (*A. crecca*)	2	680	1
American Coot (*Fulica americana*)	10	6,500	9
Gadwall (*A. strepera*)	1	989	1
FISH			
Chinook salmon (*Oncorhynchus tschawytscha*)	21	31,500	41
Sucker (*Catastomus* spp.)	4	2,800	4
European carp (*Cyprinus carpio*)	1	1,200	2
Chiselmouth (*Acrocheilus alutaceum*)	1	400	1

[a] Average weights of prey items were determined from data collected by the authors and other scientists at Pacific Northwest Laboratories.

diet on a biomass basis, and ducks and coots 53% (Table 1). In order to better understand the role of these different prey on eagle numbers, we compared yearly eagle census data with waterfowl and salmon population data.

Waterfowl counts reveal that more ducks were seen in the 1960's than in the 1970's (Fig. 3), yet eagle numbers increased in the 1970's. Apparently eagle abundance was not dependent on the abundance of waterfowl, even though the patterns of winter use of the Columbia River by ducks and eagles were similar. A significant negative correlation ($P < 0.05$) suggests that eagles were not dependent on waterfowl as a major prey source. The number of eagles appears to be related to the number of chinook salmon redds, however (Watson 1970; Fig. 4). In the early and mid-1960's, salmon redds (an indication of salmon abundance) were less numerous than in the late 1960's and 1970's, except for the winters of 1972 and 1974, when they dropped to the lowest levels recorded over the 1961–1977 period. Few eagles were recorded in 1974 and no immature eagles were seen that winter. Salmon redds increased in 1975 as did eagle numbers. Immature eagles also were present in 1975–1977. A nearly significant positive correlation ($P < 0.10$) was found between numbers of eagles and those of salmon redd densities.

The observed increase in wintering eagles may be related to the closure of the Hanford reach to public recreation since the mid-1940's. During the 1960's there was a considerable amount of nuclear reactor construction activity here, but today this section of the river is relatively quiet. It is good waterfowl habitat, particularly because of 20 cobblestone islands which provide ideal resting areas such as have been largely eliminated from the impounded stretches of the Columbia and Snake rivers.

As adjacent lands become more intensively developed and accessible, the Hanford Reservation probably will grow in importance as a sanctuary for waterfowl and salmon, and the Bald Eagles which prey upon them. The recent dedication of the Reservation as a National Environmental Research Park may help to preserve the sanctuary status of the area.

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DEVELOPMENT OF SONG OF A RUFOUS-SIDED TOWHEE RAISED IN ACOUSTIC ISOLATION

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Passerine birds raised in acoustic isolation or deafened at an early age typically develop songs which are more variable, "buzzier," and less well organized than those of wild conspecific birds (Marler et al. 1962, Konishi 1964, Konishi and Nottebohm 1969, Marler et al. 1972, Nottebohm 1975). Because embryos of some non-passerines are sensitive to sound (Gottlieb 1966) and because passerines can selectively respond to (but not necessarily learn to repeat) specific sounds when they are three days old (Messener *in* Thielcke 1976), the ontogeny of song is preferably studied with acoustically isolated birds that have been raised from the egg. I report here on the songs developed by one male Rufous-sided Towhee (*Pipilo erythrophthalmus*) which was raised to maturity from an egg. This report represents the first study of development of song in the Rufous-sided Towhee.

STUDY SITE AND METHODS

I collected three eggs from a nest at the Kalbfleisch Field Research Station, Huntington, Suffolk County, New York, on 15 July 1974. The eggs were approximately nine days old when taken from the nest. They hatched 18 July 1974 in a sound isolation chamber and on 11 August 1974 each of the two males (sexed by plumage) was transferred to its own sound isolation chamber. The birds were not deafened and could hear themselves. I moved them at night so they could not hear other birds during the move. One male died shortly after being placed in a sound chamber. I periodically monitored and tape-recorded the surviving male with a Uher 4000 Report-L tape recorder and a Uher M512 microphone. The photoperiod was adjusted to roughly correspond with the natural photoperiod except in early spring when I lengthened the photoperiod to induce singing by early April.

The male was first heard singing subsong (terminology follows Nottebohm 1975) on 28 August 1974, when he was 42 days old. A more structured subsong was heard by 17 February 1975 and either "plastic" or "full" song on 13 April 1975. Recordings used for this analysis of song development were made on 8 September 1974 (subsong), 13 April and 1 June 1975 ("plastic" or "full" song), and 10 and 25 May 1976 ("plastic" or "full" song). Song could not be classified either as "plastic" or "full" because I was not certain that the final stage of song development had been reached. The terminology used to describe song follows Mulligan (1966) and Kroodsma (1974). I analyzed 111 songs that