Alaska Plant Materials Center

1998 Annual Report

Alaska Department of Natural Resources - Division of Agriculture

ALASKA PLANT MATERIALS CENTER

1998 ANNUAL REPORT

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LETTER FROM THE DIRECTOR OF AGRICULTURE

The Alaska Plant Materials Center (PMC) celebrated its 25th anniversary in 1998. Through the efforts of dedicated staff over 26 years, the goal of providing quality service has been consistently accomplished. New contracts have made non-state funds available to strengthen PMC programs and operations. Changes in operating methods and efficiency improvements have allowed continuing service to the public.

Through a cooperative effort with the United States Department of Agriculture, the addition of the Arctic Plant Germplasm Repository has presented new opportunities and challenges. As the new century approaches, the Plant Materials Center continues to enhance its original mission, which is to collect plant materials from sub-Arctic areas worldwide that can be propagated and distributed primarily within Alaska for agricultural, ornamental, and soil stabilization projects. The beneficiaries will be the citizens of the State of Alaska.

I am pleased to present this 1998 Annual Report and anticipate that further positive direction and progress will be achieved by the PMC team.

Sincerely,

R Wells

Robert Wells
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 on August 5, 1995. Scheduling conflicts did not allow an open house in 1998.

Funding for the Plant Materials Center comes from the 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 1997, the PMC abandoned the every other year format, and returned to the traditional annual report in 1998.

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. To further streamline state operations, Forest Nursery operations were transferred to the Plant Materials Center from the Division of Forestry in 1993.

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.

Continuing budget reductions have forced the PMC to drop programs. On December 15, 1995, the chronically under-funded Forest Nursery was closed. Prior to closure, seedlings produced in 1995 were shipped or placed in protective storage.

In November 1997, the PMC was notified that the U.S. Department of Agriculture granted the PMC to operate the Arctic Germplasm Repository. 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. We expect a long and productive cooperative effort with USDA.

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.

The U. S. D. A. intends to request annual operation funds for the PMC. The new program will be very valuable to the people of Alaska.

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
275 Plot Years as of 1998.

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

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. In 1998, a follow up site visit was conducted.

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 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, 1997 and 1998.

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 1998. 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 local 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. In 1998, the PMC was awarded a second contract to assist with more site restoration and seed collection.

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, 1997 and 1998.

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 contruction 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. The areas were, however, evaluated in 1998. Additional evaluations will occur in 1999.

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 its performance. The planting was monitored for winter survival and continued growth. The final report was prepared and distributed in December 1998. Large-scale planting trials are expected in 1999.

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. The 1998 effort scheduled on Attu was cancelled due to logistic problems. Additional seed collection is planned for 1999 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. In 1998, the Anchorage, Palmer, Fairbanks and Delta Soil and Water Conservation Districts were called on to assist with the project.

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 occurred 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 USAF 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 occurred in 1998. One final site visit and evaluation will occur in 1999 followed by a final report.

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.

Plantings at Lower Knob Creek continue to grow well in 1998. The brushlayers recovered. They had all been browsed at the same height, approximately 18 inches from the ground.

No negative effects were apparent as a result of the browsing activity. Most of the bundles recovered and continued to grow throughout the 1998 growing season. Bundle mortality occurred on the south-facing slope of Area 2 where the bundles had been used to slow erosion along an ephemeral stream. The dead bundles had been undercut and the roots were exposed.

Over 50 percent of the live stakes survived. Some were lost due to erosion, particularly in Area 1, and some apparently died due to lack of water. Site scarification appeared to benefit the establishment of woody plant seedlings. A fairly high density of naturally recruited and seeded woody plants were growing well in the furrows particularly in the northeast section of Area 2. Some seedlings were eight inches tall.

The fertilizer-bioorganic test area established in Area 3 needs more time for evaluation. General observations suggest that Kiwi Power, the liquid supplement that was used on a portion of the three fertilizer treatments, Biosol, Fertil Fibers and 20-20-10, did not enhance the performance of the Biosol treated area. Kiwi Power was designed specifically for use with Fertil Fibers.

No obvious differences were noted between the Fertil Fibers and 20-20-10 treatments. Initially, they appear to be performing better than the Biosol treatment. Evaluations of these areas will continue. A more detailed evaluation of total Lower Knob Creek area will be conducted in 1999.

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.

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. Evaluations of all of the revegetation work conducted on the abandoned mine lands over the last two years will continue over the next two to three years.

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.

Plant growth along the ROW was evaluated in the spring 1998. A high percentage of the fall planted willows were growing very well. The few live stakes that had been planted in the spring of 1997 were growing well except in the southern end of the ROW where total plant cover is high and the grasses are competing with the willows. Relatively few seedlings of birch, willow and alder are becoming established. The seeded grasses are maintaining a relatively sparse cover and clover is the primary species growing where wood chips are the heaviest.

The only additional seeding that occurred in 1998 was made with bebb willow. The same seeding technique that was used in 1997 was used again in 1998. At the end of the growing season, it was not apparent that the seeding effort recruited any new willow seedlings.

Again, evaluations occurred late in the season after many species had completed their summer life cycle and had died back. Despite the late season evaluation, efforts were made to record total plant cover, plant cover for each taxa, and determine frequency for each taxa along 16 transects established along the ROW. The process of revegetation along the ROW will be monitored during the next few years.

Streambank Revegetation and Protection: A Guide For Alaska

The Plant Materials Center and the Department of Fish and Game, Habitat Division have been working with Alaskan landowners on revegetation, repair, rehabilitation and protection of streambanks for several years. Initially, we developed single page flyers that provided information on various techniques. These flyers were basically the draft of a manual that finally was produced in 1998 as a small booklet "Streambank Revegetation and Protection: a Guide for Alaska".

The guide has been extremely well received and distribution has occurred throughout Alaska, internationally and in the Lower 48. Our hope is to update the guide periodically and produce revised single page flyers that can be distributed for those situations when a guide is not needed.

South Atlantic Cooperation Project

In 1996, the PMC was contacted by the Falkland Islands Department of Agriculture, requesting seed of PMC developed cultivars and pre-cultivars. Seed was exchanged and discussions continued regarding land restoration and seed production. In January 1998, one PMC collector travelled to the Falkland Islands to collect seed. This project was funded by the USDA Plant Exchange Office through a cooperative grant. A total of 366 seed collections were made on the Falkland Islands. The seed was returned to Alaska after USDA inspection. During the summer of 1998, initial field evaluations began on the accessions.

The results of the 1998 Falkland Project led to a second collection effort on South Georgia Island. This occurred between December 2, 1998 and January 18, 1999. A total of 441 collections were made on South Georgia Island.

Commercial Native Plant Production Project

In 1998, 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.

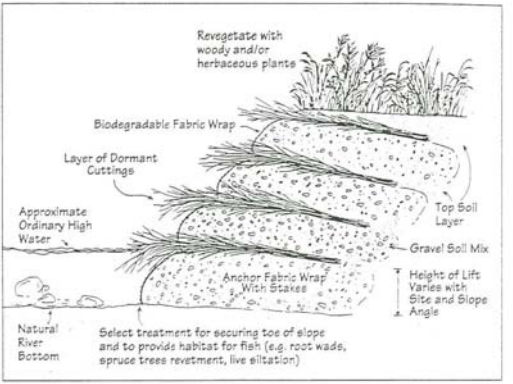
Department of Transportation/Public Facilities Southwest Seed Collection Project

Early in the fall of 1998, the PMC was informed that a previously submitted research grant was funded. Insufficient time was left in the year to complete the work originally proposed in the grant ending on October 1, 1998. Only one collection effort occurred at Cold Bay.

Port of Anchorage to Airport Pipeline

The PMC was selected to assist in the revegetation of the pipeline between the Port of Anchorage and Anchorage International Airport. The project crosses Knik Arm tidal flats adjacent to Anchorage. Locally collected native species will be re-seeded in specific areas of the disturbed right-of-way.

Brush Layering



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.

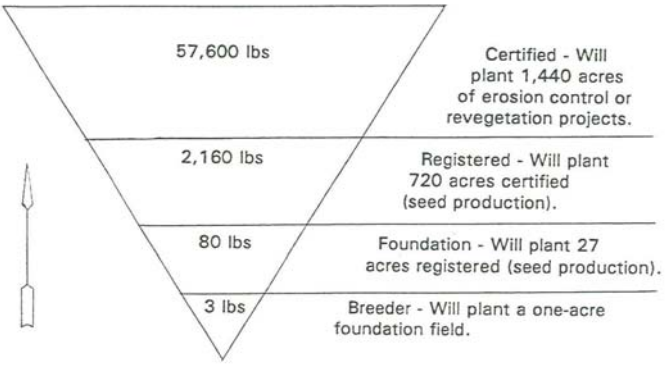
Seed quality is a prime essential to successful farming. A grower needs to know that the variety will perform, has acceptable germination and is free from contaminants.

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.

1998 Growing Season

The 1998 growing season started out warm and dry but turned cool and wet through the middle. The average number of degree days was exceeded. Harvest of grains occurred during a dry period in September. Irrigation was maintained throughout the growing season. Several grain lots were expanded to obtain a two-year supply.

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.

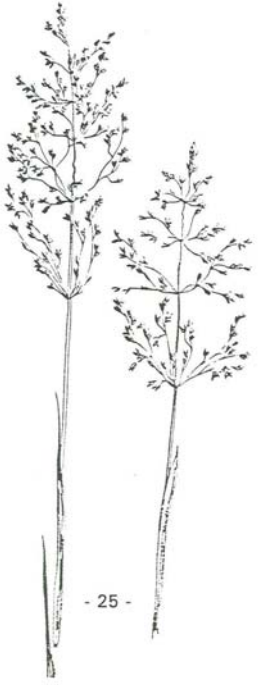


Table 1. Revegetation and Turf Varieties in Production Production in 1998.

Variety	Class	Planted	Acres
'Ingal' Wheat	Breeder	98	5
'Nogal' Wheat	Breeder	98	1
'Ceal' Oats	Breeder	98	1
'Tibetan Hulless' Barley	Common	98	.5
'Nip' Oats	Common	98	5
'Nugget' Kentucky Bluegrass	Breeder	94	5
'Nugget' Kentucky Bluegrass	Breeder	96	2
'Sourdough' Bluejoint	Breeder	97	1
'Arctared' Red Fescue	Breeder	97	1
'Nortran' Tufted Hairgrass	Breeder	97	1
'Service' Big Bluegrass	Breeder	97	1
'Caiggluk' Tilesy Sagebrush	Breeder	95	.5
'Bebral' Rye	Foundation	97	5
'Reeve' Beach Wildrye	Foundation	90	.5

Table 2. Cereal Grain Seed & Oil Seed Varieties in Storage at the Plant Materials Center, December, 1998.

Barley		Wheat		Oats		Rye	
Variety	Pounds	Variety	Pounds	Variety	Pounds	Variety	Pounds
Lidal	600	Ingal	2,000	Toral	9	Bebral	1,000
Otal	2,000	Vigal	0.9	Ceal	1,000	**Total**	1,000
Thual	5,000	Nogal	2,000	Nip	4,000		
Weal	4,000	Froid	200	Golden Rain	1		
Datal	0.5	**Total**	4,200.9	**Total**	5,010		
Pokko	Trace						
Arra	Trace						
Eero	Trace						
Paavo	Trace						
Tibet Hulless	Trace						
Galt	200						
Otra	Trace						
Steptoe	Trace						
Total	11,800.5						

Table 3. Cereal Grains Sales & Receipts, 1993-1998.

Type	1993	1994	1995	1996	1997	1998
Barley	4,300 lbs	150	500	1,000	1,500	150
	$1,007.88	$41.98	$184.25	$420.00	$533.00	$60.00
Oats	2,400 lbs	300	500	1,500	4,500	3,000
	$629.53	$87.51	$140.65	$224.00	$1,700.00	$600.00
Wheat	4,850 lbs	100	-0-	0	700	1,300
	$353.39	$32.75	-0-	0	$221.00	$278.00
Total	11,550 lbs	500	1,100 lbs	2,500	6,700	4,450
	$1,990.80	$162.24	$324.90	$644.00	$2,454.00	$938.00

Table 4. Grass Seed Sales & Receipts, 1993 - 1998.

Variety	1993	1994	1995	1996	1997	1998
'Nugget' Kentucky Bluegrass	261 lbs	46 lbs	20 lbs	25 lbs	-0-	40 lbs
	$3,276.72	$587.88	$239.40	$300.00	-0-	$480.00
'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-	20 lbs
	$583.20	-0-	-0-	-0-	-0-	$291.00
'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	60 lbs
	$9,763.53	$2,982.00	$2,200.41	$1,186.00	$3,700.00	$772.00

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.

Late Blight in Alaska

Late Blight is the most important disease of potatoes on a world-wide basis. In 1989 and 1990, outbreaks of Late Blight were reported in northwestern Washington in commercial potato fields that had received two to four late season applications of Metalaxyl. Since it's introduction in the late 70's, Metalaxyl, trade name Ridomil, was very effective in controlling foliage and tuber blight, however, the Late Blight found in Washington proved to be resistant to Ridomil. Workers across the U. S. and Canada soon found several new strains of Late Blight that until then, were not known to occur in the United States. Many of the new genotypes were shown to be resistant to Metalaxyl and were involved in several serious outbreaks in the U. S. As more information was gathered and new strains were identified, it became obvious that these new genotypes were more aggressive and better fit than the old U. S. 1. The development of methods to control the new strains became an immediate priority for the U. S. potato industry.

Late Blight was found in a field in the Matanuska Valley in early September 1995. It was determined to be an A2 mating type U. S. 7 strain by Cornell University. The field was killed, harvested, and quickly marketed. No Late Blight was found during the 1996 or 1997 growing seasons which were relatively dry.

Late Blight was found in the Matanuska Valley in mid-August of 1998 after a wet July. This time it was determined to be an A1 mating type U. S. 11 strain. A1's are usually sensitive to Metalaxyl, however, U. S. 11 is not. Late Blight was confirmed in fields of seven farms in the central valley and in four cellars since harvest. It is, therefore, anticipated to reappear during the 1999 growing season. The source initiating the 1995 or 1998 Matanuska Valley Late Blight infections has not been determined. Late Blight was also reported in 1998 at the Juneau Community Garden. This report was not confirmed by laboratory analysis.

Phytophthora infestans, the casual agent of Late Blight, has a complex life cycle. Although capable of creating a type of spore that can over-winter in the soil, this survival mechanism is believed to be an extremely rare event in the U. S. Live host tissue is required for Late Blight to survive. This aspect of its life cycle can be exploited to help manage the disease. Potatoes may be exposed to Late Blight during the growing season from inoculum produced by infected potatoes in cull piles and volunteer potato plants, or the disease may originate from planting infected seed. Tomato plants and fruit are susceptible to, and have been identified as primary sources of Late Blight inoculum. Under the right conditions, spores from infected plants can be carried in moist air for miles. If the appropriate environmental conditions exist, these wind-borne spores can infect healthy plants and thus continue to spread the disease. There are no chemicals that will effectively kill the recently identified Metalaxyl-resistant strains once they have become established in a plant. As a result, it is imperative that everyone develops a prevention attitude towards Late Blight. An effective prevention program includes implementing cultural and chemical management practices that reduce the potential for occurrence, spread and losses from Late Blight.

A Late Blight management plan for Alaska has been prepared and is available from the Plant Materials Center. The plan discusses Late Blight and its control through cultural and chemical methods in detail.

Figure 4. TUBER INTRODUCTION

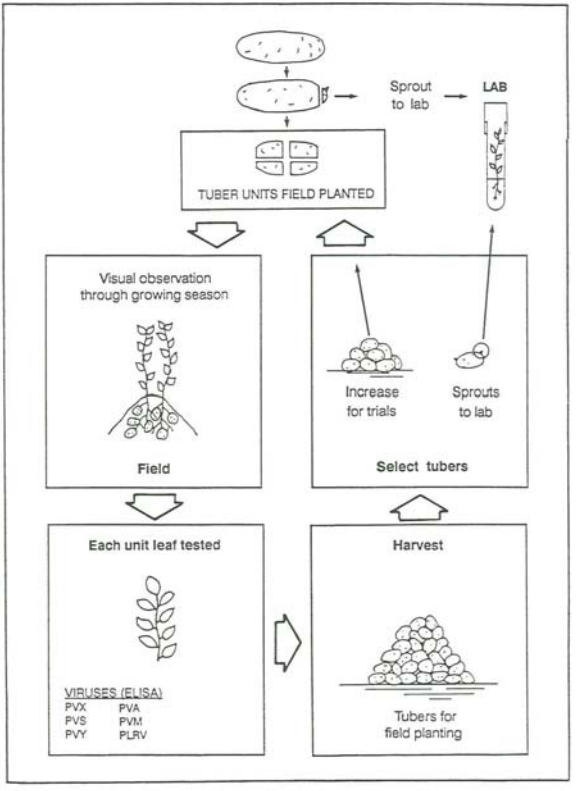
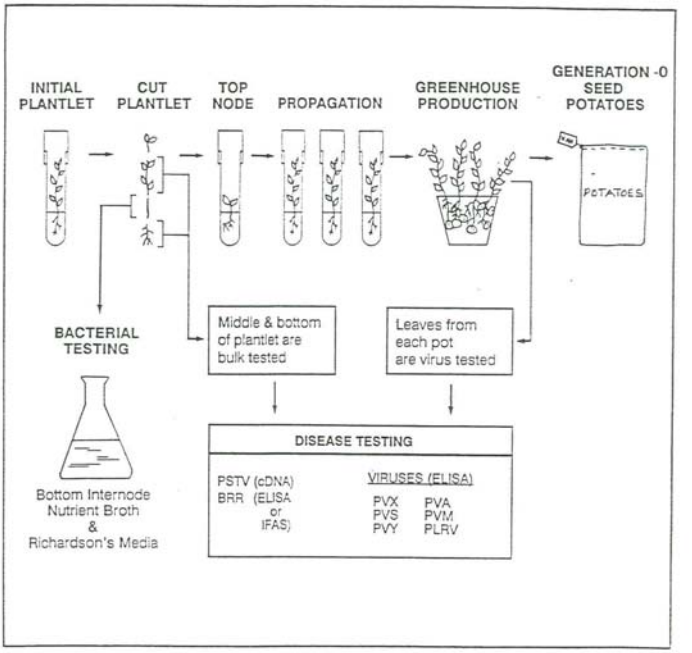


Figure 5. Alaska Seed Potato Production & Disease Testing



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
1998	17	212*	233	105

* Includes PMC variety bank.

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.

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

The annual Alaska Potato and Vegetable Growers Conference endeavors to update growers on local research findings and other innovations pertaining to production, handling, storage and marketing. The PMC participates in these events. During the 1998 conference, presentations were made providing information on the benefit from seed potatoes raised in northern areas. Research performed in Washington state compared seed lots from Alaska, Alberta, Idaho, Colorado and Washington. Statistically significant yield benefits were observed from seed potatoes from Alaska and Alberta.

Also discussed at the conference was the potental negative effect of importing less expensive seed potatoes from Canada. These included introducing the diseases Late Blight, Potato Virus Y, Potato Leafroll Virus, and Mertec-resistant strains of Silver Scurf and Fusarium.

An attempt was made to point out the potential market for sale of seed potatoes for gardeners. Seed potatoes sold through nurseries and retail greenhouse operations to home gardeners account for 10 to 20% of all seed potato sales in Alaska. Gardeners have different reasons for selecting and expectations from their potatoes. Resistance to the scab disease as well as novel flavors and colors are desired.

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 red-skinned varieties Red Ruby, Rideau and Reddale have shown fair resistance.

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 lbs.	G-1 lbs.	Plantlets
1995	48	1,520	0	1,015
1996	55	1,400	0	420
1997	80	1,456	1,200*	2,400
1998	42	1,800	1,100*	2,200

* 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.

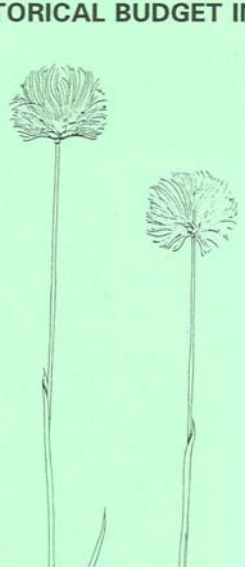
Supplemental Seed Distributions

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
Anchorage Garden Project
Anchorage

APPENDIX A

CURRENT & HISTORICAL BUDGET INFORMATION



CALENDAR YEAR 1998 AUTHORIZATIONS, EXPENDITURES, AND PROGRAM RECEIPTS

ARLF Authorizations

Authorization FY 98 PMC Total	508,600
Alaska Plant Materials Center	
Project Total	508,600
Personal Services	448,000
Travel	2,726
Contractual	45,007
Supplies	12,867
Authorizations FY 99 PMC Total	511,100
Alaska Plant Materials Center	
Project Total	511,100
Personal Services	450,500
Travel	2,900
Contractual	45,200
Supplies	12,500

PMC Operating Budgets for the Past Sixteen 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	FY 99
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 *	511.1 *
	Forest Nursery											180.0	95.2	95.2	0	0	0
Personnel		25	19	19	17	16	16	16	16	16	16	17	17	15	14	15	19
Full Time		12	10	10	9	7	7	7	7	7	7	7	7	6	5	6	5
Part Time		13	9	9	8	9	9	9	9	9	9	10	10	9	9	9	14

* Indicates Agriculture Revolving Loan Fund source.

When comparing personnel figures listed for FY 99 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 401,200 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 1998

Contracts, Reimbursable Service Agreements and Grants

Source	Face Value of Contracts Awarded in 1998
USDA Agricultural Research Service (Germplasm Repository)	287.0
USDA Agricultural Research Service (Screen House)	180.0
USDA Agricultural Research Service (Plant Exploration)	14.3
USDA Natural Resources Conservation Service	350.0
USDA Forest Service	5.0
U.S. Dept of Interior, Bureau of Land Management	3.9
U.S. Army	125.0
U.S. Navy	36.4
Alyeska Pipeline Service Company	9.0
Chugach Electric Association	5.0
Alaska Dept. of Transportation	27.0
Alaska Division of Mining and Water Management	28.5
Anchorage Water & Wastewater Utility	11.2
Alaska Seed Growers, Inc.	3.7
	Total $ 1,086.0

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	1998
42,195	31,407	58,417	117,981	126,071	202,886	377,161	334,200	212,800	304,200	1,086,000

1998 Calendar Year Monthly Expenditures to the Nearest Dollar												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PMC Totals	19,277	26,461	22,228	41,738	54,790	50,371	22,556	55,470	55,840	47,830	32,975	31,008
Personal Services	14,407	20,645	16,752	37,079	46,728	45,287	22,536	49,854	51,721	44,564	32,150	30,384
Travel	0	0	0	1,398	265	0	0	0	437	0	0	0
Contractual	3,964	4,963	5,242	2,242	5,076	3,185	20	2,453	2,003	2,766	306	87
Supplies	906	853	234	1,016	2,721	1,899	0	3,163	1,679	500	519	537

APPENDIX B

CROP RELEASES

Registration Certificate

Crop Cultivar

Egan American Sloughgrass
Reg. No. CV-143

Developed by

Alaska Plant Materials Center

Registered by the

CROP SCIENCE SOCIETY OF AMERICA

President

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.

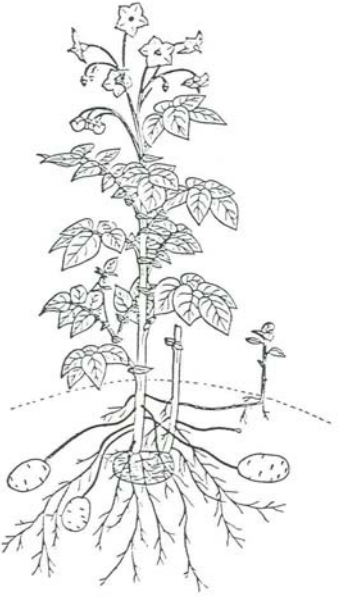
'Benson' Beach Wildrye, *Elymus mollis* - This accession was released for commercial production in 1991. Unlike Reeve, Benson was released for vegetative production only. This extremely aggressive and hardy, local collection does not produce seed in any appreciable amounts; therefore, commercial propagation 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 will occur in 1999. These are products of the recent collection efforts.

APPENDIX C

LIST OF PUBLICATIONS AND PRESENTATIONS

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Moore, N. J. and Winwood, A. Identification of Alaska Willows. Short Course for Society of Wetland Scientists Annual Meeting, Anchorage, Alaska, June 11, 1998.

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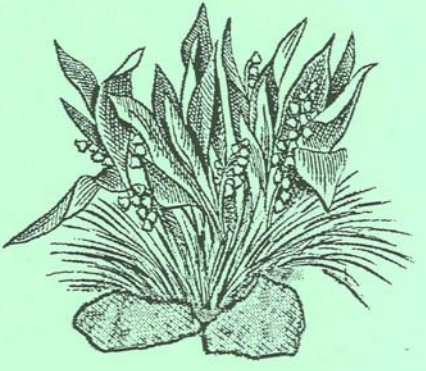
APPENDIX D

ACKNOWLEDGEMENTS



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