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BALD EAGLES OF THE HANFORD NATIONAL ENVIRONMENTAL RESEARCH PARK

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Abstract: Since 1961, near-yearly aerial surveys of Bald Eagles along the Hanford reach of the Columbia River have been conducted. Prey resources available to the eagles have also been monitored and we have thus been able to examine predator-prey relationships in a statistical fashion. Most field studies of eagles or other raptors have relied on fewer than five years of data and thus an adequate assessment of predator-prey interactions is at best only guess work. We will report then, on a unique set of data which provides insight into one of the factors (prey availability) controlling Bald Eagle wintering populations.

The winter distribution of the Bald Eagle (Haliaeetus leucocephalus) has been reported to closely follow the availability of prey (Servheen 1975, Southern 1963, Shea 1973, Spencer 1976). Fitzner and Hanson (1979) compared twelve years of eagle winter survey data on the Hanford DOE Site with waterfowl numbers and salmon redd densities over the same period and provided some statistical evidence that eagle wintering numbers varied somewhat dependently with changing Salmon redd numbers but not with changing waterfowl numbers. In assessing the role of prey

available to winter Bald Eagle densities and distribution, these long-term data sets are vital. This report, re-examines Fitzner and Hanson's (1979) twelve year data set and supplies two additional years of data for the Hanford DOE Site in order to gain additional insight into predator-prey interactions.

STUDY AREAS

This study was conducted on the section of the Columbia River which flows about 80 km through the U.S. Department of Energy's National Environmental Research Park in south-central Washington. This section of the river is unimpounded and is upstream from McNary Dam and downstream from Priest Rapids Dam.

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. Vegetation of the nonriparian surrounding areas is mostly undeveloped rangeland dominated by big sagebrush (Artemisia tridentata). The cobblestone islands in the Hanford reach support scattered stands of Lupine, (Lupinus spp.), buckwheat (Eriogonum compositum), absinthe (Artemisia absinthium), and rye-grass (Elymus cinereus). Shrub cover is sparse but includes occasional thickets of willows, mulberry (Morus rubra), and currant (Ribes cereum).

Since surface water is limited in surrounding areas, Bald Eagles and their prey are closely tied to the Columbia River.

The Hanford Reach of the Columbia River has been mostly closed to public access from 1943-1971. Since 1971, however, public access has been allowed upstream to the old Hanford Townsite; 23 miles from Richland, Washington. In 1978, the entire Hanford stretch was open to public with some hunting and fishing restrictions in effect.

METHODS

Aerial census flights for 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 were counted along with waterfowl. 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 1961-62 through 1969-70, and from 1974-75 through 1979-80. Two observers counted birds and Salmon Redds from an aircraft flying at a speed from 85 - 100 mph at an elevation of 50 - 170 m. Surveys generally were conducted from 0700 to 1000 hr. Three communal night roosts (Fig. 1) also were 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 (Table 1) in 1975 and 1976.

RESULTS AND DISCUSSION

Fitzner and Hanson (1979) report that Bald Eagles generally arrive on the Hanford Site during mid-November and are present from late November through early February. Most are gone by early March. This same pattern has prevailed to date. Waterfowl use of the Hanford area also follows a similar temporal distribution pattern and one might infer that the eagles

are accompanying southward movements of waterfowl upon which they feed. Spencer (1976) indicates that this does occur and also that eagles might act independently of waterfowl migrations and head directly to a regular occurring supply of fish. In areas where both waterfowl and fish are available as prey as on the Hanford Site, we suspect eagles may be operating in both ways.

The eagles display a distribution pattern similar to that of waterfowl but if salmon are available along with ducks then fish may influence the numbers of eagles present. Since waterfowl use of the Columbia has decreased in the decade of the 1970's one would expect that eagle use of this prey resource would have been established in the 1960's and that additional eagle use would occur if some other prey resource developed such as the Salmon or if ducks became more available as a food source. To test this hypothesis, we hafe compared maximum yearly eagle numbers (Fig. 2) with Salmon Redd counts (Fig. 3) and waterfowl counts (Fig. 4) to determine if indeed eagle density is a function of salmon density or waterfowl density or both. A significant negative correlation ($p < 0.05$) suggests that eagles were not dependent on waterfowl. A nearly significant positive correlation ($p < 0.10$) was found between number of eagles and salmon redd densities however and suggests a food base relationship is operating here.

These findings suggest a relationship between salmon and eagles however single factor relationships are not generally the rule in nature and no doubt a number of other parameters are operating to direct bald eagles to the Hanford Site. Hunting pressure on waterfowl for instance, has increased substantially along the Hanford reach of the Columbia over the study period and the number of crippled waterfowl must also have increased. Even though wintering duck populations decreased from over 100,000 in the

1960's to about 70,000 in the 1970's, the number of crippled ducks available to eagles may have doubled. Thus our waterfowl survey data would not reveal the true importance of ducks as prey for eagles.

The increased use of the Hanford Site may also be the result of a shift in distribution related to the depletion of Bald Eagle wintering habitat in other areas of the Northwest.

A final point is also in order. During the 1960's, there was a considerable amount of nuclear reactor construction activity on the Hanford Reach of the Columbia, but by 1970 this activity had ended.

Today the Hanford Site serves as a sanctuary for Eagles and their prey, where they can live relatively undisturbed by man. The relatively long-term data base presented here may in the future serve as a useful environmental barometer for detecting impacts of man related activities along the Columbia River and may also help elucidate some of the uncertainties associated with predator-prey interactions.

LITERATURE CITED

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TABLE 1. Foods of Bald Eagles on the Hanford Reservation

Prey Species	Recorded Items	Approximate Biomass* (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
Gadwell (S. 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 (Arocheilus alutaceum)	1	400	1

*Average weights of prey items were determined from data collected by the authors and other scientists at Pacific Northwest Laboratory.

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

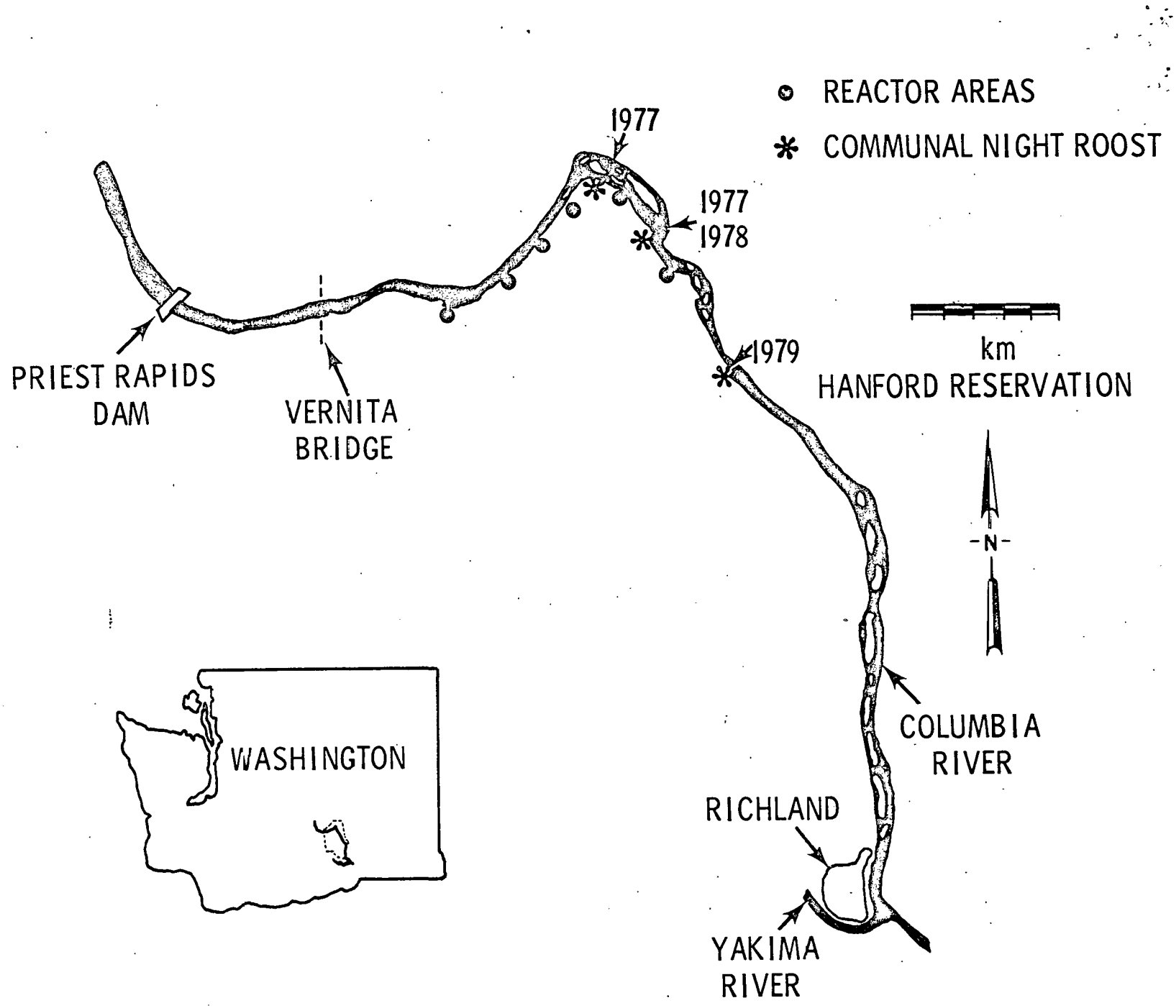
REACTOR AREAS
COMMUNAL NIGHT ROOST
1977
1977
1978
1979
km
HANFORD RESERVATION
PRIEST RAPIDS
DAM
VERNITA
BRIDGE
N
WASHINGTON
COLUMBIA
RIVER
RICHLAND
YAKIMA
RIVER

Figure 1

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).

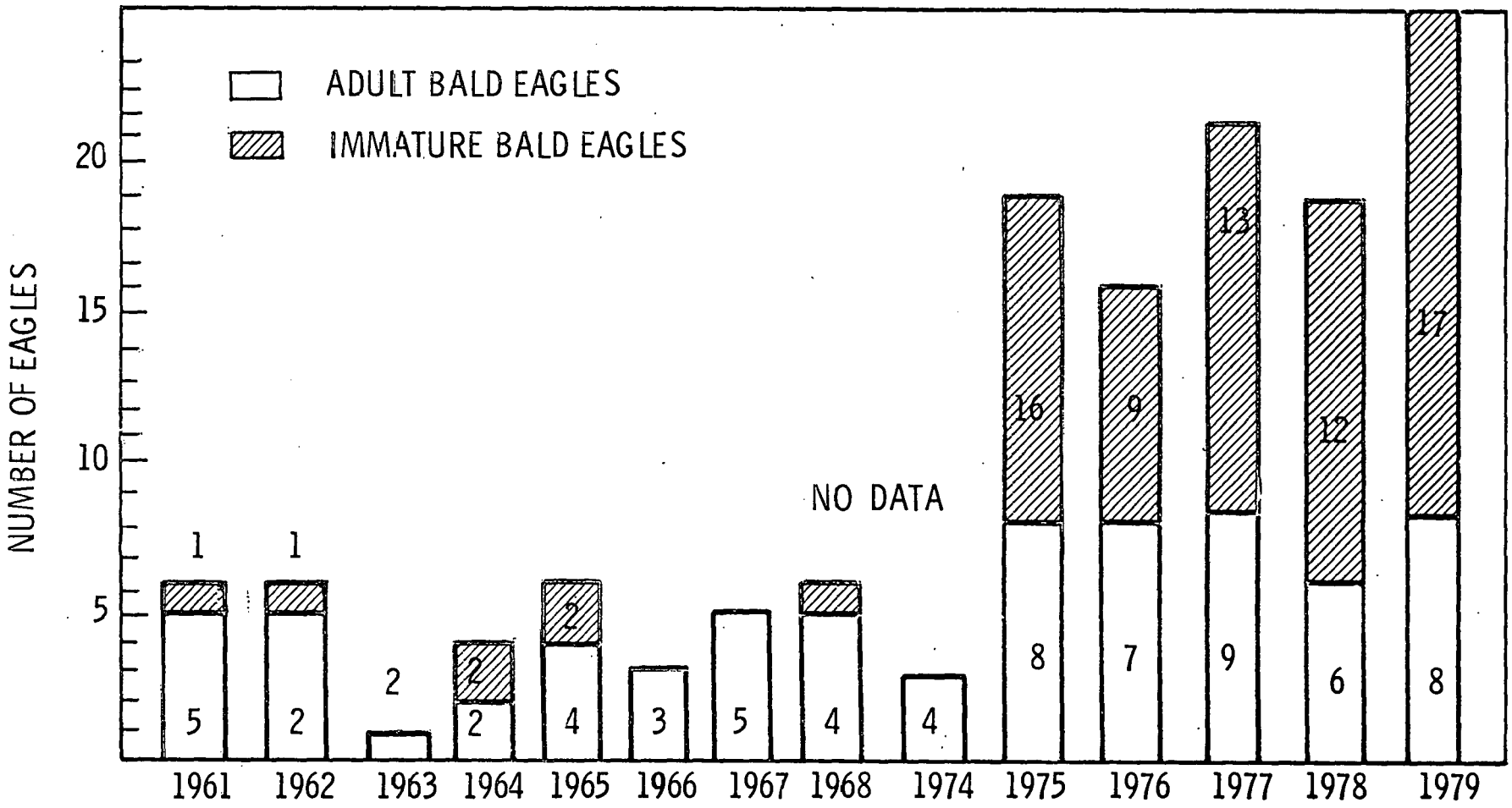
ADULT BALD EAGLES
IMMATURE BALD EAGLES
NUMBER OF EAGLES
20
15
10
5
NO DATA
1 1
5 2 2 2 4 3 5 4 4
2 2
8 7 9 6 8
16 9 13 12 17
1961 1962 1963 1964 1965 1966 1967 1968 1974 1975 1976 1977 1978 1979

Figure 2

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

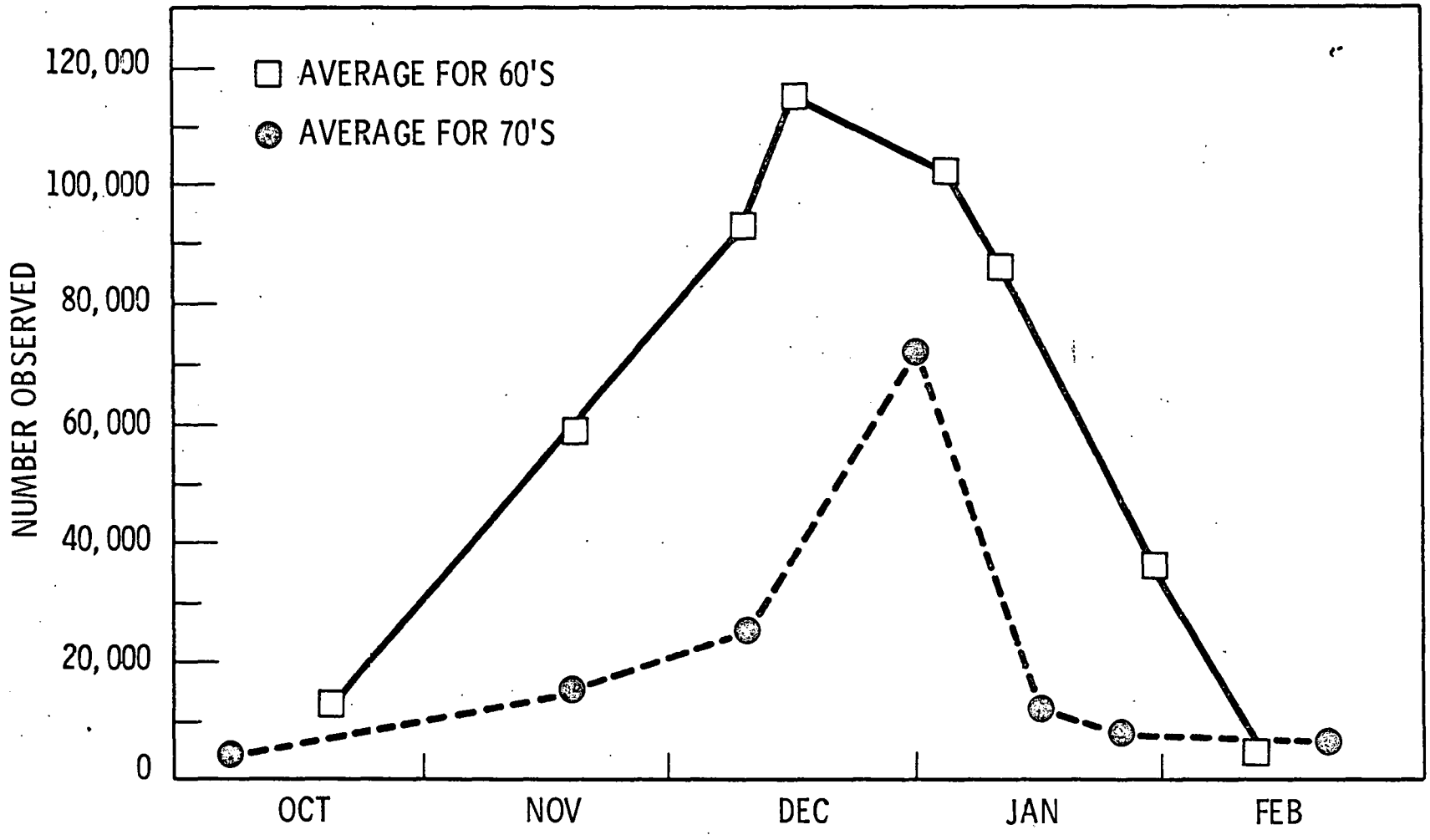
AVERAGE FOR 60'S
AVERAGE FOR 70'S
NUMBER OBSERVED
120,000
100,000
80,000
60,000
40,000
20,000
0
OCT
NOV
DEC
JAN
FEB

Figure 3

FIGURE 4. Number of chinook salmon redds observed during the fall, in the Hanford reach of the Columbia River, 1961-1980.

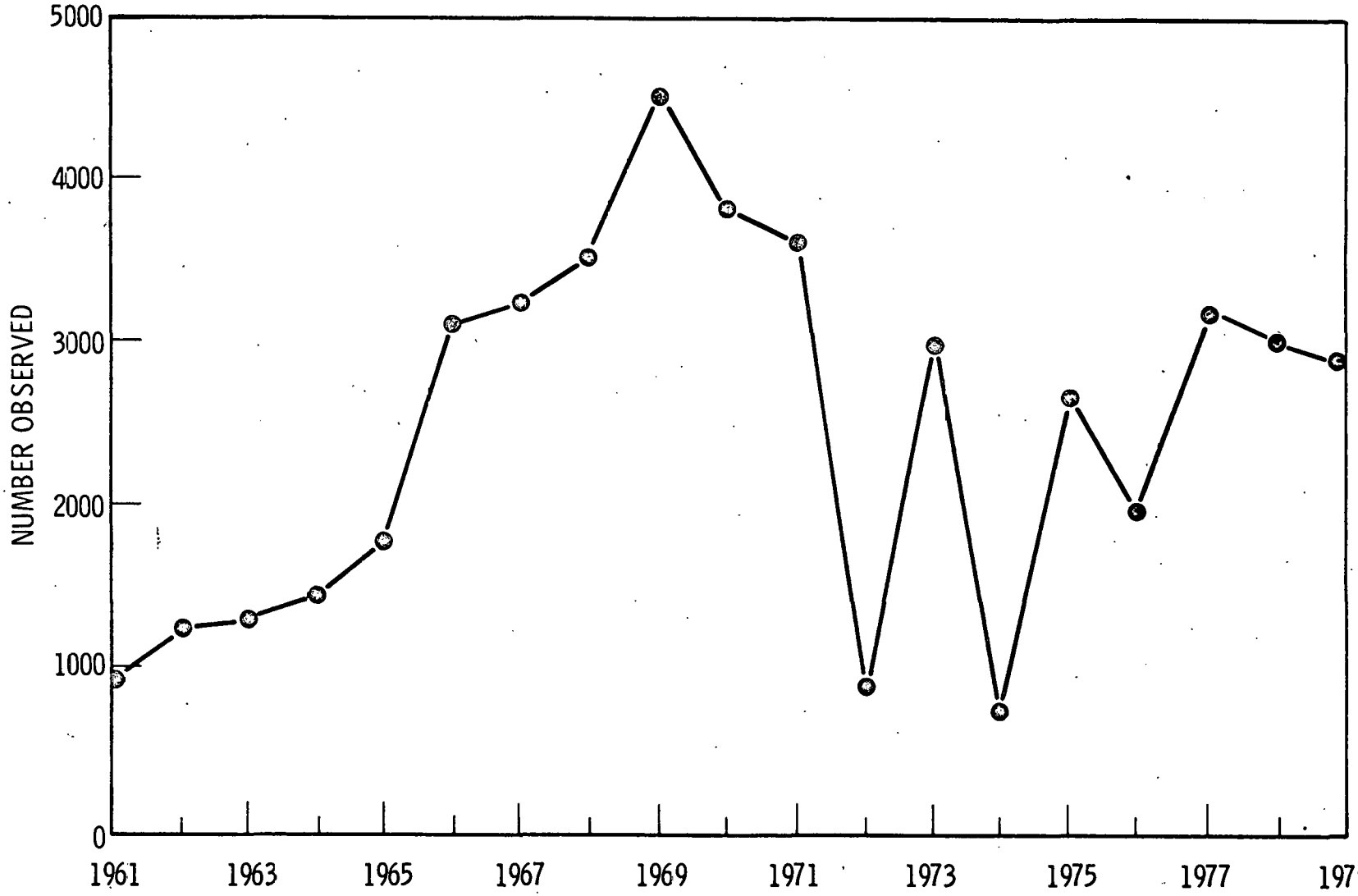
5000
4000
3000
2000
1000
0
NUMBER OBSERVED
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979

Figure 4