

**Alaska
Plant
Materials
Center**

**Serving Alaska
for 25 Years**

**1996 - 1997
Combined Annual Report**

Alaska Department of Natural Resources - Division of Agriculture



**ALASKA
PLANT
MATERIALS
CENTER**

**1996 and 1997
COMBINED
ANNUAL REPORT**

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LETTER FROM THE DIRECTOR

The Alaska Plant Materials Center (PMC) will be celebrating its 25th anniversary in 1998. The PMC's present and past dedicated employees should be proud of their accomplishments. Maintaining high levels of service over a twenty-five year period was challenging and not always easy.

The PMC has also maintained service levels and actively sought non-state funds for operation. Additionally, changes in methods of operation and efficiency improvements have allowed the PMC to continue providing services to the public and individuals it serves.

Sincerely,



Robert Wells
Director

TABLE OF CONTENTS

	<u>Page</u>
Introduction	1
History	2
North Latitude Revegetation & Seed Production Project	4
Revegetation & Reclamation Efforts	4
Shemya Air Force Base Road Close-Out	8
Homer Demonstration Plots	8
U.S. Army Revegetation of Gunnery Ranges at Ft. Richardson and Ft. Wainwright	9
Project Chariot Clean Up	10
Mass Aleutian Plant Collection Project	11
Defense Fuel Supply Wetland Restoration	12
Adak Sand Quarry Restoration	12
Forty Mile Mining District	13
Beach Wildrye Manual	14
Adak Wetland Rehabilitation	14
Chugach Electric Wetland Project	15
Alyeska Pipeline Floodplain Investigation	15
Fish Creek Wetlands Restoration Project	16
Arctic Forb Seed Collection	17
Identification of Willow Collection Sites	18
Red Dog Mine Revegetation & Demonstration Plots	18
Alyeska Ski Area Revegetation Study	20
Deep Creek Soil Bioengineering Project	20
DOT Interior Seed Collection Project	21
Navy Germplasm Preservation Project	22
U.S. Army Integrated Training Land Management	22
Southcentral Seed Collection Project	22
U.S. Air Force Cooperative Agreement	23
Adak Landfill Restoration Program	23
Southeast Alaska Plant Collection Project	23
Lower Knob Creek Abandoned Mine	23
Pillars Revegetation Project	25
Anchorage Water & Wastewater Utility	25
Foundation Seed Program	27
1996 and 1997 Growing Season	30

TABLE OF CONTENTS Continued

	<u>Page</u>
Inspection & Sampling	30
Potato Disease Control Program	35
Pathogen Testing	35
Special Disease Testing	36
Seed Potato Certification	39
Educational Program	40
Scab Resistance Trial	31
Variety Development	44
Disease-Tested Seed Potato Production	44
Virus Disease Expression Plot	45
Supplemental Seed Distribution	46
Peanut Potato Trial	46
Appendix A Current & Historical Budget Information	49
Appendix B New & Pending Crop Releases	56
Appendix C List of Publications	62
Appendix D Acknowledgements	79

List of Figures

Figure 1 Map of Alaska	6
Figure 2 Typical Plot Layout	7
Figure 3 Seed Increase Pyramid	29
Figure 4 Tuber Introduction	37
Figure 5 Alaska Seed Potato Production and Disease Testing	38

List of Tables

Table 1 Revegetation and Turf Varieties	31
Table 2 Cereal Grain Seed and Oil Seed Varieties	32
Table 3 Cereal Grain Sales and Receipts	33
Table 4 Grass Seed Sales and Receipts	34
Table 5 Certified Seed Potatoes	40
Table 6 1997 Scab Resistance Trial	42
Table 7 Single Rep Observations	43
Table 8 Seed Potato Production	45

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.

Every year 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 on August 5, 1995. Scheduling conflicts did not allow an open house in 1996 or 1997.

Funding for the Plant Materials Center comes from Agriculture Revolving Loan Fund. In the past, the PMC was funded with general funds. The 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.

In 1998, the PMC will abandon the every other year format, and is returning to the traditional annual report. This report covers two years. Future reports will cover one year.



In November 1997, the PMC was notified that the U.S. Department of Agriculture granted the PMC authority to operate the Arctic Germplasm and Plant Introduction Station. This includes an operating and capital grant.

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 seedlings 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 270 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 Plant Materials Center Plot Locations



Alaska Plant Materials Center Advanced Evaluation
and Demonstration Plot Network Representing
270 Plot Years as of 1997

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
<i>Poa glauca</i> T08867	Gruening alpine bluegrass
<i>Agropyron subsecundum</i> 371698	Sodar streambank wheatgrass
Nordan crested wheatgrass	<i>Agropyron subsecundum</i>
Fairway crested wheatgrass	<i>Agropyron violaceum</i>
Summit crested wheatgrass	<i>Agropyron boreal</i>
Critana thickspike wheatgrass	<i>Agropyron yukonense</i>
Fults alkaligrass	Vantage reed canarygrass
Climax timothy	Engmo timothy
<i>Elymus arenarius</i>	<i>Elymus sibiricus</i> 34560
Norcoast Bering hairgrass	<i>Elymus sibiricus</i> 2144
Sourdough bluejoint	Nortran tufted hairgrass
Meadow foxtail	<i>Calamagrostis canadensis</i>
Garrison creeping foxtail	<i>Alopecurus geniculatus</i>
Boreal red fescue	Arctared red fescue
Egan American sloughgrass	<i>Festuca scabrella</i>
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

Shemya Air Force Base Road Close-Out

In 1991, the PMC received a request to assist the Air Force to close out unnecessary roads on Shemya. These roads crossed lands used for potable water collection. The Air Force was concerned that fuel spills could contaminate the water gallery area, so final and complete road closures seemed to be the most effective solution. Removal of road material was not practical since communication wires were buried in the road bed. Therefore, the roads were abandoned by placing mounds of peat on the surface. These mounds required revegetation to prevent erosion and reduce the negative visual impact.

However, the PMC recommended that the site be monitored for two years before starting a revegetation program, and a natural revegetation study was implemented in 1992. A back-up plan for reseeding has been developed if a satisfactory stand of vegetation does not become established. To date, natural revegetation is occurring at a satisfactory rate. During the evaluation in October 1994, it was determined that the areas had approximately 60% cover consisting of at least 16 species. Final evaluation occurred in 1996. Cover exceeded 90% in some areas.

A final report was submitted to the Air Force after the final evaluation in 1996.

Homer Demonstration Plots

The PMC negotiated with the Homer Soil and Water Conservation District to develop a plot network for the region. During the summer of 1992, it was determined that three evaluation sites would be established in 1993.

In June of 1993, only two sites were available for planting. The first site was behind the Homer High School. This site was planted with 16 species recommended by the Revegetation Guide for Alaska. High School students assisted with the planting.

The second site was located on a farm on East End Road. This plot contained the same 16 species, however three different fertilizer rates were applied.

On August 11, 1993, the plots were evaluated. Both were heavily contaminated with weeds, a common problem when land is not properly prepared. Evaluation was difficult, however, both 'Garrison' creeping foxtail and 'Vantage' reed canary grass were showing the best performance.

In 1994, the High School plot was abandoned because of a weed problem. Information was, however, gathered from the East Road plot. In this plot, the best performance was noted for 'Vantage' reed canary grass, 'Alsike' clover, 'Norcoast' and 'Nortran' hairgrasses and 'Boreal' red fescue. This plot will be evaluated and expanded in 1998.

U.S. Army Revegetation of Gunnery Ranges at Fort Richardson and Fort Wainwright

In cooperation with the U.S. Army 6th Infantry Division and U.S. Army Corps of Engineers Cold Regions Engineering and Research Laboratory, the PMC assessed the erosion problems at small arms ranges on both Fort Richardson and Fort Wainwright. A program to evaluate plant species and potential maintenance practices was developed and agreed to by the cooperators. The planting effort began in July 1994. Evaluations will continue through 1997.

The Grezelka Firing Range at Fort Richardson was seeded during the week of July 5, 1994. Approximately 600 pounds of 'Boreal' red fescue and seven tons of 20-20-10 fertilizer were broadcast over the unvegetated portions of the range. Both mechanical and hand broadcast methods were used to seed and fertilize the range. The mechanical broadcast seeders and fertilizer spreaders were mounted on four-wheelers or towed behind.

Evaluations of the seeding were not conducted at the end of the 1994 growing season, however, reports from the Range Field Office indicate that limited germination and plant establishment had occurred. The best plant growth was found on the slopes of the berms. Most of the site consists of coarse and compact gravel and does not provide favorable growing conditions. The site would have benefited from scarification.

The Grizzly and Aurora Firing Ranges at Fort Wainwright were seeded with Boreal red fescue and fertilized with 20-20-10 fertilizer during the last week in July 1994. Much of the Grizzly Range had been colonized by native vegetation since the original revegetation plan was developed. The remaining unvegetated areas were hand seeded and fertilized. The Aurora Firing Range contained large unvegetated areas that were suitable for mechanical seeding and fertilizing methods.

Also, seed from two native plants, *Agropyron pauciflorum* and *Solidago multiradiata*, were collected from the Grizzly Range. The collections will be evaluated at the Plant Materials Center for potential commercial production.

The ranges at Ft. Wainwright were evaluated in late August in 1995. Little evidence of the seeding was apparent at the Grizzly Range. A brush cutter had cut back all of the vegetation to ground level. In contrast, the Aurora Range had benefited greatly from seeding and/or fertilizer and no unvegetated areas existed in the range area. Plant establishment on the firing line was spotty.

The seeding and fertilizer benefited the Grezelka Firing Range at Ft. Richardson also. Plant cover increased over the entire range, including around the targets. The seeded grass became established and the other species appeared to have benefited from the fertilizer.

If the military wishes to maintain a healthy ground cover on these firing ranges, the Aurora and Grezelka Range would benefit from an annual application of fertilizer. So much of the Grizzly Range was covered with vegetation prior to seeding that natural plant invasion should continue to provide plant cover at this site.

A site visit in August of 1996 found both sites vegetated with plant species other than the fescue that had been planted originally. The Grizzly range was mowed between targets and the mounds where the targets sit were sparsely vegetated. Missed gunfire continually disturbs any plants that try to grow around the targets.

The seeded area at the Aurora Range had flooded since the last evaluation and squirrel tail barley has replaced any fescue that had become established. No evaluations were conducted in 1997. The final report will be completed in 1998.

Project Chariot Clean Up

The Department of Energy requested the PMC's assistance in restoring the disturbance resulting from the clean up of radioactive material at the Project Chariot site near Cape Thompson.

The PMC proposed a restoration plan for the site. This plan was not standard as the U.S. Fish and Wildlife Service imposed restrictions on proven arctic techniques.

During the actual restoration effort, a PMC staff member was on-site guiding the contractor through the prescribed work. All work was completed during a four day period in August 1993.

On August 3, 1994, the site was evaluated. Overall, the site had a 40% cover of seedling grasses. Hairgrass was the predominant species. No sign of thermal degradation was noted. Final evaluation occurred on July 15, 1995. Overall plant cover increased on the site and no signs of thermal degradation were observed. A final report was completed in December 1995. One additional site visit is scheduled for 1998.

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.

Defense Fuel Supply Wetland Restoration

The Defense Fuel Supply (DFS) office (an independent Department of Defense agency) located in Anchorage, requested assistance from the PMC in May 1993. The agency was concerned about revegetating wetland areas and a localized fuel contaminated site on the Anchorage Fuel Terminal property.

The PMC made recommendations on changing vegetation maintenance procedures and established plots at the site. The plot work relied on transplanting cattails into wet areas, some of which were contaminated with varying levels of petroleum products. A plan to develop and construct wetland filters was delayed until more information is available. In 1994, the reseeded site and the cattail stand exhibited excellent growth. The success in using cattails has encouraged the PMC to expand research on this species.

By the fall of 1995, the cattail stand completely covered the disturbance. DFS also implemented a program to manage existing cattail stands at the site. This program will allow cattails to grow and eliminated mowing of the species. Evaluation on effectiveness continued through 1996 and 1997. Final evaluation will occur in 1998.

Adak Sand Quarry Restoration

In 1992, the PMC was awarded a Navy contract to develop and monitor a restoration program for Pringle Hill Sand Pit on Adak. The 40-acre site will be restored with beach wildrye sprigs and seeded grasses over a three-year period starting in 1993. A management plan for surrounding vegetation will also be developed. The work force employed to do the project will be Navy Seabees. Initial plans were developed in 1992.

During May 1993, one third of the site was sprigged with beach wildrye and seeded with a mix of red fescue and hairgrass. During an October 1993 evaluation, excellent growth was noted for the seeded grasses and the beach wildrye sprigs.

Additional plantings occurred in May 1994, leaving roughly ten acres for completion in 1995. By September 1994, sprigged and seeded areas were supporting vigorous stands of vegetation. Additionally, the site is now being invaded by species native to the area. It is interesting to note that the invasion process did not start until seeding, sprigging and fertilization occurred on the site.

The final area to be revegetated was completed in May 1995. Final evaluation occurred in September 1995 with a final report being published in December 1995. This project has become the most successful restoration project on the Aleutians to date. Continued evaluation has occurred in 1996 and 1997.

Forty Mile Mining District

The Bureau of Land Management (BLM) Tok Field Office expressed interest in testing cultivars suitable for revegetation along Wade Creek in the Forty Mile Mining District. The test site is located on recently reclaimed mining tailings. Two plantings were made, each on different substrates. One plot was located along the Creek on scarified mine tailings. The other plot was located across the Dalton Highway on mineral tailings covered with a thin layer of topsoil.

On May 27 and 28, 1993, commercially available cultivars including ten grasses and one forb were planted at each site. In addition, several native forbs were planted in small plots adjacent to the commercial cultivars.

Each cultivar was broadcast on individual plots measuring 20 x 50 feet. The entire planting was then fertilized with 24-12-10 fertilizer at a rate of 450 pounds per acre.

Several freshly cut feltleaf and little tree willow cuttings were randomly planted in moist areas at the topsoil site. Also, the moist areas were seeded with Egan sloughgrass.

Two native forbs, Dwarf Jacob's Ladder and Maydell's Oxytrope, were included in the plantings. Additional forbs were planted by BLM staff later in the spring.

In 1994, the staff from the BLM's Tok Field Office continued to monitor the plantings. Reports indicate that plant growth at both test locations continued to perform well. The grasses, particularly the bluegrasses, flowered and produced seed. Dwarf Jacob's Ladder was the only planted forb noted in the plots. Approximately 85 percent of the willow cuttings had rooted and become established.

After two growing seasons, the plantings are still growing well and are just beginning to show signs of decline as the benefits of the fertilizer decrease. 'Sourdough' bluejoint reedgrass is the most vigorous grass in both of the test plots. Unfortunately, this variety is not readily available commercially.

'Nortran' tufted hairgrass, 'Arctared' red fescue, 'Gruening' alpine bluegrass and 'Reeve' beach wildrye are also growing very well on the scarified mine tailings. The dwarf Jacob's ladder has also become well established and has expanded beyond the original plot boundaries.

Only minor differences were noted in the topsoil plots on the north side of the Taylor Highway. Sourdough bluejoint reedgrass and Nortran tufted hairgrass were growing the best. 'Caiggluk' tiley sage, 'Kenai' polargrass and Reeve beach wildrye were growing relatively well. Again the dwarf Jacob's ladder was growing well and had been producing seed. These plots should not be destroyed during highway construction. 'Egan' sloughgrass had been planted in the wetter areas of the topsoil site and it had become well established. Willows were colonizing the site, but it was difficult to relocate the ones that had been planted in 1993.

These early results from these plantings indicate that several species may be suitable for revegetation in this area. Hopefully, continued evaluation will occur at the topsoil site for two more years to help determine which species will grow well for several years.

The 1995 evaluation was the last evaluation for the plantings on the scarified mine tailings. DOT has plans to mine this gravel for Taylor Highway improvements.

Beach Wildrye Manual

The Plant Materials Center has been working with Beach wildrye, *Leymus mollis*, for the past eleven years. Much of the work in developing planting techniques was funded by the Department of Defense. In 1994, the U.S. Navy agreed to fund an effort to publish the data in the form of a manual. The manual was published in early 1995. All publishing costs were covered by the Navy.

The demand for this publication has exceeded expectations. A second printing will be needed within two years.

Adak Wetland Rehabilitation

In 1993, the Navy requested assistance from the PMC to rehabilitate a wetland area adjacent to a fish stream. In May 1993, a plan was developed and implemented on the site. The repair relied on seeding hairgrass, transplanting sedge and Beach wildrye.

Also, the undisturbed area around the site was fertilized to encourage additional seed production.

In September 1994, the site supported 90% vegetative cover, comprised of species identical to the surrounding area. On September 30, 1995, the site supported a 60% cover of wetland vegetation. The final evaluation occurred in September 1997. The site supported nearly 100% plant cover.

Chugach Electric Wetland Rehabilitation Project

Chugach Electric Association, Inc. requested assistance in wetland rehabilitation from the Plant Materials Center. The project area involved a transmission line re-build from Girdwood to Twenty Mile River. The PMC developed specific revegetation and rehabilitation plans for the various sites. All revegetation will rely on locally collected native species.

The PMC conducted the first Alaskan mechanical harvest of indigenous sedges and other wetland species. Over 200 pounds of locally native seed was available to Chugach Electric Association for use in the rehabilitation effort scheduled for 1995.

The seeding and fertilization program occurred during the four-day period in the first week of June 1995. The sites were periodically monitored during the summer of 1995. The final 1995 evaluation occurred on September 17. All the treated sites were supporting good to excellent stands of native wetland plant species. The PMC was awarded an extension to the project to assist with the restoration of an additional segment of powerline. An interim report was published in December 1995 and a final report was prepared in December 1996. Evaluation continued in 1997.

Alyeska Pipeline Floodplain Investigation

Alyeska Pipeline Service Company was facing the possibility of revegetating an active floodplain as a result of conditions attached to a permit. On August 9, 1994, Alyeska requested the opinion of a PMC staff member during a site visit. The conditions were rejected by the PMC as not being appropriate for either restoration or research. However, regulatory desires prevailed and Alyeska agreed to conduct a study on floodplain restoration. The study plan developed by the PMC relied on comparisons of scarification only, fertilizer with scarification, and native seed with and without fertilizer, in combination with scarification. Five species were identified as important floodplain colonizers.

During August 1995, a collection effort was initiated to collect seed from these species. The collection effort centered on the area around Pipeline Mile Post 22 and the Franklin Bluffs Camp Pad. By September, sufficient seed to conduct the study was collected. The seed was cleaned in November/December 1995. Planting occurred on the Sagavanirktok River in July 1996. The site was evaluated in August 1996 and 1997.

Fish Creek Wetlands Restoration Project

In August 1990, Anchorage Water and Wastewater Utility (AWWU) requested that the Plant Materials Center submit a proposal for restoring a wetland disturbed during a construction project. Because the request occurred late in the growing season, the PMC suggested that the project be delayed until spring, 1991. The landowner agreed. AWWU, however, wanted to demonstrate to the landowner that restoration would be attempted; therefore, a study area was established.

On August 23, 1990, PMC staff established a demonstration planting at the Fish Creek site. Sprigs of Beach wildrye which were obtained from the PMC were transplanted onto the elevated portions of the site. Low, flooded areas were planted with indigenous sedges, rush and arrowgrass transplants harvested from adjacent donor communities. The area was examined to determine the best approach for full-scale restoration activities scheduled for spring, 1991.

In May 1991, work resumed on the site. Three dikes were planted with beach wildrye sprigs and seeded with a hairgrass mix. Additional higher elevation areas off the dikes also received this treatment. In the lower areas, wetland species including sedges and rushes were transplanted.

In 1992, areas needing additional work were delineated. On June 3, 1992, these areas were planted. Areas subject to flooding by high tides were planted with seedlings of greenhouse grown sedges, plantain and arrowgrass. One dike was rototilled to reduce compaction and additional sprigs of beach wildrye were planted. The dike area also received an additional seeding of 'Norcoast' Bering hairgrass. Monitoring and data collection continued through September 1994. Performance of vegetation and the extent of high tides on the site were documented. Final evaluation of this site occurred on September 23, 1995. This project is important since few coastal wetland rehabilitation projects have been attempted and results from this project will greatly enhance our knowledge regarding revegetating wetlands. A final report is planned. This report should be published during 1998.

Arctic Forb Seed Collection

In 1990, ARCO Alaska, Inc. indicated that it wanted to investigate the use of native plants for revegetation of gravel pads. In response to this interest, the Plant Materials Center (PMC) and Alaska Biological Research (ABR) began collecting seeds of native forbs. The primary species collected included arctic sage and native legumes such as oxytropes, vetches and sweet pea.

The seed was divided between the PMC and ABR. ABR planted the seed in test plots on gravel pads to determine which species exhibited the greatest potential for revegetating these sites. Concurrently, the PMC began investigating the germination requirements, field production methods, and harvesting and processing techniques for these species.

The first field planting occurred in 1991 on a Fairbanks farm. Seedlings were grown at the PMC and transplanted into the field. Additional seed collections occurred in 1992 and 1993 and another more extensive field planting occurred in 1993.

Preliminary results indicate that arctic sage has great potential for revegetation; it grows well on gravel pads and is relatively easy to field grow. Testing needs to continue for several years to effectively select those species which can revegetate gravel pads and at the same time be grown as a commercial crop.

ABR and the PMC continued the arctic seed collection work during 1994. The collections were supported by the Arctic Slope Regional Corporation. Seed from native legumes were collected for two days during the first week in August. Primarily, oxytrope and astragalus seeds were gathered. The seed will be cleaned and the germination will be tested in Palmer.

A test planting was also established on the old Franklin Bluffs pipeline camp pad. A land use permit was obtained for the use of one acre of land to test the feasibility of producing seed of the native species. Six collections representing five species were planted. In August, some germination had occurred; additional germination and plant establishment should occur during the 1995 growing season.

The test plantings in Fairbanks are being evaluated and maintained. Since only a limited amount of flowering occurred in 1994, little to no seed was produced. The plantings were lightly fertilized mid-summer to encourage seed production in 1995.

In 1995, ABR continued monitoring the legume plot at the old Franklin Bluffs Pad; additional germination occurred in 1995. ABR also made a limited legume seed collection. The PMC did not participate in these activities although the PMC did monitor the field plantings at Fairbanks. Only a few collections had flowered and had produced seed at the time of the evaluation. Seed was harvested from two collections of *Aster sibiricus* and one collection of *Astragalus alpinus*; additional seed production is expected in 1996.

The Franklin Bluff seed production plot is managed by ABR. In 1996, the plots were fertilized and any seed collected from the plot was sown directly at the site. Nothing was done at the site in 1997. The production plot in Fairbanks gradually decreased in size to the point that ABR and the PMC will no longer manage the plot and the landowner is free to develop or destroy the plantings as he chooses. The PMC's involvement in this project has ended at this time.

Identification of Willow Collection Sites

The PMC has entered into a three-year agreement with the Department of Fish and Game to identify sites that contain willow species suitable for soil bioengineering projects in southcentral Alaska and the Kenai Peninsula. The information will be compiled and shared with individuals in need of willow cuttings.

Several willow collection sites were identified in 1996 ranging from Homer to the Matanuska Susitna Valley. Unfortunately, one of the best collection sites occurred in the DOT Right-of-Way and was cut back by a brushcutter before any dormant cuttings were made. This information was given to Fish and Game who then shared it with individuals who needed sites to collect cuttings. No additional sites were identified in 1997 and at this time it is unclear if this project will continue in 1998.

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 1996.

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. Additional evaluations will occur in 1998.

Alyeska Ski Area Revegetation Study

In 1992, at the request of Seibu Alaska/Alyeska Resort in Girdwood, agronomists from the Plant Materials Center began consulting with the resort's mountain projects manager regarding revegetation on ski slopes and mountain construction sites. During the late summer, the PMC assisted resort personnel in identifying and collecting seed of native plants for future sowing. In 1993, three revegetation test plots were established: one on the lower mountain near the new Alyeska Prince Hotel, the second at mid-mountain, and the third near the top of the mountain. These sites were selected to represent the range of climatic zones present at Alyeska Resort. The sites are located in areas unlikely to be disturbed by construction in the next few years. Evaluations will continue until 1998.

Thirty-five species of grasses and one forb were sown in each of the three plots in July, 1993. Due to dry summer conditions, germination was delayed at the mid-mountain and upper mountain plots. The lower mountain plot, sown one week earlier, exhibited good germination and ground cover for 'Kenai' polargrass, 'Climax' timothy and meadow foxtail when evaluated on September 3, 1993. All four cultivars of Kentucky bluegrass also were good performers.

At the mid-mountain and upper mountain plots, Nortran tufted hairgrass exhibited the best performance. It is expected that these seedling year performance figures will change over the next few years. In 1994, the plots were evaluated twice, the last occurred on September 7. Performance trends noted in 1993 have not changed. No evaluations occurred during 1995. Final evaluation and a complete report will be prepared in December 1998.

Deep Creek Soil Bioengineering Project

In January 1994, Division of Parks and the Department of Transportation and Public Facilities requested technical assistance from the Plant Materials Center (PMC) for the soil bioengineering component of the facility upgrade at the north Deep Creek Scenic Overlook. The PMC was asked to assist with winter identification of willow collection sites, review the harvest plan, be on call to answer questions, make site visits at critical points during construction, and monitor and evaluate performance of the soil bioengineering.

Although high water made the initial phase of construction challenging, the project proceeded well and at the end of the growing season plant growth appeared vigorous. The success of the project can only be determined after a couple of growing seasons and several high water events have passed.

The project will be monitored once or twice during the 1995 growing season. The project was visited in the early spring shortly after plant recovery began. The project appeared to survive the winter and spring breakup quite well. Portions of the lower layer of the vegetated geogrid had completely silted in suggesting that the branches slowed the water sufficiently for sediment to deposit. Approximately 50 percent of the willows in the upper three layers of the vegetated geogrid survived; over 50 percent of the live stakes survived. It was too early in the growing season to evaluate the plant recovery for the live siltation and the brush mattress and unfortunately the project was not visited later in the summer. However, reports were received that the project survived the high water in September very nicely. Future evaluations will be conducted when the opportunity presents itself.

Department of Transportation Interior Seed Collection Project

In 1995, the PMC initiated a program for the Alaska Department of Transportation (DOT) to collect and commercially increase native species. The material collected will be used for future highway revegetation programs throughout the interior region.

The collection effort began on August 6, 1995 with a ten-day collection program in the Nome area and the surrounding road system. The collection program continued from Fairbanks to Tok along the Alaska Highway, as well as 50 miles south on the Parks, Richardson Highways and the Tok Cut-off. Additional collections occurred at Port Clarence. The collection effort ended on September 8, 1995. A total of 31 man-days were expended on the collection effort.

A total of 153 collections covering 72 species were made. The amounts of seed collected ranged from 1 to 2 grams to 12 to 15 kilograms. A total of 108 kilograms of seed was delivered to the PMC.

Seed cleaning was initiated in November 1995 and continued through February 1996. In June 1996, 22 species were planted at the PMC. By September 1997, 18 were harvested for increase and distribution to growers.

In June 1997, one of the seed collections, the native wheatgrass, *Agropyron pauciflorum*, was hydroseeded onto a DOT problem site, the embankments of the on-off ramps of the Johansen Expressway at Peger Road. The wheatgrass, a dry land species, grew very well and DOT was pleased with it's performance. The planting be monitored for winter survival and continued growth.

Navy Germplasm Preservation Program

In September 1995, the PMC was awarded a three-year contract to collect and preserve Aleutian germplasm. This project is being funded by a Department of Defense Legacy Grant.

During the autumns of 1996 and 1997, collection programs occurred at Adak. Unlike the previous collection efforts, this program will preserve germplasm for future study. In 1998, additional collections will occur on Attu and Adak. When complete, over 2,500 collections will have been made.

In September 1997, an extensive germplasm collection was made on Adak. Most of the collections were made along the road system; the remainder were collected along trails and during cross-country hikes. Nearly 420 collections were made representing 33 species. The collections have been cleaned and have been placed in storage.

Additional seed collection is planned for 1998 on Adak, Attu and Shemya.

U. S. Army Integrated Training Area Land Management Project

In 1997, the PMC was awarded a significant five-year contract to assist the Army in Alaska. The Integrated Training Area Management Project (ITAM) is designed to maintain realistic and natural training lands on Army installations. Vegetation management and erosion control are the predominate areas of interest.

Over a five-year period, the PMC could be awarded as much as \$1,250,000. Much of this, however, will be redistributed as contractual awards to other entities or the private sector.

Southcentral Seed Collection Project

As part of the on-going September native plant collection program initiated in 1993, the PMC conducted a collection project in southcentral Alaska. The program was funded by Alaska DOT/PF.

In 1996, collections were made in Palmer, Talkeetna, Seward, Homer, Kenai Soldotna and the Anchorage area. Material from these collections was planted at Palmer in June 1997. Initial harvest of the seed is expected in 1998.

U. S. Air Force Cooperative Agreement

In 1996, the Plant Materials Center entered into an agreement with the United States Air Force. This agreement set the framework for future projects as they emerge. Prior to the agreement, interagency cooperation was difficult due to U.S.A.F. regulations and purchasing requirements. The agreement allows immediate action when requests arise.

This agreement allows for reimbursement for time and materials. All Air Force land in Alaska is covered.

Adak Landfill Restoration Program

In 1997, the PMC was awarded a contract by the U. S. Navy to monitor the revegetation on Adak landfills. The contract covers four large landfills. In 1997, two site visits occurred and a report was submitted to the Navy. Additional site visits will occur in 1998 with a final report scheduled for publication in December 1998.

Southeast Alaska Plant Collection Project

In 1996, the PMC was awarded a multi-agency contract to collect seed from native species in southeast Alaska. In 1996, seed was collected at Ketchikan, Metlakatla, Petersburg, Wrangell and Sitka. In 1997, this seed was planted at the PMC and Metlakatla. In the fall of 1997, additional collections occurred at Sitka, Juneau, Hoonah and Yakutat. This seed will be cleaned in the winter of 1997/1998. Additional plantings are scheduled at Metlakatla and the PMC. This project was jointly funded by Alaska DOT/PF and the U. S. Forest Service.

Lower Knob Creek Abandoned Mine

In 1996, the Division of Mining contacted the Plant Materials Center (PMC) to request assistance with the revegetation of the Lower Knob Creek abandoned mine. The revegetation plan needed to address special habitat needs for ruffed grouse, in addition to balancing plantings for erosion control and the natural process of plant colonization.

The 43-acre project was divided into three major sections that exhibited slightly different combinations of site conditions. The site generally is harsh with rocky soils and steep south-facing slopes that are exposed to the winter winds. Snow tends not to accumulate in this area.

The treatments consisted of several components: scarification, use of woody plants in brush layering, bundles and live staking techniques, fertilizing with bio-organics and seeding with willows, aspen, native grasses and forbs.

All accessible acreage was scarified. Some locations, particularly around the ponds and along the stream, were too wet for the equipment. Plants were colonizing these unscarified areas when moisture was not limiting. In addition to scarifying eight to ten inches deep, holes approximately five feet deep were created in order to catch water and develop additional microsites for native plant establishment.

Three revegetation techniques with woody plants were used at the mine site. The brushlayering was installed on the harshest sites with the greatest exposure to wind and sun. The bundles were planted on north-facing slopes of Areas 1 and 2 and in gullies that were forming on a south-facing slope. The bundles were used to attempt to slow the surface erosion that occurred during periods of high rainfall. Live stakes were planted in moist soils found in Areas 1 and 2.

Area 3 was used to test fertilizers, including bio-organics. The area was divided into four relatively equal-sized sections; one was designated a no-seed fertilizer zone. The other three sections were seeded with native grasses and forbs and each was treated with either 20-20-10, Biosol or Fertil-fibers. A portion of the three fertilized plots was also treated with a liquid amendment, Kiwi Power. No apparent differences were noted at the end of the 1997 growing season, however differences in plant growth may be noticeable during the 1998 growing season.

Two methods of broadcast seeding were used at the site. One seeding method involved cutting willow and aspen branches containing catkins that were beginning to disperse seed. These branches were carried around the areas with moist soils and waved in the air to help disperse the seed. Cyclone seeders were used to broadcast native grass and forb seed over most of the ground in all three areas. Two mixes were used, one for drier soils, the other for more moist conditions. The seeding rate was light and designed to encourage establishment of native plants. These seedings were fertilized with a mineral fertilizer. All of the plantings were growing at the end of the 1997 growing season. The performance of these plantings will continue to be monitored over the next few years.

Pillars Revegetation Project

In 1995-96, the Plant Materials Center (PMC) worked with the Division of Parks and Department of Fish and Game to develop the revegetation plan for the Pillars Boat Launch and Rest Facility on the Kenai River. Soil bioengineering techniques, including brushlayering and live siltation, were incorporated into the design. Vegetation mats and seeding with native grasses were the revegetation treatments for the upland areas. Protection for the plantings is provided by the floating docks that are an integral part of the facility. The docks reduce the wave action from boat wakes and as a result reduce the potential for riverbank erosion. PMC staff was also available to consult with the contractor and provide inspections during and at the end of construction. The project was very successful and the vegetation is thriving.

Anchorage Water & Wastewater Utility (AWWU)

In 1996, AWWU contacted the Plant Materials Center for assistance in revegetating the upland portion of the Fort Richardson Right-of-Way (ROW) for Phase I of the Anchorage Loop Water Transmission Main. Ft. Richardson (the land owner) wanted the ROW to be revegetated with willow specifically to recreate moose habitat. A contract was developed between AWWU and the PMC for five years to design and implement a revegetation plan. The contract also provided for annual evaluations of plant growth and any additional plantings in future years required by the regulatory agencies.

The revegetation plan identified five locations for planting approximately 500 live willow stakes, special plantings at the stream crossing, and a light seeding of native grasses, willow and aspen seed. Initially, most of the plantings were going to occur in the spring before July 1. However, after the initial planting efforts encountered exceptionally dry conditions, the decision was made to postpone planting.

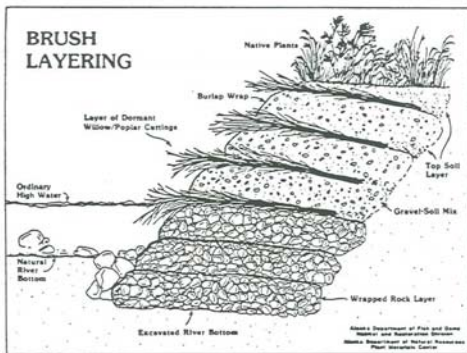
The dry weather conditions forced us to consider fall plantings even though there has been limited experience with them. The live stake plantings were eventually completed in the late summer - early fall after the willows were dormant and before the ground was frozen. The creek plantings were also delayed until fall.

The willow/aspen seeding was dictated by the timing of natural seed dispersal. As feltleaf and bebb willow and aspen began to disperse seed, staff harvested branches containing catkins that were dispersing seed.

The branches were taken to the ROW where the staff walked the ROW while waving the branches in the air and dispersing seed to the site. Unfortunately, seed dispersal coincided with the dry weather conditions that did not favor seedling establishment, particularly for these short lived seeds.

The grass seeding was delayed as long as possible hoping that the rains would arrive. A light seeding of native grass was finally broadcast in early August.

The last activity of the 1997 growing season measured plant cover, noted plant species and determined species frequency along the ROW. These measurements were taken late in the season. Many plants had died back, some species probably were not observed, and plant cover measurements were also underestimated. The process of revegetation along the ROW will be monitored during the next few years.



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 will be 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.

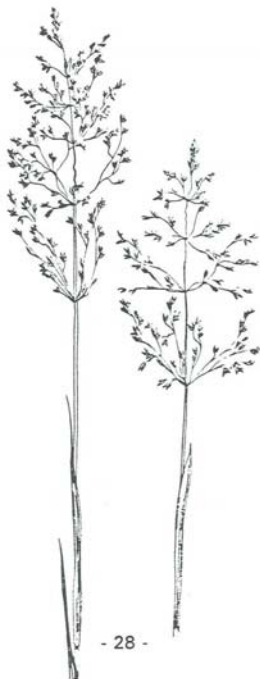
When the PMC began operations in 1973, the Foundation Seed Program began increasing newly released varieties of barley, oats, and wheat. These varieties, bred by the University of Alaska, Agricultural Experiment Station, became the primary crops of the agricultural projects of the late 1970s and early 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.

The genetic potential of a variety is explored by plant breeders. Varieties are selected based on the intended use as food, fibre, an ecological niche or its chemistry.

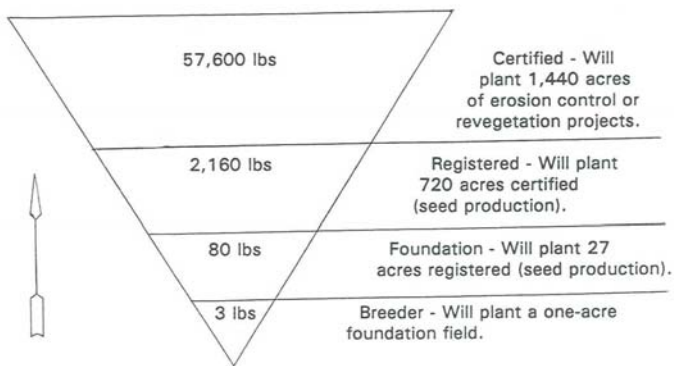
Successful growers understand the requirement for good germination and vigor from their seeds. The Federal Seed Act requires that seed offered for sale meets minimum germination standards.

Contaminants in seed include broken seed, chaff, dust, weed 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.

1996 and 1997 Growing Seasons

The 1996 and 1997 growing seasons were excellent years for grass seed and grain production. Warm weather with clear skies provided an environment conducive for maturing seed crops. Although the rainfall was below normal, supplemental irrigation supplied the necessary water.

Harvest began in July and was completed in September. New plantings were made in the fall and spring to replenish depleted supplies of grass and grain seed lots.

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 southcentral Alaska, primarily the Matanuska and Susitna Valleys. Seed lots were sampled for testing as required.

Table 1. Revegetation and Turf Varieties in Production Production in 1996 and 1997.

Variety	Class	Planted	Acres
'Arctared' Fescue	Foundation	94	1.7
'Nortran' Tufted Hairgrass	Foundation	96	1.0
'Reeve' Beach Wildrye	Foundation	89	0.5
'Egan' American Sloughgrass	Breeder	92	1.0
'Norcoast' Bering Hairgrass	Foundation	92	1.0
'Nugget' Kentucky Bluegrass	Breeder	96	1.0
'Gruening' Alpine Bluegrass	Breeder	96	0.5
'Service' Big Bluegrass	Breeder	96	1.0
'Caiggluk' Tilely Sagebrush	Breeder	94	0.5
'Sourdough' Bluejoint	Breeder	96	0.5
'Toral' Oats	Foundation	95	1.0
'Nip' Oats	Common	97	1.0
'Golden Rain' Oats	Common	97	0.5
'Weal' Barley	Foundation	95	2.0
'Thual' Barley	Foundation	95	0.5
'Datal' Barley	Foundation	95	0.5
'Otal' Barley	Foundation	95	0.5
'Lidal' Barley	Foundation	95	0.5
'Galt' Barley	Common	97	0.5
'Ingal' Wheat	Breeder	97	2.0
'Chena' Wheat	Breeder	97	1.0

Table 2. Cereal Grain Seed & Oil Seed Varieties in Storage at the Plant Materials Center, December, 1997.

Barley		Wheat		Oats		Rye		Rapeseed		Buckwheat	
Variety	Tons	Variety	Tons	Variety	Tons	Variety	Tons	Variety	Tons	Variety	Tons
Lidal	10.0	Ingal	1.2	Toral	9.0	Bebral	0.5	Candle	1.0	Oly	0.1
Otal	2.0	Vigal	0.9	Ceal	1.0						
Thual	4.0	Nogal	0.5	Nip	3.0						
Weal	0.5	Total	2.6	Golden Rain	1.0						
Datal	0.5			Total	14.0						
Pokko	Trace										
Arra	Trace										
Eero	Trace										
Paavo	Trace										
Tibet Hulless	Trace										
Galt	0.01										
Otra	Trace										
Steptoe	Trace										
Total	5.0										

Table 3. Cereal Grains Sales & Receipts, 1993 - 1997.

Type	1993	1994	1995	1996	1997
Barley	4,300 lbs	150	500	1,000	1,500
	\$1,007.88	\$41.98	\$184.25	\$420.00	\$533.00
Oats	2,400 lbs	300	500	1,500	4,500
	\$629.53	\$87.51	\$140.65	\$224.00	\$1,700.00
Wheat	4,850 lbs	100	-0-	0	700
	\$353.39	\$32.75	-0-	0	\$221.00
Total	11,550 lbs	500	1,100 lbs	2,500	6,700
	\$1,990.80	\$162.24	\$324.90	\$644.00	\$2,454.00

Table 4. Grass Seed Sales & Receipts, 1993 - 1997.

Variety	1993	1994	1995	1996	1997
'Nugget' Kentucky Bluegrass	261 lbs	46 lbs	20 lbs	25 lbs	-0-
	\$3,276.72	\$587.88	\$239.40	\$300.00	-0-
'Arctared' Red Fescue	152.7 lbs	-0-	-0-	-0-	-0-
	\$2,203.01	-0-	-0-	-0-	-0-
'Sourdough' Bluejoint	-0-	-0-	-0-	3 lbs	-0-
	-0-	-0-	-0-	\$75.00	-0-
'Alyeska' Polargrass	60 lbs	-0-	-0-	-0-	-0-
	\$970.20	-0-	-0-	-0-	-0-
'Gruening' Alpine Bluegrass	40 lbs	20 lbs	12 lbs	-0-	-0-
	\$774.00	\$490.00	\$232.20	-0-	-0-
'Kenai' Polargrass	50 lbs	-0-	-0-	-0-	-0-
	\$800.00	-0-	-0-	-0-	-0-
'Egan' American Sloughgrass	40 lbs	-0-	-0-	-0-	-0-
	\$583.20	-0-	-0-	-0-	-0-
'Norcoast' Bering Hairgrass	25 lbs	65 lbs	-0-	25 lbs	110 lbs
	\$532.00	\$974.80	-0-	\$476.00	\$2,140.00
'Nortran' Tufted Hairgrass	40 lbs	45 lbs	75 lbs	10 lbs	-0-
	\$624.40	\$930.10	\$1,578.20	\$205.60	-0-
'Polar' Brome	-0-	-0-	-0-	-0-	-0-
	-0-	-0-	-0-	-0-	-0-
'Tundra' Glaucous Bluegrass	-0-	-0-	8lbs	10 lbs	-0-
	-0-	-0-	\$150.61	\$130.00	-0-
'Caiggluk' Tilesy Sagebrush	-0-	-0-	-0-	-0-	40 lbs
	-0-	-0-	-0-	-0-	\$1,560.00
Total	668 lbs	176 lbs	115 lbs	73 lbs	150 lbs
	\$9,763.53	\$2,982.00	\$2,200.41	\$1,186.00	\$3,700.00

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 which 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.

Special Disease Testing

The results from a disease testing survey performed by the University of Alaska Fairbanks during the 1994 growing season, reported the discovery of several viruses thought not to occur in commercial potatoes in Alaska. A major concern was the report of viruses in the field-grown germplasm at the PMC. The protocols utilized by the PMC are designed to find an infection level of 0.1%. The PMC testing in 1994 could not verify the presence of PVY, PLRV or PVX as reported by UAF. It was decided that even though the potential for these viruses to exist in the field was small, extensive testing should be conducted of the field-grown materials in 1995. Dr. Chet Setula, owner of AGDIA, a well-respected disease testing company, was contacted and agreed to oversee the 1995 testing. Leaves were collected at the PMC on July 31, 1995. The testing of 11,000 plants for six different viruses was completed August 4, 1995. No viruses were detected in the PMC germplasm.

Figure 4. TUBER INTRODUCTION

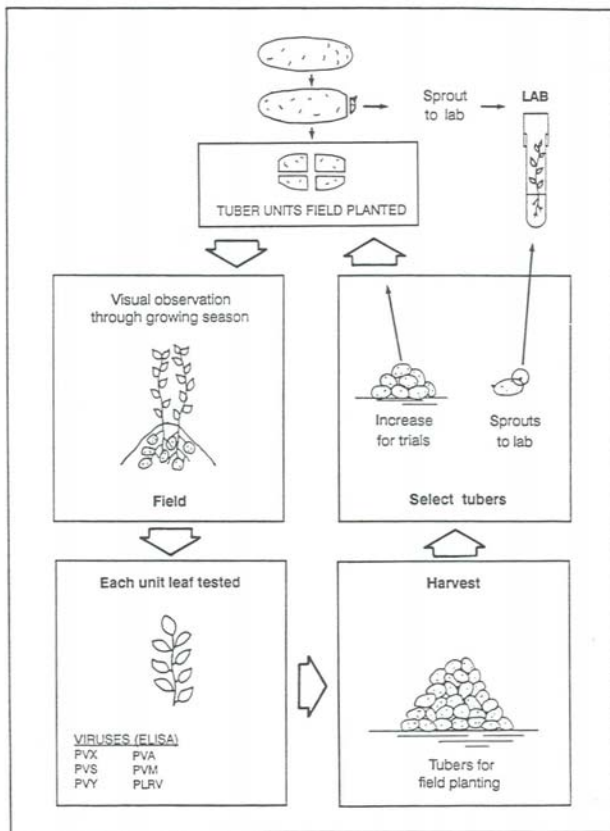
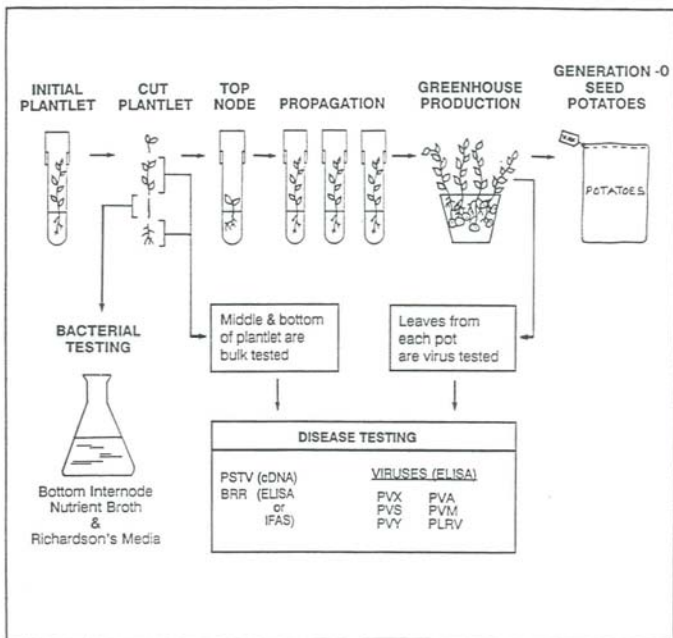


Figure 5. Alaska Seed Potato Production & Disease Testing



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 which 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 which 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
1990	14	39	176	65
1991	13	39	170	58
1992	10	38	173	55
1993	13	35	201	45
1994	13	44	210	210
1995	13	44	241	324
1996	12	204	362	126
1997	17	204	402	125

Educational Program

The educational component of the program at the PMC allows interaction with wide ranges of interested groups from elementary school children to life-long experienced farmers.

Four Houston first grade classes were shown a variety of different types of potatoes. Round, oblong, flat, white, red, russet, yellow and purple potatoes helped generate questions concerning food production from the children. The idea of a plant's life cycle and it's association with garden plants was discussed.

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.

A presentation was made at the 80th Potato Association of America held in Idaho Falls, Idaho entitled, "Disease-Tested Cultivar Maintenance". This educational opportunity was made possible with funding from Alaska Seed Growers, Inc.

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.

The PMC has an on-going cultivar evaluation program that identifies scab resistant potato varieties. To date, the russet-skinned cultivars Krantz, Lemhi, Norking and Frontier Russet have shown excellent resistance. The following table shows the results of the 1997 trial.

Table 6. 1997 Scab Evaluation Trial

	Rep 1	Rep 2	Rep 3	- +
Bake King	5	5	5	5
Bronka	1	2	2	1.7
Bzura	3	1	2	2
Frontier	1	1	1	1
Goldrush	2	1	1	1.3
Itaska	2	2	2	2
Nipigon	4	3	3	3.3
Norkota	3	3	3	3
Pimpernel	2	3	1	2
Purple Viking	2	2	3	2.3
Ranger Russet	4	2	1	2.3
Reddale	2	1	2	1.7
Red Ruby	1	1	1	1
Rideau	1	1	2	1.3
Sangre	2	3	3	2.7
Snowden	3	2	3	2.7

Scale

0 - None
 1 - Trace
 2 - 1%
 3 - 5%

4 - 10%
 5 - 25%
 6 - 50%
 7 - >50%

Table 7. Single Rep Observations Rated by Visual Inspection & Scored on a Scale of 1 - 7

Achriana	1.5
Alasclear	1
Allagash	2
Bake King	5
Bison	1
Chieftain	2
Favorite Red	1
German Butterball	1
Krantz	1
Norking	1

Scale

0 - None
 1 - Trace
 2 - 1%
 3 - 5%

4 - 10%
 5 - 25%
 6 - 50%
 7 - >50%

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.

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 from 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 8. Seed Potato Production

Year	Number of Varieties	G-0	G-1	Plantlets
1995	48	1,520	0	1,015
1996	55	1,400	0	420
1997	80	1,456	1,200*	2,400

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

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.

Supplemental Seed Distributions

The use of disease-tested seed is encouraged to eliminate the spread of seed-borne diseases. Germplasm is maintained at the PMC to serve this goal. Seed was made available for various trials to the following:

University of Alaska, Cooperative Extension Service
Palmer, Juneau, McGrath, Kenai and Nome
University of Washington, Cooperative Extension Service
Prosser and Pullman
Alaska State Fair
Palmer
Agriculture Showcase Garden
Palmer

Peanut Potato Trial

Some Peanut potatoes grown locally produced a significant percentage of tubers having purple pigment throughout the flesh as well as in the vascular bundle. Peanut potatoes exposed to light will react by turning purple rather than green, but it was not obvious that this group of potatoes had been so exposed.

The potatoes were sorted into three groups; high, medium, and none; based on the amount of pigment observed in a longitudinal section of the tuber. Four tubers of each group were planted in a garden plot along with other potato varieties. The potato plants were harvested in October and ten progeny tubers from each group were cut transversely, as well as longitudinally, and observed for pigmentation. Two tubers from the no pigment group had a small amount of color on the skin, but no pigmentation was observed in the flesh or vascular bundle of any of the 120 tubers observed.

APPENDIX A

CURRENT & HISTORICAL BUDGET INFORMATION



CALENDAR YEARS 1996 AND 1997 AUTHORIZATIONS, EXPENDITURES, AND PROGRAM RECEIPTS

ARLF Authorizations

Authorization FY 96 PMC Total	528,500
Alaska Plant Materials Center	
Project Total	433,300
Personal Services	389,000
Travel	2,300
Contractual	32,000
Supplies	32,000
Forest Nursery	
Project Total	95,200
Personal Services	88,900
Travel	1,000
Contractual	5,300
Supplies	0
Authorizations FY 97 PMC Total	484,197
Alaska Plant Materials Center	
Project Total	484,197
Personal Services	429,200
Travel	70
Contractual	43,885
Supplies	11,043
Authorizations FY 98 PMC Total	508,600
Alaska Plant Materials Center	
Project Total	508,600
Personal Services	448,000
Travel	2,900
Contractual	45,200
Supplies	12,500

PMC Operating Budgets for the Past Fifteen Fiscal Years

		FY 84	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
Author- ization in Thous- ands	PMC	912.3	863.4	888.5	733.7	596.7	556.7	566.1	566.1	620.8	608.9	585.6	595.3	433.3 100.0*	522.9 *	508.6 *
	Forest Nursery											180.0	95.2	95.2	0	0
Personnel		25	19	19	17	16	16	16	16	16	16	17	17	15	14	15
Full Time		12	10	10	9	7	7	7	7	7	7	7	7	6	5	6
Part Time		13	9	9	8	9	9	9	9	9	9	10	10	9	9	9

* Indicates Agriculture Revolving Loan Fund source.

When comparing personnel figures listed for FY 98 to those in FY 84, bear in mind that the Plant Materials Center is now performing basically the same duties at nearly the same level as it did in 1984 with 403,700 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 two 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 1996**

Contracts, Reimbursable Service Agreements and Grants

<u>Source</u>	Face Value of Contracts Awarded During 1996	Monies Collected During 1996
U. S. Navy	0	15.6
U. S. Forest Service	31.2	2.0
U. S. Forest Service/AK Division of Forestry	0	8.8
AK Dept of Transportation/PF	10.0	8.8
AK Dept of Fish and Game	9.6	0
AK Division of Forestry	19.0	2.5
AK Division of Mining & Water Management	28.0	0
Jacobs Engineering	4.5	3.6
Cominco	1.3	1.3
Chugach Electric Association, Inc.	0	4.2
Alyeska Pipeline Service Co.	0	4.8
Anchorage Water & Wastewater Utility	95.8	0
Seed, Potato & Plant Sales	<u>13.4</u>	<u>13.4</u>
	212.8	65.0

**Program Receipts
In Kind Assistance**

<u>Source</u>	<u>Estimated Value</u>
Alaska Seed Growers, Inc.	2.9
U.S. Coast Guard	1.5

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	1996
42, 195	31, 407	58, 417	117, 981	126, 071	202, 886	377, 161	334, 200	212, 800

**Program Receipts
Calendar Year 1997**

Contracts, Reimbursable Service Agreements and Grants

Source	Face Value of	Monies
	Contracts Awarded During 1997	Collected During 1997
U. S. Dept of Interior/B.L.M.	3.9	0
U. S. Air Force	8.4	7.4
U. S. Army	115.00	62.2
U. S. Navy	23.5	22.3
Alyeska Pipeline Service Co.	0	3.6
U. S. Forest Service	3.6	8.5
Chugach Electric Association	0	3.8
AK Dept of Transportation	7.5	0
AK Division of Forestry	2.6	0
AK Division of Mining & Water Management	31.7	0
Anchorage Water & Wastewater Utility	0	28.4
UAF	85.6	0
Alaska Seed Growers, Inc.	3.8	3.8
Seed, Potato & Plant Sales	<u>18.6</u>	<u>18.6</u>
	304.2	158.6

**Program Receipts
In Kind Assistance**

Source	Estimated Value
Alaska Seed Growers, Inc.	5.6
U.S. Coast Guard	1.5

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	1996	1997
42, 195	31, 407	58, 417	117, 981	126, 071	202, 886	377, 161	334, 200	212, 800	304, 200

1997 Calendar Year Monthly Expenditures to the Nearest Dollar												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PMC Totals	21,106	23,201	19,361	37,751	46,353	47,647	23,126	61,897	55,418	24,049	43,398	19,409
Personal Services	16,550	19,204	16,916	35,238	43,780	45,074	23,020	56,892	49,061	22,586	37,817	15,154
Travel	0	6	0	0	0	0	0	1,338	177	0	537	0
Contractual	4,451	3,997	2,445	2,513	2,561	2,573	106	2,162	4,984	4,724	3,037	3,147
Supplies	0	6	0	15	0	0	0	1,504	755	1,179	2,007	1,108

APPENDIX B

CROP RELEASES

Registration Certificate

Crop Cultivar

Equan American Sloughgrass
Reg. No. CV-143

Developed by

Alaska Plant Materials Center

Registered by the

CROP SCIENCE SOCIETY OF AMERICA



Steven A. Eberhart
President

Henry F. Linds
Chair, Crop Registration Committee
01/31/1991

Date of Registration

CROP CULTIVARS DEVELOPED AND ADVANCED BY THE ALASKA PLANT MATERIALS CENTER

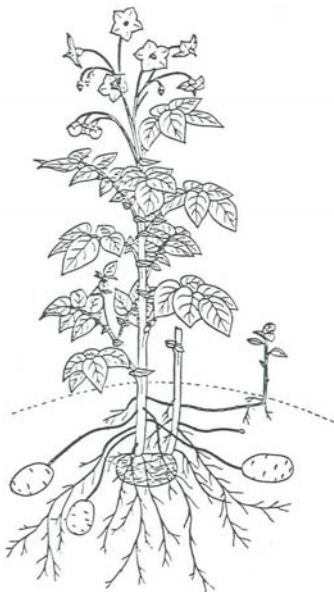
- 'Long' Barclay Willow, *Salix barclayi* - This attractive, fast growing native willow was released for commercial production in 1985. This cultivar will be used for reclamation, landscaping and shelter belts.
- 'Roland' Pacific Willow, *Salix lasiandra* - Roland was released in 1985 and is probably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



Pending Releases

Violet Wheatgrass, *Agropyron violaceum* - This native accession has undergone evaluation by the PMC since 1979. It has exhibited superior hardiness throughout Alaska, especially on dry, gravelly sites. Release is expected in 1999.

Fifteen new native plant releases may occur in 1998. These are products of the recent collection efforts.



APPENDIX C

LIST OF PUBLICATIONS AND PRESENTATIONS



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APPENDIX D

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