

Final Report on the Evaluation of  
Advanced Conservation Grasses  
at Terror Lake Hydro Electric Project  
on Kodiak Island, Alaska  
1983 - 1987

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## Index

	<u>Page</u>
Introduction . . . . .	1
Purpose . . . . .	1
Methods . . . . .	2
Results . . . . .	7
Conclusions & Recommendations . . . . .	11
Appendix	
Costs . . . . .	13

## Introduction:

The North Latitude Revegetation and Seed Project at the Alaska Plant Materials Center (PMC), a section of the Alaska Department of Natural Resources, is responsible for developing new plant varieties (cultivars) for land reclamation, habitat enhancement, and erosion control. In addition to the development of new plant varieties, this project also is responsible for developing techniques for erosion control and reclamation, and to provide technical assistance to industry so that this technology is properly used. In order to accomplish these goals, it is beneficial for the PMC to work with industry. Resource extraction or construction industries usually have disturbances on which these new varieties or techniques can be tested and demonstrated.

## Purpose:

Mining and Industrial Evaluation Plots are usually designed for reclamation and/or erosion control and are located in diverse geographical and ecological locations. The plots are developed in a manner consistent with the cooperators' intended final management practice, i.e., "Fertilize it once and forget about it." The practice of minimal maintenance is generally necessary for industry to eliminate costly yearly maintenance programs. Therefore, the plots are established with minimal surface preparation and are fertilized only at the time of planting. The plantings are then evaluated for their ability to survive on these harsh sites with no maintenance. Topsoil is not used, and the plantings are made on the substrate that is expected to be available when reclamation occurs.

These plots also serve as an advanced evaluation of plant materials that have been selected at the PMC for their outstanding performance. In addition, the program also evaluates new techniques for planting and maintenance which may make the entire reclamation or erosion control process more cost effective.

The cooperator is allowed to set some of the parameters in the testing procedures, so that the test will provide useful data for the cooperator's particular conditions or regulatory guidelines. These plots also allow the PMC to make meaningful recommendations when similar conditions are encountered by someone other than the original cooperator. This class of evaluation plots probably provides the most important and useful information to the North Latitude Revegetation and Seed Project.

#### Methods

The United States Fish and Wildlife Service and the Alaska Power Authority requested plots to determine what should be used in future erosion control or revegetation projects at the site.

On June 8, 1983, two plots were planted within Terror Lake hydro electric's construction zone. The first plot was a low elevation (80 feet above sea level) site. The soil consisted of a sandy silt gravel. The second plot was located at 1,900 feet in elevation. This site consisted of rocky spoil.

Both plots contained a modified 1983 array of accessions. Some accessions were not planted because they had performed poorly at other sites and space was limited (Figure 1). Each plot was hand-seeded with pre-measured amounts of seed. The seeding rate for each plot was approximately 40 pounds per acre. Following seeding, the 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 the plots were seeded and fertilized, the area was raked by hand to incorporate the seed and fertilizer.

Final evaluation occurred on August 11, 1987.

Layout of Terror Lake Plots

Nugget Kentucky Bluegrass	Merion Kentucky Bluegrass
Park Kentucky Bluegrass	Banff Kentucky Bluegrass
Poa ampla	Sherman Big Bluegrass
Tundra Bluegrass	Poa alpina
Poa glauca T08867	Violet Wheatgrass
Boreal Wheatgrass	Yukon Wheatgrass
Fults Alkaligrass	Vantage Reed Canarygrass
Engmo Timothy	Climax Timothy
Elymus arenarius	Elymus sibiricus 345600
Elymus sibiricus 2144	Elymus sibiricus 1996
Deschampsia caespitosa	Norcoast Bering Hairgrass
Sourdough Bluejoint	Calamagrostis canadensis Delta
Alopecurus geniculatus	Meadow Foxtail
Garrison Creeping Foxtail	Arctared Red Fescue
Boreal Red Fescue	Festuca scabrella
Pennlawn Red Fescue	Highlight Red Fescue
Covar Sheep Fescue	Durar Hard Fescue
Alyeska Polargrass	Beckmannia

Figure 1.

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 are reliable indicators of how the different accessions compare with each other.

Figure 2 is an example of the evaluation sheets that will be presented in this report and can be found on page nine. 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
6								6
7								7
8								8
9								9
10								10
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50								50
51								51
52								52

Figure 2. 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

The first evaluation occurred on September 22, 1983. This evaluation indicated that all the accessions except 'Banff' Kentucky Bluegrass, Garrison Creeping Foxtail, and Fults Alkaligrass, became established.

Additional evaluations were conducted on August 27, 1985, and August 11, 1987. Abbreviated evaluation notes can be located on Figures 3 and 4.

Evaluations were attempted in 1984 and 1986 but weather prevented departures from the Kodiak airport.

The Terror Lake plots suffered more mortality than any other plot planted to date. Only 25 percent of the accessions planted survived until 1985; that is for two years. Those accessions that did survive, for the most part continued to show very good to excellent performance until the final evaluation in 1987.

High mortality was also reported for the Kalsin Bay evaluation plots on Kodiak. The Kalsin Bay results have been published in a separate report.

Based on the 22 plot years observed on Kodiak between Terror Lake and Kalsin Bay, there appears to be a limited amount of species suitable for revegetation.

Terror Lake Lower Elevation 80'		83		85		87			
	1 Block of Plantings	vigor	stand %	vigor	stand %	vigor	stand %		
1	'Nugget' Kentucky Bluegrass	5	20	-	-	-	-		1
2	'Merion' Kentucky Bluegrass	3	30	-	-	-	-		2
3	'Banff' Kentucky Bluegrass	-	-	-	-	-	-		3
4	'Park' Kentucky Bluegrass	7	10	-	-	-	-		4
5	'Sydsport' Kentucky Bluegrass						NOT PLANTED		5
6	'Fylking' Kentucky Bluegrass						NOT PLANTED		6
7	'Troy' Kentucky Bluegrass						NOT PLANTED		7
8	Big Bluegrass 387931	5	10	-	-	-	-		8
9	'Sherman' Big Bluegrass	-	-	-	-	-	-		9
10	'Canbar' Canby Bluegrass						NOT PLANTED		10
11	'Reubans' Canada Bluegrass						NOT PLANTED		11
12	'Tundra' glaucus Bluegrass	3	30	-	-	-	-		12
13	Glaucus Bluegrass T08867	5	10	-	-	-	-		13
14	Alpine Bluegrass 235492, 236892	1	50	-	-	-	-		14
15	'Sodar' Streambank wheatgrass						NOT PLANTED		15
16	Bearded wheatgrass 371698						NOT PLANTED		16
17	Bearded wheatgrass 236693						NOT PLANTED		17
18	'Nordan' Crested wheatgrass						NOT PLANTED		18
19	'Fairway' Crested wheatgrass						NOT PLANTED		19
20	'Summit' Crested wheatgrass						NOT PLANTED		20
21	Violet wheatgrass T12050	3	60	-	-	-	-		21
22	Boreal wheatgrass T12048	7	30	-	-	-	-		22
23	Yukon wheatgrass T12051	5	50	-	-	-	-		23
24	'Critana' Thickspike wheatgrass						NOT PLANTED		24
25	'Fults' Alkaligrass	-	-	-	-	-	-		25
26	'Vantage' Reed Canarygrass	3	70	1	100	1	100		26
27	'Engmo' timothy	3	40	-	-	-	-		27
28	'Climax' timothy	3	30	-	-	-	-		28
29	Beach wildrye 345978	1	40	-	-	-	-		29
30	Siberian wildrye 345600	3	70	-	-	-	-		30
31	Siberian wildrye 2144	5	40	-	-	-	-		31
32	Siberian wildrye 1996	5	10	-	-	-	-		32
33	'Norcoast' Bering hairgrass	3	70	1	100	3	100		33
34	Tufted hairgrass 372690	1	100	3	75	1	100		34
35	Bluejoint	1	90	1	100	1	100		35
36	'Sourdough' Bluejoint	3	80	1	100	3	80		36
37	Meadow foxtail	5	30	-	-	-	-		37
38	Geniculated foxtail 314565	1	100	-	-	-	-		38
39	Garrison Creeping foxtail	-	-	-	-	-	-		39
40	'Arctared' Creeping red fescue	7	20	5	75	1	100		40
41	'Boreal' Creeping red fescue	1	100	1	100	1	100		41
42	'Pennlawn' Creeping red fescue	3	90	3	100	5	80		42
43	Rough fescue 236849	1	100	1	100	7	75		43
44	American Sloughgrass T12053	5	10	-	-	-	-		44
45	'Durar' Hard fescue	7	10	-	-	-	-		45
46	'Highlight' Sheep fescue	5	75	-	-	-	-		46
47	'Covar' Sheep fescue	-	-	-	-	-	-		47
48	'Manchar' Smooth Brome						NOT PLANTED		48
49	'Carlton' Smooth Brome						NOT PLANTED		49
50	'Alyeska' Polar grass	3	90	-	-	-	-		50
51	Tileys Sage T12052						NOT PLANTED		51
52									52

Figure 3.

	1 Block of Plantings	vigor	stand	%	vigor	stand	%	vigor	stand	%		
1	'Nugget' Kentucky Bluegrass	3	80		-	-	-	-	-	-		1
2	'Merion' Kentucky Bluegrass	5	30		-	-	-	-	-	-		2
3	'Banff' Kentucky Bluegrass	5	20		-	-	-	-	-	-		3
4	'Park' Kentucky Bluegrass	7	15		-	-	-	-	-	-		4
5	'Sydsport' Kentucky Bluegrass								NOT PLANTED			5
6	'Fylking' Kentucky Bluegrass								NOT PLANTED			6
7	'Troy' Kentucky Bluegrass								NOT PLANTED			7
8	Big Bluegrass 387931	3	20		-	-	-	-	-	-		8
9	'Sherman' Big Bluegrass	5	50		-	-	-	-	-	-		9
10	'Canbar' Canby Bluegrass								NOT PLANTED			10
11	'Reubans' Canada Bluegrass								NOT PLANTED			11
12	'Tundra' glaucus Bluegrass	3	40		-	-	-	-	-	-		12
13	Glaucus Bluegrass T08867	5	40		-	-	-	-	-	-		13
14	Alpine Bluegrass 235492, 236892	1	70	3	80	3	100					14
15	'Sodar' Streambank wheatgrass								NOT PLANTED			15
16	Bearded wheatgrass 371698								NOT PLANTED			16
17	Bearded wheatgrass 236693								NOT PLANTED			17
18	'Nordan' Crested wheatgrass								NOT PLANTED			18
19	'Fairway' Crested wheatgrass								NOT PLANTED			19
20	'Summit' Crested wheatgrass								NOT PLANTED			20
21	Violet wheatgrass T12050	7	20		-	-	-	-	-	-		21
22	Boreal wheatgrass T12048	5	10		-	-	-	-	-	-		22
23	Yukon wheatgrass T12051	5	25		-	-	-	-	-	-		23
24	'Critana' Thickspike wheatgrass								NOT PLANTED			24
25	'Fults' Alkaligrass	-	-		-	-	-	-	-	-		25
26	'Vantage' Reed Canarygrass	1	70		-	-	-	-	-	-		26
27	'Engmo' timothy	1	40		-	-	-	-	-	-		27
28	'Climax' timothy	3	80		-	-	-	-	-	-		28
29	Beach wildrye 345978	5	20		-	-	-	-	-	-		29
30	Siberian wildrye 345600	5	50		-	-	-	-	-	-		30
31	Siberian wildrye 2144	3	70		-	-	-	-	-	-		31
32	Siberian wildrye 1996	7	15		-	-	-	-	-	-		32
33	'Norcoast' Bering hairgrass	1	100	1	100	1	100					33
34	Tufted hairgrass 372690	1	100	1	100	1	100					34
35	Bluejoint	3	90	1	100	1	100					35
36	'Sourdough Bluejoint	5	25	3	75	1	100					36
37	Meadow foxtail	3	80		-	-	-	-	-	-		37
38	Geniculated foxtail 314565	3	75		-	-	-	-	-	-		38
39	Garrison Creeping foxtail	-	-		-	-	-	-	-	-		39
40	'Arctared' Creeping red fescue	5	60	7	10	1	100					40
41	'Boreal' Creeping red fescue	3	80	3	90	1	100					41
42	'Pennlawn' Creeping red fescue	5	30	5	60	5	90					42
43	Rough fescue 236849	3	80		-	-	-	-	-	-		43
44	American Sloughgrass T12053	5	15		-	-	-	-	-	-		44
45	'Durar' Hard fescue	7	5		-	-	-	-	-	-		45
46	'Highlight' Sheep fescue	7	40	9	80							46
47	'Covar' Sheep fescue	7	10		-	-	-	-	-	-		47
48	'Manchar' Smooth Brome								NOT PLANTED			48
49	'Carlton' Smooth Brome								NOT PLANTED			49
50	'Alyeska' Polar grass	5	10		-	-	-	-	-	-		50
51	Tilesey Sage T12052								NOT PLANTED			51
52												52

Figure 4.

## Conclusions and Recommendations

The conclusions drawn in this report are based on non-replicated plots, but the information is consistent with other plots on Kodiak Island. The Plant Materials Center will stand by these methods and recommendations when applied to the specific micro climates found at the Terror Lake area.

Based on the data obtained in this study, the Alaska Plant Materials Center recommends that any or all of the following commercial cultivars should be included in seed mixes for use in the Terror Lake area:

<u>Species or Accession</u>	<u>Comments</u>
1. 'Vantage' Reed Canary Grass	only on low elevation sites
2. 'Gruening' Alpine Bluegrass	only on high elevation sites
3. 'Norcoast' Bering hairgrass	anywhere
4. 'Sourdough' Bluejoint	anywhere
5. 'Arctared' Red Fescue	anywhere
6. 'Boreal' Red Fescue	anywhere

There are many commercially available species or cultivars other than those tested. It would be impossible to test each and every one. The species and varieties tested by the PMC were considered at the time the plots were established, to be the hardiest and most readily available species and varieties, and therefore, the most likely to be used by someone attempting erosion control or reclamation seedings.

A land user may elect to use other varieties, but these should be equal or superior to those listed or in a mix containing a large proportion of the listed cultivars.

The final recommendation is that a continued cooperative effort exist between Kodiak Electric Association and the North Latitude Revegetation and Seed Project at the Alaska Plant Materials Center. Hopefully, the continued efforts will result in rational and cost-effective reclamation and erosion control projects at the Terror Lake site and elsewhere on Kodiak.

APPENDIX

Costs

Date	Activity	Travel	Per Diem	Other
6-08-83	Plant	0	0	50.00
9-22-83	Evaluate	0	0	0
9-25-84	Weathered Out	0	0	0
8-27-85	Evaluate	100.00	0	0
9-11-86	Weathered Out	0	0	0
8-11-87	Evaluate	<u>100.00</u>	<u>0</u>	<u>0</u>
	Sub Totals	\$ 200.00	0	\$ 50.00

Total \$ 250.00