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Transplanting Iowa Ruffed Grouse

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Restoration of ruffed grouse (*Bonasa umbellus medianus*) to southeast Iowa met with limited success. Grouse populations were maintained at low densities 8 years after release, as evidenced by the numbers of drumming males inhabiting Shimek State Forest. Lack of suitable habitat, created by advanced secondary forest succession on state-owned lands, appeared to be the major limiting factor. Techniques for trapping and holding grouse, and the effects of confinement on grouse condition are described.

INDEX DESCRIPTORS: Ruffed grouse, restoration, weight, habitat

Ruffed grouse were found throughout Iowa in the mid 19th century, but disappeared from southwest Iowa about 1900, the southern and eastcentral regions in the 1920's, and were restricted to their present range in 6 northeast Iowa counties by 1930 (Fig. 1). Their demise from a once numerous game bird to localized populations existing on terrain too rough to clear for agriculture was due primarily to deforestation and overgrazing, which reduced the lush shrub forest understories they need to survive (Klonglan and Hlavka 1969).

Since 1930, secondary succession on private forest and pasture lands, along with acquisition of state forest lands and their removal from grazing, have increased the amount of potential grouse habitat in southcentral and southeast Iowa. The Iowa Conservation Commission began efforts to reestablish ruffed grouse in portions of southern Iowa's 2nd and 3rd growth hardwood forests with the release of 7 and 12 grouse in Shimek State Forest, Lee County, in 1962 and 1965, respectively (Klonglan and Hlavka 1969). Occasional sightings of single grouse were made for several years after these releases, but the last sighting was reported in 1969 (ICC, unpublished reports). Intensified restoration began with the release of 43 grouse into Shimek State Forest in 1971, and with an additional transplant of 39 grouse to Stephens State Forest, Lucas County, in 1972 (Fig. 1). This paper documents methods used to trap and hold grouse, and evaluates the Shimek State Forest release.

This project was funded by the Iowa Conservation Commission. The junior author coordinated trapping activities and searches for drumming males during the first 3 years post release. The senior author supervised the last 2 years of field work and the habitat evaluations. K. Moore and J. Telleen conducted field work in 1978 and 1979.

METHODS

Grouse were trapped from mid August to mid November in 1971 and 1972, in Yellow River State Forest, Allamakee County (Fig. 1). Lily pad traps (Liscinsky and Bailey 1955) were used according to the instructions of Gullion (1965). Grouse were classified by age, sex and color phase using criteria developed by Gullion (1964), and were weighed at capture and release. Observed differences from expected even age, sex, and color phase ratios were tested with chi-square.

Grouse were held in a 7.3 x 10.9 x 4.6 m holding room until at least 5 were available for transplant. The holding room was lined with a 1.3 cm mesh net hung 0.9 m from each wall and the ceiling. Branches were placed in the corners of the net to provide roosting sites, and shrubs were stretched from floor to ceiling to discourage flight. The room was kept dark 23 hr daily to reduce grouse activity; the light period was provided to encourage feeding. Cracked corn and dogwood (*Cornus racemosa*) berries were provided *ad lib.*, and quarter sections of watermelon were supplied as a water source. Dogwood was readily consumed, but little corn was eaten. Watermelon sections were usually pecked to the rind within 48 hours.

Searches were conducted for drumming males at Shimek State Forest in April and May of 1972, 1973, 1974, 1978, and 1979. Lack of personnel reduced efforts to occasional searches within a 1.6 km radius of the release site in the earlier years and made searching impossible in 1975-77. One individual spent 350 hours annually searching 3,600 ha of upland forest for drummers on the Farmington, Donnellson, Lick Creek and Croton units of the state forest, plus adjacent private lands in 1978 and 1979.

Eighty-seven percent of the study area was searched 3 or more mornings each year, and counts of drumming males in this portion, which includes all of the state forest units and immediately adjacent private land, are thought to be complete. An additional 800 ha in peripheral areas were searched 1 or 2 mornings, and some drumming males may have been missed. These lightly covered areas were primarily mature oak-hickory forests, and of marginal attractiveness to drumming grouse. The drummers that were located in 1978 and 1979 probably represent all the active drummers within a 6.4 km radius of the release site.

Each drumming log found was plotted on a topographic map and marked with a metal ID tag. Each log was assigned to an activity center, or cluster of drumming logs used by a single male (Gullion 1967) and records of occupancy were kept for each drumming log and activity center. Mirror traps were used to capture and band drummers in 1978 and 1979, using techniques described by Gullion (1965 and 1966a).

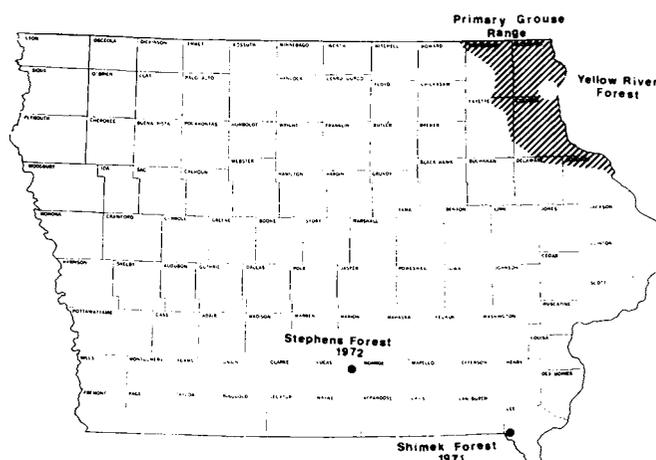


Figure 1. Primarily ruffed grouse range in Iowa and recent transplanting sites in southern Iowa.

RUFFED GROUSE RESTORATION

Table 1. Demographic composition of fall-trapped ruffed grouse from Yellow River State Forest, 1971-72 combined.

	AGE			COLOR PHASE		
	Juvenile	Adult		Gray	Intermediate	Red
Male	39	26	Juvenile male	5	3	31
Female	22	16	Adult male	3	3	20
Male:Female	178:100	163:100	Juvenile female	4	1	17
			Adult female	4	2	10
			Total	16	9	78

Table 2. Weight losses for ruffed grouse held in captivity. Table values are mean percentages of original weight lost \pm S.E. (Sample size).

	DAYS HELD IN CONFINEMENT						Mean total weight lost
	2	3	4	5	6	7	
Adult males	7 \pm 3(4)	5 \pm 1(9)	22 \pm 0(2)	8 \pm 4(2)	8 (1)	—	9 \pm 2
Juvenile males	3 \pm 4(8)	7 \pm 2(6)	13 \pm 2(2)	16 \pm 6(2)	5 \pm 3(4)	14 \pm 1(4)	8 \pm 1
Adult females	6 (1)	11 \pm 1(3)	4 (1)	12 (1)	—	8 \pm 3(3)	8 \pm 1
Juvenile females	11 \pm 3(2)	10 \pm 3(3)	—	20 \pm 5(3)	5 \pm 1(2)	18 \pm 7(3)	13 \pm 2
All grouse	6 \pm 1(15)	7 \pm 1(21)	13 \pm 4(5)	14 \pm 4(8)	6 \pm 1(7)	12 \pm 3(10)	9 \pm 1

The area in each of 9 habitat types was estimated using a planimeter on maps which delineated habitat boundaries based on changes in tree canopy composition (Forestry Section, ICC, unpublished data). Relative shrub densities were added to habitat descriptions using the releve method (Shimwell 1971). Shrubs were classified as "moderate to dense" or "open" based on the ease of human passage through 1-5, 20 x 20 m plots located randomly in each forest stand. The number of plots per stand was allocated proportionately to stand size.

RESULTS AND DISCUSSION

Trapping and holding

Of 106 grouse captured in Yellow River Forest in 1971 and 1972, 89 were released, 9 were taken to the State Wildlife Exhibit at Boone, and 8 died before release (3 were severely scalped, 1 was killed by a predator in a trap and 4 died in the holding room without visible sign of injury). Seven severely scalped grouse were treated with *Topazone*, a surface antibiotic, and their scalps were sutured. Five treated birds were held several days and appeared healthy when released, and 2 died.

The best trapping success occurred between 1 September and 31 October each year, averaging 9.5 grouse/100 trapdays, compared to 0.5 grouse/100 trapdays during earlier or later periods. Trapping efficiency averaged 10.5 trapdays expended/grouse captured during the best trapping period. Timber stands with dense shrubs were more than 2.5 times as productive as stands of mature, oak-hickory timber (12.4 versus 4.7 grouse/100 trapdays, respectively).

The age-sex composition of the 2-year sample of captured grouse is summarized in Table 1. Males were more common than females (171 M:100 F), significantly so among juveniles ($P < .05$), and juveniles were more common than adults (145 J:100 A). Juvenile males were by far the most common demographic class, and their relative abundance created the disparity in age and sex ratios. The other age-sex segments were captured in similar numbers. The high observed percentage of juvenile males could be due to the tendency of young males to wander more widely during brood break-up and dispersal than young females and adults (Godfrey and Marshall 1969).

Grouse were predominately in the red color phase (Table 1), with the proportions of each age-sex group having red tails ranging from 62 to 79%. Differences in color phase composition between age-sex segments were not significant ($P > 0.40$). The predominance of the red color phase reflects the continental clinal variation from predominately gray phases in the north to mostly red phases in the southern portions of ruffed grouse range (Aldrich and Friedmann 1943).

Most captured grouse lost some weight during the time they were held for transport (Table 2). Mean weights at time of capture were 529 \pm 10 g (\pm 1 S.E.) for 19 adult males (AM), 519 \pm 12 g for 28 juvenile males (JM), 478 \pm 12 g for 10 adult females (AF), and 465 \pm 14 g for 19 juvenile females (JF). Differences in mean weights could not be detected statistically ($P > 0.10$) between age classes for either sex.

Fourteen grouse (4 AM, 4 JM, 2 AF, 4 JF) maintained or gained weight during captivity, averaging 5% increase in body weight; 11 of these were held 3 or more days. Of 66 grouse which lost weight, juvenile females appeared to lose more total weight and lost weight more rapidly (Table 2). Although sample sizes are small when broken down by age and sex, all demographic groups exhibited declines in mean weights through the 5th day in captivity. Weight losses of birds held more than 5 days fluctuated widely, suggesting some grouse may have acclimated to captivity by that time and were regaining weight. The mean percentage of total weight lost was nearly 12% for all grouse held at least 5 days. A few grouse lost nearly 25% of their original weight in captivity, but the significance of these weight losses to subsequent survival after release is not known. Data are presented to indicate the magnitude of weight changes which can be expected under these conditions of capture and handling.

All grouse surviving captivity were released in the Lick Creek Unit of Shimek State Forest in 1971 (19 JM, 7 AM, 8 JF, 7 AF), or the Cedar Creek Unit of Stephens State Forest in 1972 (14 JM, 11 AM, 8 JF, 6 AF) (Fig. 1).

Release site evaluation

Populations. Twenty-two activity centers, containing 72 indi-

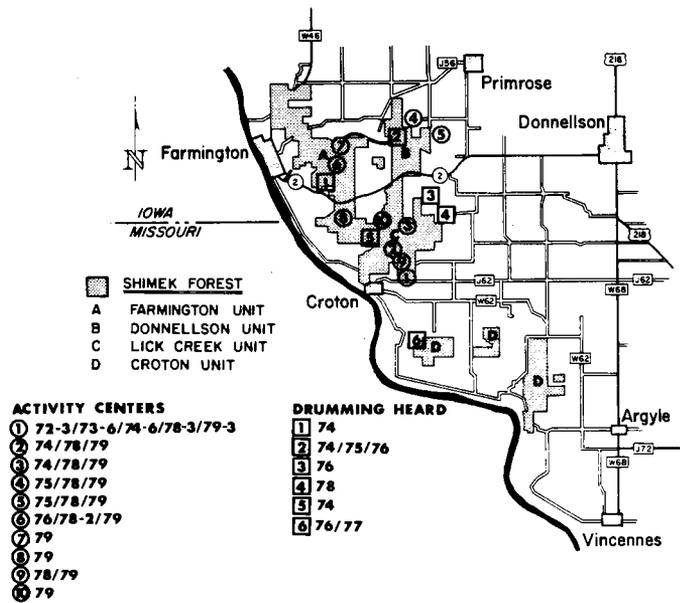


Figure 2. Distribution and history of occupancy of ruffed grouse activity centers at Shimek State Forest, 1972-1979. Circles identify confirmed activity centers, years occupied and the number of occupied centers in each year. Squares indicate areas where drumming was heard, but drumming logs were not located.

vidual drumming logs, were located on the state forest and adjacent private forest lands (Table 3). Thirteen of these activity centers were occupied more than 2 years, although prior occupancy of 3 of 6 centers first located in 1978, and 2 of 9 first located in 1979, was inferred from the accumulation of fecal droppings on drumming logs. The low intensity of effort which was expended from 1972 to 1974 makes counts of drummers in those years minimal. If all drummers were located in 1972, and all surviving males occupied a drumming log, a survival rate of 11% over the first winter after release is indicated for males.

All drummers located from 1972 to 1974 were found on private land near the release site (Fig. 2). Ten of 22 activity centers have been established in this 58 ha area, and as many as 6 centers have been occupied there in a single year. There have been at least 3-6 drummers active on private land near the release site each year, 1-3 drummers on the Lick Creek Unit, 2 drummers in 3 different activity centers on the Donnellson Unit since 1975, and at least 1 drummer on the Farmington Unit since 1976. No more than 8 drummers could be accounted for in any year prior to 1978. The 15 drummers found in 1979 produced a density estimate of 1 grouse/113 ha of forest, assuming a balanced sex ratio.

Dispersal. The known maximum distance from the release site to a drumming log was 5.6 km for an activity center in the Donnellson Unit (Fig. 2). The mean distance from the release site to occupied activity centers increased from 0.5 km in 1972 and 1973 to 2.1 km in 1974, and was 2.7 and 3.1 km in 1978 and 1979, respectively. Incidental reports from 1975 to 1977, when intensive searches were not made, indicated drumming males were established on the northern

Table 3. History of occupancy by drumming male ruffed grouse for activity centers in Shimek State Forest, Iowa, after stocking with grouse in 1971.

Activity Center	1972	1973	1974	1978	1979
C7430(1)				3502 ^a	A
C7430(2)				—	A
SC7430				A	N
NW7427			A	3504 ^b	105
NE7327			A	3503 ^b	105 _a
C7237				A	A ^b
EC7326				A	N
NE7326				A ^b	A
NC7326(1)			A	N	N
NC7326(2)		A	A	N	N
NC7326(3)	A	A	A	663	663
NC7326(4)	A	A	N	N	N
NC7326(5)	A	A	A	N	A
C7326(1)		A	A	N	N
C7326(2)		A	A	N	N
C7230					A
NW7229(1)				A	103 ^b
NW7229(2)				A	102 ^b
NC7229(1)					A
NC7229(2)					104
NW7428					A
C7228					107
Total drumming males	3	6	8	10	15

^aThe first entry for an activity center indicates the first year it was known to be occupied by a drumming male. The band number of a trapped occupant or status of the activity center is indicated, either actively occupied (A) or not occupied (N).

^bActivity in a prior year was indicated by fecal droppings accumulations at the drumming log (s).

edge of the Donnellson Unit by 1975, and in the Farmington and Croton Units by 1976 (Fig. 2). Specific drumming logs were not located for each of these reports.

Drumming males apparently remained near the release site for 2 breeding seasons after release. The 1st major extension of occupied range was documented during the 3rd spring, with relatively small increases occurring over the next 5 years. The larger number of drummers found in 1978 and 1979 appeared to result from higher densities in previously occupied areas, rather than a major extension in range. Rates of dispersal of drumming males were similar to those reported by Lewis et al. (1968) for recently stocked populations in Missouri.

Four of 10 and 7 of 15 drummers were trapped in 1978 and 1979, respectively. Three of 4 drummers trapped in 1978 did not survive to occupy a drumming log in 1979. One drummer trapped in 1978 and recaptured in 1979 was a survivor from the original release and was at least 96 months old in 1979, exceeding the published longevity record for drumming male ruffed grouse (Gullion 1966b, Stoll and Davis 1974). This drummer was trapped in an activity center 0.4 km from the release site that was occupied each year logs were checked. It probably did not move a substantial distance from the release site in the 8 years it survived.

Weights of captured drummers ranged from 546 to 603 g and are typical of spring weights of drumming males in Minnesota (Gullion

Table 4. Forest composition and utilization by drumming male ruffed grouse on Shimek State Forest.

Habitat type	Ha	% of forest	% in potential grouse habitat	% potential grouse habitat in each type	Activity centers
Oak-hickory	2,053	69	3	39	20
Conifer	275	9	0	0	1
Game management	271	9	6	12	0
Scattered trees	153	5	25	28	0
Agricultural	111	4	0	0	0
Openings	47	2	28	10	0
Bottomland hardwoods	71	2	21	11	1
Mixed hardwoods	23	1	0	0	0
Recreational development	8	< 1	0	0	0
Total	3,012	100	5		22

1970, Little 1978).

Habitat use. Classifications of habitat quality on the state forest and some private lands indicate that drumming males are utilizing only a small portion of the forest (Table 4). Of approximately 3,000 ha of forest classified by major forest type, only 137 ha (5%) appear to provide the high stem densities of shrubs and saplings which constitute suitable habitat for drumming male ruffed grouse (Palmer 1963, Rusch and Keith 1971, Stoll et al. 1979). Just 3% of the stands of oak-hickory, the most common forest type, were thought to be suitable grouse habitat, because most have progressed into advanced pole or saw-timber stages under current forest management practices.

Most of the acceptable drumming habitat in the oak-hickory forest type was found in 2 privately owned stands that were clearcut 10-20 years ago, or where disturbance reduced tree canopy coverage in a small area, resulting in an island of habitat in an otherwise unsuitable stand. Game management areas, reverted openings and areas with scattered trees and bottomland hardwoods made up the rest of the potential grouse habitat, and most of the area in these types constituted apparently acceptable habitat for drumming males. Shrubs have sprouted in these types, which have minimal tree canopy coverage, producing high shrub stem densities in areas that were previously cleared and probably once pastured.

The use of forest types by drumming males reflected the scattered nature of potential drumming sites. Most of the activity centers were found in the oak-hickory type--10 in the 2 sappling-pole stage stands south of the Lick Creek Unit, and 10 in small islands of habitat scattered through the forest (Fig. 2). Two activity centers were occupied by drummers which apparently drummed while standing on the ground because no suitable logs were available within an otherwise acceptable stand. Virtually all of the apparently suitable stands have been utilized by drummers at some time since 1972.

Crude grouse densities of 1 bird/113 ha on the study area were considerably lower than densities for recently stocked populations of 1 grouse/3-16 ha in Indiana (Kelley and Kirkpatrick 1977) and estimates from various areas in Missouri of 1 grouse/6-40 ha (Hunyadi 1978, Kurzejeski 1979, Lewis et al. 1968, Titus 1976). From 7-16% of the Missouri study areas provided suitable grouse habitat. As in Missouri, drumming males in Iowa were found in scattered pockets of early successional vegetation surrounded by larger areas of late-seral, oak-hickory forest. Ecological densities based on the amount of apparently suitable grouse habitat on Shimek State Forest were 1 grouse/5 ha in 1979, comparable to similar densities

seen in Missouri. The difference in crude densities in Iowa and Missouri appears to be due in large part to the smaller total amount of suitable, early seral habitat on Shimek State Forest.

In spite of the low total numbers of grouse found 7 years after release, there seems to be some potential for reestablishment of ruffed grouse populations in southern Iowa. Grouse populations appear capable of existing at low densities where little or no forest management has been undertaken to produce early seral stages. Natural events such as windthrow, fire and tree disease will continue to provide isolated patches of dense vegetation which will support limited grouse populations. Forest management plans which emphasize clearcutting in oak types, and which result in small timber blocks in various seral stages interspersed throughout forest stands, could increase grouse densities to huntable levels.

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