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Tagging Studies of Mule Deer Fawns on the Hanford Site, 1969-1977

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October 1979

Prepared for the U.S. Department of Energy
under Contract EY-76-C-06-1830

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SUMMARY

From 1969 through 1977, 346 mule deer (Odocoileus hemionus) fawns were tagged and released on islands and shoreline habitat associated with the Columbia River on the Hanford Site in south-central Washington. The purpose was to determine the movement of mule deer along the Columbia River shoreline from the Hanford Site through tag recovery.

Twenty-one tagged deer have been killed primarily by hunters near the Hanford Site or on areas of the Hanford Site open to public access. Movements of up to 113 km from Hanford have been documented. Although the Columbia River at Hanford is one of the largest and most swift-flowing rivers in North America it is not an impassable barrier to mule deer.

River islands are important and perhaps critical fawning habitat for the local deer herd. The selection of these islands by pregnant female deer is apparently influenced by predation, human access, and recreational use of islands.

The number of fawns captured decreased during the latter years of the study (1974-1977). This is probably a reflection of an actual decrease in deer productivity, particularly along the upper stretch of the Columbia flowing through the Hanford Site. The reasons for this apparent decrease are unknown.

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INTRODUCTION

From 1969 through 1977 intensive yearly efforts were made to capture, mark, and release mule deer (Odocoileus hemionus) fawns on the U.S. Department of Energy's Hanford Site in south-central Washington. The purpose of this study was to determine whether resident deer along the Columbia River shoreline on the Hanford Site disperse to surrounding public and private lands.

This report updates an earlier published account of the study (Hedlund, 1975) and provides a more complete summarization of the results. It includes 1977 fawn tagging data obtained by graduate student W. D. Steigers, Jr. during a study on fawn mortality on the Hanford Site (Steigers, 1978).

STUDY AREA AND METHODS

The study was conducted on the shore and islands associated with a 78 km stretch of the Columbia River flowing through the Hanford Site (Fig. 1). The area is characterized by steppe vegetation sagebrush (Artemisia tridentata)/ grass (Daubenmire, 1970) and an arid climate with approximately 16 cm of annual precipitation (Thorp and Hinds, 1977). Twenty-one islands, varying in size from 2.7 to 135 ha (Hanson and Eberhardt, 1971) are included in the study area. The islands range from a few to several hundred meters offshore. A few of the islands are practically devoid of vegetation; however, most have low-growing shrub and herbaceous ground cover. Farmlands near the eastern shoreline support some agricultural crops, primarily alfalfa and orchards.

The western shore of the study area has been closed to public access since 1943. However, portions of the river, including islands, have been open to the public throughout the study: access has never been restricted from Island 18 south, access was allowed upstream to Island 12 during 1969 and 1970 except during the Canada goose (Branta canadensis) nesting season (February-May) when the islands were protected, and in 1971 the river and islands from Richland to just north of the old Hanford Townsite were opened year-round (Fig. 1).

Mule deer in the area are apparently non-migratory. They tend to concentrate their activities on the western river shore, presumably because of restrictions to public access on this side of the river and a general lack of water and vegetative cover away from the river.

Fawns were located between late May and June from 1969 through 1976 with the aid of a helicopter. Both shorelines and islands were searched as well as nearby areas of exceptionally good habitat, such as, abandoned orchards. In 1977 intensive ground searches were employed in addition to the helicopter search (Steiger, 1978). Helicopter searches were generally conducted over a period of two to three days. Total expenditures for helicopter time were used as an indication of yearly catch effort.

Once a fawn was located, the helicopter assisted a ground crew in its capture by "pinpointing" the fawn's location or, in the case of older more mobile fawns, by driving the animal to the ground crew.

All fawns were ear tagged with a small metal strap tag with a return address inscribed and a larger cattle-type plastic tag with large highly visible numbers (Fig. 2). Sex and location of capture were recorded for all fawns.

RESULTS

A total of 346 fawns were marked and released during the nine years of study (Table 1). Figure 2 provides a summary of capture locations of fawns from 1969-1976. The majority (79%) of the 306 fawns for which capture locations are known were marked and released north of the old Hanford Townsite. This area comprises approximately 53% of the total study area and has been closed to public access throughout the study.

Sixty-nine percent (239) of all fawns captured, including 1977 data (Steigers, 1978, p. 11), were found on islands. Several islands and a few shoreline sites appeared to be favored by does for fawning and consistently had fawns year-after-year (Table 2). Maximum density of fawns present on islands was 1 fawn/0.7 ha on Island 1 in 1973. Some islands favored by deer for fawning were practically devoid of vegetative cover (Fig. 3), whereas others contained relatively dense stands of vegetation (Fig. 4).

Of the 85 fawns located on shorelines through 1976, 72 (85%) were found on the west (restricted access) side of the river. From 1971-1976, in the lower section of the river (south of the old Hanford Townsite) where the islands were open to the public and the west shoreline was closed, a significantly ($P < 0.01$, chi-square test) higher proportion of fawns (33 of 69) were located on the protected shoreline than were located on shorelines (34 of 162 fawns) in the upper section of the river where no public access was allowed.

The number of fawns captured each year showed a marked decline beginning about 1974 despite the lack of substantial changes in catch effort, as measured by expenditures for helicopter time (Table 3). In fact, the helicopter expenditures were greatest in 1975 when the fewest fawns were captured. The relatively small number of fawns captured in 1969 is attributed to inexperience with the capture techniques and the increase in the number of fawns in 1977 is attributed to more intensive ground searches than usual. The decline in the total number of fawns captured was a result of a decreased catch in the upper section of the river, while the number of fawns caught in the lower section remained relatively constant throughout the study (Fig. 5).

Twenty-seven of the 346 tagged deer (8%) are known to have been killed since their release: 15 were shot by hunters, 2 were killed by poachers,

6 were hit by vehicles, 2 drowned in irrigation canals, and 2 died from unknown causes (Table 4). Twenty-one of these animals were killed off the Hanford Site or on areas of the Hanford Site east and north of the Columbia River which were open to public access (Fig. 6). Distances moved by tagged deer from their release sites ranged from 0 to 113 km. There was no significant difference ($P > 0.05$, t - test) in the distance moved by males ($\bar{X} = 28.6 \pm 30.5$ km) and females ($\bar{Y} = 10.5 \pm 11.6$ km).

The sex ratio of the recovered sample of tagged deer (133 males: 100 females) was not significantly different ($P > 0.05$, chi-square) from that observed during tagging (127 males: 100 females). However, both of these ratios were significantly different ($P < 0.05$, chi-square) from equality.

The ages of recovered deer varied from 0.5 to 10 years; however, most were about 1.5 years old particularly in the hunter-killed segment.

DISCUSSION

Tag returns obtained during this study show that mule deer fawns born on the Hanford Site are killed offsite on public and private lands. These movements probably reflect normal daily and seasonal movements for this herd. The few long-distance movements documented during this study are not unusual for migratory herds of this species in mountainous areas (Ashcraft, 1961; Zalunardo, 1965; Robinette, 1966; Richens, 1967; Papez, 1976; Zeigler, 1978) where deer travel between summer and winter ranges. We do not know, however, if these movements are atypical for non-migratory herds such as the Columbia River Hanford herd.

Columbia River islands provide important fawning habitat for mule deer residing on or near the Hanford Site. The reasons these islands, some of which are practically devoid of vegetation, are apparently selected by deer for fawning are unclear. Cowan (In Einarsen, 1956) found that islands in the Athabaska River, Alberta, Canada, were also used for fawning by mule deer presumably as an "instinctive response" by the deer to avoid wolf (*Canis lupus*) predation or human disturbance.

Coyotes (*Canis latrans*), the major predator of fawns on the Hanford Site (Steigers, 1978), are capable of visiting any of the islands (Hanson and Eberhardt, 1971). However, it is possible that coyote use of islands is lower than shoreline habitat and therefore islands may provide some degree of protection from predation. Interestingly, several of the islands (Nos. 3, 8, and 9) on which some of the largest numbers of fawns have been captured during this study, have also been shown to suffer some of the most pronounced coyote predation on Canada goose nests (Hanson and Eberhardt, 1971, p.26).

Human disturbance may influence the selection of specific islands by deer for fawning and could account for the significantly higher proportion of fawns

captured on restricted access shorelines along the lower stretch of the river where islands were accessible to public use. However, all islands were visited periodically by biologists conducting Canada goose nesting surveys and banding, particularly early in the fawning season, from 1950 to present. In addition, there was considerable disturbance on the islands caused by tagging operations during this study. What affect, if any, this disturbance might have had is unknown. Robinette (1966, p. 344) observed a decrease in tagging success after two years of capturing fawns in an area in Utah which he felt may have been caused by the tagging operations. However, the number of fawns captured during the first five years of our study (1969-1973) remained relatively constant. The decrease we observed subsequent to this (1974-1977) was probably not related to tagging operation disturbance since this decline was limited to the upper section of the Columbia River, while fawn capture rates remained relatively constant on the lower section of the river throughout the study.

Habitat quality throughout the study area is believed to be generally poor for deer and the recent decline in the number of fawns captured could be related to decreased fecundity. However, why this decline has apparently occurred only along the upper section of the river is unknown. Government coyote control programs ceased on the Hanford Site in 1970 and it is possible that this may have influenced the decline in the number of fawns captured. In addition, much of the human activity associated with nuclear reactor sites on the western shore of the upper section of the Columbia River decreased markedly beginning in 1970. However, it is doubtful that this would have had a deleterious affect on the deer.

The preponderance of young males captured during our study (127 males: 100 females) is in contrast to the sex ratio of captured fawns (98 males: 100 females) observed by Zeigler (1978, p. 35) in 1973-1975 in a mule deer herd approximately 200 km north of our study area. It is possible that the distorted sex ratio we observed is a reflection of a possible general poor health status of the Hanford Site deer since Verme (1969) found that excessive males were produced by captive white-tailed deer (Odocoileus virginianus) when the adult females were on restrictive low quality diets. However, work by other investigators with captive white-tailed (Woolf and Harder, 1979) and mule deer (Robinette et al., 1973) herds has not always supported Verme's (1969) results.

CONCLUSIONS

Mule deer born on islands and shorelines associated with the portion of the Columbia River flowing through the Hanford Site make offsite movements which in some cases can be extensive.

The use of Columbia River islands by deer as fawning locations may be influenced by predation and human disturbance. These islands represent important and perhaps critical fawning habitat to a herd which appears to be decreasing in productivity.

ACKNOWLEDGMENTS

The field work in 1969 through 1976 was conducted by J. D. Hedlund, the 1977 data obtained by graduate student W. D. Steigers, Jr. and analysis and summarization were presented by L. E. Eberhardt of the terrestrial ecology section of the Ecological Sciences Department. The Washington State Game Department provided permits for conducting the study and use of the tag-return data. We would like to thank K. A. Gano, M. C. McShane, R. A. Geis and D. T. McCullough, and the helicopter pilot B. G. Goins for field assistance. W. C. Hanson and K. R. Price critically reviewed the manuscript. Funding for this report was provided by the Environmental Surveillance Program through the Environmental Evaluations Section, Occupational and Environmental Protection Department.

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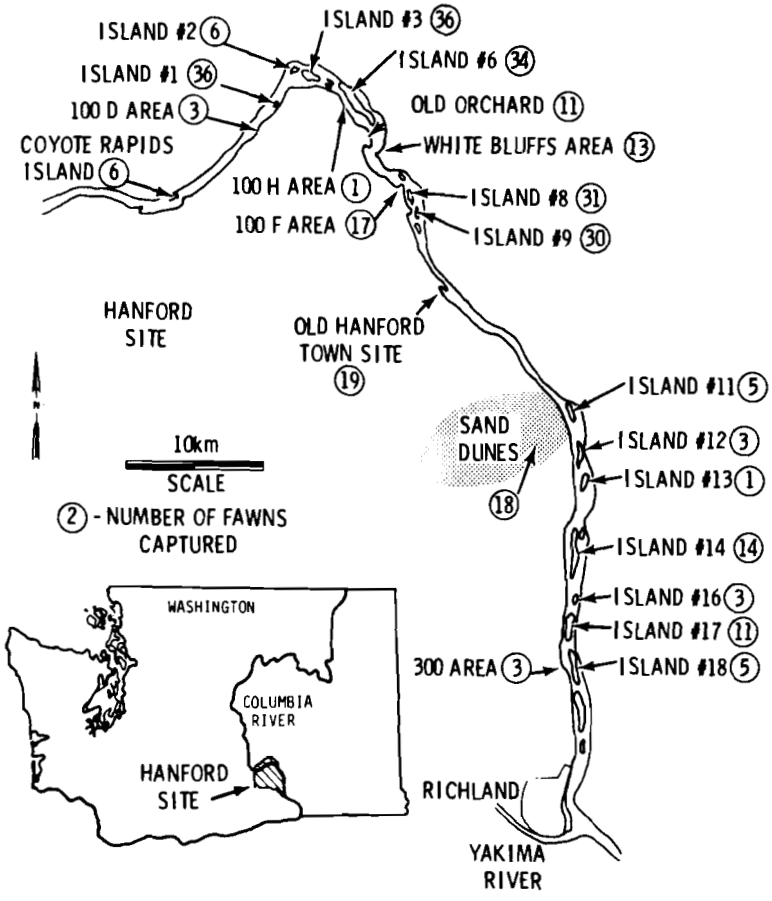

FIGURE 1. Study area and summarization of the capture locations and numbers of mule deer fawns tagged on the Hanford Site in south-central Washington (1969-1976).

FIGURE 2. Tagging and recording data on a mule deer fawn

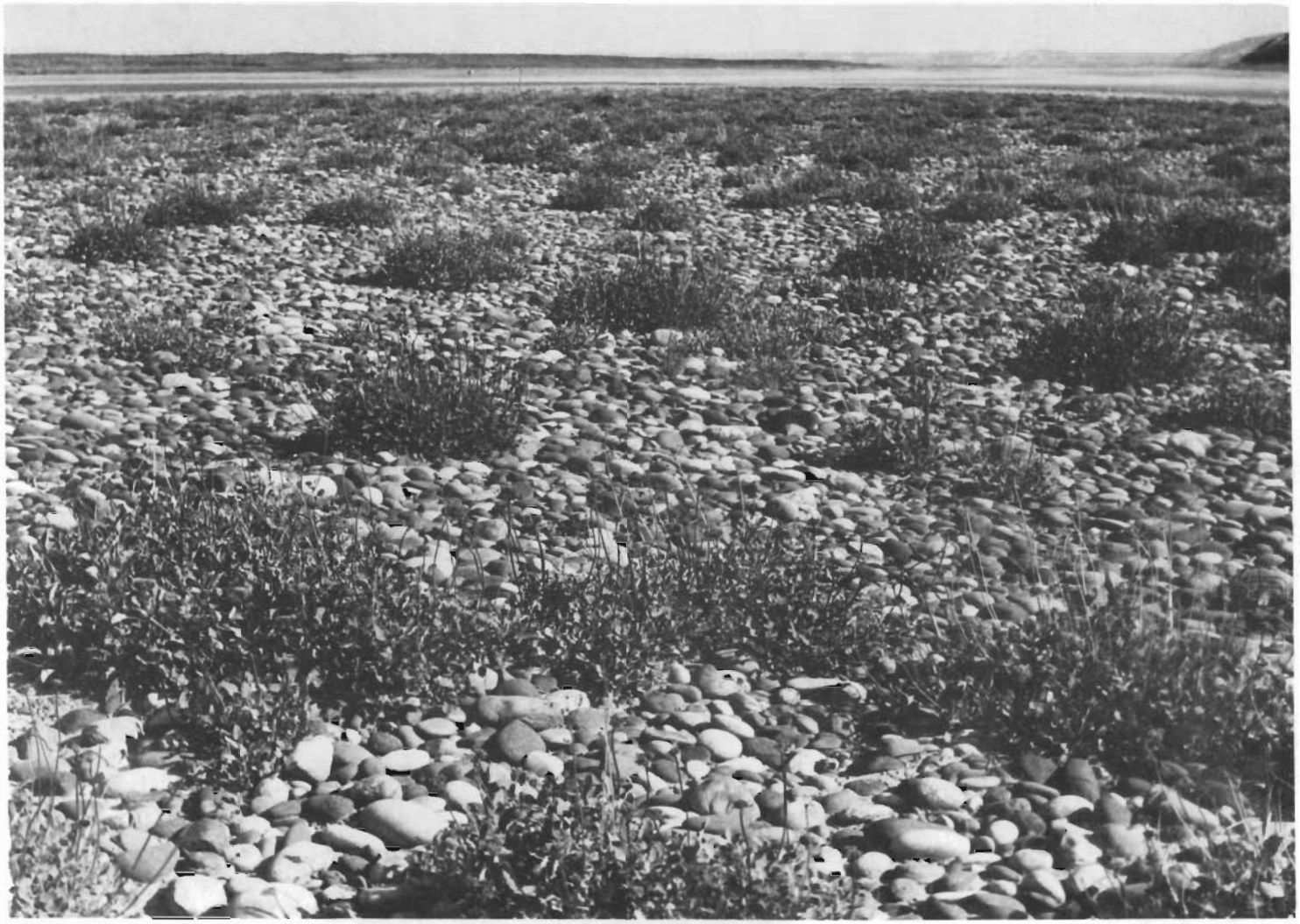

FIGURE 3. Sparse vegetation on Island 9

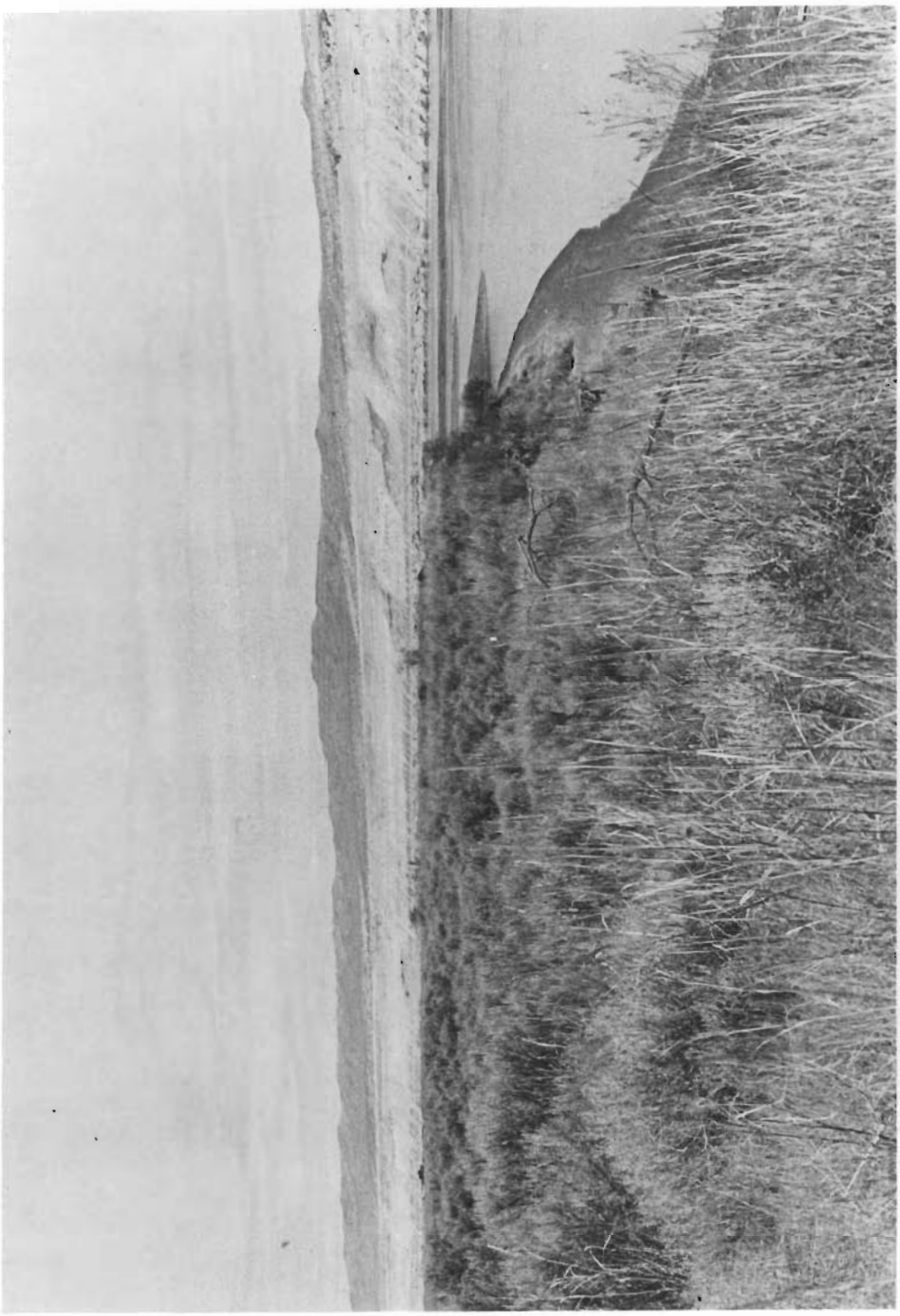

FIGURE 4. Relatively dense vegetation on Island 6

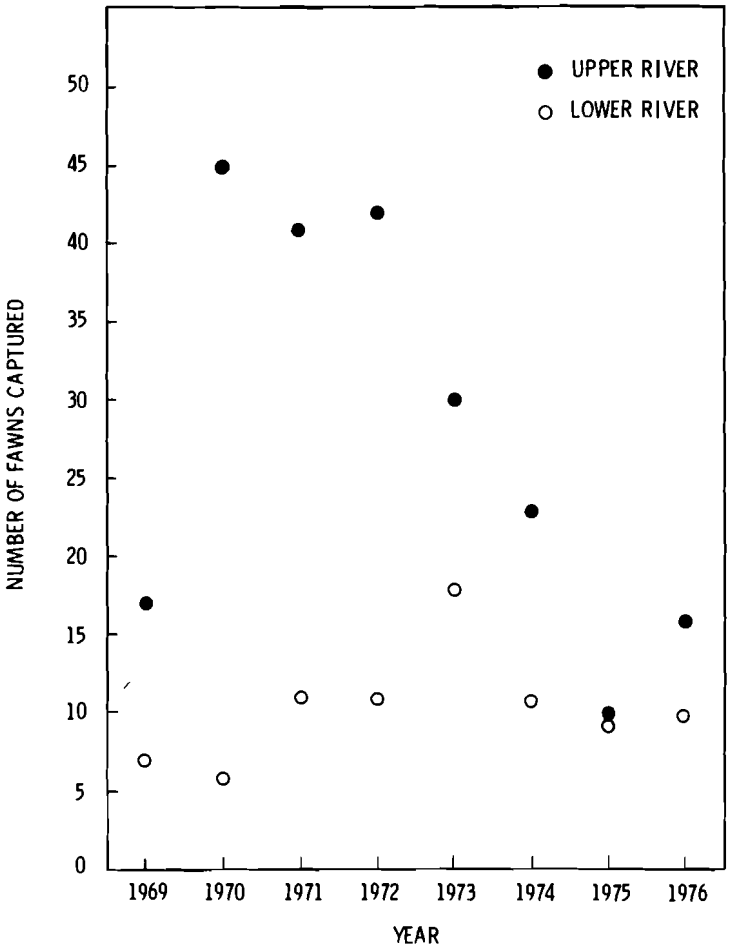

FIGURE 5. Number of fawns captured each year on the upper and lower sections of the Columbia River.

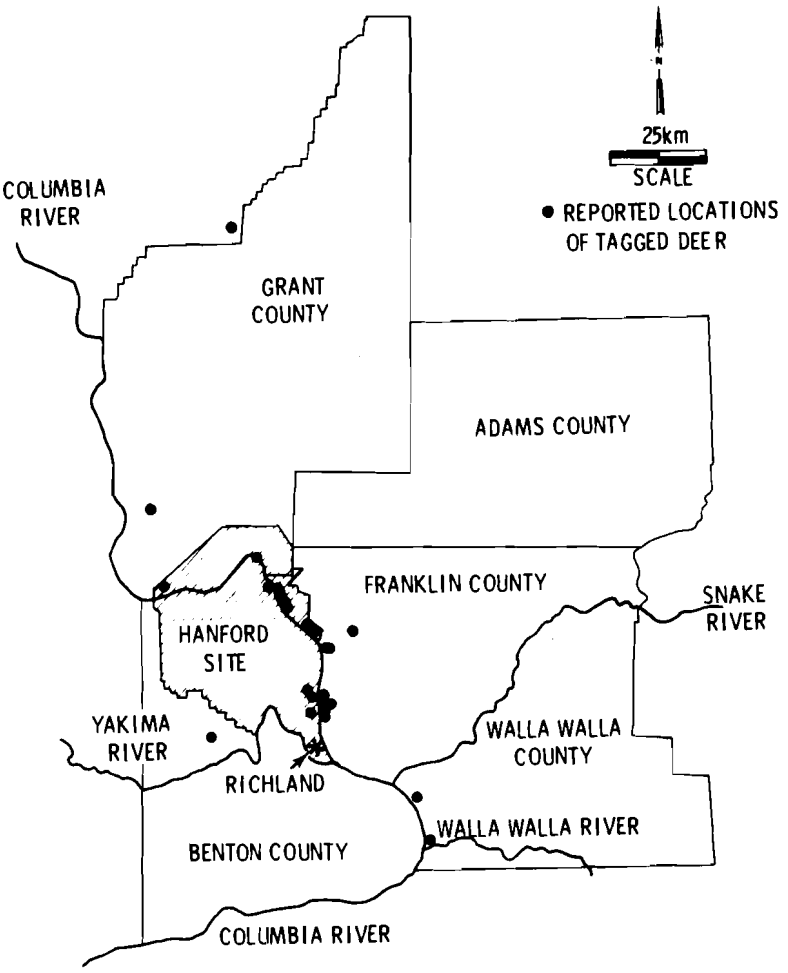

FIGURE 6. Recovery locations of mule deer tagged on the Hanford Site.

TABLE 1. Number and sex of mule deer fawns captured on the Hanford Site from 1969-1977.

Sex	Numbered Captured									Total Number Captured
	1969	1970	1971	1972	1973	1974	1975	1976	1977[a]	
Male	13(54)[b]	32(56)	29(58)	31(46)	22(46)	17(50)	9(47)	17(65)	24(62)	194(56)
Female	11	19	23	22	26	16	10	9	15	151
Total	24	51	52	53	48	34[c]	19	26	39	346[c]

[a] From Steigers (1978).

[b] Number in parentheses represent percent males in catch.

[c] Sex of one fawn was not recorded.

TABLE 2. Number of mule deer fawns and their location of capture on the Hanford Site during each year of the period 1969-1976

Location	Number Captured							
	1969	1970	1971	1972	1973	1974	1975	1976
Coyote Rapids Island	1	4					1	
100 D Area		1		2				
Island #1		4	2	5	10	4	5	6
Island #2			2		3			1
Island #3	4	8	5	10	5	3		1
100 H Area								1
Island #6	6	8	5	9	5	1		
Old Orchard	1	3	7					
White Bluffs			3	4	1	2		3
100 F Area		6		3	1	5		2
Island #8		1	12	9	2	6	1	
Island #9	5	10	5		3	2	3	2
Old Hanford Townsite	4	1	1	3	5	3		2
Island #11			3					2
Sand Dunes	1	1		4	1	5	5	1
Island #12					2			1
Island #13				1				
Island #14	2	4		1	1	3	3	
Island #16					3			
Island #17			2		5			4
Island #18			5					
300 Area				2	1			
Unknown							1	

TABLE 3. Comparison of catch effort (helicopter expenditures) and the number of mule deer fawns captured on the Hanford Site during the period 1972-1977.

Year	Total Expenditure for Helicopter Time ($)	Adjusted Expenditure for Helicopter Time ($)[a]	Number of Fawns Captured
1972	2222	2222	53
1973	3065	2758	48
1974	3065	2452	34
1975	4948	3464	19
1976	4212	2527	26
1977	3857	1929	22[b]

[a] Adjusted to a 1972 basis on an estimated 10 percent annual inflation rate.

[b] A total of 39 fawns were captured in 1977, however, only 22 were captured with helicopter assistance (Steigers, 1978).

TABLE 4. Tag returns from mule deer fawns marked on the Hanford Site.

Tag Number	Sex	Location Tagged[a]	Approximate Location Killed[a]	Approximate Distance Moved (km)	Cause of Death	Age at Death (yrs)
1	M	13N, 27E, 3	12N, 28E, 10	14	Hunter	3.5
3	F	13N, 27E, 3	12N, 28E, 24	19	Hunter	2.5
5	M	13N, 27E, 3	15N, 23E, 35	39	Hunter	1.5
6	F[b]	13N, 27E, 3	14N, 27E, 34	1	Unknown	10.0
8	M	13N, 27E, 3	13N, 27E, 24	6	Hunter	1.5
10	M	14N, 27E, 20	10N, 28E, 1	36	Hunter	1.5
22	M	11N, 28E, 14	11N, 28E, 21	4	Vehicle	0.5
29	F	13N, 25E, 1	13N, 24E, 11	13	Vehicle	1.5
35	F	13N, 27E, 3	13N, 27E, 24	6	Hunter	1.5
43	M	11N, 28E, 14	10N, 28E, 1	9	Hunter	1.5
45	M	12N, 28E, 22	10N, 28E, 1	15	Hunter	1.5
55	M	13N, 27E, 3	7N, 31E, 28	80	Hunter	2.5
59	F	14N, 27E, 28	10N, 28E, 1	37	Poacher	0.5
69	F	13N, 27E, 3	13N, 27E, 11	3	Hunter	2.5
76	M	10N, 28E, 2	9N, 25E	32	Hunter	1.5
107	M	13N, 27E, 3	12N, 28E, 4	13	Hunter	1.5
111	M	13N, 27E, 3	13N, 27E, 11	3	Hunter	1.5
184	M	10N, 28E, 2	12N, 29E	19	Drowned	1.0
186	F	10N, 28E, 2	10N, 28E, 14	5	Vehicle	0.5
190	F	12N, 28E, 22	12N, 28E, 14	2	Hunter	0.5
204	M	10N, 28E, 2	23N, 26E	113	Hunter	1.5
206	F	13N, 27E, 3	13N, 27E, 23	6	Vehicle	1.0
211	F	14N, 26E, 12	14N, 26E, 12	0	Unknown	0.5
236	F	13N, 27E, 25	11N, 28E, 27	23	Vehicle	1.0
253	M	12N, 28E, 22	8N, 31E, 20	49	Vehicle	1.5
258	M	10N, 28E, 2	10N, 28E, 1	2	Drowned	1.0
277	M	14N, 27E, 28	12N, 28E, 24	24	Poacher	1.5

[a] Locations recorded as Township, Range, Section.

[b] Misidentified as a male when initially captured.

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