



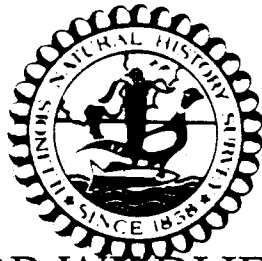
ILLINOIS

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ILLINOIS
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CENTER FOR WILDLIFE ECOLOGY

Illinois Forest Game Investigations

W-87-R-15

Annual Report

by

Charles M. Nixon, Joseph B. Sullivan, Robert G. Koerkenmeier, Dwayne Etter,
John Kube, Jeanette Thomas, Alan Woolf, and John Roseberry
Illinois Natural History Survey



1 July 1992 through 30 June 1993

**Performance Report
Annual Job Progress Report**

State: Illinois

Project No.: W-87-R-15

Project Type: Research

Project Title: Cooperative Forest Wildlife Research

Sub-project: Illinois Deer Investigations

Period Covered: 1 July 1992 through 30 June 1993.

Study No. 1; Title: Population dynamics and ecology of white-tailed deer in Illinois.

Study Objectives:

1. To assess the amount, distribution, and quality of white-tailed deer habitat in Illinois.
2. To relate spatial aspects of deer habitat to other important attributes such as hunter access, proximity to human habitation, and agricultural patterns.
3. To complete ongoing studies describing current natality rates, fawn recruitment, seasonal movements, and seasonal and annual mortality rates for previously marked deer in westcentral and northern Illinois.
4. To develop interactive, menu driven, portable computer models and software packages to facilitate analysis of harvest data, predict effects of alternative harvest regimes, and help select appropriate strategies to achieve specific goals and objectives.

Job No. A; Title: Habitat inventory, classification, and analysis.

Objectives: (1) To investigate alternative techniques for classifying white-tailed deer habitat from remote sensing data; (2) To use these techniques and data sources to inventory deer habitat in Illinois; (3) To

describe the habitat characteristics of sites selected by dispersing deer and to compare these characteristics with the habitats available within the boundaries of known dispersals from marking sites in northern, west-central, and east-central Illinois; (4) To develop HSI models for the purpose of assessing the relative quality of deer habitat using digital land use classifications from remotely sensed data and; (5) To integrate information relating to spatial distribution of habitat with other pertinent attributes relating to hunter success, human habitation, and agricultural patterns.

(a) Activity: Job and reporting assigned to Dr. A. Woolf and J. Roseberry, Southern Illinois University, Carbondale.

(b) Target date of Achievement: 1 September 1995.

(c) Date of Accomplishment: On schedule.

(d) Significant Deviations: None.

(e) Remarks: None.

(f) Recommendations: None.

(g) Costs: Federal--\$54,040; State--\$18,014; Total--\$72,054.

Job No. B; Title: Deer ecology and life history in west-central and northern Illinois.

Objectives: (1) To determine age specific natality and seasonal and annual survival rates of deer marked in westcentral and northern Illinois; (2) To determine seasonal movement patterns and habitat selection of marked deer in westcentral and northern Illinois; (3) To integrate these natality and survival data collected from this study within new population models of the Illinois deer herd.

(a) Activity:

Capture and Marking

Deer have been livetrapped and marked in westcentral (WC) (N =230) and northern (NO) (N= 115) Illinois between 1989 and 1992. A total of 57 deer (8 males, 49 females) and 32 deer (5 males, 27 females) were radio marked on the WC and NO areas, respectively.

During the R-15 segment, at least some radio location data were gathered from 43 deer (4 males, 39 females) in WC Illinois, generating approximately 12,000 radio bearings (not actual locations). The small size and scattered nature of cover on the NO Illinois study area enabled deer to be radio located within the standard 1-ha grid used for locating deer on our study areas without resort to a null-peak antenna system. Instead, a single antenna, a close approach, and direct observation were used in combination to locate deer. Approximately 1300 actual locations were obtained from 18 radio marked deer (3 males, 15 females) in northern Illinois.

Project personnel assisted Western Illinois U. in capturing 41 deer on and adjacent to the WC study area. These deer were captured to examine the effects of orphaning on female fawn-yearling movements subsequent to removal of the mother. Two females captured during trapping were recaptures from previous years (#40 and #81).

Seven fawns, including a set of quadruplets, were captured during May-June 1993 on the NO Illinois study area. The quadruplet fawns, marked 17 May, 1993, belonged to an unmarked doe. As of 1 August, 1993, 3 of the quads were known to be alive. The remaining 3 fawns belonged to does previously marked (#110, #145, #167). No fawns were captured on the WC study area.

Natality

Blood samples were collected from all does captured on the WC study area in 1990 and 1991 (68 does) and fawn does only in 1992 and 1993 (25 does). Progesterone levels indicated that breeding activity among fawn does was low all 4 years and apparently declining (Table 1).

Progesterone levels also indicated that all yearling and older does (N = 40) were pregnant when bled in 1990 and 1991.

Repeated observations of marked does allowed us to access annual breeding rates and fawn production by age class for marked does on both study areas (Table 2). Fawn and yearling breeding rates appear to be much higher on the NO study area compared to WC Illinois. Adult breeding rates and fawn production appear similar on both areas (Table 2).

Spotlight surveys and casual observations of all does and fawns (marked and unmarked) observed from August 1 through early October were used to estimate fawn recruitment into early fall on the WC and NO study areas. In 1992, for the first time, fawn:doe counts were higher on the WC area (1.39 fawns/doe, 261 does and 364 fawns) compared with the NO study area (1.18 fawns/doe, 131 does and 155 fawns).

As described in the previous annual report, we do not believe natality rates found among fawn does on the WC study areas are typical of the WC region (Nixon et al. 1992). The low breeding rates observed among fawn breeders in this population does not appear to be related to nutritional deprivation, as blood protein levels and body weights of fawns and antler beam diameters for yearlings (used as an indicator of nutritional intake) all appeared comparable to deer examined in EC and NO Illinois, where fawn breeding is common behavior. We believe the reduced incidence of fawn breeding on our WC study area to be a response to the higher number of yearling and older females present on this area compared to our other study areas (Table 3). Verme (1987) presented evidence of reduced breeding among doe fawns as deer numbers have increased in Ohio and Michigan, due to social domination of the fawns by their older female relatives. As noted in a previous report (Nixon et al. 1992), reductions in the incidence of fawn breeding have been documented within several refuge protected herds in Illinois.

Survival

Annual survival of marked yearling and older females was not different ($P > 0.05$) between NO and WC study areas for 1990-93 (Table 4). There was also no difference ($P > 0.05$) in annual survival among years for either yearlings or adults on either study area. Yearling female survival

was reduced compared to adult female survival only on the WC area ($G = 6.20$, $df=1$, $P<0.05$). Hunting and associated wounding contributed most to annual mortality among females and yearlings were more vulnerable to hunting mortality and also to auto accidents compared to adult does (Table 4).

For yearling males, seasonal and annual survival rates were calculated separately for males that dispersed and those that remained on or close to their natal range in EC, WC, and NO Illinois (Table 5). Survival was high and similar ($P>0.10$) for males marked on all study areas during the prebreeding ($>95\%$) and postbreeding ($>81\%$) periods. Survival during the breeding period was reduced ($P<0.01$) for males dispersing from our WC study area, but was not different on the NO study area. Annual survival of dispersing males was significantly reduced ($P<0.02$) compared to the annual survival of sedentary yearling males on all study areas (Table 5).

Survival of males ≥ 2 years old was significantly better ($P<0.05$) compared to yearling males that dispersed from the NO study area, but was similar ($P>0.10$) to survival of dispersing yearlings on the WC study area and survival of sedentary yearlings on both areas (Tables 5 and 6). Hunting and associated wounding were the only significant causes of mortality for adult males (Table 6), as adult males were almost free of mortality between hunting seasons. Mature males were somewhat more vulnerable to firearm hunting than archery hunting, the reverse of yearling males (Table 6).

Dispersal and Local Movements

Dispersal behavior of both sexes between 1 and 2 years old was extensive on both study areas. An average of 75% (24/32) of marked yearling males dispersed from the NO study area; The average for the WC area was 71% (44/62) ($P>0.05$). Seventy-seven percent of this behavior occurred in the spring at age 11-13 months (Table 7).

For females, an average of 44% (15/34) marked yearling females dispersed from the NO study area and 22% (11/49) from the WC area ($G = 3.36$, $P<0.10$). Overall, male dispersal was significantly higher than female dispersal ($G = 24.24$, $P<0.001$).

For yearlings marked on the NO study area, males dispersed an average of 36 ± 4.2 km (N = 13) and females 40 ± 3.1 km ($P > 0.05$). Males dispersing from the WC area averaged 19 ± 3.8 km (N = 30) and females 47 ± 9.4 km (N = 10). Most dispersing female deer moved north (8/10) from the WC area and east (12/14) from the NO study area for no apparent reason. Males moved in all 4 cardinal directions from both study areas.

Yearling males were more likely to die during a dispersal movement than were yearling females because males often dispersed in the fall during the hunting season while females only dispersed in the spring. For yearlings marked on both study areas, only 1 female died during a dispersal movement (N = 30 dispersing deer). For yearling males, 12 died during dispersal (N = 50), with most of these deaths occurring in the fall from hunting related causes (10/12).

A summary of 75% (using 75% of the overall home range as an indication of core home range size) convex polygon home ranges for yearling and adult females on both study areas did not show any clear indication of age changes in home range size as does mature. Breeding and postbreeding ranges of yearlings were somewhat larger than for adults (breeding--yearlings = 32.1 ± 9.0 ha, N = 5; adults = 10.9 ± 2.7 ha, N = 8; postbreeding--yearlings = 56.3 ± 9.0 ha, N = 5; adults = 50.6 ± 19.4 ha, N = 8), which may indicate a gradual reduction in movements as does adjust the boundaries of their ranges through interactions with adjacent deer. Prebreeding ranges were similar for both age classes (yearlings = 18.9 ± 11.1 ha; adults = 20.1 ± 4.5 ha).

Core home ranges for males averaged significantly larger than female ranges throughout the year, ranging between 1.8 km for yearling males during breeding to 2.7 km for adult males during postbreeding.

(b) Target date of Achievement: 1 September 1994.

(c) Date of Accomplishment: On schedule.

(d) Significant Deviations: None.

(e) Remarks: None.

(f) Recommendations: None.

(g) Costs: Federal--\$42,513; State--\$14,171; Total--\$56,684.

Job No. C.; Title: Population Analysis

Objectives: (1) To develop interactive, menu-driven, portable computer models and software packages to analyze population data, model herd performance, and predict outcome of alternative harvest strategies on herd size, herd composition, and hunter behavior and success; and (2) To assist the IDOC in integrating this system into their deer management program.

(a) Activity: Job and reporting assigned to Dr. A. Woolf and J. Roseberry, Cooperative Wildlife Lab, Southern Illinois University, Carbondale.

(b) Target Date of Accomplishment: 1 September 1995.

(c) Date of Accomplishment: On Schedule.

(d) Significant Deviations: None.

(e) Remarks: None.

(f) Recommendations: None.

(g) Costs: Federal--\$26,006; State--\$8,669; Total--\$34,675.

Job No. D ; Title: Analyze and Report.

Objectives: (1) To analyze results and prepare products from Jobs A-C; and (2) To report and discuss findings and present products in a timely manner.

(a) Activity: Project summaries, an annual report of progress, and quarterly reports of progress were submitted to the funding agencies as

required. Various topics dealing with deer hunting and life history and ecology were reported to the IDOC as requested.

The first draft of a manuscript titled "Ecology and social behavior of the male white-tailed deer in Illinois" was prepared and sent out for review.

Presentations discussing deer ecology in Illinois were given before various groups during the segment. Numerous queries from the press regarding deer ecology and life history were answered and ongoing discussions were held with IDOC personnel regarding deer herd management.

(b) Target Date of Achievement: 1 September 1995.

(c) Date of Accomplishment: On Schedule.

(d) Significant Deviations: None.

(e) Remarks: None.

(f) Recommendations: None.

(g) Costs: Federal--\$10,526; State--\$3,507; Total--\$14,033.

Literature Cited

Nixon, C.M., J.B. Sullivan, R. Koerkenmeier, D. Etter, T. Esker, G. Morgan, J. Van Es, and J. Kube. 1992. Ill. Forest Game Investigations, Ill Dept. Conservation, Fed. Aid in Wildl. Restor. Perf. Rep. Proj. W-87-R-12,13,14. 16pp.

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 1993

Table 1. Number of fawn does breeding on the west-central study area based on progesterone levels in blood sera collected from captured does January-March 1990-1993.

Year	No. Does Examined	No. Does Breeding	Percent Breeding
1990	8	3	38
1991	20	3	15
1992	17	1	6
1993	7	0	0
Total	52	7	13

Table 2. Breeding rates of marked does observed on the west-central and northern study areas in 1990-1992.

Breeding Age	Percent Breeding			No. Does	Production		Fawns/Breeder
	No.	Breeding	%		No. Fawns	Fawns/Doe	
WEST-CENTRAL							
Fawns							
1989-90	8	3	38	8	3	0.4	1.0
1990-91	20	3	15	20	4	0.2	1.3
1991-92	17	1	6	17	1	0.06	1.0
Yearling							
1989-90	5	4	80	5	7	1.40	1.75
1990-91	4	4	100	4	7	1.75	1.75
1991-92	11	10	91	11	13	1.18	1.30
Adult							
1989-90	20	20	100	20	37	1.85	1.85
1990-91	23	22	100	23	39	1.69	1.77
1991-92	31	30	97	31	53	1.71	1.77
NORTHERN							
Fawns							
1989-90	5	2	40	5	2	0.40	1.00
1990-91	6	5	88	6	5	0.83	1.00
1991-92	10	6	60	10	6	0.60	1.00
Yearling							
1989-90	5	5	100	5	7	1.40	1.40
1990-91	1	1	100	1	2	2.00	2.00
1991-92	7	7	100	7	12	1.71	1.71
Adult							
1989-90	4	4	100	4	9	2.25	2.25
1990-91	8	8	100	8	13	1.63	1.63
1991-92	23	23	100	21	37	1.76	1.76

Table 3. Late summer estimates of abundance for females ≥ 1 year old on 3 study areas in Illinois.

Area	Area Surveyed		No. Counts	Lincoln-Peterson			Schnabel		No. Km ²
	Km ²	Year		No. Females		Mean	95% Conf. Int.		
				Mean \pm S.E.		Km ²			
West-	10.2	1990	5	72.7	16.4	7.1	65.7	40.9-108.1	6.4
Central		1991	8	71.0	2.7	7.0	73.4	46.2-92.5	7.2
		1992	7	78.8	4.5	7.7	80.1	61.3-136.2	7.9
North	16.7	1990	4	65.5	13.9	3.9	66.8	36.5-127.7	4.0
		1991	8	76.7	8.2	4.6	80.9	57.3-115.4	4.8
		1992	7	89.6	4.4	5.4	90.7	66.2-132.5	5.4
East-	12.0	1981	3	33.3	1.4	2.8	37.7	17.6-70.8	3.1
Central		1983	5	51.5	2.4	4.3	54.8	37.1-77.2	4.6
		1984	8	63.5	5.3	5.3	64.3	47.2-84.3	5.4
		1985	7	58.3	2.7	4.9	59.3	47.5-105	4.9

Table 4. Annual survival and cause specific mortality rates calculated for female deer ≥ 1 year old in Northern and West Central Illinois.

Area	Year	Age	No. Deaths	Survival	95% Conf.	Cause of Death					
						Gun	Bow	Gun Cripple	Bow Cripple	Auto	Misc.
Northern	1990-91	Yearling	2	0.766	0.55-1.00	0.11	0.11	--	--	--	--
	1991-92	Yearling	3	0.771	0.58-1.00	--	0.073	--	0.073	0.073	--
	1992-93	Yearling	5	0.751	0.59-0.97	--	--	--	--	0.190	0.048
West-Central	1990-91	Yearling	2	0.767	0.53-1.00	0.233	--	--	--	--	--
	1991-92	Yearling	5	0.746	0.58-0.96	0.102	0.102	--	0.051	--	--
	1992-93	Yearling	8	0.672	0.51-0.88	0.162	0.041	--	--	0.082	0.041
Northern	1990-91	Adult	1	0.917	0.78-1.00	0.079	--	--	--	--	--
	1991-92	Adult	3	0.864	0.73-1.00	0.044	0.044	0.044	--	--	--
	1992-93	Adult	4	0.890	0.79-0.99	--	0.027	--	0.027	0.027	0.027
West-Central	1990-91	Adult	2	0.909	0.80-1.00	0.045	--	--	--	--	0.045
	1991-92	Adult	6	0.862	0.77-0.97	0.045	--	--	0.023	0.023	0.045
	1992-93	Adult	16	0.791	0.70-0.88	0.039	0.092	0.013	0.013	0.026	0.026

Table 5. Survival and cause specific mortality rates calculated from yearlings (11-24 mo.) males marked in NO (1990-92), WC (1990-92), and EC (1980-85) Illinois. Sedentary males remained on their natal range, dispersers moved to a new range.

Site	Movement Behavior	Season	Interval (days)	Total		No. Deaths	Survival	95% CI	Auto	Archery	Firearm	Archery Cripple	Firearm Cripple	Misc.
				Deer Days	No.									
NO	Sedentary	Prebreed	153	2,601	0	1.00	-	-	-	-	-	-	-	-
WC				5,661	0	1.00	-	-	-	-	-	-	-	-
EC				10,098	1	0.984	0.95-1.00	0.02	-	-	-	-	-	-
NO		Breed	107	1,712	5	0.724	0.55-0.96	-	0.16	-	-	0.05	0.05	-
WC				3,959	9	0.783	0.67-0.92	0.02	0.07	0.04	0.04	0.04	0.02	-
EC				6,741	19	0.737	0.64-0.84	-	0.12	0.07	0.07	0.04	0.01	0.01
NO		Postbreed	105	1,155	2	0.827	0.64-1.00	0.16	-	-	-	-	-	-
WC				2,940	0	1.00	-	-	-	-	-	-	-	-
EC				4,725	3	0.934	0.86-1.00	0.04	-	-	-	-	-	0.02
NO		Annual		5,468	7	0.626	0.44-0.88	0.10	0.16	-	-	0.05	0.05	-
WC				12,560	9	0.769	0.64-0.91	0.02	0.07	0.05	0.05	0.05	0.02	-
EC				21,564	23	0.677	0.57-0.79	0.04	0.12	0.07	0.07	0.04	0.01	0.02
NO	Dispersed	Prebreed	153	3,825	1	0.960	0.88-1.00	0.04	-	-	-	-	-	-
WC				5,508	1	0.972	0.92-1.00	0.02	-	-	-	-	-	-
EC				6,885	1	0.977	0.93-1.00	0.02	-	-	-	-	-	-
NO		Breed	107	2,568	8	0.711	0.56-0.90	0.03	0.07	0.14	-	-	0.03	-

Continued.

Table 5. Page 2.

Site	Movement Behavior	Season	Interval (days)	Total Deer Days	No. Deaths	Survival	95% CI	Auto	Archery	Firearm	Archery Cripple	Firearm Cripple	Misc.
WC				3,745	20	0.559	0.43-0.72	0.04	0.15	0.15	0.02	0.04	0.02
EC				4,173	28	0.482	0.37-0.63	0.05	0.18	0.20	0.01	0.03	0.01
NO		Postbreed		11,680	0	1.00	-	-	-	-	-	-	-
WC				2,205	0	1.00	-	-	-	-	-	-	-
EC				1,260	1	0.916	0.78-1.00	0.08	-	-	-	-	-
NO		Annual		8,073	9	0.511	0.38-0.68	0.07	0.16	0.16	0.02	0.04	0.02
WC				11,458	21	0.665	0.51-0.86	0.07	0.07	0.14	-	0.03	-
EC				12,318	30	0.410	0.29-0.56	0.09	0.19	0.21	0.01	0.03	0.01

Table 6. Survival and cause specific mortality rates calculated from adult males \geq 2 years old marked in NO (1990-92), WC (1990-92), and EC (1980-85) Illinois.

Site	Season	Interval Days	Deer Days	No. Deaths	Survival	95% CI	Auto	Archery	Firearm	Archery Cripple	Firearm Cripple	Misc. ^a
NO	Prebreed	153	4,590	0	1.000	-	-	-	-	-	-	-
WC			7,497	0	1.000	-	-	-	-	-	-	-
EC			13,311	2	0.977	0.94-1.00	0.01	-	-	-	-	0.01
NO	Breed	107	3,210	4	0.873	0.76-0.99	-	-	0.093	0.03	-	-
WC			5,243	18	0.689	0.58-0.82	-	0.13	0.08	-	0.06	0.01
EC			8,774	30	0.691	0.60-0.79	-	0.04	0.19	0.04	0.02	0.01
NO	Postbreed	105	2,730	0	1.00	-	-	-	-	-	-	-
WC			3,255	0	1.00	-	-	-	-	-	-	-
EC			5,460	0	1.00	-	-	-	-	-	-	-
NO	Annual		10,530	4	0.873 ^b	0.75-0.99	-	-	0.09	0.03	-	-
WC			15,995	18	0.662	0.55-0.80	-	0.14	0.09	0.28	0.07	0.01
EC			27,545	32	0.645	0.55-0.74	0.02	0.04	0.20	0.04	0.02	0.02

^a Includes drowning, poaching, fence, collisions, canine predation.

^b Significantly different from WC and EC Survival, (P<0.001).

Table 7. Movement behavior of marked fawns on the WC and NO study areas, whether deer were sedentary (S), dispersers (D), or migratory (M) after family breakup in May-June.

Marking Age	<u>1990</u>				<u>1991</u>				<u>1992</u>			
	No.	S	D	M	No.	S	D	M	No.	S	D	M
WEST-CENTRAL												
Fawn												
Male	17	7	10	0	18	4	14	0	27	7	20	0
Female	10	7	3	0	20	13	5	2	19	15	3	1
NORTHERN												
Fawn												
Male	6	1	5	0	12	2	10	0	14	5	9	0
Female	6	2	3	1	11	5	5	1	17	9	7	1

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217-333-6856

31 August 1993



Mr. John Buhnerkempe
Division of Wildlife Resources
Illinois Department of Conservation
Lincoln Tower Plaza
524 S. Second Street
Springfield, IL 62701-1787

Re: Annual Report for Forest Game Investigations, Project W-87-R

Dear John:

I have enclosed 5 copies of the above referenced project.

Please let me know if you have any questions.

Thank you!

Sincerely,

Charles M. Nixon
Forest Wildlife Ecologist

CMN:ts

Enclosures (5 copies)