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RESPONSE OF *VACCINIUM OVALIFOLIUM* TO FERTILIZATION

By

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Final Report
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FINAL REPORT (RESEARCH)

State: Alaska

Cooperators: Harry R. Merriam

ProjectNo.: W-17-2 Project Title: Big Game Investigations

Job No.: 2.3R Job Title: Response of Vaccinium Ovalifolium to Fertilization

Period Covered: July 1, 1969 to June 30, 1970

SUMMARY

In May 1969, 1,500 acres of cutover forest land in the vicinity of Muddy River, near Petersburg, Alaska, were treated with the fertilizer biourea (46% N). Application was at the rate of 400 pounds per acre. The project was conducted by the U. S. Forest Service and was on lands within the Tongass National Forest.

Samples of the deer browse species Vaccinium ovalifolium (blueberry) were collected from fertilized and non-fertilized sites seven months after application to determine changes in growth rates and protein levels. In addition, protein analyses were made on V. ovalifolium samples from plots located near Juneau, Alaska, which had been treated with known amounts of fertilizers.

Average current annual growth was 6.1 percent greater on fertilized areas at Muddy River than on non-fertilized areas. Protein content averaged 7.04 percent from non-fertilized areas and 8.56 percent from fertilized areas. No correlation was observed in plots treated with various applications near Juneau.

CONTENTS

BACKGROUND

Fertilizers (primarily nitrogens) have been used for many years in Scandinavian countries and Canada to accelerate growth of commercial timber species. In the United States, fertilizers are widely used on agriculteral lands, on forest nurseries and on some private forest lands, but until recently have not been utilized extensively on National Forest lands. The increased demand for forest products has prompted the U. S. Forest Service to investigate methods of increasing the productivity of the nation's forests. The use of fertilizers is one obvious technique.

In spite of lack of widespread use on National Forest holdings, much research had been done and Davies (1969), Gessel (1960 and 1966), Swan (1968) and Weetman (1969) all report increased tree growth resulting from the addition of nitrogen and other fertilizers to forest soils. Additional literature on forest fertilization programs and research is included in the Proceedings of the Third North American Forest Soil Conference (Youngberg, 1968).

The addition of nitrogen fertilizers to soil has normally resulted in an increase in protein content of plant species, as well as an increased growth rate. Most National Forest lands support big game populations. An increase in quality and quantity of deer food species should have an impact on game populations; however, I was able to locate no recent references on use of fertilizers to improve game habitat.

The Sitka black-tailed deer (Odocoileus hemionus sitkensis) is one of the most important big game species in Southeast Alaska. Its range is almost entirely within the Tongass National Forest. In 1968, the U. S. Forest Service announced plans for a pilot fertilization project near the community of Petersburg. If successful, fertilizers were to be used extensively to increase productivity of forest lands in Alaska. The application of nitrogen to forest lands in Southeast Alaska could also improve the vigor and quality of deer food species. This study was initiated to evaluate such effects. Sampling was confined to Vaccinium ovalifolium (blueberry) which is the most important winter browse species for deer in Southeast Alaska.

OBJECTIVES

To determine changes in quality and quantity of Vaccinium ovalifolium which has been treated with granular urea.

PROCEDURES

In May 1969, approximately 1,500 acres of cutover land in the Muddy River drainage, near Petersburg, Alaska (Fig. 1), were treated with 400 pounds per acre of granular urea by the U. S. Forest Service. A helicopter, equipped with a previously calibrated spreader unit, was used to dispense the fertilizer.

In December 1969, after the cessation of annual growth, samples of V. ovalifolium were collected from five randomly-located fertilized and five non-fertilized sites, all from similar locations on cutover sites within the Muddy River drainage. Two year's annual growth were included on each stem collected. The annual growth for 1968 and 1969 was measured on more than 1,000 samples from both fertilized and control plots. The 1969 growth was then clipped from each stem and ground to 40-mesh size. Fifty gram samples from each plot sampled were sent to the Wisconsin Alumni Research Institute, Madison, Wisconsin, where proximate analyses were made. In addition, samples of twigs from 12 plots located near Juneau, Alaska, and treated with various rates and types of fertilizers, were also sent to the above-named laboratory for protein analyses.

FINDINGS

Annual Growth

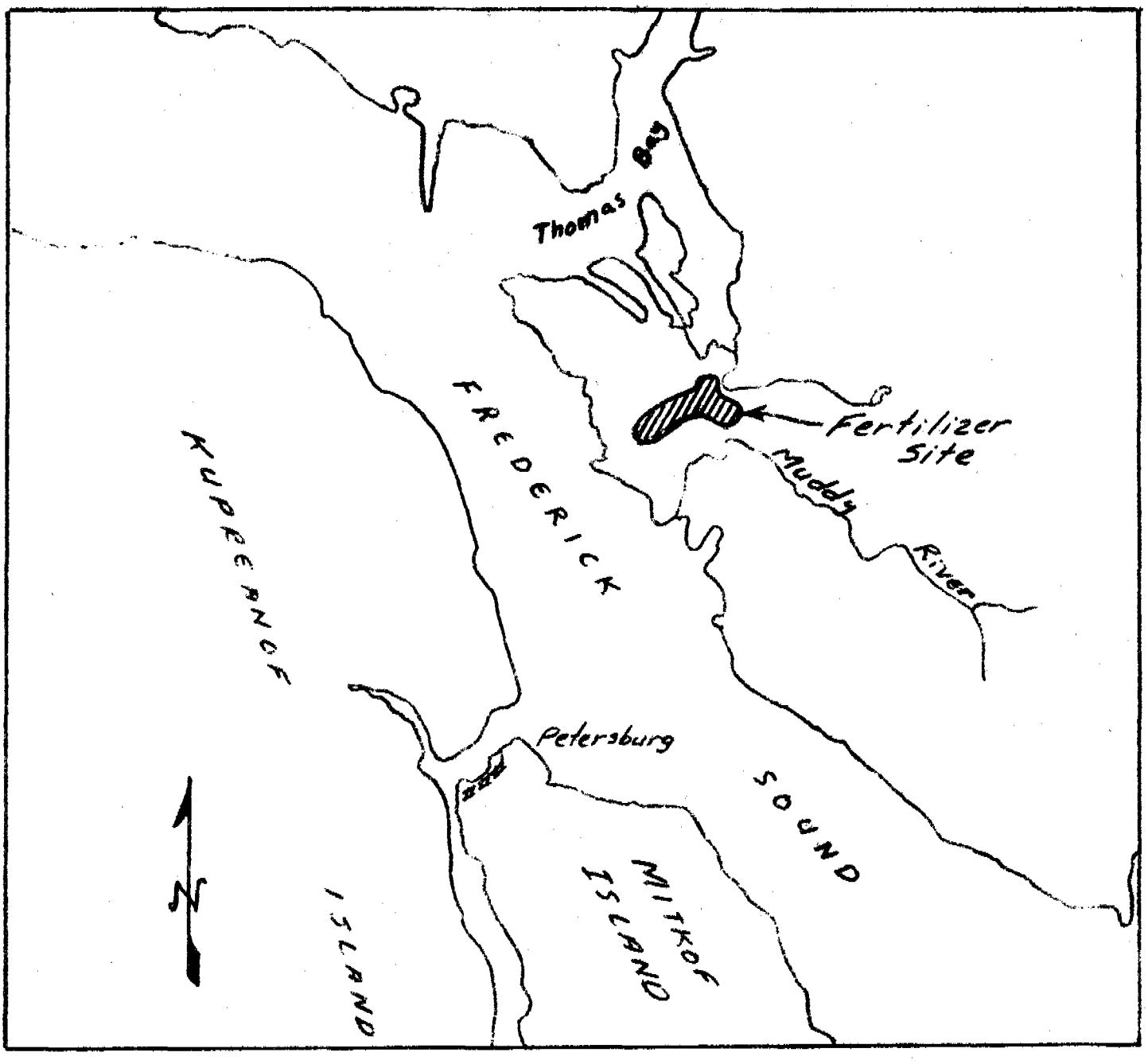
The application of bio-urea (46% N) resulted in an increased growth of 6.1 percent over sites where no fertilizer was applied. Annual growth was measured for the year preceding fertilization as well as for the year after fertilizer application. Both fertilized and control plots showed more growth in 1968, prior to fertilization, than in late 1969. Annual growth for 1968 and 1969 is shown in Table 1. In spite of lesser growth on all plots in 1969 than in 1968, fertilized plots consistently evidenced more growth in 1969 than non-fertilized plots.

Plant Quality

With the exception of one sample (P-F-5), current annual growth of V. ovalifolium plants from fertilized plots had a higher protein content than those from non-fertilized plots. Ash content was consistently lower on fertilized plots, ether extract was slightly lower and little difference was noted for fiber and carbohydrates. Proximate analysis for each sample is given in Table 2.

Protein analyses were also made for V. ovalifolium growth from plots located near Juneau, Alaska which were treated with various combinations of fertilizers. Each fertilized plot also had an adjacent non-fertilized control plot. Results of protein analyses from these plots are shown in Table 3. No difference was observed between fertilized and non-fertilized plots. Shading occurred on some of these plots which may have masked the effects of fertilization.

This study has shown an increase in both vigor and quality of the deer browse species V. ovalifolium after application of 400 pounds per acre of the fertilizer bio-urea (46% N). Chemical applications often have impacts on the environment which are not immediately apparent, however. The results of this study do not imply, therefore, that addition of nitrogen in the form



Scale: 1" = 4 mi

Fig. 1. Muddy River fertilizer site, located near Petersburg, Alaska.

Table 1. Comparison of annual growth of Vaccinium ovalifolium before and after treatment with 400 pounds per acre of bio-urea (46% N).

Control Plots (no treatment)

Plot No.	No. Samples	Ave. Growth (mm) 1968	1969	Growth Ratio 1968:1969
P-C-1	266	123.9	95.0	1.30:100
P-C-2	272	129.2	96.3	1.34:100
P-C-3	319	122.8	107.0	1.15:100
P-C-4	313	119.0	99.8	1.20:100
P-C-5	337	128.2	86.0	1.49:100
Average		124.5	96.7	1.29:100

Fertilized Plots

P-F-1	216	99.5	88.0	1.14:100
P-F-2	256	144.2	109.8	1.32:100
P-F-3	227	101.8	112.8	0.90:100
P-F-4	190	129.7	99.6	1.30:100
P-F-5	249	132.0	102.2	1.29:100
Average		122.0	102.6	1.19:100

Table 2. Proximate analyses of Vaccinium ovalifolium from fertilized and control plots.

Plot No.	Protein	Moisture	Ash	Ether Extract	Fiber	Carbohydrate
			Control Plots (No treatment)			
P-C-1	8.2	4.3	2.7	2.8	30.2	51.8
P-C-2	7.8	3.5	3.1	2.9	28.7	54.0
P-C-3	6.2	8.3	2.8	1.8	34.2	46.7
P-C-4	5.8	6.6	4.9	1.7	36.0	45.0
P-C-5	7.2	3.6	2.9	2.1	31.4	52.8
Ave.	7.04	5.26	3.28	2.26	31.10	50.06
			Fertilized Plots (400 #1 Acre bio-urea)			
P-F-1	10.7	2.1	2.0	1.9	36.7	46.6
P-F-2	9.0	3.7	2.3	2.5	30.6	51.9
P-F-3	8.3	3.7	2.6	1.9	35.5	48.0
P-F-4	8.8	3.8	2.2	2.3	32.8	50.1
P-F-5	6.0	4.5	2.3	1.8	39.6	45.8
Ave.	8.56	3.54	2.28	2.08	35.04	48.48

Table 3. Protein content of *Vaccinium ovalifolium* from plots with 1/ various fertilizer treatments.

Plot No.	Treatment (pounds per acre)	Protein
J-1-1	Control	7.0
J-1-5	800# N	6.4
J-1-8	400#N, 200#P_2O_5, 100#K_2O	6.6
J-2-1	Control	7.0
J-2-2	100#N	7.7
J-2-3	200#N	8.0
J-3-1	Control	7.2
J-3-2	100#N	8.3
J-3-4	400#N	7.7
J-3-6	100#N, 50#P_2O_5, 25#K_2O	7.0
J-3-8	400#N, 200#P_2O_5, 100#K_2O	6.9
J-3-9	800#N, 400#P_2O_5, 200#K_2O	7.0

1/ Plots established and samples collected by Freeman Stephans, U.S. Forest Service.

of bio-urea is necessarily good for deer or the total environment. It does show improved quality and quantity of deer browse resulted from fertilization.

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