

Final Report of Initial Demonstration
and Advanced Conservation Plantings
at the Kalsin Bay Evaluation Plot
on Kodiak Island, 1982 - 1986

Prepared by

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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 purpose 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 so that a plant's adaptability and range of suitability can be determined. If the plant does well at this stage it may be released as a new cultivar.

The second purpose provides an opportunity to establish 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 or DC a "classroom" where specific plant materials may be viewed and worked with by local farmers, students, and other groups interested in farming or gardening.

The PMC has been conducting evaluation on Kodiak Island plots since 1980. The initial trial was conducted on a ranch near Narrow Cape south of the City of Kodiak. The plot was not adequately protected from livestock and failed.

Continued interest from the Kodiak Soil and Water Conservation District, and the Soil Conservation Service, USDA, induced the Plant Materials Center to establish a large well protected plot on Kodiak Island. Because of the long term plans for this plot, the cooperators decided that public land should be used. The site also needed to be in an area with soils and weather fairly typical of Kodiak. The only available land that fit these criteria was the site of the former Kalsin Bay Agricultural Station, owned by the University of Alaska, located 32 miles south of the City of Kodiak. In June, 1982, permission to use the five acres on the site was granted by the University of Alaska Agricultural Experiment Station.

Management History:

On July 15, 1982, clearing and fencing started. Within five days the four-acre site was cleared of all debris and fenced cattle-tight. This was accomplished by one Soil Conservation Service employee and one Plant Materials Center employee. Immediately after fencing, the site was sprayed with the broad spectrum contact herbicide Roundup (no endorsement implied) at the rate of one gallon per acre.

On August 8, 1982, two Alaska Plant Materials Center employees transported a tractor and rotovator to Kodiak to prepare the site. The herbicide application had been effective, most vegetation except lupine and a few willow were dead and the site was able to be prepared.

Transportation of Plant Materials Center equipment back and forth to the site became expensive and an unexpected cost of the Kodiak plot. In order to reduce costs and assure that equipment would be available, the PMC acquired at no cost, a federal surplus tractor through the Soil Conservation Service. This tractor was stationed at Kodiak.

Methods

In June of 1983, 50 accessions of advance test plant material were planted. The complete 1983 array of accessions (Figure 1), with the exception of Glaucus Bluegrass T08867 and Alpine Bluegrass 235491, was replicated three times at the Kodiak plot. The Glaucus Bluegrass and Alpine Bluegrass were each planted once because seed supply was limited.

Typical Plot Layout

<-----> 10' <----->	
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	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
Fulst 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	Pumpelly Brome

4'

Figure 1. Typical Plot Layout

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.

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 20' x 60' block. The demonstration area contained the 13 varieties. Each variety was grown in two soil pH levels and three fertilizer regimes. To achieve the two pH levels, each block was divided in half. One half received lime at the rate of 3,050 lb/a; the other received none. It was determined that 3,050 pounds of lime per acre would raise the pH from the approximate 5.5 that existed in the unamended soil to a pH near 7.0 or one more tolerable to traditional agriculture species. Random soil samples were taken prior to plot establishment. The block was then 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 Kodiak ranchers, the PMC also planted five varieties of Alfalfa, three varieties of Brome, and one variety of Red Clover (Figure 3). These species prefer more alkaline soils than those found in the plot so the plots were limed at a rate of 3,050 lb/a.

Demonstration Planting

	0 Fertilizer	240 lb. 20-20-10 per acre	480 lb. 20-20-10 per acre	
Arctared	---	---	---	Lime (L) No Lime (0)
Boreal	---	---	---	L 0
Durar	---	---	---	L 0
Nugget	---	---	---	L 0
Park	---	---	---	L 0
Merion	---	---	---	L 0
Norcoast	---	---	---	L 0
White Dutch Clover	---	---	---	L 0
Alsike Clover	---	---	---	L 0
Engmo	---	---	---	L 0
Garrison	---	---	---	L 0
Meadow Foxtail	---	---	---	L 0
Vantage	---	---	---	L 0

| < 20' > |

Figure 2.

Entire plot limed at 3,050 lb./acre.

0 Fertilizer	240 lb. 20-20-10 per acre	480 lb. 20-20-10 per acre	^ 10' v
	Manchar Brome		
	Carlton Brome		
	Polar Brome		
	Dry Lander Alfalfa		
	Peace Alfalfa		
	Vernal Alfalfa		
	Beaver Alfalfa		
	Anik Alfalfa		
	Altaswede Red Clover		
<	60'	>	

Legume & Brome Plot.

Figure 3.

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 4 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.

	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
6										6
7										7
8										8
9										9
10										10
11										11
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52										52

Figure 4. 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 September 21, 1983, all of the accessions had germinated and produced measureable stands. The plots were again evaluated on June 6, 1984, and as expected some accessions had winterkilled. By August 26, 1985, the weaker survivors of the previous years had died out. Competition with the native hairgrass probably contributed to the death of some of the accessions.

By the final evaluation on September 8, 1986, 'Nugget' Kentucky bluegrass, Rough Fescue, 'Vantage' Reed Canarygrass, and 'Norcoast' Bering hairgrass performed the best.

Other accessions that performed very well were 'Boreal' Red Fescue, and 'Merion' Kentucky Bluegrass. Surprisingly, Beach Wildrye, Meadow Foxtail, 'Durar' Hard Fescue, and 'Garrison' Creeping Foxtail failed to survive. 'Garrison', Meadow Foxtail, and 'Durar' are recommended by The Revegetative Guide for Alaska. The Beach Wildrye is a PMC selection and a very common species on Kodiak. The poor performance of this species can probably be attributed, in part, to the severe competition from the native hairgrass. See Figure 5 for complete year by year detail.

In the demonstration planting of recommended varieties from The Revegetative Guide For Alaska, 'Boreal' Red Fescue, 'Norcoast' Bering Hairgrass, and 'Nugget' Kentucky Bluegrass outperformed all the other varieties of grass in all the categories. Alsike Clover was the only legume to produce a stand, although it did not perform as well as would be expected. Alsike survived until 1985. Once again, 'Garrison' Creeping Foxtail and 'Durar' did not survive. Meadow Foxtail only survived in the plot that was not limed. White Dutch Clover, another recommended variety for Kodiak, also failed to survive.

The five varieties of alfalfa and one variety of red clover planted at the request of Kodiak ranchers, died by September 1984. Of the three varieties of brome that were planted, Polar performed the best. It must be remembered that these plots were heavily limed.

Kodiak	3 Blocks of Plantings	83		84		85		86		
		vigor	stand	vigor	stand	vigor	stand	vigor	stand	
1	'Nugget' Kentucky Bluegrass	2	98	4	100	4	80	1	100	1
2	'Merion' Kentucky Bluegrass	4	100	5	47	5	50	3	67	2
3	'Banff' Kentucky Bluegrass	4	70	6	73	7	33	5	67	3
4	'Park' Kentucky Bluegrass	4	70	9	20	8	15	7	20	4
5	'Sydsport' Kentucky Bluegrass	2	100	7	23	7	22	7	33	5
6	'Fylking' Kentucky Bluegrass	3	93	5	67	5	56	5	47	6
7	'Troy' Kentucky Bluegrass	3	97	8	33	-	-	-	-	7
8	Big Bluegrass 387931	4	100	8	23	-	-	-	-	8
9	'Sherman' Big Bluegrass	1	100	-	-	-	-	-	-	9
10	'Canbar' Canby Bluegrass	4	90	8	27	-	-	-	-	10
11	'Reubans' Canada Bluegrass	1	100	5	63	-	-	-	-	11
12	'Tundra' glaucus Bluegrass	5	63	-	-	-	-	-	-	12
13	Glaucus Bluegrass T08867	*	3	100	3	100	3	60	-	13
14	Alpine Bluegrass 235491	*	3	70	1	100	-	-	-	14
15	'Sodar' Streambank wheatgrass	2	97	-	-	-	-	-	-	15
16	Bearded wheatgrass 371698	5	87	-	-	-	-	-	-	16
17	Bearded wheatgrass 236693	3	93	-	-	-	-	-	-	17
18	'Nordan' Crested wheatgrass	2	93	-	-	-	-	-	-	18
19	'Fairway' Crested wheatgrass	4	90	-	-	-	-	-	-	19
20	'Summit' Crested wheatgrass	4	73	-	-	-	-	-	-	20
21	Violet wheatgrass T12050	3	100	-	-	-	-	-	-	21
22	Boreal wheatgrass T12048	3	97	-	-	-	-	-	-	22
23	Yukon wheatgrass T12051	2	100	-	-	-	-	-	-	23
24	'Critana' Thickspike wheatgrass	1	100	-	-	-	-	-	-	24
25	'Fults' Alkaligrass	5	47	-	-	-	-	-	-	25
26	'Vantage' Reed Canarygrass	2	100	2	90	2	90	1	100	26
27	'Engmo' timothy	4	100	6	97	7	30	8	12	27
28	'Climax' timothy	2	97	7	67	5	33	9	7	28
29	Beach wildrye 345978	5	13	-	-	-	-	-	-	29
30	Siberian wildrye 345600	1	100	6	83	-	-	-	-	30
31	Siberian wildrye 2144	2	97	-	-	-	-	-	-	31
32	Siberian wildrye 1996	5	23	-	-	-	-	-	-	32
33	'Norcoast' Bering hairgrass	2	100	7	47	3	74	1	100	33
34	Tufted hairgrass 372690	2	97	4	92	6	33	5	70	34
35	Bluejoint	4	97	6	88	7	61	9	10	35
36	'Sourdough' Bluejoint	3	93	5	63	5	63	5	6	36
37	Meadow foxtail	2	100	-	-	-	-	-	-	37
38	Geniculated foxtail 314565	1	100	8	33	-	-	-	-	38
39	Garrison Creeping foxtail	5	67	-	-	-	-	-	-	39
40	'Arctared' Creeping red fescue	4	100	7	60	7	65	5	100	40
41	'Boreal' Creeping red fescue	1	100	2	100	4	75	1	100	41
42	'Pennlawn' Creeping red fescue	2	100	4	87	6	60	3	93	42
43	Rough fescue 236849	2	100	1	100	1	100	1	100	43
44	American Sloughgrass T12053	5	93	-	-	-	-	-	-	44
45	'Durar' Hard fescue	4	73	8	30	-	-	-	-	45
46	'Highlight' Sheep fescue	2	100	6	60	-	-	-	-	46
47	'Covar' Sheep fescue	4	83	-	-	-	-	-	-	47
48	'Manchar' Smooth Brome	2	100	6	50	7	43	7	27	48
49	'Carlton' Smooth Brome	4	100	5	73	5	63	8	30	49
50	'Alyeska' Polar grass	2	93	-	-	-	-	-	-	50
51	Telley Sage T12052									51
	All evaluations based on averages of three replications unless otherwise noted.									52
	* Based on 1 plot.									

Figure 5.

Conclusions & Recommendations

Native hairgrass competition within the plots became a serious problem. Discovery of this problem has provided useful information on the potential difficulties for establishing any future range or pasture seedings on Kodiak Island. Prior to planting, the PMC used a good herbicide (Roundup) to kill existing vegetation. The resulting kill was very good, and still the native grasses produced an excellent stand from seed remaining in the soil. It appears that costly herbicide application will be necessary to establish and maintain good introduced pastures or large scale introduced range seedings. A more economical and cost-effective method of range or pasture improvement would seem to be management of native rangeland. This subject is worthy of additional investigation since these comments are based on limited observations.

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 on Kodiak Island, 'Norcoast' Bering Hairgrass or 'Boreal' Red Fescue should be used. Second choices for species or cultivars could be Meadow Foxtail, 'Vantage' Reed Canarygrass, 'Nugget' Kentucky Bluegrass, or 'Engmo' Timothy.

2) For revegetation after construction activities or other major disturbances, the following species and varieties should be used: 'Nugget' or 'Merion' Kentucky Bluegrass, 'Vantage' Reed Canarygrass, 'Norcoast' Bering Hairgrass, and 'Boreal' or 'Pennlawn' Red Fescue (Arctared Red Fescue would be a 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 'Boreal' Red Fescue would seem to be ideal for revegetation.

3) It is also recommended that 'Durar' Hard Fescue, 'Garrison' Creeping Foxtail, and all clovers be dropped from The Revegetative Guide for Alaska, as possible cultivars for Kodiak as they appear to be unsuitable.

Cooperators:

- ° Soil Conservation Service, USDA
- ° Cooperative Extension Service, U of A
- ° Alaska Dept. of Transportation
- ° Kodiak Soil Conservation District
- ° Lucky Horse Shoes 4-H

Costs

KODIAK				
Date	Activity	Travel	Per diem	Other
6/7/82	Select site	184.00	397.00	14.00
7/15/82	Fence & Herbicide	314.00	450.00	520.00
8/8/82	Rotovate	390.00	640.00	20.00
5/31/83	Plant site, take John Deere	805.00	600.00	420.00
9/26/83	Sign and Evaluate	312.00	425.00	
6/11/84	Rototill & Evaluate	314.00	335.00	
9/23/84	Rotovate & Evaluate	824.00	820.00	
8/26/85	Evaluate	50.00	240.00	
9/7/86	Evaluate & Close Down	<u>180.00</u>	<u>240.00</u>	<u> </u>
	Total as of 12/86	3,373.00	4,047.00	974.00
	\$8394.00			

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

SOIL SAMPLE	pH	ppm-N NH ₄	ppm-N NO ₃	ppm-N Total	ppm-P	ppm-K	ppm-Ca	ppm-Mg	ppm-Na	% Total N	% Total P	% Loss on Ignition
1	5.71	8.0	8.0	16.0	14.5	36.						4.09
2	5.51	5.5	13.6	19.1	11.0	43.						3.85
3	5.52	6.0	21.2	27.2	12.2	35.						4.56