

**ASSESSMENT OF REVEGETATION  
ON THE ALEUTIAN ISLANDS  
OF  
ADAK, AMCHITKA, SHEMYA AND ATTU**

**PREPARED BY  
STONEY J. WRIGHT  
STATE OF ALASKA  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF AGRICULTURE  
ALASKA PLANT MATERIALS CENTER**

**December, 1991**

## ACKNOWLEDGEMENTS

Financial support for this study was provided by the Department of the Navy, West Naval Facility Engineering Command, San Bruno, California.

Additional logistic support was provided by the 17th District of the United States Coast Guard, Juneau, Alaska; and the Department of the Air Force, Pacific Air Forces, Elmendorf, Alaska.

## TABLE OF CONTENTS

	<u>Page</u>
1. Acknowledgements . . . . .	. . i
2. Table of Contents	ii
3. Introduction .	. 1
4. Assessment of Re-Seeding Projects	
Adak Naval Air Station . . . . .	. . . . . 2
Amchitka . . . . .	. . . . . 4
Shemya . . . . .	. . . . . 6
Attu . . . . .	. . . . . 8
Beach Wildrye . . . . .	. . . . . 9
9. Recommendations and Conclusions	10
10. Other References Available on Aleutian Revegetation	12

**ASSESSMENT OF REVEGETATION  
ON THE ALEUTIAN ISLANDS  
OF ADAK, AMCHITKA, SHEMYA AND ATTU**

**Introduction**

Attempts to introduce crops or produce forages on the Aleutians date back to the period of Russian colonization of the islands. None of these early efforts achieved a level of success. The original inhabitants of the Aleutians (the Aleuts) developed a successful hunter-gatherer society that did not rely on cultivated species. However, as skilled seamen and traders, the Aleuts supplemented their hunter-gatherer society with products from other regions.

After Russia sold Alaska to the United States, limited attempts to grow standard crops on the islands continued without success until the Second World War. Following the Second World War, servicemen and civilian contractors repeatedly attempted to establish various tree and shrub species on the islands they inhabited. These experiments or projects designed to make the islands more hospitable, usually ended in failure. The most successful and famous stand of spruce trees still exists on Adak Island. Along with tree and shrub planting, small plantings of grasses also occurred. These seedlings relied on standard forage and lawn species from the continental United States, and were intended primarily for mud control and simple landscaping. By the late 1950's, most military activity on the Aleutians ended.

However, beginning in the mid 1960's and continuing to the present, activity on the Aleutian's increased with both Department of Defense projects and Atomic Energy Commission's nuclear testing program. These projects initiated systematic revegetation research on the Aleutians, the most comprehensive on Amchitka Island. The early intent of these vegetation research efforts was basic revegetation and erosion control. However, these efforts did suggest the importance of indigenous species for successful revegetation.

During the 1970's and 1980's, military expansion on Adak, Shemya, Attu and Amchitka renewed the interest in revegetation. The goals in these revegetation efforts ranged from erosion control and improving the quality of life, to full reclamation.

Other efforts in revegetation on the Aleutians centered on a federal debris clean-up program. These projects were initiated to remove various military structures and trash remaining from the Second World War and post-war, military activities on all the Aleutian Islands. The intent of revegetation during these projects was reclamation.

## Assessment of Re-Seeding Projects

### Adak Naval Air Station

The use of grass seed on Adak can be traced back to initial base construction. The majority of the seeding conducted during the early attempts, relied on commercial cultivars of Red Fescue (Festuca rubra), Timothy (Phleum pratensis), and Ryegrass (Lolium sp.). The intent of these seedings was to improve the appearance of the base and, to some extent, control erosion. No examples of these initial seedings remain at this time, as all of the sites have been either recolonized by native species or have been subjected to additional construction and new seedings. Those sites that have been recolonized by native species, for the most part, are covered by Hairgrass (Deschampsia sp.), Lupine (Lupinus sp.) and/or Beach wildrye (Elymus mollis).

Revegetation efforts on Adak during the 1980's, started relying on more adapted species. Mixes used during this period, usually called for the Red Fescue, (Festuca rubra), cultivars 'Pennlawn', 'Boreal', or 'Arctared'; Kentucky bluegrass (Poa pratensis) cultivars 'Merion' or 'Park'; Meadow foxtail (Alopecurus pratense); Hard fescue (Festuca ovina) cultivar 'Durar'; and either perennial or annual Ryegrass (Lolium perenne) or (Lolium multi-florum). During the late 1980's, 'Norcoast' Bering hairgrass (Deschampsia beringensis) started to appear in seed mixes.

As the Alaska Plant Materials Center (APMC) conducted revegetation research on Adak during the period 1988 to 1991, many of the past revegetated areas were evaluated. Meadow foxtail, 'Durar' Hard fescue and the perennial and annual ryegrasses were non-existent. These species are not adapted to Adak. This lack of adaptation was also noted in the evaluation plots established by the APMC on Adak. On those sites on Adak restored as part of the Defense Environmental Restoration Program, performance is poor. These sites were heavily seeded with red fescue; in some cases, in excess of 100 pounds per acre. Now these areas exhibit poor growth due to excessive competition and sod-binding. No reinvasion by native species has been observed, nor can reinvasion be expected for some time due to the excessive, sod-bound cover presently existing on the sites. These sites, however, are not prone to erosion because of the dense vegetation mat.

Seeding trials conducted by the APMC from 1989 to 1990, relied heavily on 'Norcoast' Bering hairgrass and red fescue. From these trials, seed mixes were developed for specific uses; i.e., lawns or low maintenance areas. Areas seeded for lawns or maintained grounds, relied on heavy seedings of red fescue and Kentucky bluegrass; exact seed specifications can be obtained from the Adak Natural Resources Management Plan or in the final section of this report.

This specified mix has performed well and due to the intentionally heavy seeding rate, native reinvasion (an undesirable growth in lawns often called weeds) is not expected.

Areas intended to be low maintenance landscapes, relied on Bering hairgrass and red fescue at lighter seeding rates. Reinvasion by native species is expected and encouraged by the lighter rates. Low maintenance areas will benefit from the reinvasion which will impart a very natural appearance to the seedings.

Revegetation on Adak is, for the most part, now a matter of standard procedures. However, site specific or task specific problems still exist or could occur in the future.

## Amchitka

Amchitka Island, like Adak, was significantly impacted by military activity during the Second World War. Few, if any, of these disturbances were seeded or in any way restored after the island was abandoned.

In 1964, the Department of Defense returned to Amchitka to conduct a series of three underground nuclear tests. In addition to the three nuclear detonations (the last occurring in 1971), the U. S. Atomic Energy Commission/Energy Research and Development Administration (AEC/ERDA), conducted what probably accounts for the most significant environmental assessment of any Aleutian Island. Part of the research was dedicated to revegetation and reclamation of roads and construction sites built for the nuclear testing program. Upon completion of the nuclear testing program, many of the disturbances were reseeded using a mix of 'Boreal' red fescue, 'Highlight' chewing fescue, Bering hairgrass (precursor to Norcoast) and annual ryegrass.

In 1991, nearly 15 years after the AEC revegetation efforts were completed on Amchitka, the APMC evaluated four major disturbances for species persistence and native reinvasion. The methods employed by the APMC were subjective and did not rely on quantitative methods. All of the evaluated sites were visually rated fair to good in regard to cover. Patterns, or rows, were still visible on the revegetated sites, a common problem when drill seeding is conducted. The rows, however, do not impact the site in any manner other than being a visual disturbance. On all four sites, red fescue predominated. Hairgrass was also very common. However, some of the hairgrass present may have invaded the site as only a small fraction (less than 10%) of the original mix was composed of hairgrass. It was also interesting to note the massive invasion of Lupine on all the revegetated sites. This indicates that the species may be of extreme value in future revegetation efforts.

A limited amount of revegetation work on Amchitka was conducted under the Defense Environmental Restoration (DERA) program during the late 1980's. Three of these sites were evaluated by the APMC in 1991 using the same methodology as described previously. The seed mix for Amchitka was 40% 'Norcoast' Bering hairgrass, 20% 'Pennlawn' red fescue, 30% 'Boreal' red fescue and 10% annual ryegrass.

In excess of 80% of the grass composition of these sites is now hairgrass. The performance of the hairgrass was rated as being excellent. The remaining red fescue was rated as good. In combination, these two species have produced an excellent cover on the DERA sites.

One point worth noting; the restored hut sites on Amchitka blended in with the natural ground and topography much better than the restored hut sites on Adak. While the excavation for the huts was not as deep on Amchitka, the over-riding reason for the more natural appearance is that the pit walls are well vegetated by lupine and hairgrass. It must be assumed that the lupine has naturally reinvaded the sites, as it was not artificially seeded.

The cut slope areas around the Adak hut sites continue to be an eyesore. While erosion is not a real problem, attempts to establish vegetation on the surfaces has not been successful, and lupine has not colonized the pit walls on Adak as it has on Amchitka.

The last revegetation efforts on Amchitka occurred after the construction of the ROTH (Relocatable Over the Horizon Radar) system in 1989. Sites disturbed during the construction of the radar system were seeded with a mix composed of 60% red fescue, 30% hairgrass and 10% annual rye grass. The vegetation cover and performance on the ROTH site was excellent. Hairgrass is outperforming red fescue. The only problem noted on the ROTH revegetation was the poor final grading of the site prior to seeding. This oversight has drastically impacted the overall appearance of what would have been an outstanding revegetation effort.



## Shemya

The Alaska Plant Materials Center has been involved with revegetation on Shemya since 1983, in fact, most of the institution's Aleutian experience was gained on Shemya. Due to Shemya's small land area (approximately four miles by two miles), military activity has probably impacted this island more so than any other Aleutian island. Shemya still supports a large military installation and is second only to Adak on the Aleutians. Shemya has been almost continuously occupied since the Second World War.

Shemya has also been subjected to the most varied seed mixes of any Aleutian Island. Fortunately, the island's ecology has not been impacted since the introduced species usually die. Those that survive tend to lack vigor and are incapable of competing with native species. To date, seedings on Shemya can be placed in two categories; landscaping and erosion control.

Landscape seeding (including athletic fields) tends to perform well provided a maintenance (refertilization) program is followed. The standard specification (if used) for landscape work on Shemya consists of a mix of 40% 'Nugget' Kentucky bluegrass, 30% 'Boreal' red fescue, 20% 'Arctared' red fescue and 10% annual ryegrass. This mix has performed well throughout the main base complex and athletic fields. Once again, it is important that a regular maintenance program is followed to ensure survival and vigorous growth.

Erosion control or low maintenance seedings on Shemya clearly point out the superiority of 'Norcoast' Bering hairgrass and 'Boreal' red fescue. Seedings conducted during the 1980's are still performing very well. These seedings, usually consisting of a 60% hairgrass, 40% red fescue mix, have produced successful stands without a maintenance fertilizer program. Also, this mix has allowed for native reinvasion. Lupine, Beach wildrye and Beach pea are the common invading species in areas that have been seeded with the hairgrass-red fescue mix.

Because Shemya is so small and because of what appears to be almost continuous construction on the island, no major Defense Environmental Restoration Activity (DERA) has occurred on the island. The few remaining World War II sites have restored themselves by natural means or have been eliminated to allow for new construction. The few sites remaining from the World War II era are now predominantly covered by lupine and hairgrass. The remnants of structures close to beach areas have been overtaken by Beach wildrye.

During 1990-1991, the base commander instituted a program to clean up the Shemya Island. During this operation, derelict vehicles and metal scrap was removed from Shemya. This simple action may have been the most significant environmental and aesthetic restoration of an Aleutian island.

## Attu

Presently, Attu has the smallest contingent of military personnel. The only activity now occurring on the island, is the U. S. Coast Guard Loran Station. However, during the second World War, Attu was not only the location of a major Pacific battle, but was the location of a major military installation. Thus far, Attu has been subjected to very little revegetation activity. Most of the abandoned military structures have deteriorated by natural means. Revegetation has also progressed without human interference. On hut sites where the buildings have completely deteriorated, native vegetation is flourishing. Once again, as on Shemya and Amchitka, lupine and hairgrass are the predominate invaders. The only artificial seeding observed on Attu is a small lawn area in front of the Loran Station. Based on observations, it was determined that the area was seeded with a mix of Kentucky bluegrass and fescue. No record of cultivars used could be located. Performance was poor due to the fact that no maintenance program exists for the lawn.

Because of the natural revegetation potential of disturbances on Attu, a strong argument could be made for allowing natural deterioration of the abandoned military structure, after which natural revegetation should be encouraged. Considering the historical significance of the area, the natural processes of deterioration and the resulting natural revegetation may be ideal. Erosion is not a significant problem and therefore cannot be considered a reason for revegetating disturbances on the island.

## Beach Wildrye Restoration

Thus far, this report has only discussed the success or failure of revegetation with seeded species. Two major Beach wildrye sprigging or transplant projects have occurred on the Aleutian Islands. The first was initiated on Shemya in 1986. The second on Adak in 1988. Both projects were very successful and elevated the technique from study status to a viable method in restoration of coastal vegetation communities.

After six full growing seasons, the 27-acre site on Shemya is effectively controlling sand erosion. Additionally, a functioning coastal community has developed. Uncontrolled dune formation has also been abated for the present time, as a result of the uniformly spaced plantings. While sprigging was more costly initially than standard seeding methods, the resulting savings in runway maintenance and continual reseeding, has more than paid for the project. Additionally, by preventing the reestablishment of dunes, the integrity of the lateral clear zone was maintained.

The Beach wildrye sprigging project on Adak was also very successful. Controlling sand and protection of a military facility was once again the objective. After four years, the sprigged area on Adak is performing as planned and the majority of the sand problem has been controlled.

Part of the Adak project is an active dune area, therefore control of dune formation was not critical. However, another portion of the project needed to maintain a level condition without dunes as a security measure. During the fourth year, 1991, a small dune adjacent to a main road started forming. This, in part, was due to the discontinuous planting pattern created by the road itself. Road maintenance is also aggravating the problem as sand is being swept into this area from the road surface. Presently, a maintenance program relying on fertilization and sprig harvesting, is being developed to alleviate the duning problem and when implemented, should keep unwanted dune formation in check.

## Recommendations and Conclusions

1. Reseeding disturbances with native species on the Aleutian Islands has been proven to be practical.
2. An effective, commercially available seed mix for low maintenance areas throughout the Aleutian Islands, is a mix consisting of:
  - 60% 'Norcoast' Bering Hairgrass  
Deschampsia beringensis
  - 20% 'Boreal' Red Fescue  
Festuca rubra
  - 20% 'Arctared' Red Fescue  
Festuca rubra

If erosion in an area is a significant problem, reduce Arctared red fescue by 5% and add 5% Annual ryegrass, Lolium multiflorum. A seeding rate for this mix should not exceed 60 pounds per acre or be less than 40 pounds per acre.
3. Based on evaluations, lawns and other maintained areas on the Aleutians should be seeded with a mix consisting of:
  - 30% 'Nugget' Kentucky Bluegrass  
Poa pratensis
  - 30% 'Park' Kentucky bluegrass  
Poa pratensis
  - 20% 'Boreal' Red Fescue  
Festuca rubra
  - 20% Perennial Ryegrass  
Lolium perenne

The seeding rate for this mix should be 60 pounds per acre.
4. High use areas such as athletic fields and parade fields, should be seeded with a mix consisting of:
  - 30% 'Nugget' Kentucky Bluegrass  
Poa pratensis
  - 30% 'Park' Kentucky bluegrass  
Poa pratensis
  - 20% 'Boreal' Red Fescue  
Festuca rubra
  - 10% 'Arctared' Red Fescue  
Festuca rubra
  - 10% Perennial Ryegrass  
Lolium perenne
5. An effective fertilizer rate for low maintenance areas, is 450 to 500 pounds of 20-20-10 fertilizer or an equivalent, providing 90 to 100 pounds of nitrogen, 90 to 100 pounds of phosphorus, and 45 to 50 pounds of Potassium per acre. Application should occur at the time of seeding.

6. Lawns and other maintained areas including athletic fields, should be fertilized with 600 to 700 pounds of 20-20-10 or an equivalent providing 120 to 140 pounds of nitrogen, 120 to 140 pounds of phosphorus and 60 to 70 pounds of potassium per acre, with application occurring at the time of seeding. An annual application of fertilizer providing 1/2 the initial rate will maintain a vigorous stand of grass.
7. As 'Caiggluk' tilesy sagebrush, Artemisia tilesii, becomes commercially available, the cultivar should be included in low maintenance area seedings at a rate of 5%, replacing 5% of the recommended 'Arctared' red fescue.
8. Continue using Beach wildrye sprigging as a method to restore coastal communities and as a dune protection and stabilization measure. This technique should also be used if standard seeding methods are expected to fail because of drifting sand, or in areas where a high order of erosion control is necessary.
9. Attempt to bring native lupine into commercial production. The species' ability to colonize disturbed land should be exploited. It's use in revegetation mixes would be invaluable. Using this species in conjunction with tilesy sagebrush will also impart a more natural appearance to revegetation efforts on the Aleutians.

Critically evaluate the necessity of artificially reseeding abandoned military structures. These disturbances are usually quite small and may undergo natural revegetation in a short period of time. These sites also tend to be level and non-erodible, therefore seeding for the purpose of erosion control, is not an issue.

11. Leave abandoned military structures in place. Allow for natural deterioration.

While not directly part of this report, continued attempts to establish conifer tree species on the Aleutians should be abandoned. However, the use of these tree and other shrub species should be evaluated in site-specific, landscape tests, and then in only the most protected areas, such as near buildings.

**OTHER REFERENCES AVAILABLE ON  
ALEUTIAN REVEGETATION**

The following publication is available through West NAV FAC ENG COM, Natural Resources Management Branch, Code 243, San Bruno, California:

\_\_\_\_\_. 1990. Natural Resources Management Plan, Naval Complex, Adak, Alaska.

The following publications are available through the Alaska Plant Materials Center, HC02 Box 7440, Palmer, Alaska 99645:

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.

Wright, S. J., L. H. Fanter and J. M. Ikeda. 1987. Sand Stabilization Within the Lateral Clear Zone at Shemya Air Force Base, Alaska, Using Beach Wildrye (Elymus arenarius). State of Alaska, Division of Agriculture, Plant Materials Center and U. S. Army Corps of Engineers, Alaska District.

Wright, S. J. 1990. Final Report of Data and Observations Obtained from the Adak Naval Air Station Evaluation Plot Network, 1988-1990. State of Alaska, Division of Agriculture, Plant Materials Center.

Publications available through the University of Alaska, Agricultural Experiment Station, Palmer, Alaska, include:

Mitchell, W. M. 1976. Revegetation Research on Amchitka Island, a Maritime Tundra Location in Alaska. University of Alaska, School of Agriculture and Land Resources Management, Palmer, Alaska.