

Final Report of Initial Demonstration
and Advanced Conservation Plantings
at Ruby, Alaska
1984 - 1986

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Introduction

The Conservation Plant Project at the Alaska Plant Materials Center (PMC), in the Alaska Department of Natural Resources, Division of Agriculture, is responsible for developing new plant varieties (cultivars) for land reclamation, habitat enhancement, and erosion control. In addition to the development of new plant cultivars, this project also is responsible for developing techniques for erosion control and reclamation. In order to accomplish these goals, it is beneficial for the PMC to cooperate with industry, and other governmental agencies throughout Alaska.

Purpose

Advanced Evaluation and Demonstration Plots are established throughout Alaska for three main purposes. The first allows for advanced or final evaluation of plant materials that have performed well at the Palmer PMC for a period of at least three years. This offsite evaluation is important to determine a plant's adaptability and range of suitability. If the plant does well at this stage it may be released as a new cultivar.

The second purpose is to provide demonstration plantings containing the species recommended for the area in The Revegetative Guide for Alaska. The results from the planting determine if changes should be made in the Guide.

The third reason for the plots is to provide a centralized area for local plantings by the Cooperative Extension agents, District Conservationists (DC), or other cooperators. This allows the agent or DC to tailor the plot to local interests. The plots also give the agent, DC, or cooperator a "classroom" where specific plant materials may be viewed and worked with by local farmers, students, and other groups interested in farming or gardening.

In December, 1983, the PMC was contacted by John Dart, Farm Manager and Vo-Ag Instructor at the Ruby Farm, regarding the possibility of establishment of a plot at Ruby. An agreement was reached with the Yukon-Koyukuk School District to cover travel costs since the PMC had not budgeted for a plot at Ruby.

The Ruby plot was intended to be used as an extended classroom as well as an aid in determining future crop selections.

In addition to the standard plots, John Dart required small scale (1/10 acre) plots for grain and alfalfa trials.

Methods

In May, 1984, 51 accessions of advance test plant material were planted. The complete 1983 array of accessions (Figure 1), with the exception of Rough Fescue and Alpine Bluegrass 235491, was replicated three times at the Ruby plot. The Rough Fescue and Alpine Bluegrass were only planted twice because seed supply was low.

Each plot, was hand-seeded with pre-measured amounts of seed. The seeding rates of each block were approximately 40 pounds per acre. Following seeding, the entire plots were fertilized with 20-20-10 fertilizer at a rate of 450 pounds per acre (90 pounds actual nitrogen, 90 pounds actual phosphorus, and 45 pounds actual potash). After each plot was seeded and fertilized, the area was raked by hand to incorporate the seed and fertilizer. Plots 1 and 2 were planted by adults; plot 3 was set aside for planting by students. Each interested student was given 2 accessions to plant and maintain.

In addition to the advanced evaluation blocks, a demonstration planting of recommended varieties from the "Guide" was planted (Figure 2). Each variety was planted in a 10' x 60' block. The demonstration area contained the 14 varieties. Each variety was grown in three fertilizer regimes. The blocks were divided into thirds for fertilizer treatment. Fertilizer (20-20-10) was applied at the rates of 0 lb/a, 240 lb/a, and 480 lb/a.

At the request of John Dart, the PMC also planted five varieties of Alfalfa (see Figure 2), seven varieties of Grain, and one variety of Rape.

Typical Plot Layout

| | | |
|-------------------------------|-------------------------------|--------------|
| <-----> 10' <-----> | | 4' ^ v |
| Nugget Kentucky Bluegrass | Merion Kentucky Bluegrass | |
| Park Kentucky Bluegrass | Banff Kentucky Bluegrass | |
| Sydsport Kentucky Bluegrass | Fylking Kentucky Bluegrass | |
| Poa ampla | Troy Kentucky Bluegrass | |
| Sherman Big Bluegrass | Canbar Canby Bluegrass | |
| Tundra Bluegrass | Reubans Canada Bluegrass | |
| Poa glauca T08867 | NOT PLANTED Poa alpina | |
| Agropyron subsecundum 371698 | Sodar Streambank Wheatgrass | |
| Nordan Crested Wheatgrass | Agropyron subsecundum | Canada |
| Fairway Crested Wheatgrass | Agropyron violaceum | |
| Summit Crested Wheatgrass | Agropyron boreal | |
| Critana Thickspike Wheatgrass | Agropyron yukonese | |
| Fulfs Alkaligrass | Vantage Reed Canarygrass | |
| Climax Timothy | Engmo Timothy | |
| Elymus arenarius | Elymus sibiricus 34560 | |
| Elymus sibiricus 1966 | Elymus sibiricus 2144 | |
| Norcoast Bering Hairgrass | Tufted Hairgrass | |
| Sourdough Bluejoint | Calamagrostis canadensis | Delta |
| Meadow Foxtail | Alopecurus geniculatus | |
| Garrison Creeping Foxtail | Arctared Red Fescue | |
| Boreal Red Fescue | Festuca scabrella | |
| Beckmannia | Pennlawn Red Fescue | |
| Durar Hard Fescue | Highlight Red Fescue | |
| Covar Sheep Fescue | Manchar Smooth Brome | |
| Alyeska | Carlton Smooth Brome | |
| Tellesy Sage | NOT PLANTED Pumpelly Brome | |

Figure 1. Typical Plot Layout.

Demonstration & Legume Plantings

< 20' >

0
Fertilizer

240 lb.
20-20-10
per acre

480 lb.
20-20-10
per acre

| | | | | | |
|---------------------------|-------------------|--------------|---------------|----------------|----------------------|
| Park Bluegrass | | | | | |
| Merion Bluegrass | | | | | |
| Arctared Red Fescue | | | | | |
| Boreal Red Fescue | | | | | |
| Durar Hard Fescue | | | | | |
| Engmo Timothy | | | | | |
| Garrison Creeping Foxtail | | | | | |
| Sodar Wheatgrass | | | | | |
| Sourdough Bluejoint | | | | | |
| Alyeska Polar Grass | | | | | |
| Manchar Brome | | | | | |
| Alaskaland Red Clover | | | | | |
| Aurora Alsike Clover | | | | | |
| White Dutch Clover | | | | | |
| | | | | | |
| Beaver Alfalfa | Drylander Alfalfa | Anik Alfalfa | Peace Alfalfa | Vernal Alfalfa | Altaswede Red Clover |

< 01 >

Figure 2.

Advanced evaluation plots are evaluated at least once a year. The accessions are rated for vigor, percent stand, and numerous other factors such as hardiness, disease-resistance, and related characteristics. However, we have found that vigor and percent stand give a reliable indication of how the different accessions compare with each other. Figure 3 is an example of the evaluation sheets that will be presented in this report. The following numbers, followed by brief explanations, correspond to numbers on the example evaluation sheet:

1. Location and title of evaluation plot.
2. Number of evaluation blocks--This number may range from one to three blocks.
3. Year of Record--the year that evaluation data was collected.
4. Vigor--this number can range from one to nine. One is best and nine is the worst rating. If possible, this rating is determined by comparison with other accessions of the same species. The rating is based on color, height, health, flowering and/or seed production, and on the evaluator's knowledge of the plant, and its expected performance. If more than one block is planted, this number will be an average of the ratings for each block.

| 1 | 3 | | | | | | | | | |
|----|-----------------------------|---|---|--|--|--|--|--|--|----|
| | 2 # of Blocks | 4 | 5 | | | | | | | |
| 1 | 6 | | | | | | | | | 1 |
| 2 | 'Merion' Kentucky Bluegrass | | | | | | | | | 2 |
| 3 | 'Banff' Kentucky Bluegrass | | | | | | | | | 3 |
| 4 | 'Park' Kentucky Bluegrass | | | | | | | | | 4 |
| 5 | etc. | | | | | | | | | 5 |
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| 50 | | | | | | | | | | 50 |
| 51 | | | | | | | | | | 51 |
| 52 | | | | | | | | | | 52 |

Figure 3. Sample Advanced Evaluation Page.

5. Percent Stand--this number represents the percentage of the ground that is covered by the accession. Only live plant material is included; litter from previous year's growth and other species are not included. If more than one block is planted, this number will be an average of the ratings for each block.

6. The accession that is being rated. The accession is identified by its varietal and common name or its common name and its accession number.

Results

By August 28, 1984, all of the accessions had germinated and produced measureable stands with the exception of 'Garrison' Creeping Foxtail and 'Fults' Alkaligrass. The plots were again evaluated on September 9, 1985, and as expected some accessions had winterkilled.

By the final evaluation on September 24, 1986, 'Nugget' Kentucky Bluegrass, Alpine Bluegrass, Rough Fescue, 'Vantage' Reed Canarygrass, 'Norcoast' Bering Hairgrass, Beach Wildrye 345978, 'Sourdough' Bluejoint, 'Boreal' and 'Arctared' Red Fescue, 'Alyeska' Polar Grass, and Tellesy Sage had performed the best.

Surprisingly, Beach Wildrye, a coastal species survived this Interior location. The Beach Wildrye is a PMC selection and a very common coastal species in Alaska and much less common in the Interior. See Figure 4 for complete year by year detail.

In the demonstration planting of recommended varieties from The Revegetative Guide For Alaska, 'Arctared' Red Fescue, 'Sourdough' Bluejoint, and 'Alyeska' Polar Grass outperformed all the other varieties of grass in all the categories. Alsike Clover and Alaskaland Red Clover were the only legumes to maintain a stand, although they did not perform as well as would be expected. Alsike and Alaskaland Red Clover survived until 1986. 'Garrison' Creeping Foxtail, 'Sodar' Slender Wheatgrass, and 'Durar' Hard Fescue did not survive. White Dutch Clover, another recommended variety for the Interior, also failed to survive.

The five varieties of alfalfa and one variety of red clover planted at the request of John Dart, died out by September 1985.

The Ruby plots varied from plots established elsewhere as they included grain plantings. Yields were low for barley and wheat and will probably continue to be low until fertility or chemistry problems are corrected (See Appendix I for detailed soil analysis by George Mitchell and Chin Lu Ping). Barley yields were very low: 'Thual' - 5.8 bu/a, 'Datal' - 5.2 bu/a, and 'Otal' - 5.2 bu/a. Wheat was equally low: 'Nogal' - 10 bu/a, and 'Ingal' - 2.2 bu/a. 'Toral' oats produced a respectable 73 bu/a.

| Ruby | | 84 | 85 | 86 | | | | |
|------|---|----|-----|----|-----|---|-----|----|
| | 3 Blocks of Plantings | | | | | | | |
| 1 | 'Nugget' Kentucky Bluegrass | 2 | 88 | 2 | 85 | 2 | 90 | 1 |
| 2 | 'Merion' Kentucky Bluegrass | 2 | 77 | - | - | - | - | 2 |
| 3 | 'Banff' Kentucky Bluegrass | 6 | 80 | - | - | - | - | 3 |
| 4 | 'Park' Kentucky Bluegrass | 2 | 97 | - | - | - | - | 4 |
| 5 | 'Sydsport' Kentucky Bluegrass | 2 | 82 | 9 | 20 | 9 | 20 | 5 |
| 6 | 'Fylking' Kentucky Bluegrass | 2 | 93 | 8 | 27 | - | - | 6 |
| 7 | 'Troy' Kentucky Bluegrass | 6 | 55 | - | - | - | - | 7 |
| 8 | Big Bluegrass 387931 | 4 | 60 | 5 | 58 | 4 | 38 | 8 |
| 9 | 'Sherman' Big Bluegrass | 2 | 77 | - | - | - | - | 9 |
| 10 | 'Canbar' Canby Bluegrass | 4 | 77 | - | - | - | - | 10 |
| 11 | 'Reubans' Canada Bluegrass | 4 | 80 | 7 | 12 | 7 | 20 | 11 |
| 12 | 'Tundra' glaucus Bluegrass | 3 | 97 | 3 | 95 | - | - | 12 |
| 13 | Glaucus Bluegrass T08867 | 1 | 100 | 1 | 100 | 4 | 58 | 13 |
| 14 | Alpine Bluegrass 235492, 236892 * | 2 | 95 | 1 | 100 | 1 | 80 | 14 |
| 15 | 'Sodar' Streambank wheatgrass | 2 | 97 | - | - | - | - | 15 |
| 16 | Bearded wheatgrass 371698 | 3 | 83 | 1 | 100 | 3 | 70 | 16 |
| 17 | Bearded wheatgrass 236693 | 4 | 93 | - | - | - | - | 17 |
| 18 | 'Nordan' Crested wheatgrass | 4 | 67 | - | - | - | - | 18 |
| 19 | 'Fairway' Crested wheatgrass | 6 | 67 | - | - | - | - | 19 |
| 20 | 'Summit' Crested wheatgrass | 4 | 87 | - | - | - | - | 20 |
| 21 | Violet wheatgrass T12050 | 2 | 100 | 2 | 100 | 4 | 58 | 21 |
| 22 | Boreal wheatgrass T12048 | 1 | 100 | 2 | 93 | 3 | 60 | 22 |
| 23 | Yukon wheatgrass T12051 | 1 | 100 | 1 | 95 | 5 | 40 | 23 |
| 24 | 'Critana' Thickspike wheatgrass | 2 | 100 | - | - | - | - | 24 |
| 25 | 'Fults' Alkaligrass | - | - | - | - | - | - | 25 |
| 26 | 'Vantage' Reed Canarygrass | 1 | 100 | 2 | 95 | 2 | 90 | 26 |
| 27 | 'Engmo' timothy | 4 | 100 | 4 | 85 | 5 | 60 | 27 |
| 28 | 'Climax' timothy | 1 | 100 | 5 | 81 | - | - | 28 |
| 29 | Beach wildrye 345978 | 1 | 73 | 2 | 83 | 2 | 63 | 29 |
| 30 | Siberian wildrye 345600 | 2 | 100 | 3 | 100 | 3 | 80 | 30 |
| 31 | Siberian wildrye 2144 | 3 | 100 | 8 | 60 | 9 | 53 | 31 |
| 32 | Siberian wildrye 1996 | 7 | 43 | 8 | 43 | - | - | 32 |
| 33 | 'Norcoast' Bering hairgrass | 1 | 100 | 1 | 100 | 2 | 90 | 33 |
| 34 | Tufted hairgrass 372690 | 2 | 100 | 1 | 100 | 3 | 53 | 34 |
| 35 | Bluejoint | 1 | 100 | 3 | 100 | 3 | 90 | 35 |
| 36 | 'Sourdough Bluejoint | 2 | 97 | 1 | 100 | 2 | 100 | 36 |
| 37 | Meadow foxtail | 3 | 97 | 6 | 68 | 6 | 60 | 37 |
| 38 | Geniculated foxtail 314565 | 1 | 100 | - | - | - | - | 38 |
| 39 | Garrison Creeping foxtail | - | - | - | - | - | - | 39 |
| 40 | 'Arctared' Creeping red fescue | 2 | 100 | 1 | 100 | 1 | 100 | 40 |
| 41 | 'Boreal' Creeping red fescue | 2 | 97 | 2 | 100 | 2 | 90 | 41 |
| 42 | 'Pennlawn' Creeping red fescue | 4 | 83 | 3 | 95 | 3 | 75 | 42 |
| 43 | Rough fescue 236849 * | 1 | 100 | 5 | 80 | 2 | 80 | 43 |
| 44 | American Sloughgrass T12053 | 2 | 73 | 1 | 100 | 5 | 40 | 44 |
| 45 | 'Durar' Hard fescue | 7 | 40 | 8 | 27 | - | - | 45 |
| 46 | 'Highlight' Sheep fescue | 2 | 90 | 7 | 43 | 5 | 43 | 46 |
| 47 | 'Covar' Sheep fescue | 7 | 50 | - | - | - | - | 47 |
| 48 | 'Manchar' Smooth Brome | 5 | 90 | 4 | 100 | 5 | 53 | 48 |
| 49 | 'Carlton' Smooth Brome | 6 | 73 | 7 | 100 | 7 | 53 | 49 |
| 50 | 'Alyeska' Polar grass | 2 | 97 | 1 | 100 | 1 | 100 | 50 |
| 51 | Telley Sage T12052 | 2 | 97 | 3 | 100 | 1 | 85 | 51 |
| | All evaluations based on averages of three replications unless otherwise noted. | | | | | | | 52 |
| | * Based on two plots. | | | | | | | |

Figure 4.

'Bebral' Rye and 'Candle' Rape were also planted. The rye did not survive and the rape was removed. This yield data was collected by John Dart and does not address grain quality.

Conclusions and Recommendations

The Ruby Farm has been closed down and the plots will not be evaluated again. While only three years of evaluation data has been obtained, this information is very valuable. It is quite possible that future non-agricultural development will occur in this region. Mining and construction activities will require revegetation for erosion control and reclamation. Information from this report should be a guide as to which species should perform the best.

All the following conclusions and recommendations are based on survival and performance. None of the plots were cut or harvested in any manner, therefore, no yield data or recovery rates have been determined. This is an important factor to consider if this data is used for agricultural application.

- 1) If range or pasture seedings are attempted in the Ruby (Lower Yukon River) area, 'Alyeska' Polar grass or 'Arctared' Red Fescue should be used. Second choices for species or cultivars could be 'Boreal' Red Fescue, 'Sourdough' Bluejoint, or 'Norcoast' Hairgrass.

- 2) For revegetation after construction activities or mining disturbances, the following species and varieties should be used: 'Nugget' Kentucky Bluegrass, 'Sourdough' Bluejoint, 'Alyeska' Polar grass, 'Norcoast' Bering Hairgrass, and 'Arctared' Red Fescue or 'Boreal' Red Fescue ('Pennlawn' Red Fescue would be a poor third choice for Red Fescue). Alsike Clover could be added as a small portion of a mix for temporary cover or diversity. A mixture of 'Norcoast' Bering Hairgrass and 'Arctared' Red Fescue and 'Alyeska' Polar grass would seem to be ideal for revegetation.
- 3) Further evaluation of Beach Wildrye 345978, Alpine Bluegrass 235491 (released as 'Gruening' Alpine Bluegrass), and Tellesy Sage should be conducted in the region. Initial results indicate that these collections will perform very well in this area.

APPENDIX I. Soil Analysis Results From Agricultural & Forestry Experiment Station, University of Alaska.

George Mitchell
 Samples Received 9/84

pH, Buffer pH, N, P, K
Ca, Mg

| AES # | | | | |
|--------|--------------------------------|--------------------------------------|-------|--------|
| 550002 | Ruby - 2 mile | poor | 0-1" | 9/7/84 |
| 3 | " " | " | 1-2 | |
| 4 | " " | " | 2-4 | |
| 5 | " " | " | 4-7 | |
| 6 | " " | " | 7-10 | |
| 7 | " " | good | 0-1 | |
| 8 | " " | | 1-2 | |
| 9 | " " | | 2-4 | |
| 10 | " " | | 4-7 | |
| 11 | " " | | 7-13 | |
| 12 | " " | | 13-20 | |
| 13 | " " | 10 acre poor barley growth, | 0-6" | |
| 14 | " " | 2 1/2 acre Galt barley, good growth, | 0-6" | |
| 15 | " (A), 1/10 acre, good growth, | | 0-6" | |
| 16 | " (A), 1/10 acre, poor growth, | | 0-6" | |
| 17 | " (B), 1/10 acre, good growth, | | 0-6" | |
| 18 | " (B), 1/10 acre, poor growth, | | 0-6" | |

| SOIL SAMPLE Depth | pH | ppm-N NH ₄ | ppm-N NO ₃ | ppm-N Total | ppm-P | ppm-K | ppm-Ca | ppm-Mg | Buffer pH | % Total N | % Total P | % Loss on Ignition |
|----------------------|------|--------------------------|--------------------------|----------------|-------|-------|--------|--------|--------------|--------------|--------------|--------------------------|
| 2 0-1" | 5.21 | 85.0 | 39.5 | 124.5 | 14.7 | 40. | 158. | 21.6 | 6.19 | | | |
| 3 1-2 | 5.07 | 95.0 | 39.4 | 134.4 | 13.2 | 38. | 148. | 18.1 | 6.19 | | | |
| 4 2-4 | 5.09 | 152.0 | 51.0 | 203.0 | 12.3 | 35. | 145. | 18.8 | 6.29 | | | |
| 5 4-7 | 5.74 | 216.0 | 28.7 | 244.7 | 17.0 | 36. | 141. | 19.8 | 6.38 | | | |
| 6 7-10 | 5.63 | 3.5 | 1.1 | 4.6 | 12.3 | 16. | 453. | 125.0 | 6.65 | | | |
| 7 0-1 | 5.87 | 83.2 | 4.0 | 87.2 | 16.6 | 23. | 384. | 93.4 | 6.60 | | | |
| 8 1-2 | 5.31 | 49.1 | 24.8 | 73.9 | 16.8 | 10. | 380. | 91.6 | 6.48 | | | |
| 9 2-4 | 5.67 | 17.1 | 11.4 | 28.5 | 11.9 | 10. | 524. | 134.0 | 6.66 | | | |
| 10 4-7 | 5.84 | 3.1 | <.1 | 3.1 | 12.3 | 15. | 589. | 142.0 | 6.80 | | | |
| 11 7-13 | 6.18 | 2.0 | 0.3 | 2.3 | 9.3 | 20. | 817. | 280.0 | 7.00 | | | |
| 12 13-20 | 6.37 | 2.0 | <.1 | 2.0 | 9.2 | 19. | 927. | 261.0 | 7.13 | | | |
| 13 0-6 | 5.14 | 12.3 | 0.5 | 12.8 | 7.5 | 26. | 142. | 29.2 | 5.46 | | | |
| 14 0-6 | 5.55 | 3.1 | 2.5 | 5.6 | 22.6 | 29. | 681. | 152.0 | 6.72 | | | |
| 15 0-6 | 5.23 | 4.1 | 6.5 | 10.6 | 35.6 | 50. | 323. | 84.2 | 5.88 | | | |

APPENDIX II

Cooperators

Yukon-Koyukuk School District

Students of Ruby

Soil Conservation Service

Costs

| <u>Date</u> | <u>Activity</u> | <u>Travel</u> | <u>Per Diem</u> | <u>Other</u> |
|-------------|------------------|---------------|-----------------|--------------|
| 5-20-84 | Plant Site | 0 | 0 | 186.00 |
| 8-28-84 | Evaluate & Clean | 267.00 | 0 | 0 |
| 9-9-85 | Evaluate | 320.00 | 0 | 0 |
| 9-24-86 | Evaluate | <u>440.00</u> | <u>80.00</u> | <u>0</u> |
| | Sub Totals | \$ 1,036.00 | \$ 80.00 | \$ 186.00 |

Total \$ 1,292.00