ALASKA DEPARTMENT OF FISH AND GAME
JUNEAU, ALASKA

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DEER HABITAT STUDIES

by
Harry R. Merriam

Final Report
Federal Aid in Wildlife Restoration
Project W-17-3, Jobs 2.1R, 2.2R and 2.4R (2nd half) and 2.3R
Project W-17-4, Jobs 2.1R, 2.2R, 2.3R and 2.4R and
Project W-17-5, Jobs 2.1R and 2.3R

(Printed July, 1973)

FINAL REPORT (RESEARCH)

State: Alaska

Cooperator: Harry R. Merriam

Project Nos.: W-17-3 W-17-4 and W-17-5 Project Title: Big Game Investigations

Job No.: 2.1R Job Title: Effects of Clearcut Logging on Deer Habitat

Period Covered: January 1, 1971 to June 30, 1973

The initial phases of this study were reported in 1971 (Projects W-17-2 and W-17-3, Job No. 2.1R). Because of reorganization of the Division of Game and changes in responsibilities, the principal investigator was not able to continue this job. The job should therefore be terminated.

PREPARED AND SUBMITTED BY:

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Management-Research Coordinator

APPROVED BY:

Director, Division of Game

Research Chief, Division of Game

FINAL REPORT (RESEARCH)

State: Alaska

Cooperator: Harry R. Merriam

Project Nos.: W-17-3 and W-17-4 Project Title: Big Game Investigations

Job No.: 2.2R Job Title: Effects of the Herbicide 2-4-D on Deer Food Species

Period Covered: January 1, 1971 to June 30, 1972

SUMMARY

In June, 1968, the United States Forest Service treated approximately 700 acres of cutover land in the Nakwasina River drainage on Baranof Island with two pounds per acre of the herbicide 2-4-D to control red alder and thereby release conifer growth. This area was logged by clear-cut methods in 1960. Most forb species showed little effect from the 2-4-D application; however, shrub species evidenced defoliation or total kill of the plants. *Vaccinium ovalifolium* (blueberry), the most important winter browse species for deer in Alaska, was extremely susceptible to 2-4-D and suffered a total kill in areas where it was not protected by a forest canopy.

BACKGROUND

Clearcut logging has been the primary technique of harvesting timber in Alaska for many years. This system is used because it is the most economical method and because forest openings favor Sitka spruce (*Picea sitchensis*) reproduction. These forest openings, and the soil disturbance from moving logs, encourage red alder (*Alnus rubra*) as a primary succession species. Alder grows much faster than conifer species and the resulting shade slows conifer growth. If clearcut areas do not restock rapidly, it will make considerable difference in the cutting cycle and also the allowed annual cut. The Forest Service therefore decided to experimentally eliminate alder by use of herbicides and to augment soil nutrients by the application of fertilizer.

The application of 2-4-D within the Nakwasina drainage in 1968 was an experimental project and an attempt was made to measure impacts on other resources as well as timber.

Many states have utilized herbicides to improve game range. Most herbicides are quite selective and in some cases can eliminate undesirable species and stimulate growth in others. In some species only top-kill occurs and resulting regrowth provides more animal forage than the original plant.

OBJECTIVES

To determine the effects of 2-4-D on Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) food species in Alaska.

PROCEDURES

Prior to spraying, a study area was selected within the spray zone to evaluate the effects of 2-4-D on deer food species (Merriam, 1971). Ten randomly located milacre plots were established and plant species on each plot were recorded. A photo record was made of each plot as well as the general spray area. The area was inspected and measurements and photos were recorded in the fall of 1968 and again in 1969, 1970 and 1971.

FINDINGS

The results were conclusive. 2-4-D kills *Vaccinium ovalifolium* (blueberry), the most important winter deer browse species in Alaska.

In addition to *V. ovalivolium* it also killed *Oplopanax horridus* (devilsclub) and *Menziesia ferruginea* (rusty menziesia); neither is an important deer browse species.

No forbs were permanently affected. *Coptis* spp. (gold thread) and *Cornus canadensis* (ground dogwood) were initially discolored, but

recovered and no permanent damage was noted. Some species of lesser importance to deer including salmonberry (*Rubus spectabilis*) and red elderberry (*Sambucus racemosa*) were initially defoliated, but the plants were not killed. In post-spray years, plant growth appeared to be normal.

The total kill of *V. ovalifolium* indicates that the use of 2-4-D is detrimental to deer range in Alaska. However, areas of dense alder cover normally have very sparse understory, including *V. ovalifolium*. These areas have little present value as deer range and the removal of the alder will probably result in the establishment of more shrub species, including blueberry.

The objective of this study was to determine the impact of 2-4-D on deer food species. We can now say that it kills the most important winter browse species and has negligible effects on other deer food species.

LITERATURE CITED

Merriam, H. R. 1971. Deer Report. Fed. Aid in Wildl. Rest. Progress Report. Projects W-17-2 and W-17-3, Job No. 2.2R.

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FINAL REPORT (RESEARCH)

State: Alaska

Cooperator: Harry R. Merriam

Project Nos.: W-17-3 W-17-4 and W-17-5 Project Title: Big Game Investigations

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

Period Covered: July 1, 1970 to June 30, 1973

SUMMARY

On June 27, 1970, three 0.01-acre plots were treated with 800 pounds, 400 pounds and 200 pounds per acre of the fertilizer granular urea (46% N) to determine response of the deer browse species *Vaccinium ovalifolium* (blueberry) to fertilization. These plots are located on Mitkof Island, near Petersburg, Alaska, in an area which had been clear-cut logged in 1965.

Growth measurements in November, 1972, indicated no significant differences among plots with various treatments nor between fertilized and unfertilized plots. Both treated and untreated plots showed an increase in annual growth from 1969 through 1972, but this increase could not be attributed to the fertilizer treatment.

BACKGROUND

In 1968, the U. S. Forest Service began treating large areas of the Tongass National Forest with the fertilizer granular urea (46% N). Treatment was on areas which had been "clear-cut." The objective was to stimulate conifer growth. The average treatment was 400 pounds per acre and application was by helicopter.

Vaccinium ovalifolium is a successional species in Southeast Alaska and is the most important winter browse species for deer. Its response to fertilizer treatment would, therefore, have some impact on deer populations.

After the first treatment in 1969, the Alaska Department of Fish and Game measured changes in quantity and quality of *V. ovalifolium*. Measurements (Merriam, 1971) indicated an increase in both growth rate and protein content. The studies were inconclusive, however, as the fertilizer was applied by helicopter and there was no method to measure the exact treatment for any given area. To augment this study controlled applications of the same fertilizer were made in 1970. Three 0.01-acre plots were treated with 800 pounds, 400 pounds and 200 pounds of fertilizer, respectively. Growth measurements were made in November, 1972, after cessation of annual growth.

Fertilizers have been used for many years to increase yields of agricultural crops (Carpenter and Williams, 1972). In recent years, fertilizers have also been used extensively to improve game range. The best response is usually in forb species. Browse species have normally shown the least response. This study, though quite limited in scope, was designed to determine if applications of nitrogen to Alaskan deer range actually improves range quality.

OBJECTIVES

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

PROCEDURES

In June, 1970, three 0.01-acre plots were treated with 800, 400 and 200 pounds per acre of granular urea (46% N). In November, 1972, measurements were made of growth, using annual growth scars. Measurements included each year's growth from 1969, one year prior to fertilization, through 1972. Thirty plants were measured on each treated plot with an additional 30 measurements on an adjacent control area which had not been treated.

FINDINGS

Tables 1 through 3 record the growth measurements on the fertilized

Table 1. Annual growth measurements of *Vaccinium ovalifolium* treated with 200 pounds per acre granular urea.

Plant No.	Annual Growth (inches) 1972	1971	1970	1969
1	4.5	3.0	3.0	3.2
2	6.2	4.5	5.0	6.5
3	5.0	8.5	4.7	3.0
4	8.5	5.0	5.2	3.7
5	8.5	5.5	4.5	2.5
6	7.5	5.5	4.5	2.0
7	8.0	8.5	9.0	5.0
8	5.5	5.0	13.0	3.0
9	6.0	7.0	3.5	5.0
10	7.2	5.0	3.0	7.5
11	4.6	5.1	3.2	2.1
12	6.3	6.9	4.8	2.4
13	5.1	5.1	4.9	3.8
14	8.4	8.4	5.0	2.9
15	8.6	5.6	4.7	6.4
16	7.4	5.4	4.3	3.3
17	8.1	5.6	9.2	4.9
18	5.4	4.9	12.8	3.1
19	6.1	5.1	3.3	4.9
20	7.1	8.4	3.2	7.6
21	7.3	4.4	3.7	3.4
22	5.9	3.1	8.8	6.3
23	5.6	4.6	3.2	3.2
24	7.9	2.9	12.8	3.5
25	7.6	8.6	4.6	2.4
26	8.4	4.9	4.4	2.1
27	8.6	5.6	5.1	5.1
28	4.9	5.4	4.6	2.9
29	6.3	8.4	4.9	7.4
30	4.4	5.1	3.1	5.1
Total	2,009	1,710	1,660	1,242
Average	6.70	5.70	5.53	4.13

Table 2. Annual growth measurements of *Vaccinium ovalifolium* treated with 400 pounds per acre granular urea.

Plant No.	Annual Growth (inches) 1972	1971	1970	1969
1	5.2	4.2	6.0	5.0
2	5.0	5.2	5.5	7.5
3	5.0	7.0	8.2	5.5
4	6.2	5.0	7.5	5.5
5	8.2	9.2	3.0	5.7
6	6.8	6.5	5.0	8.5
7	6.0	6.2	3.0	6.0
8	7.5	4.2	3.0	6.0
9	4.5	4.8	3.2	5.0
10	5.5	6.0	6.5	5.5
11	5.6	4.1	6.3	8.4
12	5.1	6.6	6.2	5.8
13	4.7	5.3	3.3	5.7
14	4.8	4.7	5.4	5.3
15	7.6	6.9	3.1	7.4
16	6.1	4.3	8.1	4.9
17	5.9	4.9	2.9	6.3
18	5.1	6.3	7.6	5.7
19	6.7	6.6	4.9	5.6
20	8.1	9.1	3.1	4.9
21	5.7	6.1	5.8	5.1
22	4.3	4.7	5.7	7.4
23	7.6	4.1	7.6	5.9
24	5.9	6.3	8.1	5.3
25	6.7	6.4	3.2	8.4
26	8.3	9.3	4.8	5.6
27	5.1	7.1	3.1	6.1
28	5.1	4.9	2.9	5.9
29	4.9	5.0	6.3	5.7
30	6.3	4.4	3.4	4.8
Total	1,795	1,754	1,527	1,804
Average	5.98	5.85	5.09	6.01

Table 3. Annual growth measurements of *Vaccinium ovalifolium* treated with 800 pounds per acre granular urea.

Plant No.	Annual Growth (inches) 1972	1971	1970	1969
1	6.2	6.0	5.0	7.0
2	6.5	2.5	3.0	7.5
3	8.0	3.5	2.0	5.5
4	3.2	1.5	3.0	2.7
5	7.5	5.0	1.5	4.5
6	6.5	4.0	2.5	5.0
7	8.5	9.5	6.5	10.0
8	6.2	4.5	5.5	5.5
9	7.5	6.0	2.5	5.0
10	9.0	6.2	5.0	4.7
11	3.4	2.0	4.9	9.8
12	7.6	3.0	5.6	5.7
13	6.4	2.7	2.7	5.1
14	6.3	5.8	6.3	4.6
15	7.7	4.1	2.7	5.1
16	6.3	4.9	2.8	4.6
17	8.4	9.7	1.6	7.4
18	6.3	4.3	1.9	5.6
19	8.8	6.5	3.2	3.0
20	7.7	5.7	4.8	6.7
21	6.7	5.9	5.1	4.4
22	6.0	2.6	2.9	5.3
23	3.3	1.6	4.9	6.0
24	7.9	3.4	2.6	9.5
25	6.7	3.9	5.3	4.9
26	7.3	5.1	2.2	4.6
27	6.5	9.3	6.4	2.9
28	8.3	4.7	3.1	5.3
29	8.7	6.1	2.3	8.1
30	7.8	6.1	1.7	6.4
Total	2,072	1,461	1,095	1,724
Average	6.91	4.87	3.65	5.75

Table 4. Annual growth measurements of *Vaccinium ovalifolium* receiving no fertilizer treatment.

Plant No.	Annual Growth (inches) 1972	1971	1970	1969
1	7.0	5.7	4.5	6.0
2	6.0	5.5	6.0	6.5
3	6.2	2.5	6.2	7.5
4	7.8	7.5	4.5	7.5
5	6.0	5.2	3.5	4.5
6	8.3	5.5	3.8	3.0
7	5.2	4.0	4.8	5.0
8	8.7	4.0	5.0	3.2
9	7.0	6.2	4.5	6.0
10	5.2	7.2	7.5	8.5
11	6.9	5.5	7.4	5.9
12	6.1	5.7	4.6	6.6
13	7.9	3.0	5.2	7.3
14	5.8	7.0	4.6	7.8
15	8.5	5.0	3.9	4.4
16	5.1	5.7	3.4	3.1
17	8.8	4.3	4.7	4.9
18	6.9	3.7	6.0	3.3
19	5.3	6.3	6.1	6.1
20	6.1	7.1	4.4	8.4
21	7.3	5.8	7.1	8.6
22	5.7	5.4	4.9	5.9
23	6.3	3.4	5.3	3.1
24	7.7	6.6	4.5	5.1
25	6.0	4.9	3.8	2.9
26	8.5	5.8	3.5	4.6
27	5.0	4.5	7.0	7.6
28	8.9	3.5	5.0	7.4
29	6.8	6.2	4.7	6.4
30	5.0	7.2	3.8	6.1
Total	2,020	1,599	1,502	1,732
Average	6.73	5.33	5.06	5.77

Table 5. Summary of annual growth measurements on plots treated with granular urea and untreated plots.

Treatment (#1 AC)	Average Annual Growth (inches) 1972	1971	1970	1969	Sample Size (plants)
None	6.70	5.70	5.53	4.13	30
800	5.98	5.85	5.09	6.01	30
400	6.91	4.87	3.65	5.75	30
200	6.73	5.33	5.06	5.77	30

plots and Table 4, the unfertilized control plot. Table 5 summarizes both treated and untreated control plots.

No difference was noted among plots treated with various applications of granular urea nor between fertilized and nonfertilized plots. *Vaccinium ovalifolium* growth is apparently not influenced by the addition of nitrogen to the soil on this particular site.

Both fertilized and control plots showed an increase in growth from 1969 to 1972 but this could not be attributed to the nitrogen application. Merriam (1971) noted an increase in *V. ovalifolium* growth at Thomas Bay after an application of 400 pounds per acre of granular urea, but this was apparently a normal increase rather than a result of increased nitrogen in the soil.

The visual appearance of the treated plots on Mitkof Island was no different than the surrounding control area. It can, therefore, be stated, at least in this one location in Southeast Alaska, that the addition of nitrogen to the soil had no influence on annual growth of *V. ovalifolium*.

LITERATURE CITED

Carpenter, L. H. and G. L. Williams. 1972. A literature review on the role of mineral fertilizers in the big game range improvement. Colorado Div. of Game. Special Report No. 28.

Merriam, H. R. 1971. Response of *Vaccinium ovalifolium* to fertilization. Fed. Aid to Wildl. Rest. Final Report. Project W-17-2, Job 2.3R.

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FINAL REPORT (RESEARCH)

State: Alaska

Cooperator: Harry R. Merriam

Project Nos.: W-17-3 and W-17-4 Project Title: Big Game Investigations

Job No.: 2.4R Job Title: Browse Production on Alaskan Deer Range

Period Covered: January 1, 1971 to June 30, 1972

SUMMARY

The initial phase of this study was reported in 1971 (Projects W-17-2 and W-17-3, Job No. 2.4R). Annual growth of the deer browse species *Vaccinium ovalifolium* was measured on good and poor deer range on Mitkof Island, Southeast Alaska. Under Project W-17-4, we hoped to expand these measurements to other areas of Southeast Alaska, but because of changes in personnel and responsibilities this was impossible. The job should be terminated.

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