Alaska Plant Materials Center

Annual Report 1988

Alaska Department of Natural Resources - Division of Agriculture

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF AGRICULTURE/PLANT MATERIALS CENTER
... PRACTICAL PLANT TECHNOLOGY FOR THE NORTH

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FROM THE DIRECTOR January 26, 1989

During the past ten years, the Plant Materials Center (PMC) operations have expanded and declined with oil revenues. The PMC was established in 1972 by the Alaska Legislature (AS 03.22.010) prior to the oil wealth that followed in the early eighties. The need that existed in 1972 still exists today.

In spite of budget reductions, the PMC has continued to provide timely and appropriate responses to industry needs. The PMC will remain committed to this basic goal.

In order to fulfill this goal, the PMC conducts studies and produces information in four diverse areas:

1) development of revegetation plant materials
2) foundation seed production
3) horticultural development
4) production and maintenance of disease-free seed potato stock

Questions often arise concerning the differences between the PMC programs and those of the University of Alaska Agricultural and Forestry Experiment Station. In fact, the activities of the two agencies are complementary to each other, and to a degree PMC activities are an extension of the university's basic research and breeding programs.

The PMC plans to concentrate on long-term needs of industry. While the PMC's early development was, in some ways, directed by massive agricultural development projects or short-sighted impulses, the true and continuing commitment has been to practical and applied knowledge transfer and quality seed for industry. The development of a long-range plan of operation will allow the PMC to move forward in a progressive manner.

Additional goals that will guide the Plant Materials Center into 1989 and beyond include:

1) Continue to expand and maintain the PMC evaluation plot network so that needed information can be supplied to industry. The PMC has revegetation and/or horticultural evaluation plots in regions throughout the state, including the Interior, Aleutians, North Slope, South central, Seward Peninsula and the Kenai Peninsula.

A definite void in PMC activities exists in Southeast. This has not been an oversight or lack of interest on the part of the PMC, but rather a lack of time, funds and availability of disturbed land. Recent contacts with Echo Bay Mining Company and Greens Creek Mining Company in Juneau will rectify this situation, perhaps as early as May, 1989.

2) Produce and distribute publications on PMC activities in a timely manner so that the information can be used by growers and potential users of Alaska produced crops and adapted species.

3) Promote use of Alaska grown grass, grain and potato seed and adapted horticulture plant materials.

4) Complete the Plant Introduction Station and Germplasm Repository. This capital project was started in 1985 and should be ready for operation in FY 91 if operating funds are available at that time.

As the Director of the Division of Agriculture for the past nine months, I have seen progress made in achieving these and other goals. The PMC will remain committed to the industries it serves (agriculture, horticulture, mining and other resource development groups); this will be accomplished through cooperation.

The PMC is open for public tour annually during a scheduled open house (usually in July or August). Tours can be arranged at other times as well.

Frank Mielke

Frank Mielke, Director
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Alaska Plant Materials Center

1988 Annual Report

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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 furthers applied plant research for northern latitudes through two major programs: revegetation and seed production, and vegetable and landscape crop improvement. Each of these programs will be addressed in this report.

Funding for the Plant Materials Center comes from the state's general fund. Additionally, the center brings in small amounts of revenue through cooperative projects with other agencies and the private sector.

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, 285 acres near Palmer were selected for the center's site. An additional 120 acres were 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.

Within a dozen years after its founding, the program grew to include horticultural development and disease-free potato seed production projects. In 1987, the PMC's programs were consolidated into the two programs it carries out today: the North Latitude Revegetation and Seed Production Project and the North Latitude Vegetable and Landscape Crop Improvement Project.

North Latitude Revegetation & Seed Production Project

The Revegetation and Seed Production Project's products and methods are used to develop seed. These two functions are complementary.

Revegetation & Reclamation Efforts

The construction of the Trans Alaska Pipeline in the 70s 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 and erosion control. The use of dormant seedings to extend planting seasons, cost-effective and successful methods in willow planting, and wetland and coastal restoration are 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.

To date, this program has gathered 162 plot years of information collected from sites around the state (Figure 1), developed 7 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 elsewhere in this report. Copies of the 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 149 Plot Years as of 1987

Figure 2 - Typical Plot Layout

Nugget Kentucky Bluegrass	Merion Kentucky Bluegrass
Park Kentucky Bluegrass	Banff Kentucky Bluegrass
Sydsport Kentucky Bluegrass	Fylking Kentucky Bluegrass
Poa Ampla	Troy Kentucky Bluegrass
Sherman Big Bluegrass	Canbar Canby Bluegrass
Tundra Bluegrass	Reubans Canada Bluegrass
Poa Glauca T08867	Poa Alpina
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
Elymus Sibiricus 1966	Elymus Sibiricus 2144
Norcoast Bering Hairgrass	Tufted Hairgrass
Sourdough Bluejoint	Calamagrostis Canadensis
Meadow Foxtail	Alopecurus Geniculatus
Garrison Creeping Foxtail	Arctared Red Fescue
Boreal Red Fescue	Festuca Scabrella
Beckmannia	Pennlawn Red Fescue
Durar Hard Fescue	Highlight Red Fescue
Covar Sheep Fescue	Manchar Smooth Brome
Alyeska	Carlton Smooth Brome
Tilesy Sage	Polar Brome

Shemya AFB Sand Stabilization Projects

The North Latitude Revegetation and Seed Project (PMC) has worked with the Corps of Engineers and the U. S. Air Force on Shemya Island since 1983. Construction activity on the Lateral Clear Zone adjacent to the runway exposed 27 acres of sand to high winds, which resulted in massive erosion and sand transport. This sand was becoming a serious maintenance and safety problem. Attempts to stabilize the sand using standard seeding methods failed. The Corps of Engineers requested the assistance of the PMC to solve the problem.

The plan developed by the PMC relied on the use of Beach Wild Rye (Elymus arenarius L.), a native coastal grass. Because no commercial source of seed exists for this species, a sprigging program was the best alternative. Specifications were developed for a contractor to implement the 27 acres erosion control project. The PMC agreed to provide on-site assistance to the project contractor, as no similar project had ever been attempted in Alaska. A member of the PMC staff worked with the contractor and assisted in developing planting techniques, equipment modification and crew training.

On each acre, 20,000 sprigs were planted. Following sprigging, the site was over-seeded with other native grasses. Each acre required 60 man hours to complete. The project was completed within the contractor's estimate.

During September 1987, the site was evaluated. At that time, approximately 90% of the sprigs had become established and were growing very well. The overall project exhibited an 80-85% ground cover, which was sufficient to control the sand movement.

During the winter of 1987-1988, the Air Force reported that sand transport on this portion of the Lateral Clear Zone was under control and the associated maintenance problems were corrected.

During the last week in June 1988, the site was again evaluated. This evaluation strongly suggests that a healthy and vigorous coastal community has taken hold and the sand problem continues to be under control.

All costs associated with this project were either covered by the U. S. Army Corps of Engineers, U. S. Air Force or Shemya Constructors.

Upper Susitna Demonstration & Evaluation Plots

The Plant Materials Center (PMC) and the Upper Susitna Soil and Water Conservation District established demonstration and evaluation plots near Trapper Creek in June, 1987. The field was plowed, cultivated and seeded by staff from the PMC and the Palmer Soil Conservation Service.

The evaluation plots, consisting of 50 grasses and 1 forb broadcast seeded in 4 x 10 foot areas, were replicated three times; a fourth plot was planted in rod rows. The rod rows were 20 feet long and contained the same collection of plants as the broadcast plots. The demonstration plot consisted of 18 plant varieties recommended for the area by The Revegetative Guide for Alaska. These plantings were made in 20 x 60 foot plots; each 20 foot section received different fertilizer applications.

The plants germinated and became well established, but in many cases the plants were obscured by timothy and hemp nettle. In the spring of 1988, the plots were sprayed with 2,4,D which was relatively ineffective in killing the broadleaf weeds. In July, the PMC decided to spray the entire plot with a broad spectrum herbicide and replant in June, 1989.

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 needed information on species that would perform well in future mine revegetation programs. In 1987, Cominco agreed to provide the PMC with a site to establish evaluation and demonstration plots.

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

This combination of plots is intended to supply data for revegetation species selection and time of seeding. The Port Site plot was planted on July 6, 1987. This site will provide information regarding revegetation in the coastal portion of the mine project.

A dormant plot was seeded at the Camp Area 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 Alaska. Their elimination from the plantings should not compromise the value of the information obtained from these plots. The third plot, planted on June 15, 1988, was placed on gravely soil similar to the surface that will exist when construction is complete.

The evaluation process for these plots will be continued for a period of four growing seasons after planting.

A major demonstration planting was established on June 14, 1988. This plot, an abandoned disposal site north of the Port Site, was recontoured and seeded entirely with native species. It will also be evaluated for four growing seasons. A yearly progress report will be given to Cominco and upon the completion of the evaluation program, a final comprehensive report will be prepared.

Requests for additional revegetation studies are expected from Cominco during 1989.

Steese - White Mountan Mining District

In June, 1988, the Plant Materials Center (PMC) in cooperation with the Bureau of Land Management (BLM) Steese-White Mountain District, established revegetation test plots on recontoured mining tailings. Each plot consisted of 50 smaller plots containing 49 grasses and one forb and were planted according to the methods described in the introduction.

The BLM selected three sites in the district that had been recontoured and will not be redisturbed for several years. Four evaluation plots were planted; two replicates of the plots were planted at the Birch Creek site, Mile 98 of the Steese Highway. This site is visible and readily accessible from the highway and hopefully will serve to inform other miners of the possibilities for revegetation. Other plots were planted at Nome Creek and Hope Creek, both of which were several miles away from the Steese Highway. Staff from the Fairbanks BLM office volunteered their time to help layout, seed and fertilize the plots.

Most collections in the plot looked relatively good after the first growing season. The plots will be evaluated on an annual basis through 1991, at which time a final report will be prepared on the performance of the plantings.

At present, a cooperative agreement is being prepared for additional work with BLM. The work for 1989 will include some demonstration plantings of streambank revegetation techniques with feltleaf willow and grass species. This demonstration plot will be approximately 1/2 acre in size.

Adak Naval Air Station Erosion Control & Reclamation

As a result of the successful Shemya AFB Beach Wildrye project, the U. S. Navy asked the PMC to assist in developing a Natural Resource Management Plan for Adak NAS.

The Navy project involved all aspects of sand erosion control, lawn establishment, mine restoration and base landscaping.

As a result, several plots were established to evaluate species for the following purposes:

1. Beach stabilization using transplanted Beach Wildrye sprigs and the enhancement of natural stands of Beach Wildrye through the use of fertilizer.
2. Landfill, quarry and World War II structure site restoration and land rehabilitation using seeded species.
3. Landscaping for beautification and morale purposes using hardy species.
4. Additional plots were established to test new plant material being developed by the PMC. These plots include native trees, shrubs, forbs and grass. The plots are located on a variety of sites on the base.

This project started in May 1988 and will continue through 1990. The Navy has agreed to reimburse the PMC $17,420.00 over the project life for personal services, transportation and supplies.

The first years's work was successful, and it is likely that the Navy will consider the PMC for additional work on Adak.

A complete report will be prepared in 1990 covering the results of this project.

Kuparuk Arctic Pendant Grass Study

In 1985, the Plant Materials Center and ARCO Alaska, Inc., established a cooperative agreement to examine revegetation techniques for transplanting an emergent grass species, Arctophila fulva (Arctic Pendant grass). During the past four field seasons, two PMC staff have spent two to three weeks each season in the Kuparuk Field wetlands, transplanting Arctophila and evaluating the success of the plantings. Various planting locations and planting techniques have been tested and have met with a wide range of success. Following these initial studies, a contractor to ARCO supplied general laborers to conduct the plantings. This phase of the study allowed the ability of general laborers to carry out a project of this type to be evaluated.

This investigation sought answers to two questions: If Arctophila can be transplanted successfully, then is it economically feasible to transplant Arctophila on a large scale? What is the cost of transplanting Arctophila with an unskilled labor force? Investigation of these questions continues, and we expect additional insight after evaluations are completed in 1989.

A complete report will be prepared when this study is completed.

Chena Flood Control Demonstration & Evaluation Plots

In 1985, the Corps of Engineers requested the PMC to establish evaluation plots at the Chena Flood Control Project to control soil erosion.

A test plot containing 52 different grasses was established on the floodway. This plot was evaluated using standard PMC procedures for a period of four years. Of the 52 accessions planted in 1985, only 26 remained in 1988. Of the 26 accessions that survived, only 'Alyeska' Polargrass, 'Arctared' Red Fescue, 'Sourdough' Bluejoint, Violet Wheatgrass T12050, 'Gruening' Alpine Bluegrass, Big Bluegrass 387931 and 'Tundra' Glaucous Bluegrass consistently exhibited excellent performance.

A wetland revegetation demonstration site was also planted in 1985 at Pile Driver Slough adjacent to Eielsen Farm Road. The damaged area occurred during construction of the Eielsen Ag Project road and the parking area adjacent to Pile Driver Slough. Consistent with the Corps responsibilities, attempts were made to restore wetland vegetation to this site. This restoration effort relied on 'Egan' American Sloughgrass (a PMC release), and Sourdough Bluejoint. By 1988, the vegetative cover and composition was similar to the original stand. This plot suggests that acceptable and practical wetland species reintroduction is possible.

A final detailed report will be completed during the winter of 1988-1989. Continued evaluation will occur at this site.

Fairbanks Evaluation & Demonstration Plot

The Fairbanks Evaluation and Demonstration Plot has been a cooperative effort between the U. S. D. A. Soil Conservation Service, Cooperative Extension Service and the Plant Materials Center. Its intent was to conduct advanced evaluation of 51 collections of native grasses and broadleaf species.

This plot was established in 1985 and consisted of two replicates of advanced test material and a demonstration planting of species recommended in The Revegetative Guide for Alaska.

As with other advanced test sites, the Fairbanks plot allowed the PMC to test collections of plant material that have performed well at Palmer in a different environment. At the final evaluation on August 23, 1988, the plantings of 'Nugget' Kentucky Bluegrass, 'Merion' Bluegrass, Big Bluegrass 387931, 'Gruening' Alpine Bluegrass, 'Arctared' and 'Boreal' Red Fescue, 'Alyeska' Polargrass, Tilesy Sage and Polar Brome exhibited the best performance.

This plot has brought the PMC closer in its attempt to identify the potential of Tilesy Sage and Big Bluegrass 387931, both of which are being considered for release.

A complete, detailed report will be prepared for this site during the winter of 1988/89.

Fort Richardson Off-Road Vehicle Trail Restoration Project

This project, initiated in June 1988, was requested and funded by the U. S. Army at Fort Richardson and the Corps of Engineers Cold Regions Research Laboratory at Hanover, New Hampshire. Its basic purpose is to demonstrate alpine restoration of the unsightly trail system damaged by unauthorized civilian off-road vehicles, and to develop techniques for large-scale alpine revegetation.

The results of this study will be useful as Southcentral Alaska expands its winter recreation areas.

This project will provide results on alpine streambank revegetation, alpine wetland revegetation and revegetation of extremely dry, gravely, alpine sites. The first year of this project was somewhat disappointing since off-road vehicle use continued and damaged a portion of the plot area. While this damage was significant, the study has not been severely impacted at this time. If continued use of the trail is not curtailed, the project may be compromised.

This project is expected to continue for three more years. The PMC received in excess of $15,000.00 for its involvement to date.

ARCO Kuparuk Revegetation Test Plots

In the autumn of 1984, ARCO Alaska provided the PMC with two sites in the Kuparuk oil field for advanced testing of potential and existing revegetation grasses. This cooperative effort was of considerable benefit to both parties.

The PMC required arctic test sites to complement the test sites elsewhere in Alaska. In order for new varieties to be released for commercial production, they must be tested throughout a region or the state.

Also, ARCO Alaska needed answers to two questions: What species and varieties would perform best in future Kuparuk oil field revegetation programs, and, how successful would dormant seeding be in the arctic?

With these questions in mind, a site was selected on the 2C access spur, a gravel overlay or fill similar to work pads and roads in the region. The second site was at Mine Site D, selected because it represented another type of large disturbance that occurs in the oil field. On September 12, 1984, one plot was established on each site.

During the winter of 1984-1985, the mine site "D" plot was destroyed by construction activity. Another area within Mine Site "D" was selected for planting in the summer of 1985. This new site did not permit vehicular access and was assumed to be safe from disturbance. The site was seeded on July 15, 1985. On June 27, 1985, a spring planting plot was established adjacent to the dormant plot on the 2C access spur.

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

The plot layout of the 1985 spring and dormant seedings was identical to the 1984 dormant plots. The plots were seeded and fertilized according to the procedure outlined in the introduction.

By the August 1988, final evaluation, only an average of 16 of the original 50 collections survived. Of that, only 'Tundra' Glaucous Bluegrass, Violet Wheatgrass, Yukon Wheatgrass, 'Norcoast' Bering Hairgrass, 'Arctared' Red Fescue, and 'Egan' American Sloughgrass exhibited superior performance. Other collections that performed reasonably well were 'Alyeska' Polargrass, 'Sourdough' Bluejoint, 'Gruening' Alpine Bluegrass and 'Nugget' Kentucky Bluegrass.

Two accessions exhibited surprising results; 'Egan' American Sloughgrass, a wetland species, performed better than expected on these dry sites, and 'Alyeska' Polargrass did not perform as well as expected.

Other noteworthy observations included: germination was delayed one year in the spring seeded grasses, and no apparent difference exists in long-term performance between traditional spring seedings and dormant fall seedings.

A final report on this site will be prepared during the 1988/89 winter.

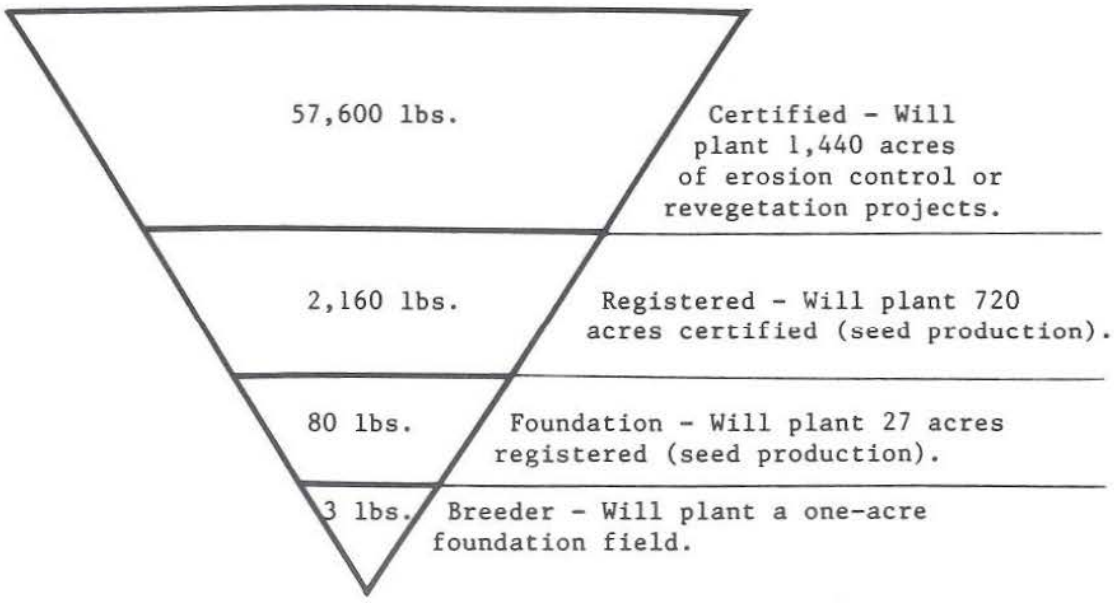
Foundation Seed Production Project

This section of the North Latitude Revegetation and Seed Production Project increases and preserves cereal grain and grass varieties developed especially for Alaskan growing conditions. Small amounts of breeder seed are obtained from the Agricultural and Forestry Experiment Station, PMC breeder plots, or other northern latitude sources. Once the PMC receives the seed, it is planted, grown, and processed according to established standards that ensure genetic purity, absence of noxious weed seeds, and freedom from injurious plant diseases.

The progeny of breeder seed, designated foundation class seed, is made available to the industry through the state's seed certifying agency, the Alaska Seed Growers, Inc. (ASG), in conjunction with the state Division of Agriculture. This process insures 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, certification standards and the Federal Seed Act.

Figure 3 - Seed Increase Pyramid

This illustrates the increase of three pounds of breeder seed to a commercially useable quantity. Yield is based on 80 lbs./ac. and planting rate is based on 3 lbs./ac. for seed production, and 40 lbs./ac. for revegetation purposes.



Upon completion of seed conditioning of the 1988 harvest, the PMC will have every Alaskan-bred released variety of grass and grain seed available for sale. Foundation class seed of two new PMC releases, 'Gruening' Alpine Bluegrass and 'Egan' American Sloughgrass, as well as two new releases from the Agricultural and Forestry Experiment Station, 'Kenai' Polargrass and 'Nortran' Tufted Hairgrass, will be available for the 1989 growing season. These four grass varieties will increase the number of commercially available native species which are often required for revegetation projects. After planting Tundra Glaucous Bluegrass in the Spring of 1988, the PMC currently has eleven foundation grass fields plus two breeder grass fields in production.

Table 1 - Revegetation and Turf Grasses in Production in 1988

Variety	Class	Acres
'Nugget' Kentucky Bluegrass	Foundation	5.0
'Arctared' Fescue	Foundation	5.0
'Norcoast' Bering Hairgrass	Foundation	3.0
'Polar' Brome	Foundation	2.9
'Tundra' Glaucous Bluegrass	Foundation	2.2
'Kenai' Polargrass	Foundation	2.0
'Sourdough' Bluejoint	Foundation	1.4
'Gruening' Alpine Bluegrass	Foundation	1.0
'Egan' American Sloughgrass	Foundation	1.0
'Nortran' Tufted Hairgrass	Foundation	1.0
'Alyeska' Polargrass	Foundation	1.0
'Egan' American Sloughgrass	Breeder	1.0
'Gruening' Alpine Bluegrass	Breeder	.3

Table 2 - Cereal grain seed & oil seed varieties in storage at the Plant Materials Center, December, 1988

Barley		Wheat		Oats		Rye		Rapeseed		Buckwheat	
Variety	Tons	Variety	Tons	Variety	Tons	Variety	Tons	Variety	Tons	Variety	Tons
Lidal	15.0	Chena	13.1	Toral	6.9	Bebral	1.2	Candle	3.1	Oly	0.3
Otal	8.4	Ingal	4.7	Ceal	4.2						
Thual	7.8	Vigal	1.9	Nip	0.7						
Weal	5.7	Nogal	1.4	Golden Rain	0.1						
Datal	5.0	1397	0.5	Freedom	0.01						
Finnaska	1.0	66116243344	0.3	**Total**	**12.0**						
Pokko	0.6	Norstar	0.07								
Arra	0.4	Gasser	0.04								
Eero	0.3	Frold	0.03								
Edda	0.05	Roughrider	0.03								
Paavo	0.03	**Total**	**22.2**								
Tibet Hulless	0.03										
Galt	0.01										
Otra	trace										
Steptoe	trace										
Total	**44.6**										

Table 3 - Grass Varieties in Storage at the Plant Materials Center December, 1988

Variety	Pounds
'Engmo' Timothy	2,080
'Arctared' Fescue	1,400
'Nugget' Kentucky Bluegrass	928
'Polar' Brome	760
'Norcoast' Bering Hairgrass	500
'Alyeska' Polargrass	380
'Egan' American Sloughgrass	180
'Gruening' Alpine Bluegrass	145
'Sourdough' Bluejoint	122
'Nortran' Tufted Hairgrass	96
'Tundra' Glaucous Bluegrass	40
'Kenai' Polargrass	15
Total	6,646

Table 4 - Cereal Grains Sales & Receipts, 1986 - 1988

Type	1988	1987	1986
Barley	3,750 lbs	12,750 lbs	4,200 lbs
	$1,074.09	$2,478.28	$1,194.92
Oats	1,200 lbs	7,978 lbs	5,900 lbs
	$ 355.40	$2,097.37	$1,394.98
Wheat	300 lbs	150 lbs	1,270 lbs
	$ 70.82	$ 24.13	$ 274.08
Rye	-0-	320 lbs	50 lbs
	-0-	$ 51.15	$ 11.47
Rapeseed	-0-	119 lbs	421 lbs
	-0-	-0-	-0-
Total	5,250 lbs	21,317 lbs	11,841 lbs
	$1,500.31	$4,650.93	$2,875.45

Table 5 - Grass Seed Sales & Receipts, 1986 - 1988

Variety	1988	1987	1986
'Nugget' Kentucky Bluegrass	550 lbs	855 lbs	706 lbs
	$4,547.60	$6,840.00	$4,942.00
'Arctared' Red Fescue	100 lbs	200 lbs	624 lbs
	$ 936.00	$2,000.00	$4,817.00
'Sourdough' Bluejoint	6 lbs	-0-	20 lbs
	$ 209.94	$ -0-	$ 615.00
'Engmo' Timothy	50 lbs	50 lbs	150 lbs
	$ 151.00	$ 225.00	$ 450.00
'Alyeska' Polargrass	-0-	95 lbs	10 lbs
	-0-	$1,000.00	$ 140.00
'Gruening' Alpine Bluegrass	10 lbs	Not Available	Not Available
	$ 130.20		
'Egan' American Sloughgrass	2 lbs	10 lbs	Not Available
	$ 17.58	$ 80.00	
'Norcoast' Bering Hairgrass	-0-	-0-	3 lbs
	-0-	-0-	$ 36.00
'Polar' Brome	-0-	-0-	35 lbs
	-0-	-0-	$ 595.00
Total	718 lbs	1,210 lbs	1,548 lbs
	$5,992.32	$10,145.00	$11,595.00

The PMC limited cereal grain production in 1988 to 'Nip' Oats, 'Bebral' Winter Rye, and 'Oly' Buckwheat to replenish low seed stocks for these varieties. Weather was favorable during the growing season, providing good maturity and low grain moisture contents at harvest, thereby minimizing drying time and reducing shrinkage. The PMC currently has in storage 44.6 tons of barley, 12.0 tons of oats, 22.2 tons of wheat and 1.2 tons of rye.

Foundation seed sales for 1988 were down. Cereal grain sales totaled 5,250 pounds; down from 21,317 pounds in 1987 and 11,841 pounds in 1986. Grass seed sales for 1988 totaled 718 pounds;down from 1,210 pounds in 1987 and 1,548 pounds in 1986. Receipts for 1988 seed sales totaled $7,492.63; down from $14,795.93 in 1987 and $14,470.45 in 1986.

North Latitude Vegetable & Landscape Crop Improvement Project

The North Latitude Vegetable and Landscape Crop Improvement Project is comprised of two individual projects. They are the Horticulture Development Project and the Potato Disease Control Project. The combination was made in an effort to streamline PMC operations. For clarity, the activities of each project are reported separately in this report.

Horticulture Development Project

This project is responsible for trials of vegetable, small fruit, and ornamental plants. Both introduced and native plants are evaluated in the trials. Cultural and production techniques are also evaluated. The project co-sponsors the Alaska Greenhouse and Nursery Conference and Polar Grower Trade Show with the University of Alaska Cooperative Extension Service and Alaska Horticultural Association.

Strawberry Plant Production Trial

In 1988, the PMC and University of Alaska Fairbanks began a joint study on the potential of strawberry plant production in Alaska. California strawberry varieties were used in this study. Factors being evaluated are the effects of Alaska's cool temperatures during August and September, and the long summer photoperiod. Data on daughter plant production and flowerbud initiation was recorded. Mother plants of six varieties were planted in early June, and grown in both Fairbanks and Palmer. Daughter plants were harvested in August and September. The trial will be continued for at least another growing season to determine the best cultural techniques to use for strawberry plant production in Alaska. A report will be published by the PMC and University upon the completion of the study. A study of the economic feasibility for this project may be justified if the cultural techniques can be developed.

Blueberry Applied Agricultural Research Account (AARA)Grant Study

Several growers have requested information on techniques to improve the fruit production of wild stands of blueberries. In 1988, the project received an AARA Grant to investigate cultural techniques to increase the fruit production in wild stands of blueberries. Three trials, each consisting of 4-10 meter by 10 meter plots were established. One trial is located in the Bartlett Hills Agricultural Project and two are located on a farm in the Montana Creek area.

All of the plots were cleared of trees and brush before receiving treatments. One plot of each trial was kept as a control and each of the other three plots received a combination of different fertilizer and pruning treatments. Elemental nitrogen, phosphorus and potassium were applied to the fertilized plots. Information to determine the plant stand and growth rate was collected. Observations made in August indicated that the fertilized plots produced a second flush of growth and flower buds.

The effect of this growth should be reflected in the yield data collected after the 1989 growing season. An interim report will be prepared this spring and after the 1989 harvest. The plots will be monitored for at least two years. The final report will be prepared when the study is completed.

Small Fruit Applied Agricultural Research Account (AARA) Grant Study

The Small Fruit AARA grant is a cooperative project with the University of Alaska Fairbanks Agriculture and Forestry Experiment Station. This study's goal is to systematically evaluate small fruit varieties in 13 locations in the railbelt area. The fruit types planted in the trial include four varieties of Amelanchier or Serviceberry, four Black Currant varieties, two Red Currant varieties, six Raspberry varieties and three Half-high Blueberry varieties. Additional varieties will be planted in 1989. Data that will be collected on this study includes rating the winter hardiness, date of bud break, bloom and harvest dates, and fruit yields. A summary report of winter hardiness, 1989 fruit production and harvest dates will be compiled when the information is available. The plants in this study will be observed for five years. A final report will be prepared when the study is completed.

Vegetable Variety Trials

Vegetable variety trials were initiated at the Plant Materials Center in 1986. Vegetable crops and varieties for commercial production are emphasized in the trials. The 1988 vegetable variety trials were grown in commercial vegetable growers' fields. Broccoli, cabbage and storage cabbage were the crops grown at a local farm. Nine varieties of broccoli and seventeen varieties of cabbage were planted as transplants on May 31, and June 1, respectively. The twelve varieties of storage cabbage were direct seeded on May 2, 1988. Minor crops including chinese cabbage, squash, kohlrabi, and kale, were planted on another farm for observation. A summary of their overall performance will be published this winter.

Off-site Plant Trials

The PMC has established plant trials throughout Alaska. The largest trials are located in Fairbanks, Delta, Kenai, Kodiak, Trapper Creek and in the Manillaq area. Cooperators assisting with the trials include the Cooperative Extension Service, local governments and native corporations. Ornamental trees and shrubs, and small fruits have been planted at these sites. During 1988, the sites were maintained; no plants were added to the trials except for the Kenai and Fairbanks sites which were used as sites for the Small Fruit AARA project.

This spring, the horticulture plants at the trial site on mile 1408 Alaska Highway, were moved to Delta High School grounds. They were moved so that they could be more closely monitored and used as a teaching tool for the Vocational Agriculture (Vo Ag) classes. Delta Vo Ag students helped to move the plants. Evaluation lists of the plants on each site are being prepared.

Alaska Greenhouse & Nursery Conference

The 7th Annual Alaska Greenhouse and Nursery Conference was held February 8 and 9, 1988 in Wasilla at the Lake Lucille Resort. The Polar Grower Trade Show was again held in conjunction with the conference. One hundred sixty people attended the Conference. This was the largest conference to date. Nine commercial exhibits representing Alaska, Washington and Canada, and three non-profit exhibits made up the trade show.

The conference was sponsored by the Alaska Plant Materials Center (PMC), the University of Alaska Cooperative Extension Service and the Alaska Horticultural Association (AHA). This was the first year that AHA assisted financially with the conference.

Guest speakers at the conference included Dr. Joseph Howland, Professor, University of Nevada Reno, and Mr. Erric Ross, Technical Representative, W. R. Grace in Portland, Oregon. Dr. Howland's presentations were on Marketing: "How You go About Expanding Your Market Size", and "How to do Consumer Market Research". Mr. Ross discussed "Practical and Inexpensive Plug Production". He emphasized the needs of smaller greenhouse operations. A panel of Mat-Valley greenhouse and nursery operators discussed the development of their businesses. A presentation made by PMC staff summarized the Apple Rootstock Trials.

Plant Sales & Distribution

In order to develop commercial horticulture production, several varieties of plants have been sold by the PMC to commercial growers since 1979. These varieties have been promoted by the University of Alaska Agriculture and Experiment Station. Growers purchasing these plants must use them for stock plants or food production. As more growers propagate these varieties, the demand on the PMC's stock has decreased.

The 1988 plant sales are:

'Holland Long Bunch' Currant	25 plants & 40 cuttings
'Swedish Black' Currant	75 plants & 5 cuttings
'Kiska' Raspberry	100 plants

Additional cuttings sold from the Small Fruit Demonstration Garden for an Applied Agriculture Research Account (AARA) project, include:

'White Imperial' Currant	43 cuttings
'Black Magnus' Currant	45 cuttings
'Viking' Currant	1 cutting
'Boskoop' Currant	3 cuttings
'Willoughby Black' Currant	4 cuttings
'OG #2' Currant	2 cuttings

Small fruit and ornamental plant varieties from the PMC collection are propagated and distributed for trial purposes. In 1988, plants were also distributed to the Yukon Territorial Government, and the Matanuska Valley Agricultural Showcase Garden. Thirty two currant plants, seventy six raspberry plants and one hundred forty eight strawberry plants were distributed for these trials.

Pending Releases & Distribution of Plants

The PMC will release a variety of Rubus arcticus or Nagoon berry in 1989. It is a very vigorous collection of the species and has a potential use as a ground cover. Fruit production has been average for this collection. Trial plantings are located on the University of Alaska Anchorage campus, the PMC, the Kenai trial site and the University of Alaska Fairbanks site. The plant competes with weeds once it is established. This collection is best suited for large areas since it spreads rapidly and has performed well on harsh sites.

Potato Disease Control Program

There are many serious diseases and pests of the potato, most of which are not known to occur in Alaska. The importation of seed potatoes to Alaska, therefore carries with it the potential to introduce problems. Alaskan potato growers constantly seek new varieties to increase their competitive advantage in the local market. The PMC has the advantage of acquiring disease-tested varieties and numbered lines from breeding programs outside of the state. New introductions are tested for bacterial and viral pathogens prior to propagation and release to growers. A plant containing a virus can be subjected to chemical and thermal therapy to eradicate the pathogen. Several varieties of local importance such as Alaska Frostless, Peanut, Rote Erstling and Alaska Red have been cleansed of viruses and released to growers for increase. Presently, seven varieties are in therapy.

In 1988, the project created 11,000 disease-tested plants of 56 varieties to be used for the production of Generation 1 (G-1) seed. Approximately 2,000 plants were made available to those interested in growing their own G-1 seed while 9,000 plants were planted and grown in greenhouses at the PMC. The 2,000 pounds of G-1 seed produced at the PMC will be distributed to seed potato growers in the spring of 1989.

Alaska's certified seed potato program is the cornerstone to a healthy potato industry. Certified seed potatoes were grown in the Matanuska and Tanana valleys in 1988. Alaskan certified seed potato growers produced 100 lots comprised of 23 varieties. Each lot was inspected according to certification standards for disease and varietal purity at least twice.

Delta Potato Variety Demonstration Project

The potato variety demonstration project was planted at the University of Alaska Agriculture and Forestry Research farm in Delta on May 22, 1988. The project was a cooperative effort including the University of Alaska Experiment Station and Cooperative Extension Service. It was intended to provide area growers the opportunity to compare 44 varieties and to give Future Farmers of America (FFA) students experience with potatoes.

Delta area growers were invited to observe the harvest on September 13, 1988. Tuber size was small across all varieties, with the largest weighing only six ounces. Total yield was consistent with previous trials.

This project was funded with a grant from the Applied Agricultural Research Account. A complete report will be prepared during the 1988/89 winter.

Special thanks to ALAMASU Farm for the use of equipment.

Matanuska Valley Potato Variety Demonstration Plot

A potato variety demonstration plot was planted at Nugen's Ranch on May 21, 1988. The project was intended to provide area growers the opportunity to compare 27 varieties. Local growers were invited to observe the harvest on September 20, 1988. The yield per variety was higher than expected. Tuber defects and diseases were noted. A complete report will be prepared during the 1988/89 winter.

Special thanks to Nugen's Ranch for assistance with the project.

Potato Sucrose Project

Alaskan potatoes are sold almost exclusively through fresh market outlets. The ability to process potatoes for use as french fries or chips would greatly expand the market. Potatoes used for processing must meet certain quality standards. One of the basic factors involved is the sugar content. This project was designed to determine the sugar content of Alaska grown potatoes at harvest, and the change in sugar content when potatoes are stored at 55° F. Samples were collected on September 22, 1988, and in bi-weekly intervals were tested for specific gravity, fry color and sucrose content.

The project was funded with a grant from the Applied Agricultural Research Account. A complete report will be prepared during the 1988/89 winter.

Appendix A

Current & Historical Budget Information

Calendar Year 1988 Authorizations, Expenditures & Program Receipts

Authorizations

Authorization FY 88 PMC Total	$ 596,700.00
North Latitude Revegetation & Seed Production Project	
Project Total	348,000.00
Personal Services	284,900.00
Travel	4,100.00
Contractual	48,400.00
Supplies	10,600.00
Equipment	-0-
North Latitude Vegetable & Landscape Crop Improvement Project	
Project Total	248,700.00
Personal Services	221,500.00
Travel	4,400.00
Contractual	19,600.00
Supplies	3,200.00
Equipment	-0-
Authorization FY 89 PMC Total	$ 556,100.00
North Latitude Revegetation & Seed Production Project	
Project Total	314,200.00
Personal Services	251,100.00
Travel	4,100.00
Contractual	48,400.00
Supplies	10,600.00
Equipment	-0-
Project Total	241,900.00
Personal Services	214,700.00
Travel	4,400.00
Contractual	19,600.00
Supplies	3,200.00
Equipment	-0-
Special Appropriations FY 89	
PMC Flood Control Project	50,000.00

General PMC Operating Budgets for the Past Ten Fiscal Years

	FY 79	FY 80	FY 81	FY 82	FY 83	FY 84	FY 85	FY 86	FY 87	FY 88	FY 89
Authorization	406,200	343,000	361,900	743,100	725,900	912,300	863,400	888,500	733,700	596,700	556,100
Personnel	13	13	13	21	21	25	19	21	17	16*	16*
Full Time	7	7	7	10	10	12	10	10	9**	7***	7
Part Time	6	6	6	11	11	13	9	9	8	9	9

* When comparing personnel figures listed for FY 88 and FY 89 to those in FY 79 to FY 81, bear in mind that the Potato Disease Control Project and the Horticultural Development Project were added in FY 85 and FY 82 respectively. Total FY 79 allotted man hours equalled 112 man months. FY 88 and FY 89 man months only totalled 121 as many of the seasonal positions are two to three month assignments.

** In FY 87, the full time position responsible for seed testing was eliminated. These functions have been assumed by the Alaska Seed Growers, Inc.

*** In FY 88, the Plant Propagationist and the Agronomist IV positions were eliminated.

1988 Calendar Year Monthly Expenditures to the Nearest Dollar

	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
PMC Totals	37,152	35,623	34,652	42,544	40,013	61,610	34,601	64,683	62,589	49,015	43,620	39,071
Personal Services	32,190	28,525	24,362	32,918	36,018	43,640	29,398	57,941	52,449	40,076	37,360	32,142
Travel	565	1,017	3,679	1,617	-0-	1,347	420	2,111	4,254	849	644	1,351
Contractual	2,850	4,381	3,052	3,012	2,793	13,164	4,146	3,144	4,735	3,824	3,384	2,794
Supplies	1,546	1,699	3,557	4,996	1,202	3,457	637	1,487	1,150	4,265	2,233	2,783
North Latitude Revegetation and Seed Production Project												
Totals	23,761	21,651	15,896	26,003	20,148	37,042	21,360	37,615	31,769	29,604	29,085	24,451
Personal Services	20,717	16,274	10,041	17,906	17,858	21,744	18,938	35,435	27,321	25,943	25,760	20,545
Travel	565	1,017	3,251	1,618	-0-	1,064	-0-	-0-	1,698	545	318	819
Contractual	1,733	3,430	1,893	1,653	1,795	11,623	2,073	1,455	2,160	1,720	1,600	1,410
Supplies	745	929	710	4,826	495	2,607	349	726	589	1,396	1,407	1,677
North Latitude Vegetable and Landscape Crop Improvement Project												
Totals	11,390	13,972	18,755	16,541	19,865	22,445	31,241	27,068	29,600	19,411	14,535	14,619
Personal Services	11,473	12,251	14,320	15,011	18,160	21,896	10,460	22,506	25,128	14,133	11,600	11,597
Travel	-0-	-0-	427	-0-	-0-	283	420	2,111	1,366	304	326	532
Contractual	1,117	951	1,159	1,359	997	1,539	2,073	1,689	2,574	2,105	1,784	1,385
Supplies	801	770	2,847	170	708	848	288	762	532	2,870	826	1,106

Program Receipts

Receipts Calendar Year 88	
Technical Assistance	
U. S. Army, Ft. Richardson	15,270.00
U. S. Navy, Adak	12,155.00
Strawberry Study	3,409.00
Applied Agricultural Research Grants	2,111.00
Sales	
Grass, Grain, Potato Seed	8,830.00
Horticultural Material	422.00
Total Receipts	42,195.00

Appendix B

New & Pending Crop Releases

New Crop Cultivars Developed by the Alaska Plant Materials Center

'Long' Barclay Willow - 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 - '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 - This willow has a dense growth form and has many potential uses for screening, windbreaks and living fences. Because of the 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 - '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 - '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 - '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.

'Gruening' Alpine Bluegrass - 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.

Pending Releases

Tilesy Sagebrush - Tilesy Sage is a non-woody native species of sagebrush. This selection has shown exceptional adaptability to drastically disturbed sites throughout Alaska south of the Brooks Range. It is expected to be used in land reclamation and mine restoration following its projected release in 1989.

Nagoonberry - The North Latitude Vegetable and Landscape Crop Improvement Project expects to release this selection of Rubus arcticus in 1989. This collection has shown potential as a landscape ground cover and may be adapted for some types of reclamation.

Big Bluegrass - The PMC has evaluated this collection against the hardiest known commercial cultivar of the species. The collection being tested by the PMC has exhibited superiority over 'Sherman' Big Bluegrass. This Big Bluegrass selection is expected to be released in 1989.

Following 1989, the PMC anticipates releasing cultivars of Beach Wildrye, Violet Wheatgrass, Yukon Wheatgrass and Glaucous Bluegrass for commercial production. The majority of these releases will occur prior to 1992.

Appendix C

List of Publications & Presentations

Publications

Campbell, W. L. 1987. Potatoes Alaska! Spudman. January and February 1987. 4 pp.

Moore, N. J. 1986. Recommendations for Reclamation Species and Techniques. Alaska Miner. April, 1986. 2 pp.

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Moore, N. J., P. Brna, W. Evans, and S. J. Wright. 1986. Field Guide for Streambank Revegetation. State of Alaska, Division of Agriculture, Plant Materials Center. 15 pp.

Moore, N. J. 1986. Final Report for the Bank Revegetation Program, Bethel Small Boat Harbor. State of Alaska, Division of Agriculture, Plant Materials Center. 23 pp.

Moore, N. J. 1986. Final Report for Evaluation of Conservation Species at Fort Richardson, 1983 - 1986. State of Alaska, Division of Agriculture, Plant Materials Center. 11 pp.

Moore, N. J. and P. J. Brna. 1987. Streambank Revegetation With Woody Plants. Alaska Fish and Game. 19:2. 4pp.

Moore, N. J. 1987. Plant Profile 'Roland' Salix lasiandra. The Public Garden. The American Association of Botanical Gardens and Arboreta, Inc. January, 1987. 1 p.

Moore, N. J. and S. Wright. (in press) Studies on the Techniques for Revegetation with Arctophila Fulva (for years 1986, 1987 and 1988). State of Alaska, Division of Agriculture, Plant Materials Center. 53 pp, 30 pp and 16 pp.

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Wright, C. I. 1988. A Better Mouse Trap? Alaska NAFEX Newsletter. December, 1988. Vol. 3. No. 10.

Wright, S. J. 1985. Willow Varieties for Alaska. State of Alaska, Division of Agriculture, Plant Materials Center and USDA Soil Conservation Service. 7 pp.

Wright, S. J. 1986. Release Notice 'Egan' American Sloughgrass. State of Alaska, Division of Agriculture, Plant Materials Center. 2 pp.

Wright, S. J. 1986. Release Notice 'Gruening' Alpine Bluegrass. State of Alaska, Division of Agriculture, Plant Materials Center. 2 pp.

Wright, S. J. and N. J. Moore. 1986. 1986 Progress Report for the Conservation Plant Project. State of Alaska, Division of Agriculture, Plant Materials Center. 87 pp.

Wright, S. J. 1986. Initial Data and Observations Obtained From the 2C Access Spur and Mine Site D Herbaceous Evaluation Plots Located in the Kuparuk Unit. State of Alaska, Division of Agriculture, Plant Materials Center. 10 pp.

Wright, S. J. 1986. Beach Wildrye (Elymus arenarius) Sprigging on Shemya Air Force Base, Lateral Clear Zone - A Qualitative Study in Response to Questions Arising From Contract DACA 85-86-C-0042. State of Alaska, Division of Agriculture, Plant Materials Center. 37 pp.

Wright, S. J. 1987. Final Report on Demonstration and Advanced Conservation Plantings at Kalsin Bay, Kodiak, Alaska 1982-1986. State of Alaska, Division of Agriculture, Plant Materials Center. 16 pp.

Wright, S. J. 1987. Final Report on Evaluation of Advanced Herbaceous Conservation Species at Usibelli Coal Mine, Healy, Alaska 1983 - 1986. State of Alaska, Division of Agriculture, Plant Materials Center. 11 pp.

Wright, S. J. 1987. Final Report of Initial and Advanced Conservation Plantings at Ruby, Alaska 1984 - 1986. State of Alaska, Division of Agriculture, Plant Materials Center. 16 pp.

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Wright, S. J. 1988. Final Report on Evaluation of Conservation Species at Valdez Creek Mine Near the Susitna River off the Denali Highway 1985 - 1987. State of Alaska, Division of Agriculture, Plant Materials Center. 12 pp.

Wright, S. J. 1988. Initial Demonstration and Advanced Conservation Plantings at the City of Kenai Evaluation Plot 1984 - 1987. State of Alaska, Division of Agriculture, Plant Materials Center. 12 pp.

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Wright, S. J. 1988. Advances in Plant Material and Revegetation Technology in Alaska. Proceedings of the High Altitude Revegetation Conference. Colorado State University. Fort Collins, Colorado. 38 pp.

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Campbell, W. Alaska Potatoes, A Text Book Example of Virus Flush Out 72nd Potato Association Annual Meeting, Colorado State University, Fort Collins, Colorado, July 26, 1988.

Moore, N. J. Revegetation With Native Willow and Potential Markets 7th Annual Alaska Greenhouse and Nursery Conference, Wasilla, Alaska, February 9, 1988.

Wright, C. I. Apple Rootstocks 7th Annual Alaska Greenhouse and Nursery Conference, Wasilla, Alaska, February 8-9, 1988.

Wright, C. I. Growing Rhubarb Alaska Chapter of North American Fruit Explorers, March 10, 1988, Anchorage, Alaska.

Wright, C. I. Small Fruit Production CES Master Gardener Class, Palmer, Alaska, March 16, 1988.

Wright, C. I. Growing Rhubarb CES Garden Week Program, Palmer, Alaska, April 13, 1988.

Wright, C. I. Small Fruit Production, Living on a Few Acres Agricultural Symposium Series, Mat-Su College, Palmer, Alaska. September 16, 1988.

Wright, S. J. Stabilization of the Lateral Clear Zone on Shemya AFB HQ AAC/DEM Elmendorf AFB, January 6, 1988.

Wright, S. J. Advances in Plant Material and Revegetation Technology in Alaska High Altitude Revegetation Conference, Colorado State University, Fort Collins, Colorado, March 3, 1988.

Wright, S. J. Government's Role in Seed Production Yukon Livestock and Agriculture Association, Whitehorse, Yukon, March 19, 1988.

Wright, S. J. Recreating a Coastal Community Using Beach Wildrye Sprigs and Seeded Grasses Alaska Association of Environmental Professionals, Anchorage, Alaska, March 25, 1988.

Wright, S. J. Recent Developments in Revegetation and Erosion Control in Alaska Alaska Association of Soil and Water Conservation Districts, Wasilla, Alaska, October 28, 1988.

Wright, S. J. Revegetation in Economic Development Zones of Alaska Resource Development Council, Anchorage, Alaska, December 8, 1988.

Appendix D

Acknowledgements

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