

**Final Report of Data and Observations  
Obtained From the 2C Access Spur and  
Mine Site D Herbaceous  
Evaluation Plots Located  
in the Kuparuk Unit**

**Presented to:**

ARCO Alaska, Inc.

**Prepared by:**

Stoney Wright  
of the  
State of Alaska  
Department of Natural Resources  
Division of Agriculture  
Plant Materials Center

January, 1989

**INDEX**

<u>Section</u>	<u>Page</u>
Introduction . . . . .	1
Purpose . . . . .	1
History & Site Description . . . . .	2
Methods . . . . .	5
Results . . . . .	7

**LIST OF FIGURES**

Typical Plot Layout . . . . .	4
Sample Evaluation Page . . . . .	6
Evaluation Data From Dormant Seeding at 2C Access . . . . .	10
Evaluation Data From Spring Seeding at 2C Access . . . . .	11
Evaluation Data From Spring Seeding at Mine Site D . . . . .	12

Introduction:

The North Latitude Revegetation and Seed Project at the Alaska Plant Materials Center (PMC), in 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 it is used properly. In order to accomplish these goals, it is beneficial for the PMC to work with industry. Resource extraction industries usually have disturbances on which these new varieties or techniques can be tested.

In the autumn of 1984, ARCO Alaska provided the PMC with two sites in the Kuparuk oil field for advance testing of potential and existing reclamation grasses.

Purpose:

In order for new varieties to be released for commercial production, they must be tested throughout a region on as many soil and climatic conditions as possible.

ARCO Alaska needed answers to two questions; 1) what species and varieties would perform best in future Kuparuk oil field revegetation programs, and 2) how successful is dormant seeding in the arctic?

History & Site Description:

With the previous questions in mind, a site was selected on the 2C access spur. This site was simply a gravel overlay or fill similar to work pads and roads in the region. The second site was at Mine Site D. The mine site spoil area was selected because it represented another type of large disturbance that occurs in the oil field.

On September 12, 1984, one plot (Figure 1), was established on each site.

During the winter of 1984-1985, the mine site "D" plot was destroyed by construction activity. Another area within Mine Site "D" was selected. This new site did not permit vehicular access and was assumed to be safe from disturbance. The PMC staff laid out this plot but because of high winds at the site on July 2, 1985, seeding could not be accomplished. The site was seeded by ARCO personnel on July 15, 1985. On June 27, 1985, a spring planting plot was established adjacent to the dormant plot on the 2C access spur.

Another dormant plot was seeded at Mine Site "D" on August 21, 1985. This plot was next to the spring Mine Site "D" planting.

The plot layout of the 1985 spring and dormant seedings was identical to the 1984 dormant plots (Figure 1).

Plot evaluations occurred on August 21, 1985, June 25 and August 22, 1986, June 30 and August 22, 1987, and July 10 and August 18, 1988.

All the established plots were evaluated with the exception of the Mine Site D dormant plot. This plot was lost because of erosion and subsidence into the lake that had formed in the mine site. We have not been able to collect any data on this plot.

Typical Plot Layout

<-----> 10' <----->		4'
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	'Gruening' Alpine Bluegrass	
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	
Fults 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	
'Egan' American Sloughgrass	Pennlawn Red Fescue	
Durar Hard Fescue	Highlight Red Fescue	
Covar Sheep Fescue	Manchar Smooth Brome	
Alyeska	Carlton Smooth Brome	
Tilesey Sage	Pumpelly Brome	

Figure 1. Typical Plot Layout

Methods:

Each plot (Figure 1), 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 500 pounds per acre (100 pounds actual nitrogen, 100 pounds actual phosphorus, and 50 pounds actual potash).

After each plot was seeded and fertilized, the area was raked by hand to incorporate the seed and fertilizer.

The advanced evaluation plots are evaluated at least once a year. The accessions are rated for vigor, percent stand, and numerous other hardiness and disease-resistant related characteristics. However, we have found that vigor and percent stand give a reliable indication of how the different accessions compare with each other. The next page is an example of the evaluation sheets that will be presented in this report (Figure 2). 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 1 to 3 blocks.
3. Year of Record--the year that evaluation data was collected.

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
11									11
12									12
13									13
14									14
15									15
16									16
17									17
18									18
19									19
20									20
21									21
22									22
23									23
24									24
25									25
26									26
27									27
28									28
29									29
30									30
31									31
32									32
33									33
34									34
35									35
36									36
37									37
38									38
39									39
40									40
41									41
42									42
43									43
44									44
45									45
46									46
47									47
48									48
49									49
50									50
51									51
52									52

Figure 2. Sample Advanced Evaluation Page.

4. Vigor--this number can range from 1 to 9. One is best and 9 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.
  
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 years' 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:

At the conclusion of 1986 growing season, an interim report was prepared. That report was intended to be informative, describing the evaluation process during the first two years. While the information contained in that report was interesting, it was premature to draw any conclusion.

In the 1986 report, the following observations were noted for the previous growing seasons:

- 1) There appeared to be a high degree of delayed germination in the spring plantings.
- 2) Many of the grasses in the plots at the 2C access site, had been grazed and/or pulled out of the ground by waterfowl. While many species were affected, the highest impact appears to have occurred to the broadleafed grasses such as Wheatgrasses, Timothy, Siberian Wildrye and Foxtail.
- 3) Early spring (by the June 28, 1986 evaluation) recovery had only occurred in those species that were native or have been reported to be hardy in arctic conditions. Many of these are Alaskan developed varieties.
- 4) As of August 22, 1986, more species survived than were expected.

Evaluations continued after 1986 and some of the same observations continued to be made through 1988. For example, waterfowl continued to use of plots intensively. Waterfowl continued to show preference for the broadleaf grasses. No waterfowl use could be detected on 'Tundra' Bluegrass or 'Arctared' Red Fescue. Moderate use occurred on 'Norcoast' Bering Hairgrass and extensive grazing was noted on Beckmannia and the wheatgrasses that were surviving.

While many more species survived through 1986 than were expected, 1987 proved to be the year when the majority of the collections failed to recover in the spring. On average, only 16 of the 52 accessions planted in each plot, initiated growth in 1987. By August 1988, only an average of 14 accessions remained in the plots.

Of the remaining 14 species, only half appear to have any significant value for the Kuparuk area. The majority of these species are commercially available. 'Norcoast' Hairgrass, 'Arctared' Red Fescue, 'Tundra' Glaucous Bluegrass and 'Sourdough' Bluejoint are readily available. 'Gruening' Alpine Bluegrass and 'Egan' American Sloughgrass will be available in the Fall of 1988. The Violet and Yukon Wheatgrasses evaluated in these plots have not been released and may not be available for three to four years.

Figures 3, 4 and 5, report the exceptional performance that was consistently recorded for 'Tundra' Glaucous Bluegrass Poa glauca. 'Egan' American Sloughgrass Beckmannia syzigachne, 'Norcoast' Bering Hairgrass Deschampsia beringensis and Violet Wheatgrass T12050 Agropyron violaceum performed very well. 'Arctared' Red Fescue Festuca rubra and 'Sourdough' Bluejoint Calamagrostis canadensis also exhibited superior performance.

Any revegetation effort in the Kuparuk area would certainly benefit from the including of these species and varieties.

2C Access Dormant Seeding		8-20-85		8-22-86		8-21-87		8-18-88		
	1 Block Planted 9-12-84	vigor	% stand	vigor	% stand	vigor	% stand	vigor	% stand	
		1	'Nugget' Kentucky Bluegrass	3	75	3	90	5	80	5
2	'Merion' Kentucky Bluegrass	7	60	5	60	-	-	-	-	2
3	'Banff' Kentucky Bluegrass	7	10	3	40	-	-	-	-	3
4	'Park' Kentucky Bluegrass	5	50	5	50	-	-	-	-	4
5	'Sydsport' Kentucky Bluegrass	7	10	7	30	-	-	-	-	5
6	'Fylking' Kentucky Bluegrass	5	45	7	40	-	-	-	-	6
7	'Troy' Kentucky Bluegrass	7	<5	5	30	-	-	-	-	7
8	Big Bluegrass 387931	9	10	7	30	-	-	-	-	8
9	'Sherman' Big Bluegrass	1	15	3	25	-	-	-	-	9
10	'Canbar' Canby Bluegrass	5	40	7	20	-	-	-	-	10
11	'Reubans' Canada Bluegrass	3	<5	3	95	-	-	-	-	11
12	'Tundra' glaucus Bluegrass	3	90	1	100	1	100	1	100	12
13	Glaucus Bluegrass T08867	1	60	5	20	7	20	5	60	13
14	Alpine Bluegrass 235492, 236892	1	<10	3	50	3	40	3	50	14
15	'Sodar' Streambank wheatgrass	1	45	3	40	-	-	-	-	15
16	Bearded wheatgrass 371698	3	10	7	15	-	-	-	-	16
17	Bearded wheatgrass 236693	1	45	-	-	-	-	-	-	17
18	'Nordan' Crested wheatgrass	1	40	1	95	-	-	-	-	18
19	'Fairway' Crested wheatgrass	1	60	3	100	-	-	-	-	19
20	'Summit' Crested wheatgrass	3	40	1	95	-	-	-	-	20
21	Violet wheatgrass T12050	3	25	3	15	1	20	1	60	21
22	Boreal wheatgrass T12048	5	10	7	10	-	-	-	-	22
23	Yukon wheatgrass T12051	3	<5	9	5	5	10	3	20	23
24	'Critana' Thickspike wheatgrass	3	50	5	75	-	-	-	-	24
25	'Fults' Alkaligrass	1	80	3	100	-	-	-	-	25
26	'Vantage' Reed Canarygrass	-	-	-	-	-	-	-	-	26
27	'Engmo' timothy	5	5	9	<5	-	-	-	-	27
28	'Climax' timothy	3	<5	5	15	-	-	-	-	28
29	Beach wildrye 345978	3	<5	3	5	7	<5	9	<5	29
30	Siberian wildrye 345600	5	15	7	10	-	-	-	-	30
31	Siberian wildrye 2144	7	10	7	20	-	-	-	-	31
32	Siberian wildrye 1996	-	-	9	<5	-	-	-	-	32
33	'Norcoast' Bering hairgrass	1	70	1	100	1	80	3	75	33
34	Tufted hairgrass 372690	1	50	3	100	5	70	5	50	34
35	Bluejoint	3	10	3	90	3	60	3	60	35
36	'Sourdough' Bluejoint	5	<5	7	5	7	10	3	20	36
37	Meadow foxtail	-	-	5	5	-	-	-	-	37
38	Geniculated foxtail 314565	7	<5	-	-	-	-	-	-	38
39	Garrison Creeping foxtail	-	-	7	20	-	-	-	-	39
40	'Arctared' Creeping red fescue	3	40	3	85	3	70	3	80	40
41	'Boreal' Creeping red fescue	3	70	3	25	-	-	-	-	41
42	'Pennlawn' Creeping red fescue	1	10	7	10	-	-	-	-	42
43	Rough fescue 236849	3	15	5	5	-	-	-	-	43
44	American Sloughgrass T12053	5	10	3	85	3	80	3	70	44
45	'Durar' Hard fescue	7	<5	5	30	-	-	-	-	45
46	'Highlight' Sheep fescue	3	20	-	-	-	-	-	-	46
47	'Covar' Sheep fescue	-	-	-	-	-	-	-	-	47
48	'Manchar' Smooth Brome	7	<5	5	30	-	-	-	-	48
49	'Carlton' Smooth Brome	9	<5	7	50	-	-	-	-	49
50	'Alyeska' Polar grass	1	40	3	90	5	40	5	60	50
51	Tiley Sage T12052	7	<5	7	5	-	-	-	-	51
52	Pumpelly Brome	-	-	-	-	-	-	-	-	52

Figure 3. 2C Access

2C Access Spring Planting		8-20-85		8-22-86		8-20-87		8-18-88		
	1 Block Planted 6-27-85	vigor	% stand	vigor	% stand	vigor	% stand	vigor	% stand	
1	'Nugget' Kentucky Bluegrass	1	20	3	80	5	70	7	90	1
2	'Merion' Kentucky Bluegrass	-	-	3	70	-	-	-	-	2
3	'Banff' Kentucky Bluegrass	-	-	3	90	-	-	-	-	3
4	'Park' Kentucky Bluegrass	5	10	1	90	-	-	-	-	4
5	'Sydsport' Kentucky Bluegrass	-	-	3	60	7	20	5	50	5
6	'Fylking' Kentucky Bluegrass	-	-	5	80	7	40	7	40	6
7	'Troy' Kentucky Bluegrass	-	-	5	75	9	10	-	-	7
8	Big Bluegrass 387931	3	25	3	75	-	-	-	-	8
9	'Sherman' Big Bluegrass	1	20	1	20	-	-	-	-	9
10	'Canbar' Canby Bluegrass	1	10	3	95	-	-	-	-	10
11	'Reubans' Canada Bluegrass	-	-	5	90	7	40	-	-	11
12	'Tundra' glaucus Bluegrass	1	15	1	50	1	100	1	100	12
13	Glaucus Bluegrass T08867	3	<5	3	20	8	50	5	60	13
14	Alpine Bluegrass 235492, 236892	5	10	1	100	3	90	5	100	14
15	'Sodar' Streambank wheatgrass	3	10	1	90	-	-	-	-	15
16	Bearded wheatgrass 371698	-	-	5	50	-	-	-	-	16
17	Bearded wheatgrass 236693	-	-	3	60	-	-	-	-	17
18	'Nordan' Crested wheatgrass	1	15	3	80	-	-	-	-	18
19	'Fairway' Crested wheatgrass	3	25	5	75	-	-	-	-	19
20	'Summit' Crested wheatgrass	5	10	1	60	-	-	-	-	20
21	Violet wheatgrass T12050	7	<5	3	90	3	70	3	60	21
22	Boreal wheatgrass T12048	5	<5	5	90	5	20	7	15	22
23	Yukon wheatgrass T12051	3	<5	3	80	3	60	1	95	23
24	'Critana' Thickspike wheatgrass	5	<5	5	80	-	-	-	-	24
25	'Fults' Alkaligrass	1	30	3	100	-	-	-	-	25
26	'Vantage' Reed Canarygrass	1	25	3	80	-	-	-	-	26
27	'Engmo' timothy	3	20	1	90	-	-	-	-	27
28	'Climax' timothy	5	10	5	90	-	-	-	-	28
29	Beach wildrye 345978	-	-	3	10	7	<5	7	<5	29
30	Siberian wildrye 345600	1	15	1	65	7	20	9	25	30
31	Siberian wildrye 2144	1	10	3	75	-	-	-	-	31
32	Siberian wildrye 1996	-	-	7	5	-	-	-	-	32
33	'Norcoast' Bering hairgrass	1	15	1	100	3	85	1	95	33
34	Tufted hairgrass 372690	-	-	1	100	5	40	3	80	34
35	Bluejoint	-	-	7	60	5	80	5	60	35
36	'Sourdough' Bluejoint	-	-	3	70	5	70	5	100	36
37	Meadow foxtail	-	-	5	30	-	-	-	-	37
38	Geniculated foxtail 314565	3	<5	7	75	-	-	-	-	38
39	Garrison Creeping foxtail	-	-	7	60	-	-	-	-	39
40	'Arctared' Creeping red fescue	5	20	3	90	3	90	3	90	40
41	'Boreal' Creeping red fescue	-	-	7	25	-	-	-	-	41
42	'Pennlawn' Creeping red fescue	5	15	7	60	-	-	-	-	42
43	Rough fescue 236849	1	5	3	80	-	-	-	-	43
44	American Sloughgrass T12053	7	10	5	80	1	90	1	100	44
45	'Durar' Hard fescue	1	15	5	20	-	-	-	-	45
46	'Highlight' Sheep fescue	-	-	7	80	-	-	-	-	46
47	'Covar' Sheep fescue	-	-	-	-	-	-	-	-	47
48	'Manchar' Smooth Brome	3	20	5	75	-	-	-	-	48
49	'Carlton' Smooth Brome	1	10	5	60	-	-	-	-	49
50	'Alyeska' Polar grass	-	-	3	80	3	70	7	90	50
51	Tilesey Sage T12052	7	<5	5	50	-	-	-	-	51
52	Pumpelly Brome	-	-	-	-	-	-	-	-	52

Figure 4. 2C Access.

Surprisingly, 'Boreal' Red fescue and 'Alyeska' Polar grass did not perform satisfactorily in these plots. Both varieties have been promoted for use in the Arctic.

The Plant Materials Center still expects 'Alyeska' Polar grass to perform in other areas of the Arctic. Perhaps the soils on which the plots were established were not suitable for the species. Apparently, sufficient moisture existed in the plot to support a good stand of 'Egan' American Sloughgrass, a wetland species.

The plots will continue to be monitored by the PMC as long as possible.