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ILLINOIS NATURAL HISTORY SURVEY

CENTER FOR WILDLIFE ECOLOGY

Illinois Forest Game Investigations

W-87-R-13

Annual Job Progress Report

by

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Illinois Natural History Survey

1 July 1990 through 30 June 1991

Performance Report

Annual Job Progress Report

State: Illinois Project No.: W-87-R-13

Project Type: Research

Project Title: Cooperative Forest Wildlife Research

Sub-project No. V11; Title: Illinois Deer Investigations

Period Covered: 1 July 1990 through 30 June 1991

This performance report covers jobs active under the W-87-R-13 segment.

Study No. 1; Title: Population dynamics of the Illinois deer herd.

Study Objectives:

1. To analyze the annual status and harvest of deer in each county using computer programs to develop a conceptual model (of deer abundance and harvest, hunter demands and success, and available habitats) that will provide current and future direction to management strategies on the county level.

2. To determine annual and seasonal sex and age specific mortality rates for deer using marked samples of deer captured in western and northern Illinois.

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3. To sample the perceptions of rural landowners regarding deer abundance and their tolerance of current deer depredation levels, hunter behavior, and harvest regulations.

4. To refine county and regional deer population computer models using natality and mortality rates provided by this project and, by aligning population levels with landowner tolerance, to develop guidelines for manipulating harvests to maintain deer numbers within acceptable limits.

5. To prepare reports from the results of project study investigations and to help defer the costs of printing these reports.

Job No. 1-A; Title: Population dynamics of the Illinois deer herd--harvest analysis and current status.

Objectives: To continue to analyze the annual status and harvest of deer, to refine county and regional deer population computer models using natality and survival estimates provided by this project, and to provide the IDOC with improved deer population projections, harvest potentials, and knowledge of hunter behaviors.

(a) Activity:

One hundred and sixteen thousand firearm hunters killed 62,982 deer in 1990, another record harvest. Statewide hunter success was nearly 55% (54.1%), also a record and indicating that deer were abundant throughout Illinois in 1990. Males comprised 61% of the statewide harvest, as hunters continued the pattern of selecting males instead of does and fawns (Table 1). Regional harvest patterns were similar to statewide data, with male selection by hunters more prevalent in the intensively farmed areas of Regions 2 and 5 and the most heavily forested Region 8 (Fig. 1, Table 1).

Regional trends in deer numbers for the decade of the 1980's were simulated using a sex-,age-,and time-specific recruitment model based upon survival, dispersal,

and migration rates for deer marked in east-central Illinois during 1980-1985 (Fig.2). This simple model, which does not include any density-dependent factors such as weather or effects of social behaviors on survival and recruitment, added and subtracted deer from a base population derived by trial and error from minimum numbers of both sexes that must have been present at the beginning of the simulation to support known mortality rates in subsequent years.

These simulations indicate deer numbers increased in all regions during the 1980-89 period, ranging from a 85% increase in deer numbers in Region 8 to a 176% increase in Region 2 (Table 2). In general, increases were larger in the more intensively farmed Regions 1, 2, 5, and 6 (Table 2). Based upon current estimates of forest cover available to deer in these regions, pre-hunt deer densities ranged from 1 deer per 4.5 acres of forest in Region 2 to 1 deer per 9.1 acres of forest in Regions 7 and 8 in the fall of 1989 (Table 2). Statewide deer abundance represented an estimated average pre-hunt density of 1 deer per 8 acres of forest, or about 540,000 deer present in the state in fall 1989.

These simulations indicate that hunters must begin to harvest more females if the IDOC wishes to begin to stabilize or reduce deer numbers. Based upon sex and age specific survival rates existing in east-central Illinois during 1980-85, harvests approaching 40% or more of the pre-hunt female segment must be achieved over a span of years (2-4) to first stabilize and then reduce deer numbers.

The county and regional summaries of harvest statistics were updated to include the 1990 harvest, downloaded to diskettes, and sent to IDOC and SIU personnel.

(b) Target Date of Achievement: 1 September 1992.

(c) Date of Accomplishment: On Schedule.

(d) Significant Deviations: None.

(e) Remarks: None.

(f) Recommendations: None.

(g) Cost: Federal - $14,190; State-$4,730; Total - $18,920

Job 1-B; Title: Estimates of regional doe natality, fawn recruitment, and yearling-adult survival.

Objectives: To determine seasonal and annual age specific survival rates and doe natality for deer in west-central and northern Illinois.

(a) Activity:

Capture and Marking

Deer were livetrapped from December 1990 through March 1991 on sites in Brown and Adams counties (west-central) and DeKalb County (northern), Illinois. A total of 77 deer were captured (75 new captures, 2 recaptures) in Brown County. These captures included 28 males (23 fawns,3 yearlings,2 adults) and 47 females (21 fawns, 6 yearlings,21 adults). To date, a total of 135 deer have been captured (133 individuals, 2 recaptures) in Brown County.

A total of 43 deer were captured in DeKalb County, 38 new captures and 5 recaptures. There were 19 males (12 fawns,4 yearlings,3 adults) and 19 females (12 fawns,2 yearlings,5 adults) captured. To date, 63 individual deer have been marked.

A total of 38 deer (3 males, 35 females)and 11 deer (2 males,9 females) have been radio collared in Brown County and DeKalb County respectively and are currently being radio located at intervals to monitor survival and natality.

Natality

Blood samples were collected from 45 females livetrapped in Brown County during 1991 and assayed for progesterone levels. For does ≥ 1 year during the fall breeding season, all but 1 was pregnant (Table 3). Of 27 fawn does assayed in 1990 and 1991, only 5 (18.5%) have shown any evidence of ovulation. This is a low rate of breeding for these precocial breeders in Illinois, as breeding rates for fawn does have been reported to exceed 50% in west-central (Grabaugh et al. 1982), east-central (Nixon et al. 1991), and northern Illinois (Hubert 1978). Whether this low rate of breeding is strictly a local condition associated with the high density deer population resident on our study area is not known at this time. We also do not know if the immediate cause is nutritional, with fawns unable to achieve the necessary fat:lean body mass ratio thought necessary for estrous to occur in this species, or, if the cause is social, where dominant older does within the existing social groups suppress estrous occurrence in fawns (Verme 1987).

Live fawn / ≥ yearling doe counts were also collected from mid-summer until December on both study areas. Fawn / ≥ yearling doe ratios averaged 1.25 fawns/ doe in Brown County and 1.29 fawns/doe in DeKalb County (Table 4). Both counts are close to the average early fall fawn/doe count from spotlight surveys of a population studied in east-central Illinois (1.33 fawns/doe) suggesting that fawn mortality rates between birth and weaning may be comparable to the east-central population where postpartum fawn mortality was low. These counts must be considered only an index to fawn production and survival as fawns are frequently underrepresented in these counts due to separation from the mother or difficulty in observing the smaller fawns in thick vegetation.

Survival

Annual and seasonal survival rates were calculated for marked deer on both study areas for the period June 1990 through June 1991. We used the program MICROMORT to calculate survival, using intervals January-May, June-September, and October-December. Fawn survival was calculated only for the January-May interval as the mean age of fawns at capture was 6-7 months.

Fawn survival was high for the January-May interval at both study sites (Table 5). Yearling survival was high for both sexes for the June-September interval but was significantly lower for males during the October-December and January-May intervals in DeKalb County compared to Brown County. Yearling female survival was less than that of adult females and did not differ significantly between areas (Table 5). Adult female survival was very high on both study sites and also did not differ between areas. We marked too few adult males to draw any conclusions as to their survival.

A comparison of survival among 3 marked populations in Illinois suggests annual survival among yearling and older deer is different for each sex and among regions (Table 6). Yearling males survive best in west-central Illinois, and are least successful in the northern counties. Yearling female survival is quite similar among regions, at about 64% annually. Adult females survived best in west-central Illinois (Table 6).

Other data

Whole blood and serum samples were collected from 73 deer on the Brown County site during December 1990-March 1991. These samples were tested for brucellosis by the Illinois Department of Agriculture and for anaplasmosis by the National Veterinary Service Lab. All samples were seronegative.

Whole blood was also sent to Dr. Ken Waldrup, Texas A&M University, for testing for Babesia odocoilileii and for inoculation into splenectomized deer in an attempt to isolate the agent. Eight deer from Brown County tested positive for this organism in 1990, a considerable geographic distance from the previous location of this disease in Texas. The finding of positive deer in 1990 prompted further investigation using the 1991 blood samples. Although some of these samples gave positive reactions to the immunofluorescent test for Babesia, none of the recipient deer showed evidence of infection either clinically or serologically. The samples that tested positive in 1990 could be false positives and thus Babesia may not be present in Brown County deer. Dr. Waldrup has accepted a position in New Zealand so further testing is on hold at present.

(b) Target Date of Achievement: 1 September 1991.

(c) Date of Accomplishment: On Schedule.

(d) Significant Deviations: None.

(e) Remarks: None.

(f) Recommendations: None.

(g) Cost: Federal - $35,475; State - $11,825; Total - $47,300

Job No. 1-C; Title: Rural landowner attitudes toward deer and IDOC deer management.

Objectives: To determine rural landowner attitudes toward present deer abundance, deer damage, IDOC harvest management, and hunter behavior.

(a) Activity:

A draft of the final report of the survey has been written and is currently undergoing review. It is anticipated that the final report will be published as a technical report by the IDOC.

(b) Target Date of Achievement: 1 September 1991.

(c) Date of Accomplishment: On Schedule.

(d) Significant Deviations: None.

(e) Remarks: None

(f) Recommendations: None.

(g) Cost: Federal - $14,190; State - $4,730; Total - $18,920

Job No. 1-D; Title: Data analysis and Preparation of Reports.

The following manuscripts were published during this R-13 segment:

Nixon, C.M., L.P. Hansen, P.A. Brewer, and J.E. Chelsvig. 1991. Ecology of white-tailed deer in an intensively farmed area of Illinois. Wildlife Monograph 118. The Wildlife Society, Washington, D.C. 77 pp.

_____, _____, _____, and_____. 1991. Longevity of female white-tailed deer on a refuge in Illinois. Trans. Illinois Acad. Sci. 84(1&2):84-91.

_____, P.A. Brewer, And L.P.Hansen. 1990. White-tailed doe tolerates nursing by non-offspring. Trans. Illinois Acad. Sci. 83(3&4):104-106.

_____, L.P. Hansen, and S.P. Havera. 1991. Growth patterns of fox squirrels in east-central Illinois. Amer. Midl. Naturalist 125:168-172.

The following manuscripts were accepted for publication during this segment:

Nixon, C.M., and L.P. Hansen. 1991. Biology of white-tailed deer in the intensively farmed midwestern United States. Chapter 3, in book titled-- Biology of Deer-- R. Brown Ed. Springer-Verlag, N.Y.

Herkert, J., C.M. Nixon, and L.P. Hansen. Dynamics of exploited and unexploited fox squirrels (Sciurus niger) in the midwestern U.S. This paper will be published in a forthcoming book entitled-- Wildlife 2000:Populations

The following manuscript was prepared during the segment and submitted to the Canadian J. Zoology:

Nixon, C.M., L.P.Hansen, P.A. Brewer, and J.E. Chelsvig. Stability of white-tailed doe parturition ranges on a refuge in east-central Illinois. 17 pp.

Project summaries, an annual progress report, and quarterly reports of progress for the present projects were submitted to the funding agencies as required. Various topics dealing with the deer harvest and deer life history and ecology were reported to the IDOC as requested at intervals throughout the R-13 segment.

(b) Target Date of Achievement: 1 September 1992.

(c) Date of Accomplishment: On Schedule.

(d) Significant Deviations: None.

(e) Remarks: None.

(f) Recommendations: None.

(g) Cost: Federal - $7,095; State - $2,365; Total - $9,460

An amendment to the R-13 project was approved to pay for the cost of publishing a Wildlife Monograph. The totals under costs shown above are the amounts originally approved for the study. The additional funds were: Federal - $13,200; State - $4,400; Total -$17,600.

Literature cited:

Grubaugh, J.W., V.C. Pederson, and F.D. Loomis. 1988. Reproductive performance of white-tailed deer (Odocoileus virginianus) in west-central Illinois. Trans. Illinois Acad. Sci. 81(1&2):189-196.

Hubert, G.F., Jr. 1978. Productivity of deer in northwestern Illinois. Illinois Dept. Conserv., Fed. Aid in Wildl. Restor. Perf. Rep. Proj. W-63-R, Job IIB. 6pp.

Nixon, C.M., L.P. Hansen, P.A. Brewer, and J.E. Chelsvig. 1991. Ecology of the white-tailed deer in an intensively farmed area of Illinois. Wildl. Monog. 118. The Wildlife Society, Washington, D.C. 77pp.

Verme, L.J. 1987. Decline in doe fawn reproduction in southern Michigan deer: a biosocial-effect hypothesis. Mich.Dep. Nat. Resour., Fed. Aid in Wildl. Restor. Perf. Rep. Proj. W-127-R-5, Job 1.9. 11pp.

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DATE: 31 August 1991

Table 1. Statistics for the 1990 firearm deer season in Illinois.

Age	No. Males	No. Females	Total
	Region 1		
0.5	807	695	1502
1.5	1160	727	1887
2.5	1253	760	2013
3.5	462	242	704
4.5	128	53	181
Total	3810	2477	6287
	Hunter success = 54.2%		
	Region 2		
0.5	589	424	1013
1.5	1339	677	2016
2.5	787	426	1213
3.5	269	101	370
4.5	46	31	77
Total	3030	1659	4689
	Hunter success = 45.5%		
	Region 3		
0.5	1778	1378	3156
1.5	2562	1187	3749
2.5	1278	944	2222
3.5	466	412	878
4.5	80	134	214
Total	6164	4055	10219
	Hunter success = 49.6%		

Region 4

	0.5	1733	1372	3105
	1.5	2714	1164	3878
	2.5	1255	1028	2283
	3.5	548	412	960
	4.5	67	164	231
Total		6317	4140	10457

Hunter success = 65.3%

Region 5

	0.5	314	255	569
	1.5	643	266	909
	2.5	368	238	606
	3.5	181	88	269
	4.5	23	34	57
Total		1529	881	2410

Hunter success = 52.2%

Region 6

	0.5	764	593	1357
	1.5	1257	554	1811
	2.5	858	576	1434
	3.5	310	218	528
	4.5	63	51	114
	Total	3252	1992	5244

Hunter success = 65.5%

Region 7

	0.5	2033	1638	3671
	1.5	3419	1829	5248
	2.5	1886	1543	3429
	3.5	668	538	1206
	4.5	156	196	352
	Total	8162	5744	13906

Hunter success = 61.4%

Region 8

	0.5	1275	954	2229
	1.5	2897	1101	3998
	2.5	1390	1089	2479
	3.5	432	337	769
	4.5	134	161	295
Total		6128	3642	9770

Hunter success = 43.2%

Statewide

	0.5	9293	7309	16602
	1.5	15991	7505	23496
	2.5	9075	6604	15679
	3.5	3336	2348	5684
	4.5	697	824	1521
Total		38392	24590	62982

Hunter success = 54.1%

Table 2. Simulated pre-hunt deer numbers for 1980 and 1989 in 9 regions of Illinois.

Region	Estimated Pre-hunt Deer			Estimated Deer Density 1989	
	Abundance		Change	Per Square	Per 100
	1980	1989	(%)	Mile	Acres Forest
1	6264	14778	136	4.3	12.0
2	20595	56940	176	5.4	22.2
3	48474	94285	95	13.7	13.6
4	42795	83952	96	16.1	13.1
5	9725	24905	156	4.7	18.7
6	17385	44194	154	8.2	12.0
7	50660	112299	122	10.7	10.9
8	50040	92606	85	24.9	10.9
9	7607	15675	106	15.0	14.9
State	253545	539634	109	9.6	12.7

Table 3. Breeding frequency of does as indicated by progesterone levels in blood serum collected from does captured in Brown county during January-March 1990 and 1991.

Breeding Age	Number Does	No. Does Barren	No. Does Breeding	Breeding Does (%)
		1990		
Fawn	8	5	3	38
Yearling	5	0	5	100
Adult	10	0	10	100
		1991		
Fawn	19	17	2	11
Yearling	3	0	3	100
Adult	23	1	22	96

Table 4. Fawn/≥ yearling doe counts from deer observed between August and December 1990 in Dekalb and Brown counties, Illinois.

Area	Method	No. Fawns	No. Does Observed	Fawn/doe
Brown	Spotlight	126	88	1.43
	General Obs.	197	169	1.17
	Marked Does	26	23	1.13
			Mean	1.25
Dekalb	Spotlight	122	98	1.24
	General Obs.	37	24	1.54
	Marked Does	17	14	1.21
			Mean	1.29

Table 5. Seasonal survival rates for the period June 1990 through May 1991 calculated using the MICROMORT program for deer marked in Brown and DeKalb counties, Illinois.

Age	Area	Interval (Mo.)	Sex	No. Deer	No. Deaths	Survival Rate	95% C. I.
Fawn	Brown	Jan-May	M	21	1	0.95	0.86-1.0
			F	21	0	1.00	----------
	DeKalb	Jan-May	M	13	2	0.85	----------
			F	11	0	1.00	----------
Yearling	Brown	Jun-Sep	M	18	0	1.00	----------
			F	12	0	1.00	----------
	DeKalb	Jun-Sep	M	7	0	1.00	----------
			F	8	0	1.00	----------
	Brown	Oct-Dec	M	18	4	0.79	0.64-0.99
			F	12	3	0.77	0.58-1.00
	DeKalb	Oct-Dec	M	7	5	0.46	0.25-0.91
			F	8	2	0.76	0.55-1.00
	Brown	Jan-May	M	17	0	1.00	----------
			F	14	2	0.86	0.71-1.00
	DeKalb	Jan-May	M	5	2	0.64	0.38-1.00
			F	7	1	0.85	0.65-1.00
Adult	Brown	Jun-Sep	M	2	0	1.00	----------
			F	24	0	1.00	----------
	DeKalb	Jun-Sep	M	1	0	1.00	----------
			F	9	0	1.00	----------
	Brown	Oct-Dec	M	2	2	0.00	----------
			F	24	1	0.95	0.88-1.00
	DeKalb	Oct-Dec	M	2	0	1.00	----------
			F	9	1	0.89	0.72-1.00
	Brown	Jan-May	M	2	0	1.00	----------
			F	43	2	0.95	0.89-1.00
	DeKalb	Jan-May	M	4	0	1.00	----------
			F	13	1	0.92	0.79-1.00

Table 6. Annual survival rates for deer ≥ year old marked in Piatt county(1980-85), Dekalb county(1990-91), and Brown county(1990-91), Illinois.

Age of Deer	Sex	Site	Region	Survival (%)
Yearling	M	Piatt	East-Central	38
		Dekalb	North	29
		Brown	West-Central	79
	F	Piatt		62
		Dekalb		64
		Brown		66
Adult	M	Piatt		39
		Dekalb		100
		Brown		66
	F	Piatt		71
		Dekalb		82
		Brown		90

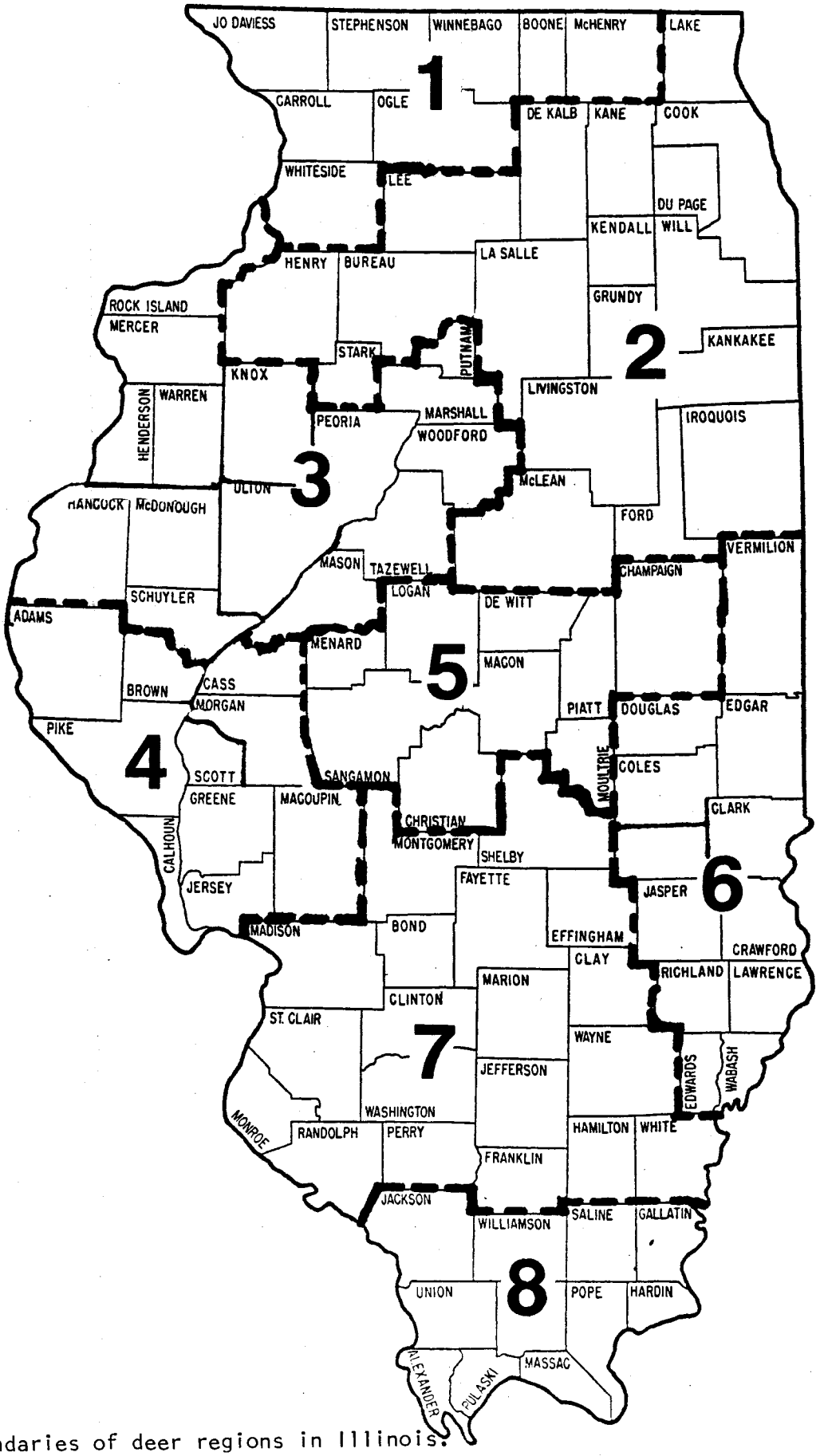

Figure 1. Boundaries of deer regions in Illinois.

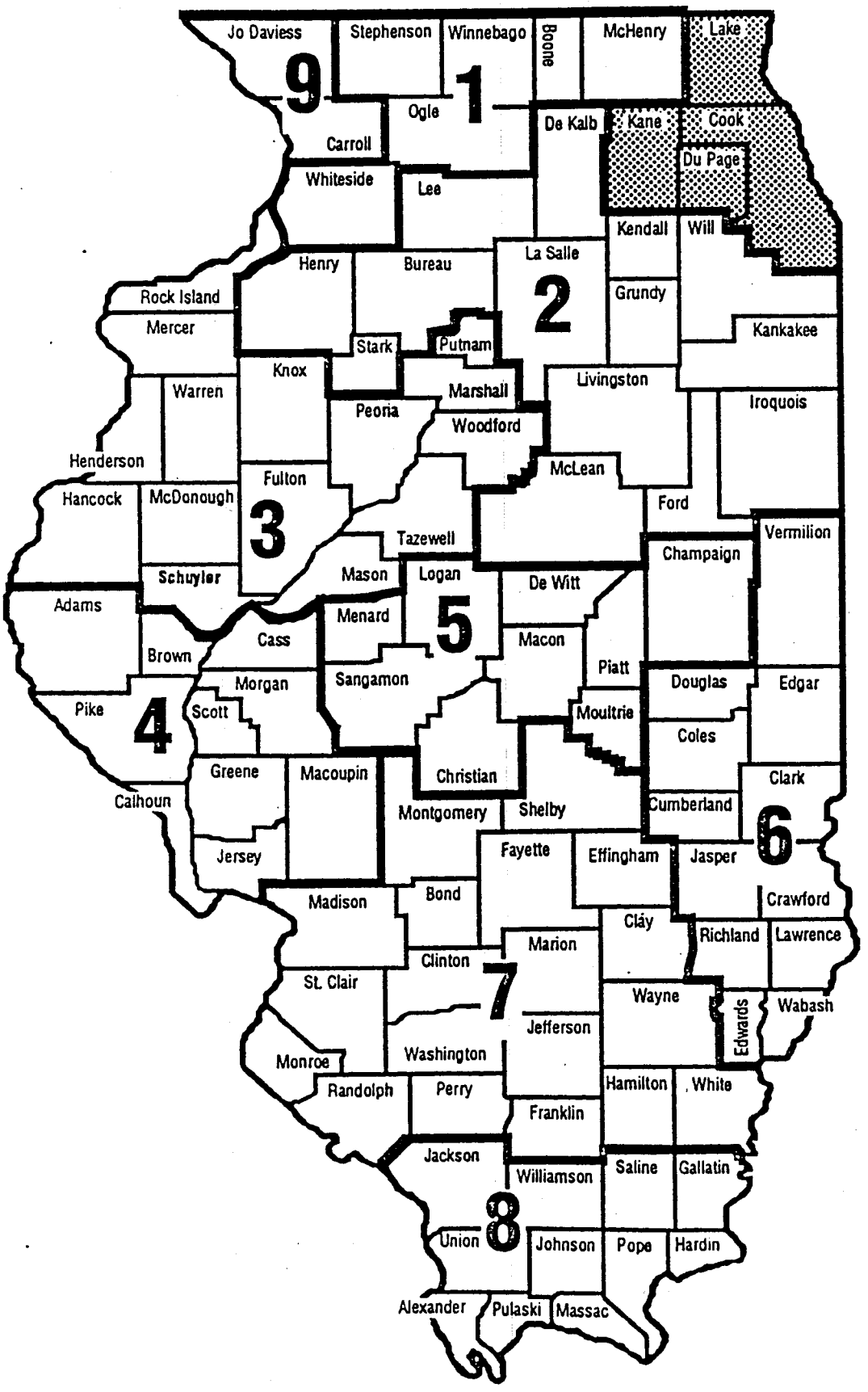

Figure 2. Regional boundaries used for simulation modeling of deer abundance in Illinois 1980-89.