ALASKA PLANT MATERIALS CENTER

ANNUAL REPORT

1976

DEPARTMENT OF NATURAL RESOURCES

Division of Agriculture

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TABLE OF CONTENTS

TABLE OF CONTENTS

INTRODUCTION

Introduction

The development of Alaska's resources has increased substantially in recent years and with it has grown an awareness of the need for environmental protection. The impact upon the environment of the trans-Alaska pipeline, the accelerated highway construction program, urban, and industrial expansion, the growing population's demand for gardens and landscaping -- essentially all man's activities which change the environment -- requires a concomitant effort to prevent or reduce damage to ecological systems or, to restore or replace them when they are damaged. Vegetation is a basic tool of this effort. The development of new plant materials and provision for their propagation and distribution to the public for use in environmental protection has been recognized as one of Alaska's requisite needs.

Representative Jalmar Kerttula of Palmer (now Senator) submitted House Bill 8 to the 1972 Legislature to establish a Plant Materials Center for the purpose of developing "... plant materials needed in soil and water conservation, agriculture, and industry ...." The bill was passed and signed into law (Chapter 138 SLA 1972 AS 03.22) by Governor William A. Egan on June 20, 1972. Responsibility for the operations of the Center was given to the Department of Natural Resources under Commissioner Charles F. Herbert, and through the Department's Division of Agriculture, William G. Lewis, Director. Operations were to be conducted cooperatively by a formal Memorandum of Understanding signed in December 1972 between the Department, the

University of Alaska Institute of Agricultural Sciences, and the USDA Soil Conservation Service. Commissioner Herbert appointed a seven-man Advisory Board to advise on policy for the PMC operations. The Board members were:

Commissioner Herbert
Director Lewis, Chairman
Dr. Donald H. Dinkel, University of Alaska
Dr. Roscoe L. Taylor, USDA Agricultural Research Service
Weymeth E. Long, USDA Soil Conservation Service
Byron J. Hollembaek, Alaska Crop Improvement Association
Doyle McCombs, Alaska Association of Soil Conservation Subdistricts

The objectives of the PMC and the scope of its activities are extensive. Initially, it will assemble, evaluate, select, and increase both native and introduced species of grasses, legumes, forbs, shrubs, and trees. The more promising material will be tested throughout the state for adaptability and applicability to the environmental problems encountered. Genetically pure stocks of seed and propagules will be maintained, including agricultural seeds. Plant materials will be cooperatively released to the public by the Department, the Institute, and the SCS. These new plants, and others presently available to the consumer, will form the foundation of Alaska's developing seed and nursery production industry. Cooperation with many state, federal, local, research, and private agencies will be necessary to successfully accomplish these objectives.

This report covers the technical operations and accomplishments for the 1976 calendar year, including plant collections assembled, seed production studies initiated, production of Foundation grains, physical improvements to land and buildings, purchases of equipment,

and a brief discussion of weather conditions and how they affected operations. Also included is a report on the 1976 fiscal year operations and expenditures.

WEATHER

Weather

The Plant Materials Center is located in southcentral Alaska, 43 road miles northeast of Anchorage and 11 miles southeast of Palmer. The flat 285 acre is 67 feet above sea level located near confluence of the Knik and Matanuska rivers. It is bordered by the Chugach mountains on the south and east, by the Talkeetna mountains to the north, and the tidal flats of Knik Arm of Cook Inlet on the west. The local geophysical factors that contribute to the unique weather conditions at the PMC are: its low elevation, its close proximation to 6300 foot Pioneer Peak, the long shape of Lazy mountain, and the Knik river trough. In brief, temperatures at the lower elevation tend to be cooler. Pioneer Peak totally blocks out the sun for 60 days in December and January and casts shadows in late fall and early spring on windless days. This normally leads to even lower temperatures. Local cloud cover surrounding Pioneer Peak, often shadow the area resulting in cooler temperatures.

The area is sheltered from the brisk northwest Matanuska river winds by the long slope of Lazy mountain about ten miles to the north. At the time the Palmer area may be experiencing high cool winds, the PMC area is calm. Whenever a low front moves in from the east, winds pass over the Chugach mountains down the Knik river trough, a warming trend follows accompanied by high winds, low clouds, and precipitation. These chinook winds have often warmed the area as much as 60 degrees in a 24 hour period in the wintertime.

January

Temperatures for January ranged from a low of -26°F on the 11th and 12th to a high of 45°F on the 30th. The month started out with a cold snap that lasted for 16 days. Daily temperatures above the freezing mark were recorded for the rest of the month. The average daily high was 17°F and the average daily low was -1°F and the monthly mean was 8°F. Four inches of snow fell amounting to .40 inches of melted precipitation.

February

Temperatures for February ranged from a low of -19°F on the 25th to a high of 47°F on the 4th and 5th. The average daily high was 22°F, the average daily low was -1°F and the monthly mean was 10°F. Thirty-four hundredths of an inch of rain was recorded. The above freezing temperatures and rain left the PMC covered with a sheet of glare ice.

March

March temperatures ranged from a low of -13°F on the 14th to a high of 54°F on the 7th. The average daily high was 37°F, the average daily low was 11°F and the monthly mean was 24°F. Ten inches of snow fell and .11 inches of rain was recorded for a total of 1.11 inches of melted precipitation. Five inches of snow remained on the ground at the end of the month.

April

Temperatures for April ranged from a low of 15°F on the 15th to a high of 72°F on the 30th. The average daily low was 29°F and the average daily high was 47°F. The monthly mean was 38°F. Melted precipitation for the month amounted to 1.92 inches.

May

May temperatures ranged from a low of 28°F on the 7th, 9th, and the 17th, to a high of 71°F on the 31st. The average daily high was 58°F, the average daily low was 36°F and the monthly mean was 47°F. Forty-six hundredths of an inch of rain was recorded for the month of May.

June

Temperatures for June ranged from a low of 33°F on the 2nd to a high of 82°F on the 26th. The average daily low was 43°F, the average daily high was 67°F, and the monthly mean was 55°F. Forty-four hundredths of an inch of rain was recorded for the month of June.

July

July temperatures ranged from a low of 38°F on the 3rd to a high of 82°F on the 9th. The average daily high was 69°F, the average daily low was 47°F and the monthly mean was 58°F. One and forty-six hundredths inches of rain fell during the month.

August

Temperatures for August ranged from a low of 33°F on the 28th to a high of 80°F on the 4th. The average daily high was 68°F, the average daily low was 43°F, and the monthly mean was 55°F. Eighty-two hundredths of an inch of rain was recorded for the month of August.

September

September temperatures ranged from a low of 21°F on the 30th to a high of 66°F on the 1st. The average daily high was 56°F, the average low was 38°F and the monthly mean was 47°F. Two and twenty-six inches of rain fell on 13 days of the month.

October

Temperatures for October ranged from a high of 55°F on the 4th to a low of -2°F on the 30th. The average daily high was 41°F. The average daily low was 24°F and the monthly mean was 32°F. Seven and five tenths inches of snow fell and .16 inches of rain was recorded for a total of .91 inches of melted precipitation.

November

November temperatures ranged from a low of 3°F on the 2nd to a high of 53°F on the 28th. The average daily high was 38°F, the average daily low was 20°F and the monthly mean was 29°F. Four and five tenths inches of snow fell and 8.23 inches of rain was recorded for a total of 8.63 inches of melted precipitation. High winds up to 60 miles per hour accompanied the rain.

December

Temperatures for December ranged from a low of -20°F on the 9th to a high of 44°F on the 13th. The average daily high was 22°F, the average daily low was 12°F, and the monthly mean was 17°F. Eleven inches of snow and 1.59 inches of rain fell for a total of 3.42 inches of melted precipitation.

Jesse G. Werner

TABLE 1. Weather Data. Mean monthly temperatures, monthly precipitation, at the Alaska Plant Materials Center.[1/]

Month	Temperature Max	Min	Ave	Rain*	Snow Depth	Melted*	Days Precip. Fell
January	45	-26	8	0	4.00	.40	4
February	47	-19	10	1.39	0.00	.00	4
March	47	-13	24	.11	10.00	1.00	7
April	72	15	38	1.81	.50	.05	3
May	71	28	47	.46	00	0	3
June	82	23	55	.44	00	0	5
July	82	38	47	1.46	00	0	9
August	80	30	55	.82	00	0	13
September	66	21	47	2.26	00	0	13
October	55	-2	32	.22	7.50	.75	9
November	33	3	29	8.23	4.50	.45	15
December	44	-20	17	1.59	11.00	1.10	18
Total				18.79	25.50	3.75	1.03
Average			35	*Total melted precipitation. 22.54			

[1/] Data is recorded at 6:00 p.m. daily
Beginning November 1, 1974 the National Weather Service designated the PMC official weather station for the Butte area.
In addition to standard temperature recordings the PMC also records snowfall, and soil temperatures and moisture content at 5 depths from 3- to 38-inches.
Last freezing date in spring, May 25.
A total of 101 frost-free days.
Maximum temperature 82°.
Minimum temperature -26°.

TABLE 2. Soil Temperatures.1/

Date	Soil Depth 3"	6"	18"	28"	38"
	Degrees				
3-1-76	-	-	-	-	34
3-22-76	24	23	26	27	33
3-29-76	23	-	26	28	33
4-5-76	31	29	28	28	33
4-13-76	34	30	29	29	33
4-19-76	34	30	30	29	33
4-26-76	36	31	30	30	33
5-3-76	42	38	33	31	33
5-10-76	47	42	34	33	33
5-17-76	47	42	36	33	34
5-24-76	48	44	41	34	34
6-1-76	60	53	45	37	34
6-7-76	52	47	45	37	34
6-14-76	58	52	47	40	34
6-21-76	56	52	47	40	35
6-28-76	63	58	48	42	37
7-6-76	49	46	45	41	37
7-12-76	62	52	48	41	37
7-22-76	60	56	50	45	41
7-26-76	58	53	48	45	42
8-2-76	62	56	50	46	41
8-10-76	58	56	51	47	47
8-16-76	56	50	52	48	47
8-23-76	54	48	50	47	46
8-30-76	53	46	50	47	46
9-7-76	48	45	47	46	46
9-13-76	47	44	47	46	46
9-20-76	47	43	46	46	46
9-27-76	45	41	45	45	46
10-4-76	42	37	42	43	45
10-11-76	37	31	38	42	44
10-18-76	36	31	36	38	42
10-25-76	35	31	34	37	40

1/ See footnote at end of table, page 13.

TABLE 2. Soil Temperatures.[1] Cont'd.

Date	Soil Depth 3"	6"	18"	28"	38"
	Degrees				
11-2-76	34	31	34	36	38
11-8-76	35	30	34	36	38
11-15-76	35	30	35	35	37
11-23-76	34	31	34	35	37
11-30-76	34	30	34	34	37
12-6-76	34	30	33	34	37
12-13-76	34	30	34	34	37
12-20-76	34	30	33	34	37
12-27-76	29	26	33	33	35

1/ Meter readings are unavailable below 23°F. A Soil-test soil moisture-temperature meter and probe are utilized for this information.

APPENDIX TABLE 1. Daily maximum and mimimum temperatures.

Day		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Max.	21	35	24	40	66	73	74	77	66	51	33	42
	Min.	9	19	-2	31	33	44	56	50	36	20	9	28
2	Max.	15	35	40	42	56	68	66	69	60	50	26	38
	Min.	-8	3	9	36	42	33	46	50	35	20	3	22
3	Max.	0	39	41	56	59	60	66	76	64	55	27	30
	Min.	-13	13	39	37	35	41	38	39	27	42	10	17
4	Max.	-5	47	45	54	76	66	52	80	58	51	35	22
	Min.	-15	37	35	36	45	46	50	44	40	35	8	16
5	Max.	0	47	39	44	68	60	54	73	58	54	43	25
	Min.	-15	39	13	22	42	44	47	53	32	36	18	15
6	Max.	1	42	47	38	58	56	74	72	63	50	20	27
	Min.	-12	32	13	20	40	44	50	58	24	40	22	11
7	Max.	5	35	54	43	54	61	75	68	62	48	42	28
	Min.	-12	12	28	22	28	45	41	50	38	38	30	13
8	Max.	15	13	37	42	55	66	81	64	63	44	43	10
	Min.	-12	3	22	28	30	45	47	52	37	19	28	-14
9	Max.	1	8	33	44	57	60	82	64	60	44	32	7
	Min.	-25	-8	9	37	28	46	48	50	42	16	22	-20
10	Max.	-14	4	27	41	58	67	73	74	55	38	46	16
	Min.	-14	-10	7	34	45	46	52	48	36	29	26	5
11	Max.	-10	10	38	47	58	74	72	68	54	40	34	41
	Min.	-26	-4	15	34	30	36	50	48	41	28	29	23
12	Max.	-19	12	29	43	55	71	62	66	56	30	48	32
	Min.	-26	-6	4	34	39	46	51	51	39	24	37	18
13	Max.	-16	20	34	38	50	65	68	66	57	44	49	44
	Min.	-25	-6	11	32	30	40	48	41	41	21	42	35
14	Max.	-4	28	26	40	54	73	73	61	57	48	46	38
	Min.	-24	3	-13	28	33	40	43	44	45	33	29	27
15	Max.	10	20	23	39	51	71	70	60	53	49	48	32
	Min.	-5	-2	10	15	29	40	48	44	38	32	42	22
16	Max.	16	11	36	44	57	62	69	60	51	49	47	27
	Min.	-6	-9	13	26	34	40	49	45	43	38	34	16

APPENDIX TABLE 1. Daily maximum and minimum temperatures. Cont'd.

Day		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
17	Max.	40	18	23	53	63	63	67	62	54	48	37	17
	Min.	5	-11	9	23	28	53	49	41	45	38	17	-1
18	Max.	41	15	31	48	53	65	70	70	49	48	27	16
	Min.	25	-15	9	35	33	38	44	44	45	33	14	-4
19	Max.	42	17	34	50	58	68	72	66	56	48	23	20
	Min.	25	-2	12	24	40	46	46	42	35	28	11	0
20	Max.	40	18	48	48	57	65	77	71	64	52	29	16
	Min.	22	-10	14	32	37	49	42	44	48	37	16	11
21	Max.	42	10	45	47	60	63	75	75	50	42	44	42
	Min.	19	-15	5	29	38	44	35	35	45	29	27	26
22	Max.	39	12	50	50	60	59	77	77	56	32	33	31
	Min.	21	-8	20	26	35	45	37	37	50	24	26	16
23	Max.	22	10	44	50	61	68	64	77	57	26	38	42
	Min.	0	-11	15	26	40	40	38	37	35	23	25	14
24	Max.	30	18	39	40	58	77	68	72	64	32	29	22
	Min.	-8	-10	22	26	40	38	44	35	34	22	15	8
25	Max.	29	20	30	40	58	77	73	69	55	33	24	22
	Min.	7	-16	18	31	29	42	42	40	44	27	10	10
26	Max.	30	23	34	51	59	82	71	68	56	32	50	26
	Min.	4	-14	11	36	39	38	58	48	46	14	32	10
27	Max.	30	24	45	52	52	73	72	62	53	18	52	36
	Min.	4	-15	18	39	46	50	54	50	28	5	30	9
28	Max.	43	27	35	63	57	72	66	67	53	32	53	43
	Min.	23	-16	-3	35	39	48	57	33	36	5	45	15
29	Max.	44	26	40	66	63	80	69	66	53	28	50	40
	Min.	36	-13	2	28	41	40	51	34	27	10	42	16
30	Max.	45		38	72	67	77	66	65	50	29	44	36
	Min.	35		-9	29	40	43	51	36	21	-2	35	5
31	Max.			37		71		80	65		41		
	Min.			7		35		40	30		7		
Av	Max.	17.8	22	37	47	58	67	69	68	56	41	38	22
	Min.	-1	-1	11	29	36	43	47	43	38	24	20	12
Mean		8°	10.5	24°	38°	47°	55°	58°	55°	47°	32°	29°	17°

INITIAL EVALUATIONS

ABSTRACT

Initial Evaluation of Herbaceous Plants

Two hundred twenty-eight accessions of grasses, legumes, and forbs were seeded in the spring of 1974. The planting contained 131 native collections, 83 foreign introductions, and 14 accessions from cooperating agencies in the lower 48. Herbaceous initial evaluation programs are completed in three growing seasons. This year marks the end of the first program for initial evaluation at the Alaska Plant Materials Center. Ninety accessions survived for final evaluation in 1976. The most promising collections were *Agropyron boreale* R-5, *A. trachycaulum* PI 372644, *A. violaceum* L-47, *A. yukonense* R-12, *Alopecurus arundinaceus* 'Garrison', *Bromus inermis* X *pumpellianus* 'Polar', *Deschampsia beringensis* R-21, *Elymus arenarius* PI 297345, *E. sibiricus* PI 325315, PI 326268, PI 345600, PI 372696, *Festuca rubra* 'Arctared', *Poa pratensis* 'Nugget', *Lathyrus cicera* PI 174236, *L. sativa* PI 283556, *Lotus ornithopodioides* PI 310413, *Lupinus luteus* PI 289173, *L. nootkatensis* L-21, *Tetragonobolus requieni* PI 244701, *Trifolium hybridium* PI 322758, *Vicia dasycarpa* 'Lana', *V. pannonica* PI 317906, *Artemesia Tillesii* R-33, *Aster sibiricus* L-62, *Atriplex hortensis* PI 310383, *Polygonum persicaria* PI 372749.

Initial Evaluations of Woody Plants

Plant evaluations at Palmer include the initial screening of woody materials for hardiness and general growth performance. Plant materials are assembled from all available sources with emphasis on plant collections from Alaska and other northern latitudes. Accessions showing sufficient hardiness and vigor are moved to secondary evaluations for further testing.

One hundred fifty-six new woody collections were assembled this year at the Plant Materials Center. One hundred five were collections of Alaskan native species; 65 of those were *Salix*. Fifty new accessions were planted in initial evaluations this year bringing the total plantings under observation in 1976 to 140. Forty-one accessions were winterkilled during the 1975-1976 winter; 17 more seriously injured. Accessions showing outstanding hardiness and growth performance during 1976 include *Salix*

alaxensis L-113 and L-130, *Artemisia frigida* L-93, *Elaegnus commutata* L-103, *Populus petrowskyana* A 49333, and *Potentilla fruticosa* L-8, A 48462, and A 7058. *Salix alaxensis* L-113 and L-130, and *Populus petrowskyana* A 49333 will begin secondary evaluations in 1977.

Initial Evaluations of Rose Cooperative

The cooperative rose evaluation project at Palmer is a combined effort between the Alaska Rose Society and the Alaska Plant Materials Center to evaluate cultivated rose varieties for hardiness and growth performance in Alaska.

The first planting of 14 varieties in 1974 survived the 1974-1975 winter well but were completely winterkilled during the 1975-1976 winter. A second planting with 13 varieties from Beaverlodge, Alberta will be evaluated in 1977.

SECONDARY EVALUATIONS

ABSTRACTS

Establishment of Vegetation on Beluga Coal Field Core Samples

Core samples of overburden material from the Beluga coal fields representing depths from 233 feet to 278 feet were evaluated in the greenhouse for establishment of vegetation from seed. Twelve species of grasses, legumes and forbs were placed on the soil surface and germinated under a mist microclimate. No fertilizer or soil amendments were used. Emergence and survival of most species was good. Five of eight species showing over 50% emergence are commercially available.

An Evaluation of 16 Grass and Legume Species for Seed Production in the Matanuska Valley

Certain grass and legume species used in conservation and forage production plantings in Alaska are recommended in an interagency publication M7-N-22612 "A Vegetative Guide for Alaska." Few of the 20-odd species listed are being grown for seed in the state. The purpose of this study was to determine the seed production potential of 16 commercial species recommended for Alaska. Based on the two-year records of this study only 'Arctared' red fescue, 'Boreale' red fescue, 'Nugget' kentucky bluegrass, and 'Engmo' timothy demonstrate economic feasibility for commercial production at this time.

An Evaluation of Lodgepole Pine

Forty lodgepole pine accessions were planted at the Plant Materials Center in 1974 as part of the US Forest Service evaluation project to select superior lodgepole pine for possible timber resources in south-central and interior regions of Alaska. Seed for the project was collected between the 53° and 63° northern latitudes throughout the Yukon Territory, British Columbia, and southeast Alaska.

Ninety-six percent of seedlings planted survived the first year, but the entire project was winterkilled the following year during the 1975-1976 winter. Ten of eleven Alaskan accessions planted were rated in worst half of the group for winter damage the first year. Seven of the eleven Alaskan accessions however, were among the top twenty in size. Four of the eleven were placed in top ten largest.

Development of Bluejoint (*Calamagrostis canadensis*) Seed Production Potential

Bluejoint (*Calamagrostis candensis*) is a perennial, rhizomatous grass native to Alaska and widely distributed throughout the state. Although its value as a forage and conservation plant has been well established, its actual use for these purposes has been limited to native stands. Commercial production of seed for establishment of new plantings and extension of usable acreages has not been pursued because of a lack of knowledge of large scale seed production techniques. There are also no official standards for purity and germination, therefore the species cannot be produced under certification.

The Soil Conservation Service and the Plant Materials Center designed a project to develop seed germination and purity standards and to evaluate seed harvest techniques that can be applied with commercial size farm machinery. The results were that a 1/2 gram sample would be used for a purity test and that a 15° to 25° C alternating temperature would be used for testing germination. Furthermore it was determined that the seed could be harvested using commercial equipment with a minimal amount of minor alterations.

An Evaluation of a Phenology Study Cooperative

The Alaska Plant Materials Center agreed this year to participate as one of 36 phenological data collection sites designated by the Alaska Agricultural Experiment Station to record phenological information.

The network of collection sites will provide an inexpensive weather prediction-data collection system over most state areas with agricultural potential. Plants selected for the study include Villosa lilac, Zabeli honeysuckle, and the native red osier dogwood.

Data collections at the Plant Materials Center will begin in 1977.

DEMONSTRATION PLOT

ABSTRACTS

Grain and Grass

Access to the large production fields of grain is limited to most Plant Materials Center visitors because of the distances out to and between the fields. Therefore a demonstration plot was designed to contain growing samples of the various grain and grass crops in a close proximity of the PMC headquarters. As a result of favorable visitor response, the demonstration plot will be maintained through 1977.

Small Fruit Demonstration

'Latham', 'Indain Summer', and 'Trent' raspberries; 'Red Lake' and 'Swedish Black' currants; and'Pixwell' gooseberry were planted this year in a demonstration plot to display recommended small fruit verieties for southcentral Alaska to the public. Additional recommended varieties will be planted in 1977.

INITIAL INCREASE

ABSTRACTS

Initial Raspberry Increase

Initial increase of raspberry hybrids, 9 and 35, from the University of Alaska began in 1974 for varietal maintenance and possible release to the public. In 1975, 200-foot rows of each hybrid were established in Field 4A from spring suckers.

Observations made after the 1975-1976 winter showed a greater number plants of both hybrids survived when mulched the previous fall than when left unmulched. Spring suckers from both hybrids will be available in 1977 for distribution.

Initial Currant Increase

'Holland Long Bunch' and 'Swedish Black' currant varieties are under initial increase for distribution to commercial nurserymen requesting such plant materials as mother plants.

Swedish Black currants in gallon containers are expected to be available in limited numbers in 1977. Holland Long Bunch will be available in 1978.

Initial Strawberry Increase

The Plant Materials Center produces parent stock of strawberry plants for commercial nurseries in Alaska. Approximately 1000 of the 'Alaska Pioneer' variety and 240 of the 'Sitka' variety will have been produced by the summer of 1977.

Sargent Cherry Initial Increase

The Sargent cherry increase is a public relations effort by the PMC to provide seedlings for the Anchorage-based firm, South-Central Timber Development Corporation. The Japanese company will donate the seedlings to the City of Anchorage as a gesture

of good will.

Seedlings from the first sowing in 1975 were killed during the 1975-1976 winter. A second seeding was made October 1976.

Increase of Homer Windbreak Materials

The Plant Materials Center grew Sitka spruce and black cottonwood plant materials in 1976 for a Homer Soil Conservation Service windbreak planting in 1977. The SCS will use the windbreak planting to demonstrate the energy conserving effect of natural windscreens in Alaska. Sitka spruce seedlings were produced this year in Spencer-Lemaire containers under strict containerized greenhouse conditions. Black cottonwood cuttings were rooted and growing entirely in styroblock containers.

Initial Increase of Scotch Pine

The Scotch pine increase project was a two-year attempt to produce 2-1 Manty Scotch pine for State Forestry using conventional bareroot production methods.

Seed sown with a grass seeder in 1974 emerged from a sterilized seedbed 46%. Mulched seedlings survived the 1974-1975 winter well but 50% were killed by desiccating winds the following spring after mulch removal. All but 53 remaining seedlings were killed during the 1975-1976 winter.

Initial Spotted Ladysthumb Increase

A request was received from the Homer Soil Conservation Service office for *Polygonum persicaria* spotted ladysthumb. The seed is to be used in marshy areas for waterfowl food and cover. Two 100-foot rows produced five pounds of clean seed.

FOUNDATION SEED INCREASE

ABSTRACT

Grain and Grass Seed Increase

Foundation seed and plant production until now has been the burdensome task of the University of Alaska Agricultural Experiment Station. The legislature made seed production one of the Plant Materials Center's responsibilities directing it to increase as well as maintain basic grain and grass seed of recommended Alaskan varieties. Four varieties of barley, two of oats, and one of wheat were planted for a total of 24.98 acres. A total of 46,000 pounds of seed grain was harvested, cleaned, and is now stored at the PMC. One acre of 'Arctared' red fescue was harvested and another two acres was planted. One acre of 'Polar' brome and one of bluejoint were also established and they should produce seed in 1977. Seed is marketed through the Alaska Crop Improvement Association.

ALASKA SEED TESTING LABORATORY

ABSTRACT

A major duty of the Plant Materials Center was to establish, staff, and maintain a seed testing laboratory. The function of the seed testing laboratory is to analyze all types of seed which are grown and sold in the State of Alaska. One hundred forty-seven germination tests were conducted on vegetable seed and over 150 purity and/or germination tests were conducted on small grain and grass seed. Several instances of improper labelling, poor quality seed, and occurrences of noxious weeds were discovered.

PHYSICAL IMPROVEMENTS

ABSTRACT

Major physical improvements to the land and buildings were made during the year as a result of a Federal CETA Title X grants of $175,000. Twelve projects were developed and completed under this program.

Construction was begun on two new buildings. An office/laboratory was only partially completed due to lack of funds. The erection of a glass/metal greenhouse will be completed in the spring of 1977. Requests for construction of a plant storage building and a chemical storage building were submitted to the Division of Buildings.

INITIAL EVALUATIONS

Initial Evaluation of Herbaceous Plants

Two hundred twenty-eight accessions of grasses, legumes, and forbs were seeded in the spring of 1974. The planting contained 131 native collections, 83 foreign introductions, mostly from Siberian Russia and the Scandinavian countries, and 14 accessions from cooperating agencies in the lower 48. Forty-five species of grasses, 34 legumes, and 19 forbs were represented.

The grasses were seeded May 15, 1974 and the legumes and forbs May 16, 1974. The area had been summer fallowed the previous year and no fertilizer was applied during the 1974 growing season. Each accession was seeded in a 20-foot row and the rows were spaced three feet apart.

During 1976 weeds were controlled by mechanical cultivation, wheel hoeing, hand weeding, and by one application of .75 pounds per acre of 2,4-D to the grass species on June 8. Control of insects was attempted by spraying Diazanon at 16 ounces per 100 gallons and 67 gallons per acre. The planting was not irrigated in 1976. The soil in the evaluation area is a Niklason silt loam, moderately deep, well-drained, strongly acid and 15 to 27 inches deep over gravelly material.

Results

Early cold spells and lack of snow cover accounted for a 39% winterkill in the herbaceous initial evaluation program. Severe winds and glaciering also occurred, as usual, throughout

the winter of 1975-76.

Perennial grasses had a 37% mortality rate. There was little damage due to insect or disease during the growing season because the most susceptible species had been winterkilled.

The legumes suffered a 59% winterkill. Every accession of nootka lupine (*Lupinus nootkatensis*) winterkilled but new seedlings emerged, vigorously, in the spring.

Forbs lost 33% to winterkill but the survivors remain hardy and many are excellent prospects for further study. Two additions to the initial evaluation study which show promise are described below:

Panricum clandestinum, T-4, tioga deertongue, will continue in initial evaluation. It is rated as the most acid tolerant grass available. It demonstrated only fair performance for seedling vigor and plant uniformity. Foliage production was poor.

Trifolium vesiculosum. Two collections of arrowleaf clover, MS-329 and AM-1975, were planted after inoculation in the spring of 1976. This clover is planted for winter use in the southern states. Its performance as a summer annual in Alaska seems to have potential. Seedling vigor was excellent and good for MS-329 and AM-1975, respectively. Plant uniformity and ability to spread was good for both accessions. The plants flowered initially on August 15 but failed to mature seed. These accessions will be included in the 1977 initial evaluation program.

The results of the evaluations for 1976 appear in Table 1.

TABLE 1. Performance of 228 accessions of herbaceous annuals and perennials established May 15 and 16, 1974.

Species	Acc.or PI No.	Origin	Stand	Foliage Production[1/]	Ability to Spread[1/]	Ground Cover[1/]	Spring Recovery[1/]	Drought Resistance[1/]	Plant Uniformity[1/]	Seed Production[1/]	Date Head	Date Bloom	Lodging	Ht.	Remarks
			%										%	in.	
Grasses															
Agropyron boreale	R-5	Ak	90	1	5	1	1	5	3	3	6/18	7/8	0	45	
A. macrourum	L-56	Ak	100	1	5	1	1	5	1	3	6/18	7/8	0	40	
Panicum clandestinum	T-4	Pa	50	7	9	9	-	3	3	-	-	-	0	3	Moderate seedling vigor
Arctagrostis latifolia	T-6	Ak	10	9	9	9	-	5	5	-	-	-	0	3	Poor seedling vigor
Agropyron subsecundum	371698	Ak	90	3	5	3	1	5	3	3	6/18	7/8	0	35	Seed collected
A. trachycaulum	371692	Ak	90	5	5	5	1	3	1	3	6/18	7/8	0	36	
A. trachycaulum	371694	Ak	80	3	5	5	7	3	3	5	6/18	7/13	0	32	
A. trachycaulum	371695	Ak	90	5	5	5	5	3	3	5	6/25	7/8	0	34	
A. trachycaulum	372644	Ak	95	1	3	1	1	3	3	1	6/24	7/8	0	36	Excellent spring rec.
A. trachycaulum	372650	Ak	10	5	5	3	9	3	5	5	6/24	7/8	0	30	
A. violaceum	L-47	Ak	100	1	3	1	1	3	3	1	6/24	7/13	0	35	Exc. spr. rec
A. violaceum	236673	Can	30	7	7	7	7	3	7	7	6/18	7/13	0	30	
A. violaceum	236674	Can	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill
A. violaceum	236675	Can	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill
A. violaceum	276712	USSR	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill
A. yukonense	R-12	Ak	100	1	3	3	1	3	3	1	6/18	7/13	0	30	

1/ See footnote at end of table on page 39.

TABLE 1. Performance of 228 accessions of herbaceous annuals and perennials established May 15 and 16, 1974. Cont'd.

Species	Acc.or PI No.	Origin	Stand	Foliage Production[1]	Ability to Spread[1]	Ground Cover[1]	Spring Recovery[1]	Drought Resistance[1]	Plant Uniformity[1]	Seed Production[1]	Date Head	Date Bloom	Lodging	Ht.	Remarks
			%										%	in.	
Grasses cont'd															
Agrostis sp.	371700	Ak	0	-	-	-	-	-	-	-	-	-	-	-100% winterkill	
Alopecurus aequalis	236730	Can	0	-	-	-	-	-	-	-	-	-	-	-	" "
A. aequalis	236731	Can	0	-	-	-	-	-	-	-	-	-	-	-	" "
A. aequalis	236732	Can	0	-	-	-	-	-	-	-	-	-	-	-	" "
A. aequalis	371701	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
A. arundinaceus	Garrison	Mont	50	7	5	5	3	3	7	9	6/11	6/18	0	30	No seed production
A. arundinaceus	P-14762	Wash	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill
A. pratensis	P-5903	Wash	0	-	-	-	-	-	-	-	-	-	-	-	" "
A. pratensis	P-15619	Ore	10	7	7	7	7	3	7	9	-	-	0	10	No seed production
A. pratensis	P-15619S	Ore	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill
A. pratensis	371702	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
A. pratensis	372659	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
Beckmannia eruceaformis	R-2	Ak	60	3	3	3	3	3	3	1	6/18	7/13	0	40	Good spr. rec.
Bromus inermis	Manchar	Wash	10	5	5	5	9	3	7	9	-	-	-	21	No seed production
Bromus inermis	372669	Ak	0	-	-	-	-	-	-	-	-	-	-		100% winterkill
B. inermis X *pumpellianus*	Polar	Ak	90	5	5	5	5	3	5	5	6/18	7/13	0	40	
B. inermis X *pumpellianus*	371494	Ak	90	7	7	7	7	5	7	7	6/18	7/8	0	20	

1/ See footnote at end of table on page 39.

TABLE 1. Performance of 228 accessions of herbaceous annuals and perennials established May 15 and 16, 1974. Cont'd.

Species	Acc.or PI No.	Origin	Stand	Foliage Production 1/	Ability to Spread 1/	Ground Cover 1/	Spring Recovery 1/	Drought Resistance 1/	Plant Uniformity 1/	Seed Production 1/	Date Head	Date Bloom	Lodging	Ht.	Remarks
			%										%	in.	
Grasses cont'd															
Calamagrostis inexspansa	372682	Ak	5	7	7	7	7	3	7	7	6/18	6/24	0	30	
C. nutkaensis	372683	Ak	10	5	5	5	7	3	7	7	6/18	6/24	0	30	
Deschampsia beringensis	R-21	Ak	5	7	9	5	7	7	9	9	-	-	0	10	No seed production
D. beringensis	314562	USSR	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill
D. beringensis	372690	Ak	10	7	7	7	9	5	9	9	-	-	0	8	No seed production
Elymus arenarius	L-20	Ak	5	9	9	9	7	3	9	9	-	-	0	30	No seed production
E. arenarius	R-25	Ak	5	9	9	9	7	5	9	9	-	-	0	25	No seed production
E. arenarius	R-39	Ak	5	9	9	9	7	5	9	9	-	-	0	20	No seed production
E. arenarius	R-40	Ak	5	9	9	9	9	9	9	9	-	-	0	20	No seed production
E. arenarius	R-44	Ak	5	9	9	9	7	5	9	9	-	-	0	26	No seed production
E. arenarius	R-46	Ak	5	7	9	9	7	5	9	9	-	-	0	25	No seed production
E. arenarius	R-47	Ak	20	9	9	9	7	5	9	9	-	-	0	30	No seed production

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TABLE 1. Performance of 228 accessions of herbaceous annuals and perennials established May 15 and 16, 1974. Cont'd.

Species	Acc.or PI No.	Origin	Stand	Foliage Production[1]	Ability to Spread[1]	Ground Cover[1]	Spring Recovery[1]	Drought Resistance[1]	Plant Uniformity[1]	Seed Production[1]	Date Head	Date Bloom	Lodging	Ht.	Remarks
			%										%	in.	
Grasses cont'd															
E. arenarius	272126	USSR	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkil
E. arenarius	294582	Sweden	40	7	7	7	7	5	5	5	6/24	7/8	0	27	
E. arenarius	294583	Sweden	0	-	-	-	-	-	-	-	-	-	-	-	100% Winterkill
E. arenarius	294584	Sweden	5	9	9	9	9	5	9	9	-	-	-	20	No seed production
E. arenarius	294585	Sweden	30	7	7	7	9	5	7	9	-	-	0	20	No seed production
E. arenarius	294636	Norway	80	1	5	3	1	5	3	3	6/24	7/13	0	35	
E. arenarius	297345	Norway	80	1	3	3	1	5	1	3	6/24	7/13	0	35	
E. arenarius	316233	USSR	5	9	9	9	9	9	9	9	-	-	0	12	No seed production
E. arenarius	372694	Ak	60	5	5	5	5	5	7	9	-	-	0	26	No seed production
E. arenarius	372695	Ak	40	7	7	7	7	5	9	9	-	-	0	20	No seed production
E. arenarius	314663	USSR	5	9	9	9	9	9	9	9	-	-	0	12	No seed production
E. innovatus	236818	Can	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill

1/ See footnote at end of table on page 39.

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Species	Acc.or PI No.	Origin	Stand	Foliage Production 1/	Ability to Spread 1/	Ground Cover 1/	Spring Recovery 1/	Drought Resistance 1/	Plant Uniformity 1/	Seed Production 1/	Date Head	Date Bloom	Lodging	Ht.	Remarks
			%										%	in.	
Grasses cont'd															
E. kartoviensis	314677	USSR	5	9	9	9	5	5	9	9	-	-	0	10	No seed production
E. sibiricus	L-2	Ak	60	5	5	5	3	5	7	5	7/6	7/13	-	23	Barley stripe 10%
E. sibiricus	R-15	Ak	50	5	5	3	3	7	5	5	7/6	7/13	0	20	
E. sibiricus	R-16	Ak	40	5	5	5	7	5	5	5	7/6	7/13	-	23	
E. sibiricus	R-18	Ak	75	5	5	5	3	7	5	5	7/6	7/13	-	20	
E. sibiricus	314619	USSR	50	3	3	3	5	7	7	5	7/6	7/13	-	29	
E. sibiricus	315427	USSR	60	5	5	5	3	5	5	5	7/6	7/13	0	33	
E. sibiricus	315428	USSR	10	7	9	9	9	7	9	7	7/6	7/13	0	26	
E. sibiricus	315429	USSR	75	5	5	3	5	5	3	3	7/6	7/13	0	34	
E. sibiricus	325315	USSR	100	3	3	3	3	5	3	3	7/6	7/13	0	35	
E. sibiricus	326266	USSR	80	3	3	5	5	5	5	3	7/6	7/13	0	34	
E. sibiricus	326267	USSR	70	3	5	5	3	5	5	5	7/6	7/13	0	36	
E. sibiricus	326268	USSR	90	1	3	1	1	5	5	3	7/6	7/13	0	36	
E. sibiricus	345599	USSR	75	1	3	3	3	5	7	3	7/6	7/13	0	30	
E. sibiricus	345600	USSR	100	1	3	3	1	5	3	1	7/6	7/13	0	36	
E. sibiricus	362191	USSR	80	3	5	3	3	5	3	3	7/6	7/13	0	28	
E. sibiricus	372696	Ak	80	3	3	3	1	3	3	3	7/6	7/13	0	30	Exc. vigor
Festuca altaica	R-8	Ak	5	9	9	9	9	9	9	9	-	-	0	-	No seed production
F. altaica	R-14	Ak	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill
F. altaica	R-17	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
F. altaica	372705	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "

1/ See footnote at end of table on page 39.

TABLE 1. Performance of 228 accessions of herbaceous annuals and perennials established May 15 and 16, 1974. Cont'd.

Species	Acc.or PI No.	Origin	Stand %	Foliage Production[1]	Ability to Spread[1]	Ground Cover[1]	Spring Recovery[1]	Drought Resistance[1]	Plant Uniformity[1]	Seed Production[1]	Date Head	Date Bloom	Lodging %	Ht. in.	Remarks
Grasses cont'd															
F. rubra	Arctared	Ak	75	3	3	3	3	3	3	3	6/11	6/25	-	12	
F. rubra	Boreale	Ak	5	9	9	9	9	9	9	9	-	-	-	6	No seed production
Hordeum brachyantherum	371744	Ak	0	-	-	-	-	-	-	-	-	-	-	-	100% winter-kill
Poa alpina	235491	Switz	5	9	9	9	9	9	9	9	-	-	-	-	No seed production
Poa alpina	235492	Can	5	9	9	9	7	9	9	9	-	-	-	-	" "
Poa alpina	236893	Can	5	9	9	9	9	9	9	9	-	-	-	-	" "
Poa alpina	236894	Can	0	-	-	-	-	-	-	-	-	-	-	-	100% winter-kill
Poa alpina	236895	Can	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa alpina	236896	Can	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa alpina	236896	Can	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa alpina	372730	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa arctica	236901	Can	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa brachyanthera	371655	Ak	5	9	9	9	9	9	9	9	-	-	-	-	No seed production
Poa canbyi	236903	Can	0	-	-	-	-	-	-	-	-	-	-	-	100% winter-kill
Poa canbyi	236904	Can	10	7	7	7	5	5	7	7	-	-	-	6	No seed production
Poa canbyi	236905	Can	10	7	7	7	7	7	7	7	-	-	-	-	No seed production
Poa compressa	182792	Can	0	-	-	-	-	-	-	-	-	-	-	-	100% winter-kill
Poa compressa	182793	Can	0	-	-	-	-	-	-	-	-	-	-	-	"

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			%										%	in.	
Grasses cont'd															
Poa epigena	R-48	Ak	40	5	7	7	5	5	7	9	-	-	-	-	No seed production
Poa glauca	372732	Ak	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill
Poa lanata	372734	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa nemoralis	284840	USSR	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa nemoralis	297364	Norway	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa nemoralis	325464	USSR	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa nevskii	314308	USSR	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa palustris	236913	Can	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa palustris	272124	Poland	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa palustris	274644	Poland	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa palustris	369296	USSR	0	-	-	-	-	-	-	-	-	-	-	-	" "
Poa pratensis	Nugget	Ak	80	3	5	5	5	3	3	3	6/18	6/30	0	12	
Poa pratensis	L-48	Ak	10	7	7	7	3	5	7	7	6/18	6/30	0	10	
Poa pratensis	371760	Ak	5	9	9	9	3	5	9	9	-	-	-	10	No seed production
Poa pratensis	371763	Ak	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill
Poa pratensis	371764	Ak	10	7	9	9	7	5	7	7	6/18	6/30	0	10	
Poa pratensis	371766	Ak	0	-	-	-	-	-	-	-	-	-	-	-	100% winterkill
Poa pratensis	371767	Ak	40	5	5	5	1	5	7	5	6/18	6/30	-	12	
Poa rupicola	371777	Ak	10	7	7	7	5	7	5	9	-	-	-	6	
Poa stenantha	236922	Can	10	7	7	9	7	5	9	9	-	-	-	6	No seed production

1/ See footnote at end of table on page 39.

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Species	Acc.or PI No.	Origin	Stand	Foliage Production[1]	Ability to Spread[1]	Ground Cover[1]	Spring Recovery[1]	Drought Resistance[1]	Plant Uniformity[1]	Seed Production[1]	Date Head	Date Bloom	Lodging	Ht.	Remarks
			%										%	in.	
Legumes															
Hedysarum sp.	L-3	Ak	10	5	7	7	5	3	7	7	6/18	6/25	0	10	
H. sp.	L-59	Ak	40	5	5	7	3	3	7	7	6/18	6/25	0	10	
H. sp.	L-27	Ak	0	-	-	-	-	-	-	-	-	-	-	-	100% winter-kill
Lathyrus maritimus	R-6	Ak	40	3	3	1	3	3	5	3	6/18	6/25	-	12	
L. maritimus	R-45	Ak	20	7	5	3	5	5	3	5	6/10	6/18	0	12	
L. palustris	R-35	Ak	40	3	3	1	1	3	3	5	6/11	6/18	0	16	
L. palustris	R-36	Ak	30	5	5	3	3	5	5	9	-	-	0	10	No seed production
L. palustris	R-42	Ak	10	7	7	7	5	5	7	9	-	-	0	10	" "
Lupinus nootkatensis	L-13	Ak	0	-	-	-	-	-	-	-	-	-	-	-	100% winter-kill
L. nootkatensis	L-15	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
L. nootkatensis	L-21	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
L. nootkatensis	L-20	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
L. nootkatensis	R-29	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
L. nootkatensis	R-30	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
L. nootkatensis	R-31	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
L. nootkatensis	R-32	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
L. nootkatensis	R-37	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
L. nootkatensis	L-33	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
L. nootkatensis	L-65	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "
Vicia cracca	371785	Ak	0	-	-	-	-	-	-	-	-	-	-	-	" "

1/ See footnote at end of table on page 39.

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Species	Acc.or PI No.	Origin	Stand	Foliage Production[1/]	Ability to Spread[1/]	Ground Cover[1/]	Spring Recovery[1/]	Drought Resistance[1/]	Plant Uniformity[1/]	Seed Production[1/]	Date Head	Date Bloom	Lodging	Ht.	Remarks
			%										%	in.	
Legumes cont'd															
Trifolium vesiculosum	MS-329	Miss	50	1	3	3	-	3	1	9	8/15	8/30	0	24	Seedling vigor good
T. vesiculosum	AM-1975	Ga	50	3	3	1	-	3	3	9	8/15	8/30	0	24	" "
Forbs															
Achillea borealis	371687	Ak	0	-	-	-	-	-	-	-	-	-	-	-	100% winter-kill
A. lanulosa	372637	Ak	0	-	-	-	-	-	-	-	-	-	-	--	" "
A. millefolium	372639	Ak	5	9	9	9	9	5	9	9	6/24	7/13	-	12	
A. sibiricus	372640	Ak	0	-	-	-	-	-	-	-	-	-	-	-	100% winter-kill
A. Tillesii	R-33	Ak	95	7	7	9	1	5	7	7	6/24	7/13	-	12	
A. Tillesii	R-38	Ak	10	5	3	5	5	5	7	7	6/24	7/18	-	12	
Aster sibiricus	L-62	Ak	5	9	9	9	3	9	9	7	6/17	6/24	-	8	
Atriplex hortensis	310383	USSR	100	1	3	1	1	1	1	1	7/6	7/14	-	80	Excellent seedling vigor
Ligusticum scoticum	R-41	Ak	10	3	5	5	3	3	3	5	6/24	7/1	0	8	
Polemonium boreale	371778	Ak	10	7	7	5	3	7	7	7	6/3	6/10	0	6	
Polygonum persicaria	372749	Ak	100	5	3	5	5	3	5	5	7/15	7/30	0	6	

1/ See footnote at end of table on page 39.

TABLE 1. Performance of 228 accessions of herbaceous annuals and perennials established May 15 and 16, 1974. Cont'd.

Species	Acc.or PI No.	Origin	Stand	Foliage Production[1]	Ability to Spread[1]	Ground Cover[1]	Spring Recovery[1]	Drought Resistance[1]	Plant Uniformity[1]	Seed Production[1]	Date Head	Date Bloom	Lodging	Ht.	Remarks
			%										%	in.	
Forbs cont'd															
Potentilla biennis	372740	Ak	0	-	-	-	-	-	-	-	-	-	-	-	100% winter-kill
Sanguisorba officinalis	P-14822	Ore	0	-	-	-	-	-	-	-	-	-	-	-	" "

1/ Ratings are 1, 3, 5, 7, 9, with 1 best.

A Summary of the 1974-1976 Initial Evaluation Program

Herbaceous initial evaluation programs are completed in three growing seasons. This year marks the end of the first program for initial evaluation at the Alaska Plant Materials Center.

Two hundred thirty-three accessions were seeded in 1974 and 92 survived for final evaluation in 1976. Originally 143 grasses were planted and by the end of the seedling year 3.6% had failed to make a stand. The first winter accounted for an 11.6% mortality rate and in the second winter another 37% of the grass accessions were lost. Sixty-three legumes were planted and 11% failed to produce a seedling stand. Annual legumes which did not mature depleted the 1975 total by 39% and another 26% were victims of winterkill. Seven legume collections remained for final evaluation. Out of the 27 forbs planted 37% failed to emerge. The winter of 1974-75 eliminated 23% and the following winter 38% failed. Eight forbs remained for final evaluation in 1976.

Both winters were drastic tests and all but the hardiest accessions were lost. The winter of 1974-75 was characterized by record low temperatures and by the high temperatures and strong winds which commonly occur in a Matanuska Valley winter. Winter temperatures in 1975-76 were not as severe but plants lacked the insulation afforded by snow cover and the ground was frozen down to eight feet in many places.

The following accessions have survived, to different degrees,

the harsh climatic conditions at the Alaska Plant Materials Center. Others which did not survive may be adaptable to different locations in the state but do not offer the hardiness or the unique characteristics exhibited by the collections listed below.

Agropyron boreale. R-5 was collected from a gravelly roadside near the old townsite of Matanuska. It showed excellent seedling vigor the first year, excellent foliage production and ground cover for all three years, and excellent spring recovery in 1976. Spring recovery in 1975 was only moderate and this may indicate that this particular collection of wheatgrass may be adapted as ground cover on exposed sites where snowfall is minimal and winter temperatures are not extremely severe. The leaves are broad, lax, and bright green. The plant is, however, susceptible to leaf rust. This plant will be further evaluated in a secondary evaluation program.

Agropyron trachycaulum. PI-372644, slender wheatgrass showed excellent seedling vigor initially and foliage production and ground cover was likewise excellent during the entire evaluation period. The final year demonstrated excellent spring recovery and seed production. Like A. *boreale*, it appeared to recover from a winter with poor snow fall better than the winter with excessively cold temperatures (-50°F). This accession proved to be superior to five others of the same species particularly in winter hardiness. The leaves are less lax than A. *boreale* and broad, soft, and glabrous. This plant is also recommended for secondary evaluations

and outplantings.

Agropyron yukonense. R-12 was collected along a sandy road bed near Tok. It demonstrated excellent seedling vigor the first year, excellent ground cover, and seed production in the final two growing seasons, and excellent foliage production for the duration of the trial. Spring recovery was only fair in the extremely cold winter of 1974-75, but was excellent in 1975-76. Leaves are more erect than other *Agropyrons*, soft, and prominently ribbed. It will be included in secondary evaluations.

Alopecurus arundinaceus. 'Garrison' foxtail is a released forage variety from Wyoming. Overall performance was good although there was a 50% winterkill in 1976. It demonstrated excellent foliage production, ground cover, plant uniformity, and seed production in 1975. This variety has been planted in low wet areas around the PMC. Plantings by the Soil Conservation Service in the interior of the state have also proved successful.

Bromus inermis X *pumpellianus*. 'Polar' brome was developed by the Agricultural Experiment Station in Palmer and released in 1971. Excellent performance was recorded for this grass in both the seedling year and the first growing season. The final year had some winterkill but this grass is still one of the most successful hay species commercially available. There was 10% winterkill in 1976 compared to 90% for 'Manchar' brome in the same year. A one-acre foundation seed field was established on the PMC in 1976.

Deschampsia beringensis. R-21 was collected near milepost 78 on the Seward Highway. The performance of hairgrass ranged from excellent to good for seedling vigor, foliage abundance, spring recovery, and seed production. However, after the 1975-76 winter there was 80% mortality. Secondary evaluation will determine the ultimate value of this plant for use in Alaska.

Elymus arenarius. PI-297345, beach wildrye, was introduced from Norway. This accession, along with PI-294636, also from Norway, proved to offer the highest degree of hardiness along with the best performance out of 18 native and exotic collections. Performance was good up to the final year when excellent foliage production, spring recovery, and plant uniformity was recorded. There was no seed production in the first two years but it was good in 1976. Establishment is slow, therefore, this grass should be seeded with a type of fast growing annual for revegetation work. It will be included in plans for a secondary evaluation program.

Elymus sibiricus. Several accessions of siberian wildrye seem to possess characteristics which would make them useful for revegetation programs in Alaska. Out of 16 different collections from Russia and Alaska, four -- PI-325315, PI-326268, PI-345600, and PI-372696 -- demonstrated superior performance for the species. More study and selection work is needed before the true potential of this grass will be realized.

Festuca rubra. 'Arctared' red fescue was developed and

released by the Agricultural Experiment Station in Palmer. It is widely used in lawns throughout Alaska and seed is commercially produced in the state. Its performance overall ranged from excellent to good in all three years for all plant evaluation categories. It is susceptible to insect damage when grown for seed. Currently, there is a total of three acres in Arctared on the PMC for foundation seed production.

Poa pratensis. 'Nugget' kentucky bluegrass was also released by the Agricultural Experiment Station. It performed excellent to good for the first two years of evaluation but suffered 20% winterkill in the final year. The winterkill on Nugget bluegrass was widespread and spotty throughout southcentral Alaska during the 1975-76 winter. This grass and Arctared red fescue are common components in Alaskan lawn seed mixtures. One acre is to be established at the PMC for foundation seed production in 1977.

Lathyrus cicera. PI-174236 from Turkey is an annual legume with rapid emergence and excellent growth throughout the season. Flatpod peavine has orange flowers which start blooming July 10 and continue blooming for 60 days. The plants are disease free, drought tolerant, and will produce abundant seed in Palmer.

Lathyrus sativus. PI-283556 from Russia is an annual legume with rapid emergence and excellent growth throughout the season reaching a height of 32 inches. Grass peavine blooms 10 days earlier than *L. cicera* but does not mature much seed before the end

of the growing season. The flowers are mixed blue, purple, and pink. It has ground cover and ornamental value.

Lotus ornithopodioides. PI-310413, deervetch, which is an annual legume from Russia, was the most rapid germinating species in this entire planting, emerging in eight days. It showed excellent seedling vigor, foliage production, and ground cover. Growth habit is prostrate. The small bright yellow flowers started blooming July 12 and continued for 45 days. Seed production was poor but 90% of the seed produced matured and shattered by the end of September. This species has potential as a reseeding annual legume for ground cover and ornamental uses.

Lupinus luteus. PI-289173, yellow lupine, from Hungary is an annual legume with excellent seedling vigor and abundant, dense foliage. The showy yellow flowers bloom in late August and the seeds do not mature before the end of the season. This species has potential as an annual ornamental.

Lupinus nootkatensis. The nootka lupine was collected mostly on the Kenai Peninsula. Two years of evaluation indicated that seven out of the twelve native collections had a very high potential for ornamental use. The collection from Valdez (L-21) demonstrated excellent seedling vigor, foliage production, and ground cover during the seedling year. However winter damage was very noticeable on the entire collection in 1975 and, in 1976, there was 100% winterkill. New seedlings did emerge in 1976 with

crude fat .80%, and ash 14.3% in the mature plant. Young leaves contained 34% protein. This plant will be put into secondary evaluation as a possible forage or silage crop. It also has excellent possibilities as a vegetable crop for human consumption.

Polygonum persicaria PI-372749, spotted ladysthumb, is a very persistent and weedy annual. It exhibits excellent performance in all categories. It was placed into production at the PMC for use as a duck food planting in Homer. This plant is recognized as a good source of waterfowl food, and seed production is possible whenever a demand for the seed is generated.

Patrick T. Mulligan

Initial Evaluation of Woody Plants

The woody plant program at Palmer includes the evaluation of woody plant materials heretofore unobserved in Alaska for hardiness and growth performance in an objective manner. The evaluation process begins with the screening of those plant materials that will survive the Alaskan environment from those that will not; a phase that takes a minimum of five to ten years to complete. During this time, measurements and ratings are made for winter survival, winter injury, spring recovery, transplant recovery, and annual growth and observational notes kept whenever possible on foliage/flower/fruit development, propagation, insect/disease damage, and others.

Once hardiness and growth performance have been satisfactorily determined in Palmer, new plantings of promising accessions are established in other state locations for a secondary phase of evaluation to more closely scrutinize their geographic range and potential use in conservation, agriculture, and industry. Such needs as soil stabilization, surface regeneration, reforestation, and ornamental landscaping are of the highest priority. Wind control too, through the use of windbreaks, is a primary concern in Alaska, especially for crop protection and home energy conservation. In the future, woody evaluations may even provide research materials for the selection of a superior growing tree for Alaska's timber industry.

The first evaluation plantings were made at the PMC in 1974. Seventy-nine accessions were assembled and planted in Field 1B that

that year, mostly bareroot seedlings from outside Alaska.

In 1975 a ten-acre plot was prepared for permanent initial evaluation plantings from a brome-'Engmo' timothy hay field in 4B and 4D. Fall plowing in 1974 and spring spraying with Roundup herbicide the following year proved effective in controlling regrowth of any sod species. One hundred sixty accessions were planted in 1975 including twenty-three accessions transferred from the temporary 1974 planting in Field 1B. Only ten plants of each 1974 accession were transferred to Field 4 in 1975. Those accessions with less than ten plants were kept at 1B for further propagation. This year 50 accessions were planted into Field 4 including 43 native species. Twenty-six of the native accessions were willows.

The new ten-acre evaluation field has been divided into eleven planting blocks (A to K) with 20 rows in each. Accessions are assigned to respective blocks according to suspected size at maturity, i.e., trees are planted to tree blocks A through C, shrubs to shrub blocks D through G, and low growing woody plants to ground cover blocks H through J. Block K has been assigned entirely to a Youth Conservation Corp[1/] project for increasing willows. Project intent is to re-establish selected willow species in state campgrounds where willows have become scarce. Plant spacings within the rows are sixteen feet,

1/ The Youth Conservation Corp (YCC) is a federal grant program within the Departments of the Interior, and Agriculture to further development and maintenance of U.S. natural resources by employing young men and women to work on conservation projects in non-federal public lands and waters.

twelve feet, and six feet, respectively, and sixteen feet between all rows. Closer spacings within the rows are used occasionally when extra plant material is available and plant growth suspected to be slow. Some four-foot wide solid strip plantings are also planned for the ground cover blocks. The minimum number of plants of any accession planted in the initial evaluation field is ten and only in cases where further increase is impractical will an exception for less be made. Parent plants providing seeds or cuttings for propagation will be planted as landscaping around the PMC buildings and yard.

Collection and Assembly

Woody plant materials were collected from both inside and outside Alaska this year. One hundred fifty-eight accessions were assembled at the PMC in 1976 including 108 native plant species and thirteen cultivated rose varieties for cooperative rose evaluations, page 81. Special interest was given to collecting native species, especially willows because of the great diversity in willow species and ease of propagation. Unfortunately, willows are difficult to identify without flowers so some accessions will remain unnamed until flowers are available. Primary contributors to the 1976 woody plant assemblage at the PMC, besides staff collections, are listed below:

Alaska Forestry Section, Division of Lands, Anchorage, Alaska
Alaska Rose Society, Palmer, Alaska
Institute of Agricultural Sciences, University of Alaska, Palmer, Alaska
Institute of Northern Forestry, U.S. Forest Service, Fairbanks, Alaska
North Central Regional Plant Introduction Station, Ames, Iowa
U.S. National Arboretum, Washington, D.C.

Materials and Methods

Propagation. Once the plant material is collected it is propagated, if less than the minimum ten plants for evaluation planting, by seed or cutting in the greenhouse, and grown there for at least one growing season before planting in the field. Ideally most plants should be grown in the greenhouse during the propagation season then moved outside in containers for a second season's growth with protection before transplanting to the evaluation field the following spring. Direct field seeding has been tried on several occasions but proved disastrous because of poor weed control and dry field conditions.

In the greenhouse, most seeds are germinated in a sterilized medium of sphagnum peat moss, and washed sand, and cuttings rooted in a propagation sand bench equipped with intermittent mist. So far, greenhouse propagation of woody plants has proven much superior to direct field seeding or field planting of unrooted cuttings. Bareroot materials arriving in early spring are heeled-in in a headhouse sawdust pit until planting time, which is usually the month of May.

Weed Control. Casoron G-4 herbicide was broadcast with a hand crank spreader at 150 pounds per acre for weed control this year in the evaluation field. The herbicide material was banded over one-year old plantings in approximately four-foot wide strips after cultivation and irrigated into the soil surface for effectiveness with 1/4-inch of water. Occasional weeding by hand in the row was still necessary during the summer. Weeds between the rows and around the field perimeter were maintained by tractor and disc.

Irrigation. Water was applied twice during the 1976 summer through the PMC wheel irrigation system at approximately two inches of water per setting. The system has proven to be a problem, however, by crushing plants with wheels out of sequence with cross-row interspaces. Hopefully, the wheel system can be replaced next year with one and one-half inch portable pipe with risers to eliminate the wheels.

Fertilization. Fertilizer was applied in early spring 1976 before cultivating for herbicide application to all evaluation plantings in Field 4. A complete fertilizer, 8-32-16, was broadcast by hand in the plant row at 400 pounds per acre, the equivalent of 32 pounds N, 56 pounds P, and 53 pounds K. A minimum rate of fertilizer was chosen for the initial evaluation field this year so as to maintain native plant material but not over-fertilize them.

Results

This has been the second full year of woody plant observations at the Plant Materials Center. Fifty new accessions were added to the initial evaluation in 1976 bringing the total under observation in Field 4 to 140. Forty-one accessions planted in 1974 and 1975 were completely killed by the 1975-76 winter (46%) and at least 17 more severely injured by last year's unusual winter.

However, trends in plant hardiness and growth performance are developing. Native species under evaluation, especially *Salix* species, have been most outstanding in plant vigor and hardiness. Unlike many natives, willow species in Alaska generally have excellent transplant

in parts of Alaska.

A most exciting planting at the Plant Materials Center during the last two years of evaluation has been a poplar selection from the Cheyenne Horticultural Field Station at Cheyenne, Wyoming. *Populus petrowskyana*, in less than eighteen months in the field, has averaged over five feet in height and four feet in width. Even more encouraging is that all ten trees of the plot survived the devastating 1975-76 winter without any winter injury. The following spring, recovery was prompt and vigorous. *Populus petrowskyana* was propagated from greenwood cuttings treated with a 50 milligram per liter indole-3-acelic acid soak for 28 hours. Cuttings rooted 100%.

Growth comparisons, however, have not been made a yet with *P. balsamifera*, a native poplar that is also a robust grower under cultivation. Comparisons between these two species will begin in 1977 in secondary evaluations.

Potentilla fruticosa is a native shrub under evaluation this year also worth honorable mention, although more time is needed to fully evaluate related cultural varieties for hardiness. Our native accession L-8 overwintered well this year with no dieback from winter exposure and recovered will in the spring. *Potentilla fruticosa freidrickseni*, A48462, overwintered fairly well but sustained 5% to 10% dieback and recovered moderatley slow. *Potentilla fruticosa* 'Hallman's Dwarf' survived about as well as *P. fruticosa*, L-8 but still suffered 1% to 2% dieback. *Potentilla fruticosa dahurica*, A32742 a white flower variety of bush cinquefoil, was affected the most by last winter

conditions. Six of the ten plants planted were killed and injuring survivors, 70% to 80%. Recovery was slow.

All accessions bloomed continually from late May through fall frost and displayed an abundance of color.

Other plantings reported in the 1975 Annual Technical Report as "worth creditable mention" survived the 1975-76 winter as follows:

Amelanchier alnifolia 'Success' -- winterkilled

Cornus stolonifera coloradensis A64205 -- survived, undergoing propagation

Lonicera olgae A7218 -- winterkilled

Potentilla fruticosa 'Manley's' A7237 -- survived, planted to Field 4, May 1976

Rosa sp. 'Suzanne' A49383 -- winterkilled

Salix alba vitellina A73126 -- winterkilled, replanted to Field 4, August 1976

Shepherdia argentea A64825 -- winterkilled

Syringa oblata 'Cheyenne' A32348 -- winterkilled

Allan Klatt

Joseph L. Stehlik

TABLE 2. Woody plant materials assembled at the Alaska PMC in 1976 for initial evaluation.

Species	Accession No.	Source	Origin	Material[1/]	Amount	
					Plants	Seed
					no.	gm
Acer glabrum	K-393	Inst. Ag. Sci.	Palmer, Ak	s		194
A. grandidentatum	NA37267	Nat. Arboretum Washington, D.C.	Oneida Narrows Franklin Co. Ida.	br	1	
A. negundo	K-319	Palmer, Ak	Palmer, Ak	c	12	
A. platanoides	K-396	Allan Klatt	Anchorage, Ak	s		10
Alnus crispa	T-4	Finger Mt., Ak	Finger Mt., Ak	s		1
A. crispa	T-7	Koyukuk R., Ak	Koyukuk R., Ak	s		4
A. crispa ssp. *sinuata*	L-399	Palmer, Ak	Palmer, Ak	s		75
A. tenuifolia	L-303	Ak PMC	Palmer, Ak	b	10	
A. tenuifolia	K-389	Eklutna, Ak	Eklutna, Ak	s		<1
Arctostaphylos uva-ursi	K-343	Chugiak, Ak	Chugiak, Ak	c	13	
A. uva-ursi	K-382	Girdwood, Ak	Girdwood, Ak	c	30	
Artemesia frigida	L-93	Palmer, Ak	Palmer, Ak	s		49
A. frigida	L-390	Palmer, Ak	Palmer, Ak	s		62
Betula glandulosa	K-342	Chugiak, Ak	Chugiak, Ak	s		9
B. papyrifera	K-371	Homer, Ak	Homer, Ak	s		21
Caragana arborescens	L-387	Dan Contini	Palmer, Ak	s		500
C. arborescens pendula	L-290	NC Reg. PI Sta Ames, Iowa	Minnesota Landscape Arbor.	br	10	
Clematis tangutica	K-335	Aline Strutz	Anchorage, Ak	brs/s	1	21
Cornus stolonifera	L-307	Palmer, Ak	Palmer, Ak	c/s	40	205
C. stolonifera	L-310	Inst. Ag. Sci.	Palmer, Ak	c	26	

1/ See footnote at end of table, page 65.

TABLE 2. Woody plant materials assembled at the Alaska PMC in 1976 for initial evaluation. Cont'd.

Species	Accession No.	Source	Origin	Material[1/]	Amount: Plants	Amount: Seed
					no.	gm
C. stolonifera 'Isanti'	L-291	NC Reg. PI Sta. Ames, Iowa	Minneapolis, Minn	br	10	
Cotoneaster interrigma	K-394	Inst. Ag. Sci.	Palmer, Ak	s		7
Crataegus sp.	L-233	" "	"	s		20
C. sp.	L-397	" "	"	s		158
Elaeagnus commutata	L-103	Palmer, Ak	Palmer, Ak	s		1866
Empetrum nigrum	K-341	Chugiak, Ak	Chugiak, Ak	s		2
Euonymous verrucosus	NA35114	Nat. Arboretum	Croatia, Yugoslavia	br	1	
Humulus lupulus	K-384	Anchorage, Ak	Anchorage, Ak	c	16	
Juniperus communis	L-73	Palmer, Ak	Palmer, Ak	s		35
J. communis	K-339	Chugiak, Ak	Chugiak, Ak	c	13	
J. communis	NA35126	Nat. Arboretum	Mt. Alan Peak, Yugoslavia	br	1	
J. communis	NA35127	"	Tjentiste, Yugo.	br	1	
J. communis	NA35128	"	Mt. Medreduica, Yugo.	br	1	
J. communis	T-8	Koyukuk R., Ak	Koyukuk R., Ak	s		<1
Larix decidua	L-398	Mat. Exp. Plot	Palmer, Ak	s		18
Ledum macrophyllum	NA36017	Nat. Arboretum	Sakhalin Is, USSR	br	1	
Lonicera coerulea edulis	L-308	Inst. Ag. Sci.	Palmer, Ak	c	56	
Malus baccata	L-395	" "	"	s		97
M. sp.	K-334	Lester Klatt	Anchorage, Ak	brs	18	
Menziesia ferruginea	K-335	Girdwood, Ak	Girdwood, Ak	c	34	

1/ See footnote at end of table, page 65.

TABLE 2. Woody plant materials assembled at the Alaska PMC in 1976 for initial evaluation. Cont'd.

Species	Assession No.	Source	Origin	Material[1/]	Amount	
					Plants	Seed
					no.	gm
Phellodendron amurense	K-325	Country Gardens Nursery	Anchorage, Ak	brs	28	
Picea glauca	K-391	Anchorage, Ak	Anchorage, Ak	s		10
P. sitchensis	L-280	SCS-Homer, Ak	Homer, Ak			74
P. sitchensis	K-403	Kenai Lake, Ak	Kenai Lake, Ak	c	50	
Pinus sylvestris #31	L-315	Ak. State Forestry	USSR-lat. 54°N long. 32°E	s		1
P. sylvestris #42	L-316	Ak State Forestry	USSR-lat. 55°N long. 57°E	s		1
P. sylvestris #11	L-317	"	USSR-lat. 54°N long. 36°E	s		1
Populus balsamifera	L-281	Inst. Northern Forestry	Talkeetna, Ak	c	32	
P. balsamifera	L-282	" "	"	c	52	
P. sp 'Northwest'	L-309	Inst. Ag. Sci.	Palmer, Ak	c	22	
P. trichocarpa	L-293	Bruce Willard	Homer, Ak	c	160	
P. trichocarpa	L-294	" "	"	c	175	
Prunus padus	L-313	Inst. Ag. Sci.	Palmer, Ak	c	26	
P. padus	H-379	Bell's Nursery	Anchorage, Ak	s		114 seeds
P. sp.	L-324	Ak. State Forestry	Japan	s		37
P. sp.	L-330	Palmer, Ak	Palmer, Ak	c/s	27	22 seeds
P. virginiana	L-312	Inst. Ag. Sci.	Palmer, Ak	c	28	
Pyrus ussuriensis	K-386	Country Gardens Nursery	Anchorage, Ak	s		85 seeds
Rhus copallina	Am3225	Americus PMC	Americus, Ga	br	12	

1/ See footnote at end of table, page 65.

TABLE 2. Woody plant materials assembled at the Alaska PMC in 1976 for initial evaluation. Cont'd.

Species	Accession No.	Source	Origin	Material[1/]	Amount: Plants	Amount: Seed
					no.	gm
Ribes hudsonianum	L-302	Anchorage, Ak	Anchorage, Ak	c	18	
R. sp.	K-370	Anchor Point, Ak	Anchor Point, Ak	rc	16	
R. sp.	K-381	Girdwood, Ak	Girdwood, Ak	c	25	
Rosa sp.	K-402	Inst. Ag. Sci.	Palmer, Ak	s		214
R. sp. Altai x Burnet		Alaska Rose Society	Palmer, Ak	b	3	
R. sp. Betty Bland		" " "	Canada	br	2	
R. sp. Butterball		" " "	"	br	3	
R. sp. Haidee		" " "	Anchorage, Ak	b	4	
R. sp. Isabelle Skinner		" " "	Canada	br	2	
R. sp. Lac La Nonne		" " "	Anchorage, Ak	br	4	
R. sp. Mrs. Anthony Waterer		" " "	Canada	br	2	
R. sp. Mrs. John McNab		" " "	Canada	br	2	
R. sp. Prairie Wren		" " "	"	br	2	
R. sp. Suzanne		" " "	Palmer, Ak	b	1	
R. sp. Turkestan		" " "	Canada	br	2	
R. sp. Wassagaming		" " "	Canada	br	2	
R. sp. Parfum de I Hay		" " "	Canada	br	2	
R. woodsii	L-311	Inst. Ag. Sci.	Palmer	c	35	
Rubus articus articus	K-360	Kasilof R., Ak	Kasilof R., Ak	rc	50/10	
R. articus	K-362	Tustemena Lake Rd., Ak	Tustemena Lake Rd., Ak	brs	20	
R. sp.	K-363	Johnson Lake, Ak	Johnson Lake, Ak	c	30	

1/ See footnote at end of table, page 65.

TABLE 2. Woody plant materials assembled at the Alaska PMC in 1976 for initial evaluation. Cont'd.

Species		Accession No.	Source	Origin	Material[1/]	Amount	
						Plants	Seed
						no.	gm
Salix alaxensis	X	L-326	Palmer, Ak	Palmer, Ak	c	39	
S. alaxensis	X	L-327	"	"	c	23	
S. alaxensis	X	L-328	"	"	c	28	
S. alaxensis	X	L-329	"	"	c	25	
S. alaxensis		L-348	Girdwood, Ak	Girdwood, Ak	c	30	
S. alaxensis		K-368	Anchor Point, Ak	Anchor Point, Ak	c	30	
S. alaxensis		R-53	YCC	Palmer, Ak	c		
S. alaxensis		R-54	"	"	c		
S. alaxensis		R-55	"	"	c		
S. alaxensis		R-56	"	"	c		
S. alaxensis		R-57	"	Wasilla, Ak	c		
S. alaxensis		R-58	"	"	c		
S. alaxensis		R-59	"	Palmer, Ak	c		
S. alaxensis		R-60	"	Palmer, Ak	c		
S. alaxensis		R-61	"	"	c		
S. alaxensis		R-62	"	Houston, Ak	c		
S. alaxensis		R-63	"	Palmer, Ak	c		
S. alaxensis		R-64	"	Palmer, Ak	c		
S. alaxensis		R-65	"	Matanuska, Ak	c		
S. alaxensis		R-66	"	"	c		
S. alaxensis		R-67	"	Eklutna, Ak	c		
S. alaxensis		R-68	"	"	c		
S. alaxensis		R-69	"	Palmer, Ak	c		
S. alaxensis		R-70	"	"	c		
S. alaxensis		R-71	"	"	c		

1/ See footnote at end of table, page 65.

TABLE 2. Woody plant materials assembled at the Alaska PMC in 1976 for initial evaluation. Cont'd.

Species	Accession No.	Source	Origin	Material[1/]	Amount	
					Plants	Seed
					no.	gm
S. alaxensis	R-72	YCC	Wasilla, Ak	c		
S. alaxensis	R-73	"	Wasilla, Ak	c		
Salix hastata	L-332	Eklutna, Ak	Eklutna, Ak	c	36	
S. lasiandra	K-318	Anchorage, Ak	Anchorage, Ak	c	40	
S. lasiandra	K-377	MP 112.6 Sterling Hwy, Ak	MP 112.6 Sterling Hwy, Ak	c	30	
S. scouleriana	K-365	Kasilof R., Ak	Kasilof R., Ak	c	28	
S. sp.	L-285	Caribou Cr., Ak	Caribou Cr., Ak.	c	21	
S. sp.	L-286	Caribou Cr., Ak	Caribou Cr., Ak.	c	10	
S. sp.	L-287	Sheep Mt., Ak	Sheep Mt., Ad	c	21	
S. sp.	L-288	Eureka, Ak	Eureka, Ak	c	20	
S. sp.	L-289	Lake Louise Airport, Ak	Lake Louise Airport, Ak	c	24	
S. sp.	L-295	Homer, Ak	Homer, Ak	c	30	
S. sp.	L-296	Homer, Ak	Homer, Ak	c	29	
S. sp.	L-297	Homer, Ak	Homer, Ak	c	31	
S. sp.	L-299	Anchorage, Ak	Anchorage, Ak	c	33	
S. sp.	L-300	Anchorage, Ak	Anchorage, Ak	c	18	
S. sp.	L-301	Anchorage, Ak	Anchorage, Ak	c	23	
S. sp.	L-304	Anchorage, Ak	Anchorage, Ak	c	26	
S. sp.	L-306	Pribilof Is., Ak	Pribilof Is., Ak	c	5	
S. sp.	L-322	Alaska PMC	PMC Eval. Field F15	c	40	
S. sp.	L-323	Alaska PMC	PMC Eval. F. G9	c	24	
S. sp.	L-333	Palmer, Ak	Palmer, Ak	c	25	
S. sp.	K-336	Chugiak, Ak	Chugiak, Ak	c	63	

1/ See footnote at end of table, page 65.

TABLE 2. Woody plant materials assembled at the Alaska PMC in 1976 for initial evaluation. Cont'd.

Species	Accession No.	Source	Origin	Material[1/]	Amount	
					Plants	Seed
					no.	gm
S. sp.	K-337	Chugiak, Ak	Chugiak, Ak	c	27	
S. sp.	K-338	Chugiak, Ak	Chugiak, Ak	c	25	
S. sp.	K-345	Girdwood, Ak	Girdwood, Ak	c	22	
S. sp.	K-346	"	"	c	35	
S. sp.	K-349	"	"	c	20	
S. sp.	K-350	Girdwood Mine, Ak	Girdwood Mine, Ak	c	50	
S. sp.	K-351	"	"	c	22	
S. sp.	K-352	"	"	c	30	
S. sp.	K-353	Girdwood, Ak	Girdwood, Ak	c	17	
S. sp.	K-354	"	"	c	25	
S. sp	K-364	Anchor Point, Ak	Anchor Point, Ak	c	29	
S. sp.	K-366	Anchor Point, Ak	Anchor Point, Ak	c	29	
S. sp.	K-367	"	"	c	25	
S. sp.	K-375	"	"	c	30	
S. sp.	K-376	"	"	c	42	
S. sp.	T-9	Dietrich R., Ak	Dietrich R., Ak	s		4
S. sp.	T-13	"	"	s		7
Shepherdia canadensis	L-305	Eklutna, Ak	Eklutna, Ak		10	
Sorbus scopulina	L-388	Palmer, Ak	Palmer, Ak	s		63
Syringa villosa	L-314	Inst. Ag. Sci.	Palmer, Ak	c	50	
Thuja occidentalis pumila	K-392	Allan Klatt	Anchorage, Ak	c	80	
Tsuga mertensiana	K-344	Girdwood, Ak	Girdwood, Ak	c	30	

1/ See footnote at end of table, page 65.

TABLE Woody plant materials assembled at the Alaska PMC in 1976 for initial evaluation. Cont'd.

Species	Accession No.	Source	Origin	Material[1/]	Amount	
					Plants	Seed
					no.	gm
Tsuga mertensiana	K-347	Girdwood, Ak	Girdwood, Ak	c/s	35	2
Ulmus sp.	K-320	Allan Klatt	Anchorage, Ak	c	100	
U. sp.	K-321	Allan Klatt	Anchorage, Ak	c	62	
Vaccinium sp.	K-340	Chugiak, Ak	Chugiak, Ak	s		2
Viburnum sp. Cayuga	NA28180-c	Nat. Arboretum	Washington, D.C.	br	1	
V. dilatatum Eric	NA32226-c	Nat. Arboretum	Washington, D.C.	br	2	
V. edule	T-12	Dietrich R., Ak	Dietrich R., Ak	s		82 seeds

1/ Codes refer to type of plant material received or collected in 1976 and defined as follows: br - bareroot, brs - bareroot seedling, b - balled, c - cuttings, rc - rooted cuttings, s - seed.

TABLE 3. Methods of seed cleaning for woody plants collected during 1976. Cont'd.

Species	Accession No.	Origin	Cleaning steps used in order of process	Percent debris remaining after cleaning[1/]
Larix decidua	L-398	Palmer, Ak	Cones tumbled in seed extractor 10 min. Seed dewinged in cloth sack. South Dakota Blower. Remaining debris picked out by hand.	2
Malus baccata	L-395	Palmer, Ak	Frozen fruit soft after thawing. Macerated 25 sec. at low speed in kitchen blendor with 1:1 fruit to water by volume. Seed washed over 20 mesh hand screen. Seeds/fruit skins air dried. Office Clipper #6 top, #1/14 bottom.	15
Potentilla fruticosa var. *friedricksenii*	A48462	Palmer, Ak	Seed heads rubbed between hands. Large debris removed by 1/8" mesh screen. South Dakota Blower. More debris removed by 1/8" mesh screen. Seed and debris rubbed between hands. South Dakota Blower. Debris removed with 1/16", 1/20" mesh screen. Office Clipper #1/15 top, solid bottom.	5
P. fruticosa var. *dahurica*	A32742	Palmer, Ak	Seed and debris in cloth sack hit on floor for 5 min. Large debris removed by 1/16" mesh. South Dakota Blower removed fine debris. Seeds/remaining debris rubbed between hands South Dakota Blower again.	5
P. fruticosa Hallmans Dwarf	A7058	Palmer, Ak	Same as above.	5
P. fruticosa Manleys	A7237	Palmer, Ak	Same as above.	5
P. fruticosa	L-8	MP 108.6 Rich. Hwy., Ak	Seed heads rubbed between hands. Large debris removed by 1/8" mesh screens. South Dakota Blower removed fine debris. Seed heads rubbed between hands. South Dakota Blower again. Large debris removed with 1/16", 1/20" mesh screen. Remaining trash removed with tweezers.	5

1/ See footnotes 1, 2, 3, 4, and 5 at end of table, page 69.

TABLE 3. Methods of seed cleaning for woody plants collected during 1976. Cont'd.

Species	Accession No.	Origin	Cleaning steps used in order of process	Percent debris remaining after cleaning[1/]
Pyrus ussuriensis	K-386	Anchorage, Ak	Crushed fruits placed in plastic bag to soften. Seeds removed with tweezers.	0
Rosa sp.	K-402	Palmer, Ak	Hips soaked 26 days in water. Hips macerated with potato masher. Seeds mashed over 1/16" mesh screen. Seeds/pulp air dried. Office Clipper #10 top, #6 bottom.	2
Sorbus scopulina	L-388	Palmer, Ak	Berries soaked 36 days in water. Macerated 20 sec. at low speed in kitchen blendor with 1:1 fruit to water by volume. Seed/debris air dried. Office Clipper #6 and #8 top, #1/15 bottom. Stems removed with 1/8" mesh hand screen. South Dakota Blower. Tweezer removal of stems.	34

1/ Percent debris remaining after cleaning consists of stalks, stems, fruit skins, wings, styles, hulls, scales, pieces of flowers, leaves, pods, and broken seeds. Hollow seeds were included as debris whenever found. Percent Debris Remaining column is intended as an evaluation of the described cleaning method and does not consider time or cost expended.

2/ A desk size air screen machine used for cleaning small seed lots from A. T. Ferrell Co., Saginaw, Michigan.

3/ An air column blower for air cleaning of seed, from Burrows Equipment Co., Evanston, Illinois.

4/ Model 449 Osterizer kitchen blendor. Low speed is 12,500 rpm. Water with the fruit cushions seeds from severe blade damage.

5/ A laboratory seed thresher with spiked cylinder-concave that is primarily used on small grains, Bill's Welding, Pullman, Washington.

APPENDIX TABLE 1. Woody plant material under field observation in 1976.

Species	Acc. No.	Origin	Date Prop[1]	Date Field Planted	Field 4 Loc.	No. Planted-Field 4	Plants Alive Oct.75 - Oct.76		Winter Injury[2]	Size (cm) Height x Width	Comments
Acer tatarica	-	Ames, Ia	-	6/75	A-7	3	3	0	6	-	Winterkilled NC-7 acc.
Alnus tenuifolia	L-303	Palmer, Ak	-	6/76	D-1	10	-	10	-	41 x 16	Balled transplant, Intergrade collection
Amelanchier alnifolia	Success	Bismarck, ND	-	5/74	G-2	10	10	0	6	-	Trnsplt. to field 4 5/75, all winterkilled
Amorpha fruticosa	AM2718	Americus, Ga	- S	5/75	G-1	10	9	0	6	-	Slow trnsplt. recovery winterkilled
Ampelopsis brevipedunculata	AM2402	Americus, Ga	-	5/75	I-2	10	8	0	6	-	Winterkilled
Arctostaphylos uva-ursi	L-142	Palmer, Ak	4/74 C	5/76	I-4	9	-	8	-	4 x 12	16% rooting under mist w/IBA treatment
Artemisia abrotanum nanum	A5088	Cheyenne Wyo	6/74 C	6/75	J-1	10	10	0	6	-	Winterkilled
A. *frigida*	L-93	Palmer, Ak	-	7/75	J-5	10	8	8	1	48 x 84	Wild plant collection, no winter inj. seed collecte
Betula papyrifera	L-44	Fairbanks, Ak	4/74 S	5/75	A-6	10	10	9	1	50 x 28	Good spring rec. no winter injury
Buxus suffruticosa	G17880	Geneva, NY	-	6/75	H-14	10	10	0	6	-	Winterkilled, no shoot growth in 75
B. *suffruticosa*	G17881	Geneva, NY	-	6/75	office	1	1	0	6	-	Winterkilled, no shoot growth in 75
Campis radicans	AM3097	Americus, Ga	-	5/75	I-3	19	17	0	6	-	Winterkilled 1-1 bareroots plntd.
Caragana arborescens	L-84	Fairbanks, Ak	5/74 S	5/75	D-6	10	10	4	2	58 x 25	Spring recovery slow

1/ See footnotes 1, and 2 at end of table page 80.

APPENDIX TABLE 1. Woody plant material under field observation in 1976. Cont'd.

Species	Acc. No.	Origin	Date Prop[1]		Date Field Planted	Field 4 Loc.	No. Planted-Field 4	Plants Alive Oct.75	Plants Alive Oct.76	Winter Injury[2]	Size (cm) Height x Width	Comments
Caragana arborescens pendula	L-290	Ames, Ia	-		7/76	H-1	10	-	10	2	20 x 37	NC-7 accession
C. microphylla Tidy	A51348	Cheyenne Wyo	4/74	C	5/75	H-2	10	10	10	1	70 x 12	
Ceanothus americanus	AM2138	Americus, Ga	-		5/75	F-1	10	8	0	6	-	Winterkilled
Cornus amomum	Mich 765	Rose Lake, Mi	-		5/74	E-1	10	5	0	6	-	Trnsplt to field 4 5/75, all winterkilled
C. stolonifera	L-191	Palmer, Ak	6/74	C	5/75	E-2	10	10	9	1	35 x 31	Spring rec. mod. slow
C. stolonifera Isanti	L-291	Ames, Ia	-		7/76	E-1	8	-	8	-	27 x 34	NC-7 accession
Crataegus arnoldiana	ND20	Bridger, Mont	5/74	S	5/75	D-8	10	2	0	6	-	Poor trnsplt rec. in 75
Dryas drummondii	L-210	Palmer, Ak	5/76	S	5/76	I-7	7.5g/ft^2	-	0	-	-	Dry seedbed conditions
Elaegnus angustifolia	Wy160	Bismarck, ND	-		5/74	D-3	10	3	0	6	-	Trnsplt to field 4 5/75 in poor condition
E. angustifolia orientalis	A71106	Cheyenne Wyo	6/74	C	5/75	D-11	10	1	0	6	-	Poor trnsplt rec. D-11 replntd to L-159
E. commutata	L-103	Matanuska, Ak	4/74	S	5/75	D-5	10	10	10	1	57 x 34	Good spr. rec. no winter inj.
E. commutata	L-198	Palmer, Ak	-		5/75	seed-house	10	9	7	1	29 x 16	Wild plant collection, no winter injury
E. umbellata	mixed lot	Americus, Ga	-		5/75	D-4	10	10	0	6	-	Winterkilled

1/ See footnotes 1, and 2 at end of table, page 80.

APPENDIX TABLE 1. Woody plant material under field observation in 1976. Cont'd.

Species	Acc. No.	Origin	Date Prop[1]		Date Field Planted	Field 4 Loc.	No. Planted-Field 4	Plants Alive Oct.75	Plants Alive Oct.76	Winter Injury[1]	Size (cm) Height x Width	Comments
Euonymus americanus	A49468	Cheyenne Wyo	6/74	C	5/75	G-3	10	8	0	6	-	Slow trnsplt rec. 75, winterkilled
E. bungeanus	AM2598	Americus, Ga	-		5/75	G-4	10	10	0	6	-	Winterkilled
Fraxinus excelsior	PI377816	Ames, Ia	-		5/75	A-9	6	3	0	6	-	NC-7 accession, no shoot growth. 3 trees killed by tractor in 75
Gleditsia sp.	L-290	Mandan, ND	4/76	S	8/76	A-11	10	-	10	-	-	Fall frost damage
Hamamelis virginia		Ames, Ia	-		5/75	F-2	10	1	0	6	-	NC-7 accession, poor trnsplt rec. winterkilled
Juniperus communis	L-199	Palmer, Ak	7/74	C	5/76	J-6	10	-	10	-	-	
J. horizontalis Bar Harbor		Fresno, Cal	7/74	C	5/75	J-3	19	18	5	3	6 x 26	
J. horizontalis Wiltoni		Fresno, Cal	5/74	C	5/75	J-2	19	15	0	6	-	Winterkilled
Larix siberica -		Bottineau, ND		S	6/75	A-8	3	3	0	6	-	NC-7 acc. winterkilled
L. siberica	L-147	Maisala, Finland	6/75	S	6/7	B-13	10	-	9	-	18 x 8	Containerized seedling
Ligustrum vulgare	PI170630	Bridger, Mont	8/74	C	5/75	E-8	10	8	0	6	-	Winterkilled
Lonicera maacki	AM1538	Americus, Ga	-		5/75	H-3	10	10	0	6	-	" "
L. tatarica Carlton	A48467	Cheyenne, Wyo	6/74	C	5/75	H-4	10	10	0	6	-	" "
L. sp Cardinal	A51186	Cheyenne, Syo	6/74	C	5/75	H-5	10	9	0	6	-	" "

1/ See footnotes 1, and 2 at end of table, page 80.

APPENDIX TABLE 1. Woody plant material under field observation in 1976. Cont'd.

Species	Acc. No.	Origin	Date Prop[1]	Date Field Planted	Field 4 Loc.	No. Planted-Field 4	Plants Alive Oct.75 - Oct.76		Winter Injury[2]	Size (cm) Height x Width	Comments
Malus baccata mandshurica	Midwest	Bismarck, ND	-	5/74	C-4	10	10	1	5	36 x 25	Trnsplt to field 4 5/75, winterkilled, lone survivor severely injured
Malus zumi	Michl340	Rose Lake, Mich	-	5/74	C-3	10	10	0	6	-	Trnsplt to field 4 5/75, winterkilled
Parthenocissus quinquifolia	AM3041	Americus, Ga	-	5/75	I-1	19	9	0	6	-	Slow trnsplt rec. winterkilled
Picea glauca	R-10	MP 1321 Ak Highway	4/74 S	5/75	B-5	10	7	3/9	2	4 x 3	7 dead seedlings replaced with live seedlings, 8/76
P. glauca	L-224	Kenai, Ak	6/75 S	7/76	B-10	10	-	10	-	12 x 6	Cont. seedlings slow trnsplt rec.
P. glauca	L-225	Fairbanks, Ak	6/75 S	7/76	B-11	10	-	10	-	13 x 6	Cont. seedlings slow trnsplt rec.
P. glauca	L-226	"	6/75 S	7/76	B-12	10	-	10	-	11 x 6	" "
P. sitchensis	L-187	Juneau, Ak	S	5/75	B-4	10	10	0	6	-	Wild plant coll. 2 yr-old seedlings winterkilled
Pinus contorta latifolia	L-236	Whitehorse, YT	6/75 S	7/76	B-15	10	-	8	-	-	Cont. seedlings
P. contorta	L-242	Hayilton, B.C.	S	5/75	B-1	19	16	0	6	-	2-0 bareroot seed. winterkilled
Pinus resinosa	L-243	Hayilton, B.C.	- S	5/75	B-2	10	10	0	6	-	2-0 bareroot seed. winterkilled
P. sylvestris Manty	L-88	Rovanienmi, Finland	6/75 S	7/76	B-14	10	-	6	-	13 x 5	Cont. seedlings mechanical damage
Populus balsamifera	L-120	Palmer, Ak	4/74 C	6/74	f4N1	10	10	7	1	60 x 30	Trnsplt to field 7 7/75, poor trnsplt care and recovery

1/ See footnotes 1, and 2 end of table, page 80.

APPENDIX TABLE 1. Woody plant material under field observation in 1976. Cont'd.

Species	Acc. No.	Origin	Date Prop[1]		Date Field Planted	Field 4 Loc.	No. Planted-Field 4	Plants Alive Oct.75	Plants Alive Oct.76	Winter Injury[2]	Size (cm) Height x Width	Comments
Populus balsamifera	L-281	Talkeetna, Ak	4/76	C	7/76	f4E1	10	-	10	-	76 x 1	100% rooting under mist
P. balsamifera	L-282	Talkeetna, Ak	4/76	C	7/76	f4E2	10	-	10	-	107 x 1	96% rooting under mist
P. balsamifera X *P. trichocarpa*	L-192	MP 40 Sterling Highway	8/74	S	7/76	A-10	10	-	10	-	201 x 27	
P. canadensis eugenia	Mich 88	Bismarck, ND		C	5/74	A-3	10	10	0	6	-	Trnsplt to field 4 5/75, all winterkilled
P. nigra	A3061	Cheyenne, Wyo	4/74	C	5/75	A-1	10	10	0	6	-	Winterkilled
P. petrowskyana	A49333	Cheyenne, Wyo	6/74	C	5/75	A-5	10	10	10	1	159 x 127	Excellent spring rec. easily propagated
P. simoni	Mich857	Rose Lake, Mich		C	5/74	A-2	10	10	0	6	-	Trnsplt to field 4 5/75, all winterkilled
Potentilla fruticosa	L-8	MP 108 Rich. Hwy.	4/74	S	5/75	H-10	10	10	10	1	55 x 56	No winter inj. profuse yellow blooms
P. fruticosa Manley's	A7237	Cheyenne, Wyo	7/75	C	5/76	H-9	10	-	9	-	27 x 39	
P. fruticosa dahurica	A32742	Cheyenne, Wyo	6/74	C	5/75	H-12	10	10	4	4	31 x 41	Slow spr. rec. white blooms
P. fruticosa frederichseni	A48462	Cheyenne, Wyo	6/74	C	5/75	H-13	10	10	10	1	50 x 72	Profuse yellow blooms
P. fruticosa Hallman's Dwarf	A7058	Cheyenne, Wyo	6/74	C	5/75	H-11	10	10	10	1	26 x 49	Yellow blooms

1/ See footnotes 1, and 2 at end of table, page 80.

APPENDIX TABLE 1. Woody plant material under field observation in 1976. Cont'd.

Species	Acc. No.	Origin	Date Prop[1]	Date Field Planted	Field 4 Loc.	No. Planted-Field 4	Plants Alive Oct.75	Plants Alive Oct.76	Winter Injury[2]	Size (cm) Height x Width	Comments
Prunus armeniaca	Morden	Bismarck, ND	-	5/74	C-2	10	10	0	6	-	Trnsplt to field 4 5/75, all winterkilled
P. cerasifera	Thunder-bird	Ames, Ia	-	5/75	A-4	8	8	0	6	-	NC-7 accession purple foliage
P. padus commutata	SD131	Bismarck, ND	-	5/74	C-1	10	10	3	4	103 x 47	Trnsplt to field 4 5/75, survivors badly injured
P. sp.	L-146	Fairbanks, Ak	5/74 C	5/75	D-10	10	10	10	1	75 x 55	Spr. rec. good foliage subject to windburn
P. virginiana melanocarpa	L-205	Palmer, Ak	8/74 C	5/75	D-9	10	8	0	6	-	CV. Shubert winterkilled
Rosa acicularis	L-43	MP 57 Steese Hwy	6/74 S	5/76	I-11	10	-	10	-	38 x 27	
R. acicularis	L-92	Palmer, Ak	3/74 S	5/76	I-10	10	-	10	-	30 x 31	
Rhus copallina	AM3225	Americus, Ga	-	5/76	J-16	10	-	4	-	29 x 5	Only 4 plants dev. foliage, but burned by early frost
Ribes laxiflorum	L-125	Juneau, Ak	7/74 C	5/76	I-5	10	-	9	-	18 x 65	1 missing
Rubus idaeus strigosus	L-260	Palmer, Ak	8/75 C	8/76	I-6	10	-	10	-	9 x 15	40% rooted w/root cuttings under mist
Salix alaxensis	L-113	Matanuska, Ak	4/74 C	6/74	F-11	10	10	9	1	199 x 232	Trnsplt to field 4 6/75, light aphid/worm infestation
S. alaxensis	L-130	Juneau, Ak	4/74 C	6/74	F-10	10	10	10	1	173 x 200	" "
S. alaxensis	R-53	Palmer, Ak	6/76C	7/76	K-1	13	-	9	-		YCC project
S. alaxensis	R-54	"	6/76 C	7/76	K-2	13	-	10	-		" "
S. alaxensis	R-55	"	6/76 C	7/76	K-3	13	-	11	-		" "

1/ See footnotes 1, and 2 at end of table, page 80.

APPENDIX TABLE 1. Woody plant material under field observation in 1976. Cont'd.

Species	Acc. No.	Origin	Date Prop[1]	Date Field Planted	Field 4 Loc.	No. Planted-Field 4	Plants Alive Oct.75	Plants Alive Oct.76	Winter Injury[2]	Size (cm) Height x Width	Comments
Salix alaxensis	R-56	Palmer, Ak	6/76	C 7/76	K-4a	4	4	-	-	-	YCC project
S. alaxensis	R-57	Wasilla, Ak	6/76	C 7/76	K-4b	9	-	7	-	-	" "
S. alaxensis	R-58	"	6/76	C 7/76	K-5a	9	-	7	-	-	" "
S. alaxensis	R-59	Palmer, Ak	6/76	C 7/76	K-5b	4	-	4	-	-	" "
S. alaxensis	R-60	"	6/76	C 7/76	K-6a	7	-	6	-	-	" "
S. alaxensis	R-61	"	6/76	C 7/76	K-6b	6		5	-	-	" "
S. alaxensis	R-62	Houston, Ak	6/76	C 7/76	K-7	13	-	12	-	-	" "
S. alaxensis	R-63	Palmer, Ak	6/76	C 7/76	K-8	13	-	13	-	-	" "
S. alaxensis	R-64	" "	6/76	C 7/76	K-9a	9	-	8	-	-	" "
S. alaxensis	R-65	Matanuska, Ak	6/76	C 7/76	K-9b	4	-	4	-	-	" "
S. alaxensis	R-66	"	6/76	C 7/76	K-10	13	-	12	-	-	" "
S. alaxensis	R-67	Eklutna, Ak	6/76	C 7/76	K-11	13	-	6	-	-	" "
S. alaxensis	R-68	"	6/76	C 7/76	K-12	13	-	11	-	-	" "
S. alaxensis	R-69	Palmer, Ak	6/76	C 7/76	K-13a	7	-	6	-	-	" "
S. alaxensis	R-70	"	6/76	C 7/76	K-13b	3	-	3	-	-	" "
S. alaxensis	R-71	"	6/76	C 7/76	K-13c/14a	10	-	9	-	-	" "
S. alaxensis	R-72	Wasilla,	6/76	C 7/76	K-14b	6	-	2	-	-	" "
S. alaxensis	R-73	Ak "	6/76	C 7/76	K-15	7	-	7	-	-	" "
S. alba vitellina	M961	Bridger, Mont	5/74	C 5/74	D-2	10	10	0	6	-	Trnsplt to field 4 5/75, winterkilled
S. alba vitellina	A73126	Cheyenne, Wyo	7/75	C 8/76	D-2	10	-	10	-	44 x 7	Replaces M961 easily propagated

1/ See footnotes 1, and 2 at end of table, page 80.

APPENDIX TABLE 1. Woody plant material under field observation in 1976. Cont'd.

Species	Acc. No.	Origin	Date Prop[1]	Date Field Planted	Field 4 Loc.	No. Planted-Field 4	Plants Alive Oct.75	Plants Alive Oct.76	Winter Injury[2]	Size (cm) Height x Width	Comments
Salix barclayi	L-131	Juneau, Ak	4/74 C	6/74	F-8	10	9	6	5	81 x 98	Trnsplt to field 4 6/75, W.I. 95%
S. bebbiana	L-143	"	5/74 C	6/75	E-17	10	9	9	1	134 x 176	Exc. spr. rec. 15-20% winter inj.
S. bebbiana	L-156	Palmer, Ak	5/74 C	6/75	D-17	10	10	10	1	119 x 124	2-5% win. inj. exc. spr. rec.
S. glauca	L-104	Matanuska, Ak	4/74 C	6/74	E-11	10	10	10	1	136 x 176	Ex. spr. rec. heavy aphid/worm dam. trnsp to field 4, 6/75
S. lasiandra	L-161	Palmer, Ak	5/74 C	5/75	E-14	10	10	10	2	133 x 138	Good spr. rec. foliage variable
S. lasiandra	L-163	"	5/74 C	6/75	F-14	10	10	10	4	130 x 105	Vigorous spr. rec. from crown, lt. aphid infestation
S. monticola	L-171	"	5/74 C	6/75	F-13	10	10	10	1	122 x 156	Heavy terminal, infestation of aphid
S. sp.	L-78	Nome, Ak	6/75 C	7/76	H-15	10	-	10	1	31 x 39	100% root. under mist
S. sp.	L-95	Kodiak Is. Ak	3/74 C	6/74	F-1	10	10	0	6	-	Trnsplt to field 4, 6/75
S. sp.	L-96	"	3/74 C	6/74	F-12	10	10	0	6	-	" "
S. sp.	L-105	Matanuska, Ak	7/75 C	8/76	C-17	10	-	10	-	78 x 71	100% root. under
S. sp.	L-107	"	4/74 C	6/74	E-9	10	10	10	1	144 x 183	Very good spr. rec. heavy aphid infest. trnsplt to field 4 6/75
S. sp.	L-111	Matanuska, Ak	4/74 C	6/74	E-10	10	10	10	4	100 x 135	Trnsplt to field 4 6/75, spr. rec. poor terminals stunted, chlorotic

1/ See footnotes 1, and 2 at end of table, page 80.

APPENDIX TABLE 1. Woody plant material under field observation in 1976. Cont'd.

Species	Acc. No.	Origin	Date Prop[1]	Date Field Planted	Field 4 Loc.	No. Planted-Field 4	Plants Alive Oct.75	Plants Alive Oct.76	Winter Injury[2]	Size (cm) Height x Width	Comments
Spirea nipponica	A56160	Cheyenne Wyo	6/74 C	5/75	G-6	10	10	0	6	-	Winter-killed
Syringa palibinana	A7186	"	6/74 C	5/75	F-3	10	10	6	1	39 x 33	
Viburnum edule	L-114	Eklutna, Ak	4/74 C	5/75	E-3	10	10	8	1	18 x 15	Spr. rec. mod. slow, some wind damaged foliage

1/ Propagation date refers to date propagation began in the greenhouse as seed or cuttings. Accessions without propagation dates were collected or received at the PMC as growing plants.

2/ Injury rating refers to percent of area affected on surviving plants by winter conditions. Ratings taken July 1976. 1, 0% to 19%; 2, 20% to 39%; 3, 40% to 59%; 4, 60% to 79%; 5, 80% to 99%; 6, 100% (dead).

Cooperative Rose Evaluations

The Alaska Rose Society began this project in 1974 with a small area on the east side of the Plant Materials Center office building and in 1976 moved surviving plants to the permanent location north of the PMC office building. The Rose Garden enables visitors to obtain on-site information as to rose hardiness, form, flower color, time and length of flowering as well as cultural considerations in transplanting and maintaining roses in the home landscape. Presently there are 32 rose bushes representing 13 *Rosa* sp. varieties planted in a semiformal block with Alaskan hardy varieties in the center and Canadian grown varieties along the block margins.

The 1975 Annual Technical Report listed *Rosa* varieties in the Woody Initial Evaluation report but not in a specific Rose Garden Evaluation report. A summary of the results of the 1974 rose demonstration bareroot planting on the east side of the PMC office building follows:

Rose Varietal Name	Number Planted	1974-75 Survival	1975-76 Survival	Comments
Altai Scotch x Burnet	2	2	0	Buds emerged and died
Assiniloine	2	1	0	Winterkilled
Betty Bugnet	2	2	0	Buds emerged and died
Cumberland	2	1	0	Winterkilled
Lac Mayea	1	1	0	Winterkilled
Lac La Noune	3	3	0	Winterkilled
Louise Bugnet	2	2	0	Winterkilled
Marie Bugnet	2	2	0	Winterkilled
Mrs. Anthony Watever	2	2	0	Buds emerged and died

Perfuma Ae La Gay	1	1	0	Winterkilled
Perfuma Ae La Hug	1	1	0	Winterkilled
Prairie Youth	2	2	0	Winterkilled
Suzanne[1/]	2	2	0	Winterkilled
Tetonhaha	2	2	0	Buds emerged and died

Roses were transplanted into the new block during July 1976 after roots had been soaked in water to replace that lost during transit from Beaverlodge, Alberta. All rose varieties were on their own roots having been propagated by cuttings rather than grafts or buds. Fertilizer was applied as 8-32-16 and shallowly cultivated into the soil. The roses were watered during the summer months as required with an oscillating sprinkler. A 4-inch to 6-inch layer of straw mulch was applied to the Rose Garden during the first week of November for winter protection.

The Alaska Rose Society has agreed to cultivate-weed and prune the roses when necessary. Plant Materials Center personnel will be responsible for irrigation, fertilization and winter mulching of the Rose Demonstration Garden.

Demonstration rose descriptions (1976) follow with the garden location number, rose name, hybridizer's name, date of hybridization, flower color and parentage as available:

1. 'Altai x Burnet' -- suspected to be *Rosa spinosissima* x *Rosa spinosissima altai*

2. 'Betty Bland' -- F. L. Skinner, 1925, deep rose, *Rosa blanda* x a Hybrid Perpetual

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1/ The source of this rose was Cheyenne, Wyoming; all others were from Beaverlodge, Alberta Canada.

3. 'Butterball' -- F. L. Skinner, 1950, creamy yellow, *Rosa spinosissima altaica* x

4. 'Haidee' -- F. L. Skinner, 1953, pink with cream center, *Rosa laxa* x *Rosa spinosissima*

5. 'Isabelle Skinner' -- pink, (*Rosa laxa* x a Tea) x a Floribunda

6. 'Lac La Nonne' -- P. H. Wright, 1975, deep pink, *Rosa rugosa plena* x *Rosa acicularis*

7. 'Mrs Anthony Watever' -- John Watever, 1898, *Rosa rugosa* x General Jaqueminot

8. 'Mrs John McNab' -- F. L. Skinner, 1941, light pink with white center, *Rosa beggeriana* x *Rosa rugosa*

9. 'Rose a Parfum de l Hay' -- Grauereaux, 1901, *Rosa damascena* x Gen. Jacqueminot x *Rosa rugosa*

10. 'Prairie Wren' -- Morden Experiment Farm, 1948, rich pink, Pedigree involved Ophelia, Turkes Rugosa Samling and *Rosa spinosissima altaica*

11. 'Suzanne' -- F. L. Skinner, 1950, coral pink, *Rosa laxa* x *Rosa spinosissima*

12. 'Turkestan' -- *Rosa laxa alba*

13. 'Wassagaming' -- F. L. Skinner, 1939, rose, (*Rosa rugosa* x *Rosa acicularis*) x Gruss an Teplitz

Allan D. Klatt

Joseph L. Stehlik

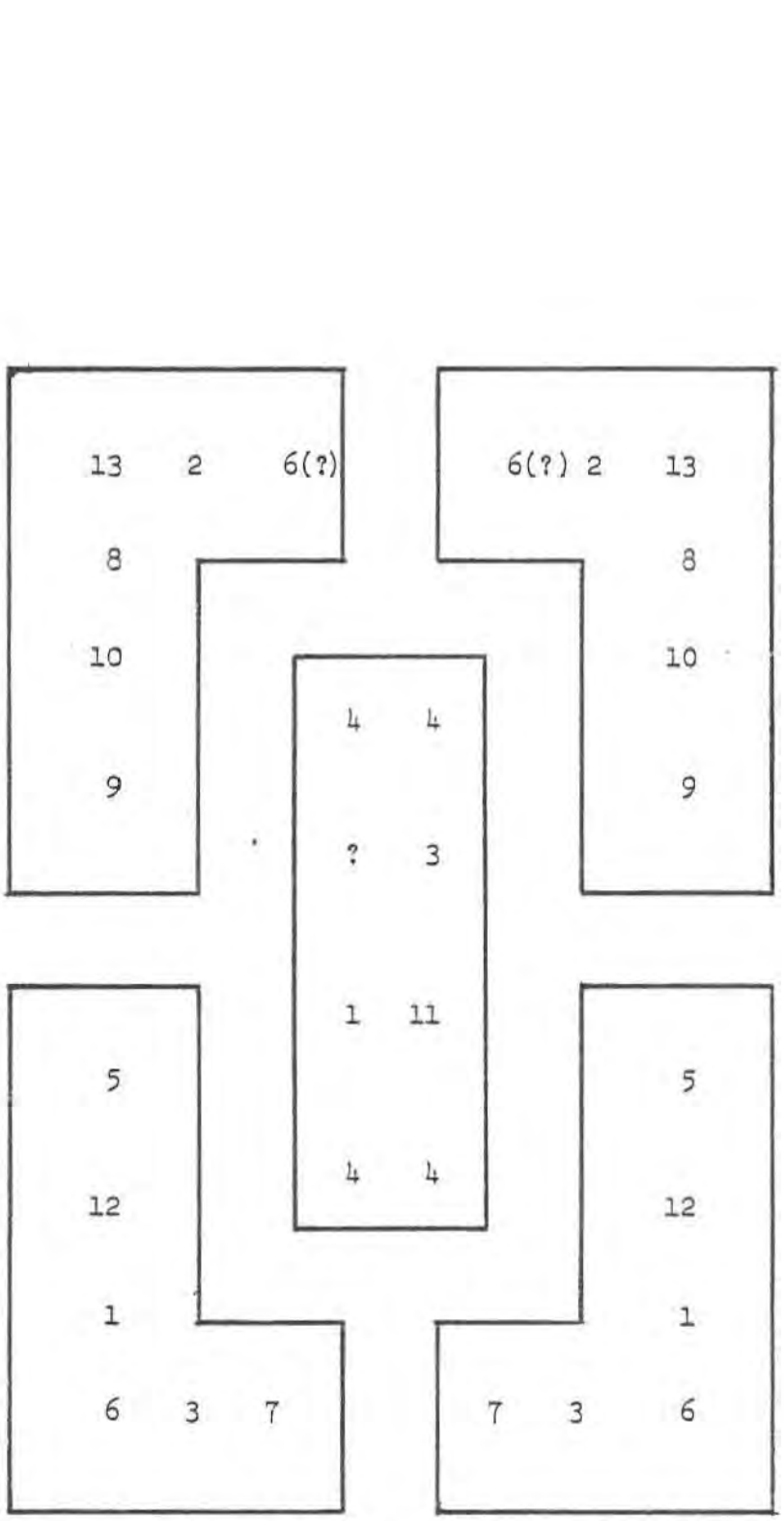


Figure 1. 1976 Rose Demonstration Garden layout1/, Scale 1 inch = 5 feet.

1/ Locational numbers refer to *Rosa* names on preceding page.

SECONDARY EVALUATIONS

Establishment of Vegetation on Beluga Coal Field Core Samples

The Beluga coal field is located west of Anchorage across the Cook Inlet. The field has been estimated to cover 450 square miles and contain as much as 2.4 billion tons of low sulfur coal lying between 300 and 1000 feet deep. It is planned to mine the coal by stripping wherever feasible and to reclaim the spoils with native vegetation.

The overburden is comprised of rather sterile material (N-13ppm, P-3ppm, K-228ppm, pH-8.64 @ 214-223 foot depth, core No. L-19c) of layered sands, silts and clays. The term "mudstone" is used to describe the material. Mining operations will mix this material to a certain extent but the eventual composition of the surface six inches of the soil cannot be determined at this time.

The Placer Amex Corporation of San Francisco is negotiating leases to mine a portion of the coal. They asked the PMC to participate in preliminary evaluations of the suitability of the overburden for revegetation. The PMC agreed to conduct greenhouse observations of selected core samples of the overburden to determine if native and introduced plant species will become established in the spoil materials.

Methods and Materials

Placer Amex, Inc. provided 22 core samples, each two to three feet long, representing depths of overburden from 233 feet to 278 feet. The samples were individually crushed in an American

Pulverizer 9 X 9 type M crusher with a one-eighth inch screen. Each sample was divided among twelve plastic pots. Ten seeds of the following were seeded separately in the pots:

Grasses

Agropyron trachycaulum, slender wheatgrass

Arctagrostis latifolia, tall arcticgrass

Bromus inermis, smooth brome, 'Polar'

Calamagrostis canadensis, bluejoint

Festuca rubra, red fescue, 'Arctared'

Panicum clandestinum, deertongue

Phleum pratense, timothy, 'Engmo'

Poa pratensis, Kentucky bluegrass, 'Nugget'

Legume

Trifolium pratense, red clover, 'Alaskland'

Forbs

Achillea sibirica, siberian yarrow

Artemesia tilesii, sagebrush

Ligusticum scoticum, beach lovage

The seeds were placed on the soil surface without a mulch.

The pots were placed in the greenhouse under an automatic misting system which applied water as a mist at a rate adjustable to the evaporation rate. No fertilizers or soil amendments were used.

Observations were made on moisture penetration into the soil, germination date, number of seeds germinating, mortality of seedlings, and percent of established plants. At the appearance of the second

true leaves the pots were moved from the misting bench and water was withheld to determine how long the plants would survive without additional moisture.

Results

Crushing the samples in this type crusher reduced the cores to a fine powder similar to talc. The surface of the soil in the pots puddled immediately upon being placed on the misting bench. Water penetration into the pots was extremely slow. Even under the misting system, which applied approximately 10 seconds of mist every 15 minutes, the pots flooded and the seeds floated into adjacent pots. The species included in the study were sufficiently different in morphology, however, that identification of the seedlings was retained.

The seeds were placed in the pots on May 20, 1976. Emergence began four days later with the earliest species (Table 1). The legumes and forbs started emerging uniformly on the same date in all core samples. The grasses started emerging over a 10-day period depending on the core sample they were planted in. There was, however, little consistency between species and cores related to date of first emergence, and the dependence may be artificial.

Only three seeds of beach lovage germinated, and those a month after planting. They did not survive. Germination of tall arcticgrass was also poor but those seedlings which emerged did survive. Seedlings of all other species which emerged survived until water stress became pronounced.

A notable phenomenon of the red clover in all core samples

TABLE 1. Date of first emergence of 12 herbaceous species seeded on 22 core samples of overburden from the Beluga coal fields. Seeded May 20, 1976.

Core depth	Species											
	red fescue	Kentucky bluegrass	Polar brome	slender wheatgrass	timothy	tall arcticgrass	bluejoint	red clover	siberian yarrow	deertongue	beach lovage	sagebrush
ft.												
233	5/28	6/2	5/31	6/2	5/26	-	5/31	5/24	5/24	6/2	-	5/24
235	5/27	5/31	6/2	5/31	5/25	-	5/31	5/24	5/24	6/2	-	5/24
237	5/26	6/2	5/31	6/1	5/26	-	5/27	5/24	5/24	6/2	-	5/24
239	5/27	6/2	6/2	5/31	5/26	6/2	5/31	5/24	5/24	6/2	-	5/24
241	5/31	5/31	6/2	5/31	5/24	6/1	5/31	5/24	5/24	6/1	-	5/24
243	5/27	5/31	5/28	5/28	5/24	5/31	5/31	5/24	5/24	6/1	-	5/24
245	5/27	5/31	5/27	5/27	5/24	6/2	5/31	5/24	5/24	6/1	-	5/24
247	5/27	5/31	5/27	5/28	5/26	-	5/31	5/24	5/24	6/1	-	5/24
249	5/27	6/2	6/1	6/1	5/27	-	5/31	5/24	5/24	6/2	-	5/24
251	5/27	5/31	5/28	5/28	5/24	6/2	5/27	5/24	5/24	6/2	-	5/24
253	5/27	5/31	5/31	5/28	5/24	-	5/31	5/24	5/24	6/2	-	5/24
255	5/28	6/2	6/1	6/1	5/26	-	-	5/24	5/24	6/2	-	5/24
258	5/28	6/1	5/31	5/31	5/27	-	5/31	5/24	5/24	6/1	-	5/24
259	5/31	6/1	6/1	6/1	5/27	-	6/1	5/24	5/24	6/1	-	5/24
262	5/27	6/2	5/31	5/28	5/27	6/2	5/31	5/24	5/24	6/1	-	5/24
264	5/27	6/1	5/29	5/28	5/27	-	5/29	5/24	5/24	6/1	6/20	5/24
266	5/27	5/30	6/1	6/1	5/24	-	5/31	5/24	5/24	6/1	6/24	5/24
268	5/28	5/31	6/1	5/30	5/26	6/2	5/29	5/24	5/24	6/1	-	5/24
270	5/27	5/31	5/28	5/29	5/27	-	5/30	5/24	5/24	6/1	-	5/24
272	5/27	6/2	5/28	5/28	5/26	-	5/28	5/24	5/24	6/2	-	5/24
274	5/28	5/31	5/31	5/31	5/27	-	5/30	5/24	5/24	6/2	-	5/24
278	5/28	5/30	5/31	5/31	5/27	-	5/30	5/24	5/24	6/2	6/20	5/24

was the inability of the roots to penetrate the soil. The roots coiled across the soil surface until they came to a small crack or the edge of the pot, whereupon penetration was achieved. No other species had this problem.

Core sample no. 247 produced an unusual response in the pot seeded to deertongue. Shortly after the six seedlings emerged they all turned purple. This discoloration slowly faded as the plants grew but was never entirely lost. There is no data available to explain this isolated occurrence.

The three outstanding species were Nugget bluegrass, slender wheatgrass, and the sagebrush, all achieving over 80% emergence and survival (Table 2). Plant vigor was excellent and no nutrient deficiencies were noted. The first two species are available commercially and the third is in initial increase at the PMC. Arctared red fescue and Engmo timothy also had good emergence and survival and are available commercially.

At the time the majority of grasses reached the full two leaf stage (approximately 30 days) the pots were moved from the misting bench and water withheld. All plants continued to grow normally for 30 days showing no moisture stress even though the amount of soil in each pot was small (1/2 cup). Moisture stress appeared uniformly in all species during the next 30 days and growth was halted. However, all plants were still alive after 90 days, in spite of obvious moisture stress, indicating a high water holding capacity in the core samples.

TABLE 2. Number of seedlings established of 12 herbaceous species seeded on 22 core samples of overburden from the Beluga coal fields. June 24, 1976.

Core depth	Species												
	red fescue	Kentucky bluegrass	Polar brome	slender wheatgrass	timothy	tall arcticgrass	bluejoint	red clover	siberian yarrow	deertongue	beach lovage	sagebrush	Average
ft.													
233	7	8	8	8	9	0	1	5	7	9	0	9	5.9
235	9	9	4	10	6	0	2	5	9	5	0	9	5.7
237	9	10	6	9	6	0	3	3	4	6	0	8	5.3
239	8	9	3	10	7	1	5	5	9	7	0	9	6.1
241	5	10	5	8	8	1	2	6	4	7	0	8	5.3
243	7	7	9	9	10	1	5	4	7	7	0	8	6.2
245	7	9	8	10	7	2	5	6	7	5	0	10	6.3
247	10	9	9	10	10	0	4	5	7	6	0	8	6.5
249	6	9	8	6	9	0	3	5	8	9	0	10	6.1
251	8	10	9	10	6	1	5	4	8	5	0	10	6.3
253	7	8	9	8	5	0	2	5	4	10	0	8	5.5
255	8	9	5	10	10	0	0	5	3	4	0	9	5.3
258	5	8	1/	1/	1/	0	3	5	10	6	0	10	5.1
259	4	5	6	7	9	0	1	8	9	7	0	10	5.5
262	8	5	6	10	8	2	2	2	5	9	0	10	5.6
264	9	9	7	10	7	0	4	4	7	6	2/	9	6.5
266	4	9	5	8	6	0	1	3	4	7	2/	6	4.5
268	10	9	6	4	7	1	3	5	5	8	0	8	5.5
270	5	9	8	10	7	0	1	6	3	7	0	8	5.3
272	9	10	4	10	9	0	2	3	6	3	0	9	5.4
274	8	9	9	8	8	0	3	2	4	6	0	10	5.6
278	4	9	7	10	8	0	2	5	8	5	2/	10	5.8
Av.	7.1	8.6	6.7	8.8	7.7	0.4	2.7	4.5	6.3	6.5	0.1	8.9	

1/ Seedling counts not possible.
2/ Seedlings did not survive.

Summary

Crushing the core samples to a fine powder caused problems with surface puddling and water penetration at the beginning of the study. Once the soil material became saturated, the high water-holding capacity permitted the plants to survive 90 days without additional water. Emergence and survival of most species included in the study was good. Those showing poor emergence are known to have inherent germination problems; their performance cannot be attributed to the core samples. Five of the eight species showing over 50% emergence are, or soon will be, commercially available.

The results conclude that seed will germinate and the plants will become established on these core samples under the ideal conditions of a greenhouse misting bench. Continued survival of the plants, their management, fertility requirements, production and ground cover potentials need to be evaluated under field conditions utilizing unprocessed overburden material. Additional species including woody plants should also be tested.

James R. Stroh

An Evaluation of 16 Grass and Legume Species for Seed Production in the Matanuska Valley

Certain grass and legume species used in conservation and forage production plantings in Alaska are recommended in an interagency publication M7-N-22612 "A Vegetative Guide for Alaska." Few of the 20-odd species listed are being grown for seed in the state. Most are either imported from outside or are not commercially available anywhere.

The purpose of this study was to determine the seed production potential of sixteen commercial species recommended for Alaska. Seed production of each species must be high enough to return a profit to the producer at prices that are competitive with imported seed of the same species and variety.

Materials and Methods

The study was planted June 21, 1973 in Field 1D on the Plant Materials Center. Each entry was seeded in four rows spaced three feet apart in plots 12 by 30 feet and replicated three times in a randomized complete block design. Seeding rates were approximately 10 pounds per acre. The legumes were inoculated with the appropriate rhizobia.

The soil in the study area is a Susitna silt loam, a Typic Cryofluvent, coarse loamy, mixed and acid.

Entries in this study are:

Agropyron dasystachyum, thickspike wheatgrass 'Critana'

Agropyron desertorum, desert wheatgrass 'Nordan'

Agropyron riparium, streambank wheatgrass 'Sodar'

Agropyron sibiricum, siberian wheatgrass P-27

Alopecurus arundinaceus, creeping foxtail 'Garrison'

Astragalus cicer, cicer milkvetch 'Lutana'

Bromus inermis, smooth brome 'Manchar'

Bromus inermis X *pumpellianus*, brome 'Polar'

Festuca o. duriuscula, hard fescue 'Durar'

Festuca rubra, red fescue 'Arctared'

Festuca rubra, red fescue 'Boreale'

Medicago falcata, sickleqod alfalfa P-14488

Phleum pratense, timothy 'Engmo'

Poa glaucantha, upland bluegrass 'Draylar'

Poa pratensis, kentucky bluegrass 'Newport'

Poa pratensis, kentucky bluegrass 'Nugget'

Results

Poor spring recovery was noted for almost the entire planting in June of 1976 Table 3. Because of this initial poor performance and the severe winterkill the project was abandoned.

A summary of the three replicates including 1976 spring recovery, percent stand for 1973 to 1976, and seed production for 1974 and 1975 is included in Table 4.

Conclusion

Seed matured and was collected from Arctared red fescue, Nugget kentucky bluegrass, and Garrison creeping foxtail in

TABLE 3. Results of 1976 spring recovery in the Seed Production Study

Plot	Replications I Variety	I Spring Recovery	II Variety	II Spring Recovery	III Variety	III Spring Recovery
A	Draylar	1[1/]	Engmo	1	Critana	1
B	Sodar	4	Draylar	1	Garrison	3
C	Nugget	4	P-14488	1	Manchar	1
D	Arctared	4	Nordan	1	Boreal	1
E	Critana	2	Garrison	3	Arctared	4
F	Lutana	1	Aurora	1	Nugget	3
G	Polar	1	Manchar	1	Sodar	1
H	Engmo	1	Durar	1	Polar	3
I	Newport	1	Alaskland	1	Draylar	1
J	Manchar	1	Critana	2	Engmo	1
K	P-14488	1	Nugget	2	Alaskland	1
L	P-27	1	Arctared	3	Newport	1
M	Durar	1	P-27	1	Aurora	1
N	Alaskland	1	Boreal	1	Durar	1
O	Garrison	3	Sodar	3	Nordan	1
P	Nordan	1	Lutana	1	P-14488	1
Q	Boreal	1	Newport	1	P-27	1
R	Aurora	1	Polar	2	Lutana	1

1/ Spring recovery is rated on a scale from 1 to 10 with 1 being dead and 10 being excellent.

TABLE 4. Spring recovery and percent stand, for 1976, and seed production for 1974 and 1975, of 18 grass and legume varieties grown at Palmer, Alaska. Average of 3 reps. 1976

Variety	1976 Spring Recovery	Percent Stand				Seed Production	
		1973	1974	1975	1976	1974	1975
						lbs/acre	
Arctared red fescue	fair	91	30	75	10	106.0	188.7
Sodar streambank wheatgrass	poor	93	95	75	5	-	75.0
Nuggett kentucky bluegrass	poor	97	100	95	5	219.0	114.8
Critana thickspike wheatgrass	poor	98	100	35	5	-	29.1
Polar brome	poor	93	100	100	5	-	103.2
Garrison creeping foxtail	poor	73	90	100	5	71.0	114.9
Engmo timothy	dead	17	20	60	0	-	196.6
P-14488 sickle-pod alfalfa	dead	83	85	45	0	-	-
P-27 siberian wheatgrass	dead	99	60	70	0	-	-
Durar hard fescue	dead	8	10	35	0	-	-
Boreal red fescue	dead	91	30	75	0	-	366.3
Manchar brome	dead	100	100	70	0	-	62.9
Nordan desert wheatgrass	-	83	5	0	0	-	-
Newport kentucky bluegrass	-	78	T	0	0	-	-
Lutana cicer milkvetch	-	99	0	0	0	-	-
Alaskland red clover	-	95	0	0	0	-	-
Aurora alsike clover	-	18	0	0	0	-	-
Draylar upland bluegrass	-	7	0	0	0	-	-

1974. Seed from Arctared red fescue, Sodar streambank wheatgrass, Nugget kentucky bluegrass, Critana thickspike wheatgrass, Polar brome, Garrison creeping foxtail, Engmo timothy, Boreale red fescue, and Manchar brome was harvested in 1976.

Boreale red fescue, Engmo timothy, Arctared red fescue, and Nugget kentucky bluegrass were the only grasses to produce seed at an economically feasible rate (based on 175 to 200 pounds per acre, being the economic breaking point). Currently Arctared, Engmo, and Nugget seed is produced commercially in Alaska and Boreale is grown in Canada.

Based on the two-year records of this study, out of the 16 grass and legume species recommended in the interagency publication, "A Vegetative Guide for Alaska," only the before mentioned varieties should be considered for commercial seed production in Alaska without additional cultural or management studies.

Patrick T. Mulligan

Lodgepole Pine Evaluations

Forty lodgepole pine accessions were planted at the Plant Materials Center in 1974 as part of a U.S. Forest Service evaluation project to select superior lodgepole pine for a possible timber resource in the southcentral and interior regions of Alaska. Lodgepole pine, *Pinus contorta*, is not native to these areas of the state although it has been introduced occasionally as an ornamental and proven fairly successful. The species is native, however, to southeast Alaska and areas of the Yukon Territory, British Columbia, and Alberta as far north as the 63° latitude.

The PMC has agreed to maintain a planting and collect growth performance data annually. Seeds for the project were collected between the 53° and 63° latitudes throughout the Yukon Territory, British Columbia, and southeast Alaska, and the seedlings raised at the Red Rock Forestry nursery in Prince George, B.C. by the Canadian Forestry Service. John Zasada, Research Silviculturist at the Institute of Northern Forestry, United States Forest Service, (USFS) in Fairbanks made the 2-1 bareroot seedlings available to the PMC via State Forestry in 1974.

Materials and Methods

Planting. Tree seedlings were planted June 11 to June 13 in 1974 in a small rototilled plot immediately north of the PMC office building in 8-inch deep tractor dug furrows. The furrows were flooded with water just prior to planting and the seedlings rewatered by

sprinkler after setting. Each accession was replicated five times with replications varying from six to ten plants each.

In late June 1975, it was necessary to transfer the seedlings to new locations. The seedlings were reestablished in a staggered planting design, 8 feet by 8 feet, along the east fence in Field 1E and along the northern and eastern borders of Field 4. Transplant recovery in 1975 appeared to be good.

Irrigation. Three irrigations were made after planting in 1974 with an oscillating garden sprinkler. The last watering was approximately two weeks before freezeup.

Irrigations after transplanting the seedlings to Fields 1E and 4 in 1975 were accomplished with a wheel irrigation system. Three waterings were made after transplanting, again, the last in late fall just before freezeup. Water applications averaged four hours at each setting, applying approximately one inch of water at each.

Fertilization. The only fertilizer application made in 1974 was a 9-45-15 soluble fertilizer material applied in early October. The fertilizer was mixed at 6 pounds per 100 gallons water and applied as a root drench at roughly 450 gallons per acre from a 100-gallon tractor-mounted sprayer. Although fertilizing trees in this manner is not a recommended practice, the intent was to improve root development, if possible, through the remaining fall and early winter period without stimulating top growth. A better practice would have been to incorporate a superphosphate fertilizer or complete low

nitrogen-high phosphate fertilizer such as 8-32-16 into the soil before planting. The decision not to apply a nitrogen fertilizer at the time of planting was made in 1974 for fear of promoting tender growth into fall and early winter period.

In May 1975, 400 pounds per acre of 8-32-16 fertilizer was broadcast in the plot by hand spreader and cultivated into the top two inches of soil in each tree row. An application rate of 400 pounds per acre of 8-32-16 is an actual 32 pounds N, 56 pounds P, and 53 pounds K per acre. The same fertilizer at the same rate was applied again in early June to the seedlings after transferring to the new location.

Weed Control. All weed control in the tree rows was by hand during both seasons. Tractor cultivation provided weed control between the rows.

Mulching. Three-foot wide mulch strips of grain straw were laid over each tree row eight- to twelve-inches deep in 1974 after the ground had thoroughly frozen, and was removed the following spring in mid-April. Mulch was not applied in 1975.

Results

First-year survival of the lodgepole seedlings was good. Ninety-six percent of the seedlings planted survived the first year. Forty-nine percent of those not surviving were lost the first four months after planting and at least another thirty percent entered the

1974-75 winter in a chlorotic condition. So very few losses, if any at all, can be attributed to a lack of winter hardiness the first year. However, winter survival the second year was considerably different -- every tree in the test was killed.

A contributing factor to the 1975-76 winterkill was the unusually long winter period at temperatures below -30°F without snowcover. Another detrimental factor was the drying spring winds between late March and mid-June. It is also possible the late June transplanting may not have provided sufficient time for seedlings to reestablish before winter.

Winter damage was observed after the first year in an attempt to compare hardiness among accessions. Injury ratings in Table 5 and Table 6 represent percent average desiccation to foliage occurring that first winter after planting and following spring. See Table 5 for rating explanation. Not surprisingly, ten of the eleven Alaskan accessions planted were rated in worst half of the group for damage. See Table 6. This is probably due to the fact that all Alaskan accessions were coastal collections.

Seven of the eleven accessions from Alaska, however, were among the top twenty for growth size. Four of the eleven were placed in top ten largest. See Table 7.

Unfortunately, performance data is just not conclusive enough after one year's time to select superior hardiness among collections which of course was the trial's primary objective. The trial will be reestablished whenever seed or seedlings become available. Replication data of first year's performance can be found in Table 8.

TABLE 5. First year survival, winter injury, and size observations of 40 lodgepole pine accessions planted at the PMC in 1974 as 2-1 bareroot seedlings.

Accession Number	Origin	Collection Coordinates Lat. N/Long. W	Collection Elevation ft.	Number Planted 6/74[1]	First Year Survival[2]	Winter Injury Rating[3]	Average Size Height x Width - in.[4]
P-19	Nithi R., B.C.	54°31'/125°25'	3150-3200	42	37	4.5	73.9
P-21	Doris L., B.C.	54°59'/126°33'	3150	45	42	4.1	91.7
P-24	Finlay Forks, B.C.	55°57'/123°48'	2250	45	42	4.7	69.1
P-25	Hudson Hope, B.C.	56°02'/122°05'	2380	48	46	3.1	70.7
P-26	Tower L., B.C.	56°01'/120°37'	2600	45	44	3.2	84.9
P-27	Pink Mt., B.C.	57°0'/122°24'	3600-3700	45	41	3.2	74.6
P-28	Tetsa R., B.C.	58°40'/124°10'	2500	45	45	2.0	69.4
P-29	Muncho L., B.C.	59°03'/125°46'	2800	46	45	1.8	66.3
P-32	Carmacks, Y.T.	62°14'/136°18'	2200	46	44	2.0	45.9
P-33	Ethel L., Y.T.	63°18'/136°28'	2850-2900	46	38	2.8	30.8
P-34	Takhini R., Y.T.	60°41'/136°11'	2450	45	44	1.9	43.2
P-35	Atlin, B.C.	59°48'/133°47'	2500-2675	46	43	3.1	52.8
P-36	Kinaskan, B.C.	57°29'/130°13'	2650-2700	45	44	3.3	76.0
P-37	Cassiar, B.C.	59°06'/129°44'	2600	45	44	2.0	59.5
P-38	Jackfish Cr., B.C.	58°32'/122°42'	1500	46	46	3.0	87.1
P-39	Redwillow R., B.C.	54°56'/120°15'	3130	45	45	1.9	75.5
P-40	McLeod L., B.C.	54°49'/122°51'	2275-2300	45	43	3.6	69.3
P-62	McKale R., B.C.	53°25'/120°20'	2300	45	41	4.3	72.6
P-64	Wendle Pk., B.C	53°24'/121°30'	4200	45	38	4.3	70.1
P-65	Lynx L., B.C.	53°39'/122°58'	2700	45	44	4.0	70.4

1/ See footnotes 1, 2, 3, and 4 at end of table, page 103 and 104.

TABLE 5. First year survival, winter injury, and size observations of 40 lodgepole pine accessions planted at the PMC in 1974 as 2-1 bareroot seedlings. Cont'd.

Accession Number	Origin	Collection Coordinates Lat. N/Long. W	Collection Elevation ft.	Number Planted 6/74 1/	First Year Survival 2/	Winter Injury Rating 3/	Average Size Height x Width - in. 4/
P-66	Stone Mt., B.C.	58°39'/124°46'	3800-3900	45	44	2.3	82.8
P-88	Yakutat, Ak.	59°30'/139°10'	100- 200	45	45	4.1	64.7
P-89	Skagway, Ak.	59°27'/135°18'	0- 200	45	45	3.2	58.6
P-90	Gustavus, Ak.	58°27'/135°15'	20	45	45	4.3	82.8
P-91	Juneau, Ak.	58°24'/134°42'	1300-1450	45	45	3.4	76.8
P-92	Douglas Is., Ak.	58°20'/134°31'	100- 200	45	43	4.7	86.3
P-93	Beaver L., Ak.	57°05'/135°11'	800- 900	46	45	4.1	70.3
P-94	Sitka, Ak.	57°04'/135°21'	100	43	43	4.9	76.3
P-96	Thorne R., Ak.	55°40'/132°45'	200- 250	45	45	5.1	90.7
P-97	Klawack R., Ak.	55°34'/133°04'	100	45	44	5.8	87.6
P-98	Graviná Is., Ak.	55°22'/131°42'	50- 100	45	45	5.1	73.6
P-99	Annette, Ak.	55°03'/131°35'	110	44	44	4.3	59.3
P-101	Kispiox, B.C.	55°38'/127°54'	2000	44	41	5.6	80.3
P-102	Nass R., B.C.	55°37'/128°38'	1000	47	43	5.4	67.4
P-103	Kalder L., B.C.	54°49'/124°16'	3100	45	41	4.7	72.4
P-105	Bowron R., B.C.	53°54'/122°0'	2200	46	43	3.9	63.2
P-106	Wells, B.C.	53°08'/121°35'	3600-3700	45	44	3.3	58.6
P-141	Hawk Hills, B.C.	57°23'/117°33'	2350	45	42	3.1	65.3
P-142	Swan Hills, B.C.	54°18'/116°35'	2700	45	45	2.7	100.6
P-163	Petitot R., B.C.	59°54'/122°05'	1300	46	44	3.0	86.2

1/ Figure represents total number seedlings planted for each accession. See Appendix Table 1 for number planted in each replication.

2/ Figure represents total number plants alive in five replications one year after planting. Evaluation made 5/16/75. See Appendix Table 1 for number alive in each replication.

3/ Winter injury rating refers to percent foliage surface desiccated according to five replication

(Continued)

(Continued)

averages during 1974-75 winter and 1975 spring period. Subjective rating made 5/16/75. 1 = 10% foliage desiccation, 2 = 20%, 3 = 30%, 4 = 40%, 5 = 50%, 6 = 60%, 7 = 70%, 8 = 80%, 9 = 90%, 10 = 100%.

4/ Average size figure equals accession average height (in.) multiplied by accession average width (in.).

TABLE 6. Rating of 40 *Pinus contorta* accessions from least to most damage according to percent foliage desiccation occurring during the 1974-75 winter and 1975 spring period.

Rating	Accession No.[1/]	Origin Lat. N.	Winter Injury Rating[2/]
1	P-29	59°03'	1.78
2	P-34	60°41'	1.88
3	P-39	54°56'	1.94
4	P-37	59°06'	2.00
5	P-28	58°40'	2.02
6	P-32	62°14'	2.06
7	P-66	58°39'	2.26
8	P-142	54°18'	2.66
9	P-33	63°18'	2.80
10	P-38	58°32'	2.96
11	P-163	59°54'	3.02
12	P-35	59°48'	3.06
13	P-141	57°23'	3.12
14	P-25	56°02'	3.12
15	P-27	57°0'	3.18
16	*P-89	59°27'	3.18
17	P-26	56°01'	3.22
18	P-36	57°29'	3.26
19	P-106	53°08'	3.30
20	P-40	54°49'	3.60
21	P-105	53°54'	3.86
22	*P-91	58°24'	3.42
23	P-65	53°39'	4.00
24	*P-88	59°30'	4.08
25	*P-93	57°05'	4.10
26	P-21	54°59'	4.12
27	*P-90	58°27'	4.26
28	P-62	53°25'	4.28
29	P-64	53°25'	4.32
30	*P-99	55°03'	4.32

1/ See footnotes 1, and 2 at end of table, page 106.

TABLE 6. Rating of 40 *Pinus contorta* accessions from least to most damage according to percent foliage desiccation occurring during the 1974-75 winter and 1975 spring period. Cont'd.

Rating	Accession No.[1]	Origin Lat. N.	Winter Injury Rating[2]
31	P-19	54°31'	4.48
32	P-103	54°49'	4.66
33	P-24	55°57'	4.66
34	*P-92	58°20'	4.74
35	*P-94	57°04'	4.88
36	*P-98	55°22'	5.08
37	*P-96	55°40'	5.10
38	P-102	55°37'	5.44
39	P-101	55°38'	5.58
40	*P-97	55°34'	5.82

1/ Accession numbers marked with * indicates Alaskan collections.
2/ Winter injury rating refers to percent foliage surface desiccation according to five replication averages during 1974-75 winter and 1975 spring period. Subjective rating made 5/16/75. 1 = 10% foliage desiccation, 2 = 20%, 3 = 30%, 4 = 40%, 5 = 50%, 6 = 60%, 7 = 70%, 8 = 80%, 9 = 90%, 10 = 100%.

TABLE 7. Rating of 40 *Pinus contorta* accessions from largest to smallest according to size in 1974-75.

Rating	Accession Number[1/]	Origin Lat. N	Size (in.) Height x Width[2/]
1	P-142	54°18'	100.6
2	P-21	54°59'	91.7
3	*P-96	55°40'	90.7
4	*P-97	55°34'	87.6
5	P-38	58°32'	87.1
6	*P-92	58°20'	86.3
7	P-163	59°54'	86.2
8	P-26	56°01'	84.9
9	*P-90	58°27'	82.8
10	P-66	58°39'	82.8
11	P-101	55°38'	80.3
12	*P-91	58°24'	76.8
13	*P-94	57°04'	76.3
14	P-36	57°29'	76.0
15	P-39	54°56'	75.5
16	P-27	57°0'	74.6
17	P-19	54°31'	73.9
18	*P-98	55°22'	73.6
19	P-62	53°25'	72.6
20	P-103	54°49'	72.4
21	P-25	56°02'	70.7
22	P-65	53°39'	70.4
23	*P-93	57°05'	70.3
24	P-64	53°25'	70.1
25	P-28	58°40'	69.4
26	P-40	54°49'	69.3
27	P-24	55°57'	69.1
28	P-102	55°37'	67.4
29	P-29	59°03'	66.3
30	P-141	57°23'	65.3

1/ See footnotes 1, and 2 at end of table page 108.

TABLE 7. Rating of 40 *Pinus contorta* accessions from largest to smallest according to size in 1974-75. Cont'd.

Rating	Accession Number[1/]	Origin Lat. N	Size (in.) Height x Width[2/]
31	*P-88	59°30'	64.7
32	P-105	53°54'	63.2
33	P-37	59°06'	59.5
34	*P-99	55°03'	59.3
35	P-106	53°08'	58.6
36	*P-89	59°27'	58.6
37	P-35	59°48'	52.8
38	P-32	62°14'	45.9
39	P-34	60°41'	43.2
40	P-33	63°18'	30.8

1/ Accession numbers marked with * indicates Alaskan collections.
2/ Average size seedling figure equals accession average height (in.) multiplied by accession average width (in.).

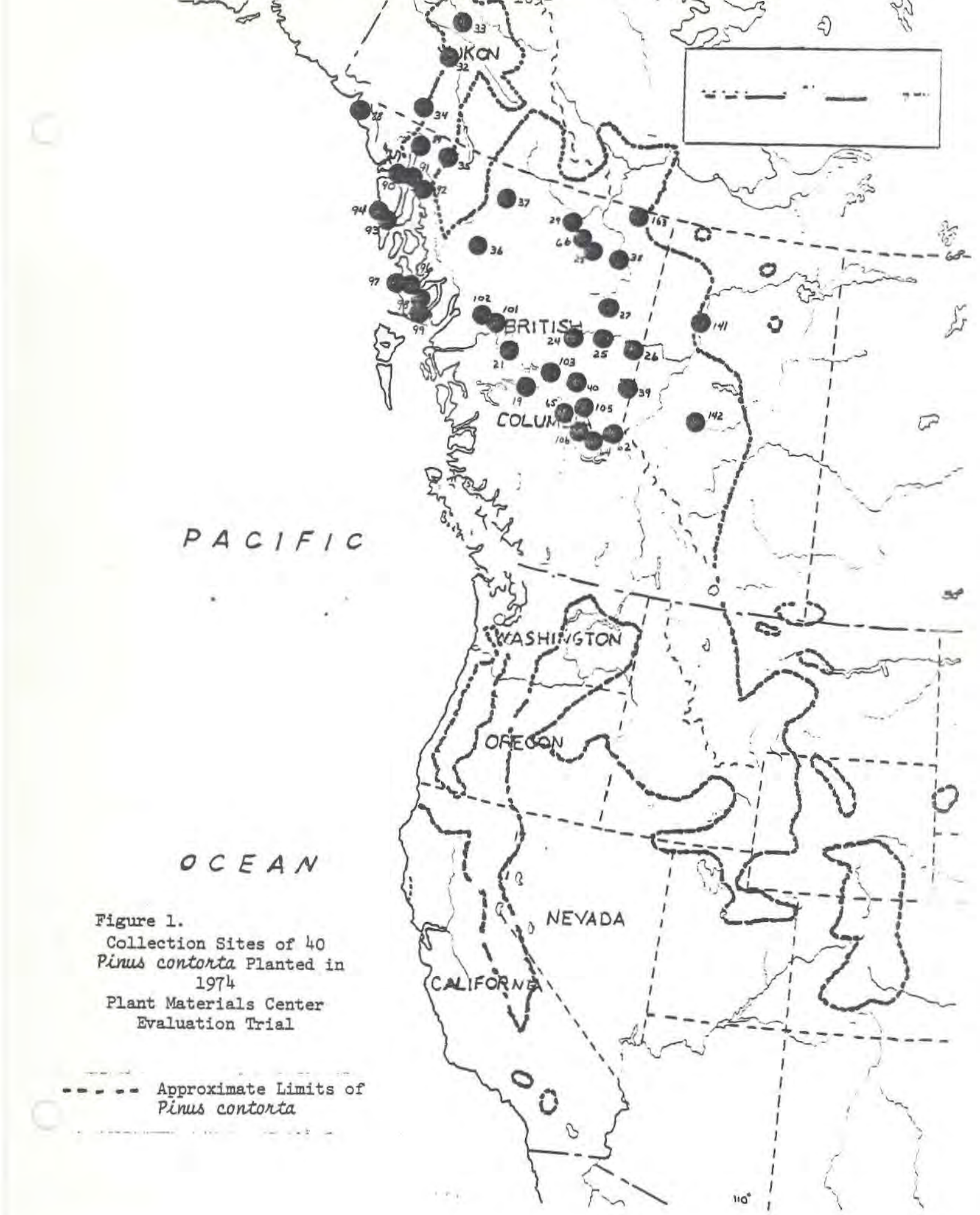


Figure 1.
Collection Sites of 40 *Pinus contorta* Planted in 1974
Plant Materials Center
Evaluation Trial

- - - - - Approximate Limits of *Pinus contorta*

TABLE 8. First year survival and winter injury rating one year after field planting of 40 lodgepole pine accessions at the PMC in 1974-1975.

Acc.	Number Planted						First Year Survival						Winter Injury Rating/					
No.	R1	R2	R3	R4	R5	Tot.	R1	R2	R3	R4	R5	Tot.	R1	R2	R3	R4	R5	Av.
P-19	9	6	9	9	9	42	5	6	9	9	8	37	5.9	3.3	3.4	3.2	6.6	4.48
P-21	9	9	9	9	9	45	9	9	8	8	8	42	4.4	3.4	3.0	4.9	4.9	4.12
P-24	9	9	9	9	9	45	8	9	9	8	8	42	5.8	3.0	3.4	6.3	4.8	4.66
P-25	9	10	10	10	9	48	9	9	9	10	9	46	4.6	3.4	1.5	3.4	2.7	3.12
P-26	9	9	9	9	9	45	9	9	9	8	9	44	2.4	3.2	4.1	3.6	2.8	3.22
P-27	9	9	9	9	9	45	9	9	9	7	7	41	2.2	2.8	2.1	4.0	4.3	3.18
P-28	9	9	9	9	9	45	9	9	9	9	9	45	1.4	1.9	2.6	2.2	2.0	2.02
P-29	10	9	9	9	9	46	10	9	9	9	8	45	1.4	1.2	1.9	2.4	2.0	1.78
P-32	10	9	9	9	9	46	10	7	9	9	9	44	1.0	3.7	1.9	1.7	2.0	2.06
P-33	9	9	9	9	10	46	9	9	8	7	5	38	1.7	2.3	2.8	3.3	3.9	2.80
P-34	9	9	9	9	9	45	9	8	9	9	9	44	1.1	2.6	2.2	1.9	1.6	1.88
P-35	10	9	9	9	9	46	10	7	9	9	8	43	2.1	4.6	2.1	3.3	3.2	3.06
P-36	9	9	9	9	9	45	9	8	9	9	9	44	4.0	3.0	3.8	2.4	3.1	3.26
P-37	9	9	9	9	9	45	9	9	9	8	9	44	2.0	1.6	1.8	2.7	1.9	2.00
P-38	9	9	10	9	9	46	9	9	10	9	9	46	3.0	2.4	2.8	3.3	3.3	2.96
P-40	9	9	9	9	9	45	8	9	9	8	9	43	4.6	2.1	2.2	5.0	4.1	3.60
P-62	9	9	9	9	9	45	9	9	8	6	9	41	5.0	1.9	5.7	5.9	2.9	4.28
P-64	9	9	9	9	9	45	8	7	7	8	8	38	3.7	4.0	4.7	5.2	4.0	4.32
P-65	9	9	9	9	9	45	9	9	9	9	8	44	4.3	3.0	3.6	3.8	5.3	4.00
P-66	9	9	9	9	9	45	9	9	8	9	9	44	1.9	1.9	2.9	2.6	2.0	2.26
P-88	9	9	9	9	9	45	9	9	9	9	9	45	3.3	3.1	4.9	6.0	3.1	4.08
P-89	9	9	9	9	9	45	9	9	9	9	9	45	2.8	2.3	3.8	3.6	3.4	3.18
P-90	9	9	9	9	9	45	9	9	9	9	9	45	3.8	3.0	4.3	5.3	4.9	4.26
P-91	9	9	9	9	9	45	9	9	9	9	9	45	3.3	2.8	4.0	3.4	3.6	3.42
P-92	9	9	9	9	9	45	9	9	9	9	7	43	5.3	2.7	5.4	4.7	5.6	4.74
P-93	10	9	9	9	9	46	9	9	9	9	9	45	4.0	3.1	4.6	3.6	5.2	4.10
P-94	8	9	8	9	9	43	8	9	8	9	9	43	6.4	2.7	3.6	5.3	6.4	4.88
P-96	9	9	9	9	9	45	9	9	9	9	9	45	4.8	4.7	4.9	4.4	6.7	5.10
P-97	9	9	9	9	9	45	9	8	9	9	9	44	6.1	4.4	5.8	6.0	6.8	5.82
P-98	9	9	9	9	9	45	9	9	9	9	9	45	3.3	4.1	5.6	4.8	7.6	5.08
P-99	9	9	9	9	8	44	9	9	9	9	8	44	4.0	4.0	4.6	3.9	5.1	4.32
P-102	11	9	9	9	9	47	11	9	8	8	7	43	2.7	3.1	4.4	5.9	8.1	5.44
P-103	9	9	9	9	9	45	9	7	8	8	9	41	4.7	4.0	4.6	4.6	5.4	4.66
P-105	9	9	9	9	10	46	8	9	8	9	9	43	3.1	2.4	5.0	4.2	4.6	3.86
P-106	9	9	9	9	9	45	9	8	9	9	9	44	2.0	4.0	3.7	3.6	3.2	3.30

TABLE 8. First year survival and winter injury rating one year after field planting of 40 lodgepole pine accessions at the PMC in 1974-1975. Cont'd.

Acc. No.	Number Planted						First Year Survival						Winter Injury Rating					
	R1	R2	R3	R4	R5	Tot.	R1	R2	R3	R4	R5	Tot.	R1	R2	R3	R4	R5	Av.
P-141	9	9	9	9	9	45	9	6	9	9	9	42	2.6	5.0	2.2	2.9	2.9	3.12
P-142	9	9	9	9	9	45	9	9	9	9	9	45	1.9	1.6	2.1	4.1	3.6	2.66
P-163	9	10	9	9	9	46	9	10	9	9	7	44	2.3	1.4	1.7	1.6	8.1	3.02

APPENDIX TABLE 1. Seedling size one year after field planting 40 lodgepole pine accessions At the PMC in 1974-1975.

Acc. No.	Average Size												Height x Width
	Height (in)						Width (in)						
	R1	R2	R3	R4	R5	Av.	R1	R2	R3	R4	R5	Av.	
P-19	11.5	9.8	11.1	9.2	11.0	10.52	7.3	6.7	6.4	7.0	7.7	7.02	73.8504
P-21	10.8	10.8	11.3	9.9	11.8	10.92	7.8	7.6	8.6	8.1	9.9	8.40	91.7280
P-24	11.3	9.6	9.3	9.6	10.0	9.96	5.8	6.1	7.7	7.3	7.8	6.94	69.1224
P-25	11.3	9.2	9.4	9.3	7.9	9.42	8.3	6.9	6.8	8.1	7.4	7.50	70.6500
P-26	11.9	11.4	10.1	9.8	10.1	10.66	7.3	8.2	8.0	7.9	8.4	7.96	84.8536
P-27	10.3	10.3	10.4	8.7	9.4	9.82	7.6	6.4	7.8	7.9	8.3	7.60	74.6320
P-28	9.4	8.1	9.6	9.7	9.1	9.18	7.3	6.4	7.3	8.9	7.9	7.56	69.4008
P-29	10.5	7.9	9.6	8.4	8.3	8.94	7.6	7.0	6.6	8.4	7.5	7.42	66.3348
P-32	6.7	5.3	7.8	6.8	8.3	6.98	6.5	5.3	7.0	7.2	6.9	6.58	45.9284
P-33	7.0	5.6	5.5	5.7	4.3	5.62	6.1	4.6	5.5	6.0	5.2	5.48	30.7976
P-34	8.1	6.9	6.7	7.7	6.8	7.24	6.6	5.7	4.6	6.9	6.0	5.96	43.1504
P-35	8.5	7.0	8.6	8.3	7.1	7.90	6.8	5.2	6.7	6.9	7.8	6.68	52.7720
P-36	11.4	9.0	9.9	9.7	9.9	9.98	7.9	7.7	6.8	9.1	6.6	7.62	76.0476
P-37	10.0	9.0	8.7	7.7	8.0	8.68	7.2	6.1	7.2	7.0	6.8	6.86	59.5448
P-38	13.0	10.1	10.4	11.4	9.0	10.78	7.8	7.4	8.6	8.2	8.4	8.08	87.1024
P-39	11.0	9.9	9.6	9.8	8.7	9.80	8.4	7.9	6.3	8.7	7.2	7.70	75.4600
P-40	10.0	9.8	10.8	7.9	8.6	9.42	6.1	7.8	8.3	6.6	8.0	7.36	69.3312
P-62	10.4	8.7	9.6	8.9	9.9	9.50	7.7	6.9	7.3	8.3	8.0	7.64	72.5800
P-64	11.6	9.9	10.3	8.2	9.4	9.88	8.2	6.3	6.6	6.9	7.5	7.10	70.1480
P-65	11.8	10.2	11.0	7.6	9.4	10.00	7.4	8.7	6.0	6.1	7.0	7.04	70.4000

APPENDIX TABLE 1. Seedling size one year after field planting 40 lodgepole pine accessions at the PMC in 1974-1975. Cont'd.

Acc. No.	Average Size												Height x Width
	Height (in)						Width (in)						
	R1	R2	R3	R4	R5	Av.	R1	R2	R3	R4	R5	Av.	
P-66	10.2	11.7	9.9	12.2	10.2	10.84	6.9	8.3	6.8	9.1	7.1	7.64	82.8176
P-88	8.6	9.1	8.0	9.2	8.2	8.62	6.4	7.7	6.1	9.2	8.1	7.50	64.6500
P-89	9.7	8.3	9.4	8.9	7.7	8.80	6.7	6.3	6.0	7.7	6.6	6.66	58.6080
P-90	11.4	9.6	12.1	10.8	8.0	10.38	8.4	7.3	8.0	9.0	7.2	7.98	82.8324
P-91	8.4	10.8	10.3	9.4	9.2	9.62	8.2	8.1	7.7	7.8	8.1	7.98	76.7676
P-92	11.4	10.4	10.3	10.1	9.3	10.30	8.9	9.4	7.6	8.2	7.8	8.38	86.3140
P-93	9.0	9.1	9.7	8.9	9.2	9.18	7.5	7.3	7.3	8.3	7.9	7.66	70.3188
P-94	10.1	9.8	9.5	10.2	9.2	9.76	8.6	7.2	7.0	8.1	8.2	7.82	76.3232
P-96	9.4	11.0	11.0	9.6	10.3	10.26	8.8	9.0	7.2	9.2	10.0	8.84	90.6984
P-97	10.1	9.4	10.6	11.0	8.7	9.96	9.8	7.3	7.9	10.1	8.9	8.80	87.6480
P-98	8.9	9.7	10.0	10.1	10.0	9.74	7.3	7.9	6.6	8.4	7.6	7.56	73.6344
P-99	9.1	8.4	7.6	8.2	7.1	8.08	7.6	6.9	6.7	8.1	7.4	7.34	59.3072
P-101	13.1	11.0	10.2	11.9	9.4	11.12	7.8	7.6	5.7	8.6	6.4	7.22	80.2864
P-102	10.7	9.8	10.8	10.2	9.4	10.18	7.2	6.1	6.5	6.7	6.6	6.62	67.3916
P-103	10.8	9.3	9.6	10.4	9.9	10.00	8.1	7.0	6.9	7.1	7.1	7.24	72.4000
P-105	8.6	8.9	9.1	10.4	7.6	8.92	7.1	6.3	6.3	8.9	6.8	7.08	63.1536
P-106	9.6	8.1	10.4	9.9	7.1	9.02	7.3	5.7	5.8	7.4	6.3	6.50	58.6300
P-141	9.6	9.1	9.6	9.4	7.3	9.00	7.7	6.3	6.9	7.8	7.6	7.26	65.3400
P-142	12.2	11.1	12.1	12.8	9.9	11.62	9.2	8.7	7.9	9.6	7.9	8.66	100.6292
P-163	12.8	12.3	10.8	7.6	12.3	11.16	8.9	8.4	7.1	5.3	8.9	7.72	86.1552

DEVELOPMENT OF BLUEJOINT (*CALAMAGROSTIS CANADENSIS*) SEED PRODUCTION POTENTIAL

Bluejoint (*Calamagrostis canadensis*) is a perennial, rhizomatous grass native to Alaska and widely distributed throughout the state. The history of its use as a pasture and hay plant dates back to the Russian settlers in the late 1700's. It has been evaluated by the Alaska Agricultural Experiment Stations since the early 1900's.

Although its value as a forage and conservation plant is well established, its actual use for these purposes has been limited to native stands. Commercial production of seed for establishment of new plantings and extension of usable acreages has not been pursued because of a lack of knowledge of large scale seed production techniques and requirements for germination. The seed is extremely small, numbering approximately 3.7 million per pound. There are no official standards for either purity or germination analyses accepted by the Association of Official Seed Analysts. Thus, the species cannot be produced under certification should a variety be released.

The seeds are surrounded by a ring of callus hairs making them extremely difficult to harvest with present farm machinery. The smallness of size and the lightness accentuated by the "parachute"-like callus hairs causes much seed to be lost to wind as well as improperly adjusted machinery.

The development of purity and germination standards, and a solution to the harvesting and processing difficulties could provide the needed impetus to release a variety of this valuable species.

The Soil Conservation Service (SCS) and the Plant Materials

Center (PMC) agreed, in April of 1975, to undertake the Development of Bluejoint Seed Production Study. The basic provisions of the contract were that SCS would extend funding and the PMC would provide the personnel, equipment, and supplies. Two primary objectives will be pursued in this Study, (1) development of seed germination and purity standards that will be acceptable for certification purposes for commercially produced seed. These standards need to be reviewed by the Association of Official Seed Certifying Agencies (AOSCA) and the Association of Official Seed Analysts (AOSA). These agencies authorize the acceptance of new or revised standards. And (2) evaluate seed harvest techniques that can be applied with commercial size farm machinery. These techniques, preferably, will require no additional equipment to that currently used for seed production of other grass species. Modifications of procedures, equipment adjustment, timing of harvest, and possibly management of stands will be evaluated.

Procedures to be followed are:

1. Determine the optimum sample size to be used for purity analysis which will provide a 95% confidence level that the analysis is within official tolerances.
2. Determine the optimum temperature and light regimes, substratum, and pretreatment for maximum seed germination in the laboratory.
3. Determine the phenology of Bluejoint, specifically, seed development in a native stand which has been selected

for use in item 4.

4. Evaluate mechanical seed harvest techniques on a pre-selected native stand of Bluejoint.
   a. direct combine
      (1) cylinder speed and spacing
      (2) sieve adjustments
      (3) air adjustments
      (4) ground/reel speeds
   b. swath/combine
      (1) date of swathing
      (2) combine adjustments as in a, above.

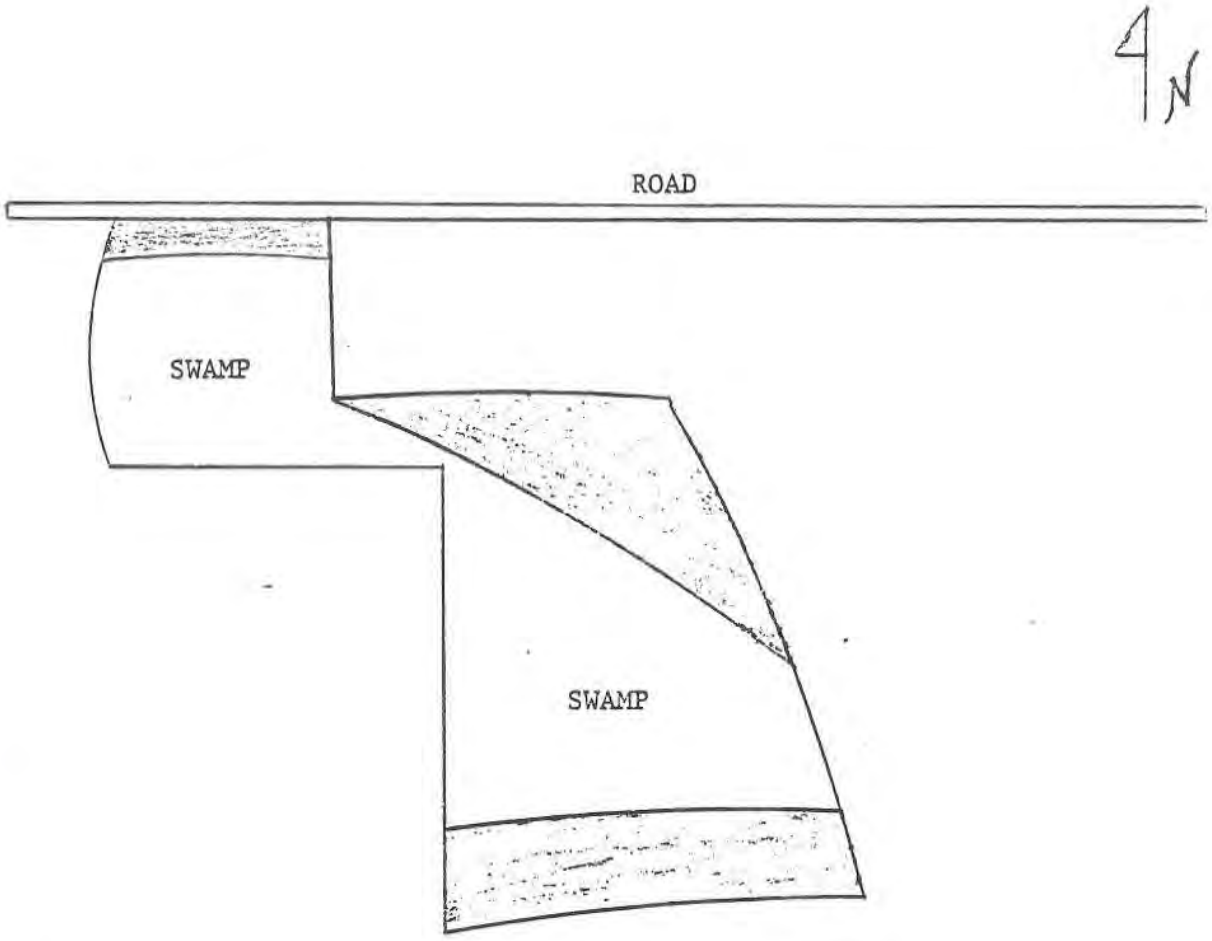
Phenology Study

This phenology study will provide the PMC and SCS personnel needed information on seed maturity to organize a mechanical harvesting program for this study site in 1976.

Materials and Methods

A native stand of Bluejoint was located on the OHM farm in the Clearwater area near Delta Junction. The study site is a peat bog, approximately fifteen acres in size. Standing water covers less than an acre, with between five and ten acres suitable for mechanical harvest; the remainder being subject to periodic standing water from rainfall during the growing season (Fig. 1).

The area is level with some debris from burn piles located around the fringes. A three-foot deep drainage parallels the road on the north side of the field. This area was located on June 10



Areas shaded are best producing and most readily adaptable to mechanical harvest of Bluejoint seed.

Scale 1" = 300'

Figure 1. *Calamagrostis* study site on O.H.M. Farm near Delta Junction.

by Jim Stroh and Burt Clifford.

A series of photographs, consisting of 4" by 5" black and white, and 35mm color slides were made. The 4 by 5 photos were taken periodically and the 35mm slides were taken weekly. Photographs were taken from June 10 to August 27 standing on the back of the vehicle, at the same spot, and facing south.

Associations will be made between Season Growing Degree Days (SGDD) and the phenological growth stage. This data will be used as an aid to forecast seed development for the 1976 harvest season.

The figures on SGDD were obtained from the Crop Weather Report issued by the Agricultural Statistician, USDA Statistical Reporting Service (SRS), in Palmer. Season growing degree days are computed by subtracting 40°F from the weekly average temperature and multiplying it by 7, for the number of days per week.

Herbarium collections of panicles were made on a weekly basis as was determination of the phenological stage of seed development.

Results

July 3 The start of weekly trips began with Jim Stroh and Burt Clifford locating the study site for Pat Mulligan, who would carry out the field work on the phenology study. Heading was well under way. There had been a total of 391 SGDD (Fig. 2) since the June 10 trip. The weather was hot, in the 80's, and dry.

July 9 A majority of the field showed little or no anther extension. Some plants along the edges of the road

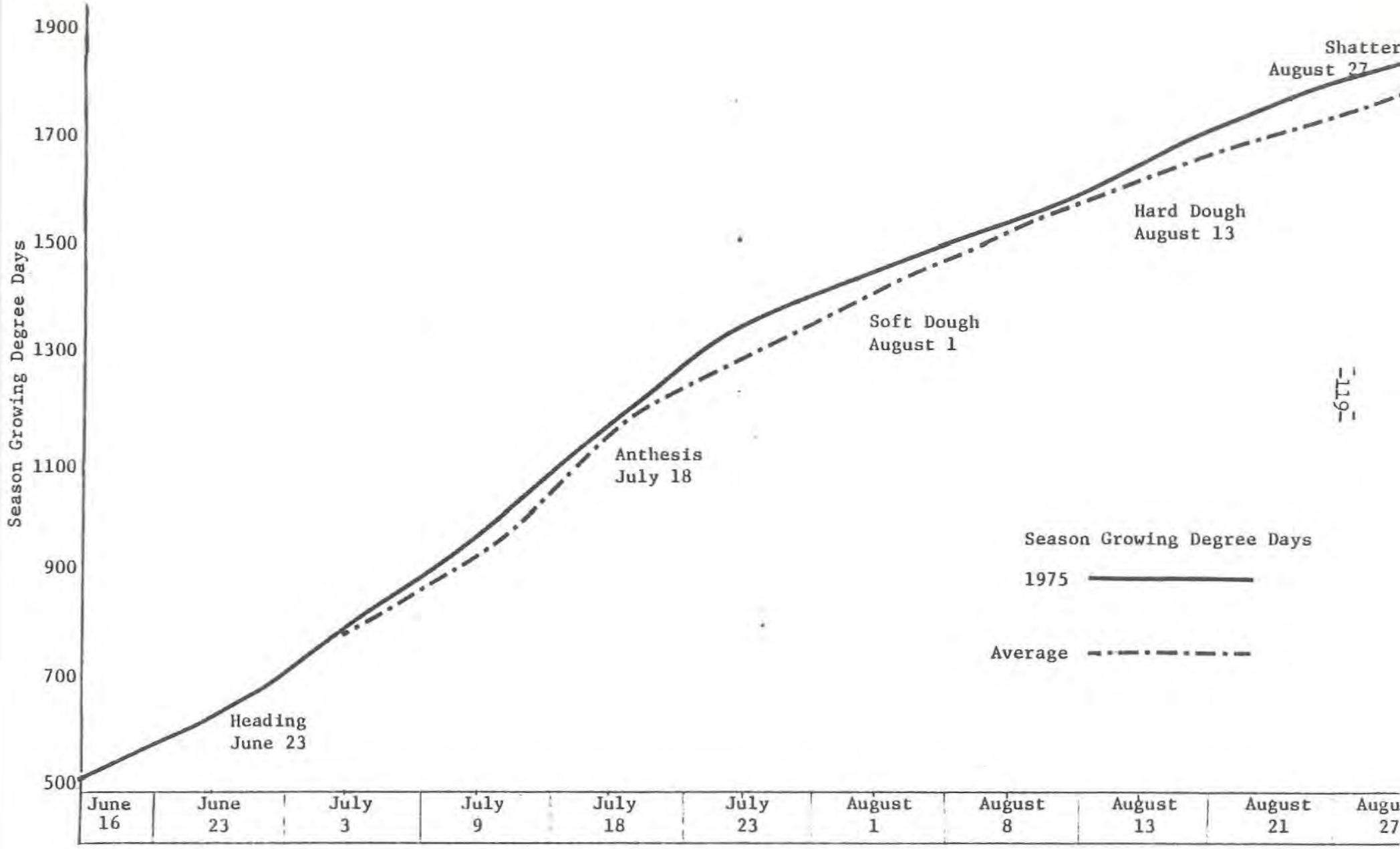


Figure 2. Season Growing Degree Days for 1975 and 32 year average in Delta Junction.

had anthers exposed. Panicles remained tight and closed. The study site was roughly paced out and mapped. Wet and otherwise untillable areas were noted. The weather remained hot and dry.

July 18 Full anthesis had begun. Anthers were exposed on 90% of the stand. Panicles were loose and open. The total SGDD which had occurred since heading was 588, which is 47 degree days higher than average. Hot and dry weather persisted.

July 23 Plants were past anthesis and the beginning of seed development could be noted in the form of some early milk stage. Color change could be noted on roadside plants as the panicle took on a brownish tinge. Periods of heavy rain had occurred within the past week (Fig. 3). No lodging was observed. Some portions of the field, previously dry, now held surface water. The ditch along the edge of the field also held water.

August 1 Further seed development could not be observed. Seasonal degree days have been less than earlier in the season but continue above normal. Rainfall to date was 2.6 inches above average. Some slight lodging was observed.

August 8 Seed development reached early soft dough stage. Browning of the field, in general, was becoming more evident. Jim Harding was contacted about possible burning or cutting and baling of the stand this

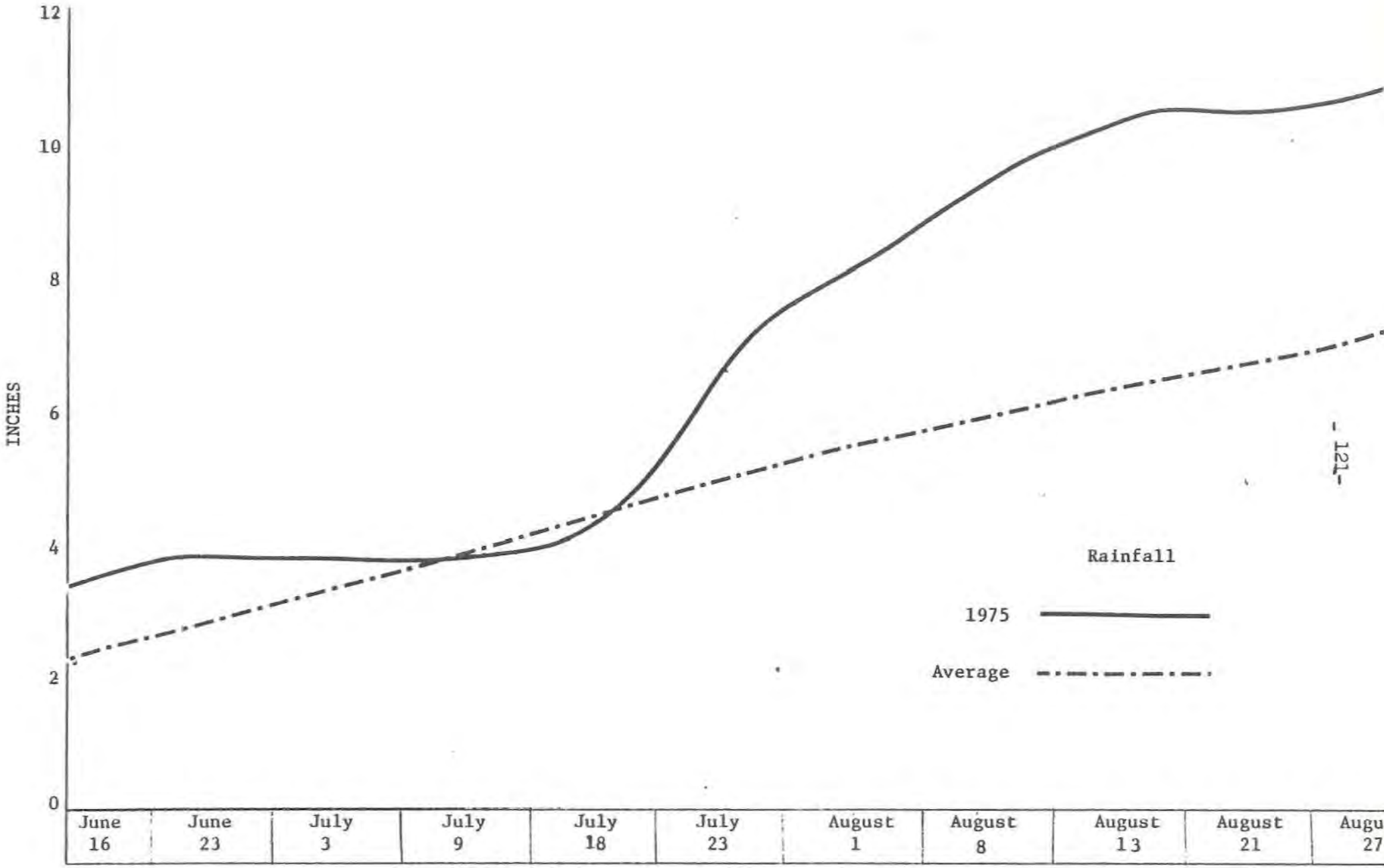


Figure 3. Weekly accumulation of rainfall for the 1975 growing season and the average rainfall for the Big Delta area.

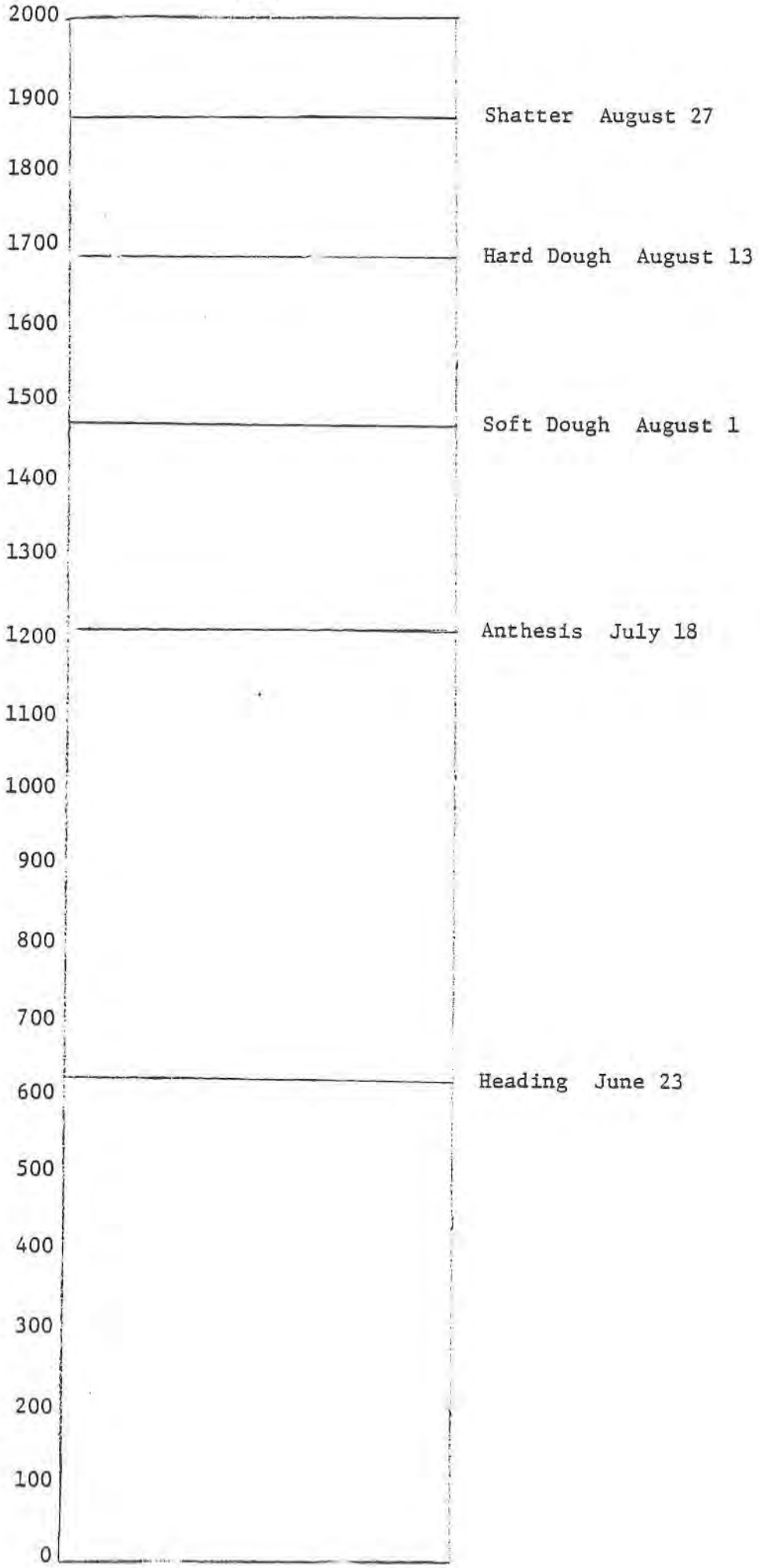


Figure 4.

Season growing degree days accumulated and associated phenological stages for *Calamagrostis* stand.

Delta Junction
-1975-

Establishment of Purity and Germination Standards

The establishment of purity and germination standards is essential in the development of new plants for commercial uses. Before a type of seed can enter the certification program these standards must have been adopted by the Association of Official Seed Analysts (AOSA). The development of these standards is a two-fold operation: one, for the optimum germination conditions; and another for establishing the size of the working sample in purity analysis. These two operations are described, separately, below.

Germination

The germination standard establishment program demands that the optimum temperature, light duration, light intensity, moisture, medium, and pretreatment be employed so that the ultimate germinability of the seed lot is known.

Materials and Methods

Three studies were run to determine a set of conditions which would be most beneficial to the germination of *Calamagrostis canadensis*. Two trials were germinated on a temperature gradient table. This table allows for a temperature gradient to be established across the table at almost any preselected temperature range. The third trial was conducted in a two-chamber germinator.

The first trial consisted of placing 20 rows of 300 seeds each (100/rep) on three layers of premoistened blotter paper for a duration

of 21 days. Temperature was monitored by daily readings on thermometers placed under the blotters at approximately every other row of seeds.

The second trial involved a five-day prechill period at 4-5°C, plus treatment with a .2% potassium nitrate solution (KNO_3). This test was conducted with eight rows of petri dishes containing 100 seeds per dish. Each row, which represented a different temperature, contained 800 seeds (100 seeds/rep). Four reps were treated with KNO_3 and four with water. Temperature was monitored by a chart recorder at one-hour intervals. A thermister was placed inside each petri dish at the head of each row. Both sides of the table were monitored to check on the reliability of the temperature gradient. Counting in both tests was commenced when germination began and continued at frequent intervals throughout the 21 days.

A seedling was considered germinated and normal under the following criteria:

1. Well developed primary root, usually with root hairs
2. Well developed green plumule which has usually broken through the coleoptile by the end of the test period
3. Slight fungi infection.

Abnormal seedlings are those demonstrating the following abnormalities:

1. No root
2. A weak, stubby, or spindly root, associated with a decayed seed
3. No plumule, with short thick coleoptile only

4. Short plumule, one-half distance up through the coleoptile
5. Spindly plumule (pale and watery)
6. A shattered or longitudinally split plumule with or without splitting of the coleoptile
7. Decayed plumules.

In the third study, following determination that 25°C would be the high germination temperature, the following schedule was applied:

A. Prechill at 5°C

B. With KNO_3 (.2% solution)

C. Constant 20°C temperature with over 24 hours of light at or over 100 foot-candles

CC. Alternating temperatures of 15°C for 16 hours without light and 25°C for 8 hours with light at or over 100 foot-candles per 24-hour period

BB. Without KNO_3

C. Constant 20°C temperature with 24 hours of light at or over 100 foot-candles

CC. Alternating temperatures of 15°C for 16 hours without light and 25°C for 8 hours with light at or over 100 foot-candles per 24-hour period

AA. No prechill

B. (same as B above)

C. (same as C above)

CC. (same as CC above)

BB. (same as BB above)

C. (same as C above)

CC. (same as CC above).

These tests were conducted in a two-chamber germinator. Each side could be independently controlled for temperature and light.

The standard procedures, as prescribed by the AOSA were followed in all tests. Four replicates of 100 seeds each, in petri dishes, were grown for 21 days. Counts at seven and fourteen days were taken to get an idea of seedling vigor.

The same criteria for determination of germinated seedlings were used in both the gradient table and germinator experiments.

Four different lots of seed were tested and evaluated under identical conditions.

Results

Germination data for Trials 1 and 2 were evaluated through randomized complete block and split block designs, respectively. Temperature data for both Trials was analyzed with a linear regression. Results for Trials 1 and 2 appear in Tables 1 and 2.

Trial 1 indicated that germination was statistically equal from 20°C to 30°C. Likewise, Trial 2 demonstrated the same statistical equality from 17.28°C to 28.11°C. No significant differences were noted between KNO_3 and H_2O treatments. Therefore, on the basis of this data 25°C was set as the optimum high temperature for Bluejoint germination. The same temperature is commonly used for such cool season grasses as 'Nugget' kentucky bluegrass (*Poa pratensis*) and 'Arctared' red fescue (*Festuca rubra*).

Temperature data for Trials 1 and 2 is plotted in Fig. 5 and Fig. 6.

TABLE 1. Average germination at various temperatures for Bluejoint on a temperature gradient table. (Trial 1)

Row	Average Temperature[1]	Average Germination[2]	Duncan's Multiple Range Test Ranking[3]
	°C	%	
1	13.45	18.2	c
2	-	23.7	c
3	20.00	40.3	ab
4	21.67	49.2	a
5	-	55.1	a
6	24.65	41.3	ab
7	-	51.0	a
8	26.03	53.1	a
9	30.00	51.1	a
10	31.28	28.5	bc
11	-	3.3	d
12	34.75	0	
13	-	0	
14	36.73	0	
15	-	0	
16	-	0	
17	40.75	0	
18	-	0	
19	-	0	
20	48.35	0	

1/ Over a 21-day test period.
2/ Average of three reps.
3/ Duncan's Multiple Range Test @ P =< .05%, C.V. = 21%.

TABLE 2. Average germination temperature, average germination with KNO_3, H_2O, and that combination for Bluejoint in petri dishes on a temperature gradient table. (Trial 2)

Row	Average temperature	Average germination		Total germination[1/]	Duncan's Test[2/]
	°C	%		%	
		KNO_3	H_2O		
1	10.42	0	2.25	- [3/]	-
2	13.69	15.25	9.00	12.1	c
3	17.28	38.00	31.00	34.50	a
4	20.19	36.67	38.00	37.50	a
5	22.97	43.75	33.50	38.60	a
6	26.08	35.00	36.75	35.90	a
7	28.11	42.25	36.00	39.10	a
8	34.50	31.33	24.67	22.50	b

1/ KNO_3 and H_2O treatments were combined because no statistical variation existed between them.

2/ Duncan's Multiple Range Test @ P =< .05%, C.V. = 21.7% for the whole plot and 41.17% for the split plot.

3/ The first row was eliminated because it contained zeros which would not fit into the statistical analysis.

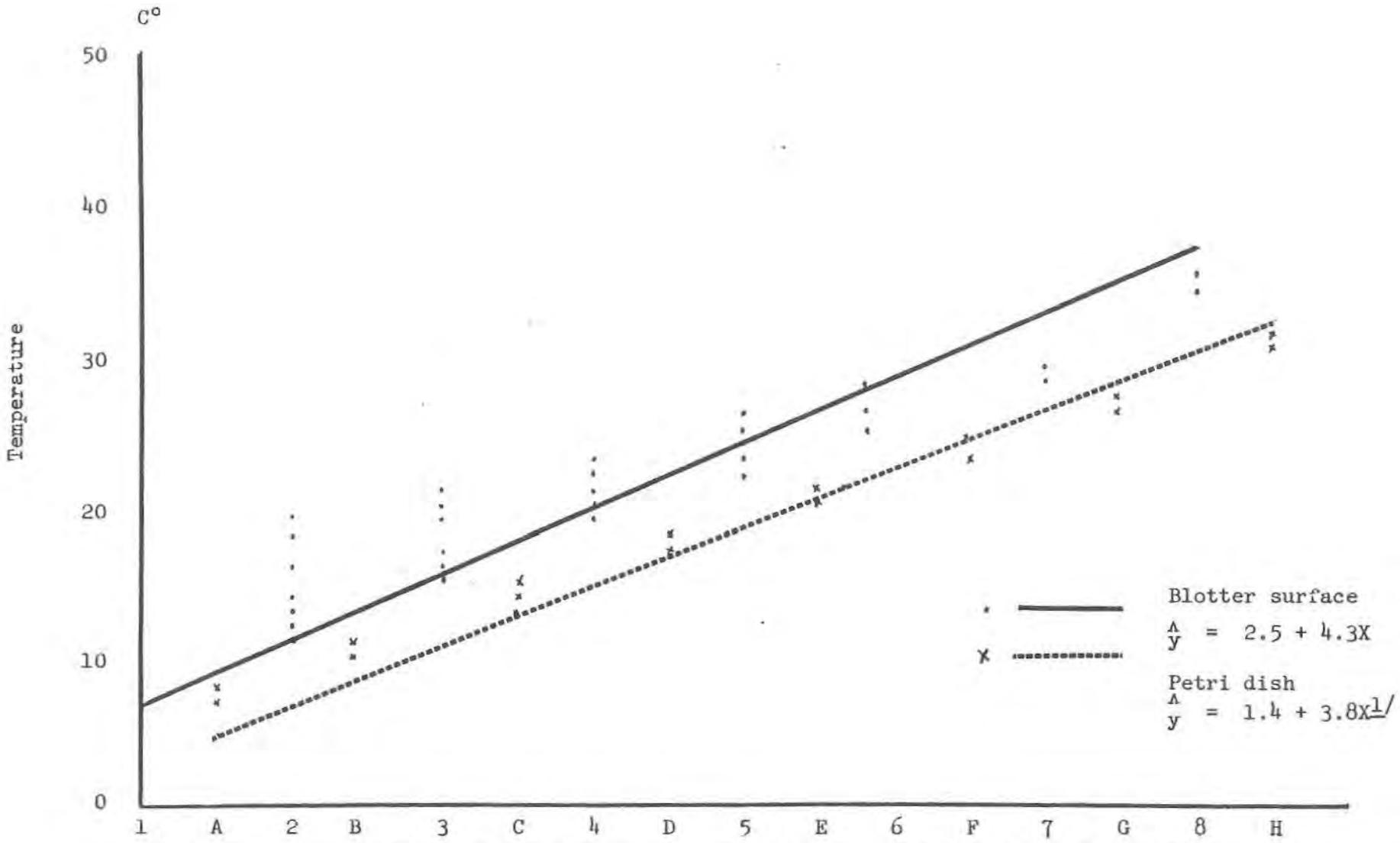


Figure 5. Temperatures on the surface of blotter paper and inside petri dishes on a temperature gradient table. Gradient table stations; numerals, blotter surface; letters, petri dish. Trial 2.

1/ Based on hourly reading for 4 days.

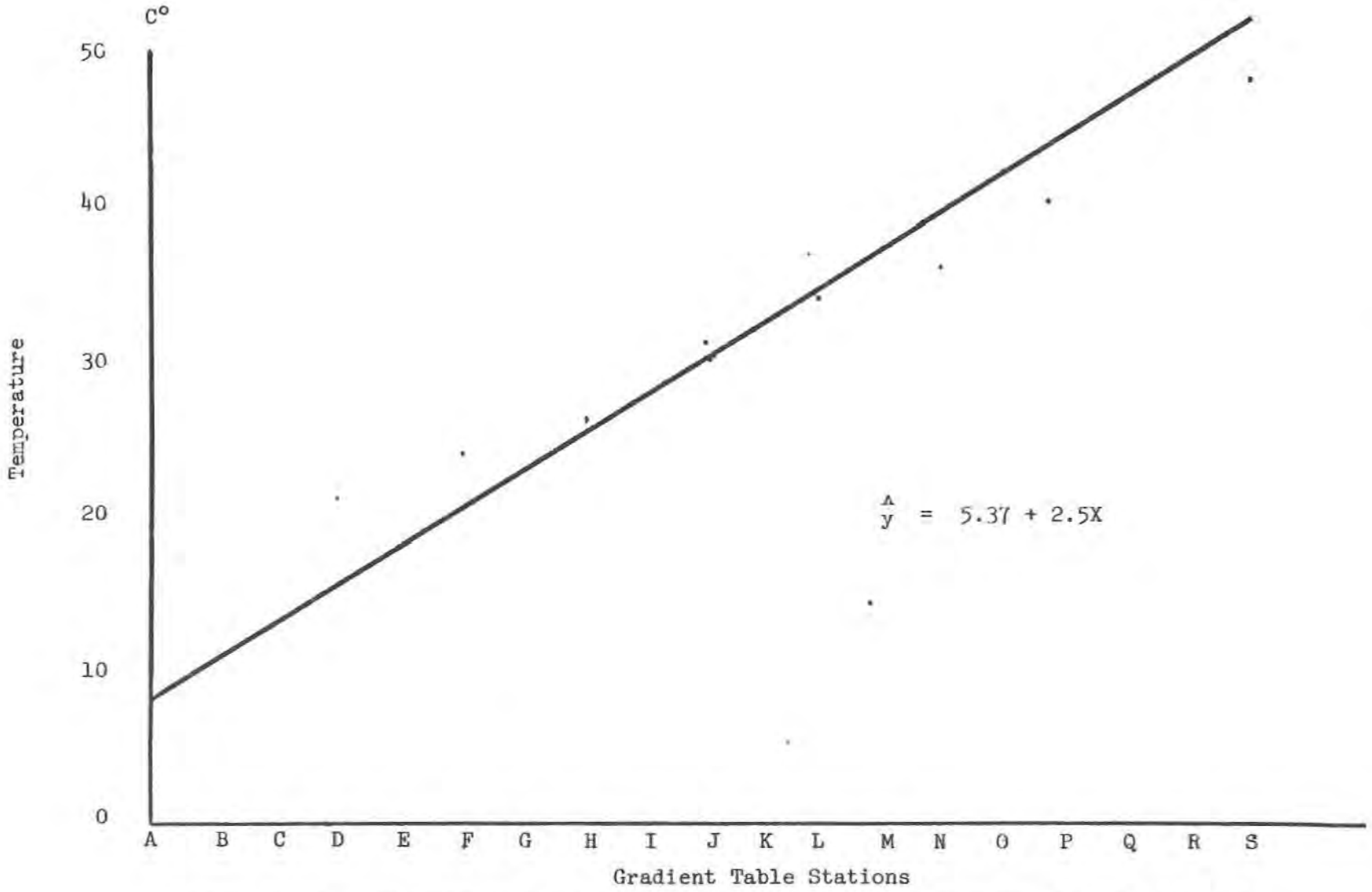


Figure 6. Temperatures on the surface of blotter paper at various stations along a temperature gradient table. Trial 1.

The regression of temperature against the location on the gradient table was highly significant ($P =< .01$) with $r = .93$ and $.99$ for Trials 1 and 2, respectively. A difference of recorder temperature and measured thermometer temperature was noted in Trial 2. This difference may be due to a microenvironmental climate within the petri dishes.

A severe infection of seed-borne fungi was noted on the seed lot used in these germination analyses. The fungi, mostly of the *Penicilium* genera, is a seed-borne organism which is common in natural ecosystems. Total percent germination was severely influenced by this fungus but the data obtained indicates the same basic trends.

Each lot from the germinator was analyzed through seed germination by a randomized split block design.

The 15°C to 25°C temperature range showed significantly higher germination in three of the four lots tested. Lots BH-75 and GF-76 were highly significant ($P = <.01$), Lot DJ-76 was significant ($P =< .05$), and Lot GF-75 showed no significant difference (Table 3).

Analysis of the treatments by Duncan's Multiple Range Test showed that the potassium nitrate (KNO_3)-prechill combination and the prechill alone encouraged higher germination than the control in all cases. Lot GF-75 ($P = <.05$), and GF-76 ($P = <.01$), had significantly higher germination with the KNO_3-prechill and prechill alone treatments than with the KNO_3 alone. Lots DJ-76 ($P =< .01$), and BH-75 ($P = < .05$) showed no significant difference between any of the pretreatments. There was a significant difference in the interaction of

TABLE 3. Mean germination percent of four lots of *Calamagrostis canadensis* at two different temperature regimes and four different pretreatments.

Lot ID	Temp °C	Treatment Means				Mean temperature Totals °C
		KNO_3 & PC[1]	KNO_3	PC	Control	
GF-75	15-25	86.00	82.50	91.00	85.75	86.32
	20	89.25	82.00	85.75	76.75	83.44 [6]
Mean treatment Totals		87.63 a[7]	82.25 b	88.38 a	81.25 b	
GF-76	15-25	70.25	66.75	68.25	63.25	67.13
	20	63.00	42.00	63.75	38.75	52.13** [8]
Mean treatment Totals		66.63 a[4]	54.88 b	66.00 a	51.00 b	

1/ .2% KNO and Prechill at 5°C for 5 days.
2/ * = P =< .05, CV = 10%.
3/ Duncan's Multiple Range Test (DMRT), P =< .01, CV = 17%.
4/ ** = P =< .01, CV = 14%.
5/ DMRT. P = < .05, CV = 16%.
6/ Not significant.
7/ DMRT. P = < .05, CV = 6%.
8 P = < .01, CV = 9%.

TABLE 3 continued. Mean germination percent of four lots of *Calamagrostis canadensis* at two different temperature regimes and four different pretreatments.

Lot ID	Temp °C	Treatment Means				Mean Temperature Totals °C
		KNO_3 & PC[1]	KNO_3	PC	Control	
DJ-76	15-25	66.25	54.50	60.00	51.00	57.94
	20	69.25	44.50	55.50	35.00	51.07*[2]
Mean treatment Totals		67.75 a[3]	49.50 ab	57.75 a	43.00 b	
BH-75	15-25	41.00	42.25	43.75	38.25	41.32
	20	36.25	32.50	35.50	21.25	31.38**[4]
Mean treatment Totals		38.63 a[5]	37.38 a	39.63 a	29.75 b	

1/ .2% KNO_3 and Prechill at 5°C for 5 days.
2/ * = P =<.05, CV = 10%.
3/ Duncan's Multiple Range Test (DMRT). P = < .01, CV = 17%.
4/ ** = P =< .01, CV = 14%.
5/ DMRT. P = < .05, CV = 16%.

the temperature with the treatments only in Lot GF-76 (P = <.05).

Purity

The AOSA rules state that a purity working sample must be based on a minimum of 2000 seeds. The amount of seed for a noxious weed seed examination is determined by multiplying the working portion weight by ten. The Association has set 0.25 gram as the smallest working portion to test and 500 grams as the maximum size for a noxious weed seed examination.

Materials and Methods

Four replicates of 2000 seeds each were counted and weighed to five significant figures. Four different seed lots were tested.

Eight purity tests were conducted, according to AOSA procedures, on the same lot of seed. Four tests used .25 gram and four used .50 gram as the size for the working sample.

Results

The average weight of 2000 seeds was .2396 gram (Table 4). The difference between the lots was highly significant (P =< .01 CV = 5.68). The range of weights among the lots was .2075 to .2749 gram.

The .25 gram sample had an average purity of 95.31%. The .50 gram sample had an average purity of 98.65%. The difference between working sample size was highly significant (P =< .01 CV = 1%).

TABLE 4. Mean weight of 200 seeds and the calculated number of seeds per gram, and seeds per ounce for four lots of *Calamagrostis canadensis*.

Lot ID	Mean wt. of 2000 seeds[1]	Number of seeds/gm	Number of seeds/oz	DMRT[2]
	gm			
GF-75	.2715	7367	208,840	a
BH-75	.2363	8464	239,949	b
DJ-76	.2075	9639	373,253	c
GF-76	.2782	7190	203,810	a

Range and Mean Weight of 2000 seeds

.2075 - .2749 grams

.2396 grams

Range and Mean Number of Seeds per Gram

7279 - 9639 seeds/gram

8461 seeds/gram

Range and Mean Number of Seeds per Ounce

206,325 - 273,253 seeds/ounce

239,842 seeds/ounce

1/ Mean values are based on four repetitions of 2000 seeds each.
2/ Duncan's Multiple Range Test. ($P =< .01$, CV = 5.68%)

Four standard one-half gram purity analyses were conducted on one lot of *Calamagrostis canadensis* to test that the results met the AOSA demands at the 95% confidence level.

Test	% Pure seed
1	98.66
2	98.76
3	97.84
4	98.04
Average	98.33

According to Table 6, Regular tolerances for any component of a purity analysis, on page 78 in the AOSA "Rules for Seed Testing 1976," the tolerance for the average found is 0.76. Therefore, since the apparent deficiencies do not exceed the tolerance level the deficiency is not considered real and the results are within the 95% confidence level.

Conclusion

A working sample size of .5 gram is recommended for determining the purity of *Calamagrostis canadensis* based on the following results:

1. A .25 gram sample does not consistently contain 2000 seeds
2. The .50 gram sample yields a significantly higher purity percentage.

Summary

Based on the analysis of the data presented within this paper the recommended purity procedures for Bluejoint will be as follows:

Minimum weight for purity analysis	Minimum weight for noxious weed seed examination	Approximate number of seeds per gram	Approximate number of seeds per ounce
gram	gram	No.	No.
1/2	5	8,461	239,842

The procedures for germination analysis will be as follows:

Substrata	Temperature °C	First count	Final count	Additional directions
P[1]/	15-25[2]/	10[3]/	21[4]/	Light, 5-day prechill at 5°C, .2% KNO_3 is optional

1/ Covered petri dish with seed placed on top of the two layers of moist blotters.
2/ 16 hours of dark at 15°C, and 8 hours of light at 25°C.
3/ The first count is designed to give an idea of seed vigor.
4/ Determines the final germination percentage.

Seed Harvest

The original plan for this project was to not only evaluate direct combining but swathing then combining with a pick-up reel as well. However, due to a lack of equipment, only the direct harvest method was evaluated.

The Bluejoint field, which was the same field used for the phenology study, began to shatter almost three weeks earlier than in 1975. Two days were needed to get the combine to Delta Junction and by the time harvest operations could be started the field was 50% shattered.

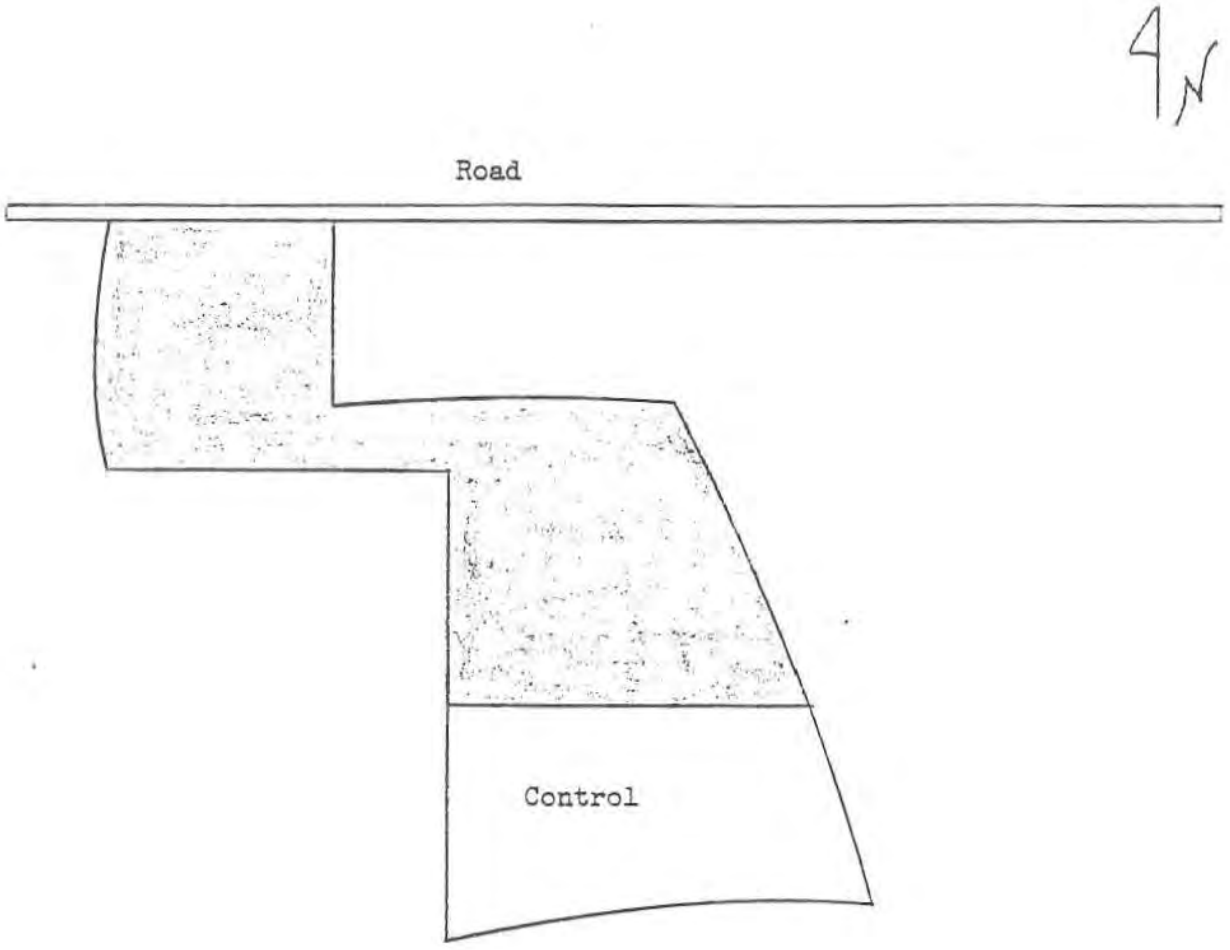
Materials and Methods

The field was burned on April 25 to remove the accumulation of vegetation. Approximately three-quarters of the area was burned leaving the remainder as a control (Fig. 7).

An Allis-Chalmers Gleaner K combine was used for the direct mechanical harvest of Bluejoint.

The parachute-like character of the seed made it necessary to decrease the movement of air within the machine. This was accomplished by removing the blades in the cleaner and separator fans. Some air movement was still apparent due to the rotation of the cylinder but this was unavoidable.

The ground and reel speeds were adjusted according to the stand of Bluejoint and were not significantly changed during the entire operation. A ground speed of one and one-half miles per hour and a reel speed of thirty-five revolutions per minute were maintained.



Shaded area was burned prior to the
1976 growing season

Scale 1" = 300'

Figure 7. *Calamagrostis* study site on OHM farm near Delta Junction.

All the adjustments that were made are ordinary and common practice in commercial grain and grass harvest. The initial setting was recommended in the combine owner's manual for small-seeded grasses. The adjustments involved the cylinder spacing, cylinder speed, and chaffer and sieve openings. The closest the cylinder would go to the concaves without hitting was one-eighth inch. The cylinder speeds ranged from 800 to 1200 revolutions per minute and the chaffer and sieve openings were from three-sixteenths to five-eighths inch.

The evaluation for the threshing efficiency was made by direct observation of threshed and unthreshed seed heads coming off the straw walker.

The amount of seed lost was determined by observation of the seed, which was massed by its callus hairs, as it rode off the chaffer and onto the ground.

Results

Two problems were immediately encountered in trial number one, Table 5. First, only fifty percent of the seed was being threshed out of the panicle, and second, most of the seed was riding over the chaffer and onto the gound.

The threshing problem was determined, in trials two and seven, to be one of cylinder speed and not a matter of cylinder spacing. The one-quarter inch spacing was much too wide to adequately thresh the small Bluejoint seed. Trials four, eight, nine, and ten indicated that the most efficient threshing was at the one-eighth inch

TABLE 5. Combine settings and results for the direct harvest of Bluejoint.

Combine settings					Results		
Trial number	Concave opening	Cylinder speed	Chaffer opening	Sieve opening	Threshing	Seed lost	Remarks
	in.	rpm	in.	in.	%	%	
1	1/8	800	3/16	3/16	50	90	Most seed rode over the chaffer and onto the ground
2	1/4	800	5/16	5/16	70	70	Most seed still is riding over the chaffer.
3	1/8	900	3/8	3/8	75	50	Seed is bridging on the chaffer and very little is going through to the sieve
4	1/8	1000	5/8	5/8	80	0	All seed is bridging on chaffer and won't go through to the sieve
5	1/8	1100	5/16	5/16	50	60	Less bridging but most of seed is lost off chaffer
6	1/8	1200	5/16	5/16	20	60	Rpm on cylinder is too high for optimum threshing
7	1/4	1000	5/8	3/8	20	60	Concave is opened too far. Seed continues to bridge and be lost
8	1/8	1000	3/8	5/16	80	50	Most seed runs off chaffer, seed on sieve bridges.
9	1/8	1000	3/16	5/16	80	70	Seed continues to run off end of chaffer.
10	1/8	1000	taken out	taken out	80	0	All seed is saved and elevated to bin.

concave opening and a cylinder speed of 1000 revolutions per minute.

No chaffer setting would permit the seed to run through it. The callus hairs entangled and the entire mass would either ride over the chaffer or bridge on it and eventually plug the machine. Very little seed could get through the chaffer and the little that did would only bridge-up on the sieve. It was apparent in trials one through nine that no combination of chaffer and/or sieve openings would allow any form of precleaning. Finally, in trial ten both the chaffer and the sieve were removed and 100% of the seed was saved.

The data from the phenology study and from the observations on the same field in the harvest year indicates that seed maturity is unpredictable without very close observation.

Shatter was first observed on August 27, in 1975, at 1900 season growing degree days. This year, 1976, the field was 50% shattered on August 8 with an accumulation of 1641 season growing degree days. Generally, the growing season in 1975 was quite rainy with four inches of precipitation above the normal. The 1976 growing season was less rainy but still over one-half inch above the normal.

Harvest should begin when the majority of seed is in hard dough. Shatter can occur any time after this stage is reached.

The recommended settings for the direct combining of Bluejoint are: air-off, concave opening-1/8", cylinder speed-5000 feet per minute1/ (approximately 1000 rpm on a 19-1/4" diameter cylinder), chaffer screen removed, and sieve screen removed. The ground and

1/ Feet per minute -- revolutions per minute x cylinder diameter x 3.15.

reel speed is variable and dependent on the stand which is to be harvested.

Summary

Based on the results of this study, the following recommendations are made for the direct combining of Bluejoint: concave setting, 1/8-inch; cylinder speed, 5,000 feet per minute; the chaffer and sieve screens should be taken out of the machine, and the fans should be blocked off or disconnected. Ground and reel speeds will depend on the physical characteristics of each particular stand of Bluejoint.

Patrick T. Mulligan

APPENDIX TABLE 1. Germination data in percent of four lots of *Calamagrostis canadensis* at two different temperature regimes and four different pretreatments.

Lot	Temp.	Rep.	KNO_3 and Prechill	KNO_3	Prechill	Control
DJ-76	15-25	1	70	62	50	75
		2	64	50	59	42
		3	62	50	66	44
		4	69	56	65	43
	20	1	73	42	58	41
		2	71	45	53	36
		3	70	48	52	32
		4	63	43	59	31
BH-75	15-25	1	32	46	37	39
		2	48	41	48	35
		3	47	39	46	38
		4	37	43	44	41
	20	1	36	36	32	26
		2	34	32	37	19
		3	45	32	39	21
		4	30	30	34	19

APPENDIX TABLE 1 continued. Germination data in percent of four lots of *Calamagrostis canadensis* at two different temperature regimes and four different pretreatments.

Lot	Temp. °C	Rep.	KNO_3 and Prechill	KNO_3	Prechill	Control
GF-75	15-25	1	90	87	91	89
		2	86	86	91	81
		3	85	83	89	89
		4	83	74	93	84
	20	1	87	84	89	76
		2	89	83	90	75
		3	88	83	82	73
		4	93	78	82	83
GF-76	15-25	1	72	68	66	67
		2	65	71	61	67
		3	70	64	78	52
		4	74	64	68	67
	20	1	59	46	63	55
		2	67	45	63	34
		3	68	41	66	36
		4	58	40	63	30

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	Rep			
Lot	1	2	3	4
A	.2720	.2756	.2824	.2526
B	.2431	.2358	.2250	.2411
D	.2151	.2005	.2000	.2142
E	.2740	.2716	.2817	.2853

APPENDIX TABLE 3. *Calamagrostis canadensis* man-hour requirements.

	Hours
A. Phenology Study	
1. Agronomist III	30
2. Agronomist II	135
3. Farm Foreman	15
Subtotal	180
B. Harvesting	
a. Burning	
1. Agronomist II	15
2. Farm Foreman	15
3. Equipment Operator	15
b. Combining	
1. Agronomist III	30
2. Agronomist II	30
3. Farm Foreman	30
4. Equipment Operator	30
Subtotal	165
C. Purity and Germination Standards	
a. Germination	
1. Agronomist II	148
2. Lab Technician	52
b. Purity	
1. Agronomist II	60
2. Lab Technician	30
c. Analysis	
1. Agronomist II	80
Subtotal	370

APPENDIX TABLE 3 continued. *Calamagrostis canadensis* man-hour requirements.

D. Reporting	Hours
a. Writing	
1. Agronomist II	40
b. Typing	
1. Clerk Typist	5
Subtotal	45
Grand Total	760

Phenology Study

The Plant Materials Center agreed this year to participate as one of thirty-six data collection sites, established by the Alaska Agricultural Experiment Station, to record phenological information within state regions of agricultural potential. Data is being collected in an attempt to correlate plant growth responses in these areas with optimum planting dates, plant growth, and harvesting dates for various agricultural crops.

Identical sets of indicator plants, selected for distinctive, and easily recognized phenological stages, are planted at each of the collection sites and their reactions to local climatic and weather patterns recorded. Then by comparing dates of succeeding plant growth stages from all the sites, climatic maps can be developed showing weather progressions across these potentially productive areas to aid growers in selecting and raising suitable crops.

Advantages of such a phenological network in Alaska are several according to Lee Allen, Associate Agricultural Engineer, for the Alaska Agricultural Experiment Station in Palmer, and phenological project coordinator. Costs to establish such a system are relatively low when compared to investments in instruments needed for comparable information and the data can be collected simply by having the observer record a date with no charts to change, instruments to maintain, or calculations to make. Data collected in this manner

is also less biased by unseasonable weather changes than that collected by recording instruments because plants are able to compensate for such changes. Characteristics in local climates not easily detected with other evaluation methods may also be expressed in plant responses according to Mr. Allen.

Materials and Methods

Indicator plants. Plants selected for the University study and ultimately those planted at the Plant Materials Center data collection site were selected for their relative hardiness and early response to spring weather. Three species were selected-- all woody perennial shrubs. Included are Villosa lilac, *Syringa villosa*; Zabeli honeysuckle; *Lonicera korolkawi zabeli*; and the native red osier dogwood, *Cornus stolonifera*.

Arrangements were made with the Experiment Station to receive planting material for the PMC collection site last spring but changed to a 1977 delivery date by the Station because of short supply.

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Clones of Villosa lilac and Zabeli honeysuckle are located at Fairbanks. Plants from each are promised for 1977 spring delivery.

Data collection. Collection of phenological information begins in the spring with swelling buds and greening foliage and continues through the summer with various stages of stem growth and flower development into the fall of the year where seed dissemination and changing leaf color bring it to a close. Cards for recording data are shown in Figure 8.

Results

Data collections will begin next year after plantings are established at the PMC weather station site.

Joseph L. Stehlik

PHENOLOGY DATA FOR FIRST HALF 19___ Card #1
Please list date of occurrence of phenological stage

STAGE	Villosa Lilac	Zabeli Honeysuckle	Red Osier Dogwood
1. Leaf Bud Swelling	_____	_____	_____
2. Leaf Emergence (1/4")	_____	_____	_____
3. Full Leaf	_____	_____	_____
3a. Plant Height at Stage 3 (Inches)	_____	_____	_____
4. First Bloom	_____	_____	_____
5. Full Bloom (95% open)	_____	_____	_____
5a. Dieback at Stage 5	_____	_____	_____

Comments:_____

_____

Observer_____Location_____

PHENOLOGY DATA FOR SECOND HALF 19___ Card #2
Please list date of occurrence of phenological stage

STAGE	Villosa Lilac	Zabeli Honeysuckle	Red Osier Dogwood
6. Bloom Dried (95%)	_____	_____	_____
6a. Date Plants Trimmed	_____	_____	_____
7. Seeds Formed	_____	_____	_____
7a. New Growth Length at Stage 7 (Inches)	_____	_____	_____
8. Seeds Turn Color	_____	_____	_____
9. Leaves Shown Frost	_____	_____	_____
10. Leaves Fall	_____	_____	_____

Comments:_____

_____

Observer_____Location_____

Figure 8. Information cards used by cooperators in the collection of phenological data for Alaska Agricultural Experiment Station study.

1976

CONTAINERIZED SEEDLING

ANNUAL REPORT

by

Michael J. O'Hara

ACKNOWLEDGMENTS

Acknowledgments are proffered to the Plant Materials Center staff for performing germination tests and stratifying seed. Special recognition is accorded Joseph L. Stehlik of the Plant Materials Center for his time and interest devoted to the containerized seedling project. His advice, knowledge, and unfailing optimism were greatly required and appreciated. Particular thanks is offered to Wiletta W. Stehlik for making this study a part of the Plant Materials Center Annual Report.

Michael J. O'Hara

ABSTRACT

The staff at the Alaska State Forestry greenhouse in Palmer, Alaska, planted 65,000 individual cells as part of a pilot program designed to produce containerized seedlings. The growing period extended from mid June to mid September.

A chlorinated hydrocarbon based wood preservative is presumed to have caused a 47% mortality in the emerged seedlings. Consequently, 33,000 three month old seedlings of the Picea glauca, Picea sitchensis, Pinus contorta, and Pinus sylvestris species were produced.

INTRODUCTION

In August, 1974, a symposium in Denver, Colorado, introduced members of the Alaska State Forestry to containerized seedling production, which can produce a harvestable tree in 90% of the time required by the more conventional bare-root system.

In early 1975, a 24'x62' double film plastic greenhouse with headhouse was built to produce seedlings under a cooperative agreement between the Division of Agriculture, Plant Materials Center, and the Division of Lands, Forestry section. 55,000 seedlings were produced in 1975, 60% of which died due to an unusually severe winter. In 1976, the second year of the pilot project, 65,000 seedlings were produced, 47% of which died, presumably due to contamination by a chlorinated hydrocarbon.

In 1976, the greenhouse was equipped with two 200,000 BTU propane heaters, an overhead poly tube ventilation system, and three 30" fans with cooling pads. It now has a timed bank of incandescent lights on both sides of the greenhouse to prevent seedling dormancy before maturity has been reached. A thermoalarm, thermemeters, thermostat, hydrothermograph, and humidistat have been installed to record and control environments in the greenhouse. A travelling water boom mechanized the fertilization procedure. In short, soil properties, fertilizers, temperatures, light conditions, and pests are all carefully controlled.

To overwinter the seedlings, cold frames with individual watering systems have been installed. These cold frames help prevent winter dessication of the seedlings from high winds.

The head house is used for planting, seed cleaning, and cone drying materials. On the west side and adjoining the head house is the storeroom, where fertilizers, chemicals, potting mediums, and containers are stored. As of this writing a laboratory table and sink are being installed. Overhead is the cabinet and carpentry shop.

PREPLANTING ACTIVITIES

Seed sewing in Alaska should begin in early March, but preparations for that planting begin six months earlier. From cones collected in October, seed is extracted, cleaned, tested, and stratified (if desired). Planting and seeding materials, fertilizers, and containers must be cleaned and readied.

Seed is obtained from cone extraction at the nursery, from a donor, or from purchase from a commercial source. The cone extraction process includes drying the cones in a rack, tumbling the cones to release the seed, and dewinging the seed. The amount of seed depends upon the species and collection year. Frequently, seed is more economical when purchased from a commercial source. Table I shows the accessions, origin, and collection data for the seed planted in 1976.

A germination test is required on each seed lot received, extracted, or planted. The purpose of such a test is to eliminate from the planting schedule those poorly germinating accessions. The tests were performed by the Plant Materials staff and the methods used vary with the species. A 0.2% KNO3 solution is used because the nitrate molecule breaks dormancy in the seed. The seed is kept moist with temperature and light conditions carefully controlled for 20 to 28 days. The light period and temperatures may change for species as noted in Table II. Three replications of one hundred seeds each are required for an official test.

In 1975, three different container types were tested to determine the advantages and disadvantages of each container. The Spencer Lemaire folding book container was found to be inexpensive, easily disposable,

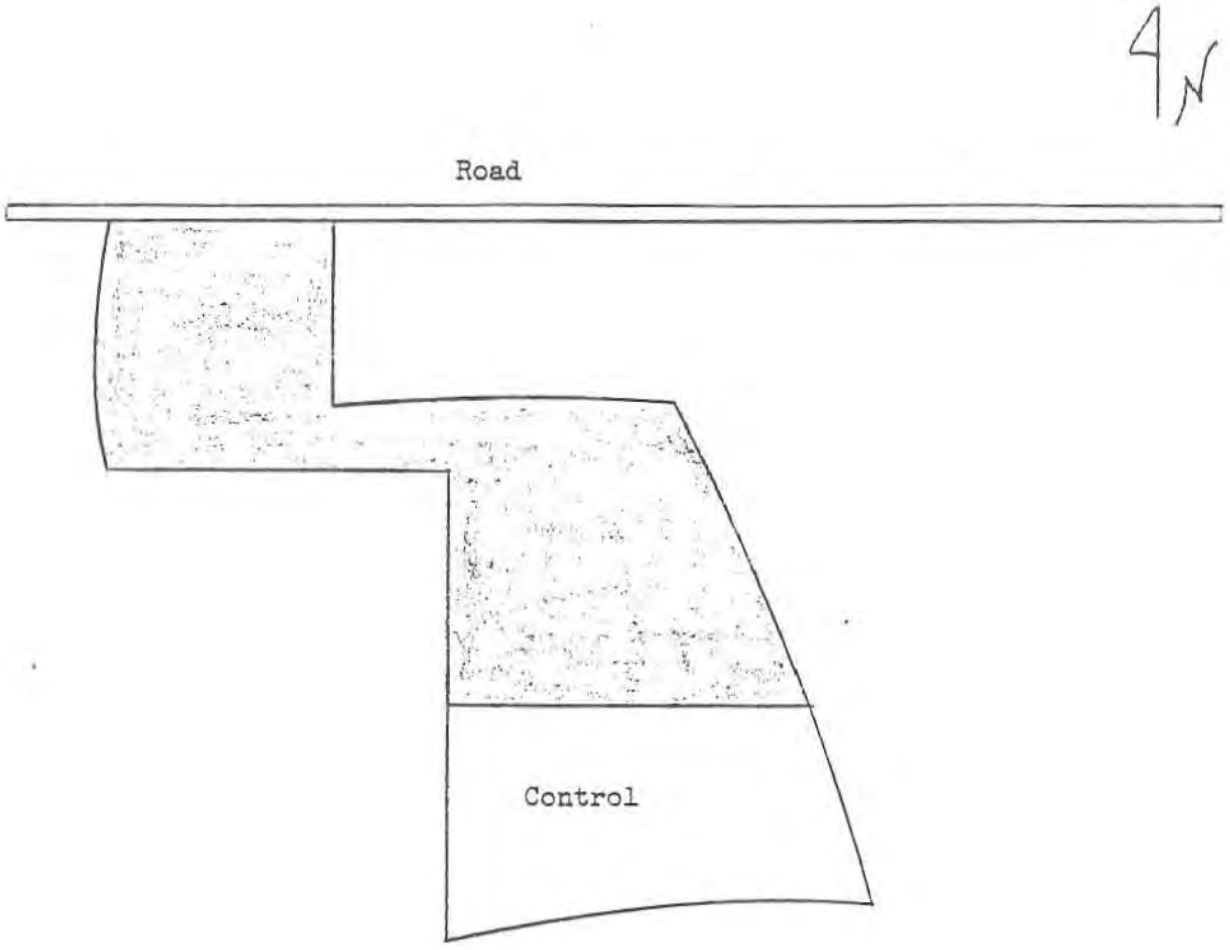

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Figure 7. *Calamagrostis* study site on OHM farm near Delta Junction.

All the adjustments that were made are ordinary and common practice in commercial grain and grass harvest. The initial setting was recommended in the combine owner's manual for small-seeded grasses. The adjustments involved the cylinder spacing, cylinder speed, and chaffer and sieve openings. The closest the cylinder would go to the concaves without hitting was one-eighth inch. The cylinder speeds ranged from 800 to 1200 revolutions per minute and the chaffer and sieve openings were from three-sixteenths to five-eighths inch.

The evaluation for the threshing efficiency was made by direct observation of threshed and unthreshed seed heads coming off the straw walker.

The amount of seed lost was determined by observation of the seed, which was massed by its callus hairs, as it rode off the chaffer and onto the ground.

Results

Two problems were immediately encountered in trial number one, Table 5. First, only fifty percent of the seed was being threshed out of the panicle, and second, most of the seed was riding over the chaffer and onto the gound.

The threshing problem was determined, in trials two and seven, to be one of cylinder speed and not a matter of cylinder spacing. The one-quarter inch spacing was much too wide to adequately thresh the small Bluejoint seed. Trials four, eight, nine, and ten indicated that the most efficient threshing was at the one-eighth inch

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5	1/8	1100	5/16	5/16	50	60	Less bridging but most of seed is lost off chaffer
6	1/8	1200	5/16	5/16	20	60	Rpm on cylinder is too high for optimum threshing
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10	1/8	1000	taken out	taken out	80	0	All seed is saved and elevated to bin.

concave opening and a cylinder speed of 1000 revolutions per minute.

No chaffer setting would permit the seed to run through it. The callus hairs entangled and the entire mass would either ride over the chaffer or bridge on it and eventually plug the machine. Very little seed could get through the chaffer and the little that did would only bridge-up on the sieve. It was apparent in trials one through nine that no combination of chaffer and/or sieve openings would allow any form of precleaning. Finally, in trial ten both the chaffer and the sieve were removed and 100% of the seed was saved.

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Based on the results of this study, the following recommendations are made for the direct combining of Bluejoint: concave setting, 1/8-inch; cylinder speed, 5,000 feet per minute; the chaffer and sieve screens should be taken out of the machine, and the fans should be blocked off or disconnected. Ground and reel speeds will depend on the physical characteristics of each particular stand of Bluejoint.

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3. Farm Foreman	15
Subtotal	180
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Please list date of occurrence of phenological stage

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2. Leaf Emergence (1/4")	_____	_____	_____
3. Full Leaf	_____	_____	_____
3a. Plant Height at Stage 3 (Inches)	_____	_____	_____
4. First Bloom	_____	_____	_____
5. Full Bloom (95% open)	_____	_____	_____
5a. Dieback at Stage 5	_____	_____	_____

Comments:_____

_____

Observer_____Location_____

PHENOLOGY DATA FOR SECOND HALF 19___ Card #2
Please list date of occurrence of phenological stage

STAGE	Villosa Lilac	Zabeli Honeysuckle	Red Osier Dogwood
6. Bloom Dried (95%)	_____	_____	_____
6a. Date Plants Trimmed	_____	_____	_____
7. Seeds Formed	_____	_____	_____
7a. New Growth Length at Stage 7 (Inches)	_____	_____	_____
8. Seeds Turn Color	_____	_____	_____
9. Leaves Shown Frost	_____	_____	_____
10. Leaves Fall	_____	_____	_____

Comments:_____

_____

Observer_____Location_____

Figure 8. Information cards used by cooperators in the collection of phenological data for Alaska Agricultural Experiment Station study.

1976

CONTAINERIZED SEEDLING

ANNUAL REPORT

by

Michael J. O'Hara

ACKNOWLEDGMENTS

Acknowledgments are proffered to the Plant Materials Center staff for performing germination tests and stratifying seed. Special recognition is accorded Joseph L. Stehlik of the Plant Materials Center for his time and interest devoted to the containerized seedling project. His advice, knowledge, and unfailing optimism were greatly required and appreciated. Particular thanks is offered to Wiletta W. Stehlik for making this study a part of the Plant Materials Center Annual Report.

Michael J. O'Hara

ABSTRACT

The staff at the Alaska State Forestry greenhouse in Palmer, Alaska, planted 65,000 individual cells as part of a pilot program designed to produce containerized seedlings. The growing period extended from mid June to mid September.

A chlorinated hydrocarbon based wood preservative is presumed to have caused a 47% mortality in the emerged seedlings. Consequently, 33,000 three month old seedlings of the Picea glauca, Picea sitchensis, Pinus contorta, and Pinus sylvestris species were produced.

INTRODUCTION

In August, 1974, a symposium in Denver, Colorado, introduced members of the Alaska State Forestry to containerized seedling production, which can produce a harvestable tree in 90% of the time required by the more conventional bare-root system.

In early 1975, a 24'x62' double film plastic greenhouse with headhouse was built to produce seedlings under a cooperative agreement between the Division of Agriculture, Plant Materials Center, and the Division of Lands, Forestry section. 55,000 seedlings were produced in 1975, 60% of which died due to an unusually severe winter. In 1976, the second year of the pilot project, 65,000 seedlings were produced, 47% of which died, presumably due to contamination by a chlorinated hydrocarbon.

In 1976, the greenhouse was equipped with two 200,000 BTU propane heaters, an overhead poly tube ventilation system, and three 30" fans with cooling pads. It now has a timed bank of incandescent lights on both sides of the greenhouse to prevent seedling dormancy before maturity has been reached. A thermoalarm, thermemeters, thermostat, hydrothermograph, and humidistat have been installed to record and control environments in the greenhouse. A travelling water boom mechanized the fertilization procedure. In short, soil properties, fertilizers, temperatures, light conditions, and pests are all carefully controlled.

To overwinter the seedlings, cold frames with individual watering systems have been installed. These cold frames help prevent winter dessication of the seedlings from high winds.

The head house is used for planting, seed cleaning, and cone drying materials. On the west side and adjoining the head house is the storeroom, where fertilizers, chemicals, potting mediums, and containers are stored. As of this writing a laboratory table and sink are being installed. Overhead is the cabinet and carpentry shop.

PREPLANTING ACTIVITIES

Seed sewing in Alaska should begin in early March, but preparations for that planting begin six months earlier. From cones collected in October, seed is extracted, cleaned, tested, and stratified (if desired). Planting and seeding materials, fertilizers, and containers must be cleaned and readied.

Seed is obtained from cone extraction at the nursery, from a donor, or from purchase from a commercial source. The cone extraction process includes drying the cones in a rack, tumbling the cones to release the seed, and dewinging the seed. The amount of seed depends upon the species and collection year. Frequently, seed is more economical when purchased from a commercial source. Table I shows the accessions, origin, and collection data for the seed planted in 1976.

A germination test is required on each seed lot received, extracted, or planted. The purpose of such a test is to eliminate from the planting schedule those poorly germinating accessions. The tests were performed by the Plant Materials staff and the methods used vary with the species. A 0.2% KNO3 solution is used because the nitrate molecule breaks dormancy in the seed. The seed is kept moist with temperature and light conditions carefully controlled for 20 to 28 days. The light period and temperatures may change for species as noted in Table II. Three replications of one hundred seeds each are required for an official test.

In 1975, three different container types were tested to determine the advantages and disadvantages of each container. The Spencer Lemaire folding book container was found to be inexpensive, easily disposable,

TABLE I

PERTINENT SEED DATA

NAME	COMMON NAME	ACCESSION NUMBER	COLLECTION AREA	COLLECTION DATE	VENDOR/ DONOR	SEED AVAILABLE FOR 1976
Picea sitchensis	Sitka spruce	L223	HAINES	11/21/74	Silvaseed Co.	143 g
Picea sitchensis	Sitka spruce	L277	KENAI	10/08/75	State Forestry	140 g
Picea sitchensis	Sitka spruce	L278	AFOGNAK ISLAND	10/17/75	U. S. Forest Service	
Picea glauca	White spruce	L276	KENAI	10/08/75	State Forestry	267 g
Picea glauca	White spruce	L274	FAIRBANKS	10/01/75	State Forestry	3603 g
Picea glauca	White spruce	L266	TALKEETNA	9/03/75	Private	179 g
Picea lutzii	Lutz spruce	L267	TYONEK	9/ /75	Private	201 g
Pinus contorta latifolia	Lodgepole pine	L236	WHITEHORSE	2/20/75	Yukon Lands & Forest Service	218 g
Pinus contorta latifolia	Lodgepole pine	L284	WHITEHORSE	5/19/76	Yukon Lands & Forest Service	314 g
Pinus sylvestris	Scotch pine	L88	FINLAND	3/05/74	Private	116 g
Populus trico-carpa	Black cottonwood	L275	TALKEETNA	6/26/75	U. S. Forest Service	45 g
Laris siberica	Siberian larch	L147	FINLAND	5/15/74	Private	43 g
Castenea dentata	American chestnut	L279	WISCONSIN	11/18/75	Private	200 seeds
Prunus species	Cherry blossom	L324	JAPAN	7/29/76	Japan Air Lines	1000 g

TABLE II

GERMINATION TESTING PROCEDURE

NAME	ACCESSION NUMBER	GERMINATION PERCENTAGE	TEST CONDITIONS
Picea sitchensis	L223	82.0%	12% KNO3 & 27 days
Picea sitchensis	L277	71.3%	at 20°C at 8 hrs
Picea sitchensis	L278	2.3%	light & 30°C for 16 hrs dark
Picea glauca	L276	66.1%	For 21 days moist
Picea glauca	L274	85.0%	20°C at 8 hrs light
Picea glauca	L266	45.3%	& 30°C at 16 hrs dark
Picea lutzii	L267	32.0%	
Pinus contorta	L236	53.0%	28 day pre-chill at
Pinus contorta	L284		5°C, .2% KNO3, 20° to 30°C 8 hrs light
Pinus sylvestris	L88	83.0%	20° to 30°C 8 hrs light for 14 days
Larix siberica	L147	51.7%	20° to 30°C 8 hrs light for 20 days

and to provide 82 seedlings per square foot, but if cavities did not germinate, the seedlings could not be consolidated. Ray Leach cells are individual tubes which proved to be rather expensive, but reusable, durable and provided a density of 100 seedlings per square foot. In addition, cells which did not germinate could be replanted. The Styro-block proved to be expensive, easily damaged in shipment, and not to be consolidated if cavities did not germinate.

The Spencer Lemaire "book-five" was chosen for the 1976 planting primarily on the basis of the low cost, but results from the Fall 1976 field planting show this container to be inefficient due to the dead cavity weight carried to the field. Ray Leach cells have been recommended for future use for the reasons described above.

The planting medium chosen for 1976 was a vermiculite and mica peat mix in a 1 to 1 ratio. The prime consideration of a planting mix are sterility (to retard disease), a high cation exchange capacity, a low pH (5.5), and a low mineral content. Unfortunately, lime had been added to the lot of mica peat purchased; the pH was too high (6.8). The recommended future planting medium is peat moss and vermiculite in a 1 to 1 ratio with a pH of approximately 4.6.

The ideal fertilizer regime starts the seedling on a high phosphorus/potassium (PK) schedule for two weeks to develop roots, then changes to a high nitrogen (N) schedule to stimulate shoot and leaf growth. Before the seedling reaches dormancy (14 hours daylight for Picea glauca), a high PK fertilizer is applied to "harden-off" the seedling.

In 1976, a fertilizer schedule recommended by Dr. Richard Tinus was used. These stock solutions (Table III) were made from soluble chemicals and prepared for a 1:100 fertilizer injector. The major advantage of these solutions is the ability to add or subtract macro, micro, and trace nutrients as required. In addition, Peters 20-20-20 and 9-45-15 were used. Table IV displays ppm and rates of application for the three fertilizers.

Table IV

FERTILIZER RATES

	N			P			K		
	PPM	lbs/acre	g/m²	PPM	lbs/acre	g/m²	PPM	lbs/acre	g/m²
Stock Solution	550	68.4	0.76	20	2.4	0.03	300	37.3	0.42
Peters 20-20-20	150	18.7	0.20	65	8.1	0.09	124	15.4	0.17
Peters 9-45-15	150	19.7	0.20	624	76.8	0.86	208	25.8	0.29

In accordance with the early high P regime desired, before seeding, Peters 0-45-0 (treblesuperphosphate) pellets were thoroughly mixed at a rate of 300g/m2 (1/2 lb/yd3). Because the pellets did not dissolve during mixing, some cells had a higher P concentration than others. With the exception of a slow release fertilizer, preplanting fertilizer application is not recommended. MagAmp 7-40-6 5.5 lbs/yrds is at the time of this writing being tested in a growth chamber.

Seed of Picea sitchensis, Picea glauca, and Pinus sylvestris were stratified for the 1976 planting to compare emergence and growth between stratified and unstratified seed.

TABLE III

Stock solutions for high N nutrient solutions

Dilution factor: 200

Stock Solution #1	gm/4l (approx. 1 gal.)
Potassium nitrate	240
Calcium nitrate	190
Ammonium nitrate	320

Dissolve in hot water and make up to 1 gallon.

Stock Solution #2	
Magnesium sulfate	190
Iron chelate (12% Fe)	25
Manganese sulfate	0.82
Copper sulfate	0.09
Zinc sulfate	0.11
Ammonium molybdate	0.01

Dissolve in hot water and make up to 1 gallon. If soluble trace elements are used, add them to solution #2 instead of manganese sulfate, copper sulfate, zinc sulfate, and ammonium molybdate. Also delete boric acid from solution #3.

Stock Solution #3	Per/4l
Phosphoric acid 85%	55 ml
Potassium carbonate	55 gm
Boric acid	0.90 gm

Pour the phosphoric acid into 1/2 gallong of water and dilute. Then add the potassium carbonate and boric acid.

TABLE III

Stock Chemicals for Nutrient Solutions

NAME	GRADE	QUANTITY	ESTIMATED PRICE
Potassium nitrate	tech	100 lb sack	$18
Calcium nitrate	tech	100 lb sack	14
Magnesium sulfate	tech	100 lb sack	20
Ammonium nitrate	tech	50 lb sack	3
Phosphoric acid	85% USP	200 lb drum	45
Potassium carbonate	tech	100 lb sack	30
Iron chelate	12% Fe	5 lb bag	6
Soluble Trace Elements		5 lb bag	4

- should be formulated to provide Mn 0.3 ppm, B 0.2 ppm, Cu 0.03 ppm, Zn 0.03 ppm, Mo 0.007 ppm, or something close to those ratios. Or, make your own:

Manganese sulfate	tech	1 lb	$ 2
Boric acid	tech or USP	1 lb	1
Copper sulfate	USP	1 lb	2
Zinc sulfate	purf powder	1 lb	1
Ammonium molybdate	reagent	¼ lb	3

TABLE III

Stock solutions for low N high PK solutions. Dilution factor: 200.

Preparation same as in table 3.

Stock Solution #1

Calcium nitrate	190 gm/41 (approx. 1 gal.)

Stock Solution #2

No change. See table 3

Stock Solution #3

Phosphoric acid 85%	165 ml
Potassium carbonate	165 gm
Boric acid	0.90 gm

TABLE IV

RECORD OF FIRST PLANTING

Date of Planting	Number Pallets Planted	Name	Accession Number	Origin	Seeds/ Cavity	Total Cavities Planted
5/18	6	Picea sitchensis	L223	Haines	3	10,140
5/19	6	Picea sitchensis	L277	Kenai	3	10,140
5/20	1	Picea sitchensis	L278	Afognak	5	1,690
5/20	1	Populus trichocarpa	L275	Talkeetna	5	1,690
5/20	1	Larix siberica	L147	Finland	2	1,690
5/21	1	Picea glauca	L276	Kenai	3	1,690
5/21	3	Picea glauca	L274	Fairbanks	3	5,070
5/25	2	Picea glauca	L266	Talkeetna	3	3,380
5/26	2	Pinus sylvestris	L88	Finland	2	3,380
5/26	5 1/2	Pinus contorta	L236	Whitehorse	2	9,295
5/27	9 1/2	Pinus contorta	L284	Whitehorse	2	16,055
Total						64,220

TABLE VI

RECORD OF SECOND PLANTING

Date of Planting	Number Pallets Planted	Name	Accession Number	Origin	Seeds/ Cavity	Total Cavities Planted
6/18	5	Picea sitchensis	L223	Haines	2	8,450
6/21	5	Picea sitchensis	L277	Kenai	2	8,450
6/22	1	Picea sitchensis	L278	Afognak	3	1,690
6/22	2	Picea glauca	L276	Kenai	3	3,380
6/22	4	Picea glauca	L274	Fairbanks	3	6,760
6/23	4	Picea glauca	L266	Talkeetna	2	6,760
6/23	4	Pinus sylvestris	L88	Finland	2	6,760
6/24	3	Pinus contorta	L236	Whitehorse	2	5,070
6/24	9	Pinus contorta	L284	Whitehorse	2	15,210
6/25	1	Populus trichocarpa	L275	Talkeetna	5	1,690
Total						64,220

Stratification is a process which matures the seed so that after planting the stratified seed will germinate more quickly than if it were unstratified. The process varies slightly with species but, generally, the seed is kept moist 28 days at a temperature slightly above freezing. For the Picea genus, 41°F is recommended temperature with a 24 hour seed presoak; for the Pinus genus, 41°F again is recommended with a seed presoak.

In addition to preparing the plant materials, certain tools required construction. These tools included a soil auger and soil bin, a shaker table, a seeding bench, a dibble board, a seeder, a rock dispenser, pallets, an irrigation system, and a bench system in the greenhouse.

The soil bin is a truncated inverted right prism, such that the base of the prism is 8'x8', the apex is 1'x8', and the height is 6'. At the inverted apex of the bin is an auger which, when filled, draws soil from the bin into the head house. The inside of the bin is fiberglassed, but should be coated with marlite to insure ease of soil movement.

PHOTO 1: Soil bin with head house and greenhouse in background.

PHOTO 2: Soil auger drawing to the right of the photo.

A shaker table, built in May, 1976, was designed to evenly distribute the planting medium in the cells. This table consists of a 1 h.p. motor fixed to a belt and cam which rotates against a striker plate, raising and lwering the table. This action compacts the mix.

A 4'x16' seeding table is the base for the dibble board, the seeder, and the grit dispenser. The dibble board is a press with multiple fingers designed to compress the soil to a uniform level 1/2" below the lip of the cell. The seeder is an attempt to mechanize seeding. It consists of a wooden box, the size of the tray, topped by two sheets of holed plexiglass. When the holes align, the seeds simultaneously drop into the cells. The rock dispenser drops #2 grit (Silica) onto the seeded cells to a height of 3mm. The grit protects the seed, allows easy penetration by the emerging seedling, and retards extraneous growth. It is operated by a lever actuated, spring loaded closure.

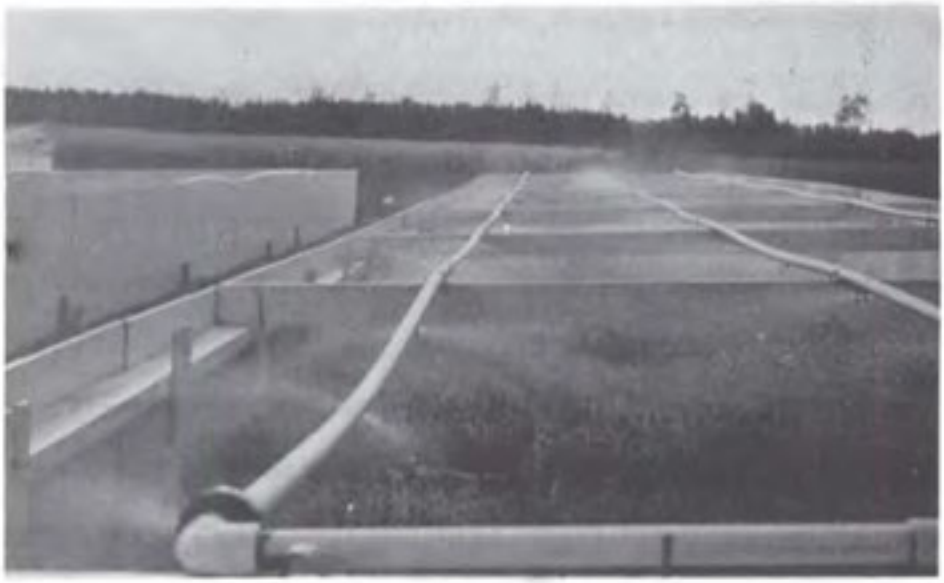
The seeded trays were then placed on 3'x8' wooden pallets which were hand carried to the greenhouse and set on the benches. The frames of the pallets were 2"x4" with 1/4" lath supporting the trays. The bench system consisted of two supported wooden rails on both sides of the greenhouse. The rails, pallets, and supports were coated with a commercial wood preservative and painted. The wood preservative, which was obtained at a local hardware store, used pentachlorophenol as the base. As will be discussed later, this preservative may have caused major problems throughout the greenhouse.

In October, 1976, accompanying the decision to use Ray Leach containers for the 1977 planting, the bench system was changed to

facilitate handling and to increase the seedling density by 41%. The rails and supports were coated with a greenhouse approved copper napthanate based wood preservative.

The irrigation system is composed of a travelling boom, a 500 gallon water tank, a pressure tank, and a 1:100 Smith fertilizer injector. The travelling water boom (20ft/min) is equipped with 80 gal/min nozzles fixed to the boom so as to provide an equal distribution of water. The holding tank was built to climatize the water within the tank so as to prevent cold water shock to the plants and to provide sufficient water pressure and volume to the greenhouse and cold frames. (See Photo 3).

PHOTO 3: Cold frame irrigation system.



PLANTINGS

Four plantings were made during 1976. Two were greenhouse plantings; one was an experimental planting; the other was a bareroot planting. The greenhouse plantings extended from March 18 to March 27 and from June 18 to June 25. By June 17 all seedlings from the first planting had been discarded. No data was taken from the first planting, but observations affirmed that the contamination which resulted in 47% mortality in the second planting accounted for 100% mortality in the first planting. Tables V and VI show accessions and other pertinent data relating to the first and second plantings, respectively.

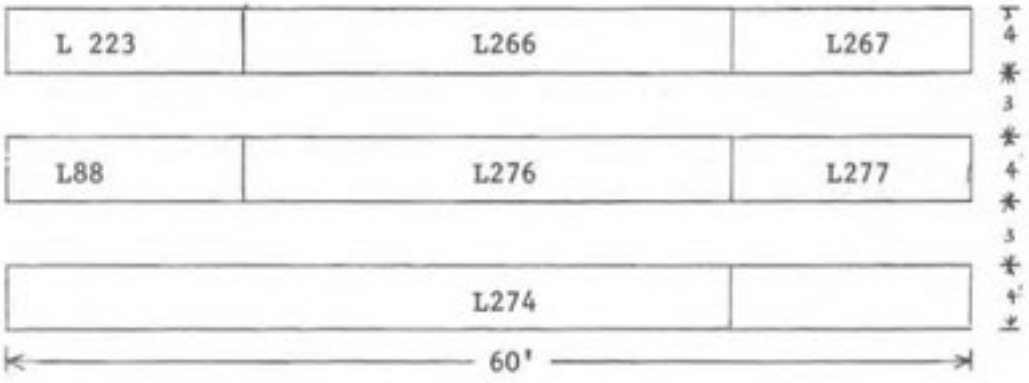
In response to the symptoms which displayed themselves in the first and second plantings, an experimental planting was made. Four species were planted in different soils ranging from mica peat, and mica peat and vermiculite, to pure vermiculite. Each accession was planted in two containers of the same soil, one of which went to the forestry greenhouse, and the other to the PMC greenhouse. In total, 50 experimental trays (3250 seedlings) were planted. The purpose of the experimental plot was to duplicate, then isolate the chlorotic symptoms using soil and location as variables, while maintaining other qualities of the environment. After 1 month, when the symptoms had appeared in the seedlings in the forestry greenhouse but not in the PMC greenhouse, soil had been eliminated as a cause of the chlorosis.

As a comparison between the containerized seedlings and the more conventional bareroot seedlings, on September 16, seeds were sewn in seed beds to provide bareroot stock. (See Photo 4).

PHOTO 4: Bare root plot between stakes.

Seed from as many accessions available were planted and will be nurtured for three years. 8-32-16 fertilizer was applied at the rate of 9.00 g/m2 (800lbs/acre). The beds were well watered, mulched with 1-1/2" of wood fiber (Weyerhauser), and staked with hog wire to keep the mulch in place. (See Diagram 1).

DIAGRAM 1: Accessions and locations in the bare root plot.



On June 17, 1976, three distinguished guests visited the forestry greenhouse. They were Dr. Richard Tinus, Principal Plant Physiologist, Rocky Mountain Forest and Range Experimentation Station, Bottineau, North Dakota; Dr. Stephan McDonald, Western Nursery and Greenhouse Specialist, Forest Service, Lakewood, Colorado; and, Dr. Peyton Owsten, Principal Plant Physiologist, Oregon State University, Corvalis, Oregon.

The discussion concerned the cause of the seedling mortality in the first planting, the heating, cooling, and ventilation arrangements in the greenhouse, artificial lighting, fungicides, optimum NPK levels, best pH, salts in soils, winter storage and general "green thumb" techniques.

Containerized seedling production is a relatively new idea, and very little is known about the best methods of producing seedlings in Alaska. Much stress was placed on keeping sequential and accurate records of observation, profiting from mistakes, and finding a permanent and energetic staff.

SEEDLING PERFORMANCE

The natural growing period from thaw to freeze in South Central Alaska is from four to five months. Under greenhouse conditions, that period can be economically extended to six and one-half months (March 1-September 15). This growing period can be extended even farther with considerable application of heat to the greenhouse.

The desired product is a 15 cm. (6") dark green Picea glauca seedling with a large enough root mass so that during and after extraction, the roots hold the soil. The root to shoot ratio (dry weight) should be about 3:1. For the other genera, criteria has not been established.

During 1976, the growing period was three months (mid June to mid September). During that time, seedling emergence, height, caliper, dry weight, and root length were recorded weekly. Weekly soil samples were taken and analyzed for pH, electroconductivity, and concentration of the NPK nutrients. The irrigation water was analyzed for macro, micro, and trace nutrients. In addition, a photographic record was kept.

Percent emergence is displayed graphically for stratified and unstratified seed for Picea sitchensis (L223, L277), Picea glauca (L274, L276, L266), and Pinus sylvestris (L88). (See charts 1-6). Seedlings of all genera began emerging between 5 and 10 days after planting. Stratified seed emerged first in all cases. Stratification of Picea sitchensis and Pinus sylvestris seed did not improve overall emergence. Stratification of Picea glauca seed significantly reduced total emergence in two accessions over the test period. The results are not conclusive and stratification tests should continue.

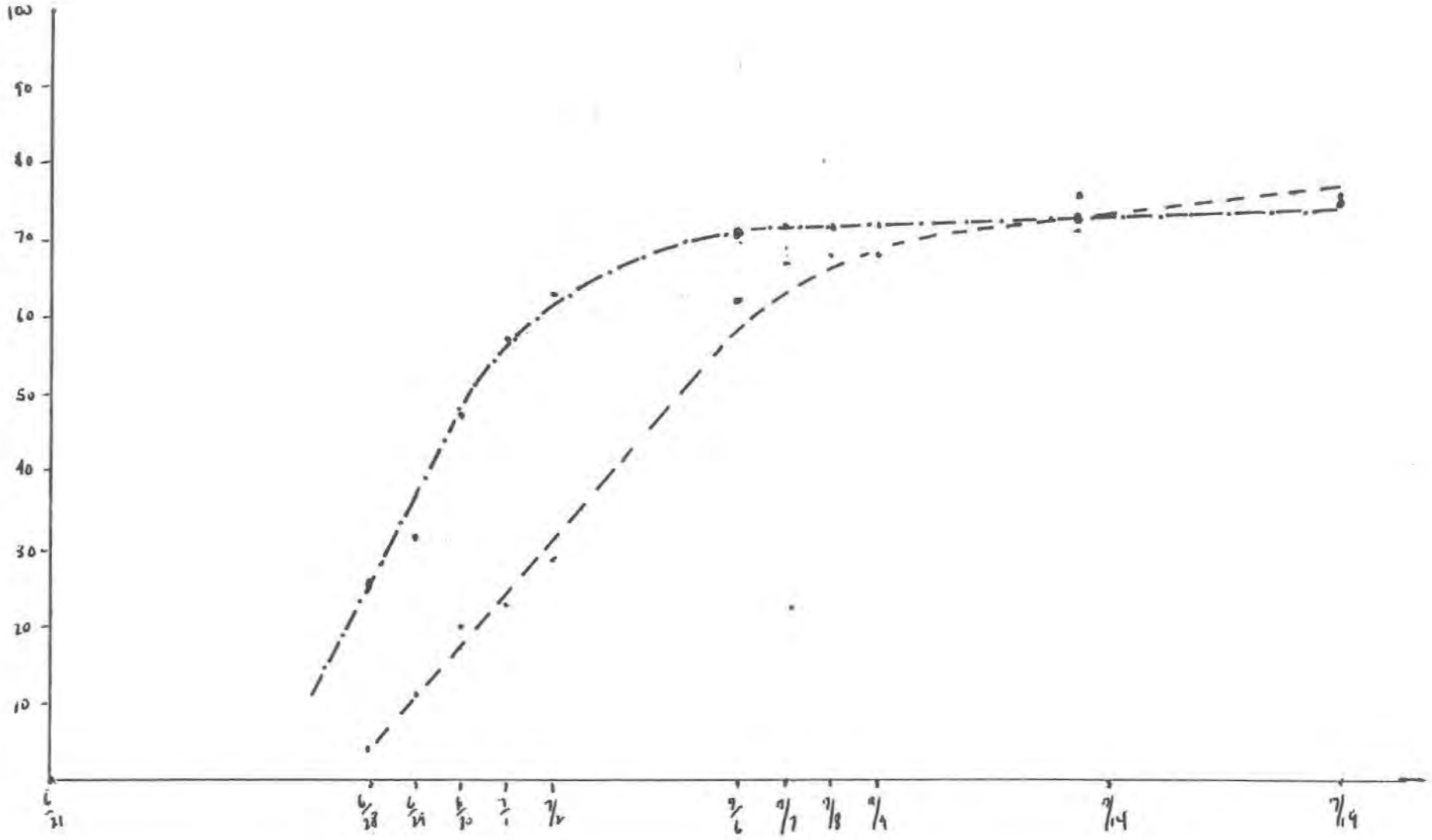
EMERGENCE with time.

CHART 1

L223 Sitka SPRUCE

— — — — ■ UNSTRATIFIED

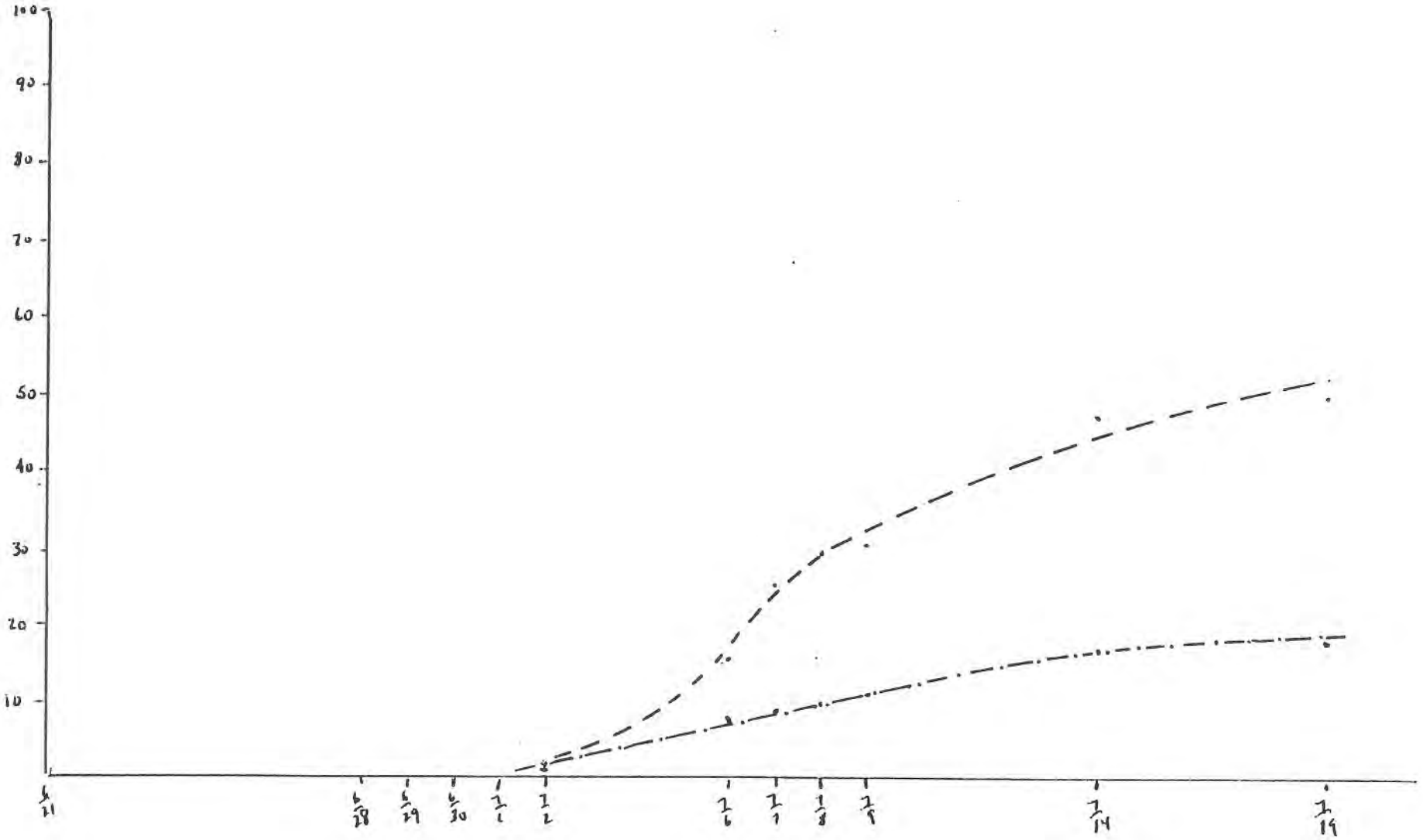
— · — · — · — □ STRATIFIED



EMERGENCE with time

Chart 2

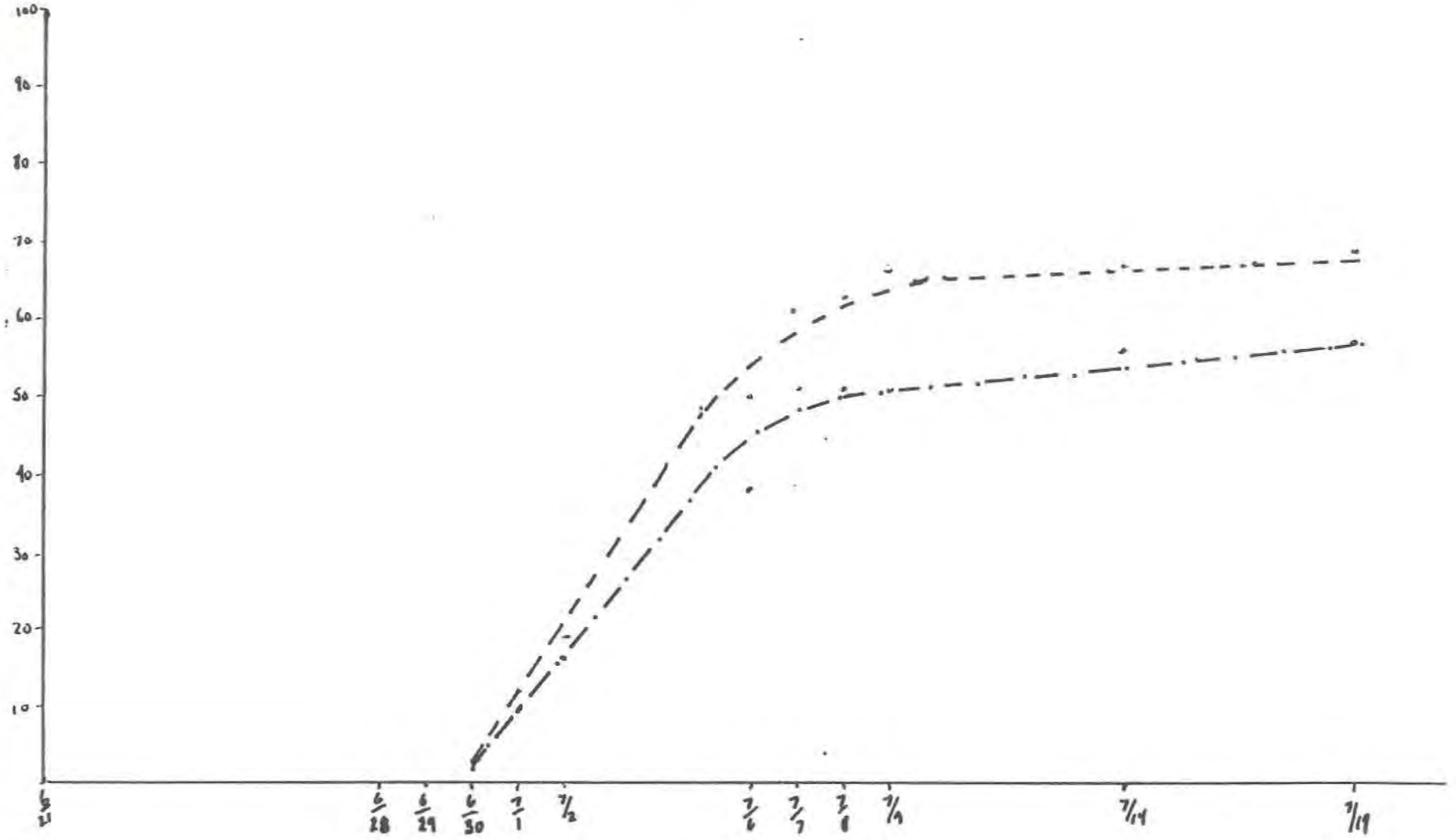
L277



% EMERGENCE with time
L274 white spruce - Fairbanks

Chart 3

— — — — — ■ UNSTRATIFIED
-·-·-·-·- ■ STRATIFIED



% EMERGENCE with time
L266 white spruce TALKEETNA

Chart 4

- - - - - - - UNSTRATIFIED
— · — · — · — STRATIFIED

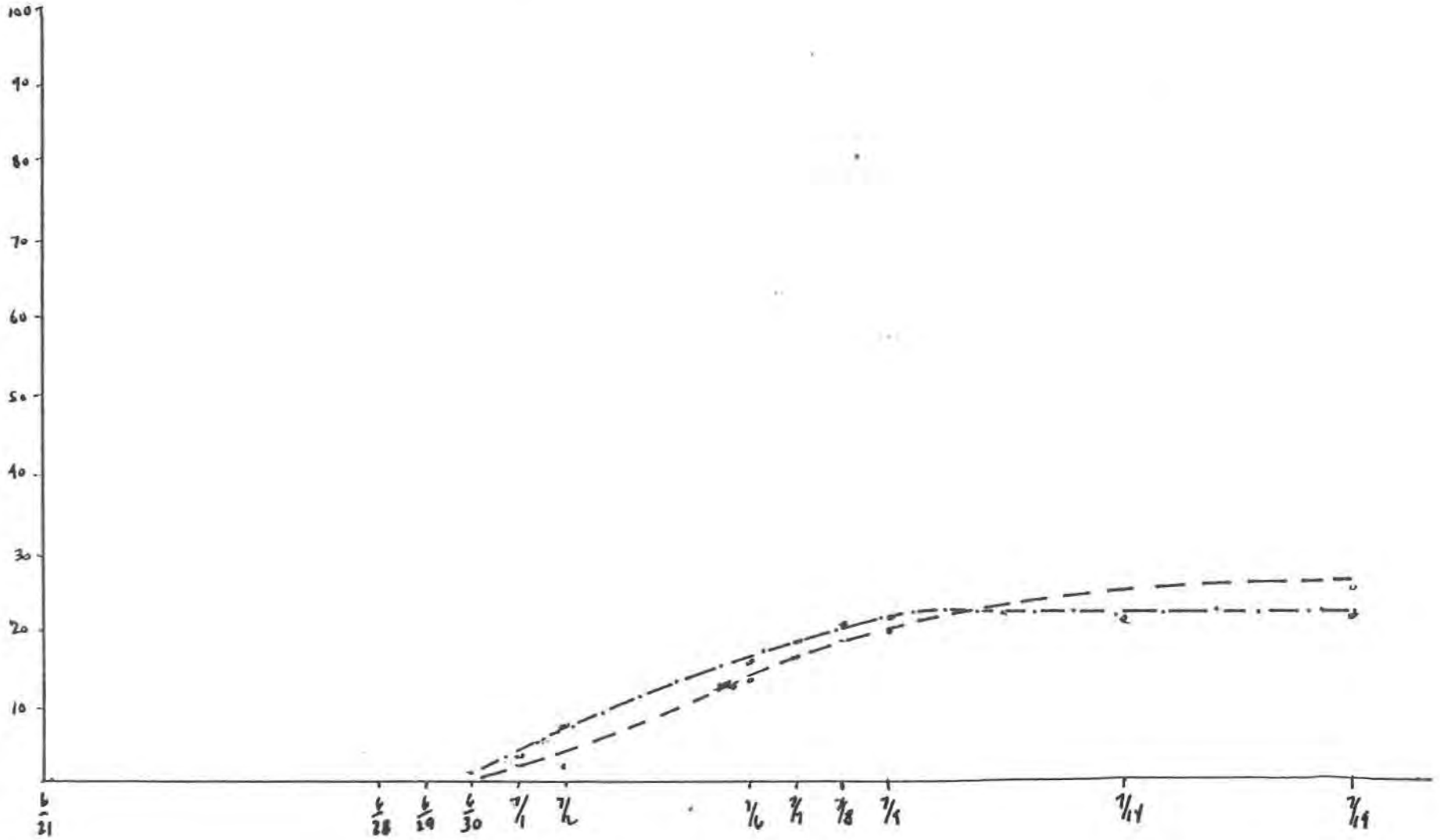
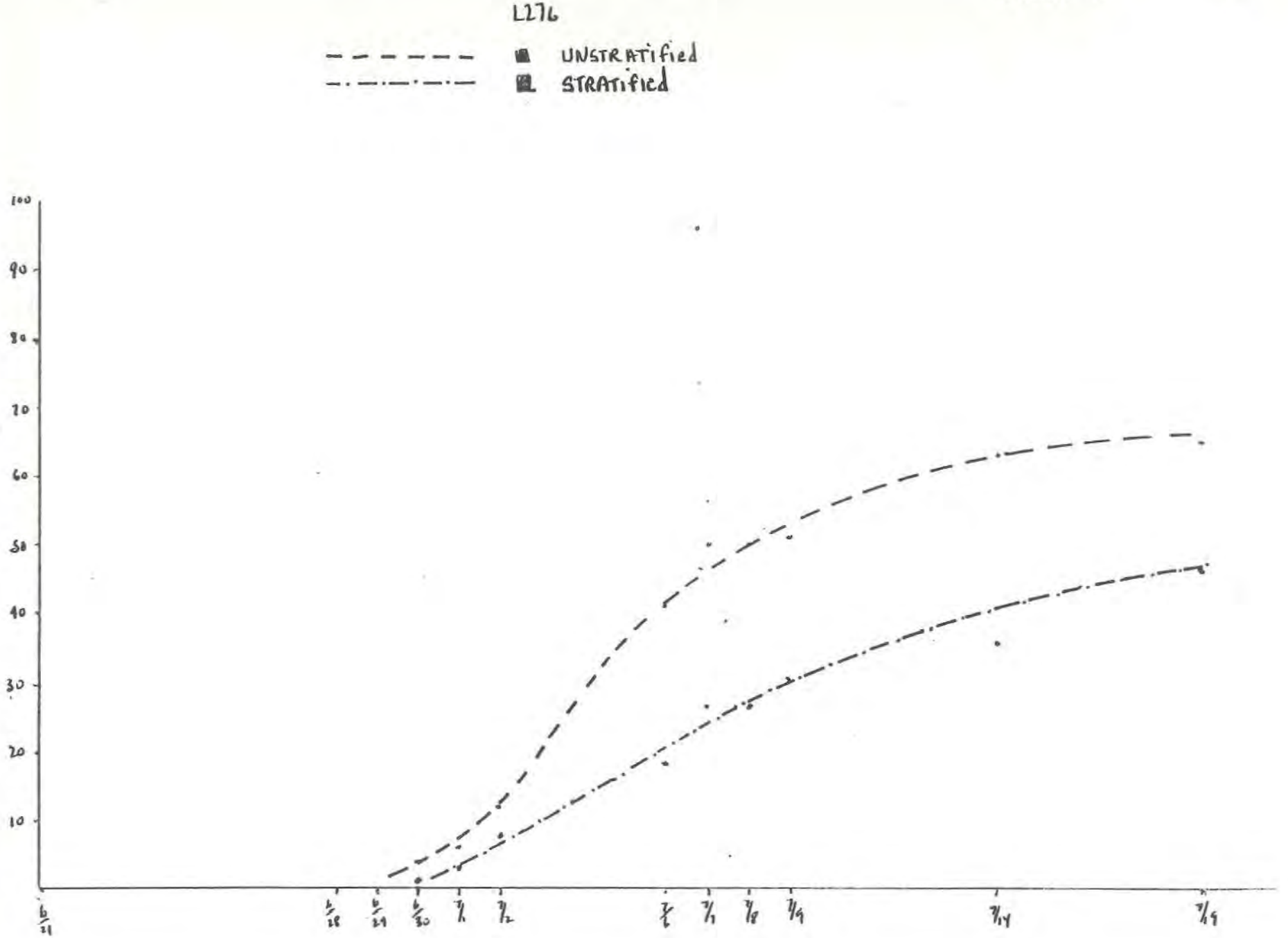


Chart 5

EMERGENCE with time

L276



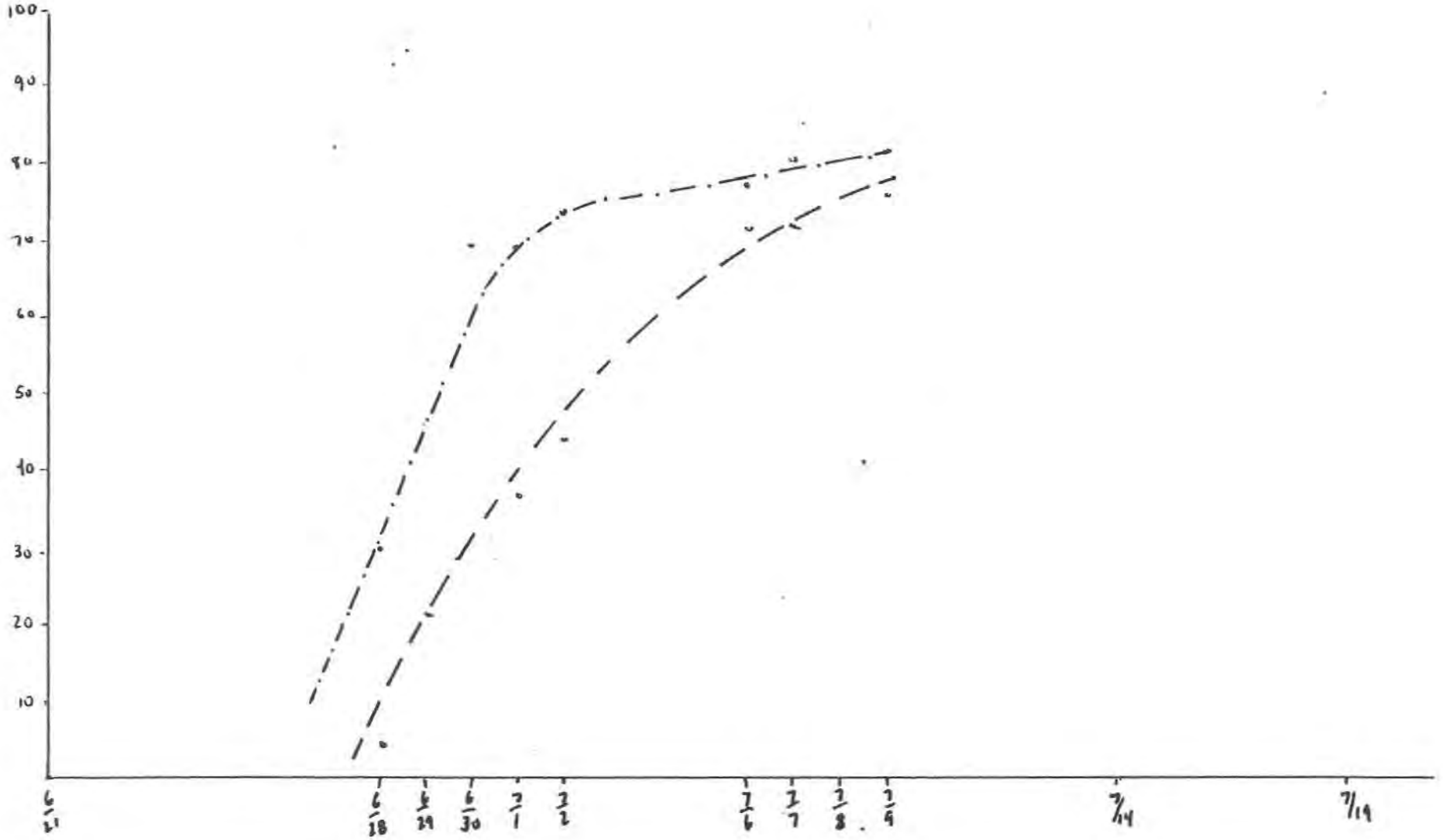
% ENERGENCE with time

Chart 6

L88 Scotch Pine

– – – – – ▣ UNSTRATIFIED

– · – · – · – ▣ STRATIFIED



Seedling heights (see charts 7-9) and projected heights (chart 10) for a six-month growing period show the standard form of the growth curve. The Pinus seedlings were terminated in mid August so data is incomplete. Seedling height is measured from the soil to the growing terminal and does exclude needles. The projected heights, 100mm for Pinus contorta, 96mm for Picea glauca, and 86mm for Picea sitchensis, are based on growth data for contaminated seedlings. Picea sitchensis is a faster growing tree than Picea glauca so 86mm is probably a low estimate.

Caliper data (see Table VII) is an indication of seedling growth. Insufficient data exists to correlate caliper with seedling quality.

The desired pH range for seedling soil is 5.0-6.0, and corrective action should be taken when pH rises over 6.5. At these acidic levels, Fe, Mg, and Mn, nutrients are most available. Through fertilizing and watering, the natural tendency of the soil is to become more basic. When the soil reaches the upper pH limits, a dilute phosphoric acid application and rinse are required.

The results of the 1976 pH analyses are graphed in Chartll. The planting medium when purchased had a pH of 6.8. The pH increased 1 point (decreased hydrogen ion concentration tenfold) in 3 months. With two applications (two days) of 0.05NH_3PO_4, the pH can be lowered 1 point (increased hydrogen ion concentration tenfold).

The weekly analyses showing Nitrogen (N), Phosphorous (P), and Potassium (K) concentrations in ppm are graphed in charts 12, 13, and 14, respectively. Superimposed is the fertilizer schedule during 1976.

Chart 7 AVERAGE SEEDLING HEIGHT (MM) FOR Picea Sitchensis

- L223 HAINES
- L277 KENAI
- L278 AFOGNAK

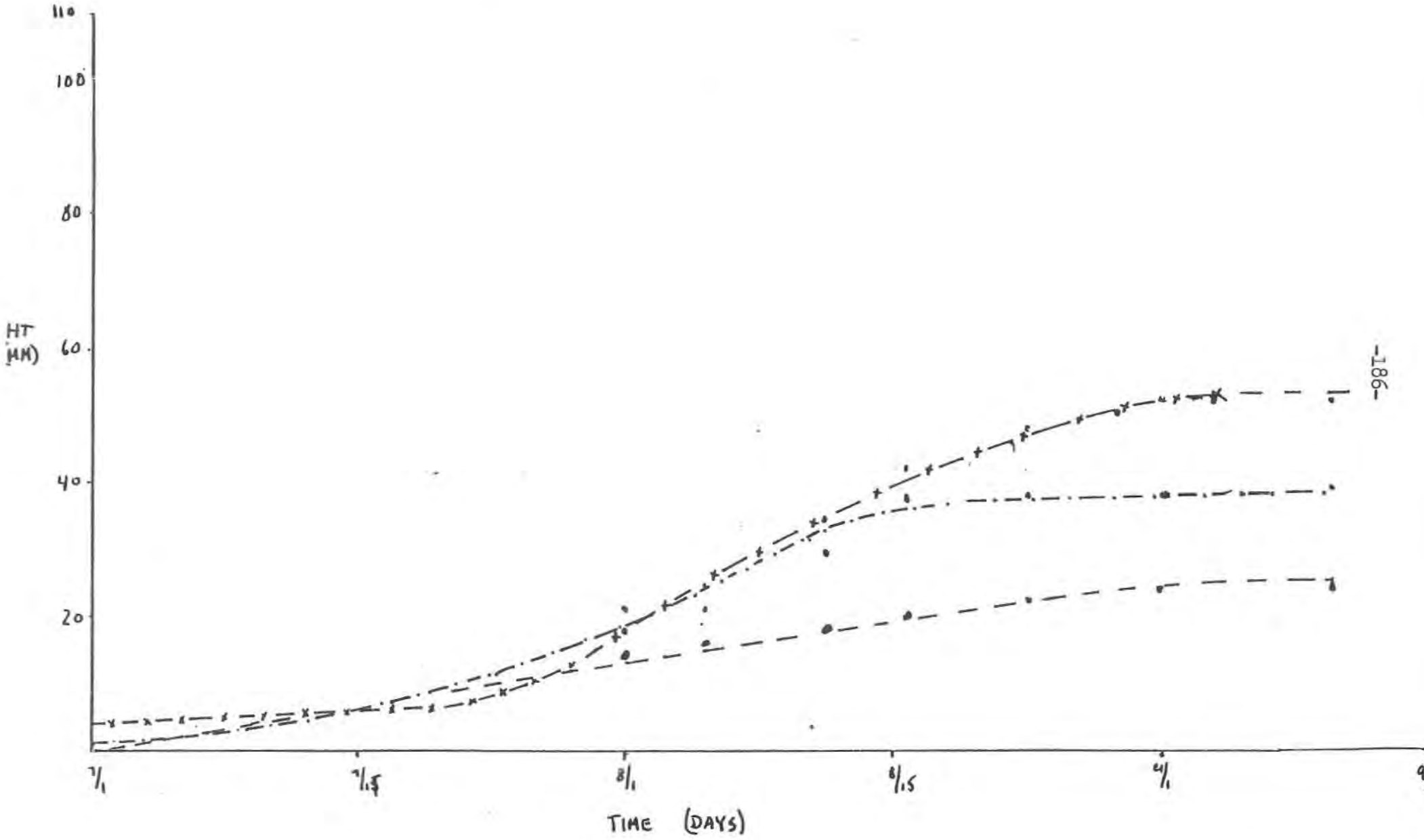
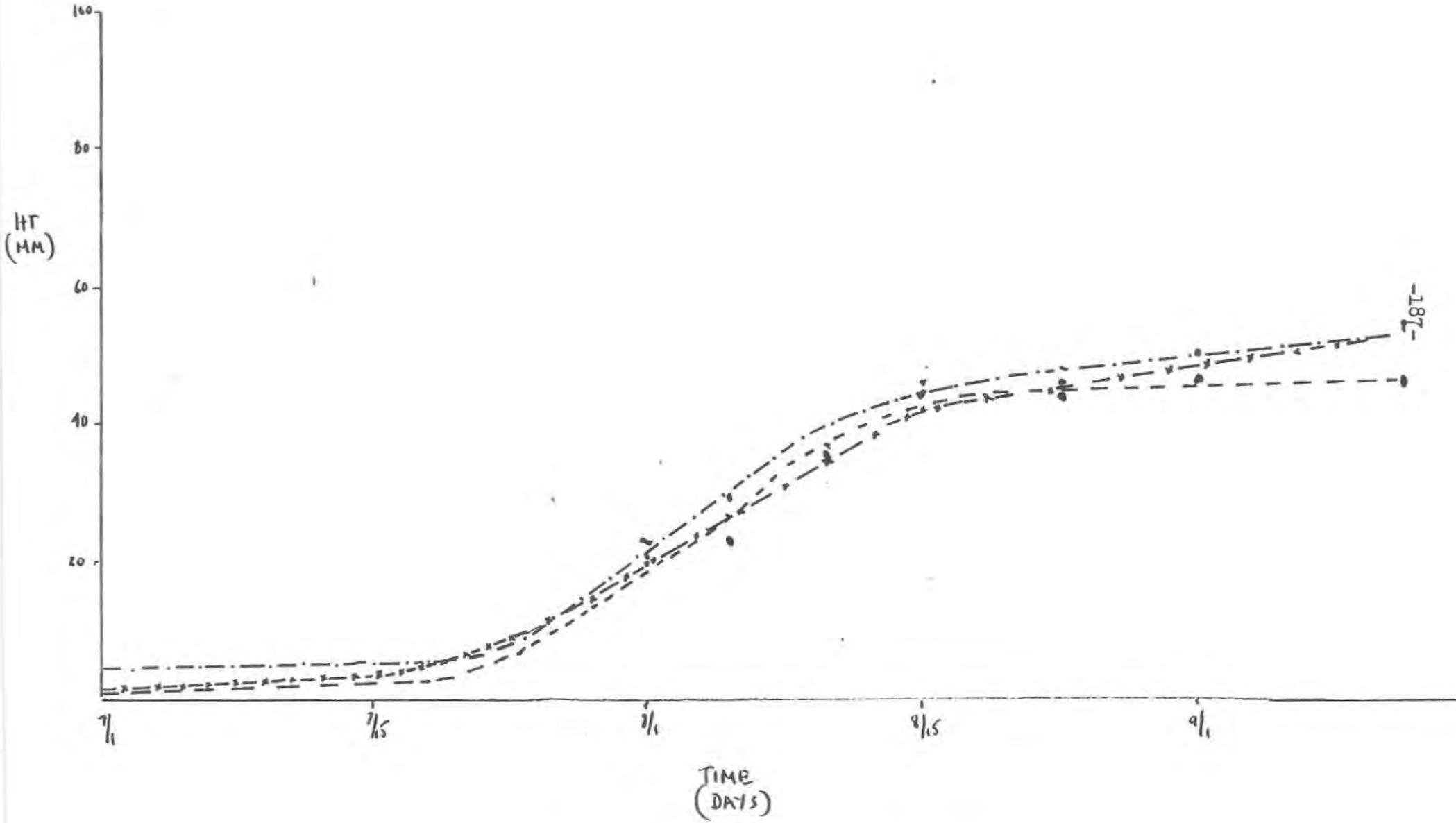


CHART 8

AVERAGE SEEDLING HEIGHT (MM) PICEA GLAUCA

L 276	KENAI
L 274	Fairbanks
L266	TALKeetna



AVERAGE HEIGHT (MM) OF PINUS SEEDLINGS CHART 9

L284 PINUS Contorta Latifolia - White Horse
L236 PINUS Contorta Latifolia - White Horse
L88 PINUS SYLVESTRIS - FINLAND

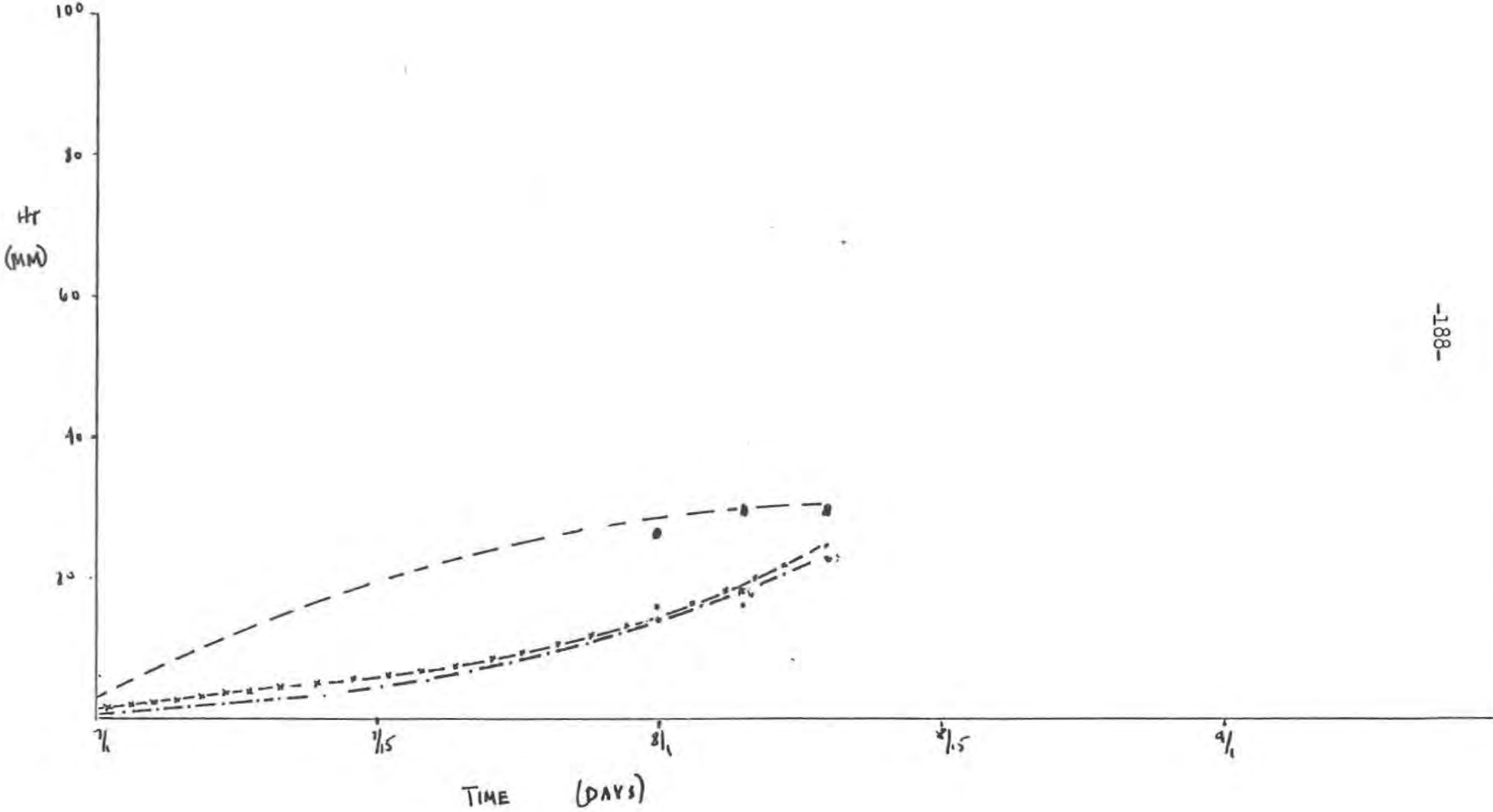


CHART 1D

PROJECTED HT. IN 6 months for PINUS and PICEA GENERA

—x—x—x—x— PINUS Contorta Latifolia
—·—·—·—·— PICEA Glauca
— — — — — PICEA Sitchensis

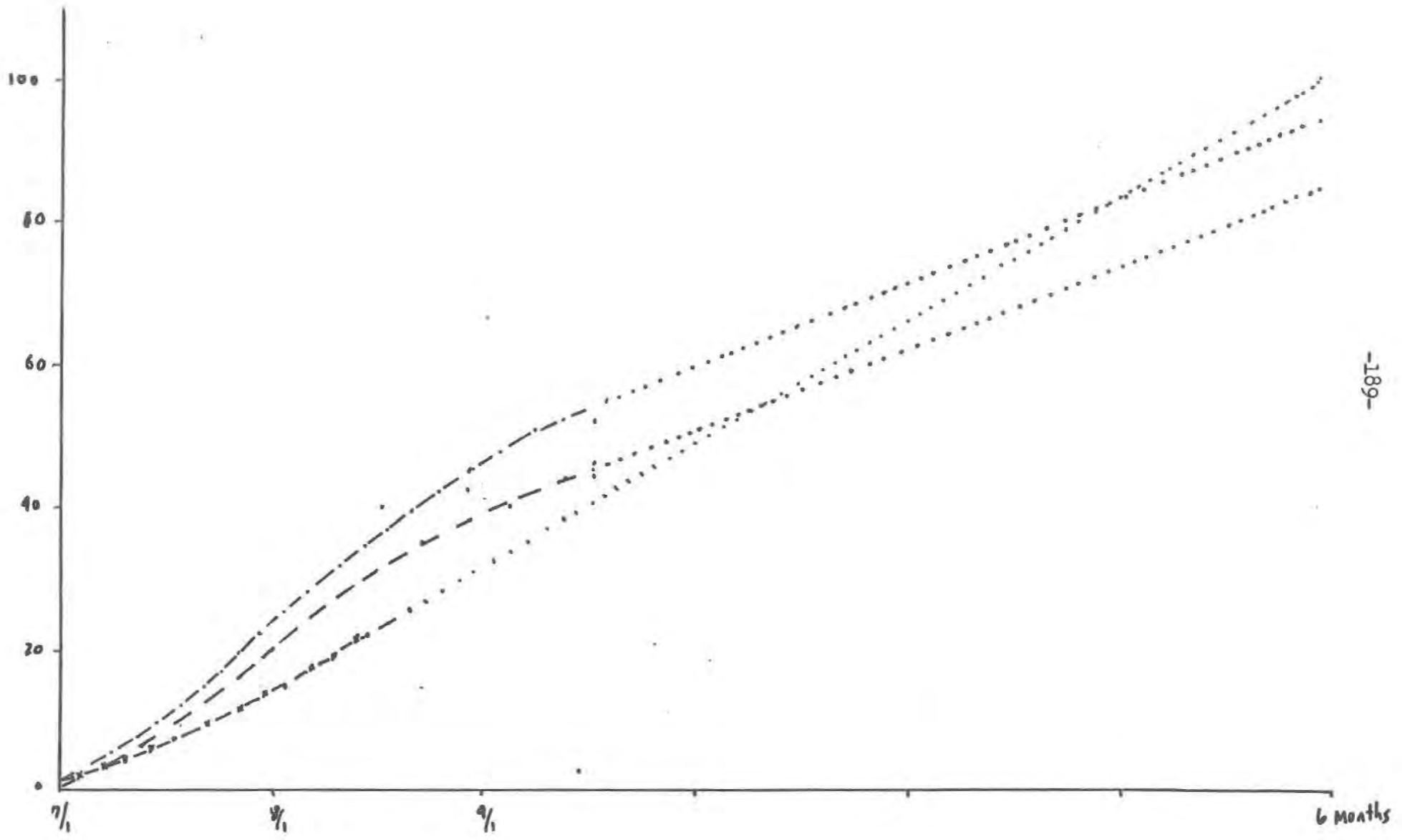


TABLE VII

CALIPER (mm)

	7/7	7/21	8/9	8/23	8/30	9/9
L223	.30	.3	.55	.76	1.04	1.20
L277	.17	.30	.47	.58	.90	1.05
L278	0	.20	.41	.55	.76	.87
L274	.38	.44	.57	.78	.96	1.19
L276	.10	.30	.55	.71	.96	1.15
L284	.25	.36	.51			

pH

Chart 11

- SAMPLE #1
- SAMPLE #3
- SAMPLE #5
- x SAMPLE #4 (TERMINATED 8/9)

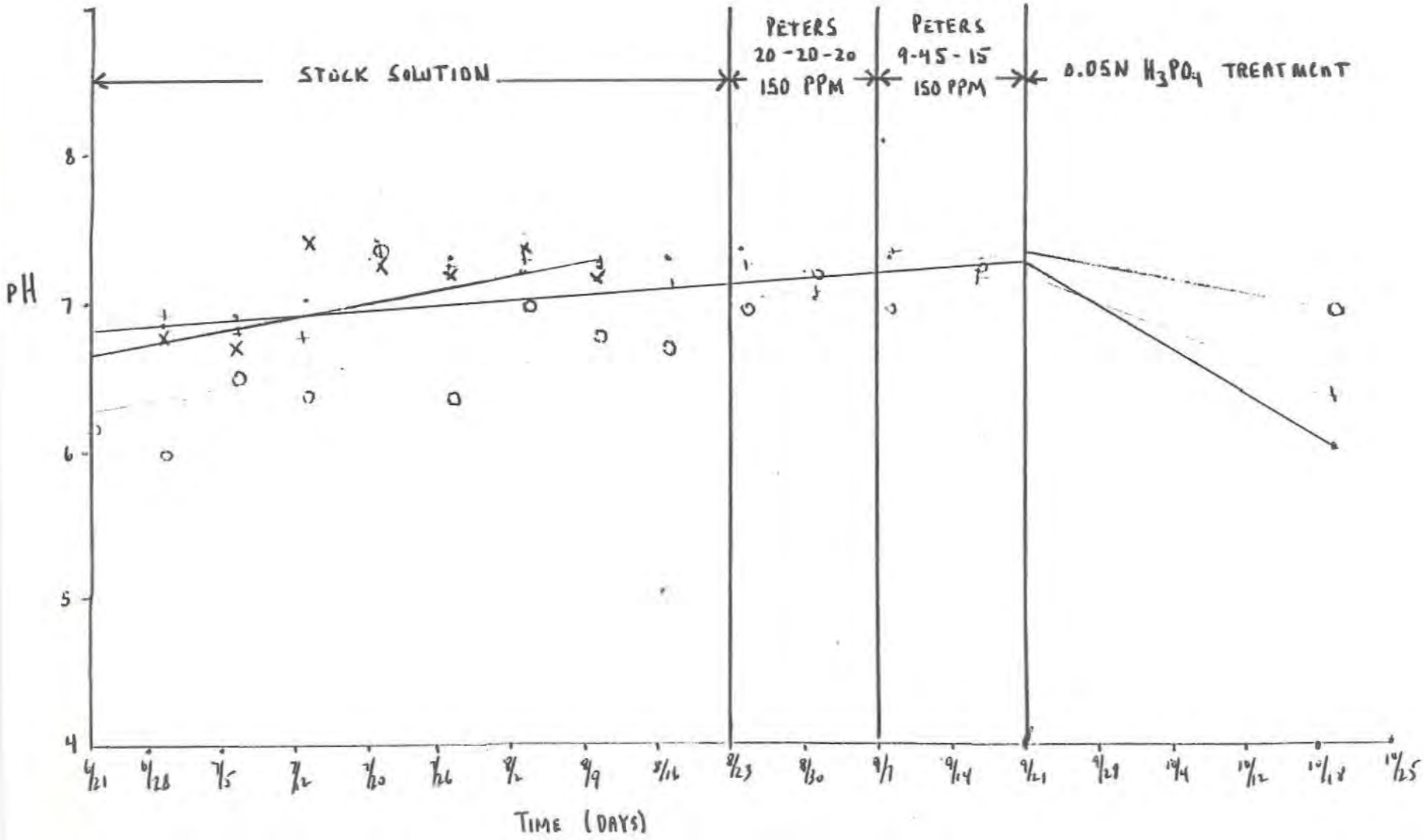


CHART 12

PPM N Concentration

- • SAMPLE 1
- † [illegible]
- D SAMPLE 3
- x [illegible] 4 (terminated 8/4)

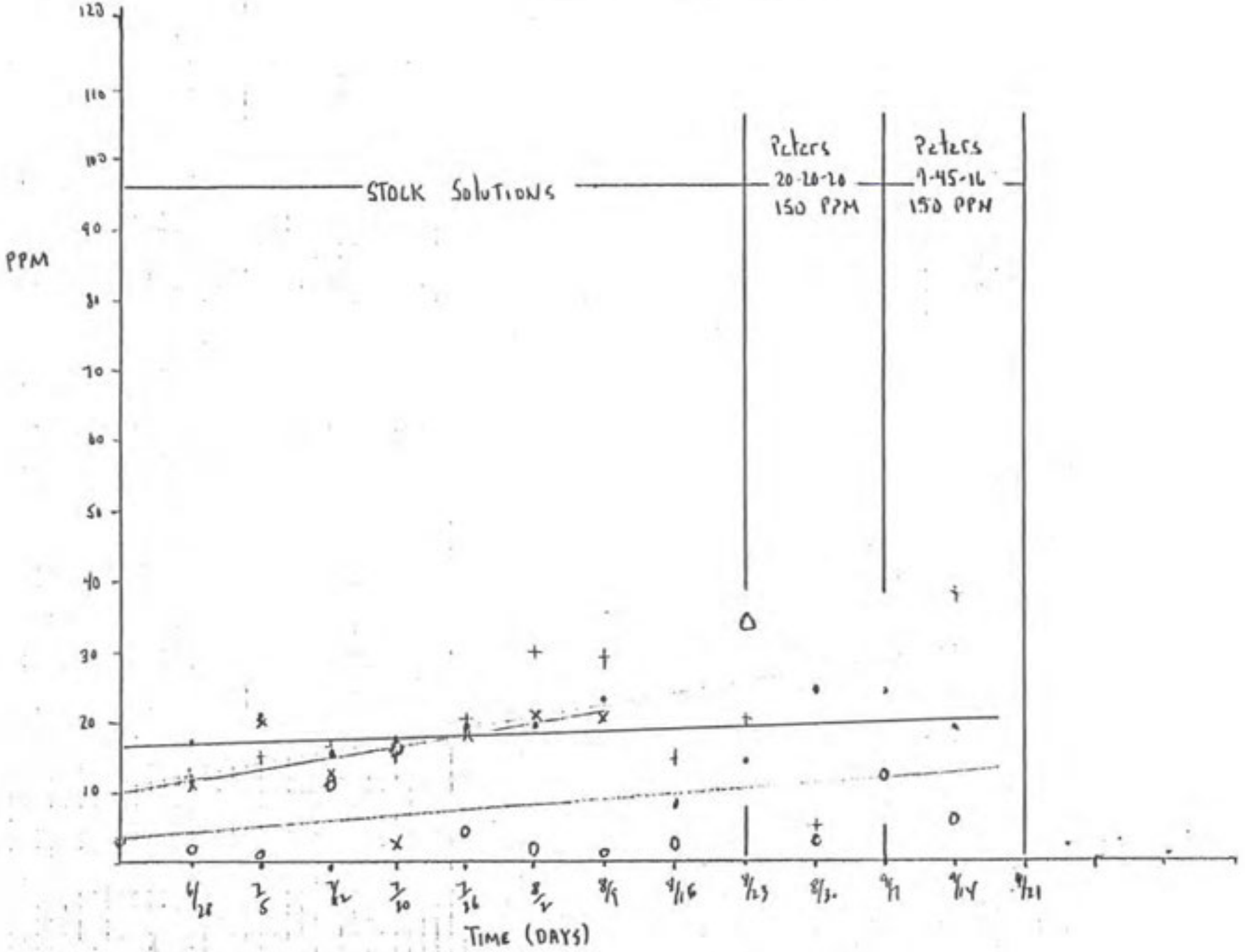


chart 13

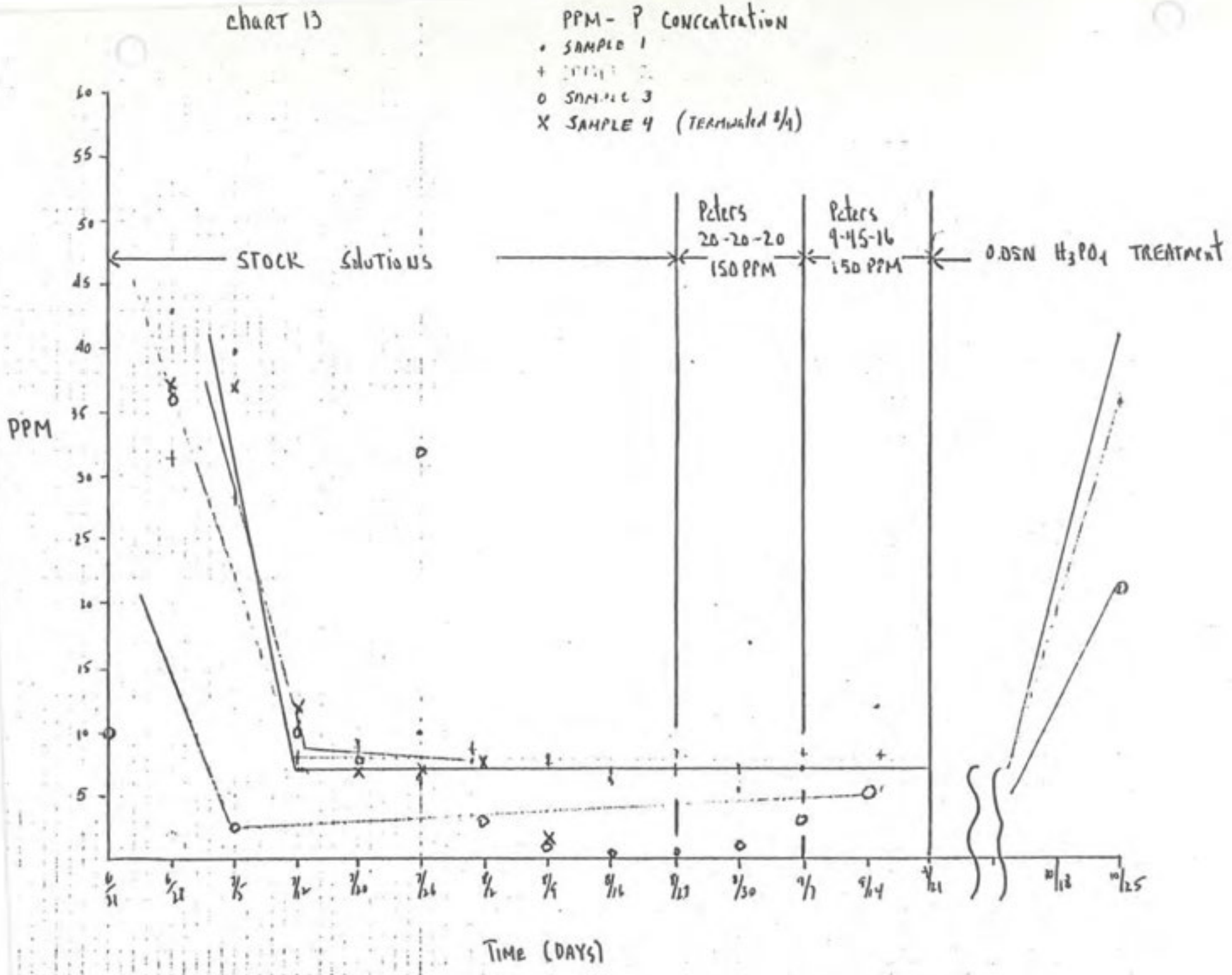
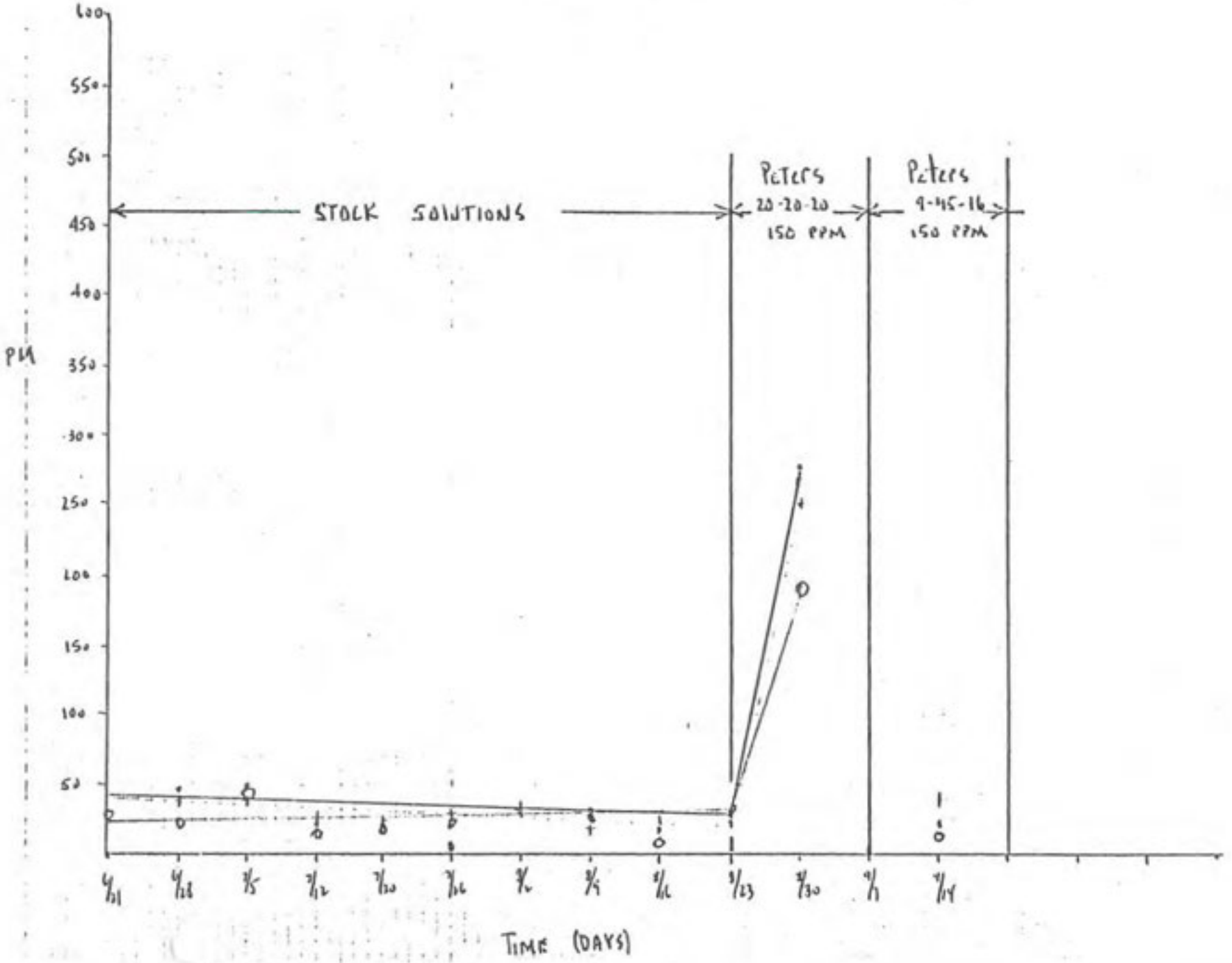

PPM - P CONCENTRATION
• SAMPLE 1
+ [illegible]
o SAMPLE 3
X SAMPLE 4 (TERMINATED 8/4)
STOCK SOLUTIONS
Peters 20-20-20 150 PPM
Peters 9-45-16 150 PPM
0.05N H_3PO_4 TREATMENT
PPM
TIME (DAYS)

Chart 14

PPM - K Concentration

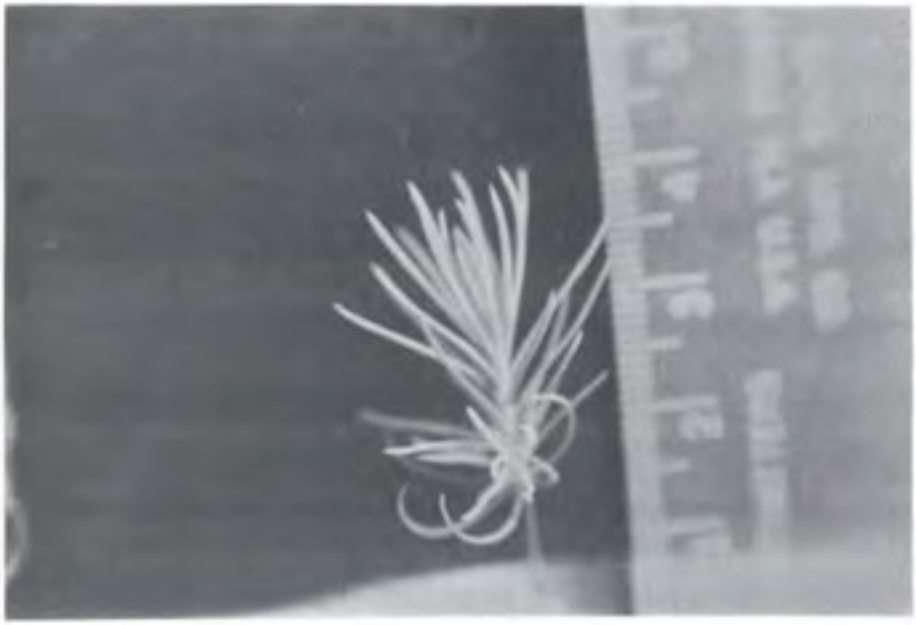
• Sample 1
! Sample 2
o Sample 3



Total seedling survival and percent survival are shown in Figure 1. Picea sitchensis from Afognak demonstrated the expected low survival due to the 2.5% germination of the seed. But mortality of other species was primarily due to contamination.

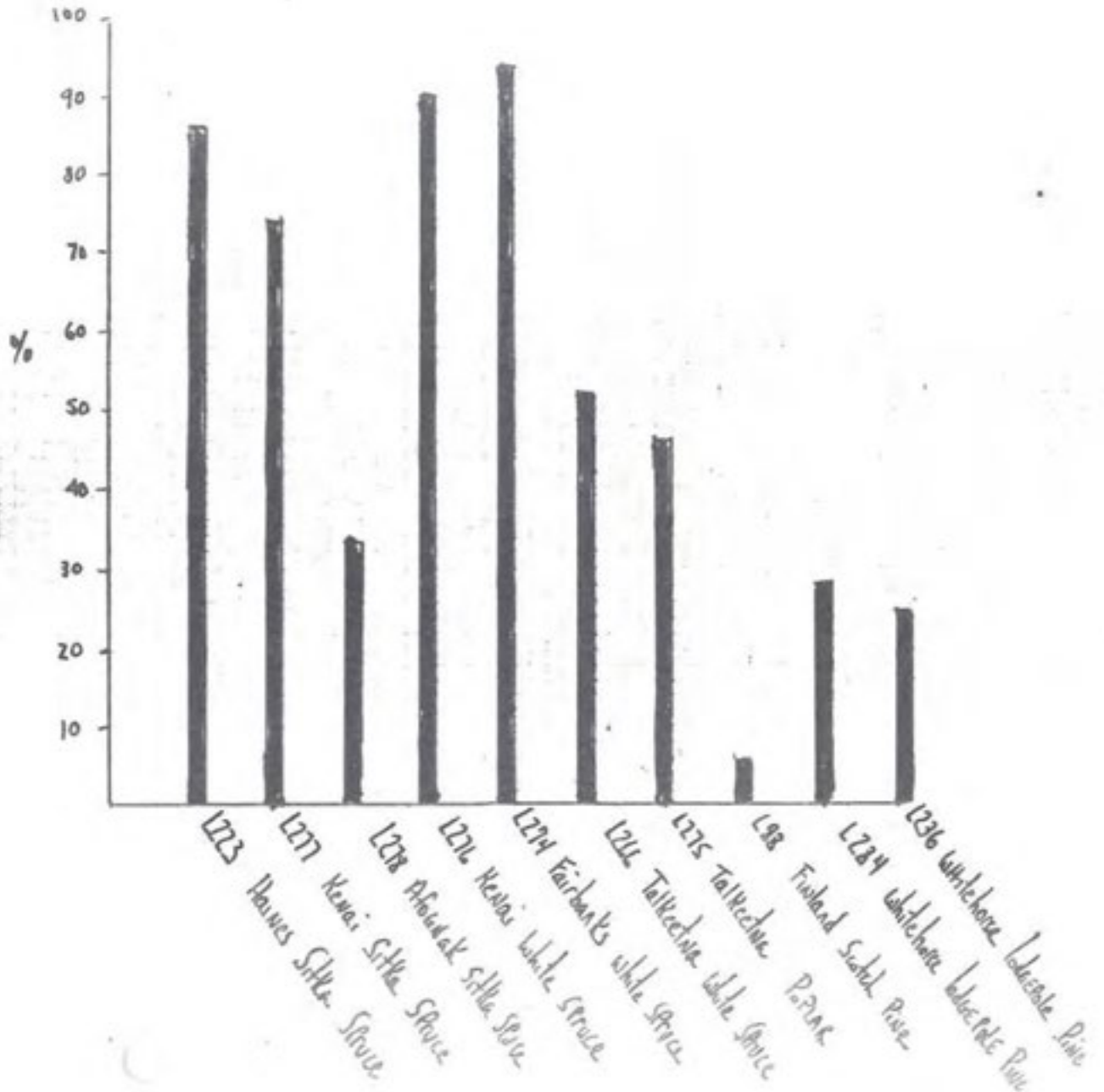
From seven to ten days after seedling emergence, chlorotic tips and moderate leaf distortions appeared in the first and second leaf stages. In some cases the chlorosis continued to extend the length of the leaf until the entire leaf was discolored. This latter symptom was most prevalent in the Pinus genus, all of which were on the warmer, southern side of the greenhouse. The Picea genus symptoms were generally less severe and appeared on both sides of the greenhouse. (See Photos 5 & 6).

PHOTO 5: Picea glauca - Note chlorosis on tips.



PRE Winter Survival Percentages OF CAVATIES PLANTED 6/21/76

FIGURE 1

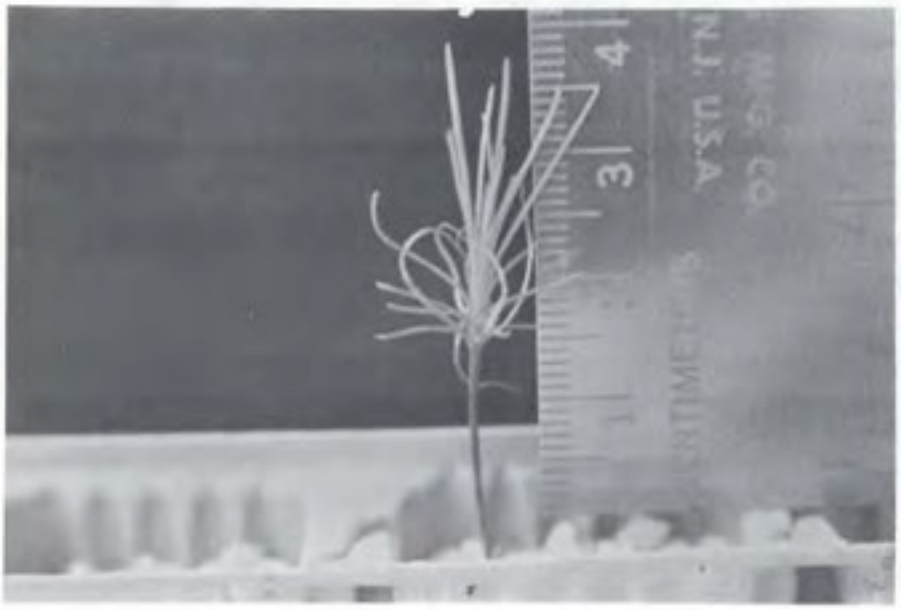


Total trees Surviving 9/30/76

L223	7300
L277	6300
L278	550
L276	3050
L274	6350
L266	3600
L275	350
L 88	1250
L 284	4250
L236	800

-196-

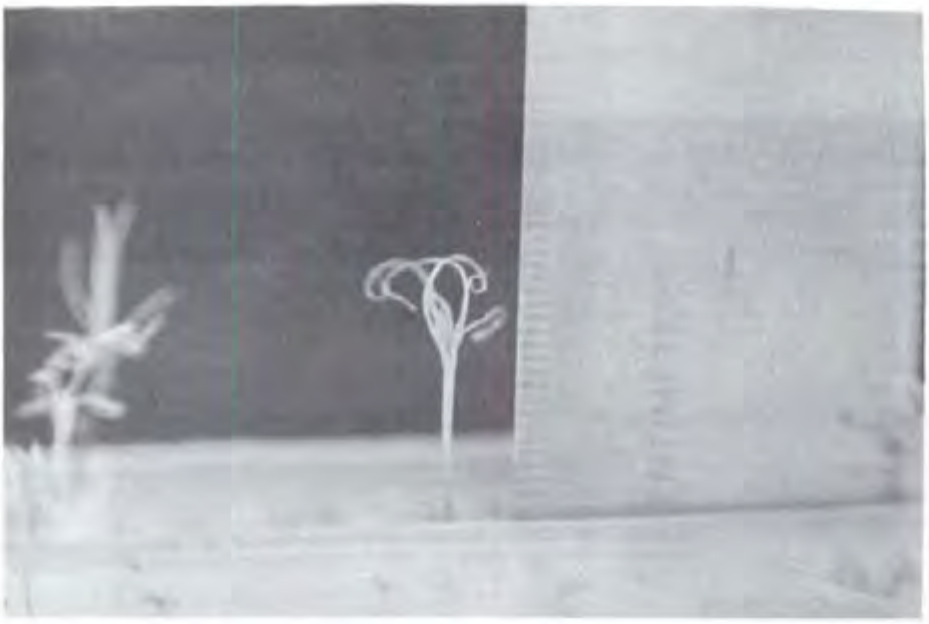
PHOTO 6: Pinus sylvestris



Leaf distortions varied somewhat with seedling size and species. Curling leaf tips were associated with the larger (3-4 leaf stage) seedling, especially the Picea genus. Some smaller Picea and Pinus seedlings did experience an inward curving of the leaves over the growing terminal. (See Photo 6).

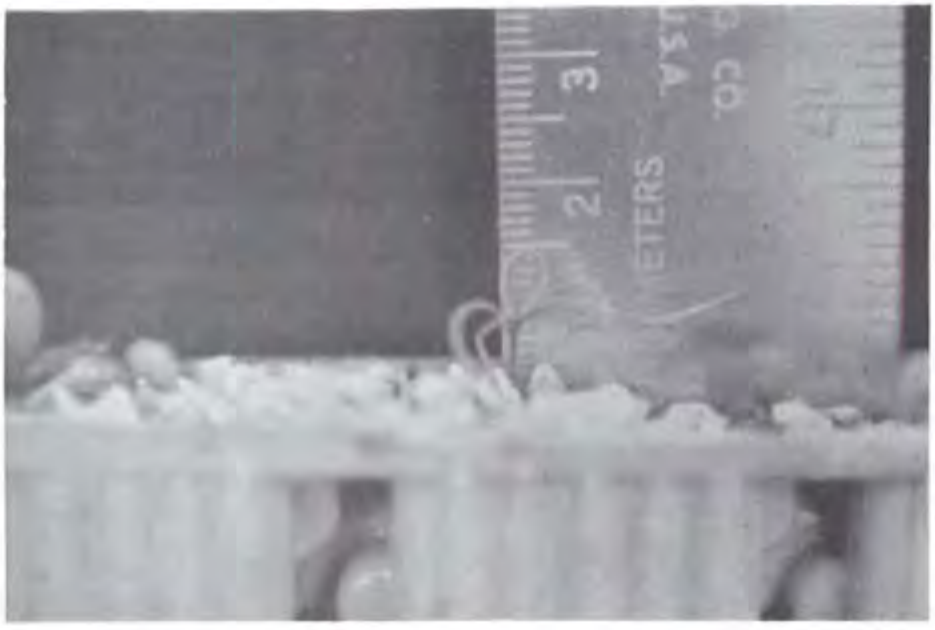
During the third week after emergence, the crowns of 95% of the Pinus sylvestris, 70% of the Pinus contorta, 20% of the Picea sitchensis, and 7% of the Picea glauca discolored and dried. (See Photo 7).

PHOTO 7: Pinus contorta showing inward curling tips.



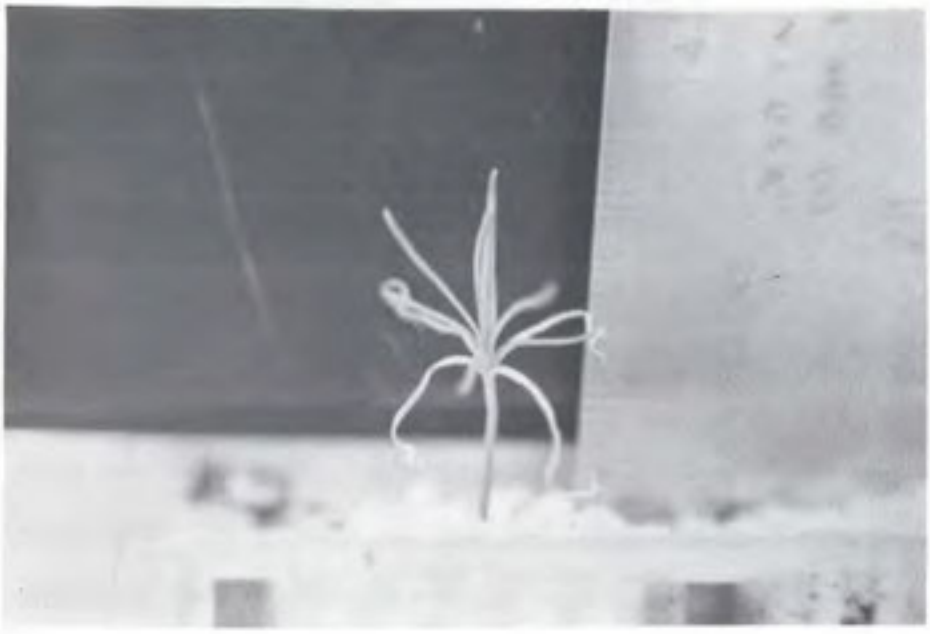
When the seedling reached this stage, recovery was not possible. All the above ground meristematic growing tissue had been destroyed. After the cooling system had been installed during the second planting, seedlings whose crown had not been totally damaged became healthy and grew. (See Photo 8).

PHOTO 8: Recovery of this Pinus sylvestris seedling not possible.



Usually the stems, and in all cases the roots, remained turgid and had a healthy color. A mosaic leaf pattern was discernible during the second seeding.

PHOTO 9: This Pinus contorta seedling recovered from contamination.



Those seedlings in the experimental crop which were placed in the forestry greenhouse experienced, to a lesser degree, (See Photo 9) the above symptoms without discrimination due to planting medium type. Those seedlings in PMC greenhouse had none of the above symptoms, although a mosaic leaf pattern was discovered. (See Photo 10).

PHOTO 10: Picea sitchensis showing chlorotic tips.

There was no indication of "damping off." Fungicide was applied after the first symptoms appeared, but was not effective. The suspected toxic agent is the base for the wood preservative which was pentachlorophenol and was later found to be phytotoxic, especially under poor ventilation and high temperature conditions. The greenhouse cooling system was not operative during the first and part of the second growth periods. Temperatures in the greenhouse reached 90°F, most frequently on the south side of the greenhouse. In spots the chlorinated hydrocarbon was sufficiently volatile to bubble through the covering paint. As the pentachlorophenol dissipated, the temperatures modulated, and ventilation improved, the deadly effects stopped. Hence, those plants with intact meristematic tissue grew.

With the change to Ray Leach containers and the corresponding change in the bench system, corrective measures have been taken.

On September 15, the seedlings were moved to the cold frames, well watered, fertilized (high P) and treated with 0.05N H_3PO_4. They were mulched with 1" of wood fiber. Straw was used as bedding and filling.

PHOTO 11: Pinus contorta in experimental crop.

PHOTO 12: Pinus sylvestris in experimental crop.

LABOR

Table VIII shows a breakdown of labor in the 1976 forestry project. Because the construction phase of the project is temporary, and greenhouse related work Table IX can be examined for future reference.

TABLE VIII

DUTY	MAN HOURS	PERCENT OF TOTAL MAN HOURS
Data Collection	960	8
Supervisory	1120	10
Greenhouse	1855	16
Cabinet Work	1120	10
Traded to PMC	1820	15
Construction	3840	32
Miscellaneous	- 1285	9
	12000	100

TABLE IX

DUTIES	MAN HOURS
1st planting	280
2nd planting	280
1st thinning	35
2nd thinning	45
1st move	120
2nd move	120
mulching	38
seedling disposal	60
bareroot planting	70
container cleaning	200
watering and fertilizing	35
care of greenhouse	22
weeding	540
Total	1855

APPENDIX TABLE 1. Forestry seed inventory as of December 31, 1976.

Accession Number	Name	Origin	Seed Balance (gm)
L-404	*Betula papyrifera*	Tyonek, Ak.	3.7
L-279	*Castanea dentata*	Wisconsin	0
L-147	*Larix siberica*	Maisala, Finland	9.0
L-224	*Picea glauca*	Kenai, Ak.	225.0
L-225	*P. glauca*	Bonanza Cr., Fairbanks Ak.	0
L-226	*P. glauca*	Chena R., Fairbanks	0
L-266	*P. glauca*	Talkeetna, Ak.	104.5
L-274	*P. glauca*	Fairbanks, Ak.	3336.0
L-276	*P. glauca*	Kenai, Ak.	265.0
L-400	*P. glauca*	Kenai, Ak.	2092.0
L-267	*P. glauca* X *P. sitchensis*	Tyonek, Ak.	79.0
L-406	*P. lutzii*	Seward, Ak.	932.0
L-405	*P. marina*	Fairbanks, Ak.	25.0
L-223	*P. sitchensis*	Haines, Ak.	95.0
L-228	*P. sitchensis*	Moose Pass/Seward, Ak.	6.0
L-229	*P. sitchensis*	Chilkoot R., Haines, Ak.	0
L-277	*P. sitchensis*	Kenai, Ak.	50.0
L-278	*P. sitchensis*	Afognak Is., Ak.	41.0
L-407	*P. sitchensis*	Homer, Ak.	928.4
L-236	*Pinus contorta latifolia*	Whitehorse, YT	0
L-284	*P. contorta latifolia*	Whitehorse, YT	88.0

APPENDIX TABLE 1. Forestry seed inventory as of December 31, 1976. Cont'd.

Accession Number	Name	Origin	Seed Balance (gm)
L-401	*Pinus contorta latifolia*	Whitehorse, YT	947.0
L-88	*Pinus sylvestris*	Rovaniemi, Finland	0
L-315	*P. sylvestris* (Supertree #31)	Russia	7.2
L-316	*P. sylvestris* (Supertree #42)	Russia	6.0
L-317	*P. sylvestris* (Supertree #11)	Russia	7.0
L-275	*Populus trichocarpa*	Talkeetna, Ak.	20.0
L-324	*Prunus* sp. (cherry)	Japan	714.2
L-268	*Tsuga mertensiana*	Tyonek, Ak.	47.0

DEMONSTRATION PLANTING

DEMONSTRATION PLANTING

Grain and Grass

Access to the large production fields of grain is limited to most Plant Materials Center visitors because of the distances out to and between the fields. Therefore a demonstration plot was designed to contain growing samples of the various grain and grass crops in a close proximity of the PMC headquarters.

Materials and Methods

Two barley varieties, two of oats, one wheat variety, and three of grass were planted across from the PMC office, near the main road. Forty pounds of N, eighty of P, and forty of K per acre were broadcast and six rows of grain or grass for each variety was planted. Weeds were controlled by hand hoeing. Tags were installed on wooden stakes to identify the species and variety. The species included in the demonstration plot are:

'Weal barley (hooded variety)

'Lidal' barley (bearded barley)

'Nip' oats (black oats)

'Toral' oats (white oats)

'Gasser' wheat (developed in Alaska)

'Engmo' timothy (popular for hay)

'Arctared' red fescue (popular lawn variety)

'Nugget' bluegrass was planted in all noncropped areas of the study for establishment of a lawn.

Conclusion

No way exists to accurately measure the number of visits to the demonstration plot. Many people did mention that they thought it was interesting and informative to have the plot close to other points of interest on the PMC grounds. As a result of this favorable response the grain and grass demonstration plot will be maintained through 1977.

Patrick T. Mulligan

Small Fruit Demonstration

Small fruit recommendations are published every two years by the Cooperative Extension Service to help guide Alaskan growers in selecting suitable varieties for their particular area but little opportunity exists for the gardener to observe any of these varieties under actual growing conditions. Although most commercial nurseries in Alaska grow their own propagation material, few if any, grow all varieties recommended for their area. Some varieties are not grown simply because propagation material is not available to the nurseryman.

It is the intent of this demonstration planting to provide gardeners this opportunity to observe recommended varieties of raspberries, currants, and gooseberries under field conditions. It is hoped these plantings and those in the future will eliminate some of the trial and error so common with Alaskan gardens and encourage local producers to widen their selections of small fruit varieties.

Demonstration plantings at the Plant Materials Center will be expanded eventually to include all small fruit varieties recommended for southcentral, including crabapples.

Materials and Methods

Demonstration plantings this year include the following small fruit varieties:

'Latham' raspberry
'Indian Summer' raspberry
'Trent' raspberry

'Red Lake' currant
'Swedish Black' currant
'Pixwell' gooseberry

A native collection of American red raspberry, *Rubus idaeus* var. *strigosus* (L261) was also added to the planting for comparing differences between the native raspberry and cultivated varieties. The native red currant, *Ribes triste*, will be added next year for the same reason. All small fruit plants, except for Swedish Black currant, that were planted were purchased from local Palmer/Anchorage suppliers. Swedish Black cuttings were furnished by Dr. Charles Logsdon and rooted in the PMC greenhouse. Commercial sources for 'Chief' and 'Boyne' raspberries and 'Holland Long Bunch' currant could not be found in Palmer or Anchorage. Chief and Boyne varieties will be ordered from an out-of-state source next year. Holland Long Bunch will be propagated for a demonstration planting from currant increase stocks.

Planting. The demonstration plots are located in field 1B next to the present PMC office. Each variety planted will eventually be a ten-plant-plot three feet by 25 feet, and separated from adjacent plots with three-foot strips of 'Nugget' bluegrass. Soil was prepared with tractor mounted rototiller after plot layout. Planting dates and plot locations are given in Figure 1, page 218.

Fertilization. Individual plots were fertilized by hand with 8-32-16 fertilizer at 400 pounds per acre after planting. Actual pounds per acre is equivalent to 32 pounds N-56 pounds P-53 pounds K. A low rate per acre was used than ordinarily recommended to

guarantee late-plantings time to harden-off properly before severe frosts occurred in the fall. Fertilizer was incorporated by hand into the top four inches of soil in each plot.

Irrigation. Water was applied as needed with an oscillating garden sprinkler.

Weed Control. All weeds were controlled by hand this first year to avoid any possible herbicide damage.

Mulching. Plots were mulched the first week in November this year with approximately twelve inches of grain straw. Portions of a .025% Warfarin rodenticide mixture were placed underneath the mulching to help control mice from feeding on the plants during the winter. The mulch will be removed in the spring after winds subside.

Joseph L. Stehlik

INITIAL INCREASE

Raspberry Increase

Project objective is to increase and maintain unreleased raspberry stocks for further field evaluations by the University of Alaska, and others, and supply their propagules, if released, to commercial nurserymen wishing to establish such plant material as propagation sources.

In 1974, the Plant Materials Center was requested by the Institute of Agricultural Sciences to increase and maintain two unreleased hybrid varieties of *Rubus idaeus strigosus* for further field testing. *Rubus idaeus strigosus*, commonly known as American red raspberry, is a hardy Alaskan native found throughout Alaska's interior to southeast but not in the far north. Fruits are rounded, three-quarters of an inch long and broad, maturing in July, August, and September, and can be eaten fresh or in jams and jellies. The shrub ranges from two- to four-feet tall under natural conditions with biennial stems, comparatively low in yield but very hardy.

Rooted cuttings of hybrids numbers 9 and 35 were supplied from Fairbanks by University horticulturist, Don Dinkel, and five of each planted June 1974 at the Plant Materials Center for increase. The following summer, rooted suckers of both were transplanted to 200-foot rows in Field 4A. One hundred plants were established of each accession. Project intent this year was to maintain established plot size and prepare for spring requests in 1977.

Materials and Methods

Irrigation. The increase plot was irrigated three times during the growing season this year, including a fall watering in mid-September for winter moisture. Approximately one inch of water was applied with the wheel sprinkler system at each setting.

Fertilization. Granulated 8-32-16 fertilizer was broadcast along each plant row in a three-foot strip, by hand, and raked into the top two inches of soil. Fertilizer was applied in early June at 1000 pounds per acre; the equivalent of 80 pounds N, 140 pounds P, 133 pounds K, actual per acre.

Weed Control. Casoron G-4 herbicide[1/] was broadcast in six-foot wide strips down each plant row after fertilizing in early June, and watered into the soil surface with one-half inch of water from the wheel irrigation system. A Cyclone handcrank seeder was used to apply the formulated material at 1000 pounds per acre. It is important that Casoron granules be incorporated into the top one-half-to one inch of soil as soon after application as possible especially under high temperature conditions to prevent chemical volatilization. Cultivations as well as irrigation are used to incorporate the material.

Only one hand-weeding was necessary this season in the plots because of the pre-emergence herbicide treatment. Weeds between plant rows were maintained with tractor and disc.

1/ Casoron is an aromatic nitrile compound (2, 6-Dichlorobenz nitrile) used as a pre-emergence, selective herbicide that is licensed and sold in the U.S. by Thompson Hayward Chemical Co.

Mulching. Wheat straw was used to mulch both increase rows last year. Comments on plant survival are made later. This year oats were drilled between the plant rows and around the plot perimeter for mulching purposes rather than covering the plant row with straw as was done in 1975. The objective was to provide wind protection to plants during late summer and fall and at the same time create a winter mulch that would catch drifting snows. The oat seed was planted in late July to prevent maturing seed-heads and drilled to within two feet of the raspberry row at 350 pounds per acre. No other mulching was applied to the raspberry increase plot in 1976.

Results

1975 Mulching Results. Survival counts made in June of mulched and unmulched raspberry plots indicate that mulching is beneficial to overwintering raspberries. Observations of plots mulched with wheat straw in October 1975 show three times as many one-year-old raspberry canes surviving winter rigors last year as survived in unmulched plots (Table 1). More trials are needed however, to develop mulching recommendations for raspberries.

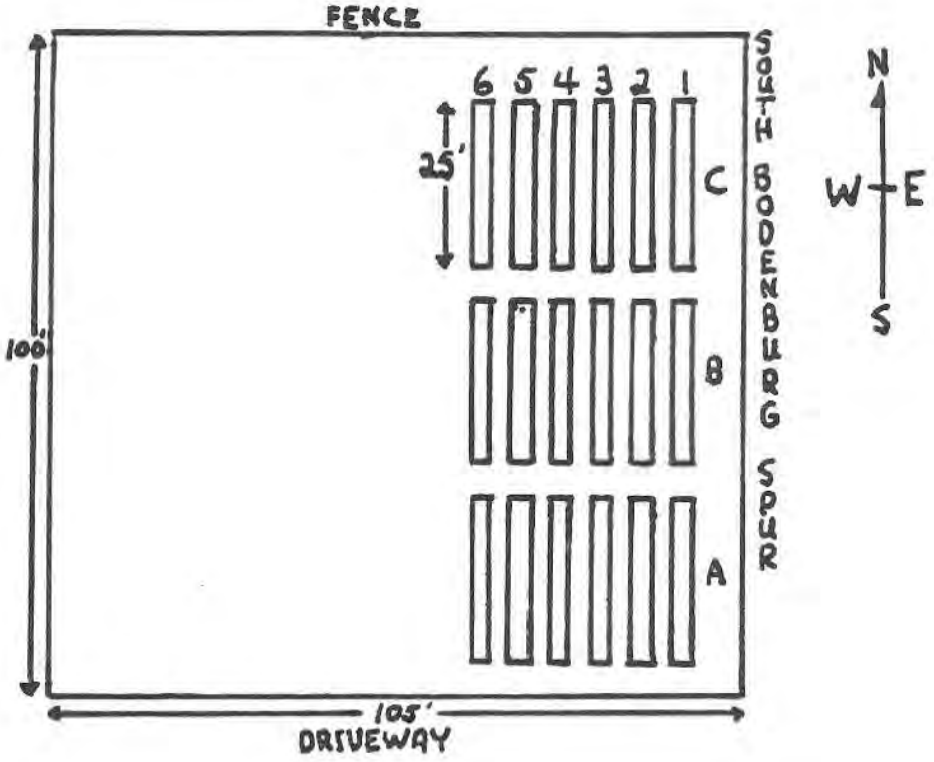
Plant Distributions. Most spring suckers grown in 1977, although scheduled for possible spring distribution, will be used to replace winterkilled plants lost last year, but a small surplus is still expected. Research personnel interested in spring suckers should contact the Plant Materials Center by July 1. One-year-old canes will not be available until 1978.

Joseph L. Stehlik

TABLE 1. Survival counts made June 1976 from one-year old hybrid raspberry plants, *Rubus idaeus* var. *strigosus*, overwintered under mulched and unmulched conditions during 1975-76 winter.[1/]

Raspberry hybrid	Plants mulched	Plants survived	Survived	Plants unmulched	Plants survived	Survived
ID No.	No.	No.	%	No.	No.	%
9	50	27	54	50	9	18
35	50	32	64	50	4	8

1/ Two one hundred-plant raspberry rows were divided both into two equal sections of 50 plants each. One section in each row was mulched with a 6-foot wide, 12-inch deep (depressed) strip of wheat straw after freezeup in Oct. 1975. The other two sections were left unmulched.



Key to varieties noted in diagram.

Variety	Source	Plot Location	Number Planted	Date Planted
Raspberry				
Latham	Bell's Nursery Anchorage	C3	10	6/8/76
Indian Summer	Dearborn's Nurs. Palmer	C4	10	6/18/76
Trent	Dearborn's Nurs. Palmer	C5	10	6/18/76
Rubus idaeus	PMC collection L-261	C1	10	6/17/76
Currant				
Red Lake	Alaska Greenhouses Anchorage	B2	8	6/8/76
Swedish Black	C. E. Logsdon	B3	10	7/12/76
Gooseberry				
Pixwell	Bell's Nurs.	A1	4	6/8/76

Figure 1. Small fruit demonstration planting, Field 1B.

Currant Increase

The Plant Materials Center was requested in 1975 by the Institute of Agricultural Sciences to increase parent material of 'Holland Long Bunch' and 'Swedish Black' *Ribes* sp. currant varieties for distribution among nurserymen requesting plant material for stock plants. Objective is to make parent material of both varieties more accessible to producers who will establish the material as a commercial source. Propagules then produced from the source are to be used for growing plants for resale. The spirit of PMC involvement with such a project is to support and encourage the local nursery industry, not circumvent it.

Project objectives also includes the increase and maintenance of unreleased currant varieties for further field evaluations. If released, their plant materials will be made available to qualified nurserymen.

As with raspberry increase, all currant plant material distributed from the PMC must be purchased through the Alaska Crop Improvement Association.

Materials and Methods

Propagation. Original Holland Long Bunch project material was supplied as greenwood cuttings in 1975 by University of Alaska Horticulturist, Don Dinkel, from his parents' home in Wasilla. Thirty-four, five-inch cuttings were prepared and rooted without hormone treatment in a propagation sandbench equipped with intermittent

mist. Cuttings rooted completely within six weeks and were transfered to three-inch peat posts for growing on. In late August, the pots were stepped up into one-gallon containers and overwintered in an unheated plastic greenhouse.

In early June the next year, twelve plants surviving the winter were transplanted from the greenhouse to a Field 4A stool bed.

Swedish Black plant material was furnished this year by Charles Logsdon from parent plants growing at a garden site near Bradley Lake, Palmer. Fifty-three rooted layers were collected from the site in late May and planted to Field 4A. Top growth was removed from the layers before planting to reduce transplanting shock and used to grow more plants for completing the increase row. The cuttings were prepared six-inches long, rooted without treatment in the greenhouse misting bench, and transplanted into three-inch peat pots four weeks later. In August, 47 of the peat pots were planted to row 4 in Field 4A to complete the plot.

Irrigation. The two currant increase plots were irrigated three times during the growing season this year including a fall watering in mid-September for a winter supply. Approximately one-inch of water was applied at each setting with the wheel sprinkler system.

Fertilization. Granulated 8-32-16 fertilizer was broadcast along both plot rows by hand and raked into the top two inches of soil. Fertilizer was applied in early June after planting at 1000 pounds per acre; an equivalent of 80 pounds N, 140 pounds P, 133 pounds K,

actual per acre.

Weed Control. All weed control was by hand this year except cultivations between and around both plots with a tractor and disc. No herbicide was used during the planting year to protect plants against possible damage. Casoron herbicide will be used next year.

Mulching. Oats were drilled between the plant rows and around the plot perimeter to provide mulching material later in the fall. Objective is to also provide wind protection to the plants during late summer and fall periods as well as to grow a mulch on-site that can be disced under the following spring. Whether or not this will supply enough insulation and collected snow for the coldest winter is to be seen.

Oat seed was planted in late July to prevent maturing seedheads and drilled to within two-feet of the currant rows at 350 pounds per acre. No other mulching was applied to either currant row in 1976.

Results

Holland Long Bunch plant material is not scheduled for distribution until 1978. About 60 gallon plants of the Swedish Black variety will be available this coming spring through the Alaska Crop Improvement Association. Those interested in acquiring plants should contact Charles Logsdon, ACIA Secretary, for details. The Swedish Black plants available are one-year-old container grown plants from cuttings. Cutting wood will also be available of Swedish Black this

spring from prunings in late May. Pruning will be necessary to promote adventitious growth in both Holland Long Bunch and Swedish Black varieties. All wood from Holland Long Bunch will be used to increase initial plot size.

Joseph L. Stehlik

Strawberry Production

The entire population of 'Alaska Pioneer' strawberries (*Fragaria* spp.) was winterkilled during the severe winter of 1975-76. A demand for parent nursery stock is still evident in Alaska, therefore, the project was continued with new parent plants in the spring of 1976. Eighty-six plants of the Alaska Pioneer variety were obtained from Dr. Don Dinkel at the Agricultural Experiment Station in Fairbanks. Twenty-six of the 'Sitka' variety were donated by Allan Klatt, from Country Gardens Nursery in Anchorage.

The old beds were sprayed with Dalpon (5 pounds in 50 gallons of water per acre) using a backpack sprayer then disced. Three new beds were formed, 78 feet long and 4 feet wide, in field 1E. The beds were formed by discing and then rototilling, which raised the beds four inches. Finally they were levelled, compacted, and shaped with a backblade.

The Alaska Pioneers were planted on June 17, and the Sitkas on June 21. The spacing was two feet between plants. Weeds were controlled by weekly hand-hoeing. Irrigation was applied by hand-watering throughout the summer. The plants were heavily mulched on November 8 with straw.

The expected reproduction ratio is 1 to 25. If this rate is maintained some plant distribution may be possible in the summer of 1977.

Patrick T. Mulligan

Sargent Cherry Initial Increase

The Plant Materials Center was requested by the South Central Timber Development Corporation in 1974 to grow Sargent Cherry (*Prunus sargenti*) seedlings for public relation plantings within the City of Anchorage. The South Central Timber Development Corporation is a Japanese logging company based in Anchorage.

Seed was received in December 1974 from Saghanien, Hokaido, Japan and 800 were seeded the following May in the greenhouse, after a warm/cold stratification. Later in August 1975, 132 seedlings, varying from 1/2 to 2 1/2 feet in height, were transplanted into gallon containers and left unmulched in an unheated greenhouse for the winter.

Seventy-five percent of the gallon-sized transplants had rodent gnawing and girdling the following spring about the basal stem area to a maximum height of two and one-half inches above the container soil surface. All eventually died in 1976 as a result of the 1975-76 winter injuries and/or rodent damage. Twenty-two percent of the transplants killed showed no rodent damage at all. Only four of the 132 seedlings transplanted in 1975 survived the 1975-76 winter. Topkill of the four survivors averaged 58%, however, three of the four survivors suffered only 10% to 20% topkill.

In 1976 seeds remaining in storage were treated the first week in May with concentrated sulfuric acid for a second seeding. The one-half-hour treatment soak was used to destroy surface fungi mycelia and scarify the hard seed coat. During the scarification unfilled seeds were detected and discarded. After scarification, a

remaining 349 seeds were treated with a 50% Benlate/30% Truban fungicide combination and placed in plastic bags with moist peat/sand mixture for warm/cold stratification. Stratification involved 14 days at 71°F, then 41°F until seed germination began 138 days later.

Six percent of the seed had germinated by the time of sowing on October 4, 1976. A 1 to 1 peat/sand seeding medium with 4 pounds per cubic yard 7-40-6 MagAmp slow release fertilizer was used. Approximately 4% of the seed emerged before the seedflat medium was solidly frozen October 26, 1976. Winter survival of these emerging seedlings remains in doubt even though a one-inch layer of dry, fine perlite was spread over the seedflat surface October 27, 1976 to act as a mulch.

The four (1976) surviving Sargent cherry in gallon containers were moved from the greenhouse July 1976 and planted outside in the holding block where they will hopefully, put on sufficient new growth to take softwood cuttings in 1977. The four survivors were mulched with six inches of straw during late October for winter protection. A Warfarin rat and mouse bait was placed in inverted, plastic, containers with a V notch cut in one side for rodent access and placed beneath the straw mulch for wind protection and proximity to rodent activity.

The future landscape-environmental usefulness of Sargent cherry to Palmer conditions appears limited considering the 97% container winterkill experienced during the severe 1975-76 winter.

Allan D. Klatt

Homer Windbreak Materials

The Plant Materials Center is cooperating with the Soil Conservation Service this year by growing Sitka spruce *Picea sitchensis*, and black cottonwood *Populus trichocarpa*, for a windbreak trial planting scheduled next spring in Homer. The SCS is planting the windbreak at the Bruce Willard residence in Homer to determine what effects a natural windscreen such as this can have in lowering heating costs and conserving energy for the Alaskan homeowner.

Jim Preston, District Conservationist in Homer, made the request for plant material last year and asked for enough plants to establish a 1,100-foot four row windbreak. According to Preston, two rows of each species will be planted using six-foot plant spacings within the row. A total of 753 plants are necessary for the windbreak, half Sitka spruce, and half black cottonwood.

Materials and Methods

Sitka Spruce Increase

Seeding. Spruce cones[1/] were collected last fall at the Kirkpatrick homestead near Homer for the project and seeds processed and stored after drying the cones. The seeds were planted this spring (4/26/76) directly into Spencer-Lemaire model five Rootrainers and the seedlings raised in the Forestry greenhouse under a containerized production regime for four and

1/ Three accessions were collected, 9/10/75, all showing different variations of foliage and branching habit. Accessions include L269, L270, and L271.

one-half months.[2/] Three seeds were planted in each cavity to guarantee seedlings in each container growing space and then covered with one-fourth inch number two chicken grit. Three weeks after emergence seedlings were thinned to one per cavity.

Containers. The Rootrainer, manufactured by Spencer-Lemaire Industires Limited, Alberta, Canada is an interesting new concept in seedling containers and best described simply as a folding book. The molded plastic container is manufactured flat but bends together for use like two pages of a book and locks to form an inexpensive container with five vertically ribbed cavities. The ribs guide the roots down the cavity wall. Individual Rootrainers are grouped thirteen to a plastic holding basket during use and then discarded usually after the seedlings are transplanted. A desirable feature this container has the others do not, is its ability, throughout the entire growing period, to be opened and closed as often as desired. This means roots can be inspected at any time for development, moisture, disease, etc. by simply unlocking the two container halves without sacrificing roots, soil, or seedling.

Fertilizer. A 1:1 Mica Peat [3/] vermiculite soil mix was the growing medium used in the containers with one-half pound per cubic yard of treble superphosphate (0-45-0) added root inducement. A modified Hoaglands solution[4/] supplied weekly plant nutrition and applied through the automatic irrigation boom in the greenhouse. The solution concentrate

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2/ See attached growing schedule table used for increasing Sitka spruce this year. Schedule suggested by Dr. Richard Tinus, Principal Plant Physiologist, Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Bottineau N.D.

3/ Mica Peat is the brand name for sphagnum peat/vermiculite potting medium manufactured by Landley Peat Limited, Fort Langley, B.C. Canada

4/ See containerized seedling report page 155 for stock solution formulations.

TABLE 2. Sitka spruce growing schedule prepared by Dr. Richard Tinus for Palmer, Alaska.

SEASON		MARCH		APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	JAN	FEB
Growth Stage		Sowing	Germination	Juvenile Growth (4 wks)		Height Growth May 1 to Aug 30			Natural Hardening Bud Set Caliper Growth		Cold Hardening		Over-Winter	
Day Temp. (°F)	Optimum		65-70	75-80		75-80			65-70		35-40		33-38	
	Permissible		60-75	60-95		60-95			60-70		30-50		20-50	
Night Temp. (°F)	Optimum		65-70	60-65		60-65			60-65		33-36		33-36	
	Permissible		60-75	55-75		55-75			50-70		25-45		20-45	
Rel. Hum. (%)	Optimum		60-80	50-70		50-70			50-70					
	Permissible		55-90	40-80		40-80			30-90					
Daylight			75% Sunlight			75% Sunlight			90-100% Sunlight				50% Sunlight	
Supplemental Light				8 watts/ft^2 incandescent light at least 6% of night. No dark period over 15 minutes (24 sec/6 min)					None					
Water			Frequent light, surface wet	As needed with nutrient solution surface should dry, root ball always near field capacity					Leach w/H_2O dry to 15 atmos	Treat as before				
Fertilizer			None	Complete, high N, pH 5.5-6.0, conductivity 1500-2200 mhos, use for all waterings. Water in excess each time, rinse foliage.						Complete, low N, high P, K. Otherwise, same as before.				
CO_2 Level			Normal atmos.	1000-1500 ppm whenever vents are closed during daylight.						Normal atmosphere				
Other		Fill, seed load greenhouse		Thin to one tree per cavity										

was injected into the waterline with a Smith 1:100 fertilizer injector.

Irrigation. Approximately one-half inch of water was applied each irrigation through a travelling water boom (20 feet per minute) and equipped with 80 gallons per minute nozzles, each overlaping the other with a 60° fan pattern to provide as equal distribution as possible. Irrigations were determined by container moisture levels rather than by a set watering schedule. Generally, the warmer the greenhouse air temperature, the more irrigations needed.

Hardening off. On September 15th the seedlings were moved from the greenhouse after a short hardening-off process naturally. Seedlings were watered well and treated with phosphoric acid. Once temperatures had fallen sufficiently to keep container soil frozen, an inch of wood fiber mulch 5/ was applied over the seedlings for winter protection.

Seedlings reached an average height of 50 millimeters by the end of the four and one-half months growing period and set buds for next years growth by the time mulch was applied. If all survive the winter, 390 seedlings will be available for shipment to Homer by mid-June next year. A second seeding was made as backup, however; and the seedlings over wintered in the PMC greenhouse.

Black Poplar Increase

Cuttings. Greenwood cuttings were collected in late spring 6/ this year at Kachamak Baptist summer camp near Homer. Eight inch cuttings

5/ Manufactured by Weyerheauser as 'Silva-Fiber' for soil erosion control and mulching.

6/ Two accessions of *Populus trichocarpa* were collected 6/02/76: L293 and L294.

were prepared from three-sixteenths to five-sixteenths inches in diameter-one year sucker wood, 320 cuttings in all, and stuck directly into styroblock containers without hormone treatment to root under a light mist. The rooting/growing medium used is a standard potting mixture of sphagnum peat, perlite, and sandy silt loam with two pounds per cubic yard of MagAmp slow release (7-40-6) fertilizer added.

Rooted four weeks later, the cuttings were removed in the containers from under the mist and set on a dry greenhouse bench to continue growing. Seventy-five percent of the cuttings planted had rooted. More cuttings will be taken to provide the needed 376 poplars for thr project.

Container. The styroblock is a pressed styrofoam container manufactured by Beaver Plastics Limited, Edmonton, Alberta in six models and used by containerized seedling nurseries for growing conifer seedlings. The model used for this project is a styroblock number 8, containing 80 cubic-inch cavities with a six-inch depth and one and one-half inch cavity top diameter.

The container was chosen for the black poplar increase for two primary reasons: (1) the container will provide a one step planting operation at the nursery. Because cuttings will be grown on in the same container they are rooted, transplanting from propagation bench to liver stock is eliminated. Saving both labor and recovery time for the plant at the nursery. (2) planting rooted plugs into the field should be easier and faster than planting bareroots or unrooted cuttings planted directly.

Fertilizer. After rooting, a complete 20-20-20-soluble fertilizer was added on a weekly basis to suppliment the MagAmp mixed with the soil medium earlier. The fertilizer was prepared in diluted form 2.78 grams per one gallon of water (150 ppm N) and stored for weekly use through mid-September. After this, all fertilizing was stopped and watering reduced to harden off the rooted cuttings. Containers were watered well before freeze up.

Mulch. Straw mulch was used in late October (10/27/76) to bury the four styroblock containers ccmpletely and left to overwinter on the floor of the PMC greenhouse.

The poplar cuttings are expected to be large enough for outplanting the same time the Sitka spruce seedlings will be ready, mid-June. The SCS office will be notified in spring 1977 as to the condition of both plant materials for early summer planting of the windbreak trial.

Joseph L. Stehlik

Scotch Pine Initial Increase

This is a summary report on a two-year productive attempt with Mänty Scotch pine, *Pinus sylvestris*, at the Plant Materials Center. The objective was to evaluate the conventional bareroot production method of growing seedlings under Alaskan conditions. The project was initiated by a State Forestry request to supply 2-1 and 2-2 Scotch pine seedlings to them for private landowners interested in land improvement and reforestation. Some seedlings were also to be used in field trials and landscaping around State buildings. Seed for this planting was a selection from Rovaniemi, Finland and supplied to the Plant Materials Center by the Institute of Northern Forestry in Fairbanks.

Methods and Materials

Seedbed preparation. Preparations began May 1974 with the selection of a 5 foot by 100 foot seedbed site on the leeward side of the PMC office building. Though not completely protected from winds, the site was adjacent to an immediate water supply, a determining factor. The area was cleaned of all rocks and debris, rototilled to a depth of six inches, and then fumigated with a Vorlex drench 1/ at a rate of 15 fluid ounces concentrate per 100 square feet.

1/ Vorlex active ingredients include 80 percent mixture of 1,2-dichloropropane: 1.3- dichloropropane and related compounds: and methyl isothiocyanate. Vorlex is licensed to be sold in the United States by Nor-Am Agricultural Products, Inc.

The concentrate was immediately watered into the soil with one-half inch of water and the seedbed covered with a plastic film tarpaulin to restrict volatizing gases. Seven days after application, the plastic was removed and the seedbed allowed to aerate for three more weeks. It was necessary during this time to disc the seedbed twice before all trace odors were lost and planting could begin.

Seeding. A Brillion grass seeder was used to plant the pine seed June 28 at a rate of 1.5 ounces of seed per 100 square feet; the equivalent of 77 seeds per square feet. No pretreatment was given to the seed before planting. Rice hulls were mixed with the pine seed as a filler to improve seed distribution in the planter while seeding at a recommended rate of 0.66 pounds per 1000 square feet. Counts six weeks later showed 46 percent seedling emergence in the seedbed; a density of 35 plants per square foot or roughly 17,500 seedlings. A woven plastic shade cloth covered the seedbed during both growing seasons to protect the seedlings from hot sun and predators.

Weed Control. Seedbed fumigation with Vorlex before seeding is estimated to have cut hand weeding the first year by eighty percent. Pineapple weed, *Matricaria matricarioides* (less.) Porter and knotweed, *Polygonum aviculare* L. however, were not effectively controlled and continued to be the two largest hand weeding problems during both growing seasons. A liverwort population also developed in the seedbed under the moist, shaded growing conditions to eventually cover almost the entire seedbed the second year.

Attempts to remove the liverwort by hand only lifted soil from around the seedlings exposing the young roots to drying. Preliminary greenhouse trials earlier this year with 2-0 Scotch pine seedlings, however, did show ferrows sulfate to be effective in controlling liverwort with no apparent effect to seedling growth.

Irrigation. Water was applied as needed during both growing seasons with an oscillating sprinkler that applied three-fourths to one inch of water at each setting.

Fertilization. Seedlings were fertilized twice during the project period. Once the first year with a fall application of soluble 9-45-15 at 0.66 pounds per 10 gallons per 100 square feet, an equivalent 21 pounds N, 56 pounds, 36 pounds, per 100 square feet of MagAmp., a 7-40-6 slow release fertilizer. The MagAmp was worked into the top two inches of the seedbed by hand.

Mulching. Mulching should be applied in the fall to most woody and herbacious perennials grown in the Matanuska Valley area. Lack of snowcover and drying winds during the winter and spring make it necessary. Straw and sawdust are commonly used because they are inexpensive and easily found but inorganic materials such as perlite and vermiculite make excellent mulches and are available through local suppliers. Once moist, the perlite or vermiculite particles freeze together to form a solid insulating blanket.

To be effective, the mulch must insulate the plant root zone from extreme changes in temperature and reduce moisture loss from both plant and soil. Mulches should restrict buffeting the ground below from temperature

changes above. Without the insulation soil temperatures would rise and fall at a faster rate and to greater extremes causing root damages from heaving soil. Unusually high temperatures during dormancy can also force buds to break exposing new growth at an unfavorable time.

Three inches of perlite was applied as mulch over the seedbed the first fall covering seedling tops with about an inch of material and removed the following spring with an industrial vaccumn cleaner. In the fall of 1975, wheat straw was used to mulch the bed instead of perlite because of perlite's expense ($2.60 per cubic foot).

To evaluate the benefits of straw, only half of the seedbed was covered, the other half was left exposed. Mulch was applied twelve inches deep and D-Con mouse bait stationed in cups under the straw.

Results

In terms of production, the two year attempt to grow Scotch pine seedlings in an outdoor seedbed was a loss. Only 53 survived to the third spring out of an estimated 17,500 emerging seedlings. However in terms of experience, the gains were many.

In proper timing of mulch removal was found to be our most critical problem. Early removal in late April before spring winds had completely subsided caused the desiccation of half the seedlings grown the first year. The seedbed was located on the leeward side of the FMC two story office building and chosen because its ready access to water but unfortunately only partially screened from the wind. Complete screening from the wind of course would have been preferable. In areas without natural windbreaks

or buildings to screen the wind, artifical screens must be established. Anymore seedbed plantings at the Plant Materials Center will be seeded in cold frames with 12-16 inch collapsible sides and removable glass covers.

The seedlings remaining in 1975 were lost the following winter. The 53 surviving seedlings were found scattered over the entire seedbed favoring neither the mulched or unmulched conditions. It's interesting to note that over 95 percent of the Scotch pine seedlings planted in 1975 by Forestry survived the same winter outside without damage. The Forestry seedlings were from the same seed lot but grown under greenhouse conditions with constant fertilization. The seedlings produced under this regime reached an average height equal to the two-year-old seedbed tree in less than six months.

Recommendations for future seedbed plantings at the PMC:

a. select a wind protected site for the seedbed.

b. remove mulch after spring winds completely subside if growing in wind exposed location.

c. use cold frames and artifical wind screens whenever necessary.

d. fertilize seedbed area according to soil tests before seeding for better incorporation.

e. use herbicides for weed control whenever possible.

TABLE 3. Ten sample averages of Mänty Scotch pine seedlings for height, spread, and density at the end of the 1974 and 1975 growing seasons on the Alaska PMC.

Evaluation Date	Average Seedling Height	Average Seedling Spread	Average Seedling Density
	in.	in.	sq. ft.
Oct. 1974	2.0	-	34.6
Oct. 1975	3.7	4.2	17.3 1/

1/ Drop in number of seedlings/sq. ft. caused by dehydration of approximately 50% of seedlings during late spring winds in May and June 1975 after bed mulch was removed.

Ladysthumb Production

A request for seed from the Homer Soil Conservation Office for *Polygonum persicana* spotted ladysthumb was received in April. The seed is to be used in marshy areas to provide waterfowl food and cover.

Two 100-foot rows were fertilized with 40 pounds of N, 80 pounds of P, and 40 pounds of K per acre. The seeding rate was 10 pounds per acre and it was planted on May 25. Seedling vigor and foliage production was excellent. Two inches of irrigation water were added in June and an additional inch in the middle of July. The plants began heading on July 19, blooming on July 30, and were harvested on August 18.

Drying was accomplished with some difficulty on the main floor of the barn. The seed was threshed and approximately 50% was lost because it would not thresh out of the head. Five pounds of cleaned seed was obtained with a germination of 62.4%. Yield was 265 pounds of clean seed per acre.

Patrick T. Mulligan

FOUNDATION SEED INCREASE

FOUNDATION SEED INCREASE

Foundation seed and plant production until now has been the burdensome task of the University of Alaska Experiment Station requiring more time and greater acreages each year. The Legislature made seed production one of the Plant Materials Center's responsibilities directing it to increase as well as maintain basic grain and grass seed supplies of recommended Alaskan varieties. Hopefully, this seed production program will encourage the State's young seed industry to grow and meet the ever increasing demand for certified seed both in and out of Alaska by making foundation seed available to more seed growers in commercial quantities. All released grain and grass varieties in the state will eventually be grown, processed, and maintained annually for foundation seed stock by the PMC and distributed through the Alaska Crop Improvement Association.

The maintenance and production of plant propagules, cuttings, and seedlings will also be carried out at the PMC. Released varieties of fruits, ornamentals, and trees require the same base of foundation stock as do grains and grasses. Breeder stock supplied by cooperating agencies, as well as those developed at the Center, will be increased and distributed through the Alaska Crop Improvement Association.

Foundation Grain Production

Four varieties of barley, two of oats, and one of wheat were planted, for a total of 24.98 acres, in fields one, three, and four

at the Plant Materials Center in 1976.

Planting began on May 3 and harvest started on August 10 with 'Lidal' barley at 16% moisture. Production and quality figures for 1976 appear in Table 1.

Herbicide application designed to control annual broadleaf weeds was begun on June 4. The mixture, consisted of 0.64 pints Banvel 4-S, 0.64 quarts Premerge, and 0.96 quarts 2,4-D per acre. Good control of weeds was achieved.

Irrigation was applied twice during the 1976 growing season. Two inches per acre was applied in eight-hour sets in the middle of June. One inch per acre was applied in four-hour sets toward the middle of July.

Weather conditions were good for growing grain in 1976. Warm spring temperatures allowed equipment to begin seedbed preparation in late April. Hot and dry summer days promoted fast growth and even maturity in the grain crops. Small grain plant performance for 1976 appears in Table 2. There was a 100% stand for all varieties in 1976.

TABLE 1. Production and quality of four varieties of barley, two of oats, and one of wheat at the Alaska Plant Materials Center in 1976.

Crop	Class	Acres	Seeding Rate lbs/acre	Yield bu/acre	Purity %	Germ %	Protein %	Test Weight lbs/bu
Weal barley	Foundation	1.29	104.0	52	100	82.0	15.44	52.0
Weal barley	Registered	3.80	90.0	39	100	83.5	12.67	55.5
Lidal barley	Certified	3.54	125.0	42	99.8	87.75	17.40	52.9
Finnaska barley	Foundation	0.95	91.0	16	99.8	77.5	18.74	53.3
Otra barley	Foundation	0.77	91.0	73	99.9	89.25	16.02	51.0
Nip oats	Foundation	0.42	91.0	54	100	86.0	16.40	41.1
Nip oats	Commercial	4.69	195.0	46	99.6	93.0	17.30	45.0
Toral oats	Foundation	0.86	91.0	90	100	94.25	17.55	43.8
Toral oats	Registered	4.62	325.0	55	99.8	94.0	17.62	46.9
Gasser wheat	Foundation	0.72	91.0	11	99.9	81.0	19.49	60.3
Gasser wheat	Registered	3.32	406.0	32	99.9	50.75	19.67	62.0

TABLE 2. Performance of four varieties of barley, two of oats, and one of wheat at the Alaska Plant Materials Center in 1976.

Kind and Class	Seeding Date	Seedling Vigor	Drought Resistance 1/	Disease Kind	Disease %	Date Headed	Date Bloomed	Lodging %	Date Harvested
Weal barley Foundation	5/15	Exc.	Fair	None	0	7/1	7/14	0	8/26
Weal barley Registered	5/7	Fair	Poor	None	0	6/28	7/14	0	8/26
Lidal barley Certified	5/6	Exc.	Fair	Barley stripe	5	6/28	7/14	0	8/10
Finnaska barley Foundation	5/4	Exc.	Poor	Smut Barley stripe	Trace 95	6/28	7/14	75	8/27
Otra barley Foundation	5/13	Exc.	Poor	Smut Barley stripe	5 5	7/3	7/14	50	9/13
Nip oats Foundation	5/5	Exc.	Excellent	Unknown*	50	7/6	7/14	0	8/25
Nip oats Commercial	5/6	Exc.	Good	Unkn.	75	7/6	7/14	0	8/25
Toral oats Foundation	5/5	Exc.	Good	None	0	7/6	7/14	10	9/2
Toral oats Fegistered	5/3	Good	Excellent	None	0	7/6	7/14	0	9/2
Gasser wheat Foundation	5/4	Good	Poor	Unkn.	50	7/6	7/14	0	9/7
Gasser wheat Registered	5/3	Fair	Poor	None	0	7/6	7/14	0	9/7

1/ Drought resistance was a function of the soil type as much as it was the particular grain type and variety.

Grass Seed Production

A 13-acre field of 'Engmo' timothy, which was managed for seed production in 1975, suffered 90% winterkill and was plowed up in June of 1976. One acre will be planted back to timothy in 1977. The demand for timothy seed has not been great and a balance of 1,800 pounds remains at the PMC.

One acre of 'Arctared' red fescue was fall fertilized in September of 1975 with 40 pounds of N, 80 pounds of P, and 40 pounds of K actual per acre. Weed control in 1976 was accomplished for annual broadleafs through mechanical cultivation and one application of herbicide. The herbicide mixture was sprayed in early August at a rate of 0.64 pints of Banvel 4-S, and 0.96 quarts of 2,4-D per acre.

Perennial grasses were removed by hand rogueing in July. The plot was sprayed with a hand sprayer using 1 cup of Diazanon in four gallons of water to control insects which crimp the spikelet and reduce yield. The Arctared began to head on June 18, bloomed on June 28, and approximately 100 pounds of seed was harvested on July 28. Fall fertilization with 72 pounds of N, 72 pounds of P, and 36 pounds of K actual per acre took place on August 5.

Three varieties of grass were planted in 1976 and will be managed for foundation seed production. *Festuca rubra* Arctared red fescue, *Bromus inermis* X *pumpellianus* 'Polar' brome, and *Calamagrostis canadensis* bluejoint were established in the eastern quarter of field 3 at the PMC. Planting information and species performance appears in

Table 3.

The fields were designed with one meter between rows and irrigated with two inches per acre immediately after planting. Another inch per acre was applied in mid-July.

Weed control was accomplished with good success through one application of herbicide, several mechanical cultivations, and one intense hand rogueing. The herbicide spraying was in July at a rate of 0.64 quarts of Premerge, and 0.96 quarts of 2,4-D per acre.

The planting will be fertilized in the spring of 1977 and a light seed crop should be harvested in late July or early August.

Patrick T. Mulligan

TABLE 3. Planting information and performance of three grasses at the Alaska Plant Materials Center in 1976.

Kind	Acres	Seeding Rate lbs/acre	Date Seeded	Stand %	Seedling Vigor	Drought Resistance 1/	Height in.
Arctared red fescue	1.6	5	6/1	90	Good	Good	6
Polar brome	1.1	6	6/2	90	Excellent	Good	12
Bluejoint	1.1	2	6/3	80	Fair	Good	4.5

1/ Drought resistance was a function of the soil type as much as it was the particular grass species.

ALASKA SEED TESTING LABORATORY

Alaska Seed Testing Laboratory

A major duty of the Plant Materials Center was to establish, staff, and maintain a seed testing laboratory. Acting Director of Agriculture, Fred Honsinger, declared in April of 1975 that the Plant Materials Center would be the official seed testing laboratory in Alaska. In June, the laboratory was recognized by the Association of Official Seed Analysts (AOSA) and the International Seed Testing Association (ISTA).

The function of the seed testing laboratory is to analyze all types of seeds which are grown and sold in the State of Alaska. Before any seed is sold it must bear a label which includes the results of the purity and germination analysis. Seed imported into Alaska should also be tested to protect buyers against fraudulent or incorrectly labeled packages.

Purity analysis consists of individually examining the seeds and separating them into pure seed, other crop seed, weed seed, and inert matter, such as chaff, broken seed, and other foreign impurities. Percent of each component, by weight, is then determined and recorded.

Germination analysis requires 400 pure seeds. Many crops are prechilled and treated with potassium nitrate to break dormancy. The seeds are then placed in a special germination chamber. The chamber is adjusted for a predetermined temperature, light intensity, and duration. The length of time for the analysis ranges from seven to twenty-eight days, with intermediate counts to determine seed vitality. Upon completion, an average percent of normal seedlings,

abnormal seedlings, and dead seeds is computed and recorded. A special chemical technique for germination, Tetrazolium analysis, can be used, for some seeds, to yield comparable results in 24 hours. A complete report of the purity and germination analysis is mailed to the grower and a sample of the seed lot is kept for three years at the laboratory.

Many Alaskan native plants are developing high economic interest. Before a certain variety can be certified, purity and germination standards must be established with the AOSA. The seed laboratory, in cooperation with the Soil Conservation Service, is engaged in such a study using bluejoint (*Calamagrostis canadensis*).

Samples of vegetable seed in packets were taken from retail outlets by the agricultural inspector. One hundred twenty-seven samples were examined by the seed laboratory. Germination was tested and the packets were examined for proper and accurate labeling information. The results of these tests appear in Table 1 and Table 2.

Twenty-six packets were found to contain seed which germinated less than the minimum standard set forth by the Federal Seed Act. Twelve packets contained less seed by weight than was stated on the label.

An outdated Alaskan regulation required that all seed sold in packets have the date the seed was tested for germination as part of the label. Alaska is the only state which applies this regulation to seed packets and consequently none of the seed sampled had this

information. Subsequent revision of the regulations have updated them to the point where they are current with the trends of other states and the seed industry.

Results of purity and germination analyses appear in Table 1. Weed seed occurrence is shown in Table 2.

Generally speaking, seed purity remained very high. Germination, however, was somewhat lower than the year before because of the wet and windy growing season experienced in 1975. These types of conditions tend to lower germination by delaying maturity and pushing harvest well into the fall. Much of the highest quality and most mature seed is then lost to shatter before the crop can be harvested.

Patrick T. Mulligan

TABLE 1 Results of purity and germination tests at the Alaska Seed Testing Laboratory in 1976.

Type of seed	Number of tests		Germ. Range %	Average Germ. %	Pure Seed Range %	Average Purity %	Average Inert Matter %	Average Weed %	Average Crop %
	Standard	Tz							
Vegetable	147	-	0 - 100	70.68	-	-	-	-	-
Bluejoint	41	-	21.00-91.00	58.84	95.26-98.76	96.82	3.09	-	-
Oats	30	1	0 - 94.75	76.55	93.80-99.60	98.01	.89	.01	1.02
Woody Plants	28	-	2.30-85.00	50.34	-	-	-	-	-
Barley	26	4	13.25-91.80	62.55	99.30-100	99.64	.24	.01	.04
Arcticgrass	8	-	-	94.50	-	95.10	4.70	Trace	.20
Fescue	6	-	84.00-97.50	93.37	88.20-99.60	95.38	4.14	0.12	.36
Bluegrass	3	2	73.60-95.40	86.15	-	100.	-	-	-
Timothy	5	-	75.50-84.30	79.90	99.91-100	99.95	.05	-	-
Wheat	4	-	63.00-84.25	72.35	99.90-100	99.93	Trace	Trace	.007
Grass Mix Fescue-Bluegrass Bluegrass	1	-	-	88.75 86.25	-	33.82 63.09	2.27	-	.89
Ladysthumb	1	-	-	62.40	-	-	-	-	-
Flax	1	-	-	0	-	-	-	-	-

Physical Improvements

A CETA Title X program was utilized from July 1, 1975 through June 30, 1976 to accelerate the development of physical facilities at the PMC. A total of $175,000 was made available from the US Department of Commerce through the USDA Soil Conservation Service. Twenty-two laborers were hired over a nine month period, September 1975 through June 1976. Many of the improvements mentioned here were accomplished as a result of this program.

Land

Approximately 6,600 lineal feet of stump rows were burned, hand picked, and brought to seedbed condition. This made available an additional eight acres of tillable land but, more importantly, allowed 80 acres of additional land to be irrigated.

A land float was constructed for smoothing uneven ground. It has been used for two seasons and does an excellent job preparing smooth, firm seebeds for grain and grass seedings.

Approximately 5 acres of brush on abandoned land in Field 2 was mowed. Part of this was plowed and awaits removal of roots. The next will have to be rototilled with the Experiment Station's rototiller because of the larger stumps and roots in that area.

Two waterways were seeded to 'Garrison' creeping foxtail in the spring of 1976. Good stands were obtained. These waterways have no open outlets, can not be tilled until late spring because of wetness, and are a constant source of weed seed spreading to adjacent areas. By fall, the foliage

had reached a height of 12 to 16 inches. The weeds were 19 percent suppressed. Winter survival (1976-1977) was excellent. Emergence from rhizomes beneath four to six inches of silt deposition in several areas was very good.

Buildings

The installation of seed cleaning equipment was completed in December 1976. All machines were used successfully in trial runs. Several lots of grain seed were cleaned to 100 percent purity.

A pole lean-to machinery storage building was constructed on the west side of the old barn. This provided 2,040 square feet of storage area and relieved most of the main floor of the barn for other uses.

The milkroom and calf wing of the barn were renovated to provide for a machine shop, a carpenter shop, and a large-equipment repair shop. This provided an additional 1,500 square feet of much needed heated shop space.

The old milkhouse was renovated to provide lunch room, shower, and restroom facilities for the seasonal crews.

Construction began on two new buildings in September 1976. An office/laboratory building will only be partially completed due to a lack of funds caused by skyrocketing construction costs in the interim between design, allocation of funds, and award of bid. The laboratory will be operable. The foundation and erection of the glass greenhouse is proceeding quickly. Both buildings will be ready for occupancy by spring of 1977.

Requests for construction and transfer of funds to the Division of Buildings for a heated/refrigerated plant storage building and a heated chemical storage building were made in the fall of 1976. No bids have been awarded by the close of the report year.

James R. Stroh

FISCAL EXPENDITURES-1976

Fiscal Expenditures-1976

The Plant Materials Center operated with five separate funding sources in FY 76. Two were State general funds and three were Federal Grants. Total allocations for the year were $662,953 of which $445,078 were expended (Table 1). One hundred seventy-seven thousand three hundred and ninety-five dollars were carried over into FY 77 in continuing accounts.

Operations-General Funds. Operating funds amounted to $258,919 of which 85.1% was expended (Table 2). Personal Services experienced a dramatic increase in expenditures of 70% over the previous year, due primarily to wage and salary increases. Other operating expenditures increased modestly due to inflationary pressures.

CETA[1/] Title II-Federal Grant. This program was continued from FY 75 through the Governor's Office. It provided three laborer positions in lieu of state funded positions (Table 3). When the state positions were approved, two of the CETA II employees were transfered to permanent seasonal status. One CETA II position was reclassified from laborer to clerk-typist to provide assistance in the administration of the more complicated CETA Title X program.

CETA Title X-Federal Grant. This program provided $175,000 by grant through the Soil Conservation Service to provide jobs in seriously depressed areas (Table 4). The unemployment rate in the

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1/ CETA-Comprehensive Employment and Training Act of 1972.

Matanuska-Susitna Borough was estimated at 27%. During the course of FY 76 twenty-two people were hired to fill thirteen positions. A schedule of projects was developed and completed during the year which greatly speeded up the construction, installation, and upgrading of the PMC facilities:

1. Maintenance of evaluation and production plantings
2. Installation of seed cleaning equipment
3. Construction of machinery storage building
4. Removal of stump rows and debris
5. Renovation and refurbishing of existing buildings
6. Maintenance of grounds
7. Installation of weather station fencing
8. Installation of lunchroom and restroom for laborers
9. Construct grain pallets
10. Construct irrigation pipe racks
11. Construct land float

Two employees hired under this program were transfered to permanent-seasonal state positons when those positions became approved and funded.

The CETA X program terminated June 30, 1976 and was not renewed.

Soil Conservation Service Grant-Federal Grant. This was a special research grant from the SCS to evaluate the seed production potential of a native grass, bluejoint (*Calamagrostis canadensis*). A memorandum of understanding between SCS and the Department of

Natural Resources provides funding over a three-year period -- $4,600 in FY 75, $6,000 in FY 76, and $6,000 in FY 77. State personnel restrictions precluded the employment of technicians specifically for this program. Expenditures listed in Table 5 may be misleading in that the nature of the three-year study will accumulate the greatest costs in FY 77.

Capital Projects-General Funds. A balance of $30,000 remained in FY 76 from an initial allocation of $50,000 in FY 75 (Table 6), for a new metal/glass greenhouse. The greenhouse and equipment were purchased in FY 75. Erection of the greenhouse and installation of the equipment were delayed in the fall of 1975 due to cold weather which prevented pouring the foundation. The contractor was unable to fulfill the contract the following spring. The remainder of the contract was prepared for rebidding at the end of the fiscal year. No funds were expended.

An allocation of $140,000 was received for the construction of an office/laboratory building. Design and bidding delays precluded construction in FY 76 and no funds were expended.

James R. Stroh

TABLE 1. Allocations and Expenditures for FY 1976-Summary of Budget Funds.

Fund	Allocation	Expenditure	Percent of Total Allocation
Operations	$258,919.00	$220,257.18	85.1
CETA Title II	48,439.00	47,758.37	98.6
CETA Title X	175,000.00	174,037.51	99.5
SCS Grant	10,600	3,205.62	30.2
Capital Projects	170,000.00	- 0 -	- 0 -
Total	$662,958.00	$445,078.68	67.1

TABLE 2. Allocations and Expenditures for FY 1976-Operations

Object code and name	Allocation	Expenditure	Per cent of total allocation
100 Personal services	134,419		
111 Regular compensation		105,714.39	
121 Overtime		1,552.76	
180 Benefits		19,069.10	
199 Transfer		(2,395.16)	
Total	134,419	123,941.09	47.9
200 Travel	3,600		
211 Instate transportation		143.13	
212 Instate per diem		673.90	
213 Outside transportation		539.96	
221 Instate transportation		468.10	
222 Instate per diem		120.00	
224 Outside per diem		200.00	
Total	3,600	2,145.09	0.8
300 Contractual Services	57,200		
310 Communicatinn services		574.65	
311 Lon distance Telephone		620.69	
314 Postage		304.20	
320 Printing and advertising		508.55	
321 Photo processing		56.21	
325 Advertising		72.00	
330 Rents and utilities		67.80	
335 Heat, light, water		2,504.00	
340 Repairs, etc.		5,298.18	
345 Janitorial services		2,296.45	
350 Transportation of things		375.38	
360 Equipment rental		1,799.46	
361 Highway equipment rental		7,027.90	
370 Insurance and bonding		519.16	
380 Professional fees		19,600.00	
390 Other fees and services		2,461.11	
Total	57,200	44,085.74	
400 Commodities	22,000		
440 Fuel, non-vehicular		3,443.48	

TABLE 2. Allocations and Expenditures for FY 1976-Operations. Cont'd

441	Fuel, butane		160.88	
450	Materials		7.80	
451	Materials, construction		825.61	
452	Lumber		1,724.64	
453	Signs and preservatives		73.27	
456	Hardware		711.21	
459	Other maintenance material		938.71	
460	Equipment parts		15.55	
461	Fuel, diesel		301.18	
462	Fuel, gasoline		287.32	
463	Lubricants		138.88	
464	Liquid petroleum		414.19	
465	Miscellaneous parts and supplies		1,768.43	
470	Professional scientific supplies		513.38	
474	Books, library and reference		336.02	
480	Office supplies		502.66	
490	Other supplies		8,179.03	
	Total	22,000	20,314.94	7.9
500	Equipment	41,700		
530	Special equipment		28,493.05	
560	Shop maintenance equipment		1,306.18	
	Total	41,700	29,799,23	11.5
Total Operations Budget		258,919	220,257.18	85.1

TABLE 3. Allocations and Expenditures for FY 1976-CETA Title II

Object code and name	Allocation	Expenditure	Per cent of total allocation
100 Personal Services	48,439		
111 Regular compensation		45,536.93	
121 Overtime		155.23	
180 Benefits		3,371.05	
199 Transfere		(1,304.84)	
Total	48,439	47,758.37	98.6

TABLE 4. Allocations and Expenditures for FY 1977-CETA Title X

Object code and Name	Allocation	Expenditure	Percent of total allocation
100 Personal services	138,800		
111 Regular compensation		128,263.24	
121 Overtime		111.76	
122 Shift differential		22.83	
180 Benefits		9,510.21	
Total	138,800	137,908.04	78.8
300 Contractual Services	400		
330 Rents and utilities		86.40	
340 Repairs		105.00	
360 Equipment rentals		118.80	
361 Highway equipment rental		10.00	
Total	400	320.20	0.2
400 Commodities	35,800		
410 Clothing		23.76	
440 Fuel, non-vehicular		808.29	
450 Materials		5,774.32	
451 Materials, construction		20.40	
453 Signs and preservatives		22.50	
456 Steel and hardware		111.28	
459 Other maintenance material		166.72	
460 Equipment parts		3.09	
465 Miscellaneous parts		8.77	
480 Office supplies		62.10	
490 Other supplies		28,808.04	
Total	35,800	35,809.27	20.5
Total CETA X Bidget	175.000	174,037.51	99.5

TABLE 5. Allocations and Expenditures for FY 1976-Soil Conservation Service Grant, Calamagrostis Study

Object Code and Name	Allocation	Expenditure	Percent of total allocation
100 Personal Services	600		
111 Regular compensation		312.93	
121 Overtime		164.16	
180 Benefits		75.62	
Total	600	552.71	5.2
200 Travel	2000		
212 Instate perdiem		660.00	
221 Instate Transportation		132.40	
222 Instate perdiem		385.00	
Total	2000	1,177.40	11.1
300 Contractual	7000		
350 Transportation of things		9.23	
361 Highway equipment rental		898.04	
Total	7000	907.27	8.6
400 Commedities	1000		
490 Other supplies		568.24	5.4
Total		568.24	
Total SCS Grant Budget	10,600	3,205.62	30.2

TABLE 6. Allocations and Expenditures for FY 1976-Capital Projects

Project	Allocation	Expenditure
Greenhouse	$ 30,000	- 0 -
Office/Laboratory	140,000	- 0 -
Total	$170,000	- 0 -