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Ecology of Sage Grouse

ECOLOGICAL STUDIES ON THE
IDAHO NATIONAL ENGINEERING LABORATORY SITE
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THE ECOLOGY OF SAGE GROUSE ON THE IDAHO NATIONAL
ENGINEERING LABORATORY SITE

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ABSTRACT

A comprehensive study of sage grouse (*Centrocercus urophasianus*) ecology was initiated on the INEL Site in 1977. Objectives include documentation of radionuclide concentrations, population size, habitat use and movement patterns of sage grouse on the Site. Sixteen grouse have been collected and radionuclide concentrations determined. Only part of the Site and surrounding area have been adequately searched for strutting grounds (leks), but 32 have been located to date. Trapping success has been strongly influenced by weather conditions and by the season; 121 sage grouse have been captured, banded and color- or radio-marked.

INTRODUCTION

The Idaho National Engineering Laboratory (INEL) Site contains wintering and breeding populations of sage grouse (*Centrocercus urophasianus*) about which little is known. However, sage grouse populations in several Idaho counties to the north and east of the INEL were studied (Dalke et al., 1960; 1963; Klebenow, 1969; 1970). Dalke et al. (1963) indicated that sage grouse from their study areas migrated into the vicinity of the Site during the winter, the distance of the migration depending upon the severity of the winter. Aside from these studies, there is little published information on sage grouse in southeastern Idaho.

Sage grouse populations on the INEL Site are of particular interest for several reasons. First, portions of the Site which may provide key winter habitat for these birds are under increasing pressures for agricultural development. Second, although the Site is considered an important sage grouse wintering area, the size of its wintering and breeding grouse populations are unknown and critical wintering and breeding areas within the Site have not been documented. Finally, during middle and late summer, sage grouse utilize wetlands, meadows, and lawns on the INEL Site, some of which contain above normal background concentrations of radionuclides. Local movement patterns, migration routes, wintering areas, and radionuclide concentrations of these birds should be documented, and an effort made to determine the environmental conditions which attract grouse to the vicinity of the contaminated areas. Because of the relatively unaltered habitat in many areas and its inaccessibility to the general public, the INEL Site provides a unique opportunity to study sage grouse in relatively natural environments and in areas altered by man.

The main study objectives are briefly described below, in approximate chronological order of study:

- (1) Determine radionuclide concentrations in sage grouse on the INEL Site and document movement patterns of grouse using areas known to contain above normal background concentrations of radionuclides.
- (2) Estimate the numbers of sage grouse on the INEL Site throughout the year.
- (3) Determine the primary or "Key Use" areas for sage grouse on the INEL Site.
- (4) Determine migration routes and summer locations of sage grouse wintering on the INEL Site.

METHODS

It appears that sage grouse frequent contaminated areas only during summer and early fall. Approximately 12 grouse are being collected each summer from areas known to contain above normal background concentrations of radionuclides and a similar number of control birds are being collected from other areas. Gamma spectra analyses are then used to compare radionuclide concentrations accumulated by the experimental versus control groups. A few grouse may also be analyzed for the presence of the alpha emitters plutonium, americium, and curium. In addition, thermoluminescence dosimeters will be attached to some radio-marked sage grouse to further aid in estimating radiation doses received by these birds.

Movements and habitat use of sage grouse utilizing contaminated areas are being documented by capturing birds and equipping them with either color markers or radio transmitters. A color scheme is being used to allow those grouse captured and marked near contaminated areas to be differentiated from grouse captured elsewhere on the Site. Movements of radio-marked birds are being regularly monitored, with special emphasis placed on their use of contaminated ponds for water versus use of associated features such as vegetation, insects and shade. Sage grouse that are radio-marked during this phase of the study will be tracked through the winter and following breeding season to document migration routes, wintering grounds, breeding grounds, and to determine whether the same brood-rearing area is used year after year.

To help estimate summer and winter sage grouse populations on the INEL Site, line transects will be constructed throughout the Site and run according to guidelines suggested by Anderson et al., (1976). These transects will be conducted each winter, beginning with winter 1978-79. If possible the routes may also be surveyed

during the summer. During the spring of 1978 and 1979, the INEL Site and surrounding area will be searched by aircraft to locate strutting grounds. Several of these grounds immediately adjacent to the Site have been previously documented by the Idaho Department of Fish and Game (Robert Sherwood pers. comm.). All strutting grounds will be censused according to recommendations made by Rogers (1964) and Jenni and Hartzler (1978). A third general approach being used to estimate grouse populations on the Site involves attempting to locate all brood-rearing habitats on the Site and censusing hens with broods.

Research efforts outlined in the previous sections have begun to document those areas supporting high concentrations of sage grouse at various times of the year. Birds on these concentration areas are being captured, marked and radio-tracked to more precisely document the characteristics of these areas which are particularly attractive to the grouse, and to guide research on why these aspects are important.

A sample of sage grouse will be collected on the wintering grounds and crop contents analyzed by paper chromatography (Hanks et al., 1971) to determine the species and subspecies of sagebrush (*Artemisia* spp.) consumed. A comparison of these data to the species/subspecies composition of a random sample of sagebrush leaves will indicate whether grouse are selecting only certain plants as has been suggested for deer and livestock (Hanks et al., 1971). If such a preference is shown, it may help to explain winter sage grouse distributions much more fully than is now possible.

While radio-tracking hens during the breeding and nesting periods, we hope to be able to answer several basic questions about the breeding biology of sage grouse; foremost among these is whether hens reneest after loosing their first clutch. The frequency of reneesting has not been well documented in this species and it is of strong interest to the Idaho Department of Fish and Game. (Robert Autenrieth pers. comm.).

Sage grouse are being captured on major concentration areas throughout the Site and are being marked with highly visible, numbered ponchos or patagial tags or radio transmitters. These birds will be monitored throughout the year to determine migration routes and summer and winter locations. Tracking of radio-marked grouse is accomplished from a ground vehicle with a mounted or hand-held antenna unless individuals are "lost", in which case an air search is made. Observations are coded and will be keypunched for computer sorting and analysis.

RESULTS AND DISCUSSION

Data from the first summer's field work indicate that the Central Facilities Area (CFA) and Test Reactor Area (TRA) are used by sage grouse hens and broods. Sage grouse also use areas near the Idaho Chemical Processing Plant (ICPP) and Experimental Breeder

Reactor II (EBR II), however no counts were made of birds near these two facilities. The grouse appear to be particularly attracted to the lawns and ponds near the facilities, probably because of the availability of succulent vegetation. During 1977, sage grouse began using the CFA and TRA facilities during the last week of June and continued using CFA through the second week of November (Table 1). Some birds remained in the vicinity of TRA for an additional week. The prolonged use of summering areas by these birds may be related to the drought conditions experienced during 1977. This hypothesis is further supported by the fact that marked sage grouse made extensive daily use of a leaky fire hydrant during October and November at CFA. When this leak was repaired, these grouse moved approximately 5.6 km north to the TRA leaching ponds. The birds used the ponds for drinking and feeding daily for about 1 week and discontinued using them at about the time of the first snowfall on the Site.

During 1977, 16 sage grouse were collected for radionuclide analysis. Thirteen different radionuclides were identified in grouse tissues. Of the detected radionuclides, Cs-137 had the highest overall occurrence in birds collected both on and off site (Table 2). With the exception of one sage grouse which had a high concentration of Na-24 in its muscle, the highest average and maximum radionuclide concentrations occurred in the gut (Table 3). Na-24 had the highest maximum concentration of all radionuclides, but was detected in only one bird. This radionuclide may have occurred in other samples but not detected because of its short half-life (15 hrs) and the time lag between collection of a specimen and its analysis. However, the concentration was less than three times the standard deviation, and Na-24 did not occur in the GI tract of this bird. Therefore, additional samples must be analyzed before definite conclusions can be made relative to Na-24 in muscle tissues. Cr-51 had the highest average and maximum concentrations in gut tissue of birds collected near facilities; it was not detected in birds collected off-site (Table 3). Twelve of the 13 radionuclides identified in grouse tissue were detected in samples from birds collected near TRA (Table 2). Five radionuclides were detected in CFA samples and six radionuclides were detected in grouse collected off-site. TRA specimens also had higher average and maximum radionuclide concentrations than grouse taken at CFA or in off-site background areas (Table 3). More data are needed on radionuclide concentrations in sage grouse using areas near the Idaho Chemical Processing Plant and Experimental Breeder Reactor II. During the summer of 1977, only one grouse was collected near EBR II. No radionuclides were detected in the muscle from this specimen, but 0.12 pCi/g fresh weight of Cs-137 were detected in the gut.

In a study of radionuclides occurring in tissues of waterfowl using the TRA ponds Halford et al. (1976) identified a larger number of radionuclides and higher concentrations than were detected in sage grouse. This was probably related to the longer residence time of waterfowl at the contaminated ponds and to the fact that waterfowl feed on organisms within the pond which have relatively

TABLE 1. Sage grouse use of Central Facility Area lawns between 26 June and 13 November 1977.

Week ^a	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Count ^b	11	4	15	18	14	11	31	9	30	7	5	4	8	24	29	8	28	14	10	13	8
Count ^b	8	5	21	18	15	8	--	10	27	10	21	10	7	29	--	--	32	26	16	12	--
Average	9.5	4.5	18	18	14.5	9.5	--	9.5	28.5	8.5	13	7	7.5	26.5	--	--	30	20	13	12.5	--

^a Beginning on week of 26 June 1977 and ending on week of 13 November 1977.

^b Counts were made twice weekly. If more than 2 counts were taken during the week, the 2 maximum counts were used.

TABLE 2. Frequency of occurrence of radionuclides in tissue samples from sage grouse collected near the Test Reactor Area, Central Facilities Area, and off-site background areas.

Nuclide	Half-life	PERCENT OCCURRENCE					
		Test Reactor Area		Central Facility Area		Off-Site ^a	
		Gut (N=8)	Muscle (N=8)	Gut (N=3)	Muscle (N=3)	Gut (N=4)	Muscle (N=4)
Nb-95	35.0d (days)	88	0	67	0	75	0
Cs-137	0.0y (years)	63	50	0	67	50	50
Co-60	5.3y	50	25	33	0	0	0
Zr-95	65.0d	38	0	33	0	50	0
Ru-103	39.6d	25	13	0	0	50	0
Cs-134	2.1y	25	13	0	0	0	0
Ce-144	284.0d	25	0	0	0	25	0
Cr-51	27.8d	25	0	0	0	0	0
Ce-141	33.0d	13	0	0	0	50	0
Ru-106	369.0d	0	0	33	0	0	0
La-140	40.2h (hours)	13	0	0	0	0	0
Se-75	120.5d	13	0	0	0	0	0
Na-24	15.0h	0	13	0	0	0	0

^a Off-site areas include lower Birch Creek and lower Little Lost River valleys.

TABLE 4. Counts of male sage grouse at strutting grounds on and around the INEL Site in Spring 1978.

Ground	Male Sage Grouse	
	Average Count ^a	Maximum Count
Frenchman's Cabin	24	46
Farragut Blvd ^b	6	9
Gravel Pit	13	17
Cedar Butte	24	26
Cedar Butte North	7	10
Farm	21	21
Richard Butte	36	42
Richard Butte North ^b	2	2
White Swan ^{b,c}	32	36
Kyle Canyon Road ^b	2	4
Reno Ditch ^c	26	29
Overall Average	17.5	22

^a Average of 3 counts made between 24 March and 8 May.

^b Only two counts used in computing the average.

^c Counted by Idaho Department of Fish and Game personnel.

TABLE 3. Average and maximum radionuclide concentrations (pCi/g^a fresh weight) in tissue samples from sage grouse collected near the Test Reactor Area, Central Facilities Area, and in off-site background areas.

Nuclide	Test Reactor Area				Central Facility Area				Off-Site			
	Gut (N=8)		Muscle (N=8)		Gut (N=3)		Muscle (N=3)		Gut (N=4)		Muscle (N=4)	
	Ave.	Max.	Ave.	Max.	Ave.	Max.	Ave.	Max.	Ave.	Max.	Ave.	Max.
Cr-51	90.5	415	ND	--	ND	--	ND	--	ND	--	ND	--
Cs-137	5.4	34.7	0.7	3.1	ND	--	<0.1	0.2	<0.1	0.1	0.1	0.3
Co-60	2.5	16.2	0.3	1.9	0.1	0.3	ND	--	ND	--	ND	--
Ce-144	1.6	7.1	ND	--	ND	--	ND	--	0.4	1.5	ND	--
Cs-134	0.9	5.3	0.1	0.5	ND	--	ND	--	ND	--	ND	--
Nb-95	0.6	1.8	ND	--	0.2	0.4	ND	--	0.3	0.7	ND	--
Zr-95	0.3	1.1	ND	--	0.3	0.9	ND	--	0.3	0.8	ND	--
Ce-141	0.3	2.2	ND	--	ND	--	ND	--	0.1	0.8	ND	--
Ru-103	0.2	0.9	<.1	0.4	ND	--	ND	--	0.2	0.6	ND	--
La-140	0.1	0.6	ND	--	ND	--	ND	--	ND	--	ND	--
Se-75	0.1	0.4	ND	--	ND	--	ND	--	ND	--	ND	--
Na-24 ^c	ND	--	470,000	3,760,000	ND	--	ND	--	ND	--	ND	--
Ru-106	ND	--	ND	--	0.4	1.1	ND	--	ND	--	ND	--

^a Conversion to Bq=0.037 Bq/pCi.

^b Zero used in computing average for individual samples with nuclide below detection limits (ND).

^c Na-24 occurred in only one muscle sample and was less than three times the standard deviation of the concentration. The data was corrected for decay of the 15-hr half-life for 15 days. See text.

high concentrations of radionuclides (Millard et al., this report). Halford et al. (1976) concluded that waterfowl using the TRA ponds did not pose a health hazard to man. Since radionuclide concentrations in sage grouse using these ponds appear to be lower than those of waterfowl, it seems that grouse from this area also could not be considered a health hazard to man.

Counts of sage grouse on brood rearing areas were begun in summer 1977 (Table 1) and will continue for the duration of the study. Initial attempts to use strip census methods for estimating sage grouse populations have shown that the census lines must be relatively long in order to be run efficiently and cannot be run from either a pickup truck or a motorcycle because of rough terrain and vegetation present. Time constraints and the extremely long distances involved preclude running the transects on foot. Running the transects by snowmobile in winter appears to be the only viable solution.

An inventory of strutting grounds on and near the INEL Site was begun in April 1978 and should be completed during the spring of 1979. Approximately 1,251 square km were searched by light aircraft in 1978 and 23 grounds located. An additional nine grounds were found by use of a pickup truck for a total of 32 located to date (Fig. 1). Only 11 strutting grounds were censused in 1978 because most of the effort was put into locating strutting grounds and trapping sage grouse. Table 4 shows average and maximum numbers of male sage grouse using the grounds that were censused.

Preliminary field observations, together with information on vegetation of the Site and surrounding areas, suggest that at least 10 important sage grouse brood-rearing areas exist on and around the Site (Fig. 2). Three wintering sites supporting flocks of 100 to 500 sage grouse from December through February have also been identified (Fig. 2). It is important to realize, however, that only portions of the INEL Site have been searched for brood-rearing and wintering areas, and that these searches often occurred in conjunction with other research activities. More systematic searches over the next two years will define more key areas and refine the boundaries of those already known.

To date, 121 sage grouse have been captured, banded, and either color-or radio-marked at various locations on the INEL Site. Recoveries and radio locations of these birds are still too few for meaningful analysis. Trapping success has been highest during spring and summer (Table 5). Several trapping methods have proved productive during spring and summer, but in winter only night-lighting has been successful, and only on dark nights with moderate to heavy snowfall.

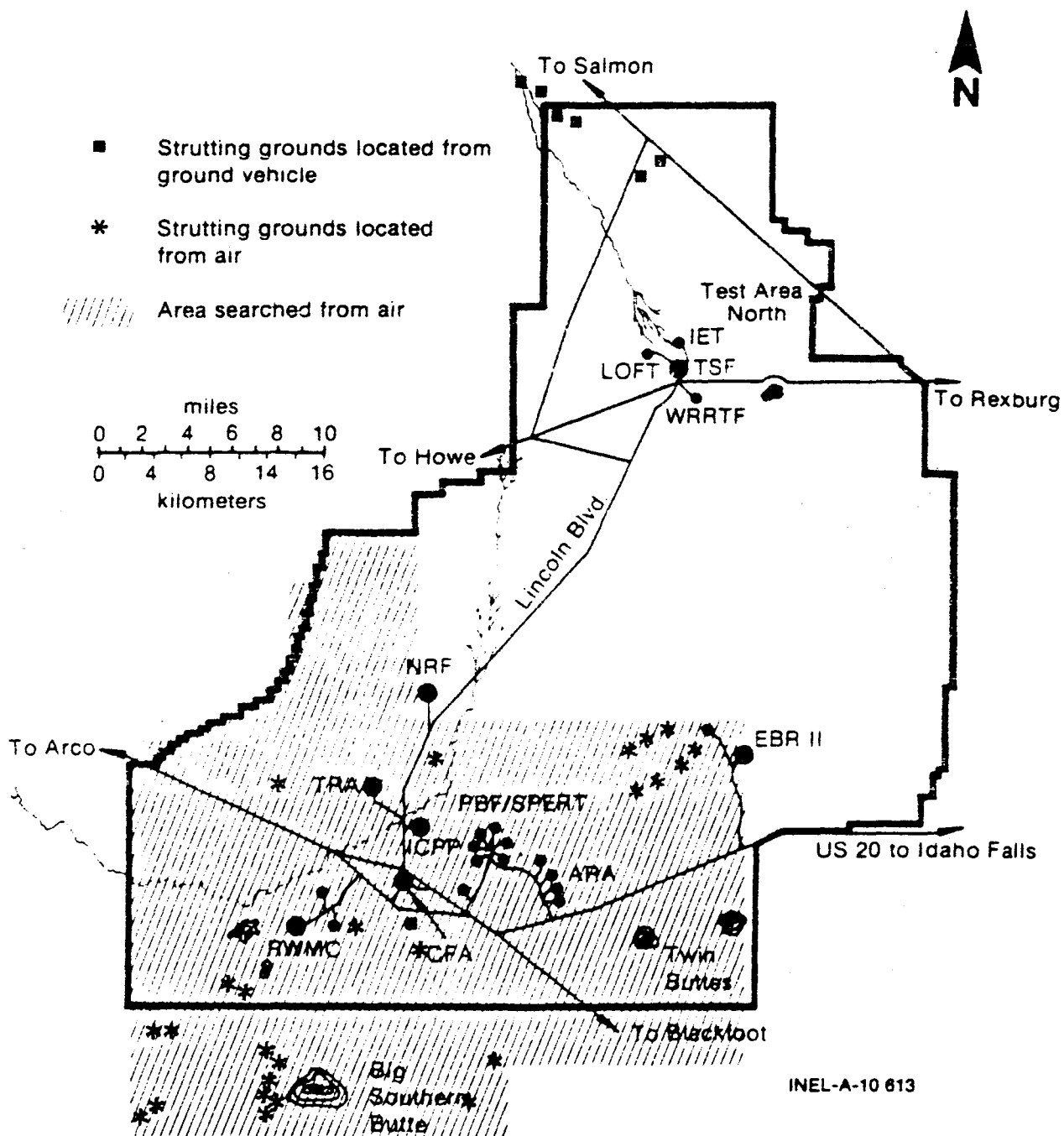


Fig. 1. Area searched by aircraft and sage grouse strutting grounds located on and near the INEL Site. Strutting grounds located from a ground vehicle are also indicated.

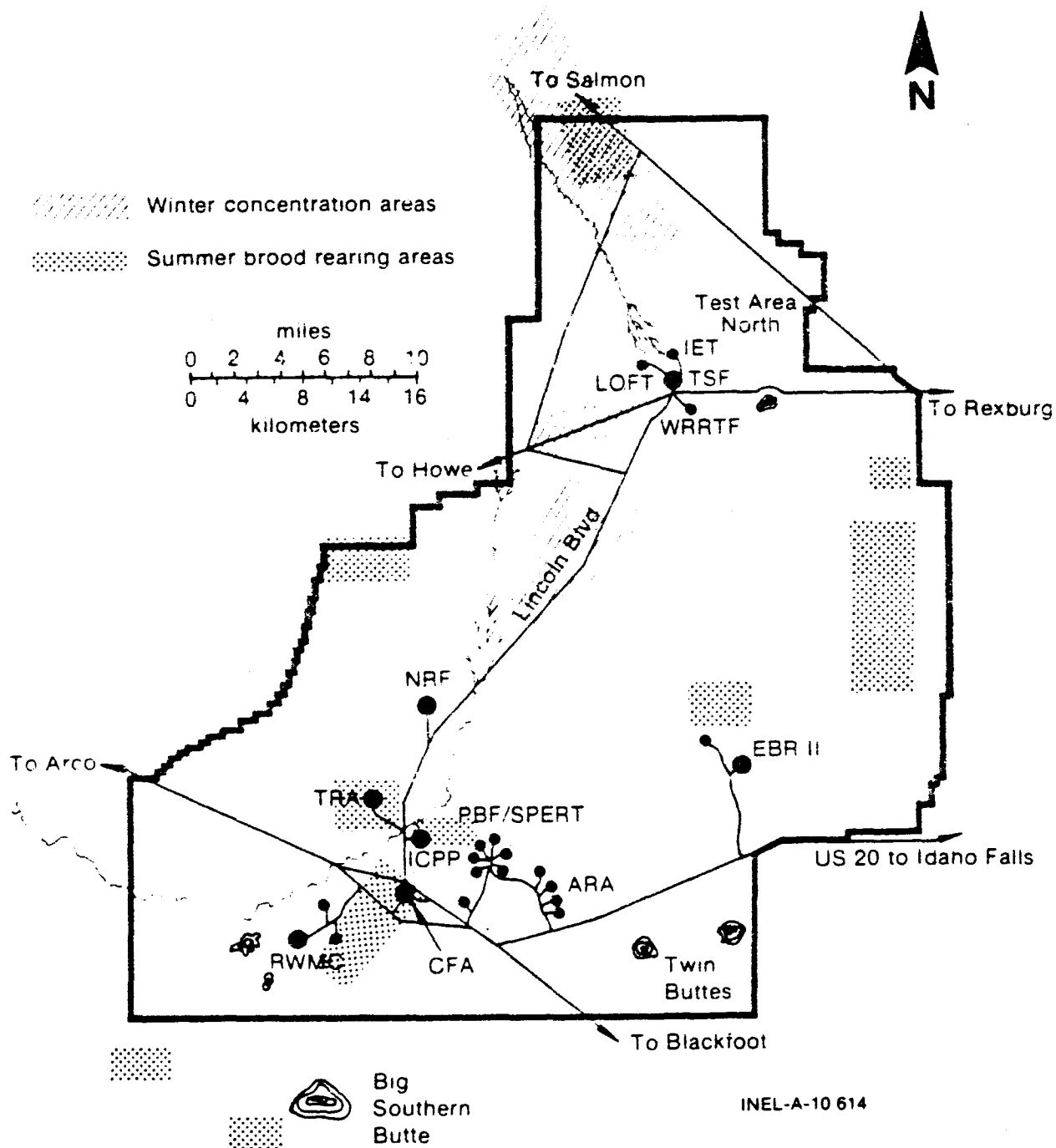


Fig. 2. Preliminary locations of sage grouse brood rearing and wintering areas on and near the INEL Site. Areas were delineated from data collected during summer 1977 and winter 1977-78 and from information provided by the Idaho Department of Fish and Game.

TABLE 5. A summary of trapping activities between 26 July 1977 and 15 August 1978.

Area	Number of Birds Caught						Trapping Methods	Date
	Male		Female		Unknown	Total		
	Ad.	Juv.	Ad.	Juv.				
Central Facilities Area	5	22	3	16	0	46	Walk-in traps, night-lighting	Summer, 1977-1978
Test Reactor Area	4	22	1	10	5	42	Walk-in traps	Summer, 1977-1978
Lower Birch Creek	1	0	2	0	0	3	Night-lighting	12/30/77-1/7/78
Farm Strutting Ground	4	0	0	0	0	4	Rocket Nets	4/22/78-5/18/78
Richard Butte Strutting Ground	24	0	0	0	0	24	Night-lighting	3/31/78-5/5/78
White Swan Strutting Ground	2	0	0	0	0	2	Night-lighting	4/14/78
Totals	40	44	6	26	5	121		

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