



UNITED STATES

DEPARTMENT OF DEFENSE

**FINAL REPORT
NATURAL REVEGETATION OF PEAT SOILS ON
EARECKSON AIR STATION,
SHEMYA ISLAND, ALASKA**

A QUALITATIVE STUDY OF A NATURAL PROCESS



U.S. AIR FORCE
611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AIR FORCE BASE, ALASKA

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NATURAL REVEGETATION OF PEAT SOILS ON
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SHEMYA ISLAND, ALASKA**

A QUALITATIVE STUDY OF A NATURAL PROCESS

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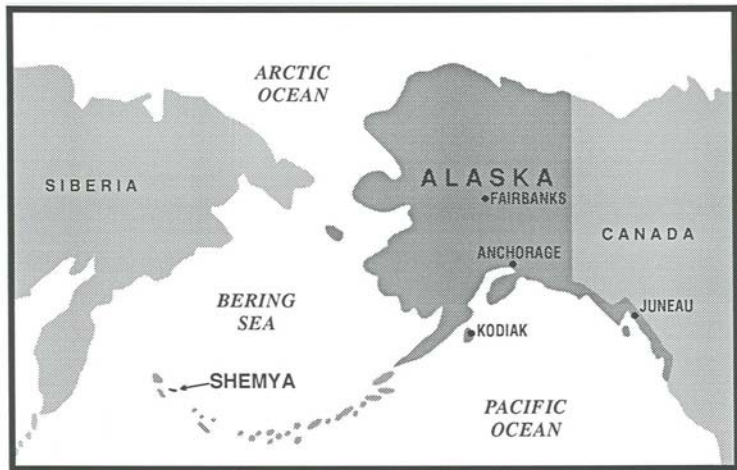
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Introduction

In 1991, the Alaska Plant Materials Center received a request to help the Air Force close unnecessary roads on Eareckson Air Station (AS) on Shemya Island, Alaska. The roads in question traversed the watershed area used to supply the drinking water for the island's population. The watershed area was developed to utilize surface water through a series of galleries. An accidental fuel spill on these roads would have had dire consequences for the base.

Revegetation options to address the possible risk were developed by the Plant Materials Center (See Appendix 1). The options available for closing the roads ranged from pulling the roads to covering them with fill to render them unserviceable and impassable. The Eareckson Base Civil Engineering Office determined that simply closing the roads would be the most advantageous method of reducing the risk of water supply contamination. The decision was made that placing fill material (excavated peat) was the most desirable method to close the roads. The fill material needed to accomplish the road close-out was readily available from a construction site on Eareckson AS. Use of the excavated material also resolved a disposal problem. Using the material on the roads would not only address disposal, but also allowed efficient closing of the roads.

Figure 1. Shemya Island located near the end of the Aleutian chain.



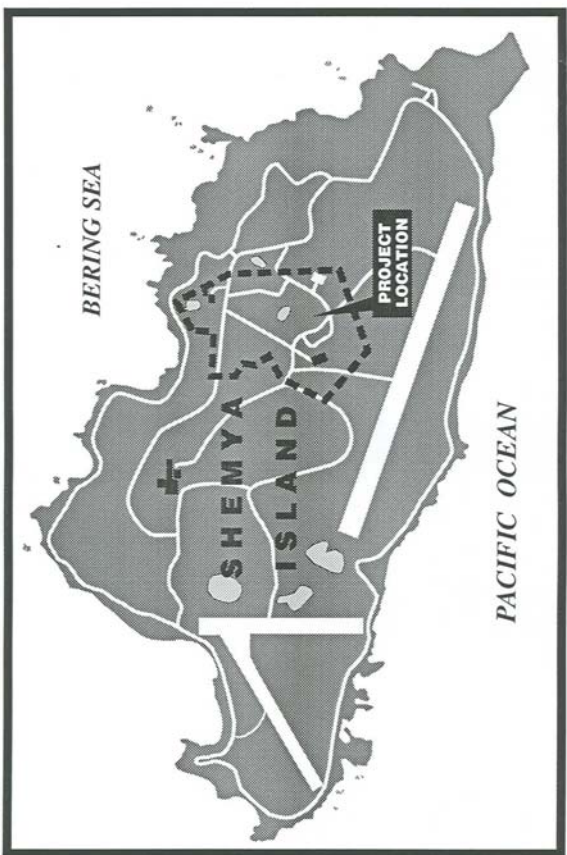
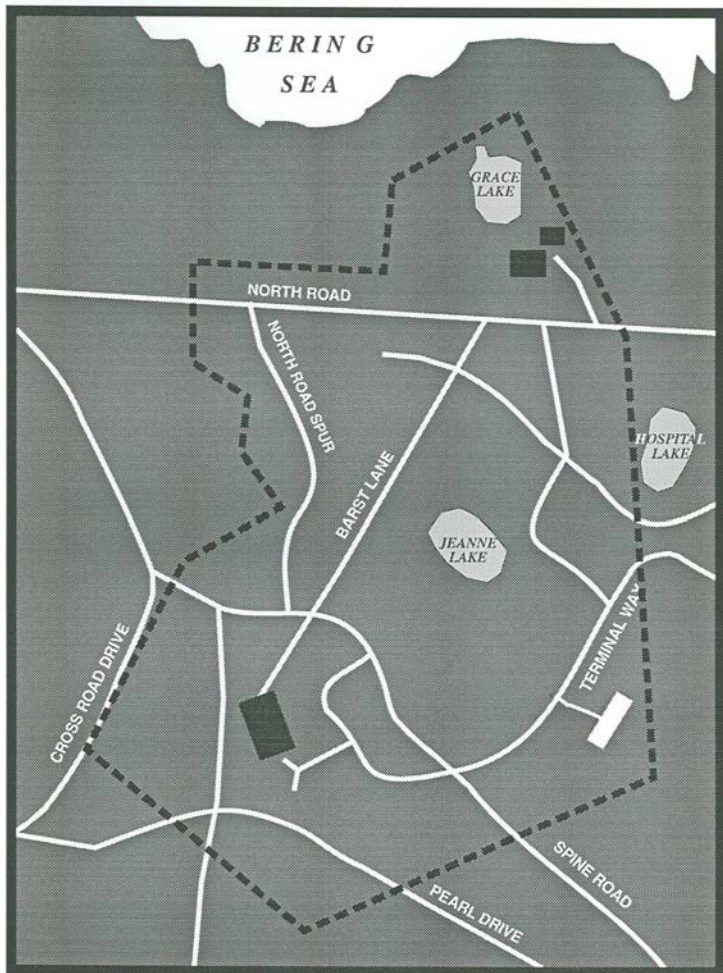


Figure 2. Island map.

Figure 3. Watershed area and affected roads.



Methods

In 1992, the roads were covered with excavated peat four to six feet deep. The material was simply dumped into place. No additional compaction or leveling was done on the site. The peat was not seeded, fertilized or amended in any manner.

This report will present photo documentation of the process of re-invasion of the sites. A final report was not anticipated at the inception of the project. In fact, the degree of monitoring from 1992 to date was not addressed in the initial concept. Other projects on Shemya and Attu allowed for site monitoring and data accumulation. The resulting success of the project dictated the need for the final report. Re-invasion of peat soils on the Aleutians had never been documented prior to this project. This documentation will allow for future specifications for natural restoration of these sites on the Aleutian Islands and elsewhere in Alaska.

What is being presented is data derived from a qualitative, historical study. The study does not have controls usually associated with scientific studies. The natural revegetation process was documented.

The site was visited on six occasions: May 15, 1992, September 17, 1992, October 1993, October 4, 1994, October 4, 1995 and August 2, 1996. The 1995 site visit was an aerial view only as landing was not scheduled by the U. S. Coast Guard.

Figure 4. Roads through the watershed area after project completion.

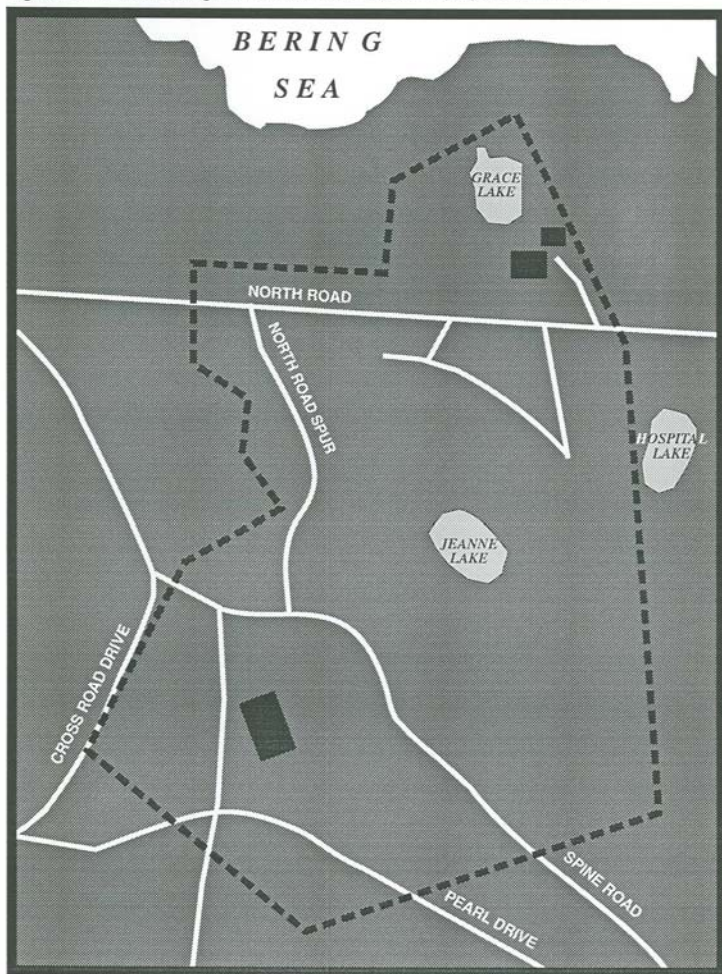


Figure 5. Signage notifying drivers of watershed sensitivity.



Figure 6. Signage notification of leaving the watershed area.



Figure 7. Road north of Hangar 4, May 1992.



Figure 8. Same road in 1994.



Figure 9. Road north of Hangar 4, 1996.



Figure 10. Area east of Hangar 4, September 1992.



Figure 11. Same area east of Hangar 4, 1994.



Figure 12. Area east of Hangar 4, 1996.



Figure 13. Barst Lane, 1992, view to the north.



Figure 14. Barst Lane, 1994, view to the north.



Figure 15. Barst Lane, view to the north in 1996.



Figure 16. Different area of view on Barst Lane, 1996.



Figure 17. Barst Lane, viewed to the south in 1996.



Figure 18. Hospital Lane, view west, 1992.



Figure 19. View from East Road looking northwest to Hospital Lane, 1996.



Figure 20. Terminal Way, 1993, view to the north.



Figure 21. Terminal Way, view to the north in 1996.



Figure 22. Hospital Lane, 1996. Vegetation consists of *Equisetum* sp., *Leymus mollis*, *Poa macrocaylx*, *Phleum commutatum*, *Agrostis exarata*.



Results

The revegetation process on the peat overlay started in 1992. During September 17, 1992, beach wildrye, *Leymus mollis*, sedge and *Legusticum scotium* were observed. The plants were widely spread and were regrowing from buried plants. Seedlings were not observed or noted. Cover was estimated to be less than 5%.

By October 11, 1993, the peat overlay supported a vegetation cover of 20%. This was considered an exceptional value since no active restoration was used on the site. Species composition was restricted to six species: *Leymus mollis*, *Agrostis exarata*, *Heracleum*, *Ligusticum* and *Cirsium*.

During the next site visit in 1995, cover was approaching 60% on approximately 80% of the area. Species composition was comparable to the 1993 observations. The only new species encountered were *Phleum commutatum*, *Poa macrocaylx*, *Juncus arcticus*, *Anaphalis margaritaceae* and *Artemisia unalaskensis*.

The 1995 site visit was a simple aerial overview. Due to weather, the October 3 landing and stay over on Shemya was cancelled. Cover of 80% was estimated. Little faith can be placed on this number, however, as it was taken at 500 feet elevation from a Coast Guard C-130 aircraft.

The final evaluation occurred during the August 2-5, 1996 site visit. During this visit, it was determined that a 90-95% cover existed on the peat overlay. Species composition increased to 31 species. A complete listing of species can be noted in Table 1.

Figure 23. Barst Road vegetation, 1996. *Juncus arcticus*, *Anaphalasis marginateaus*, *Taraxacum* sp., *Leymus mollis*, *Galium aparine*.



Figure 24. Terminal Way, 1996. Vegetation: *Ligusticum scoticum*, *Achillea boreal*, *Cristium Kamtschaticum*, *Heracleum lanatum*, *Carex macrocheata*, *Agrostis exerata*, *Poa macrocaylx*, and *Carex pluriflora*.



Figure 25. Vegetation cover on Barst Lane, 1996. *Heracleum*, *Leymus mollis*, and *Artemisia unalaskensis*.



Figure 26. Terminal Way vegetation, 1996. *Lupinus nootkatensis*, *Heracleum lanatum*, *Artemisia unalaskensis*, *Leymus mollis*, *Taraxacum* sp., *Phleum commutatum*, and *Galium aparine*.



Table 1. Species found on peat overfill by year.

Species		Year			
Scientific	Common	1992	1993	1994	1996
<i>Equisetum</i> sp.	Horsetail		X	X	X
<i>Phleum commutatum</i>	Alpine Timothy			X	X
<i>Agrostis exarata</i>	Red Top		X	X	X
<i>Calamagrostis canadensis</i>	Bluejoint				X
<i>Deschampsia caespitosa</i>	Hairgrass				X
<i>Trisetum spicatum</i>	Trisetum				X
<i>Poa arctica</i>	Arctic Bluegrass				X
<i>Poa eminens</i>	Spear Bluegrass				X
<i>Poa macrocalyx</i>	Big Leaf Bluegrass			X	X
<i>Festuca rubra</i>	Red Fescue				X
<i>Leymus mollis</i>	Beach Wildrye	X	X	X	X
<i>Eriophorum russeolum</i>	Cottongrass				X
<i>Carex macrocheata</i>	Sedge	X	X	X	X
<i>Carex pluriflora</i>	Sedge	X	X	X	X
<i>Juncus arcticus</i>	Arctic Rush			X	X
<i>Juncus falcatus</i>	Rush	X	X	X	X
<i>Juncus ensifolius</i>	Rush				X
<i>Juncus Mertensianus</i>	Rush				X
<i>Luzula tundricola</i>	Wood Rush		X	X	X
<i>Polygonum viviparum</i>	Polygonum				X
<i>Geranium erianthum</i>	Cranesbill				X
<i>Epilobium glandulosum</i>	Fireweed				X
<i>Ligusticum scoticum</i>	Beach Lavage	X	X	X	X
<i>Conioselinum chinense</i>	Hemlock Parsley				X
<i>Angelica lucida</i>	Angelica				X
<i>Heracleum lanatum</i>	Cow Parsnip		X	X	X
<i>Galium aparine</i>	Bedstraw				X
<i>Anaphalis margaritaceae</i>	Pearly Everlast			X	X
<i>Achillea borealis</i>	Yarrow		X	X	X
<i>Artemisia unalaskensis</i>	Mugwort			X	X
<i>Cirsium Kamtschaticum</i>	Thistle		X	X	X
<i>Taraxacum</i> sp.	Dandelion		X	X	X

Conclusions

Allowing natural re-invasion to occur on peat soils was very successful on Eareckson AS. Often the peat blocks or material dries out and becomes difficult to re-wet. This obviously was not the case on Shemya. The resulting cover and rapid development of cover surprised the observer. The method of restoration has been successful and should be considered on future sites of a similar nature on the Aleutian Islands.

Future users of this technique must also be aware that the fill material used on the site was taken from a more upland site. The fill was not stockpiled prior to placement on the roads. In other words, the fill was immediately excavated and replaced.

The drastic difference in species composition on the fill when compared to the surrounding tundra wetlands, is probably the result of the original source of the fill. The material was taken from an upland area. The species now growing on the fill are usually associated with more upland sites. The peat fill will also have a different hydrologic makeup than the surrounding tundra; factors also responsible for the composition differences.

The upland nature of the new vegetation cover is also indicative of the more dynamic nature of upland species. Upland species are, for the most part, more aggressive invaders of disturbed sites.

APPENDIX 1

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

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

WALTER J. HICKEL, GOVERNOR

HC 02, BOX 7440
PALMER, ALASKA 99645
PHONE: (907) 745-4469

August 20, 1991

Lt. Carpenter
5073 ABG/CC
Shemya AFB, AK 98736

Dear Lt. Carpenter:

Enclosed are copies of pertinent correspondence and reports regarding revegetation on Shemya Air Force Base. I have also enclosed copies of the revegetation sections from Adak NAS Natural Resources Management Plan.

The revegetation specifications called for in the Adak management plan are based on the latest Aleutian research and can be used on Shemya without modification. Your idea to close out unnecessary roads through the water galleries is very good. A fuel spill in this area would probably cause a significant impact to the base.

To revegetate these abandoned roads, you would have five options:

1. **Do nothing and allow for natural reinvasion** - This process is slow and sometimes ineffective.
2. **Enhanced natural reinvasion** - This method only requires the road surfaces to be scarified and fertilized. Fertilizer should be applied at the rate of 600 pounds per acre on the road surface, and in a 20-foot band on each side of the road. I suggest you use 20-20-10 fertilizer. This method is not as slow as the do-nothing approach but still has a relatively low success rate.
3. **Charged overburden veneer** - This technique relies on spreading overburden (topsoil) from construction sites (i.e. the proposed landfill). The technique relies on growth seed and roots contained in the soil. The drawback is that you are placing an erodible material in an area where you might not want it (uphill from the water gallery). Success rate is fairly high, however it is still a gamble.
4. **Standard seeding with native species** - This method can be followed out of the enclosed Adak plan. This is the most cost-effective method to revegetate an area when rapid results and a high success rate is desired. It follows a logical sequence of surface preparation, fertilizing and seeding.

Lt. Carpenter
August 20, 1991
Page 2

5. **Sprigging Beach wildrye** - This technique is highly successful, however it is quite labor intensive.

Considering the upland nature of the vegetation around the water gallery, I would advise against using technique 5, using instead either option 3, 4 or a combination of 3 and 4. Reserve sprigging Beach wildrye for the critical coastal dunes.

I will provide you with any technical assistance you may need in this effort. However, my main interest on Shemya is controlling sand and protecting the foredune area on the South Beach Road. I still believe that the base should develop a management plan for these areas. The plan must include provisions for banning all vehicular traffic on the foredunes and limiting access on the lateral clear zone only to emergency and maintenance equipment.

Sincerely,



Stoney Wright, Manager
Alaska Plant Materials Center

SJW/ds

enclosures



DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

3008
REPLY TO: 673 CES/DEC (Lt Carpenter, 392-3752)
ATTN OF:

24 APR 1992

SUBJECT: Closing Down Roads on Shemya AFB

TO: Stoney Wright
State of Alaska
Department of Natural Resources
SR B, Box 7440
Palmer, Alaska 99645

1. Enclosed is a drawing of the first set of roads we would like to closed down on Shemya. We hope to develop a more extensive plan for all of the unnecessary roads on the base. Clearly, our best method for closing the roads is to use excavated topsoil and beachgrass. This will improve the overall appearance of the base and will allow us to "recycle" our natural resources rather than waste them. We believe it is a step in the right direction.
2. Please contact me at 392-3752 if you have questions or comments. Thank you for your assistance in this matter. Our predecessors will be pleased with the results in the long run!

Cindy L. Carpenter
CINDY L. CARPENTER, 1st Lt, USAF
Engineering Flight Commander

1 Atch
Road Closure Map