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Division of Wildlife Conservation

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Interrelationship of Forage and Moose in Game Management Unit 13

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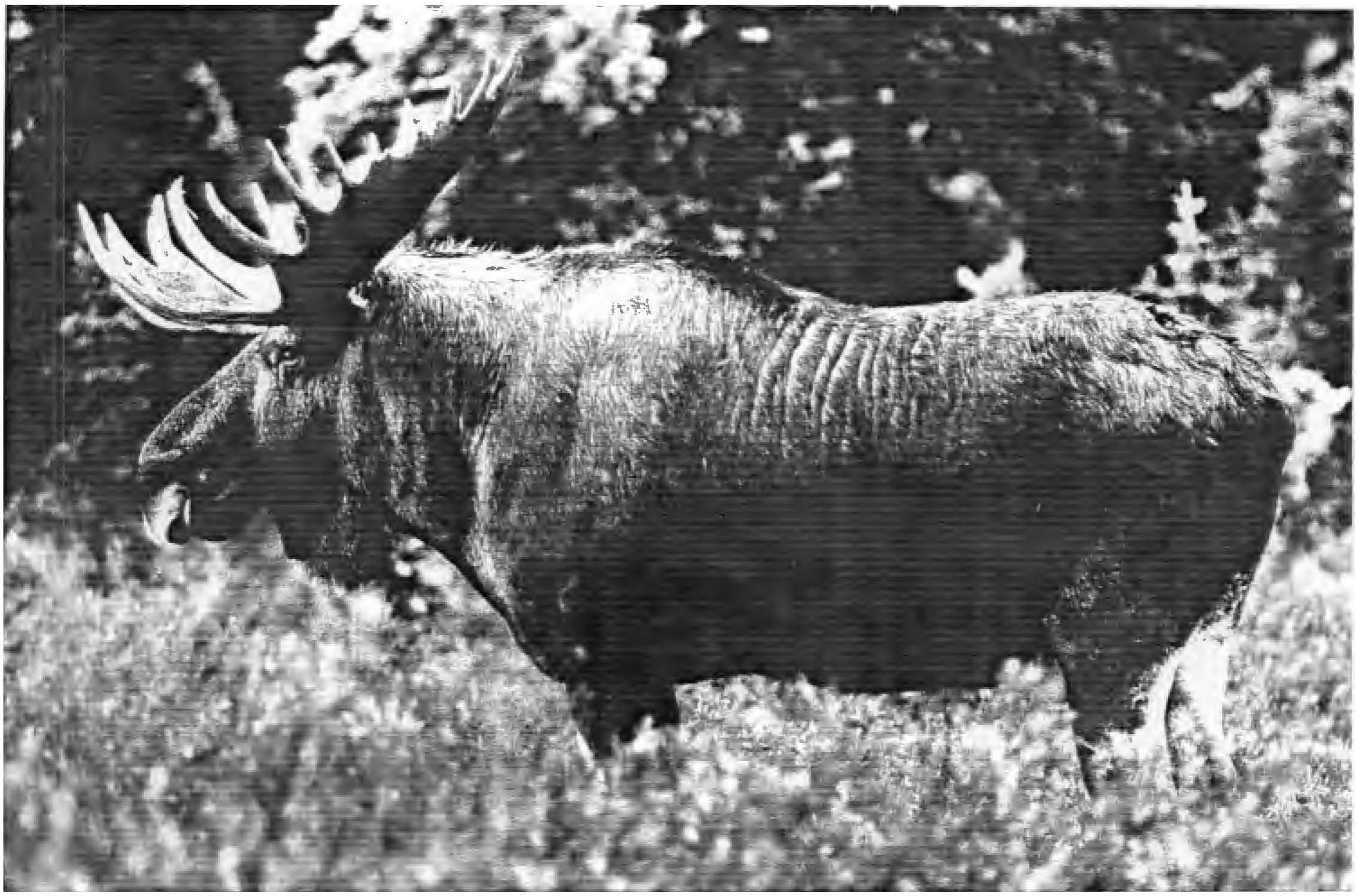

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RESEARCH PROGRESS REPORT

STATE: ALASKA **STUDY NO.:** 1.50

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TITLE: INTERRELATIONSHIP OF FORAGE AND MOOSE IN GAME MANAGEMENT UNIT 13

PERIOD: 1 JULY 1995-30 JUNE 1996

SUMMARY

We constructed 4 exclosures within riparian willow stands in Tyone Creek and Oshetna River floodplains to protect browse clipping experiments. We determined diameter, length, and weight characteristics of feltleaf willow and estimated percent utilization for winters 1994-1995 and 1995-1996. Feltleaf willow twigs are generally larger in the Oshetna drainage than in the Tyone drainage. Percent browse utilization was 76.2 % and 82.0 % in winter 1994-1995, but only 12.0 % and 13.0 %, respectively, in winter 1995-1996.

CONTENTS

BACKGROUND

The Alaska State Board of Game has selected human consumptive use as the priority for wildlife management in Game Management Unit 13 (GMU 13). In accordance with this priority, the Alaska Department of Fish and Game (ADF&G) must determine what biological potential may exist for increasing the productivity and/or harvest of game species, including moose. Management biologists question if Unit 13 moose are limited by forage resources or predation, or a combination of both.

Availability of nutrients to moose is one aspect of ecological carrying capacity that must be determined before these questions can be answered. Nutrient availability is affected by forage productivity and availability relative to weather conditions and utilization histories. Assessment of these factors will be useful in development or modification of strategies to manage harvest and habitat for the welfare of Unit 13 moose.

According to Bishop and Rausch (1974), range condition has operated as a limiting factor to the Unit 13 moose population in the past. Ballard et al. (1991) believed the degree of this limitation was unclear but recognized the significance of severe winters and their influence on forage availability as a probable cause of Unit 13 moose productivity declines. They also recognized the significance of habitat decline resulting from fire suppression and subsequent vegetation succession.

Effects of moose foraging affect the quantity and quality of food available to them (Moen et al. 1990, Wolff and Zasada 1979, Molvar et al. 1993, Danell et. al. 1994, McKendrick et al. 1980), causing feedback decreases in moose reproduction (Franzmann and Schwartz 1985, Boer 1992) and increased mortality. Forage-moose relationships are complicated by factors of snow accumulation in winter (Bishop and Rausch 1974, Schwab and Pitt 1991, Coady 1974, Telfer 1970 and 1978) and amount of solar radiation in summer (Bo and Hjeljord 1991). Ecological carrying capacity for moose is also affected by frequency and intensity of fire (Spencer and Hakala 1964, Wolff and Zasada 1979).

OBJECTIVES

To identify relationships of moose browse availability and quality to utilization histories, I will test the following null hypotheses:

H1. Productivity of principle winter browse species in Unit 13A is not limited by previous levels of utilization by moose (tested at 4 levels of utilization).

H2. Crude protein and digestible energy of current annual growth are not affected by point of origin within the shrub.

H3. Winter nutrient consumption rates are not limited by utilization in prior years.

METHODS

SEASONAL DIETS

Winter diets of moose in 3 principal vegetation types are being determined in early, mid, and late winter by backtracking radiocollared moose over 24-hour sets of tracks and counting freshly browsed twigs at feeding sites. This will enable determination of forage species, plant parts, foraging rates, and diet mixing (Hobbs and Spowart 1984). Early, mid, and late winter twig counts, focusing on relative utilization of browse species, are being used to assess browsing preferences and how they are affected by earlier browsing and snow accumulation. Quantities of browse produced and percent utilization are being determined from twig counts in spring (Shafer 1965).

DIET QUALITY

Principal foods (>5% of diet) and composite diets will be analyzed for digestible energy and digestible protein (Robbins 1983). Late winter collections of browse are being used in nutritional analyses.

WINTER BROWSE AVAILABILITY

Twig counts and shrub density estimates will be used to compute availability of winter browse species and associated nutrients in 3 principal vegetation types used by Unit 13 moose in winter: riparian tall willow, hillside diamond willow, and black spruce-willow communities. Availability is being determined by height strata for stems less than 4 cm diameter at 1.5 m above ground (dbh), but only up to 2.5 m height for stems greater than 4 cm dbh.

Constriction of winter browsing areas by snow accumulation will be quantified in terms of browse availability over time as indicated by moose distribution. Moose distribution (use) versus availability will be compared at the population level (Thomas and Taylor 1990). Individual patterns of distribution will be determined by classifying radio locations of moose according to vegetation. Locations of moose being radiotracked in a concurrent study by Ward Testa will be classified by vegetation/habitat type. Goodness-of-fit comparisons will be used to test the null hypothesis that moose use different habitats in proportion to their availability. Individual habitat use will be determined by utilization-availability analyses, using Bonferroni Z-statistics.

BROWSING EFFECTS

Effects of browsing and clipping on feltleaf willow will be evaluated in terms of shrub survival, number of branches, total current annual growth (CAG), distribution/availability of CAG, and browse quality. Feltleaf willow and riparian stands of diamond willow will be evaluated in this manner because they are the principal sources of browse in severe winters when browse availability is most limited. As such, these plants are most susceptible to overbrowsing and most indicative of "carrying capacity." Significance of leaf dimensions, leaf weight, and numbers of flowering stalks and seeds (Cook 1977) will also be investigated to determine their value as indicators of willow vigor.

Interpretation of browsing effects will require knowledge of browsing histories of individual shrubs (Shepherd 1971). Within the principal study area, browsing histories will be approximated through interpretation of shrub structures (numbers and chronological positions of previous browsing points) and supported by interpretation of historical moose trend-count data.

Browsing effects will also be determined through clipping treatments, since interpretations of browsing effects based on approximated histories are prone to subjective biases and are less conclusive than results from controlled experiments. Four exclosures (600 m^2) were constructed within riparian willow stands to protect clipping treatments from browsing interference by moose and caribou. Exclosures are on state land in Tyone Creek and Oshetna River floodplains.

Inside each exclosure, 4 treatment levels of utilization (none, light, moderate, and heavy) will be imposed in each exclosure. "Heavy" clipping treatments will simulate 90% utilization, or approximately 15% more than what Wolff and Zasada (1979) suggested represents the carrying capacity of feltleaf willow. "Light" and "moderate" levels of clipping will approximate 30 and 60% utilization, respectively. Actual utilization as currently occurs outside the proposed exclosures will be treated as inference covariates in analysis of shrub responses. We will analyze shrub response annually following a repeated measures, randomized block design, blocking on site (exclosure) in each vegetation type.

RESULTS

SEASONAL DIETS

Snowfall in winter 1995-1996 was infrequent and limited, making backtracking of moose inefficient for most of the winter. Presence of caribou further compounded the problem of tracking, and the effort was postponed until winter 1996-1997.

DIET QUALITY

Diet quality assessment was postponed until seasonal diets are determined.

BROWSING EFFECTS

Exclosures were constructed at 2 locations in the floodplain of the Oshetna River and at 2 locations in the floodplain of Tyone Creek.

Height distribution of browsing and mean diameters of utilization were determined in April 1996 for the purpose of setting clipping criteria.

Percent of terminal feltleaf willow twigs browsed in winter 1994 - 1995 in the Tyone and Oshetna drainages were 76.2% and 82.0%, respectively, but only 12.0% and 13.0%, respectively, in winter 1995-1996 (Table 1). In winter 1994-1995 deep snow accumulations concentrated moose in drainage bottoms, whereas snow accumulation in winter 1995-1996 did not restrict moose to drainages.

Diameter, length, and weight characteristics of feltleaf willow CAG (Table 2) were determined late March-early April in the Oshetna and Tyone drainages.

RECOMMENDATIONS

We should make twig counts and shrub density estimates for estimating browse and nutrient availability during winters when moose distribution is restricted by snow. Clipping treatments in exclosures should be maintained for the next 4 years to determine effects on shrub productivity and browse availability.

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Table 1. Percent utilization of feltleaf willow by moose. Standard deviations are in parenthesis.

	Oshetna River		Tyone Creek	
Twig height	1994-1995	1995-1996	1994-1995	1995-1996
0.5 - 1.5 m	n.d.	9.3(11.1)	n.d.	4.3(4.5)
1.5 - 2.5m	n.d.	10.5(3.4)	n.d.	5.0(4.2)
Terminal	82.0(22.2)	13.0(11.6)	76.2(16.2)	12.0(12.8)

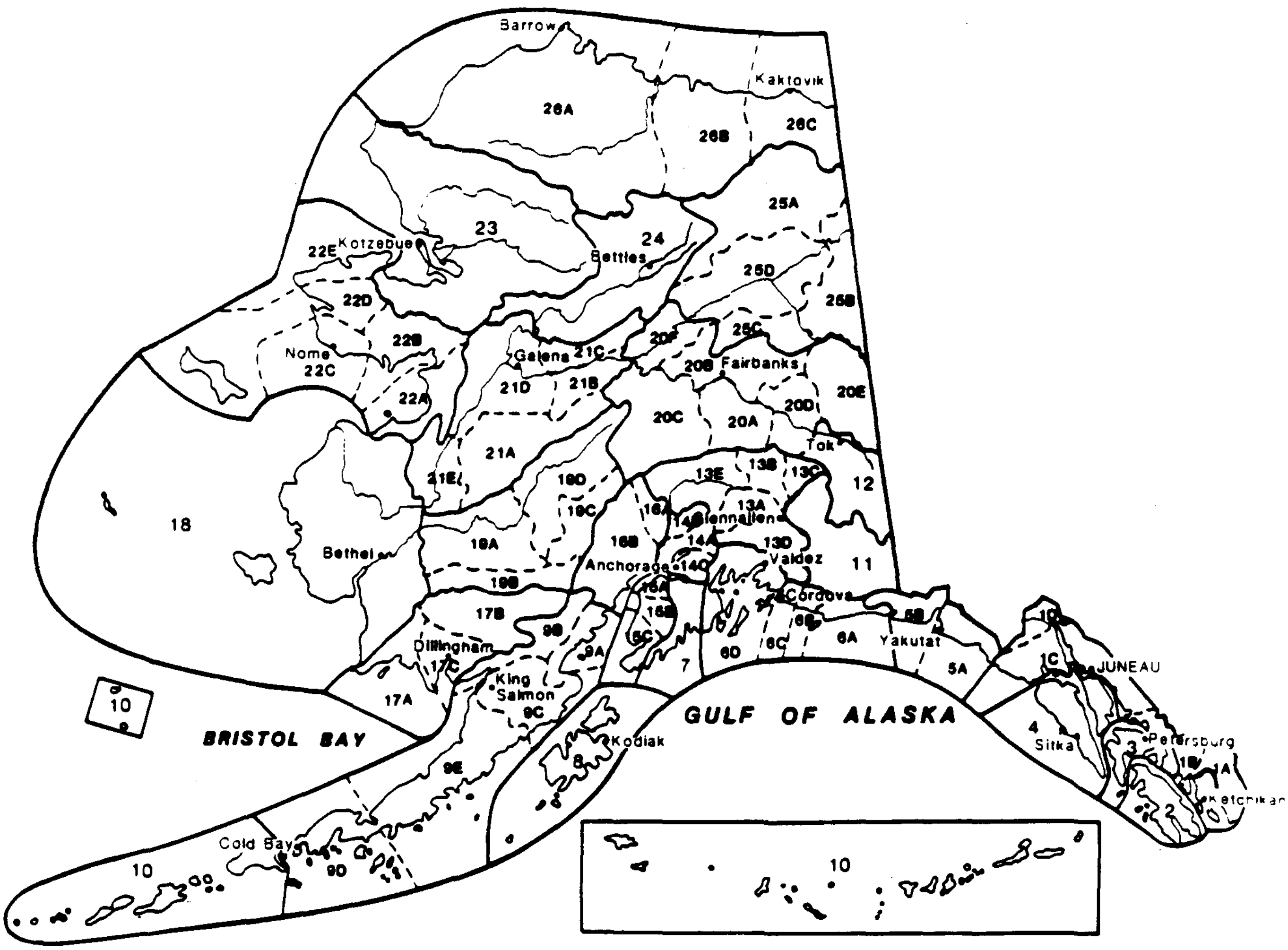
Table 2. Characteristics of feltleaf willow current annual growth in the Oshetna (O) and Tyone (T) drainages, 1996.

	diameter (mm)		length (cm)		weight (g)	
	O	T	O	T	O	T
Mean	4.5	3.7	26.8	20.7	1.8	1.1
Minimum	1.4	1.2	2	2	0.05	0.03
Maximum	9.8	8.6	90	80	12.2	10.9
S.E.	0.06	0.05	0.62	0.58	0.08	0.06
95% CI	0.12	0.11	1.27	1.13	0.16	0.11
n	666	609	666	609	666	609

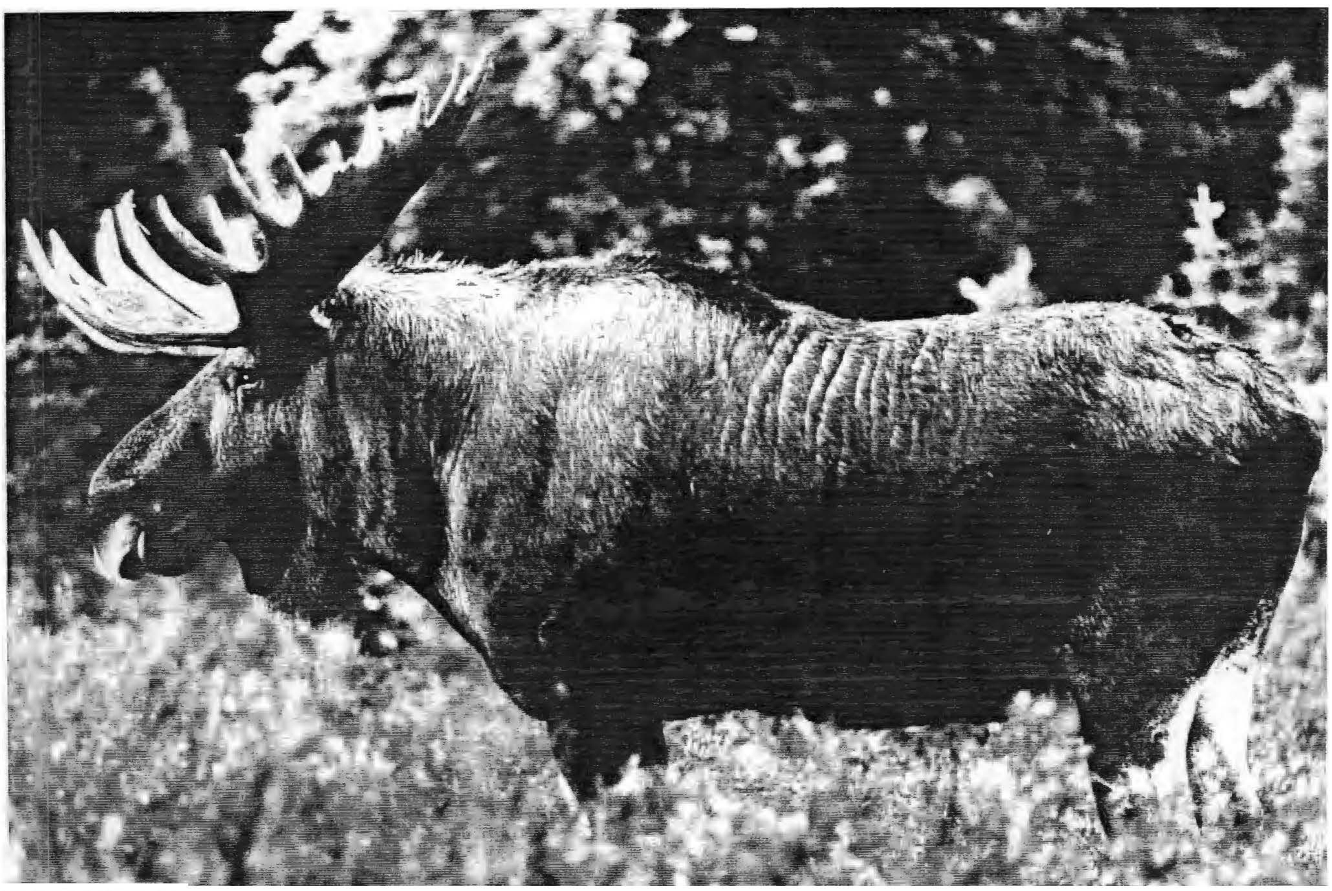
NOTES

NOTES

Alaska's Game Management Units



The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program allots funds back to states through a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum 5% of revenues collected each year. The Alaska Department of Fish and Game uses federal aid funds to help restore, conserve, and manage wild birds and mammals to benefit the public. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes for responsible hunting. Seventy-five percent of the funds for this report are from Federal Aid.



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