

Landfill Restoration

On Adak Island

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**Prepared for
U. S. Navy
Engineering Field Activity Northwest
Southwest Division Naval Facilities
Engineering Command**

December 1999



Alaska Department of Natural Resources

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LANDFILL RESTORATION ON ADAK ISLAND 1997 - 1999

Introduction:

In 1997, the Alaska Plant Materials Center (AKPMC) entered into an agreement with the U.S. Navy to monitor and assist in the restoration of abandoned landfills on Adak. The AKPMC has been working on Adak since 1988; during that time many major revegetation projects were completed.

Several environmental cleanup projects were conducted at Naval Air Facility Adak under the Installation Restoration (IR) Program and as part of the Federal Facilities Agreement (FFA) for Adak. The FFA was a legal agreement between the United States Navy, the United States Environmental Protection Agency (EPA), and the Alaska Department of Environmental Conservation (ADEC) to evaluate and clean up hazardous substances on Adak Island.

The selected remedies for a number of sites included revegetation of disturbed soils for protection of human health and the environment. Construction services were contracted for hydroseeding in accordance with a specification obtained from Alaska Department of Natural Resources Plant Materials Center (AKPMC). Native plant species were preferred for planting because they provide long-term stability and habitat restoration or enhancement.

Objective:

The purpose of this agreement was to procure expert services for the review of project plans and perform quality control inspection and oversight. AKPMC was to review contract documents and make recommendations regarding schedule, procurement methods and sources, and hydroseeding specifications to maximize revegetation success. AKPMC was to make site visits to assess hydroseeding technique and results, report findings and make recommendations to the Navy.

Projects:

Quality control review and inspection projects included:

- a. Palisades Landfill: approximately 9 acres;
- b. Metals Landfill: 19-acres with approximately 5 acres to be hydroseeded;
- c. Robert's Landfill: approximately 70 acres, including borrow areas;
- d. White Alice Landfill: approximately 25 acres;
- e. White Alice PCB Cap: approximately 3 acres;
- f. Three unidentified Solid Waste Management Units (SWMUs) having an aerial extent of 1 acre or less;
- g. Three unidentified SWMUs having an aerial extent of 1 to 5 acres.

Description of Tasks:

This agreement consisted of two major elements: (1). project planning and review; and (2) on-site inspection and reporting. The following tasks were to be undertaken by the AKPMC.

Task 1. Project Plan Review:

AKPMC was to review project documents and make recommendations regarding revegetation methods, specifications, scheduling and materials procurement to maximize revegetation success and value. Quality control reviews assessed the availability of materials, appraised and identified materials sources, assessed specified materials, weight ratios and application methods as related to project goals; appraised overall revegetation methods; reviewed and optimized schedules and related tasks which lead to recommendations for best value to the Navy. Project documents were provided by the Navy (EFA NW).

Reviews culminated in annual submittals of approximately 3 pages which contain a summary of findings and recommendations.

Task 2. Field Quality Control Oversight:

AKPMC visited the seven project sites to assess preparation, application, execution, or completion of the specified revegetation work. The phase of each project to be inspected varied, depending on work schedules.

Palisades Landfill:

Palisades Landfill covers approximately 9 acres. Work started on the site in 1995; seeding occurred in 1996. The original seed recommendation was:

60% 'Norcoast' Bering hairgrass, *Deschampsia beringensis*

20% 'Boreal' Red fescue, *Festuca rubra*

15% 'Arctared' Red fescue

5% Annual Ryegrass

The fertilizer rates and formulation were 450 – 500 pounds of 20-20-10 or equivalent N-P-K per acre. These seed and fertilizer mixes had been successful on previous Adak restoration projects.

The initial site evaluation in 1996 suggested that the seeding and fertilizer specification was not followed. The site was densely covered with Annual rye; a cover much higher than would be expected with a seeding rate of 5% (Figure 1). A year later in 1997, the perennial cover on the site was near 95% (Figure 2). However, less than 5% of the perennial grass cover was hairgrass, also supporting the possibility that a substitution was made to the seed mix. Native species began recolonizing the site in 1997.

On August 28, 1998, Palisades supported nearly a 100% cover of perennial grasses (Figure 3). The percentage of cover had increased since 1997. The overall vigor of the Palisades vegetation was starting to decline in 1999 (Figure 4). The dense Red fescue stand was showing signs of fertilizer deficiencies. The primary reason hairgrass was included in the seed mix is because it tends to perform well on the low fertility soils of the Aleutians. A maintenance fertilization program has been recommended to the Navy.



Figure 1. Palisades Landfill, fall 1996, showing heavy stand of Annual ryegrass



Figure 2. Palisades Landfill, 1997, showing nearly 100% composition of Red fescue.



Figure 3. View of Palisades Landfill (background) showing good cover but declining vigor of perennial grasses



Figure 4. Palisades 999 Note invasion of lupine and low vigor of seeded grasses

Metals Landfill:

Metals Landfill was most notorious landfill on Adak. The accumulation of debris began near the end of World War II and continued to grow into the 1980's. Restoration of Metals Landfill began in 1996; seeding was finished in 1997 (Figures 5 and 6). Only small areas of Metals Landfill were seeded. The majority of the site was identified for natural revegetation; i.e., reinvasion of native species.

During the design phase, the AKPMC suggested the site be replanted with Beach wildrye. This procedure was, in the past, extremely successful on a number of sites on Adak and Shemya. The contractor rejected the idea and suggested natural revegetation instead. In retrospect, the contractor's view of natural revegetation must have meant "do nothing". In reality, for natural reinvasion to succeed most sites require surface scarification and at least one application of fertilizer.

Those areas of Metals Landfill that were seeded included slope areas on the recontoured landfill cap and slopes leading away from the landfill. The areas scheduled for seeding were to receive the same seed mix as Palisades Landfill. Once again, the grass cover did not reflect the ratios of the species in the recommended seed mix. The vegetative cover in 1997 was adequate to control erosion on the seeded areas. The same finding was reported in 1998 (Figures 7 and 8). During the final evaluation in 1999, the seeded areas were showing signs of fertilizer depletion. Plant cover, however, was still keeping erosion in check.

The areas intended for natural revegetation were still languishing and not performing as expected; plant cover was sparse (Figure 9). Light surface scarification and fertilization would assist the natural revegetation process. The most significant problem noted at the Metals Landfill was the erosion on the back slope adjacent to the pit. The effect of the erosion is limited to the interior of the landfill and none of the sediment is escaping the confines of the landfill (Figures 10 and 11). Each year beginning in 1996, these problems were brought to the Navy's attention. Successful corrective measures for the problem area would be very costly.



Figure 5. Metals Landfill, 1997, after final grading.



Figure 6. Metals Landfill, 1997, showing finished grades and site preparation for natural revegetation.



Figure 7. Seeded areas in Metals Landfill, 1998, foreground.

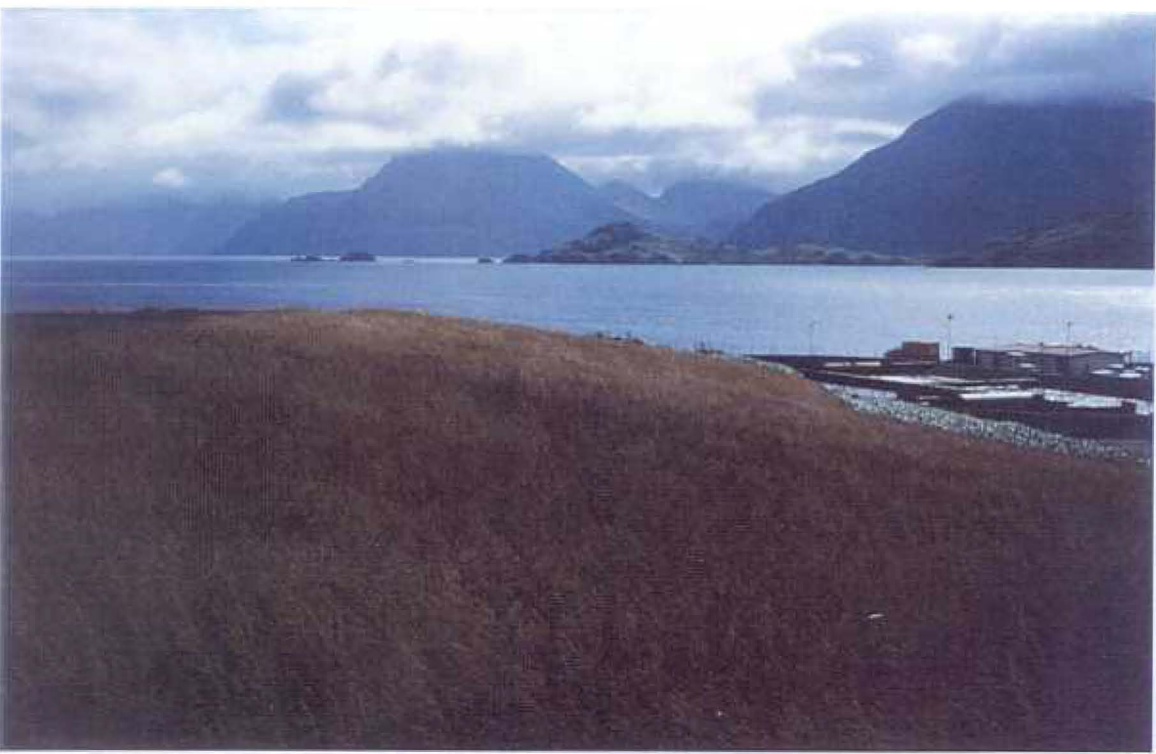


Figure 8. Seeded slope at Metals Landfill, fall of 1998.



Figure 9. Metals Landfill at edge of natural vegetation stand (not disturbed during construction) and invading plants on left.



Figure 10. Eroding back slope area at Metals Landfill, 1998.



Figure Active erosion back slope Metals andfill

White Alice Landfill:

Initial work began on the White Alice Landfill in 1996. Seeding occurred in 1997 (Figures 12 and 13). The design specified the same 60-35-5 (Hairgrass-Fescue-Annual ryegrass) mix called for on the other sites. The specifications did, however, allow for substitution to the mix without prior approval. Unfortunately, the species and cultivars used as substitutes were poor choices; they had been used previously and had not survived on Adak. The initial plant establishment was very poor and much poorer than stands found at other sites on Adak including the Metals and Palisades Landfills. Poor plant establishment probably occurred because inexpensive non-native substitutes were made to the seed mix.

In addition to this poor seed mix, the White Alice Landfill was heavily mulched with straw and then covered with excelsior blankets. Heavy mulching can slow the warming of the soils in Alaska. Also, excelsior blankets have the tendency to come apart, leaving plastic netting behind to be carried by the wind (Figures 17 and 18). The excelsior blankets did come apart at the White Alice Landfill creating an eyesore and potential trap for small animals and birds. This material is not recommended by the AKPMC for this reason. Straw also is not recommended because of possible weed seed content, cost of shipping and the potential for over-insulating the soil.

During the final evaluation of White Alice Landfill (Figures 15 and 16), the vegetation was showing signs of nutrient deficiencies. If hairgrass been used this problem would not have occurred.



Figure 12. White Alice Landfill after grading, 1997



Figure 13. White Alice Landfill, 1997. Note excelsior and emerging Annual ryegrass.



Figure 14. White Alice Landfill, 1997



Figure 15 White Alice landfill 1998 Note very poor growth perennial grasses and poor cover



Figure 16. White Alice Landfill, 1999. Note exposed soil and absence of excelsior blankets.



Figure 17. Unraveling excelsior at White Alice Landfill, 1998.



Figure 18 Plastic netting from excelsior piling up fence around White Alice andfill 1998

Robert's Landfill:

Robert's Landfill was the largest (70 acres) and most recently closed landfill on Adak. The majority of Adak's residential solid waste was placed in Robert's Landfill. Site grading and contouring began in 1997 and continued through 1998. Seeding started in 1998 (Figures 19, 20, 21 and 22) and continued in 1999 (Figures 23, 24 and 25). The White Alice Landfill specifications for seed, fertilizer, and surface mulch (excelsior) were used on Robert's Landfill. The initial results indicate this site will follow the same pattern as the White Alice site. The seeded grasses will slowly die out and the excelsior blankets will unravel and spread plastic netting throughout the area.



Figure 19. Robert's Landfill, 1998, showing the young grasses emerging from excelsior blankets.



Figure 20. Another area of Robert's Landfill in 1998. Note sparse vegetation.



Figure 21. Robert's Landfill, 1998, showing Annual ryegrass emergence.



Figure 22. Another area of Robert' Landfill 1998



Figure 23. Robert' Landfill 1999 showing decline 1998 seeding.



Figure 24 Robert landfill 1999, showing other areas stand decline 1998 seeding.



Figure 25 Robert' Landfill showing good stand grass 1999 This seeding planted earlier 1999

Conclusions and Recommendations:

One of the primary aspects of landfill design is to develop a "cap" that will resist erosion and maintain its integrity. None of the landfills are showing any signs of erosion. Erosion on the backslope of the Metals Landfill does not affect the landfill itself but does affect the adjacent area. This problem is a result of the restoration of the Metals Landfill.

Currently, erosion is being prevented by the vegetation cover on the sites. However, the vegetation is in decline and should be monitored. The vegetation at the Metals, White Alice and Palisades sites would benefit from remedial action; i.e., additional fertilizer during the next growing season. Continued decline of the grass cover could result in erosion and adversely affect the integrity of the landfill caps.

The problems created by the changes to the seed mixes and the fertilizer formulations will be difficult to correct now. Reseeding into existing red fescue sod with hairgrass seed may be unsuccessful. Unfortunately, the seed mixes used at the sites were not monitored more closely. Each bag of seed used on Adak should have been plainly labeled with the exact content by weight of each species and variety. Verification of the seed mix would have been very easy. The labels are required by both state and federal laws.

The appearance of Metals Landfill poses a special problem. The large unvegetated area presents an eyesore to ships coming into port. Without some form of vegetative cover on the site, it remains a potential erosion hazard. Ideally, the bare surfaces of Metals Landfill should be sprigged with Beach wildrye. This species is a very common grass on sandy, gravelly areas adjacent to the coastline. It has been used on a number of projects on Adak with success. A program to replant Beach wildrye could effectively and quite likely permanently stabilize the site in one to two years. The resulting vegetation cover would be a permanent stand of native plants.

A second less effective method to reestablish vegetation would be to seed the area with a good adapted seed mix. This method could also provide permanent total surface protection in two years. The vegetation would not be entirely native to Adak.

Natural reinvasion is still possible. However, the process will require more than one to two years and would benefit by light surface scarification and a fertilizer application. Natural reinvasion would be the least expensive method of revegetating the site and is the most difficult method to predict the results.

All the landfills mentioned in this report need supplemental fertilization. The vegetation is in decline and the only method to reverse the trend is a reapplication of fertilizer. But on the other hand, erosion is not a problem now. So the question that needs to be considered is: Is the cost of fixing a potential problem worth it or should the Navy continue to gamble that erosion will remain in check?

Appendix

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STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF AGRICULTURE


September 11, 1998

BRYAN HAELSIG
U.S. NAVY
EFA NORTHWEST
19917 7TH AVE NE
POULSBO WA 98370

Dear Bryan:

Attached is a narrative report on the state of the Adak landfills.
If you have questions, please call me at (907) 745-4469.

Sincerely,



Stoney J. Wright, Manager
Alaska Plant Materials Center

SJW/ds

cc: Lt. Fairbanks, USN, Adak

TONY KNOWLES, GOVERNOR

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October 16, 1997

Tim Anderson
EFA
Naval Facility Engineering Command
CODE 18-T4BC
19917-7th Ave NE
Poulsbo WA 98370

Dear Mr. Anderson:

Attached is an interim report on the Adak Landfill Revegetation project. We have also prepared a billing for the work conducted during Federal FY 1997.

Our agreement states a site visit will occur in November 1997. If this is needed, we will arrange for the visit. The value of a November site visit will be limited. If snow cover is minimal, grade and surface conditions could be ascertained.

We assume the revegetation efforts will restart in April/May 1998.

Sincerely,



Stoney J. Wright, Manager
Alaska Plant Materials Center

SJW/ds

Attachments

1997 INTERIM REPORT LANDFILL REVEGETATION ON ADAK NAF

Palisades Landfill: The landfill was revegetated in 1996. In September 1996, the area supported an excellent stand of grass. The predominant species was annual ryegrass. On September 3, 1997, the landfill was re-evaluated. The annual ryegrass composition was reduced to less than 5%. Perennial grasses provided nearly 95% cover. The predominant species was red fescue. Less than 5% of the vegetation was composed of hairgrass. Initial stages of recolonization by other native species was starting in 1997. The site showed no signs of erosion or surface degradation.

Metals Landfill: This landfill was seeded in the summer of 1997. Level areas were not seeded, thereby allowing for natural revegetation. On September 3, 1997, the area was re-evaluated. The seeded areas were showing good stands of perennial vegetation. Cover in these areas was estimated at 70%. The areas scheduled for natural revegetation were showing initial signs of re-invasion. No erosion or surface degradation was noted on the site.

White Alice Landfill: The White Alice Landfill was revegetated in July 1997. In addition to seed and fertilizer, the site was heavily mulched with straw and excelsior blankets. The September 3, 1997 site evaluation showed a good stand of seedling vegetation. The erosion blankets were still very visible, but these will not be as apparent after another year. No signs of erosion were observed.

Roberts Landfill: During the summer and fall of 1997, Roberts Landfill was being shaped, graded and capped. Revegetation is expected to occur in 1998.

White Alice PCB Cap: This area was not scheduled for revegetation. It would benefit from fertilization and seeding. Using seed previously collected on Adak would be beneficial.

Other Sites: No other sites have been identified.

THE STATE OF ADAK LANDFILLS, SEPTEMBER 1998

Palisades Landfill: The Palisades Landfill was revegetated in 1996. In September 1996, the area supported an excellent stand of seedling grass. The predominant species in 1996 was annual ryegrass. On September 3, 1997, the landfill was re-evaluated. The annual ryegrass composition was reduced to less than 5%. The perennial grasses provided nearly 95% cover on the site. The predominant perennial grass was red fescue. Less than 5% of the remaining cover was composed of hairgrass, the other perennial grass used in the seed mix. Initial recolonization of the site by other native species started in 1997. By August 28, 1998, Palisades Landfill supported nearly a 100% cover of perennial grasses. The composition value of hairgrass seems to have increased slightly. The vegetation cover was still thriving and performing adequately. There were no signs of erosion on the site. Reinvasion by other native species is continuing.

Metals Landfill: Metals Landfill was seeded in the summer of 1997. Level areas were not seeded, thereby allowing for natural revegetation. The landfill was evaluated on September 3, 1997. The seeded areas exhibited good stands of vegetation. The cover in 1997 was estimated at 70%. Areas scheduled for natural revegetation were showing early signs of reinvasion. No erosion was observed in 1997.

During the August 28, 1998 evaluation, the seeded areas were still performing well. Cover was estimated at 85 - 90%. No erosion was observed in these areas. The portions of Metals Landfill set aside for natural revegetation were showing more signs of initial reinvasion. Both *Agrostis exarata* and *Lathyrus maritimus* were aggressively invading the site. Less than 1% of the total area showed signs of natural reinvasion. The set-aside areas were level and no erosion was observed.

The back slope areas of Metals Landfill are actively eroding. Some areas showed massive gully formation. The outwash sediments from these sites are covering large areas within the landfill. This is a problem that should be addressed in the near future.

White Alice Landfill: White Alice Landfill was revegetated in July 1997. This area was also heavily mulched with straw and excelsior blankets. In 1997, a good stand of vegetation was emerging from the mulch and blankets. The light color of the excelsior blankets made the site highly visible. No erosion was apparent on the landfill.

In 1998, the vegetation stand was rated as good. The percent cover was estimated as being 60%. The grass, however, did not exhibit the vigor usually encountered on Adak. This could, in part, be attributed to the insulating effect of the straw, mulch and excelsior blankets. Both products individually are capable of over insulating soil in Alaska.

In combination, the result will obviously be more pronounced. Neither have been needed on Adak in the past. Why they were used is not known. Also, the plastic backing on the excelsior blankets is separating from the excelsior. This is leaving pieces of plastic netting throughout the landfill. In other areas of Alaska, excelsior has been avoided because of this trait. It is especially poor near fish streams as the netting can act as gill nets. I recommend the netting be picked up as it breaks loose from the excelsior. Entanglement of small creatures and birds is a real possibility.

Robert's Landfill: In 1997, Robert's Landfill was being graded and prepared for revegetation. Revegetation occurred in 1998. Robert's Landfill was also covered with excelsior blankets. During the August 1998 evaluation, vegetation was starting to emerge from the excelsior. It too showed a marked reduction in vigor similar to the White Alice Landfill. Cover was estimated at roughly 60%. There were no signs of erosion.

South Davis Landfill: The South Davis Landfill was completed in 1998. This landfill restoration relied on traditional materials and methods used on previous revegetation projects on Adak. The site supports a 90 - 95% vegetation cover. Vigor of the grass is excellent and erosion is non-existent. This site should be used as a standard against which Robert's, White Alice and Metals Landfills are measured.

Recommendations:

1. Develop a plan to correct the erosion problems in Metals Landfill.
2. Gather plastic netting as it separates from excelsior blankets in White Alice and Robert's Landfills.
3. Eliminate the use of excelsior blankets in revegetation projects on Adak.
4. Weigh the true value of straw mulch. It does not provide much in way of surface protection.
5. Consider extending the duration of this contract to allow for an additional site visit in 1999. This will allow for the evaluation of Robert's Landfill and the corrective measures employed at Metals. The existing obligated monies will cover the contracts extension.

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF AGRICULTURE

September 1, 1999

Jim Daigle, Senior Project Geologist
Hart Crowser
Adak Project Office
USN, Adak Naval Facility
Adak, Alaska

Jim,

I am sorry for the delay in getting the seeder information to you. I've been to Prudhoe, Kenai and I forget where else, since Adak. The attached page is from the owner's manual of a Thompson seeder. The unit we have is wheel-mounted and tows behind a four-wheeler. It will hold about 400 pounds of fertilizer at a time. It is simple to use and maintain as well. It would be an ideal unit for maintenance fertilizer programs. At about \$450.00 it could also be classified an expendable.

I do believe a maintenance fertilization program may be real valuable for the landfill close out program. White Alice and Palisades Landfills are showing signs of fertilizer deficiencies. Also, Metals landfill was intended (at USFWS and design contractor request) to be a natural revegetation project. As such, only erosion prone areas were seeded. The remainder of the site was to be naturally colonized with native species as they invaded the site, an unpredictable process on a site the size of Metals Landfill. The process is starting but the plants could use some help. Light scarification would help but that would affect the integrity of the cap. An application of fertilizer (20-20-10) would help the process along. I suggest the area be refertilized at a rate of 500 pounds per acre. I believe this will give the invading plants the boost they need. White Alice and Palisades would benefit from a fertilizer application of 300 pounds of 20-20-10 as well. Based on the performance of these sites I expect Robert's landfill may also need some supplemental fertilization next year.

While on Adak this last time, the only fertilizer I noticed was 10-20-20. If this was, in fact used, the actual nitrogen application would have been half the recommended rate assuming the prescribed rate was even followed. I am questioning the application rate simply because the species composition of the seeded areas does not correspond with the suggested seed mixes. These mixes have been used on Adak in the past with very good results and the composition more closely matched the recommendation. Also, in the specifications for White Alice Landfill I noticed an allowable substitute seed mix. This allowed the substitution of known good performing adapted native grass species with the really poor introduced selection—Durar. If this has actually been substituted in the past, it would explain the rather poor performance of the seeded grasses. If this variety was used on Robert's, it too will be in poor shape next summer. I expect cost of seed to be the primary reason for substitution, saving pennies to jeopardize a project.

TONY KNOWLES, GOVERNOR

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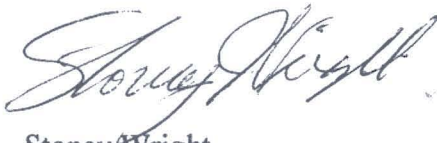
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Jim Daigle, Senior Project Geologist
September 1, 1999
Page 2

How good has the quality control program been on Adak? Did anyone gather seed bag tags as the seed was applied? State and federal laws require these tags on each bag. They give the percent of each component in a seed mix.

This letter is the interim report. A full report will follow this fall.

Sincerely,

A handwritten signature in cursive script that reads "Stoney Wright".

Stoney Wright
Manager, Alaska Plant Materials Center