Advanced Evaluation Plantings in Interior Alaska
Cold Regions Plot Evaluation Network

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Introduction:
Advanced evaluation plantings are established to evaluate the performance of accessions that have previously performed well in initial evaluation plantings. These plantings aid in the development of new varieties for many end uses. The plantings also allow comparisons of new plant material with varieties that have been traditionally used. Plant material with potential for forage, turf and conservation uses were selected for planting in several Interior Alaska locations. Plots were planted near Fairbanks and Seven Mile Camp in 2003 and evaluated through 2007. Plots near McGrath and Delta Junction were planted in 2004 and evaluated through 2007.

Project History:
The Alaska Plant Materials Center (PMC) has established advanced evaluation plantings throughout its history as part of the mission of developing plant material for different uses within Alaska. This particular effort was conducted as part of the larger Cold Regions Project funded by a grant from the United States Department of Agriculture, Natural Resource Conservation Service.

Plot Layout:
The initial effort on this project was to develop the plot layout which consisted of accessions with varied end uses. Native species suitable for conservation was one of the primary focuses though input from small scale agricultural producers from around the region encouraged the inclusion of forage crops for evaluation. Turf varieties were also included along with some native wild flowers. Table 1 presents the typical plot layout. Each accession was planted in 4 foot by ten foot block at a rate of 40 pounds per acre. Seed was raked in by hand to incorporate at an approximate depth of ¼ inch. Varieties with similar end uses were planted adjacent to one another to allow for better comparison. Each plot was fertilized with one application of 20-20-10 following planting. Two blocks of 'Boreal' red fescue were planted to result in an even number of blocks.

Table 1. Typical Plot Layout

'Park' Kentucky Bluegrass	'Alene' Kentucky Bluegrass
'Nugget' Kentucky Bluegrass	'Tundra' Glaucous Bluegrass
'Service' Big Bluegrass	'Norcoast' Bering Hairgrass
'Durar' Hard Fescue	'Nortran' Tufted Hairgrass
'Arctared' Red Fescue	'Boreal' Red Fescue
'Pennlawn' Red Fescue	'Boreal' Red Fescue
'Gruening' Alpine Bluegrass	'Andrew Bay' Large-glume Bluegrass
'Ninilchik' Puccinellia nutkaensis	'Egan' American Sloughgrass
'Alyeska' Polargrass	Meadow Foxtail (Common)
'Sourdough' Bluejoint	'Caiggluk' Tilesius Sage
'Hannas High Tech' Alfalfa	'Beaver' Alfalfa
'James' Dahurian Wild Rye	PI 345600 Siberian Wild Rye
Altai Wild Rye (Common)	Russian Wild Rye (Common)
'Kirk' Crested Wheatgrass	Slender Wheatgrass (Common)
'Wainwright' Slender Wheatgrass	'Chief' Intermediate Wheatgrass
'Manchar' Smooth Brome	'Carlton' Smooth Brome
'Climax' Timothy	'Engmo' Timothy
'Farol' Timothy	'Alma' Timothy

Some additional accessions were included at the McGrath and Delta Junction locations because they were planted at a later time when more plant material had been added to the plot layout. These additional accessions included:

'Kenai' Polargrass	'Port Clarence' large flower speargrass
'Polar' Brome	'Solomon' Thick Spike Wheatgrass
'Max Q' Tall Fescue	'Lodorm' Needlegrass
'Paxson' Hedysarum alpinum	'Casco Cove' Beach Lovage
'King Salmon' Golden Rod	'Clam Lagoon' Beach Fleabane
Nootka Lupine (Common)	'Tok' Jakutsk Snow Parsley
'Shemya' Dusty Miller	'Kotzebue' Arctic Chamomile
Polemonium acutiflorum	'Denali' Alfalfa

The seed needed for the advance evaluation plantings were acquired from existing PMC seed stocks, Alaska Mill and Feed, and Hannas Seeds.

Plot Locations and Preparation:

The plots were replicated at sites around the region including Fairbanks, McGrath, Delta Junction, and Seven Mile Camp. Cooperators including The Project Inc., Malone Farms, Olberg Farms, and the Department of Transportation (DOT) aided in the project by providing land for the plots as well as ground preparation. The soil at each plot location was prepared by removing existing vegetation if present by cultivation or blading with a dozer or loader.

The Fairbanks plot was established at The Project Inc. farm in the Eielson Farm Loop area in a waste area on the corner of the property with the aid of the farmer, Warren Smith. The site was prepared by rototilling the site and remove existing vegetation.

The plot in McGrath was installed with the cooperation of Malone Farms at the Les Malone family farm located north of McGrath along the Takotna River. The site on the edge of a production field was prepared by rototilling to remove existing vegetation.

The Delta Junction plot was planted with the aid of Harley Olberg on his farm east of town near the Gerstle River. The plot was prepared by rototilling to remove existing vegetation along the edge of a production field.

The Seven Mile Camp plot was established with the aid of DOT at the maintenance station located seven miles north the Yukon River on the Dalton Highway. Preparation was accomplished by blading with a dozer to remove existing vegetation.

Planting and Evaluation:
Planting occurred in Fairbanks on June 27, 2003. The Seven Mile Camp plot was planted June 28, 2003. The McGrath plot was planted June 8, 2004 and Delta Junction on July 1, 2004. At least one evaluation per year including the planting year was anticipated for each of the three years following planting.

Evaluation of the plots included an assessment of the vigor and percent stand of each accession. Vigor is a qualitative assessment and was rated on a scale of 0 to 10. A lower rating number represents a better vigor assessment with the exception of 0 which indicates no plants present. The percentage of stand formed by each accession planted was the quantitative assessment though no statistical measurements were taken.

Tables 2 through 5 present the evaluation data collected for each of the planted plots.

Table 2. Fairbanks Plot Evaluation

	9/24/2003 Vigor	9/24/2003 % Stand	9/1/2004 Vigor	9/1/2004 % Stand	6/7/2005 Vigor	6/7/2005 % Stand	6/1/2006 Vigor	6/1/2006 % Stand	7/18/2007 Vigor	7/18/2007 % Stand
Alene Kentucky Bluegrass	5	40	3	60	3	70	2	90	3	50
Park Kentucky Bluegrass	4	60	5	60	4	70	1	90	2	90
Tundra Bluegrass	4	50	3	10	5	20	4	50	2	50
Nugget Kentucky Bluegrass	3	70	4	50	4	70	4	50	2	90
Norcoast Hairgrass	7	30	7	10	9	10	7	10	5	30
Service Big Bluegrass	4	60	4	70	2	70	2	90	1	90
Nortran Hairgrass	8	20	1	30	2	50	2	50	1	80
Durar Hard Red Fescue	4	60	2	100	1	100	2	90	2	90
Boreal Red Fescue	3	40	2	60	2	100	4	90	3	60
Arctared Fescue	5	50	3	60	3	80	4	100	1	90
Boreal Red Fescue	3	25	3	50	3	100	4	50	3	60
Pennlawn Red Fescue	2	60	3	80	1	100	5	90	2	90
Andrew Bay Bluegrass	3	50	3	40	1	50	5	50	2	50
Gruening Alpine Bluegrass	1	80	2	80	1	100	2	90	1	90
Egan American Sloughgrass	4	30	3	60	7	10	0	0	0	0
Ninilchik Alkali Grass	4	20	5	10	0	0	6	20	0	0
Meadow Foxtail	4	50	4	80	2	100	4	90	3	60
Alyeska Polargrass	4	20	0	0	0	0	6	10	0	0
Ciaggluk Tilessi Sage	3	60	2	70	3	20	6	30	0	0
Sourdough Bluejoint	4	50	4	90	4	50	3	80	3	70
Beaver Alfalfa	2	70	4	40	0	0	0	0	0	0
Hannas High Tech Alfalfa	3	60	0	0	0	0	0	0	0	0
Siberian Wildrye	3	60	2	70	4	60	3	50	0	0
James Duhorian Wild Rye	4	50	0	0	0	0	0	0	0	0
Russian Wild Rye	3	50	0	0	0	0	0	0	0	0
Altai Wild Rye	6	10	0	0	3	50	0	0	0	0
Slender Wheatgrass	2	60	2	90	3	90	3	60	0	0
Kirk Crested Wheatgrass	4	50	8	10	6	10	0	0	0	0
Chief Intermediate Wheatgrass	2	70	1	100	2	100	3	70	0	0
Wainwright Wheatgrass	6	40	2	90	4	30	4	60	3	70
Carlton Smooth Brome	3	80	2	100	3	100	3	100	3	70
Manchar Smooth Brome	4	80	2	100	2	100	3	100	2	80
Engmo Timothy	3	70	2	90	3	90	4	100	2	90
Climax Timothy	3	70	3	90	2	70	4	100	4	20
Alma Timothy	3	70	3	90	3	90	4	100	5	30
Farol Timothy	3	60	4	80	2	90	4	100	5	30

Table 3. Seven Mile Camp Plot Evaluation

	9/23/2003 Vigor	9/23/2003 % Stand	8/31/2004 Vigor	8/31/2004 % Stand	8/16/2005 Vigor	8/16/2005 %Stand
Alene Kentucky Bluegrass	1	100	4	30	5	20
Park Kentucky Bluegrass	1	90	6	20	6	20
Tundra Bluegrass	1	90	7	20	0	0
Nugget Kentucky Bluegrass	2	85	6	20	4	30
Norcoast Hairgrass	2	80	3	60	4	50
Service Big Bluegrass	2	70	3	30	3	50
Nortran Hairgrass	5	50	4	10	6	30
Durar Hard Red Fescue	2	80	6	30	0	0
Boreal Red Fescue	3	75	9	0	0	0
Arctared Fescue	5	60	3	50	4	10
Boreal Red Fescue	3	70	0	0	0	0
Pennlawn Red Fescue	1	70	5	30	0	0
Andrew Bay Bluegrass	4	30	0	0	0	0
Gruening Alpine Bluegrass	1	70	2	60	2	70
Egan American Sloughgrass	6	20	3	20	0	0
Ninilchik Alkali Grass	1	90	2	50	5	40
Meadow Foxtail	2	70	4	30	4	40
Alyeska Polargrass	8	10	0	0	0	0
Ciaggluk Tilessi Sage	0	0	8	10	0	0
Sourdough Bluejoint	0	0	0	0	0	0
Beaver Alfalfa	6	30	0	0	5	10
Hannas High Tech Alfalfa	7	20	7	10	3	40
Siberian Wildrye	3	50	4	60	4	40
James Duhorian Wild Rye	3	55	0	0	9	10
Russian Wild Rye	5	35	4	20	7	20
Altai Wild Rye	6	20	0	0	0	0
Slender Wheatgrass	4	60	3	50	4	30
Kirk Crested Wheatgrass	1	95	4	30	8	10
Chief Intermediate Wheatgrass	2	60	3	10	4	20
Wainwright Wheatgrass	5	20	2	40	2	50
Carlton Smooth Brome	6	30	5	20	6	40
Manchar Smooth Brome	4	40	4	50	7	30
Engmo Timothy	2	95	3	40	3	60
Climax Timothy	1	90	8	10	6	40
Alma Timothy	3	90	4	40	5	60
Farol Timothy	2	100	6	30	7	10

Table 4. McGrath Plot Evaluation

	6/20/2005	6/20/2005	6/26/2006	6/26/2006	7/26/2007	7/26/2007
	Vigor	% Stand	Vigor	% Stand	Vigor	% Stand
Alene Kentucky Bluegrass	4	60	9	10	0	0
Park Kentucky Bluegrass	5	40	9	10	0	0
Tundra Bluegrass	2	60	0	0	0	0
Nugget Kentucky Bluegrass	3	50	5	50	9	10
Norcoast Hairgrass	2	30	9	10	3	10
Service Big Bluegrass	1	80	2	70	2	70
Nortran Hairgrass	1	80	3	60	1	80
Durar Hard Red Fescue	4	60	5	50	5	50
Boreal Red Fescue	3	60	3	20	8	20
Arctared Fescue	3	60	4	50	2	50
Boreal Red Fescue	4	50	4	60	0	0
Pennlawn Red Fescue	3	80	5	40	9	10
Andrew Bay Bluegrass	2	40	0	0	0	0
Gruening Alpine Bluegrass	2	80	8	70	2	40
Egan American Sloughgrass	7	10	0	0	0	0
Ninilchik Alkali Grass	8	80	0	0	0	0
Meadow Foxtail	8	70	9	10	0	0
Alyeska Polargrass	2	60	4	60	1	70
Ciaggluk Tilessi Sage	3	50	0	0	0	0
Sourdough Bluejoint	1	100	1	100	1	100
Beaver Alfalfa	0	0	0	0	0	0
Hannas High Tech Alfalfa	0	0	0	0	0	0
Siberian Wildrye	9	10	9	10	0	0
James Duhorian Wild Rye	0	0	0	0	0	0
Russian Wild Rye	0	0	0	0	0	0
Altai Wild Rye	8	10	0	0	0	0
Slender Wheatgrass	7	10	0	0	0	0
Kirk Crested Wheatgrass	9	10	0	0	0	0
Chief Intermediate Wheatgrass	7	30	0	0	0	0
Wainwright Wheatgrass	7	40	0	0	0	0
Carlton Smooth Brome	7	20	8	10	0	0
Manchar Smooth Brome	8	10	0	0	0	0
Engmo Timothy	3	90	7	90	0	0
Climax Timothy	5	90	0	0	0	0
Alma Timothy	5	90	8	10	0	0
Farol Timothy	4	90	9	10	0	0
Port Clarence Bluegrass	1	100	1	100	1	100
Kenai Polargrass	1	100	1	100	1	100
Agropyron macrorum	4	70	0	0	0	0
Polar Brome	8	10	0	0	0	0
Lodorm Needlegrass	7	10	0	0	0	0
Max Q tall Fescue	5	90	0	0	0	0
Casco Cove Beach Lovage	9	10	9	10	0	0
Paxson Eskimo Potato	0	0	0	0	0	0
Clam Lagoon Beach Fleabane	0	0	0	0	0	0
King Salmon Golden Rod	8	20	6	10	3	20
Tok Jakutsk Snow Parsley	0	0	0	0	0	0
Lupinus nootkatensis	2	60	2	80	3	50
Kotzebue Arctic Chamomile	6	10	9	10	0	0
Shemya Dusty Miller	0	0	0	0	0	0
Polemonium acutiflorum	9	10	3	10	8	10
Denali alfalfa	0	0	0	0	0	0

Table 5. Delta Junction Plot Evaluation

	9/2/2004 Vigor	9/2/2004 % Stand	6/8/2005 Vigor	6/8/2005 % Stand	8/18/2005 Vigor	8/18/2005 %Stand	6/2/2006 Vigor	6/2/2006 % Stand	7/12/2007 Vigor	7/12/2007 % Stand
Alene Kentucky Bluegrass	3	30	2	80	1	100	1	100	4	50
Park Kentucky Bluegrass	3	40	2	80	1	100	1	100	4	80
Tundra Bluegrass	1	20	1	90	1	100	1	100	2	60
Nugget Kentucky Bluegrass	4	40	1	50	1	100	2	100	1	90
Norcoast Hairgrass	2	20	3	60	1	100	1	70	5	40
Service Big Bluegrass	2	20	1	70	1	50	1	100	2	60
Nortran Hairgrass	2	10	1	80	1	100	1	100	3	90
Durar Hard Red Fescue	3	30	3	70	1	100	1	100	2	90
Boreal Red Fescue	1	50	1	90	1	100	2	100	5	60
Arctared Fescue	1	50	1	100	1	100	1	100	1	90
Boreal Red Fescue	1	40	2	90	1	100	2	100	4	80
Pennlawn Red Fescue	1	50	2	80	1	100	4	100	5	60
Andrew Bay Bluegrass	5	10	3	50	1	60	1	60	3	60
Gruening Alpine Bluegrass	1	30	1	80	1	100	6	100	3	50
Egan American Sloughgrass	0	0	7	10	1	90	1	60	6	10
Ninilchik Alkali Grass	2	30	2	80	1	50	4	20	3	40
Meadow Foxtail	3	50	1	100	1	100	1	100	3	80
Alyeska Polargrass	0	0	7	90	2	90	1	100	3	50
Ciaggluk Tilessi Sage	3	10	2	90	1	100	1	100	2	80
Sourdough Bluejoint	4	10	4	70	2	100	1	100	2	90
Beaver Alfalfa	1	50	7	10	0	0	0	0	0	0
Hannas High Tech Alfalfa	3	40	7	10	8	30	0	0	0	0
Siberian Wildrye	1	80	1	90	1	100	1	100	2	80
James Duhorian Wild Rye	1	70	3	70	2	50	4	60	2	60
Russian Wild Rye	2	70	4	60	3	100	3	80	3	80
Altai Wild Rye	2	60	6	30	0	0	0	0	0	0
Slender Wheatgrass	1	80	3	100	2	100	1	100	2	80
Kirk Crested Wheatgrass	1	90	4	50	3	70	0	0	2	50
Chief Intermediate Wheatgrass	1	70	1	100	1	100	3	100	2	80
Wainwright Wheatgrass	2	60	1	90	1	100	2	100	3	80
Carlton Smooth Brome	3	60	2	90	2	100	1	100	2	90
Manchar Smooth Brome	1	90	1	90	3	100	1	100	1	100
Engmo Timothy	5	20	2	80	1	100	4	50	6	40
Climax Timothy	3	50	3	60	3	100	0	0	7	50
Alma Timothy	3	50	1	90	2	100	0	0	6	40
Farol Timothy	2	60	4	50	4	100	0	0	8	20
Port Clarence Bluegrass	0	0	0	0	0	0	3	100	3	20
Kenai Polargrass	4	10	3	100	2	100	3	60	3	60
Agropyron macrorum	2	60	2	70	1	100	0	0	3	70
Polar Brome	2	60	1	100	1	100	4	60	2	80
Lodorm Needlegrass	4	10	4	80	1	100	1	100	3	50
Max Q tall Fescue	1	70	4	50	4	50	2	100	0	0
Casco Cove Beach Lovage	0	0	3	80	3	60	0	0	0	0
Paxson Eskimo Potato	4	10	5	10	0	0	0	0	0	0
Clam Lagoon Beach Fleabane	0	0	6	10	0	0	0	0	0	0
King Salmon Golden Rod	0	0	5	40	3	60	3	60	1	90
Tok Jakutsk Snow Parsley	0	0	0	0	8	10	0	0	0	0
Lupinus nootkatensis	8	10	6	10	0	0	0	0	0	0
Kotzebue Arctic Chamomile	9	10	2	90	3	100	4	80	0	0
Shemya Dusty Miller	9	10	8	10	3	20	0	0	0	0
Polemonium acutiflorum	5	10	3	10	2	50	2	80	4	30
Denali alfalfa	4	20	8	10	9	10	0	0	0	0

Discussion:
The advanced evaluation plantings in Interior Alaska performed generally well. Conditions at the individual plots varied widely in soil texture though consistency of results was reasonably maintained across the region. Impact from vehicle traffic was a minor issue at a few of the locations.

The Fairbanks plot performed well on the extremely sandy site. The plot had been mowed at least once annually during the evaluation period. This likely aided the turf and forage grasses while hindering Caiggluk. Turf grasses all performed well in this plot with Park, Boreal and Arctared doing the best overall. Conservation grass including Gruening, Nortran, Wainwright and Sourdough were the top performers. Forages also did well with the bromes being about equal and Engmo being the best of the timothy. One of the most notable observations was Chief intermediate wheatgrass growing over six feet tall during the second and third season. Egan and Alyeska would have likely performed better if the site would not have been so dry.

The Seven Mile Camp plot was the northern most plot in the region with highly compacted mineral soils. It was only evaluated through 2005 since it was discovered to have been turned into a parking area on the 2006 visit. This being the case, reasonable information was still able to be gained from the short evaluation period. None of the turf grasses showed much potential in this location though it is anticipated that a little better sight preparation and maintenance would result in a good lawn. Conservation grass with reasonable performance included Wainwright, Gruening, Norcoast and Service with Nortran and Siberian Wildrye being close seconds. Ninilchik also did OK though well outside of its natural range. The forage crops similarly struggled at this location. Like the turf grasses, many would have likely done better if managed for their intended purpose. Engmo timothy was the best forage performer. Surprisingly, the alfalfa varieties survived throughout the evaluation period.

The McGrath plot was located on a fairly wet site with highly organic, acid soil conditions. This was likely a factor in the poor survival of many of the accessions. The only turf variety with good performance was Arctared. Conservation grasses did a little better with Nortran, Sourdough, Port Clarence and Kenai being the most notable. Alyeska and Gruening would also be reasonable conservation choices for this location. The *Lupinus nootkatensis* did quite well in the native wildflower category followed by King Salmon then *Polemonium acutiflorum*. None of the traditional forage grasses performed which was quite disappointing to the cooperator though Kenai could potentially be a dual purpose crop if seed was readily available.

The plot near Delta Junction performed the best overall in this region. Soil quality was better than other locations and moisture came at the right time after planting with 5 inches of rain falling that month. All of the turf varieties did quite well with Arctared and Nugget leading the way. The conservation plant materials of note include Tundra, Service, Nortran, Caiggluk, and Sourdough. Gruening, Egan, Wainwright, Alyeska and Kenai also had reasonable performance. Native wildflowers with good ratings include

King Salmon and *Polemonium acutiflorum*. The brome grasses were the best of the forage crops with Manchar edging ahead of Polar and Carlton.

Conclusions:
Turf varieties evaluated in this study suitable for use in Interior Alaska include Arctared and Nugget. Park and Boreal would be good components to round out a turf mix. Forage varieties with good potential for this region include Engmo and Manchar. Additional evaluations of intermediate wheatgrasses are warranted due to the good stand of Chief established at many of the sites. If Kenai polargrass was more readily available, it would be a good forage component on highly organic, acid soil locations. Conservation plant materials with high levels of success in the region include Tundra, Gruening, Service, Nortran, Wainwright, Caiggluk, Sourdough, King Salmon, and *Polemonium acutiflorum*. *Lupinus nootkatensis* is also worth additional evaluation as a component to conservation mixes. Alyeska and Egan, though not performing at a high level in this evaluation, are good conservation plant material components for wet locations. Future advanced evaluation plantings in this region should occur with a narrower focus on native plant collections from within the region.