1991

FINAL REPORT

for the
Evaluation of the Effects of
Short-Duration Grazing on Wildlife
at Valentine National Wildlife Refuge

U. S. Fish and Wildlife Service
Fort Niobrara-Valentine NWR Complex

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I. INTRODUCTION

In 1987, a 3 year study was started to compare wildlife use of short-duration grazed and rested grasslands at Valentine National Wildlife Refuge. Some aspects were continued for a fourth year. This is the final report on the study. Progress reports were done in 1987, 1988, and 1989. Data in this report is primarily a summary of all years combined. For individual year's information, refer to the 1987-1989 Progress Reports and the appendix for 1990 information.

Information on waterfowl nesting, snakes, prairie grouse, songbirds, rodents, and vegetation was gathered. Waterfowl, grouse and snake information are in Dbase files for anyone wishing to see the raw data.

There were 4 study sites all on Valentine NWR (Figure 1.). The sites were a short-duration grazed sub-irrigated meadow (Unit 26B*, 460 acres), a rested sub-irrigated meadow (Unit 25A, 258 acres), a short-duration grazed sandhill unit (Unit 22B*, 791 acres), and a rested sandhill unit (31B, 984 acres). Throughout this report an * indicates a short-duration grazed habitat management unit.

The sub-irrigated meadows are flat to gently rolling areas vegetated with warm season native grasses, primarily switchgrass, Indian grass, little bluestem, and big bluestem. Water is at or just below ground level. Small potholes are found throughout and hold water is most years. The sandhill units are high hills, gently to steeply rolling, composed of sand. Warm season native grasses as prairie sandreed, sand bluestem, sand love, sandhills muhly, and little bluestem grow here. Annual precipitation averages 53 centimeters. Summers are hot with temperatures above 30° C occurring in July and August. Winters are cold with below -20° C temperatures common from December through March. Variations in timing and amount of rainfall greatly impact growth of grasses from year to year.

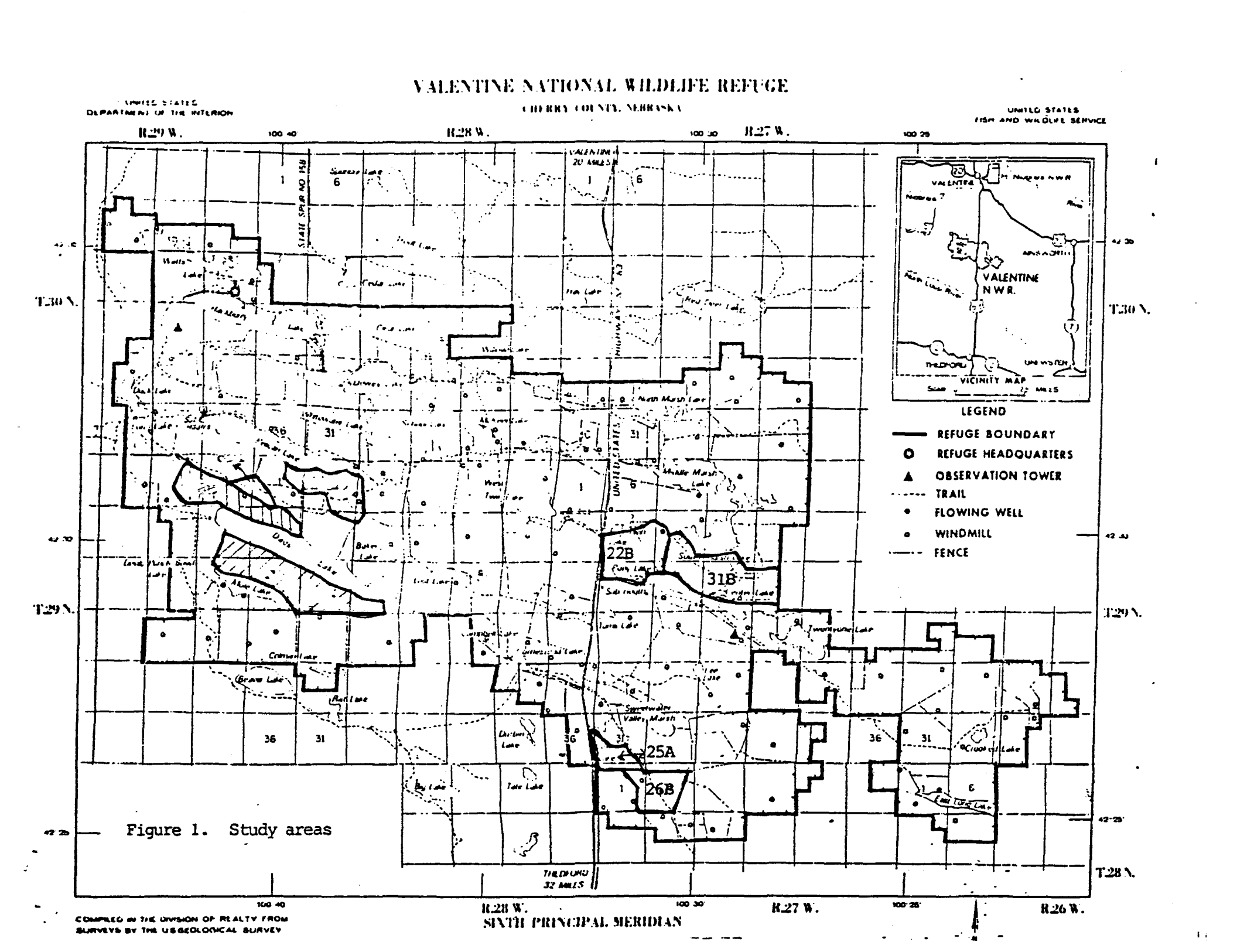

Figure 1. Study areas

II. WATERFOWL

A. Methods

Waterfowl nesting was monitored by nest dragging on meadow sites with a 165 foot cable chain. Dragging was done in the morning only. Two searches were conducted in each unit. Nests were again visited to determine fate. Data was recorded on the nest record form of Klett et. al. 1986. (Techniques for Studying Nest Success of Ducks in Upland Habitats on the Prairie Pothole Region). Robel readings were taken at the nest site and the type of vegetation noted. In all, 455 nests were located.

B. Results

Over the 4 years of the study, Mayfield nest success ranged from 3 to 51 percent in rest Unit 25A and from 12 to 19 percent in short-duration grazed Unit 26B*. If all years and all nests are pooled , the rest unit had an overall Mayfield of 18 percent and the short-duration grazed unit 15 percent. Overall nest densities were greater in the rest unit (28 nests/100 acres) than in the short-duration grazed unit (22 nests/100 acres). Successful nests per 100 acres was also greater in the rest unit (11 nests/100 acres) than in the short-duration grazed unit (8 nests/100 acres). (Table 1.)

The cause of nest destruction differed between the rest and short-duration grazed units. Mammals destroyed a larger percent of nests (37%) in the short-duration grazed unit than in the rest unit (20%). The opposite was true for snakes, with 35 percent of the nests snake destroyed in the rest unit versus 20 percent in the short-duration grazed unit. (Table 1).

Table 1. Comparison of waterfowl nesting in a short-duration grazed area (26B*) and a rest area (25A) at Valentine NWR, 1987-1990.

		1987	1988	1989	1990	all years combined
Mayfield nest success						
	26B*	19	12	16	15	15
	25A	51	26	11	3	18
Traditional nest success						
	26B*	44	26	33	31	37
	25A	69	41	24	10	40
nests/100 acres						
	26B*	27	22	17	21	22
	25A	28	35	22	23	28
successful nests/100 acres						
	26B*	11	7	6	6	8
	25A	18	15	5	2	11
% nests snake destroyed						
	26B*	18	21	22	30	20
	25A	19	40	29	63	35
% nests mammal destroyed						
	26B*	32	45	41	33	37
	25A	12	16	43	21	21
number of nests						
	26B*	102	83	66	62	313
	25A	37	46	29	30	142
acres searched						
	26B*	381	381	381	295	--
	25A	130	130	130	130	--

Data from mallards was looked at separately from other nests. Mallards preferred the rest area with a density of 9 nests/100 acres in rest versus 4 nests/100 acres in the short-duration grazed unit. Mayfield success for mallards was also higher in rest (18 percent) than in short-duration grazed (9 percent). (Table 2).

Table 2. Comparison of mallard nesting in a short-duration grazed (26B*) and a rest unit (25A) at Valentine NWR, 1987-1990.

Unit	Nests	Successful	Nests/ 100 acres	Traditional nest success	Mayfield nest success	bullsnake destroyed	mammal destroyed	Abandon	Unknown
26B*	62	18	4	31	9	8	33	0	2
25A	46	18	9	40	18	15	10	2	0

Other species found were blue-winged teal, shoveler, gadwall, pintail, and redhead. Blue-winged teal was the most numerous nesting duck in both the rest and short-duration grazed unit and nested in similar densities and with similar success in both the rest and short-duration grazed units. Other species were not present in large enough numbers to compare. (Table 3).

Table 3. Waterfowl nests by species in short-duration grazed* and rest areas at Valentine NWR, 1987 - 1990.

Unit	Acres Searched	Mallard	Blue-winged Teal	Shoveler	Gadwall	Pintail	Redhead
26B*	381	62	217	20	10	12	2
25A	130	46	80	7	7	1	1

(In 1990 only 295 acres searched in Unit 26B*)

C. Discussion

There was considerable variation in nest success over the 4 years in the rest unit (3-51 percent) which complicated the picture. Wetland conditions also varied during the study with 1987 and 1988 having good wetland conditions and 1989 and 1990 having poor wetland conditions. The grazing of the short-duration grazed area also varied from .1 to .5 AUM's per acre. These variations make drawing conclusions difficult but probably are more indicative of the variations in wetland condition, predation, and grazing that occur on the refuge. If results are pooled for all years the nest success in the rest and short-duration grazed units are nearly the same. The rest area, however, had a higher nest density, so it produced more successful nests/100 acres (11 per 100 vs 8 per 100 for short-duration grazed).

The causes of nest loss were different for the short-duration grazed units and the rest areas. Mammals were the main nest predator in the short-duration grazed area and bullsnakes in the rest area. Cover was probably responsible for this. Mammals were able to more easily locate nests in the less dense cover found in the short-duration grazed unit. The less dense cover also, however, reduced the number of bullsnakes as seen in the snake trapping results (see Section VI) and on the lower loss of nests to bullsnakes. The opposite was seen in the rest unit. The more dense cover reduced losses to mammals but increased losses to bullsnakes. The possibility also exists that some bullsnakes displaced from the short-duration grazed area migrated into the adjacent rest area. A fact to keep in mind, however, is that no matter which cover treatment, rest or short-duration graze, was used the nest success was still unacceptably low. Some form of predator control, both snake and mammal would be needed in either case to make this area productive for waterfowl.

Mallards showed a preference for nesting in the rest area over the short-duration grazed area. Mallards are selecting for the tall, dense cover found in the rest area. The rest area contained more of this as is indicated by the higher Robel readings found (see Section VII). Mallards also nested more successfully in the rest area. Mallards nest earlier than the other species of ducks and thus avoid some bullsnake predation. Bullsnakes emerge in the spring after mallard nesting is underway. Thus mallards are able to avoid some bullsnake predation by nesting early and also some mammalian predation by nesting on the more dense cover. Again, however, the nest success was unacceptably low with both rest and short-duration grazing.

III. PRAIRIE CHICKEN AND SHARP-TAILED GROUSE

A. Methods

Prairie grouse densities were sampled using a line transect method. Transects of 1.3 mile in length in hill Unit 22B* and 1.5 miles in length in hill Unit 31B were walked once a month from May of 1987 through April of 1990. Number of grouse, species, sighting distance, and sighting angle were recorded for all flushes. Prairie grouse nests found while nest dragging in meadow Units 26B* and 25A were marked and monitored in the same method as duck nests.

B. Results

Table 4 shows grouse flushed in the rest (31B) and short-duration grazed (22B*) hill units. Flushes by month were summed for the 3 year period.

Table 4. Prairie grouse flushed on line transects at Valentine NWR, 1987-90

Unit	Transect Length (Mile)	Grouse Flushes by Month												Total	Grouse/mile
		J	F	M	A	M	J	J	A	S	O	N	D		
22B*	1.3	7	2	5	9	0	2	23	20	25	24	3	6	13 PC 113 ST	2.7
31B	1.5	0	2	1	2	0	4	0	23	26	23	32	10	32 PC 91 ST	2.3

The average distance from the observer to the flushed grouse was 55 meters in Unit 22B* and 53 meters in 31B. The percentage of prairie chickens and sharp-tails was 90% sharp-tail, 10 % prairie chicken in Unit 22B and 74% sharp-tail, 26% prairie chicken in 31B.

In three years of nest dragging, a total of 36 prairie chicken and 5 sharp-tailed grouse nests were found. Numbers and success are shown in Table 5 for those nests where fate was determined.

Table 5. Prairie grouse nesting success on short-duration grazed and rested habitat units at Valentine NWR, 1987 - 90.

		Sharp-tail		Prairie Chicken	
Unit	Acres	Successful	Unsuccessful	Successful	Unsuccessful
26B*	381	1	2	13	12
25A	130	1	0	6	2

Note: in 1990 only 295 acres were searched in 26B.

Of the unsuccessful sharp-tail nests, 2 were mammal destroyed and 1 was destroyed by the drag. Of the unsuccessful prairie chicken nests 2 were destroyed by snakes, and 12 by mammals. Two prairie chicken nests could not be relocated and one was destroyed by the drag. Three prairie chicken hens were either found dead at the nest or evidence that they were killed was present.

C. Discussion

There was little difference seen in grouse flushed per mile of transect between the short-duration grazed unit (2.7/mile) and the rest unit (2.3/mile). The flushing distances were also very similar with a 55 meter average in the short-duration grazed and a 53 meter average in the rest. If the cover was less dense in a unit, the flushing distance would probably be greater in that unit. In Section VII of this report the vegetation of the rest and short-duration grazed units are compared and show little difference. There was a larger percentage of prairie chicken sighted in the rest unit (26%) than in the short-duration grazed unit (10%). Sample size was, however, small. In conclusion, there was no detectable difference in use of the short-duration grazed and the rested hill units by prairie grouse.

On the meadow units where nesting was monitored, nest densities were comparable with 1.7 nests/100 acres in the rest unit and 2.1 nests/100 acres in the short-duration grazed unit. Nest success was, however, greater in the rest area (78%) versus the short-duration grazed area (50%). Of interest is the ability of prairie chickens and sharp-tails to nest far more successfully than waterfowl in the same area. This is due to somewhat lower predation rates by mammals and much lower predation rates by bullsnakes. Though sample sizes are small, it appears that prairie grouse nested more successfully in the rested than in the short-duration grazed unit.

IV. SONGBIRDS

A. Methods

In 1987 and 1988 songbirds were counted along transects in Units 26B*, 25A, 22B*, and 31B. Transects were walked in June in 1987 and May in 1988. Only displaying males were counted. Transects were run in the morning when winds were less than 5 mph. In 1988, birds flushed while nest dragging in May were counted in Units 26B* and 25A.

B. Results

Similar numbers of birds were spotted along transects in both hill and meadow short-duration grazed and rested units (Table 6). The number of species seen was also similar although the species composition was a little different. Some species were represented by only one or two individuals. In 1988, when birds flushed by the drag were counted, species not counted along the transects were seen. Table 7 lists birds counted as flushed by the drag. More birds were flushed in the short-duration grazed then in the rest area.

Table 6. Songbirds sighted along transects at Valentine NWR, 1987 and 1988 combined.

	UNIT			
	26B*	25A	22B	31B
Transect length (miles)	1.1	1.1	1.3	1.5
Red-winged Blackbird	32	32	10	16
Yellow-headed Blackbird			1	5
Meadow Lark	1	7	23	9
Gold finch				6
Yellow throat		1		
E. Kingbird		1	2	
W. Kingbird			2	
Upland Sandpiper			2	1
Lark Sparrow				1
Grasshopper sparrow				1
Virginia rail	1			
Wilson's phalarope	5			
Bobolink				
Common nighthawk			1	
Unidentified sparrow			4	
Brown-headed cowbird			1	
Total individuals	38	41	46	39
Number of species	4	4	9	8

Table 7. Birds other than waterfowl flushed by cable chain while nest dragging at Valentine NWR, 1988.

	Unit		
	26B*	25A	
Acres Dragged	381	130	
Sora Rail	6	-	
Virginia Rail	16	1	
Sparrow	76	5	
Red-winged Blackbird	65	15	
Yellow-headed Blackbird	12	3	
Wilson's Phalarope	16	2	
Upland Plover	2	2	
Meadowlark	71	15	
Killdeer	1	-	
Cowbird	10	-	
American Bittern	3	-	
Common Snipe	-	1	
Short-eared Owl	-		1
TOTAL	278	45	
Birds/acre	.7		.3
Number of species	11		10

C. Discussion

Neither census method, drag or transect, appeared adequate. In the meadow units 25A and 26B* many species counted while nest dragging were not recorded on the transects. The drag also possibly sampled many birds that were migrants. The transect indicated equal numbers and species diversity of birds in both the hill and meadow short-duration grazed and rest units, while the drag method showed a higher density (.7 birds/acre) in 26B* than in 25A (.3 birds/acre). From these cursory surveys, I can not conclude any difference in song bird populations between rest and short-duration grazed areas.

V. RODENTS

A. Method

Rodent populations were sampled in Units 31B, 22B*, 25A, and 26B* with a catch per unit effort method. In 1987, 25 and in 1988 and 1989, 20 Sherman live traps were pre-baited with grain and locked in an open position in each unit for 6 nights. Traps were placed on transects at 15 meter intervals. All trapping was done in the fall. After the pre-baiting, traps were again baited, activated, and checked the next morning. In Unit 31B and 22B*, pocket gopher mounds were counted on transects of 1.5 and 1.3 miles in length respectively. Only those mounds on line were counted. Counts were done in August in 1987 and 1988 and in October in 1989.

B. Results

Rodents trapped in each unit are shown in Table 8.

Table 8. Rodents captured in short-duration grazed and rested meadow study sites and rested and short-duration grazed hill study sites on Valentine NWR, 1987-90 combined.

Unit	Ord's Kangaroo rat	Plains/Western harvest mouse	Deer mouse	Northern grasshopper mouse	Plains pocket mouse	Meadow vole	Prairie vole	TOTAL
31B	18	5	8	1	1	0	2	35
22B*	22	4	5	0	1	0	0	31
25A	0	0	5	0	0	2	22	29
26B*	0	0	7	0	0	0	15	22

Number of plains pocket gopher mounds counted on the transect lines are shown in Table 9.

Table 9. Plains pocket gopher mounds counted on transect lines in Units 31B and 22B* at Valentine NWR, 1987-89.

Unit	Transect length	1987	1988	1989	Average mounds/mile
31B	1.5 mile	54	43	199	66
22B*	1.3 mile	37	59	187	73

C. Discussion

Little difference was seen between short-duration grazed and rest areas. The same species in similar numbers were generally seen in both upland and meadow rest and short-duration grazed units. The one exception was the 1988 trapping result in Units 26B* and 25A. In 1988, 10 voles were trapped in the rest area while none were caught in the short-duration grazed unit. In 1988, 26B* was grazed at .5 AUM/acre which apparently was enough to alter the habitat and reduce the population. As would be expected there were differences in populations between the hill units and meadow units. Voles were the predominant rodent, trapped in meadows and Ord's Kangaroo rats and harvest mice were predominant in the hills.

Numbers of plains pocket gopher mounds counted were about the same in rested (66 mounds/mile) and short-duration grazed units (73 mounds/mile). The higher count in 1989 may be due to the count being done in October rather than August as was the case in 1987 and 1988.

Of interest is the high numbers of rodents present, especially in the hill Units 31B and 22B*. Rodents are surely impacting the grassland and soil, perhaps more than cattle. Burrowing, mounds, cuttings, and signs of rodents are present in almost all areas.

VI. SNAKES

A. Methods

Snake numbers were sampled in meadow units 25A and 26B* with funnel traps with hail screen leads 25 centimeters high. Traps were all 15 meters long including the capture boxes which were also made of hail screen and covered with burlap.

All traps were set with one end of the lead at a wetland edge. Wetlands dried up over the period of the study so leads were not at the waters edge at the completion of the study. In 1987, there were 2 traps each in 25A and 26B*. In 1988, 2 traps were added to each unit for a total of 4 per unit. Traps were operated from May 15 to August 31 in 1987; May 1 to August 30 in 1988; May 1 to August 28 in 1989; and May 3 to August 30 in 1990. From 1987 through 1989 all snakes were released at the trap site. In 1990, all snakes but bullsnakes were released. Bullsnakes were destroyed in 1990. From 1987-89 scales were clipped off the jaw of bullsnakes captured. It is not known if this mark was reliable for checking for recaptures. All snakes had total length and length to vent measured.

B. Results

A total 410 snakes were captured over the period of study. Blue racers and garter snakes were the most common species. Bullsnakes and hognosed snakes were lesser in number. Table 10 shows snakes captured by unit over the 4 years. The average length for each species is also shown.

Table 10. Snakes captured in rest and short-duration grazed meadows at Valentine NWR, 1987-1990.

Unit	Bullsnake	Bullsnake % Female	Blue racer	Garter	Hognose	Total
26B*	11 (86cm)	80	67 (99cm)	67 (67cm)	9 (57cm)	153
25A	39 (104cm)	88	93 (95cm)	106 (71cm)	19 (52cm)	257

Average length is in parenthesis.

More snakes of all species were captured in the rest unit than in the short-duration grazed unit. Bullsnakes captured in the rest area were larger on an average than those caught in the short-duration grazed unit.

The effectiveness of the different traps, for the years 88-90 when four snake traps were used in each unit, was compared. In 26B*, the traps caught 2,2,2 and 4 bullsnakes each. In 25A, the traps caught 12, 2, 15, and 8 bullsnakes each. The sex of bullsnakes caught was determined by comparing the length of the tail to total length. Female snakes have shorter tails (9-16 percent of total length) than male bullsnakes (tail 21-30 percent of total length.) In 26B*, 80% of snakes captured were female and in 25A, 88%. The reliability of using tail length to sex bullsnakes needs to be confirmed.

C. Discussion

The short-duration grazed unit had fewer snakes of all species than the rest unit. This is probably due to the reduced thatch which is important cover for snakes. The vole population, an important food for snakes, was also reduced at least in 1988. Jules Fox also found reduced use of grazed meadows by bullsnakes at Crescent Lake NWR. The bullsnake destroys large numbers of waterfowl nests on Valentine NWR. Fewer nests were destroyed by snakes in the short-duration grazed unit (20 percent) than in the rest unit (35 percent). This is discussed further in the waterfowl nesting section of this report. Confounding this result is the fact that the short-duration grazed and rest units are adjacent and bullsnakes are highly mobile. The possibility exists that bullsnakes moved from the grazed (26B*) into the rest area (25A). The larger snakes found in 25A (104 cm average length) are also more effective predators on nests than the smaller (86 cm average length) bullsnakes found in 26B*. Part of the difference in length may be due to more female bullsnakes, generally larger, being captured in the rest than in the short-duration grazed unit.

VII. VEGETATION

A. Method

The point-sampling method of Savory (1985), Center for Holistic Resource Management Aide Memoir for Biological Monitoring, was used in the upland Units 22B1*, 22B2*, 31B and the George Wiseman Natural Area. One transect was run in each unit. The distance from the dart tip to the nearest non-sedge plant was measured rather than the distance to the nearest plant. In 1990, a height-density reading with a pole marked in one inch increments was added to each transect. Two readings were taken at 50 points.

Meadow sites 26B* and 25A were monitored using height-density transects as described by Kirsh (1979), Instructions for Use of Height-Density Pole for Evaluating Wildlife Habitats on Grasslands. Twenty-five points with 4 readings at each point were taken for each transect. Grass species were also noted where each reading was taken. Observations on grazing were noted and photo points recorded.

B. Results

The hill Units 22B1* and 22B2* were short-duration grazed from 1986 - 1991. Grazing was done in June and July for periods of 3 to 6 days. AUM's per acre utilized ranged from .11 - .28. A detailed description of the grazing done is found in the Appendix. Unit 31B was rested from 1987 through 1989. In 1990, part of the unit was short-duration grazed but only following completion of this study.

Little difference was seen between the rested hill unit 31B and the short-duration grazed unit 22B* over the course of this study. No consistent differences were seen between the short-duration grazed unit and the rested unit in cover, canopy, capping, plant type, distance between plants, cool/warm season grasses, or plant age. Table 11 summarizes information gathered using the Savory monitoring technique.

Table 11. Summary of vegetation monitoring in upland units at Valentine NWR, 1987 - 1990 averages.

	Units			
Parameter	31B	22B1*	22B2*	Natural Area[1]
% COVER				
Bare	23	22	19	19
Litter 1	19	27	27	20
Litter 2	47	40	45	41
Basal	12	11	10	20
CANOPY				
Grass	68	66	73	64
Forbs	15	19	9	20
CAPPING				
Mature	>1	0	>1	4
Young	5	1	3	12
Recent	29	44	37	17
Broken	5	>1	0	5
Covered	63	60	60	62
PLANT TYPE				
Grass	88	92	87	84
Forb	11	7	9	5
x in " between Plants	1.7	2.0	1.5	1.6
Cool Seasons	13	8	7	6
Warm Season	78	84	80	77
AGE				
Seedling	1	>1	0	0
Young	56	56	62	41
Mature	44	32	38	59
Dead	1	1	0	0
Over-rested	0	0	0	0
Height-density in.[2]	5.5	4.9	4.4	-

1 - transect done only 1 time in 1989
2 - done only 1 time in 1990

Observations made following grazing in the hill units over the course of the study follow:

1. Some trailing occurred.
2. Cattle grazed entire area including the tops of hills in some years.
3. Open sand areas were marked by hooves.
4. Old and new dung broken up in some places by hoof action.
5. Cattle did not graze over entire unit in some years.
6. Little bluestem was not grazed, some trampled.
7. Some dead material trampled but little broken down.

8. Following grazing there was quite a bit of cover remaining in all years.
9. Insects, especially grasshoppers, were numerous.

The rest meadow unit 25A was given a spring grazing treatment in 1986 and rested from 1987-1990. The short-duration grazed unit 26B* was fall grazed in 1986 and then short-duration grazing was done in early June in 1987 and in the first part of July in 1988 and 1989. The unit was divided into two units in 1987 and into 4 units in 1988. Sub-units were grazed for 2 to 6 days at a rate of .11 to .53 AUM's/acre. More complete information on grazing is given in the appendix. In 1990, part of Unit 26B3 burned and was dropped from the study. This unit was also grazed in the spring of 1990. The rest of 26B was rested in 1990 at least until data collection was completed.

Robel readings in meadows were taken in early May to evaluate cover for nesting waterfowl and grouse and again in late August to evaluate growth over the summer. Robel readings were higher in the rest area in May than in the short-duration grazed unit. Robel readings increased in the short-duration grazed unit over the summer due to regrowth but did not catch up to the rest unit. This information is summarized in Table 12.

Table 12. VOR averages in meadow units at Valentine NWR,1989.

Unit	Transect	May	August
26B*	a	.8	1.3
26B*	b	.7	1.6
26B*	c	.8	1.7
26B*	d	.8	1.7
26B(combined)		.8	1.6
25A	a	1.2	3.8
25A	b	.9	2.0
25A(combined)		1.1	2.9

General observations made in Unit 26B* following grazing follow:

1. The best growth occurred in 1987 when grazing was done in early June.
2. Most green grasses were grazed one time.
3. Some trailing occurred.
4. Very little dried grass was eaten.
5. Dung was not broken down by hoof action until AUM/acre approached .5.

6. Cattle covered entire area some years and some years only parts.
7. Trailing was less as stock density increased.
8. Dried grasses were trampled but little broken into small pieces.
9. Switchgrass was left in a "clumpy" pattern following some grazes.
10. Following July short-duration grazed grass grew little foliage, just went to seed.

C. Discussion

There was little difference seen between the rested hill Unit 31B and the short-duration grazed Unit 22B* (Table 11). The units were uniform in almost all parameters measured using the Savory monitoring system. In 1989, a transect was also run in the George Wiseman Natural Area which has 35 plus years of rest. This area was also little different from the short-duration grazed unit (Table 11). General observations in the short-duration grazed unit suggest that grazing at the rate of around .1 AUM/acre did not greatly alter or impact vegetation. Another factor is that the rest area was not grazed by cattle but rodents and insects are impacting the vegetation here and perhaps on the short-duration grazed area even more than cattle. Evidence of rodent and insect activity was abundant. Grasshoppers were numerous each year of the study as were pocket gophers, which turn over large portions of the area each year with their burrowing activity. There was little buildup of thatch in the hill study units. More intense short-duration grazing may impact and improve vegetation. In hill units not included in this study improvements in grassland have occurred under short-duration grazing.

Short-duration grazed meadow units did not provide as much cover as the rest units. Robel readings were consistently lower in the grazed than in the rest unit (Table 12). The implications of this are discussed in the waterfowl section. In 1987, the short-duration grazed unit was grazed in June. In this year growth was very good and almost equaled the rest unit. This occurred again in 1990 when the short-duration grazed unit was rested through the growing season. Short-duration grazing on meadows may have some use if rest is added into the cycle.

Presently a spring grazing treatment is used on meadows. This treatment produces excellent growth of grasses but eliminates waterfowl nesting in the year of treatment and reduces it the following year. A short-duration graze in July on a meadow could be used instead of a spring grazing treatment with a reduced loss of nesting. Rest would then follow for several years as is done with a spring grazing treatment.

APPENDIX

Exhibit 1. Nesting densities and success on rest and short-duration grazed areas a Valentine NWR, 1990

unit	acres	nests	nest/100 acres	Mayfield	trad	sucess/100
26B*	295	62	21	15	31	6
25A	130	30	23	3	10	2

Exhibit 2. Causes of nest loss on rest and short-duration grazed areas at Valentine NWR, 1990

unit	nests	success	unsuccess	bullsnake deprad/dest	mammal dest	aband	unknown
26B*	62	19	42	1	18	20	4	1
25A	30	3	27	1	18	6	2	1

Exhibit 3. Waterfowl nests by species in short-duration grazed and rest areas at Valentine NWR, 1990

unit	acres	mallard	b.w.teal	shovelor	gadwall	pintail
26B*	295	4	54	2	0	2
25A	130	7	17	3	3	0

Exhibit 4. Prairie grouse flushed on line transects at Valentine NWR in 1989 and 1990

unit	transect length	grouse flushes by month O N D J F M A	total
22B*	1.3 mile	7 2 1 7 0 2 0	19
31B	1.5 mile	0 1 1 0 2 0 2	6

Exhibit 5. Prairie grouse nesting on short-duration grazed and rested areas at Valentine NWR, 1990

unit	shart-tail		prairie chicken	
	successful	unsuccessful	successful	unsuccessful
26B*	0	2	1	4
25A	1	0	0	0

Exhibit 6. Snakes captured in funnel traps from May 3 - August 30, 1990 at Valentine NWR.

unit	bullsnakes	blue racer	garter	hognosed	total
26B*	1	20	0	4	25
25A	12	18	5	3	38

Exhibit 7. Robel reading averages in meadow rest and short-duration grazed areas at Valentine NWR, 1990

unit	transect	May	August
26B*	a	.8	1.7
26B*	b	.7	1.5
26B*	c	.7	1.8
26B*	d	.9	1.8
25A	a	1.5	3.3
25A	b	.9	1.5

Exhibit 8. 1987 grazing history for study units a Valentine NWR

unit	acres	dates	days	AUMs/acre	stock
26B(W)*	235	5/26-29	3	.12	286 adult
26B(E)*	225	5/29-6/1	3	.12	286 adult
22B2*	461	6/1-6/6	5	.11	237 cows and
22B1*	330	6/6-6/10	4	.12	calves

Exhibit 9. 1988 grazing history for study units at Valentine NWR

unit	acres	dates	days	Aums/acre	stock
26B1*	110	7/12-15	3	.53	602 adults
26B2*	115	7/15-18	3	.50	602 adults
26B3*	110	7/6-9	3	.53	602 adults
26B4*	125	7/9-12	3	.46	602 adults
22B2*	461	7/11-17	6	.12	230 cows/
22B1*	330	7/17-21	4	.12	calves

Exhibit 10. 1989 grazing history for study units at Valentine NWR.

unit	acres	dates	days	AUMs/acre	stock
26B1*	110	7/5-7	2	.43	724 adults
26B2*	115	7/11-13	2	.41	724 adults
26B3*	110	7/9-11	2	.43	724 adults
26B4*	125	7/7-9	2	.38	724 adults
22B2*	421	6/26-30	4	.12	207 cow/calf and
22B1*	240	6/21-24	3	.16	126 adults

Exhibit 11. 1990 grazing history for study units at Valentine NWR

unit	acres	dates	days	AUMs/arcre	stock
26B1*	110	rest			
26B2*	115	rest			
26B3*	110	5/17-22	5	.04	27 adults
26B4*	125	10/5-15	10	.62	188-257 adults
22B1*	240	6/14-17	3	.28	687 adults
22B2*	421	6/4-7	3	.16	687 adults

Exhibit 12. Summary of vegetation monitoring in upland units at Valentine NWR, 1990.

parameter	31B	22B1*	22B2*
%COVER			
bare	25	29	28
litter 1	30	39	30
litter 2	37	28	40
basal	8	4	2
CANOPY			
grass	64	56	63
forbs	21	35	27
CAPPING			
mature	0	0	0
young	9	0	1
recent	45	68	55
broken	0	0	0
covered	46	32	44
PLANT TYPE			
grass	89	93	83
forb	3	5	7
Average dist between plants	2.4 in	2.3 in	1.7 in
Cool seasons	16	12	9
Warm Seasons	73	81	74
AGE			
seedling	4	1	0
young	63	76	81
mature	33	18	19
dead	0	5	0
over rested	0	0	0
Average height/ density inches	5.5	4.9	4.4

APPENDIX

Exhibit 1. Nesting densities and success on rest and short-duration grazed areas a Valentine NWR, 1990

unit	acres	nests	nest/100 acres	Mayfield	trad	sucess/100
26B*	295	62	21	15	31	6
25A	130	30	23	3	10	2

Exhibit 2. Causes of nest loss on rest and short-duration grazed areas at Valentine NWR, 1990

unit	nests	success	unsuccess	bullsnake deprad/dest	mammal dest	aband	unknown
26B*	62	19	42	1	18	20	4	1
25A	30	3	27	1	18	6	2	1

Exhibit 3. Waterfowl nests by species in short-duration grazed and rest areas at Valentine NWR, 1990

unit	acres	mallard	b.w.teal	shovelor	gadwall	pintail
26B*	295	4	54	2	0	2
25A	130	7	17	3	3	0

Exhibit 4. Prairie grouse flushed on line transects at Valentine NWR in 1989 and 1990

unit	transect length	grouse flushes by month O N D J F M A	total
22B*	1.3 mile	7 2 1 7 0 2 0	19
31B	1.5 mile	0 1 1 0 2 0 2	6

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young	63	76	81
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over rested	0	0	0
Average height/ density inches	5.5	4.9	4.4