Alaska Plant Materials Center

2003 Annual Report

Alaska Department of Natural Resources- Division of Agriculture

ALASKA PLANT MATERIALS CENTER

2003 ANNUAL REPORT

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LETTER FROM THE DIRECTOR

The Alaska Plant Materials Center (PMC) will be celebrating its 31st anniversary in 2004. The PMC'S present and past-dedicated employees should be proud of their accomplishments. Maintaining high levels of service over a thirty- one year period has been challenging with increased costs of operation while at the same time state funding decreased.

The PMC has maintained excellent service levels while actively seeking non-state funds to continue their daily operations. Additionally, changes in methods of operation and efficiency improvements have allowed the PMC to continue providing a multitude of services to the public and individuals it serves.

The PMC Manager has promised further improvements and efficiency changes. These will include increasing the level of non-state funding, thereby further reducing the need for Agriculture Revolving Loan Funds.

The PMC is a strong asset to the State of Alaska and the Agricultural industry.

Sincerely,

Douglas Warner
Acting Director

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Introduction

The Alaska Plant Materials Center (PMC) is a section of the Division of Agriculture within the Department of Natural Resources. The Plant Materials Center's work advances applied plant research for northern latitudes through two major programs: Revegetation and Native Seed Production, and Potato Production. Each of these programs will be addressed in this report.

Often in late July or early August, the Plant Materials Center hosts an open house. The PMC staff is available to answer questions about the projects and give tours of the facilities. Over 300 people attended the last open house. Scheduling conflicts did not allow an open house in 2002. Construction activities will likely preclude an open house in 2004. However, in 2005 the PMC's open house program will resume.

The majority of the Plant Materials Center's funding comes from non-state sources. In recent years, USDA has become the major funding source. The majority of the remaining operating monies are allocated from the Agriculture Revolving Loan Fund. The PMC no longer relies on the state general fund. That change occurred in fiscal year 1997. Additionally, the center brings in small amounts of revenue through cooperative projects with other agencies, the private sector and through the sale of plant materials. All funds derived from outside sources can be used for direct operations of the Plant Materials Center.

History

Early attempts to establish a federal Plant Materials Center in Alaska were unsuccessful because the U. S. Department of Agriculture believed that the centers at Pullman, Washington and Corvallis, Oregon could serve the needs of Alaska.

The Alaska Legislature was not discouraged, and at the urging of the University of Alaska, conservation groups, and farmers, prepared legislation that would establish the Alaska Plant Materials Center.

In 1972, Governor Bill Egan signed into law a bill creating the Alaska Plant Materials Center. This legislation directed the Plant Materials Center to fulfill several traditional agricultural responsibilities and to develop plant varieties and techniques for revegetation and erosion control and provide technical reclamation assistance to industry.

Soon after the Plant Materials Center bill was enacted, a 285-acre tract near Palmer was selected for the center's site. An additional 120-acre parcel adjacent to the PMC was acquired through a land exchange with the Matanuska-Susitna Borough in 1982. This gave the PMC a total of 405 acres to accomplish its mandated duties which now included revegetation work, horticultural development, foundation seed production and disease-free potato seed stock production.

In 1987, the PMC's programs were consolidated into the two programs; the North Latitude Revegetation and Seed Production Project and the North Latitude Vegetable and Landscape Crop Improvement Project.

In 1994, the PMC assumed responsibility for the maintenance and production of breeder class seed of all University of Alaska developed grass. The transfer of responsibility has placed the PMC in the position of being the repository and maintainer for Alaska developed germplasm.

In November 1997, the PMC was notified that the U.S. Department of Agriculture granted the PMC to operate the Arctic Genetic Resources Unit. This includes an operating and capital grant. In 1998, the Germplasm Repository became a reality. The first USDA employee was hired and the state initiated designing of a screenhouse. The screenhouse was completed in 2001. The Arctic Genetic Resources Unit currently holds accessions of alpine, arctic, polar plants with a special emphasis on wetland species. The site also became instrumental at increasing germplasm held at other USDA repositories. We expect a long and productive cooperative effort with USDA. A new short term specific cooperative agreement was implemented in 2003.

In 1999, a grant from USDA Natural Resource Conservation Service (NRCS) allowed the PMC to expand its program in native seed production and commercialization. This program is expected to last five years or more.

In the year 2000, an additional grant from NRCS allowed the PMC to expand a cold regions program. The program not only allows for the establishment of a supplemental plot network throughout Alaska, it funds additional circumpolar seed exploration/collection projects.

The PMC has been very aggressive in securing grants and federal funds. This trend is not expected to decline, in fact, the level of non-state funding is expected to increase.

North Latitude Revegetation & Seed Production Program

The Revegetation and Native Seed Production Program's products and methods are used to encourage a healthy seed industry and develop new plant materials and methods for land reclamation and erosion control. These two functions are complementary and are intended to promote an instate seed industry while providing state-of-the-art revegetation and erosion control information to the public.

Revegetation & Reclamation Efforts

The construction of the Trans Alaska Pipeline in the 70's triggered the current reclamation research activity in Alaska, however, since the pipeline, ideas associated with revegetation have changed. Continued oil development, renewed interest in surface and placer mining, as well as new federal, state and local regulations have caused applied research activities to address "reclamation" as defined by regulations, which in some cases has precluded the use of "traditional" plant material and planting technology.

The Alaska Plant Materials Center continues to lead Alaska in reclamation, erosion control, research and technology transfer and revegetation. The use of dormant seedings to extend planting seasons, cost-effective and successful methods in willow planting, and wetland and coastal restoration are research priorities for the Plant Materials Center.

The project follows seven basic steps to establish a resource of conservation plants for use in land reclamation, wildlife habitat improvement and erosion control. They are: 1) define and anticipate conservation problems and establish priorities; 2) research and assemble candidate plant materials; 3) conduct initial evaluations; 4) establish small scale seed or vegetative increases; 5) advanced and final testing and field evaluation plantings; 6) establish large scale seed or vegetative increases; and, 7) release of a variety or cultivar.

This program has gathered at least 275 plot years of information collected from sites around the state (Figure 1), developed 11 new cultivars for revegetation and reclamation and assisted scores of agencies and private companies in reclamation, erosion control and revegetation. Figure 2 represents a typical plot layout used in off-site evaluations.

This report outlines some of the present revegetation and reclamation research being conducted by the PMC and summarizes current activities at sites around the state. Additional information can be found in the individual reports that are listed in this report. Copies of these reports are available from the Alaska Plant Materials Center.

Figure 1 – Map of Alaska

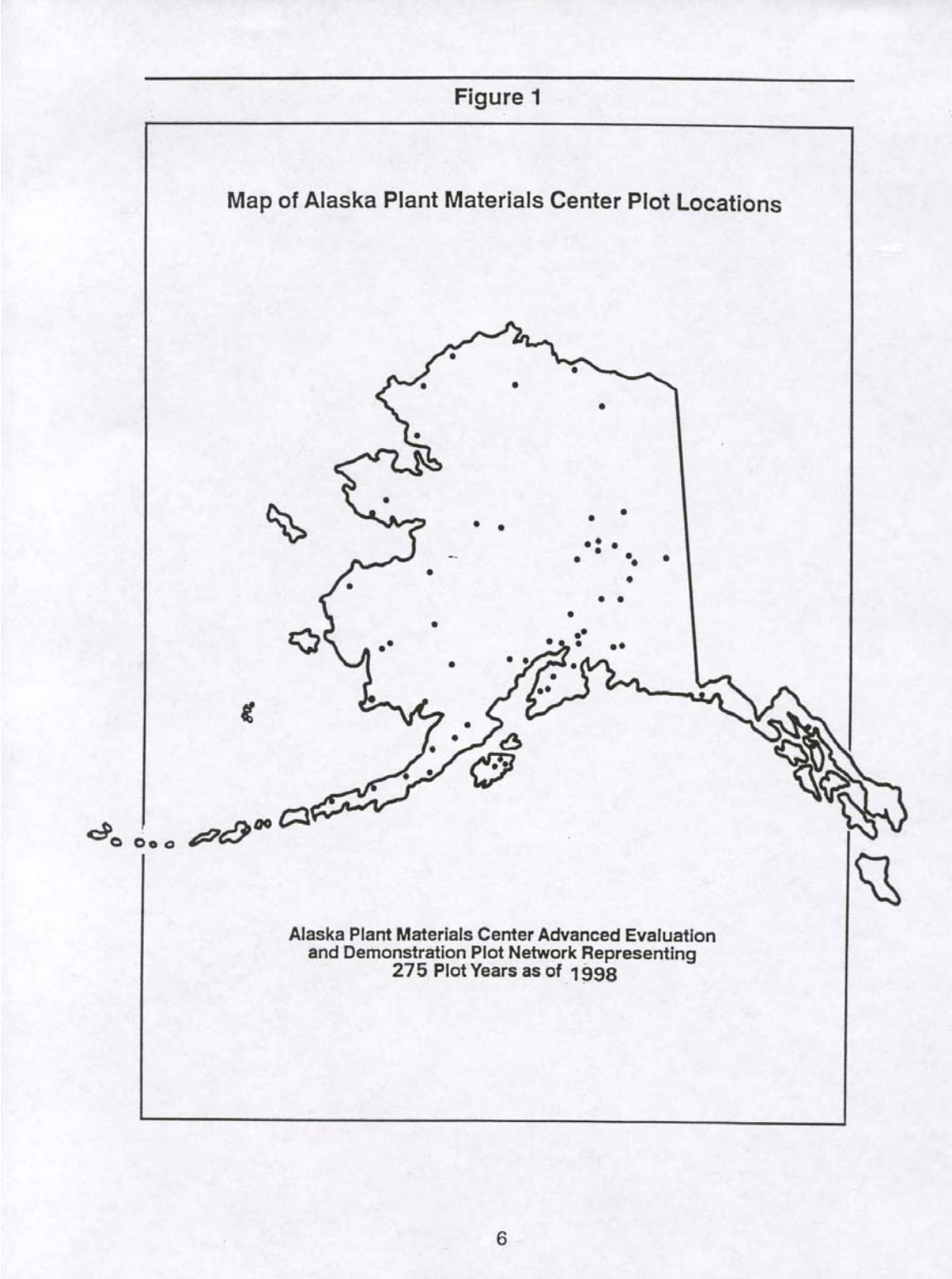


Figure 2 – Typical Plot Layout

Nugget Kentucky bluegrass	Merion Kentucky bluegrass
Park Kentucky bluegrass	Banff Kentucky bluegrass
Sydsport Kentucky bluegrass	Fylking Kentucky bluegrass
Service big bluegrass	Troy Kentucky bluegrass
Sherman big bluegrass	Canbar canby bluegrass
Tundra glaucous bluegrass	Reubans Canada bluegrass
Poa glauca T08867	Gruening alpine bluegrass
Agropyron subsecundum 371698	Sodar streambank wheatgrass
Nordan crested wheatgrass	*Agropyron subsecundum*
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
Norcoast Bering hairgrass	*Elymus sibiricus* 2144
Sourdough bluejoint	Nortran tufted hairgrass
Meadow foxtail	*Calamagrostis canadensis*
Garrison creeping foxtail	*Alopecurus geniculatus*
Boreal red fescue	Arctared red fescue
Egan American sloughgrass	*Festuca scabrella*
Durar hard fescue	Pennlawn red fescue
Covar sheep fescue	Highlight red fescue
Kenai polargrass	Manchar smooth brome
Alyeska polargrass	Carlton smooth brome
Caiggluk tilesy sagebrush	Polar brome

Cold Regions Plot Evaluation Network

Seed was obtained from Alaskan and Canadian sources. They were as follows:

-Alaska Mill and Feed
-Alaska Plant Materials Center
-Hannas Seeds

All test plots were laid out in the same manner. Each species was planted in a 4' x 10' plot making the overall plot dimensions 20' x 72'. The plot layout is as follows:

Park Kentucky Bluegrass	Alene Kentucky Bluegrass
Nugget Kentucky Bluegrass	Tundra Glaucous Bluegrass
Service Big Bluegrass	Norcoast Bering Hairgrass
Durar Hard Red Fescue	Nortran Tufted Hairgrass
Arcta Red Fescue	Boreal Creeping Red Fescue
Pennlawn Red Fescue	Boreal Creeping Red Fescue
Gruening Alpine Bluegrass	Poa macrocalyx
Puccinellia nutkaensis	Egan American Sloughgrass
Alyeska Polargrass	Meadow Foxtail
Sourdough Bluejoint	Artemisia tilesii
Hannas High Tech Alfalfa	Beaver Alfalfa
James Dahurian Wild Rye	Siberian Wild Rye
Altai Wild Rye	Russian Wild Rye
Kirk Crested Wheatgrass	Slender Wheatgrass
Wainwright Slender Wheatgrass	Intermediate Wheatgrass
Manchar Smooth Brome	Carlton Smooth Brome
Climax Timothy	Engmo Timothy
Farol Timothy	Alma Timothy

Plots have been planted across the state with many different cooperators. The plot locations, date planted and the cooperators are as follows:

Location	Date Planted	Cooperator
Homer	June 11, 2003	Jim Van Oss
Willow	June 23, 2003	DOT&PF
Delta Junction	June 25, 2003	UAF
North Pole	June 27, 2003	Warren Smith
7 Mile Camp Dalton Hwy	June 28, 2003	DOT&PF
Jim River Camp Dalton Hwy	June 29, 2003	DOT&PF
Talkeetna	July 7, 2003	DOT&PF
Trapper Creek	July 7, 2003	DOT&PF
Cascade Camp Glenn Hwy	July 9, 2003	DOT&PF
Nome	July 15, 2003	Alaska Gold and DOT&PF

Kodiak	Aug 28, 2003	Bill and Buck Burton

All the plots except the Kodiak one have been evaluated this season. Plots are scheduled for evaluation at least once per year for the next three years. Of the plots evaluated this year, good growth is present in most species.

Several more plots are planned for next year. More species will be included in the plots from sources such as the Alaska Plant Materials Center Native Plant Nursery, Arctic Alpine Seed, Northstar Seeds, Seedland, and others.

Mass Aleutian Plant Collection Project

The PMC proposed to both the U.S. Navy and U.S. Air Force that a major effort be initiated to collect seed of species native to the Aleutians and Alaska Peninsula. Both agencies agreed with the concept, a full proposal was developed and by July 1993 an agreement was signed by each cooperator.

This program is possibly one of the more significant efforts undertaken by the PMC. If even partially successful, the native seed industry in Alaska will enter a new era of production and the local seed producers should benefit significantly. All production of these species will be limited to Alaska, eliminating the competition from producers in other regions. Some of the species collected will also have potential markets outside the state.

During the months of August, September and October, staff from the PMC conducted large scale seed collection at King Salmon, Dutch Harbor, Adak, Shemya and Attu. Sixty-four species were collected.

The species with the greatest potential were distributed to seed producers on the Kenai Peninsula in the spring of 1994, with first sales to the Air Force and Navy planned for the spring of 1996. The attempt to propagate the more difficult or obscure species was undertaken by the PMC.

In June 1994, 33 species were planted at the sites at Kenai and the PMC. All plantings produced stands. Several other species are still undergoing tests to determine requirements for germination. In 1995, the first production crop was harvested. Seed was collected from 30 species. Part of this seed will be used to increase production fields and the remainder will be sold to either the Navy or Air Force for use on Adak or Shemya. In 1996 and 1997, additional seed was collected from the production fields. Part of this will be increased at the PMC. Part has been or will be distributed to private growers. Commercial production of some of the species started in 1999 and continued in 2002. Full release documentation will be published in 2003. New larger scale plantings of the most promising collections were established at the PMC in 2003.

Red Dog Mine Revegetation & Demonstration Plots

This project grew out of a mutual need for information. The PMC required revegetation data from northwestern Alaska, and Cominco Alaska, Inc. needed information on species that would perform well in future mine revegetation programs. In 1987, Cominco agreed to provide the PMC with sites to establish evaluation and demonstration plots for at least four years.

In order to provide the best information for both the PMC and Cominco, three plot sites, representing different conditions were selected. A site selected near the port facility was a sandy, gravel beach area common to the region. The second plot was located at the original camp site's fuel bladder containment area. The third plot was similar to the camp area, but provided a site to compare spring and fall seedings.

This combination of plots was intended to supply data for revegetation species selection and planting windows for seeding. The port site was planted on July 6, 1987 and provided information regarding revegetation in the coastal portion of the mine project.

A dormant plot was seeded at the camp site on September 8, 1987. Because of space limitations, the plot dimensions were slightly reduced and 12 accessions were dropped from the plot. The accessions that were eliminated are species that have failed elsewhere in northern Alaska. Their elimination from the plantings did not compromise the value of the information obtained from the plots. On June 15, 1988, a plot was planted on gravelly soil similar to the surface that will exist when construction of the mine is complete.

A major demonstration planting was also established on June 14, 1988. This plot, located on an abandoned disposal site north of the facility, was recontoured and seeded entirely with native species. It was also evaluated for four growing seasons. The completion of the evaluation program occurred September 1990, at which time a final report was prepared for Cominco.

A complete listing of conclusions and recommendations can be found in 1990 Final Report of Data and Observations Obtained From the Red Dog Mine Evaluation and Demonstration Plots.

During September 1992 and 1993, these sites were again visited and evaluated. All of the plots and trials continued to perform very well. During the 1993 site visit, plans were developed for a new research effort planned for 1994. These plans were put "on hold" until 2002.

In 1996, a collection of native species occurred near the port site. This seed was cleaned at the PMC and returned to the mine operator. The 1997 site visit was not conducted because of scheduling conflicts. The areas were, however, evaluated in 1998. Additional evaluations occurred in 1999 and a new program is expected to be in place for the 2003 field season.

In 2001, soil samples were taken from several locations within the mine site. The samples were sent to the PMC and were tested for pH, N, P, and K as well as several heavy metals that are known to be present in the mine spoils. The soils were then used in greenhouse trials with the goal of determining specific plant species that might tolerate and thrive in the toxic soils.

In 2003, Red Dog mine was again visited to review revegetation efforts. Changes in Tech Cominco personnel resulted in the loss of some of the technical notes on soil sample locations and revegetation activities. A summary of the historical involvement of the PMC with Red Dog was prepared along with pressed samples of plant materials currently being used for revegetation at the mine.

A site visit is planned for the summer of 2004. Introductions to new personnel as well as setting up more test plots are some of the goals for the trip. New soil samples will be taken and more greenhouse trials will occur.

Upper Knob Creek and Jones Mine

In 1998, the Plant Materials Center continued to work with the Division of Mining and their abandoned mine land program to revegetate two additional sites, Upper Knob Creek and Jones Mine Phase II. Upper Knob Creek is divided into several pits of varying size totalling over 40 acres. The Jones Mine is a 15- acre area across the valley from Upper Knob Creek. These sites were characterized by gravelly, rocky material mixed with finer particles of clay, silt or sand. When wet the substrate was slippery, sticky and easily eroded. When dry the substrate was crusty with cracks that formed as it dried.

Past revegetation efforts have demonstrated that planting combinations of brushlayers, bundles, live stakes, transplants and seeding with native grasses and forbs are appropriate techniques for revegetating sites with steep slopes and erosive soils.

These techniques were used at Upper Knob Creek and Jones Mine Phase II sites. Also, soil that had been salvaged was spread over a relatively small area on the upper slopes of the Jones Mine.

The Jones Mine contains both cut and fill slopes. After the area was graded to contour, most of the area was scarified. Some areas on the middle and upper portions of the cut slope could not be scarified because large rocks would be pulled to the surface and disturb the site too much. Several terraces were created on the lower section of the mine to reduce slope length.

Transplants salvaged from Phase III of the Jones Mine restoration were placed on the terraces. In addition to transplants, numerous brush layers were scattered over the slope. Bundles were strategically placed in areas where rilling had begun to occur and in other locations that appeared to be prone to erosion.

Plots were also established to evaluate three alternative fertilizers, Biosol, Fertil-fibers and Humazyme. Three large plots were set up on the southeast facing slope and three smaller plots were set up on a northeast facing slope. The products were applied according to manufacturer's directions. The site was seeded with native grasses and forbs and the area outside of the fertilizer study plots was fertilized with 20-20-10 fertilizer.

The timing of activities is important and this project reminded us of this point on several occasions. The site was well scarified and then a backhoe was used to move transplants and install brushlayers. The substrate where the backhoe had traveled became compacted and smooth. The benefits of scarification were lost and the soils became more vulnerable to erosion.

During June 2000, a seven-acre section of Phase III of the Jones Mine was revegetated. The site was scarified and planted with willow bundles and a few brush layers. A large quantity of willows had been purchased for the 2000 planting season with the idea that more of Phase III would be ready for revegetation. Since only a total of seven acres was available, the site was planted heavily. Excess material was used on selected areas in Lower Knob Creek.

Driwater, the gel slow release watering product described in the Lower Knob Creek section, was used at this site also. The product was installed late in the season when the rains were beginning and it is not apparent that it provided a benefit. In dry years it may be very beneficial. This site will be monitored for several years.

The Upper Knob Creek site contained four pits. The primary revegetation effort focused on slowing surface water erosion. Bundles, and to a limited extent, brushlayers were placed in areas that had begun to show signs of rilling in Pits 6 and 7. After a very heavy thundershower, the importance of timing became apparent again. Many of the bundles had just begun to leaf out when they were buried by sediment resulting from the erosion caused by the intense rainfall. The young new shoots required careful excavation by hand. Despite the weather conditions, the woody plantings became well established.

All of the pits were seeded with native grasses and forbs and fertilized with 20-20-10 granular fertilizer. With the exception of Pit 6, seed and fertilizer was broadcast by hand. The fertilizer for Pit 6 was applied with an airplane.

The 1998 plantings will be evaluated early in the spring of 1999. Pit 6 is particularly susceptible to erosion and additional soil stabilization and erosion control work may need to be done next spring. In 1999, additional willows and grass seed were planted at Pits 6 and 7 at Upper Knob Creek. Considerable erosion had occurred at these pits late in the 1998 growing season. Intensive willow plantings using brushlayering, bundles and gully plantings addressed these erosion areas. A light seeding of grass was also broadcast on bare areas.

The 1999 plantings appeared to be growing well at the end of growing season. Some of the woody plantings were not completed until mid-July, nearly two weeks after the recommended cutoff date. A survey of the plantings in 2000 indicated that the late planted willows survived.

Extensive cooperation with the Division of Mining, Land and Water's Abandoned Mine Land Project continued in 2002 with the revegetation of Phase V of Jonesville Mine. The area consisted of a large rock face that needed seed and fertilizer above and below it. The lower 18-acre portion was easily treated using a 4x4 tractor with a broadcast spreader. The upper 8-acre portion was considerably more challenging due to poor accessibility and steep terrain. The entire project was completed August 10, 2002 and good growth was apparent in September. Continued monitoring and photo documentation will occur in 2003.

Planning for the revegetation of Phases III and IV of Jonesville Mine was completed and then revised in 2002. The plan was be implemented during the summer of 2003. These areas have steep, erosive slopes consistent with the rest of the site. The area was contoured to decrease downhill water movement. Live stakes, bundles, straw logs and seeding with native grasses and forbs were the techniques employed to revegetate this portion of the site. Alder seedlings were planted as a new possible technique on the upper most portion of phase IV. Seeds were collected in the fall of 2002 for around the mine site. The seed was cleaned and tested. Seeds were sown in flats in a greenhouse and were about 3 inches tall at the time of transplanting onto the site. Approximately 4000 alder seedling were planted.

A monitoring program was implemented on phases III and IV and monitoring continued on phase V. Phase V is showing good growth after one season with only one small area needing more seed in 2003. By the fall of 2003, the willows and grass seedlings were growing well across phases III and IV.

North Atlantic Germplasm Collection Project

As a part of the newly funded Cold Regions Vegetation Project, the PMC initiated a seed collection project on Iceland and the Faroe Islands in 2001. Part of the program is dedicated to acquisition of seed from other circumpolar regions.

Germplasm Collection Project on Iceland and the Faroe Islands
August 19, 2001 – September 11, 2001

Results of the Collection Effort:
Iceland - August 19-25, 2001, North Iceland
Faroe Islands – August 31 – September 7, 2001
Iceland – September 8-11, 2001, South Iceland

Most of the species targeted and collected were indigenous to both Alaska and the two Atlantic Island groups. Collection of material not present in Alaska was limited and only conducted based on interest expressed by the Icelandic or Faeroese scientists.

Material Collected/Total Accessions:

- *Angelica archangelica* /1
- *Anthoxanthum odoratum* /4
- *Dactylis glomerata* /2
- *Deschampsia caespitosa* /14
- *Deschampsia flexuosa* /4
- *Festuca richardsonii* /11
- *Festuca rubra* /12
- *Holcus lanata* /4
- *Leymus arenarius* /23
- *Ligusticum scoticum* /1
- *Lolium multiflorum* /2
- *Lupinus nootkaetensis* /9
- *Luzula sylvatica* /1
- *Phleum alpinum* /3
- *Phleum pretense* /1
- *Poa alpine* /14
- *Poa glauca* /11
- *Poa pratensis* /3
- *Trisetum spicatum* /2

Total: 123 accessions

All the material collected was immediately re-cleaned and tested after arrival in Palmer. In March 2002, all the collections were planted in greenhouses. The resulting seedlings were field planted in July 2002. All the plantings are on PMC property at Palmer. Between July and October 2002, all the plantings were evaluated three times.

Again in 2002 a seed collection project was planned and conducted on the Svalbard Archipelago (Spitzbergen), Norway and the Tromso region of Norway. The collections occurred between August 16 and September 10, 2002.

As with the Iceland and Faeroe Islands collections of 2001, the Norway collections concentrated on species common to both the collection areas and Alaska. The new material from Norway and particularly Svalbard, (78-81 degrees north latitude) has added a significant and important component to the U.S. collection.

Material collected/total accessions:

Leymus arenarius /19
Deschampsia caespitosa /40
Deschampsia boreal /10
Deschampsia alpina /88
Trisetum spicatum /6
Poa arctica /7
Poa alpina /4
Poa glauca /2
Alopecurus borealis /3
Festuca rubra /4
Festuca hyperboreal /1
Festuca richardsonii /19
Festuca vivipara /1
Colpodium vahlianum /1
Puccinellia phyganodes /1
Calamagrostis stricta /1
Dupontia pelligera /1
Luzula arcuta /1
Papaver dahlianum /1
Rumex acetosa /1
Oxyria digyna /1

Total: 212 accessions

All the seed was returned to the U.S. under a Norwegian phytosanitary permit and the general USDA import permit. No problems were encountered on return to the U.S. This seed was field planted on the PMC property in June 2003.

West and South Greenland Collection Project

In 2003 a seed collection project was conducted in west and south Greenland between September 5 and October 8, 2003. The seed collection project was very successful resulting in 403 collections, including 31 species. This is the largest collection the Plant Materials Center has ever made during a federally funded germplasm collection project. The volume (weight) and number of species exceeded the initial goal by at least sixty percent. This was in part due to the fact that grazing animals, primarily sheep, are well managed and restricted in Greenland. Therefore, no competition for the resource existed. But more importantly, the suggested time of the collection project was perfect the availability of the maximum amount of seed. This combined with the previous summer's weather contributed to very high quality seed. The collection conditions were nearly ideal with only a few days of rain.

There were only minor flight delays between towns so time on the ground was maximized. The people on Greenland were very helpful. All of these factors contributed to the success of the project.

The Danish Plant Health Directorate, located outside Copenhagen, was helpful and efficient in having the seed inspected. Every collection was inspected and a Phytosanitary Certificate was issued after two working days.

Upon arrival in Seattle the seed was immediately sent to the local APHIS inspection station for a final screening. Four collections needed further inspection and were held in Seattle. Two days after the seed collection was surrendered to APHIS the remainder of the collections arrived in Palmer.

Greenland Species and Accessions Collected

Agrostis capillaries	14
Agrostis mertensii	1
Alopecurus alpina	18
Angelica archangelica	4
Artemisia borealis	8
Calamagrostis langsdorffii	9
Calamagrostis neglecta	5
Campanula gieseckiana	4
Cerastium alpinum	1
Deschampsia caespitosa	45
Deschampsia flexuosa	14
Dryas integrifolia	1
Elymus alaskanus	9
Eriophorum scheuchzeri	1
Festuca brachyphylla	16
Festuca Richardsonii	11
Festuca rubra	22
Hierochloe odorata	2
Leymus mollis	91
Nardus stricta	1
Phleum alpina	3
Poa alpina	9
Poa arctica	35
Poa glauca	16
Poa pratensis	19
Poa flexuosa	18
Papaver radicatum	1
Puccinellia maritima	10
Salix glauca	1
Saxifraga oppositifolia	3
Trisetum spicatum	13
Viscaria alpina	2
Total	**407**

The remaining areas of the Circumpolar region are still of interest. Closing this loop will be possible over the next two years. A collection project in the High Canadian Arctic is now in the planning stage.

Commercial Native Plant Production Project

In 1999, the PMC was awarded a federal grant to initiate a project of commercializing native plants in Alaska. The $350,000 grant is intended to fund additional collection efforts and hire employees and purchase equipment. The project is intended to last five years with continued grants of an equal size. This project also allows for the re-use of the Alaska Forest Nursery. The project is funded by the U. S. Natural Resources Conservation Service.

One of the first accomplishments of this project was to produce the second edition of the Directory of Alaska Native Plant Sources in January 2000. This document is very useful as a marketing tool for our native plant growers and suppliers.

By April of 2000, the project was fully staffed with 2 Agronomists, a Maintenance Mechanic and 2 Laborers. By mid-April planting was well underway.

During this first growing season, plants were grown from seed collections made by the PMC staff over the last several years. Seed of nine wetland species and 20 upland plants were sown. Different growing media were used to address the growing requirements of the various species.

This initial growing season was an experiment to begin identifying cultural requirements for the different species. There was no attempt to involve growers at this early stage.

The plants produced from these first seedings were planted in a variety of locations for demonstration and evaluation. The dryland plants such as the Oxytropis, *Potentilla multifida, Plantago canescens* and Dryas were planted into droughty sites.

The remainder of the upland species was planted at a school, the PMC fields and the outside production beds at the PMC Nursery. The wetland species were planted into newly created wetland and production beds at the PMC Nursery. Any seed produced at these sites will be harvested.

Additional seed collections were made from native plants in the Southcentral Region for production and hopefully distribution to growers during the 2001 growing season.

The first announcement of the 2001 native plant distribution came during the Alaska Greenhouse Conference and Garden Fair on April 19-21, 2001. A letter was distributed to interested native plant growers; attached to the letter was a listing and brief description of the plant offerings. Additional advertisement of the program occurred through NRCS, the newspaper and word of mouth.

We received over 20 inquiries about the program. In early June and later in August, we distributed 7,399 plants and 7.29 pounds of seed to 17 growers. At the same time, we provided written material describing the techniques we used to produce the plants, including soil media and scarification techniques.

Not all of the plants we had placed on the April 19th plant listing were ready for distribution in June. We distributed those plants in August. In the meantime, we had produced additional plants which were also offered to growers.

The plants were distributed free of charge with the understanding that once production was underway that the grower would pay the Nursery in seed for the plants and/or seed they had received.

Considerable effort was made to germinate and produce wetland plants. The program experienced mixed results and those species that grew well were distributed to growers and special wetland revegetation projects.

Another accomplishment in 2001/2002 was the updating of the Directory of Native Plant Sources. The directory is now online at http://www.dnr.state.ak.us/ag/native_directory.htm.

The plans for 2002 include producing more species for distribution follow up with the current growers and expanding our seed collection efforts. An agreement with DOT/PF has been developed to produce wetland vegetation mats for installation in 2004 as a trial/demonstration planting.

In 2002, the Native Plant Nursery distributed over 38 grams of seed and 20,000 plants representing 57 species to 20 growers. Additional plants were placed in another demonstration project, a new wildlife pond at Big Game Alaska.

Information continues to be shared with growers on marketing opportunities and plant growing tips. Interaction with the growers after they receive plants has been limited. In 2003, we hope to conduct site visits.

An extensive fall planting was made; the seeded trays were placed in the cooler for over-wintering and stratification. This method of over-wintering should be better than placing the trays in wood chips. The trays in the cooler are protected from the wind, snow and ice and can be moved to the greenhouse for germination earlier.

The 2003 growing season began with a disaster. The temperatures were near 0º F, the winds were howling and a roof panel broke causing the greenhouse to freeze and the water system to break. A planting of 5,000 alders also froze. Repairs to the greenhouse and watering system were repaired and eventually the alders were reseeded. This event set us back approximately 3 weeks. Despite the slow start the growing season was highly productive.

The fall seedings, planted in 2002, were overwintered in a cooler that was controlled by outdoor ambient temperatures. Again the plantings were well protected f rom the weather and grew well when placed in the greenhouse. Approximately 42 accessions had been overwintered and additional 49 accessions were planted in the spring.

The Nursery tested new stratification protocols for the fall plantings. One method that worked particularly well for the wetland plants was the peat sandwich. The seeds were exposed to moist peat throughout the winter. This method helped to increase the germination of *Carex aquatilis* considerably.

Sixty seven species or 7600 plants and 424 grams of seed were distributed to 16 growers. Twelve of the growers were new participants in the program. Five of our past growers have provided seed for payment of plants received.

In 2003 the Native Plant Nursery provided alder seedlings and other upland plants to several special projects with State Forestry, Division of Mining and the US Fish and Wildlife Service in Kenai. Surplus wetland plants were provided to a wastewater treatment project in Talkeetna and to Big Game Alaska for a pond in a moose enclosure.

After distributing thousands of plants to growers and special projects there were still many plants left in the Nursery inventory. The accessions with large numbers of plants were placed into upland, facultative upland and wetland fields at the Plant Materials Center (PMC). Those accessions with fewer numbers of plants were placed into approximately 30 raised beds. Hopefully these plantings will provide a continuous source of seed for the various species.

In July and August we conducted site visits to observe the plant production operations of several of the growers. Fourteen site visits were conducted in Talkeetna, Trapper Creek, Willow, Wasilla, Sheep Mountain, Anchorage, Seward, Girdwood, Ester, Two Rivers and Delta. Site visits were not conducted in Southeast, Sterling and Homer. The results of our visits and phone conversations were varied. Generally growers that were already in the plant production business and/or avid gardeners were having the greatest success growing native plants. However, none of the growers are ready yet to be listed in the Directory for Native Plants.

The challenges encountered by several growers included loss of plants because the plants were never placed in the ground, water stress and weeds. One grower returned the seed and plants because she felt that her clientele was not interested in native plants. Three or four growers have experienced life events that have forced them to no longer have time to work with the native plants and a few others appear to have thought growing native plants was a good idea but were unable to follow through.

Seed was collected from the fields at the PMC, raised beds at the Nursery and the wild during the late summer and fall. Over 160 accessions were collected, representing approximately 120 species. Most of the accessions were cleaned and 62 species were seeded in the fall for growth in 2004.

The Program is in the process of entering native plant propagation protocols on the Native Plant Network, an international database found at http://nativeplants.for.uidaho.edu/network. Nine protocols have been entered so far. We will continue to add protocols to the database until all suitable propagation protocols have been entered.

The Directory of Native Plant Sources has been updated. The 5th edition can be found on the web at http://www.dnr.state.ak.us/agNEWnative_directory.htm.

Evaluation of current plantings will continue. Maximizing seed production from our field plantings will also be a priority.

Department of Transportation and Public Facilities Vetch Survey

Recent statewide interest in invasive/non-native plants prompted concern in DOT/PF about certain species becoming established along road right-of-ways. *Viccia cracca* is one that is prevalent, thus DOT/PF and the PMC joined together to look into the extent of the infestation and the role DOT/PF should play in its control. The report is available on the internet at: http://www.dot.state.ak.us/stwddes/research/assets/pdf/fhwa_ak_rd_02_11.pdf.

Though infestations are considered a problem, more research is needed to determine the invasiveness of this species before eradication control measures are implemented. Including this species in a general weed management plan is appropriate. Care must be taken not to misidentify other native legumes with similar growth habits as the problem vetch. Many strategies are effective in controlling it but mowing is preferred.

Foundation Seed Program

This section of the North Latitude Revegetation and Seed Production Project increases and preserves cereal grain and grass varieties developed for the special growing conditions prevalent in Alaska and other northern latitude countries.

In the past, “breeder” seed of grasses and grain were obtained from the University of Alaska, Agricultural and Forestry Experiment Station (AFES). The Alaska Plant Materials Center was given the responsibility for producing breeder seed of the numerous varieties of grasses in 1994. Small blocks of breeder seed have been established and are being maintained. Breeder seed of the numerous grain varieties developed and released by the AFES are still provided.

The progeny of breeder seed, designated “foundation” seed, is made available to the industry through the state’s seed certifying organization, the Alaska Seed Growers, Inc., in conjunction with the state Division of Agriculture. This process ensures that farmers growing “registered” (progeny of foundation) and “certified” (progeny of registered) classes of seed meet all requirements of genetic purity and cleanliness, and are in compliance with state seed regulations and the Federal Seed Act.

When the PMC began operations in 1973, the Foundation Seed Program began increasing newly released varieties of barley, oats, and wheat. These varieties, bred by the University of Alaska, Agricultural Experiment Station, became the primary crops of the agricultural projects of the late 1970s and early 1980s. At the same time, new varieties of grasses for revegetation and turf gradually became available. As production from the large projects wound down, interest increased in revegetation varieties. Today, the Foundation Seed Program raises over a dozen varieties of grasses and forbs bred for revegetation and reclamation throughout the state. In addition, new seed collections from throughout the state are planted and evaluated. Promising species are increased at the PMC and made available for new revegetation projects.

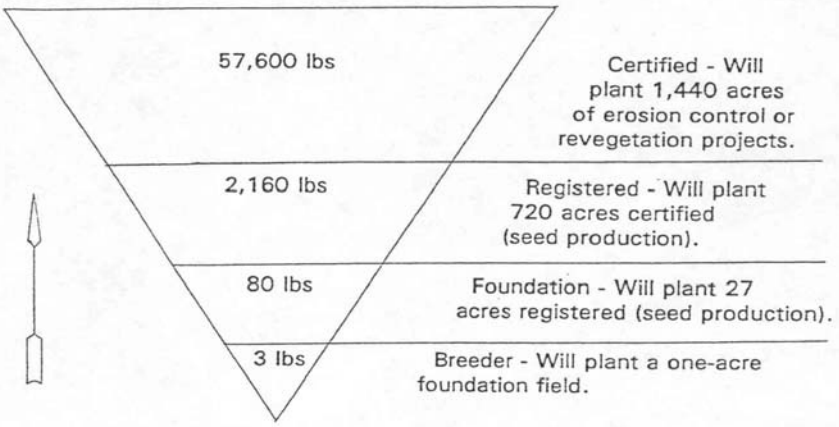
Seed quality is a prime essential to successful farming. A grower needs to know that the variety will perform, has acceptable germination and is free from contaminants.

Plant breeders explore the genetic potential of a variety. Varieties are selected based on the intended use as food, fiber, an ecological niche or its chemistry.

Successful growers understand the requirement for good germination and vigor from their seeds. The Federal Seed Act requires that seed offered for sale meet minimum germination standards.
Contaminants in seed include broken seed, chaff, dust, weed seed, other crop seed and pathogenic organisms. The higher the purity of clean seed, the less the possibility of introducing unwanted pests. The introduction of weeds or diseases in the seed increases the production costs and reduces yields not only in the present, but in future years as well.

As a member of the Association of Official Seed Certifying Agencies, the PMC's Foundation Seed Program, along with the Alaska Seed Growers, Inc., joins 43 other states in insuring that in-state and interstate purchasers have access to high quality, genetically pure seed.

Figure 3 - Seed Increase Pyramid



This diagram illustrates the increase of three pounds of grass breeder seed to a commercially useable quantity. Clean seed yield is based on 80 lbs./acre. The planting rate is based on 3 lbs./acre for seed production and 40 lbs./acre for reclamation purposes.

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Figure 3 – Seed Increase Pyramid

2003 Growing Season

The 2003 growing season began rather dry. A stick lodged in the impeller of the irrigation pump drastically decreased its capacity, making for a nerve-racking start to the dry part of the season. The pump was fixed and the season ended up being one of the best on record. The cool rains came throughout July, but they subsided in late August and early September to make harvesting easy. This year produced the best yields of hairgrass in memory.

Inspection and Sampling

A service formerly delegated to the Division of Agriculture's main office has been reassigned to the PMC's Foundation Seed Production Program - inspection of certified seed fields and official sampling of seed lots for germination and purity testing. The area of responsibility is south central Alaska, primarily the Matanuska and Susitna Valleys. Seed lots were sampled for testing as required.

Table 1. Revegetation and Turf Varieties in Production in 2003.

Variety	Class	Planted	Acres
'Nugget' Kentucky Bluegrass	Breeder	94	5
'Nugget' Kentucky Bluegrass	Breeder	96	2
'Nugget' Kentucky Bluegrass	Breeder	01	2
'Sourdough' Bluejoint	Breeder	97	.5
'Sourdough' Bluejoint	Breeder	01	1
‘Arctared’ Red Fescue	Breeder	97	1
‘Arctared’ Red Fescue	Breeder	01	2
‘Norcoast’ Bering Hairgrass	Breeder	00	2
'Nortran' Tufted Hairgrass	Breeder	97 & 00	3
‘Kenai’ Polargrass	Breeder	01	2
‘Alyeska’ Polargrass	Breeder	01	.5
'Caiggluk' Tilesy Sagebrush	Breeder	95	.5
'Reeve' Beach Wildrye	Foundation	90 & 00	2
‘Gruening’ Alpine Bluegrass	Breeder	00 & 02	1.5

Table 2. Cereal Grain Seed & Oil Seed Varieties in Storage at the Plant Materials Center, December 2003.

Barley		Wheat		Oats		Rye	
Variety	lbs	Variety	lbs	Variety	lbs	Variety	lbs
Lidal	2,300	Ingal	1,000	Toral	17,000	Bebral	1,000
Otal	1,800	Nogal	2,600	Ceal	5,000		
Thual	20,000	Froid	150	Nip	10,000		
Weal	11,000			Golden Rain	5,000		
Finnaska	2,800						
Datal	13,000						
Pokko	400						
Arra	650						
Eero	500						
Total	52,850	**Total**	3,750	**Total**	37,000	**Total**	1,000

Table 3. Cereal Grains Sales & Receipts, 1998 - 2003.

Type	1998	1999	2000	2001	2002	2003
Barley	150	13,000	500	2,450	2,800	6,100
	$60.00	$2,600.00	$170.00	$689.40	$878.77	$2071.24
Oats	3,000	6,600	1,100	5,500	1,100	400
	$600.00	$1,980.00	$390.00	$1,997.42	$380.62	$153.98
Wheat	1,300	1,500	400	1,500	0	0
	$278.00	$330.00	$133.75	$431.90	0	0
Total	4,450	21,000	2,000	9,450	3,900	6,500
	$938.00	$4,910.00	693.75	$3118.72	$1,259.39	$2,225.22

Table 4. Grass Seed Sales & Receipts, 1998 - 2003.

Variety	1998	1999	2000	2001	2002	2003
'Nugget' Kentucky	40 lbs	0	97 lbs	25 lbs	119 lbs	110 lbs
Bluegrass	$480.00	0	$1,164.00	$288.75	$743.65	$1248.50
'Arctared' Red	0	200 lbs	0	0	185 lbs	0
Fescue	0	$2,600.00	0	0	$1,551.19	0
'Sourdough'	0	0	0	0	0	0
Bluejoint	0	0	0	0	0	0
'Alyeska'	0	0	0	0	19 lbs	0
Polargrass	0	0	0	0	$336.68	0
'Gruening' Alpine	0	0	0	0	0	0
Bluegrass	0	0	0	0	0	0
'Kenai' Polargrass	0	0	0	0	0	0
'Egan' American	20 lbs	0	80 lbs	30 lbs	0	30 lbs
Sloughgrass	$291.00	0	$1,840.00	$637.80	0	$418.20
'Norcoast' Bering	0	0	0	0	0	4 lbs
Hairgrass	0	0	0	0	0	$64.52
'Nortran' Tufted	0	100 lbs	0	151 lbs	39 lbs	39 lbs
Hairgrass	0	$1,500.00	0	$1422.53	$542.10	$648.96
Polar Brome	0	0	0	0	0	0
'Tundra' Glaucous	0	10 lbs	0	0	0	0
Bluegrass	0	$130.00	0	0	0	0
'Caiggluk' Tilesy	0	0	0	0	0	0
Sagebrush	0	0	0	0	0	0
	60 lbs	310 lbs	177 lbs	206 lbs	362 lbs	183 lbs
Total	$772.00	$4,230.00	$3,004.00	$2,349.80	$3,173.62	$2,380.18

Potato Disease Control Program

Potatoes are among the most valuable crops grown on Alaskan farms. Commercial potato production is highly capital intensive. High yields with good quality are required to assure a fair return on investment. Diseases can cause significant losses reducing yield and quality factors.

The potato is a vegetatively propagated plant and as a consequence, has unique production problems. Many economically important diseases and pests can be carried in or on the tubers used as seed. The use of seed potatoes having little or no disease is basic to any management plan. Planting certified seed reduces the risk of losses caused by disease. It is for this reason that the production of disease free seed is a primary goal of the Plant Materials Center.

Seed produced at the PMC is sold to growers who increase the original allotment over the next several years. Seed potatoes are subjected to strict certification inspections to assure minimal disease incidence. The volume of certified seed produced in this fashion enables a grower to replace older diseased seed with clean seed.

Alaska is unique in that many disease and insect pests common to North America that require chemical control do not occur here. The importation of seed from outside the state has the potential to introduce pests not known to occur in Alaska. The inadvertent introduction of these diseases or pests would cause major problems. The importation of seed is therefore discouraged. Growers who wish to try new varieties are encouraged to obtain clean seed stock from the PMC.

Pathogen Testing

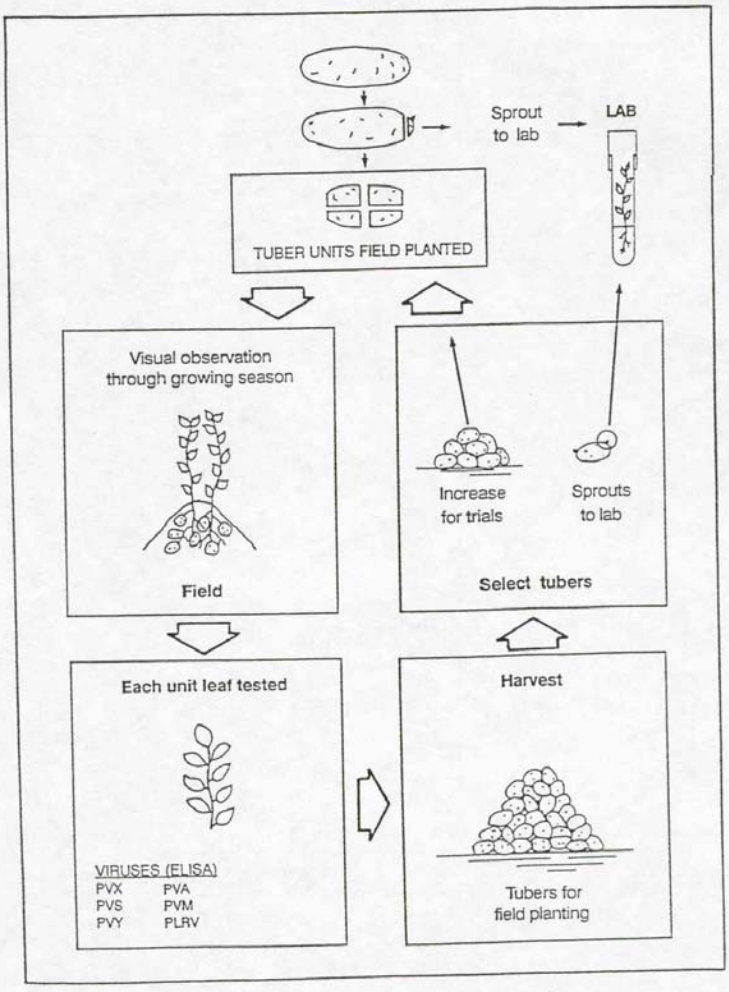
The major focus of the potato program is providing quality seed potatoes to commercial seed growers. Low levels of disease are required of quality seed because diseases can negate a crop's usefulness as seed. The seed provided by the PMC is used as the initiating stock for the ensuing multiple year certified seed production scheme. This seed, therefore, must be of the highest quality possible since any disease introduced at this point would be multiplied during each successive year of seed increase. To this end, all production is rigorously tested and retested for disease prior to sale.

Testing for the presence of diseases is performed in the PMC laboratory on all the initial seed stocks (Figure 4). The diseases of primary importance are Bacterial Ring Rot (BRR) and the viruses Potato Leafroll Virus (PLRV), Potato Virus Y (PVY), Potato Virus X (PVX), Potato Virus S(PVS), Potato Virus A (PVA), Potato Virus M (PVM), and the viroid Potato Spindle Tuber Virus (PSTV).

All newly acquired germplasm and each mother plant used for the in vitro propagation of the greenhouse stock are tested prior to production and again prior to harvest. The field grown materials are visually inspected during the growing season with laboratory testing performed prior to harvest (Figure 5).

Monitoring the health of the potato stocks at the PMC is a critical function. Understanding and accurately performing the disease test procedures, as well as interpreting the results, is essential. The PMC participates in the Potato Association of America Certification Section Standardization Project. This exercise provides participating labs the opportunity to test their materials and methods against a standardized series of antigens, and thereby developing a level of credibility. The PMC has been successful in detecting very low antigen levels as well as various strains found in North America.

Figure 4. TUBER INTRODUCTION



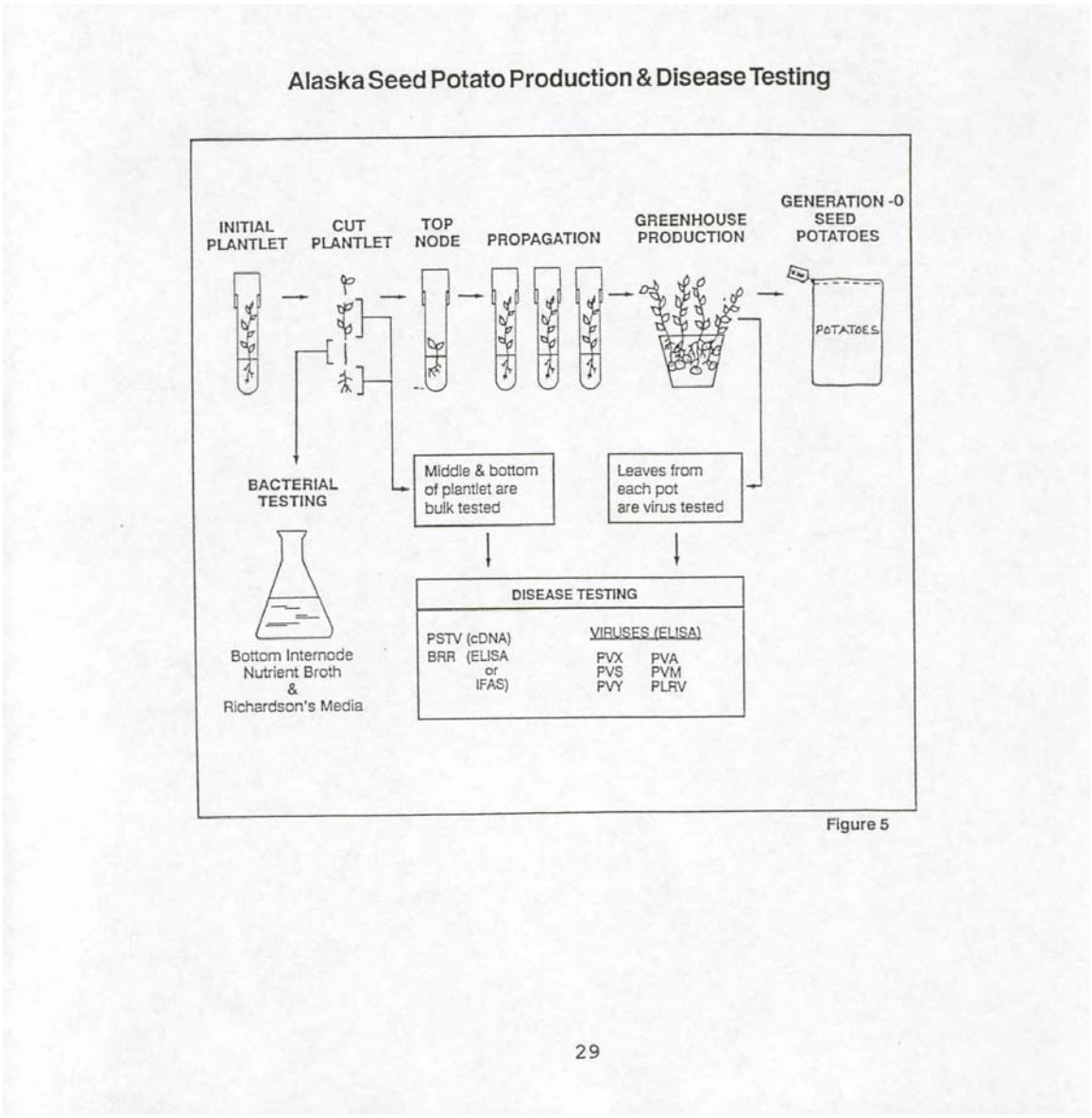


Figure 5

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Seed Potato Certification

State of Alaska Seed Regulation 11 AAC 34.075 (J) requires that all potatoes sold, offered for sale or represented as seed potatoes be certified.

The Seed Potato Certification Program is designed to provide growers with potato seed stock that is varietally pure and relatively free from disease causing organisms. These results are achieved by the voluntary compliance of seed growers to the certification regulations. Growers manage their seed production to limit the possible exposure to diseases, but reinfection can occur from soil or other sources. Certification is designed to identify and remove from use as seed those seed lots that have become diseased or are otherwise of reduced value for use as seed.

Diseases are capable of causing severe losses. Many of the diseases affecting the potato are carried in or on the potatoes themselves. The use of seed in which diseases are absent or at low levels has been proven to greatly reduce the risk of losses caused by disease. Certified seed has been inspected during the growing season and has met low levels of the disease tolerances allowed for seed. Certified seed potatoes produced in Alaska are far superior to seed produced outside of the state. The importation of potatoes carries with it the risk of introducing diseases that are capable of having severe consequences to Alaskan growers. The local availability of disease-tested seed reduces the potential of introducing diseases not presently found in Alaska through imported seed.

The Alaska Certification Program is a "limited generation system" in which the initiating seed lot, called Generation 0 (G-0), can be field planted only a limited number of years; i.e., eight years. The rationale of a limited generation system is that the contamination of seed stocks by tuber-borne pathogens increases with each replanting. If the older seed stock is continually removed from the system and replaced with new stock, the probability that pathogens will build up to problem levels is reduced. This system has been very effective in reducing, and in some cases, eliminating virus diseases.

Seed fields are inspected for diseased plants twice during the growing season and once while in storage. Seed lots in which excessive amounts of disease are found, are not allowed to be sold as certified seed.

Alaska's Certified Seed Program is administered by the Alaska Seed Growers, Inc. The inspections are conducted by the PMC's Potato Disease Control Program.
Certified seed potatoes are grown in the Matanuska Valley, Fairbanks, Bartlett Hills, Nenana, Delta Junction and Kodiak. Each lot was inspected according to certification standards for disease and varietal purity.

Table 5. Certified Seed Potatoes

Year	# Growers	# Varieties	# Lots	Acreage
1998	17	212*	233	105
1999	17	44	188	123
2000	14	238*	180	122
2001	12	49	153	128
2002	11	49	160	116
2003	8	43	172	145

*Includes PMC variety bank.

Educational Program

The University of Alaska Cooperative Extension Service holds an Annual Potato Conference to update growers on research projects and innovations pertaining to potato production. Presentations were made outlining potato diseases found in Alaska. Various control measures were discussed focusing primarily on using quality seed as a management tool.

Scab Resistance Trial

Potato scab is caused by the bacteria *Streptomyces scabies*. It causes brown, circular lesions on the potato skin. The lesions can be raised or sunken and detract from the appearance of the potato. Peeling removes the affected area. Recent work has demonstrated that a chemical (Thaxtomin) produced by this organism can cause lesions to form on tubers in the absence of the live pathogen. The amount of the phytotoxic chemical produced has been shown to correlate with the severity of the pathogenicity of various isolates of the causal organism.

Planting cultivars known to be resistant to scab coupled with production practices that help reduce disease severity is central to integrated pest management systems.

Variety Development

The search for improved varieties is an on-going process. Finding a potato that bulks earlier, has more and better disease resistance, requires less fertilizer and tastes better are but a few of the traits we seek. The new horizon opened with the advances in biological technology appears limitless. Perhaps, a potato that would sprout legs and climb into the sack is the next level.

Breeding programs perform controlled cross-pollination between promising parental material in the hope of creating improved cultivars. The PMC has obtained true seed from several breeders. The seed was planted in the greenhouse and transplanted to the field. One or two small tubers were harvested from each plant. These will be field planted using wide spacing and single hills, which will be observed for yield, skin color and tuber shape. The few hills that meet the minimum requirements will be harvested and replanted for further observations. True seed will be obtained from several potato breeding programs to extend the types of families for testing.

There are thousands of cultivars in the world today. Each year, millions of dollars are spent on breeding programs in the search for better potatoes. Since the early 1900's, Alaskans have planted and observed hundreds of different potato varieties. Certain varieties have had their day with improvements making the older ones obsolete, and yet sentiment or special circumstances create a desire to keep replanting them.

There are many varieties of potato beyond the mainstream russets, whites and reds. A veritable cornucopia of shape, size, color, texture and flavor await those willing to explore. As new and unusual potato varieties are collected by the PMC, they are tested for diseases, purified and then planted. Observations are made of horticultural characteristics, plant type, flower color, tuber shape and color, yield, and storage characteristics; the end result being a variety description.

Several novel varieties lacking this type of database have been cleansed of virus and offered for production as "experimental" varieties. These novelty potatoes have been promoted in several gardening magazines and are prized by some Alaskan growers. The PMC maintains these cultivars to provide an instate source to help obviate the necessity of importing seed potatoes which could introduce exotic diseases.

Disease-Tested Seed Potato Production

Disease-tested potato plants are mass propagated in a sterile environment. The PMC produces tubers from these plants in greenhouses. Growers place orders for these seed tubers the winter prior to production. This provides the time necessary to propagate the thousands of plants required for planting tubers which are distributed the following spring. The process takes 18 months form start to finish. Stock material, if not on hand, is typically obtained from other similar programs. In some instances, the only source is a diseased tuber, so radical treatments are used by the PMC to create the initial disease-free stock. The PMC maintains a disease-tested collection of more than 200 cultivars as field grown stock, while 40 are maintained in culture and are ready for propagation.

The commercial growers have shifted from white-skinned to russet-skinned varieties during the last ten years. Gardeners who purchase a considerable amount of certified seed, have broadened their desire to include many novelty varieties having unique color flavor or shape.

Table 6. Seed Potato Production

Year	Number of Varieties	G-0	G-1	Plantlets
1998	42	1,800	1,100*	2,200
1999	50	1,877	1,000	550
2000	72	1,200	687	2,880
2001	49	1840	350	400
2002	62	3,645	699	160
2003	74	1,553	989	1,200

* Due to a shortage of certified seed potatoes, the Plant Materials Center sold field grown seed.

Seed stocks were provided to:

Ohio Potato Growers Association
University of Wisconsin Madison
University of Minnesota

Virus Disease Expression Plot

A small plot was established to examine viral disease symptom expression. Four seed pieces each of known virus-infected materials were planted May 30th. The diseases were Potato Leafroll Virus (PLRV), Potato Virus Y (PVY), Potato Virus M (PVM), Potato Virus X (PVX), Potato Virus S (PVS), and very small tubers harvested from a plant having Witches Broom symptoms.

Symptoms of virus infection, except PVS, were apparent throughout the season for all viruses beginning a few days after emergence. The Witches Broom material did not emerge until mid August. It appeared healthy until late September when a light marginal chlorosis could be observed on the newer expanding leaves.

Weather Monitoring

The PMC's computerized weather monitoring station has improved meteorological monitoring. The Davis Groweather system, installed May 12, 2000, has been collecting data mostly uninterrupted since then. The summary reports for 2003 are in Tables 7, 8 and 9.

ANNUAL CLIMATOLOGICAL SUMMARY

Table 7. Temperature (°F)

					HEAT	COOL							
		MEAN	MEAN		DEG	DEG					MAX	MIN	MIN
YR	MO	MAX	MIN	MEAN	DAYS	DAYS	HI	DATE	LOW	DATE	<=32	<=32	<=0
3	1	25.0	7.9	15.5	1504	0	45.1	12	-8.0	1	21	31	9
3	2	37.4	25.9	31.5	933	0	47.2	8	4.4	20	7	21	0
3	3	34.7	15.6	25.1	1235	0	46.1	16	-8.9	14	9	30	3
3	4	47.8	25.1	37.1	172	0	64.2	30	12.8	3	0	5	0
3	5	57.2	37.2	47.8	553	0	67.4	29	28.5	1	0	4	0
3	6	64.4	45.8	55.3	297	0	75.8	30	35.4	2	0	0	0
3	7	69.0	49.8	59.4	174	1	82.9	8	42.6	19	0	0	0
3	8	64.5	46.0	55.3	303	0	81.4	9	35.9	2	0	0	0
3	9	56.7	35.4	45.9	569	0	65.4	11	23.0	17	0	11	0
3	10	50.2	35.4	42.1	688	0	64.8	1	24.4	17	0	14	0
3	11	26.7	13.3	20.2	1350	0	52.7	8	-22.3	27	17	21	11
3	12	21.4	4.4	12.7	1615	0	41.6	29	-23.6	27	22	30	12
		46.2	28.7	37.4	9393	1	82.9	Jul	-23.6	Dec	76	167	35

Table 8. Precipitation (in.)

YR	MO	TOTAL	MAX OBS DAY	DATE	DAYS OF RAIN OVER .01	0.1	1
3	1	0.61	0.31	3	4	2	0
3	2	1.27	0.50	4	5	3	0
3	3	0.15	0.06	2	3	0	0
3	4	0.00	0.00	1	0	0	0
3	5	0.83	0.26	16	7	3	0
3	6	0.81	0.58	14	8	1	0
3	7	1.27	0.46	3	8	3	0
3	8	1.14	0.32	20	10	3	0
3	9	0.88	0.43	13	8	2	0
3	10	1.11	0.88	3	6	1	0
3	11	1.01	0.14	23	11	5	0
3	12	0.89	0.33	22	7	4	0
		9.97	0.88	Oct	77	27	0

Wind Speed (mph)

YR	MO	AVG.	HI	DATE	DOM DIR
3	1	1.0	33	4	W
3	2	5.1	55	4	WSW
3	3	2.5	33	9	W
3	4	3.0	14	1	WSW
3	5	4.5	43	9	E
3	6	3.3	30	5	E
3	7	2.5	31	28	E
3	8	3.4	35	11	E
3	9	2.4	44	30	E
3	10	3.1	43	1	E
3	11	1.2	34	8	W
3	12	1.1	50	29	ENE
		2.7	55.0	Feb	E

APPENDIX A

CURRENT & HISTORICAL BUDGET INFORMATION

CALENDAR YEAR 2003 AUTHORIZATIONS, EXPENDITURES, AND PROGRAM RECEIPTS

ARLF Authorizations

Authorizations FY 2003 PMC Total	535,600
Alaska Plant Materials Center	
Project Total	535,600
Personal Services	470,300
Travel	3,000
Contractual	45,200
Supplies	17,100

PMC Operating Budgets
for the Past Seventeen Fiscal Years

		FY87	FY88	FY89	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03
Author-ization in Thous-ands	PMC	733.7	596.7	556.7	556.1	566.1	620.8	608.9	585.6	595.3	433.3	522.9*	508.6*	511.1	485.9	523.4	522.0	535.6
											100.0*							
	Forest Nursery			0	0	0	0	0	180	0	95.2	0	0	0	0	0	0	0
Personnel		17	16	16	16	16	16	16	17	17	15	14	15	19	22	24	36	37
Full Time		9	7	7	7	7	7	7	7	7	6	5	6	5	6	8	9	13
Part Time		8	9	9	9	9	9	9	10	10	9	9	9	14	16	16	17	24

* Indicates Agriculture Revolving Loan Fund source.

When comparing personnel figures listed for FY 03 to those in FY 89, bear in mind that the Plant Materials Center is now performing basically the same duties at nearly the same level as it did in 1989 with 198,100 fewer dollars. The PMC has started generating operating money from federal and private grants to cover needed operations. These funds are in the form of short-term contracts that must continually be renewed. Money to hire and keep labor support staff has been the most critical issue facing the PMC. In the last three years, reductions in supplies and contractual (utilities) have also become areas of constant concern. These funds are now being supplemented with program receipts.

Program Receipts
Calendar Year 2003

Contracts, Reimbursable Service Agreements and Grants

Source	Face Value of Contracts Awarded in 2003
USDA Agricultural Research Service (Germplasm Repository)	265,000
USDA Natural Resources Conservation Service	350,000
USDA Natural Resources Conservation Service	268,800
USDA/ARS	11,987
U.S. Army National Guard	8,200
U.S. Depart of Military and Veterans Affairs	10,729
Alaska Dept. of Transportation/PF	10,695
Alaska Dept. of Transportation/PF	9,048
Alaska Division of Mining, Lands and Water	28,500
Alaska Division of Mining, Lands and Water	10,000
Alaska Division of Forestry	1,800
Alaska Seed Growers	21,588
University of Alaska/ USDA CREES	266,205
	$1,262,552

RSA, Program & Federal Receipt Values Since CY 1988

Prior to 1988, Program Receipts and contracts were not sought by the Plant Materials Center.

1988	1989	1990	1991	1992	1993	1994	1995
42,195	31,407	58,417	117,981	126,071	202,886	377,161	334,200

1996	1997	1998	1999	2000	2001	2002	2003
212,800	304,200	1,086,000	928,400	1,013,200	5,630,000	1,238,389	1,262,552

2003 Calendar Year Monthly Expenditures of ARLF Funds to the Nearest Dollar

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PMC Totals	23,215	20,355	-33,299	18,933	20,075	40,594	38,962	44,859	68,431	76,588	40,908	42,724
Personal Services	19,715	16,664	-37,969	13,190	13,459	39,887	33,275	41,488	55,955	70,349	38,189	35,299
Travel	0	0	0	399	0	0	0	249	713	529	0	0
Contractual	2,629	1,901	3,470	3,076	5,895	527	388	1,624	10,015	4,155	2,555	5,316
Supplies	871	1,790	1,200	2,268	721	180	5,299	1,498	1,748	1,555	164	2,109

APPENDIX B

CROP RELEASES

CROP CULTIVARS DEVELOPED AND ADVANCED BY THE ALASKA PLANT MATERIALS CENTER

'Long' Barclay Willow, *Salix barclayi* - This attractive, fast growing native willow was released for commercial production in 1985. This cultivar will be used for reclamation, landscaping and shelter belts.

'Roland' Pacific Willow, *Salix lasiandra* - Roland was released in 1985 and is probably the most attractive willow selected by the PMC to date. This cultivar will be used for landscaping, stream protection and revegetation throughout most of Alaska.

'Wilson' Bebb Willow, *Salix bebbiana* - This willow has a dense growth form and has many potential uses for screening, windbreaks and living fences. Because of the species' wide range of adaptability, it is also expected to be utilized for reclamation activities. Wilson is a 1985 release.

'Oliver' Barren Ground Willow, *Salix brachycarpa* - Oliver was released for commercial production in 1985. This cultivar's interesting growth form will lend itself well for incorporation into hedges. Additional uses range from reclamation to windbreaks.

'Rhode' Feltleaf Willow, *Salix alaxensis* - Rhode was also released for commercial production in 1985. This species occurs throughout Alaska and is listed as a preferred wildlife species. This cultivar will find uses in habitat restoration, reclamation, streambank protection and shelter belts.

'Egan' American Sloughgrass, *Beckmannia syzigachne* - Egan was released for commercial seed production in 1986. This cultivar has performed well at most test sites. Its expected uses are wetland restoration and waterfowl habitat enhancement. In 1991, Egan was registered as a crop cultivar with the Crop Science Society of America.

'Gruening' Alpine Bluegrass, *Poa alpina* - This selection of alpine bluegrass was released for production in 1987. A native species, alpine bluegrass has shown extreme hardiness throughout Alaska and it is well adapted to harsh sites such as mine spoil. In 1991, Gruening was registered as a crop cultivar with the Crop Science Society of America.

'Caiggluk' Tilesy Sagebrush, *Artemisia tilesii* - Caiggluk tilesy sagebrush is a native collection of sagebrush. It was placed in commercial production in 1989. The expected uses range from mine reclamation to restoration of sites contaminated

with toxic metals. The cultivar will add diversity to seed mixes. This is the first native broadleaf species brought into commercial production in Alaska. In 1991, Caiggluk was registered as a crop cultivar with the Crop Science Society of America.

'Service' Big Bluegrass, *Poa ampla* - This accession of big bluegrass was derived from a collection made in the Yukon Territories. During the PMC evaluation process, the collection out-performed 'Sherman' big bluegrass (the only known cultivar of big bluegrass) in all categories. Service is expected to find use in dry land revegetation projects in Alaska south of the Yukon River.

'Reeve' Beach Wildrye, *Elymus arenarius* - Reeve beach wildrye was developed from a seed collection obtained from Norway. During the evaluation process, it was determined that this accession was capable of producing commercially viable amounts of seed. This was of extreme interest, as beach wildrye is notorious for not producing seed. Further evaluation indicated that the accession also had hardiness and adaptive traits making it useful in coastal revegetation and reclamation. In 1991, Reeve was released for commercial production. Reeve was registered as a crop cultivar with the Crop Science Society of America in 1994.

'Benson' Beach Wildrye, *Elymus mollis* - This accession was released for commercial production in 1991. Unlike Reeve, Benson was released for vegetative production only. This extremely aggressive and hardy, local collection does not produce seed in any appreciable amounts, therefore, commercial propagation can only be accomplished by vegetative means. This cultivar will find use in transplanting projects where erosion and accretion are beyond the capabilities of any seed species. Benson will become an important cultivar in coastal dune stabilization and restoration in Alaska. In 1994, the cultivar Benson was registered with the Crop Science Society of America.

'Kenai Carpet' Nagoonberry, *Rubus arcticus L*. - 'Kenai Carpet' nagoonberry was selected from a native collection made on the Kenai peninsula. This vigorously growing ground cover has been tested at various trial sites since 1985. It is best suited for use in large areas where an alternative to turfgrass or a mulch is desired. Kenai Carpet nagoonberry spreads by rhizomes and often out competes the surrounding vegetation. A minimal amount of fruit is produced by this cultivar. It was named and released for commercial production in 1991.

'Peanut' syn. 'Swede' Potato. This fingerling potato traces back to the Matanuska Valley in the 1930s. The tubers are small and resemble a peanut in shape and have yellow flesh. Desirable qualities include good yield under adverse conditions and a long dormancy.
'Rote Erstling' syn. 'Rode Eerstling' Potato. European variety promoted by Dr. Donald Dinkel, University of Alaska Fairbanks (retired). Round, red with yellow flesh. Early maturing.

'Alaska Sweetheart' Potato. Germplasm provided by Jayson Dearborn. Round, red with pale pink flesh.

APPENDIX C

LIST OF PUBLICATIONS AND PRESENTATIONS

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Moore, N.J. Propagation of Native Plants, Landscape Supply's Saturday Morning Plant Talks, May 2003.

Moore, N.J. Streambank and Wetland Revegetation Techniques in Alaska. Ravenwood Elementary 4th Grade Classes, May 2003.

Nolen, A.S. Oct, 2003. Vetch Surveys on DOT Right of Ways. 4th Alaska Noxious and Invasive Plants Management Workshop, Oct 28, 2003.

APPENDIX D

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