United States Air Force
11th Air Control Wing
11th Civil Engineering
Operations Squadron

Elmendorf AFB, Alaska

Revegetation Manual
For
Eareckson AFS
Shemya, Alaska

May 1994

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INTRODUCTION

SECTION 1

1.0 Introduction

The Alaska Plant Materials Center, a section of the Alaska Department of Natural Resources, Division of Agriculture, was contracted by the United States Air Force 11th Air Control Wing, 11th Civil Engineering Operations Squadron, Elmendorf AFB, Alaska, to produce this reference. This manual is intended to allow engineers and land managers flexibility and discretion in selecting proven techniques and materials for revegetation, vegetative erosion control and reclamation of disturbed land. The manual will also address limited landscaping practices associated with lawns and other maintained grass plantings.

1.1 Manual Layout

This manual has been designed to take the user through a series of logic charts to select the best methods and materials to be used at the specific location, installation or region. First, however, the user must have a basic foundation of information which can be drawn upon. This base will include the following topics:

A. Background

Erosion control
Restoration & Reclamation
Habitat Plantings
Landscape Plantings
Special & Advanced Techniques
Natural Revegetation

B. Basic Steps in Revegetation

Planning
Site Preparation
    Requirements
    Methods
Seed Specifications
    Species & Cultivars for Alaska
    Species to be Avoided
    Native Species
Fertilizer
Equipment
    Broadcast
    Drop
    Drill
    Hydroseeding
Mulch & Erosion Netting
Transplanting & Sprigging (Advanced Techniques)
Natural Revegetation (Do Nothing)

C. Local Specifications

1.2 Changes in the Manual

When new information becomes available, corrections to this manual will be submitted to the Air Force. THESE MUST BE ENTERED AND CORRECTIONS NOTED ON THE MANUAL RECORD OF CHANGE, PAGE i.

A BACKGROUND

IN REVEGETATION

SECTION 2

2.0 Background in Revegetation

Why revegetate an area? The reasons for revegetation are varied. This manual will address some of the commonly accepted reasons.

2.1 Erosion Control

Erosion control is based on the assumption that soil can be kept in place with a vegetative cover. The reasons to keep soil in place can include:

A. Protection of engineered grades
B. Reduction of maintenance on buildings, structures and other man-made objects
C. Maintaining quality of surface water
D. Visual enhancement

2.2 Restoration and Reclamation

These terms, often have legal implications and refer to returning a disturbed site to a condition similar to the site prior to disturbance. This concept is more nebulous than erosion control and is often the result of the following:

A. Request of the landowner or manager
B. Terms of development
C. Punitive actions; or
D. A desire by the creator of the disturbance

2.3 Habitat Plantings

Habitat plantings may be viewed as a form of reclamation, but instead of attempting to return the disturbed site to it's former condition, plantings are made to enhance the habitat of certain animal species. Instead, an animal species is targeted as the beneficiary of the planting. The reasons for habitat plantings are similar to restoration and reclamation, but are usually the result of the following:

A. Mitigation
B. Desire of the landowner
C. Desire of special interest groups

2.4 Landscape Plantings

Beautification or visual enhancement is probably the most common goal of vegetation plantings. These often require high levels of maintenance in order to sustain the desired appearance. This manual will only address lawns and playing fields. Landscape plantings are usually called for by design in the following situations:

A. Beautification/aesthetics
B. Safety-reducing fire hazard
C. Policy

Maintained landscapes are often used on military installations. The policy requiring highly manicured lawns and fields should be closely reviewed and compared to the cost of planting a more natural revegetation program.

2.5 Special Revegetation Techniques

Special or alternative techniques for revegetation use materials other than seed to provide a vegetative cover. Usually, these techniques rely on vegetative (cuttings and sprigs) or transplanting procedures. These alternatives should be carefully assessed prior to implementation. Costs can be considerably higher than seeding. However, in certain circumstances, these alternatives will provide the best results. This manual will only cover sprigging with grasses and willow planting techniques.

2.6 Natural Revegetation

With time, most disturbed sites will revegetate. However, very few landowners and managers find this revegetation approach acceptable. Surface preparation techniques and fertilization, natural reinvasion can hasten the invasion of native plants, but the process can take many years.

BASIC STEPS

IN REVEGETATION

SECTION 3

3.0 Basic Steps of Revegetation

3.1 Planning

The planning phase of any project should be the first step. In revegetation projects, planning is critical, since the designer is working with biological processes that have specific timing and environmental requirements.

In addition to identifying the type and purpose of revegetation, logistics must be given careful consideration. After the project contract is awarded, seed and plant materials should be purchased. This approach helps to ensure that the revegetation portion of the project can be completed while equipment and personnel are available.

Contractors should be aware that although at times cultivars have been difficult to obtain, some contractors have been known to say a particular cultivar is not available so that a less costly and often unsuitable seed could be substituted. If questions arise during this decision phase, contact local suppliers regarding availability or contact the State of Alaska, Department of Natural Resources, Plant Materials Center at (907) 745-4469.

3.2 Site Preparation

3.2.1 Site preparation methods are fairly standard for all forms of revegetation. An adequately prepared site will have the characteristics listed in Table 3.1.

Table 3.1

Conditions Required for Adequate Surface Preparation
1. Free of construction debris.
2. Relatively few large rocks or other natural objects.
3. Free of ruts or gullies.
4. Top two inches should be in a friable condition (non-compacted). Ideally, allowing a heel to make a 1/4 inch impression.
5. Heavily compacted sites should be scarified to a depth of 6 to 8 inches.

3.2.2 Methods of Preparation

With most construction activity, availability of soil preparation equipment is often limited and often can be accomplished with standard construction machinery. For example, ripper teeth on a grader tool bar will adequately prepare a site. Ideally, scarification will be done in two passes perpendicular to each other. However, on sloping land and in areas of high wind, mono-directional scarification perpendicular to the direction of slope or prevailing wind is preferred.

If traditional surface preparation equipment such as disks and/or chisel plows are available, the conditions required for adequate surface preparation are the same as previously noted.

* Note: If hydroseeding is used to apply seed, surface preparation as described in this section may not be necessary.

3.3 Seed Specifications

Quality seed is a critical component to success. The ideal method to assure quality, is to specify "certified" seed. Certified seed must meet certain standards for germination and purity; also certification provides some assurance of genetic quality.

Some native seed species are not available as certified seed. Seed quality can still be ascertained by examining percent germination and percent purity; this information is required for any seed sold in Alaska (See copy of seed regulations in Appendix A).

True cost of seed can be determined by multiplying percent germination by the percent purity which equals Pure Live Seed (PLS). PLS is then divided into the price per pound to determine actual cost of good seed. These calculations can increase the accuracy of bid comparisons. All seed sold or used in the state of Alaska must also be free of noxious weeds. This is also noted on seed tags along with germination and purity (See Appendix A).

The seed mixes presented in this manual have been carefully developed and are based on results from trials throughout the state. Deviation from the recommendations should be carefully considered. If problems occur or questions arise regarding seed, call the Alaska Plant Materials Center at (907) 745-4469. Seed stored on site should be kept cool, dry and in rodent-free areas.

3.3.1 Cultivars & Species for Use in Alaska

The following listing of adapted, commercially available species and cultivars, represents what is available in Alaska as of 1993:

A. 'Arctared' Red Fescue, *Festuca rubra*, was released in 1965 as a revegetation species showing extreme hardiness throughout Alaska (Hodgson, 1978). The overly aggressive, sod-forming nature of this species often makes this cultivar unacceptable in reclamation. However, in erosion control the cultivar is outstanding. The cultivar was cooperatively developed by the University of Alaska Agricultural Experiment Station and the USDA.

B. 'Boreal' Red Fescue, *Festuca rubra*, was developed by the Canadian Department of Agriculture Research Station, Beaverlodge, Alberta (USDA 1972). This very hardy cultivar is similar to Arctared in adaptation and potential use in Alaska. It is often substituted for Arctared and is less expensive than Arctared.

C. 'Pennlawn' Red Fescue, *Festuca rubra*, was released in 1954 by the Pennsylvania Agricultural Experiment Station (USDA 1972). The cultivar has less hardiness than either Arctared or Boreal, but still has potential in milder areas of Alaska. This cultivar was selected for turf uses, and therefore, tends to be used for landscaping more than for revegetation.

D. 'Egan' American Sloughgrass, *Beckmannia syzigachne*, was released by the Alaska Plant Materials Center in 1990 as a wetland rehabilitation cultivar (Wright, 1991a). This is the state's first cultivar developed solely for wetland restoration. Additionally, the species has wildlife benefits by providing forage and seed for waterfowl (Wright 1992).

E. 'Alyeska' Polargrass, *Arctagrostis latifolia*, is a cultivar developed by the University of Alaska Agricultural Experiment Station. The prime purpose for this cultivar is revegetation in interior and western Alaska (Mitchell, 1979). The species is adapted to moderately wet areas.

F. 'Kenai' Polargrass, *Arctagrostis latifolia*, is a variety recommended for forage and revegetation in the central interior and southern portions of Alaska (Mitchell, 1987). This species has potential for revegetating wet areas. This cultivar was developed by the Alaska Agriculture and Forestry Experiment Station at Palmer, Alaska.

G. 'Sourdough' Bluejoint, *Calamagrostis canadensis*, is a cultivar with a wide range of adaptability. The species occurs throughout Alaska on both dry and wet sites. The cultivar was developed by the University of Alaska Agricultural Experiment Station for revegetation in northern latitudes (Mitchell, 1979). Commercial availability is erratic and when it is available, the seed is expensive (Wright 1992).

H. 'Norcoast' Bering Hairgrass, *Deschampsia beringensis*, was released in 1981 by the University of Alaska Agricultural Experiment Station as a forage and revegetation grass in northern areas. Norcoast is recommended for revegetation use in coastal regions of western Alaska to southwestern Alaska and possibly in the northern maritime regions (Mitchell, 1985).

I. 'Nortran' Tufted Hairgrass, was also released by the University of Alaska Agricultural Experiment Station. Intended use is similar to Norcoast, however, this cultivar is better adapted to northern regions of Alaska (Mitchell 1986). Commercial availability should begin in 1994.

J. 'Tundra' Glaucous Bluegrass, *Poa glauca*, was originally collected in Arctic Alaska. The cultivar was released by the University of Alaska Agricultural Experiment Station for revegetation in extreme northern areas with severe environmental conditions (Mitchell, 1979).

K. 'Caiggluk' Tilesy Sagebrush, *Artemisia tilesii*, was developed and released by the Alaska Plant Materials Center in 1989 as a reclamation species (Wright 1991b). This forb has a wide range of adaptations throughout Alaska (Wright, 1992).

L. 'Gruening' Alpine Bluegrass, *Poa alpina*, was released by the Alaska Plant Materials Center in 1986. The species is widely adapted throughout Alaska. As the name implies, the species is adapted to high elevation areas. It also performs well on sites drier than those tolerated by Kentucky bluegrass. Seed availability is limited. Before this cultivar is included in a planting plan, the availability of the seed should be researched (Wright 1991c).

M. 'Nugget' Kentucky Bluegrass, *Poa pratensis*, was released and developed by the University of Alaska Experiment Station in 1966. The source of this cultivar was a single plant collection made in 1957 at Hope, Alaska. Nugget has outstanding winter survival (USDA 1972), and is used extensively in Alaska for turf and lawns.

N. 'Park' Kentucky Bluegrass, *Poa pratensis*, was developed by the Minnesota Agricultural Experiment Station in 1957 (USDA 1972). Hardiness of this cultivar is not as good as Nugget in extreme northern areas of Alaska. However, it is still used in volume in Alaska. Like Nugget, it's use tends to be limited to landscape and lawns.

O. 'Merion' Kentucky Bluegrass, *Poa pratensis*, was released in 1947 by the USDA Plant Service Research Division, ARS and the U.S. Golf Association Green Section. The cultivar is more adapted to close mowing than any other Kentucky bluegrass (USDA 1972). Merion is often used in lawn mixes in Alaska.

P. 'Engmo' Timothy, *Phleum pratense*, was released by the Agricultural Experiment Station at Tromso, Norway. It is very winter hardy and superior to others (timothy) tested in Alaska (USDA 1972). Engmo is an introduced species; is very aggressive on wetter sites and has the tendency to out-compete other seeded species.

Q. 'Climax' Timothy, *Phleum pratense*, was released in 1947 by the Canada Department of Agriculture Research Station (USDA 1972). While not as hardy in Alaska as Engmo, the cultivar is suitable for use in Alaska. Climax can also be aggressive and, in certain conditions, outcompetes other species.

R. Meadow Foxtail, *Alopecurus pratensis*. No cultivars have been developed in this species. Meadow foxtail is a cool season, slightly spreading benchgrass introduced to North America in mid 1800 from Eurasia. The species is adapted to wet areas (USDA 1972). Like the timothies, Meadow Foxtail tends to be aggressive and can outcompete other species.

S. 'Manchar' Smooth Brome, *Bromus inermis*, is a release developed in 1943 by USDA Plant Materials Center, SCS, Pullman, Washington. It is classified as an intermediate spreading selection not as aggressive as other northern types of smooth brome (USDA 1992). The cultivar is adapted to dry soils throughout most of Alaska. This species also tends to form monocultures and may be slightly aggressive for revegetation work.

T. 'Reeve' Beach Wildrye, *Elymus arenarius* (*Leymus arenarius*), is a 1991 release of the Alaska Plant Materials Center. The cultivar has high potential in coastal restoration, especially in the fore dune and other sandy sites throughout coastal and insular Alaska (Wright 1991d). This cultivar will be available as seed in 1996.

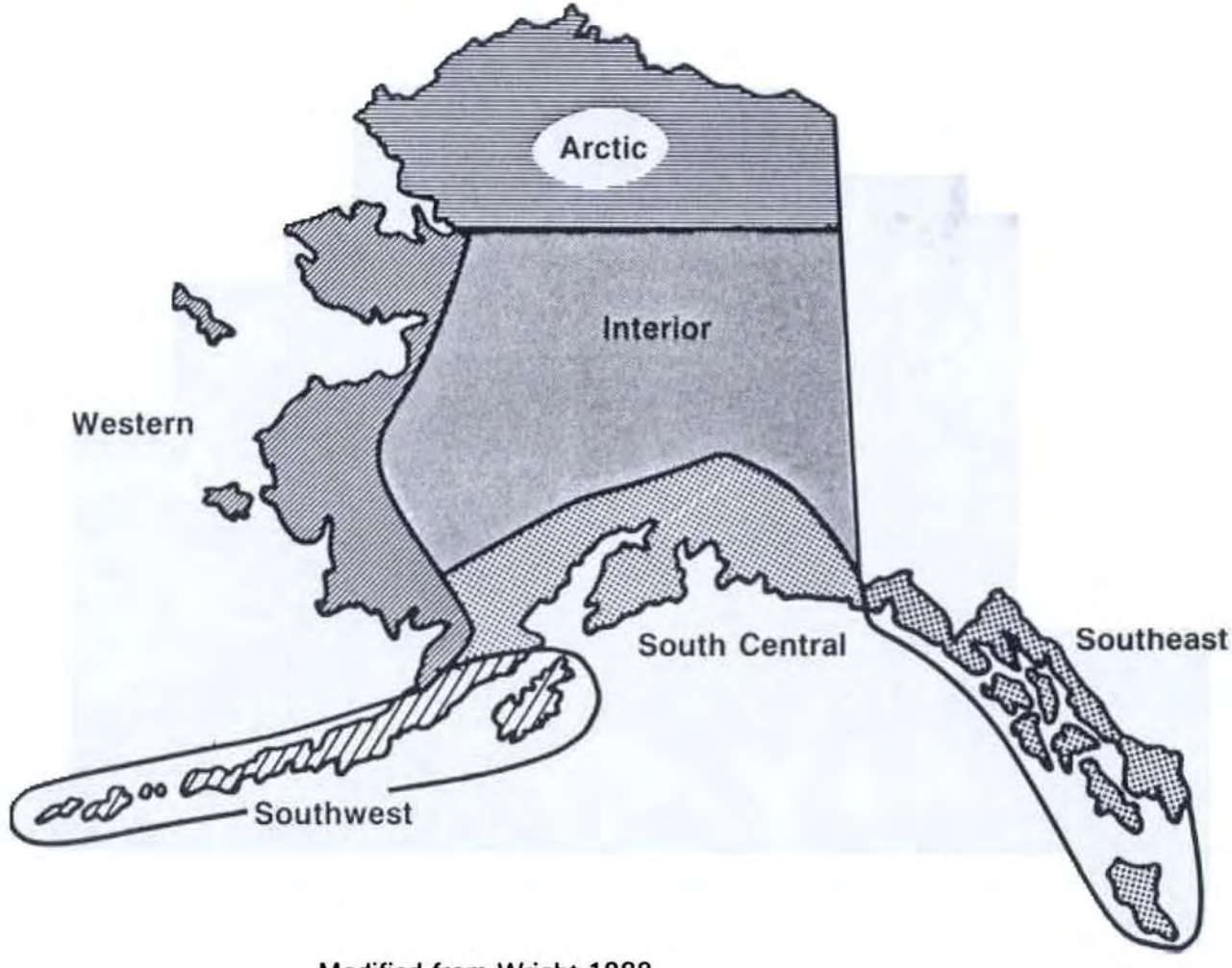
U. 'Benson' Beach Wildrye, *Elymus mollis* (*Leymus mollis*), is a cultivar of native species released by the Alaska Plant Materials Center in 1991 (Wright 1991e). Unlike Reeve, Benson is available only from vegetative cuttings (sprigs). Seed will not be available. Benson was selected for use in sandy areas of high erosion potential. Revegetation with sprigs is a preferred method of revegetating at highly erosive areas.

V. Annual & Perennial Ryegrass. There are no cultivars called for in these species since long-term survival is not critical and may not be desirable. These species provide a quick, temporary cover and should be limited to 10% or less of a seed mix. The use of these species should be limited. These species use nutrients that are intended for the perennial species included in the mixes and can produce a heavy plant cover which can slow the growth of the perennial species.

Table 3.2 Species/Cultivar Characteristic Chart

Species	Cultivar	Availability	Site Conditions Adaptation	Wetland Status or Other Comments
Red Fescue	Arctared	Very Good	Dry to Wet	Facultative
	Boreal	Excellent	Dry to Wet	Upland Facultative
	Pennlawn	Excellent	Dry to Wet	Upland Facultative
American Sloughgrass	Egan	Good	Wet	Obligate
Bering Hairgrass	Norcoast	Excellent	Dry to Wet	Facultative
Tufted Hairgrass	Nortran	1993 Poor	Dry to Wet	Facultative
Polargrass	Alyeska	Fair	Wetter Areas	Facultative
	Kenai	Fair	Wetter Areas	Facultative Wetland
Bluejoint	Sourdough	Poor	All	Facultative
Tilesy Sagebrush	Caiggluk	Poor	All	Upland
Glaucous Bluegrass	Tundra	Fair	North of Alaska Range, Dry	Upland
Alpine Bluegrass	Gruening	Fair	Dry	Upland
Kentucky Bluegrass	Nugget	Excellent	Lawns	Limit Use
	Park	Excellent	Lawns	Limit Use
	Merion	Excellent	Lawns	Limit Use
Timothy	Engmo	Good	Wet	Limit Use
	Climax	Good	Wet	Limit Use
Meadow Foxtail	-	Good	Wet	Limit Use
Brome	Manchar	Excellent	Dry	Upland
Beach Wildrye	Benson	Poor	Sandy, Dry	Coastal Dunes
	Reeve	Poor	Sandy, Dry	Coastal Dunes
Annual Ryegrass	-	Excellent	Dry, Limit Use	Limit Use
Perennial Ryegrass	-	Excellent	Dry, Limit Use	Limit Use

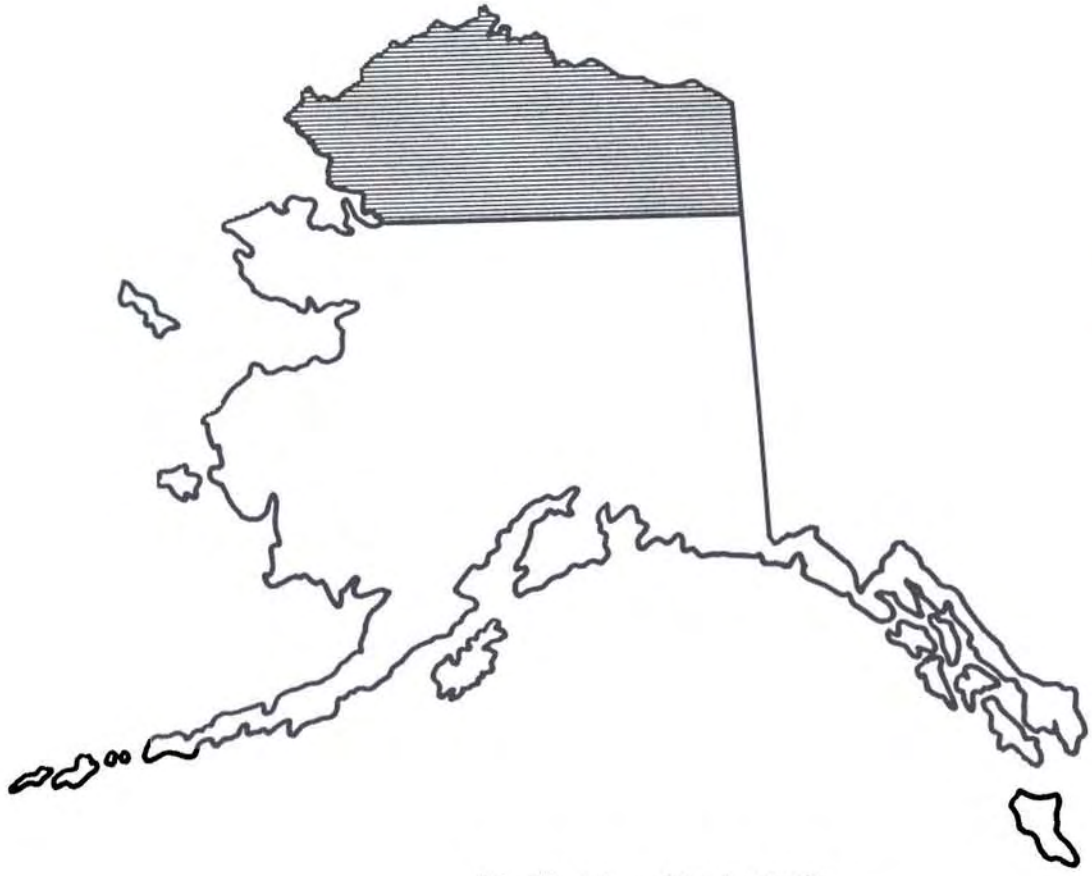
Table 3.3 Revegetation Regions of Alaska



Modified from Wright 1988

Table 3.3.1

Arctic Region
Revegetation Recommendations



Modified from Wright 1988

Cultivars Adapted For Use in Arctic Alaska
'Tundra' Glaucous Bluegrass
'Alyeska' Polargrass
'Arctared' Red Fescue
'Egan' American Sloughgrass
'Nugget' Kentucky Bluegrass
'Norcoast' Bering Hairgrass
'Nortran' Tufted Hairgrass
'Sourdough' Bluejoint

Table 3.3.2 Western Region Revegetation Recommendations

Cultivars Adapted For Use In Western Alaska
'Norcoast' Bering Hairgrass
'Nugget' } - Kentucky Bluegrass
'Merion' }
'Tundra' Glaucous Bluegrass
'Sourdough' Bluejoint
'Arctared' } - Red Fescue
'Boreal' }
'Egan' American Sloughgrass
'Alyeska' Polargrass
'Caiggluk' Tilesy Sagebrush
'Polar' Brome
'Manchar' Smooth Brome
'Benson' } - Beach Wildrye
'Reeve' }

Modified from Wright 1988

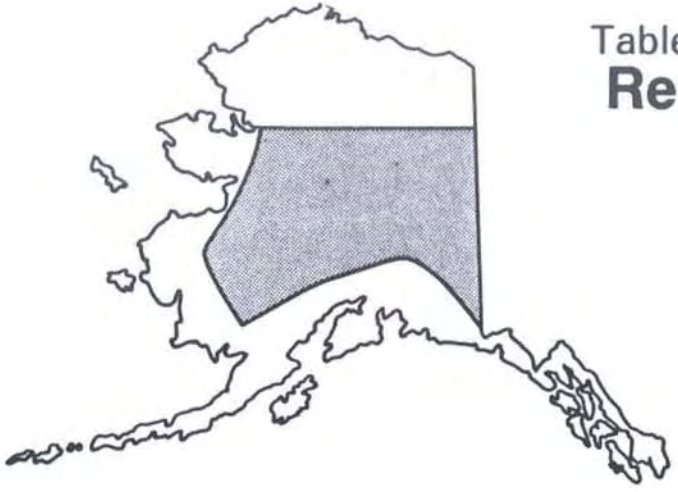
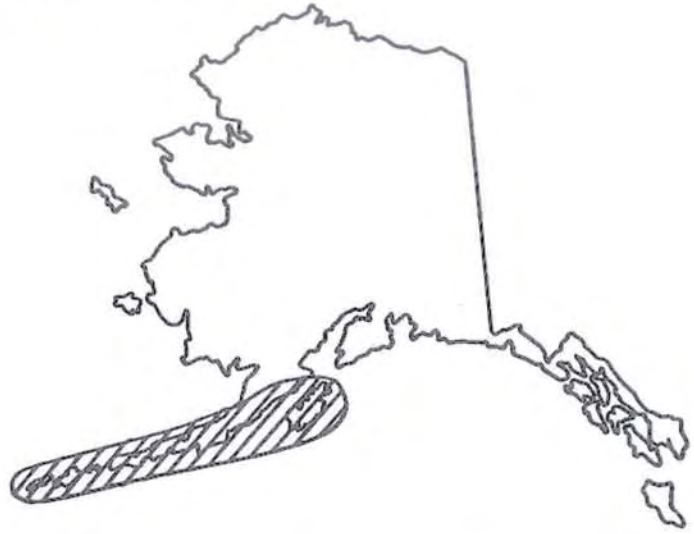


Table 3.3.3 Interior Region Revegetation Recommendations

Cultivars Adapted For Use In Interior Alaska
'Nugget' } - Kentucky Bluegrass
'Park' }
'Tundra' Glaucous Bluegrass
'Gruening' Alpine Bluegrass
'Engmo' Timothy
'Norcoast' Bering Hairgrass
'Nortran' Tufted Hairgrass
'Sourdough' Bluejoint
'Arctared' } - Red Fescue
'Boreal' }
'Alyeska' Polargrass
'Egan' American Sloughgrass
'Manchar' Smooth Brome
'Caiggluk' Tilesy Sagebrush

Modified from Wright 1988

Table 3.3.4 Southwestern Region Revegetation Recommendations



Cultivars Adapted For Use In Southwest Alaska	Preferred Cultivars For Alpine Areas In Southwest Alaska
'Norcoast' Bering Hairgrass 'Nortran' Tufted Hairgrass 'Boreal' } - Red Fescue 'Pennlawn'} 'Arctared' } 'Nugget' } - Kentucky Bluegrass 'Merion' } 'Sourdough' Bluejoint 'Meadow' Foxtail 'Reeve' } - Beach Wildrye 'Benson' }	'Arctared' } - Red Fescue 'Boreal' } 'Gruening' Alpine Bluegrass 'Norcoast' Bering Hairgrass 'Sourdough' Bluejoint

Modified from Wright 1988

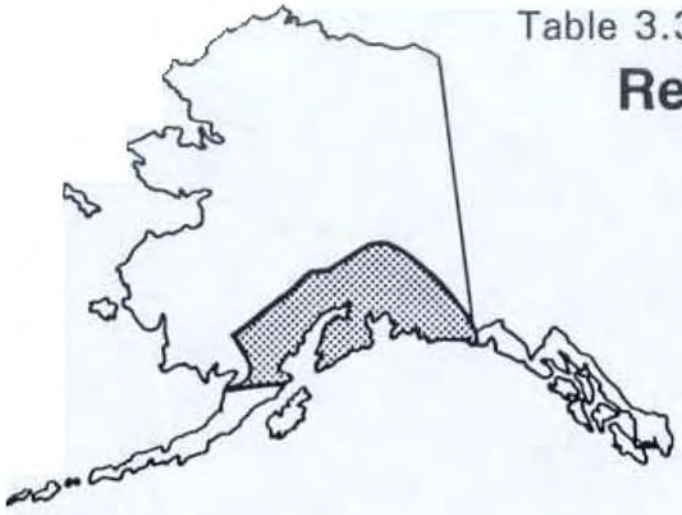


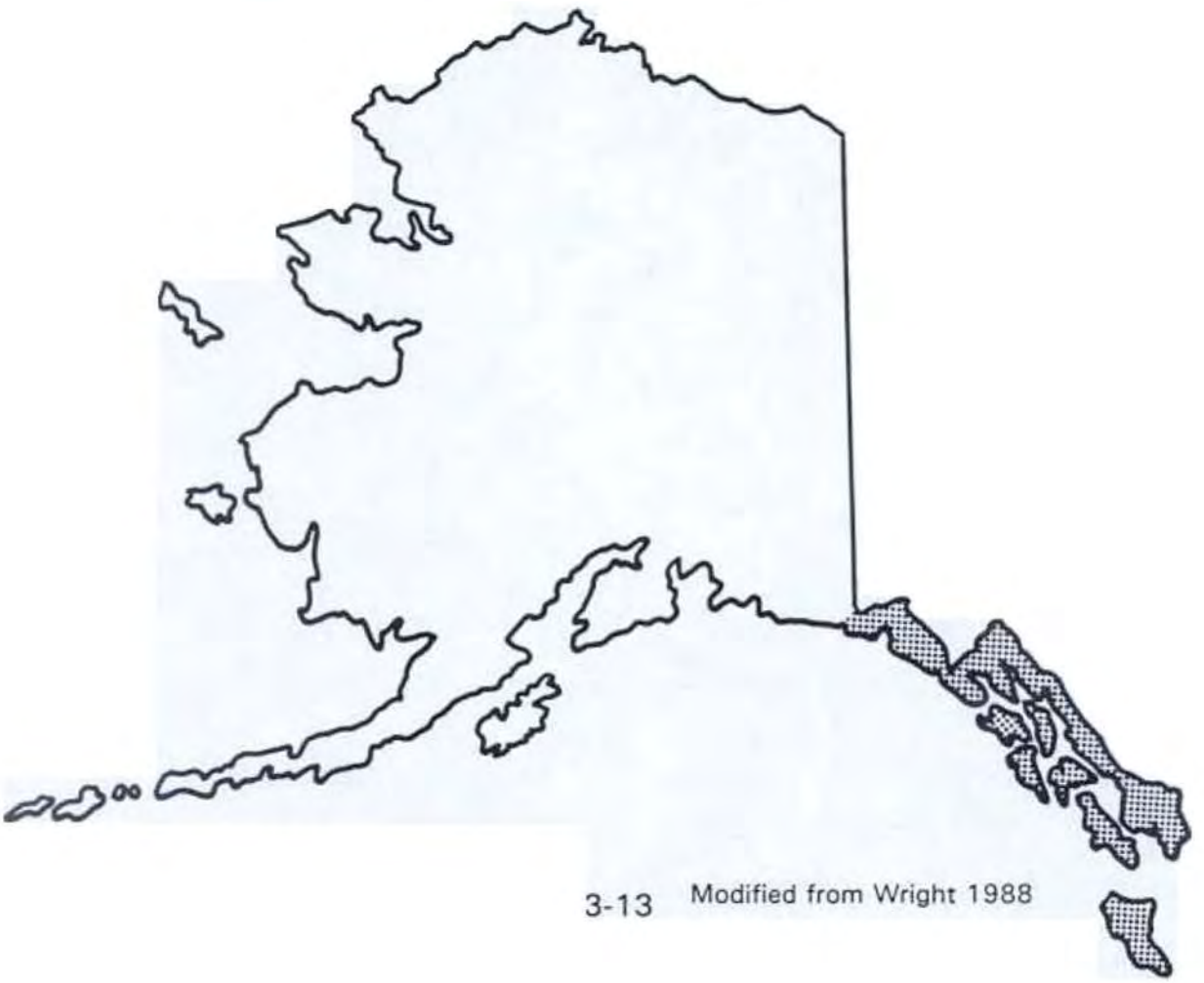
Table 3.3.5 Southcentral Region Revegetation Recommendations

Species And Cultivars For Use In Southcentral Alaska
'Nugget' } - Kentucky Bluegrass
'Park' }
'Merion' }
'Engmo' } - Timothy
'Climax' }
'Norcoast' Bering Hairgrass
'Nortran' Tufted Hairgrass
'Sourdough' Bluejoint
'Arctared' } - Red Fescue
'Boreal' }
'Pennlawn' }
'Manchar' Smooth Brome
'Alyeska' } - Polargrass
'Kenai' }
'Caiggluk' Tilesy Sagebrush
'Egan' American Sloughgrass
'Meadow' Foxtail
'Reeve' } - Beach Wildrye
'Benson' }

Modified from Wright 1988

Table 3.3.6 Southeast Region Revegetation Recommendations

Species & Cultivars for Use in Southeast Alaska
'Nugget' } - Kentucky Bluegrass
'Park' }
'Merion' }
'Arctared' } - Red Fescue
'Boreal' }
'Pennlawn' }
'Norcoast' Bering Hairgrass
'Nortran' Tufted Hairgrass
'Sourdough' Bluejoint
'Engmo' } - Timothy
'Climax' }
'Reeve' } - Beach Wildrye
'Benson' }
'Gruening' Alpine Sloughgrass
'Caiggluk' Tilesy Sagebrush
'Egan' American Sloughgrass
'Kenai' Polargrass



Modified from Wright 1988

3.3.2 Species to be Avoided

In most areas of Alaska, clovers should be avoided because they invade native plant communities. This is especially true in remote areas. Clover can be used near Fairbanks and Anchorage.

3.3.3 Native Species

Revegetation with native species is strongly encouraged. Federal agencies are directed to use native species by Executive Order 11987 (E.O.), Appendix B. This order does not specify germplasm source, however, species collected near a disturbance tend to be more biologically suited for revegetating the site.

The need to select more native species for revegetation on the Aleutian Islands and Alaska Peninsula provided the incentive to fund the seed collection program. Funding was also provided to prepare a manual which outlines revegetation practices with species that are currently available. The manual will be updated when new native species become available. A copy of the 1993 Native Plant Directory can be found in Appendix C.

Revegetation with native species provides the following advantages: they are better adapted and appear more natural than introduced species. Introduced species have the potential to escape into the natural environment. This problem has not occurred in Alaska, yet some introduced species have become well established; clovers are a good example.

The use of introduced species for lawns and playing fields is acceptable. In Appendix D, a list of new species, some of which should be available in 1996, is presented.

3.4. Fertilizer & Other Soil Amendments

3.4.1 Fertilizer

In all forms of revegetation, applications of fertilizer at the time of seeding is necessary. Most commercial fertilizers meet minimum standards and quality problems are seldom encountered. If problems arise with fertilizers, it can usually be traced to the product becoming wet during storage or shipment.

If possible, fertilizer should be applied at the same time or prior to seeding, because once the seed has been applied no additional traffic should be allowed on the site.

Fertilizer is described by a three digit designator; for example, 20-20-10. These numbers are percentages of three elements; nitrogen, phosphorus and potassium, respectively. Therefore, 20-20-10 fertilizer contains 20% nitrogen, 20% phosphorus and 10% potassium by weight.

3.4.2 Lime & Other Amendments to Adjust pH

Using adapted or native species will not require the use of lime or agents to acidify the soils. In testing throughout the state, amendments have never been needed to establish effective stands of vegetation, provided adapted or native species are used. The species and varieties called for in this manual will survive and produce effective stands without amendments.

Lawns and playing fields and other high maintenance may require lime if extremely lush growth is required. These areas will only benefit from such application if pH is lower than 5.0.

3.4.3 Topsoil

Gravelly sites tend not to be highly erodible and if some fines are present, can grow adapted species without topsoil. The addition of a layer of topsoil on the gravel surface could increase the erosion potential. The top layer of soil in undisturbed areas often is very thin and expensive to salvage. However, this layer is a source of native seed, plant propagules, organic matter and soil microbes which can enhance the quality of the substrate that is being revegetated. Often imported topsoil is a very peaty material and although it may look dark and rich, it does not provide a suitable growing medium.

3.5 Equipment Needs (Specialized)

Usually, equipment needed to complete a revegetation project is supplied by the contractor. This manual will include a section on equipment, in order to give the designer the advantages and drawbacks of each. This section has also been included to guide local commands if revegetation or vegetation maintenance programs are initiated by base personnel.

3.5.1 Broadcast Seeders

Broadcast seeders are usually the least expensive and require less training and support equipment. Broadcast type equipment can usually be used for both seed and fertilizer.

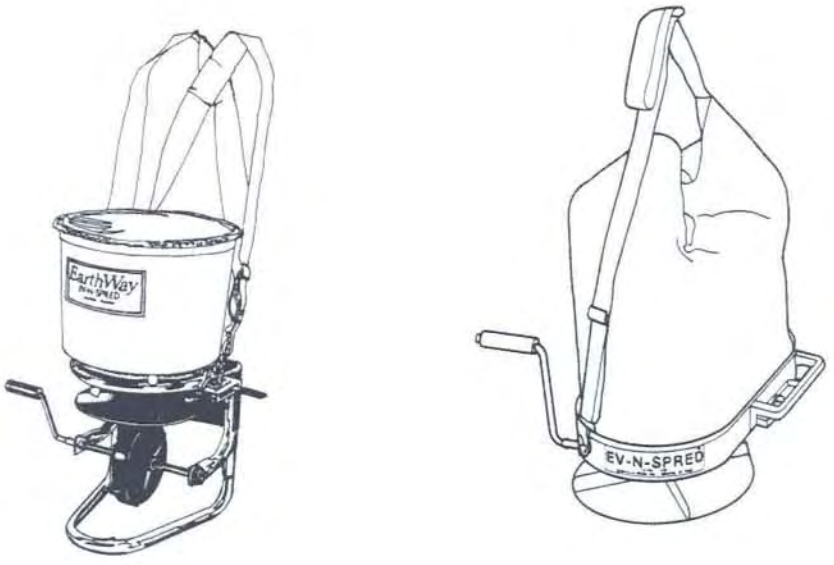


Figure 3.5.1 Spinner Type, Chest-Mounted

Drawings Courtesy of Earth Way

Figure 3.5.2 Spinner Type, Electric Spin

Photograph Courtesy of Herd Seeder

Figure 3.5.3 Spinner Type, PTO Driven

Photograph Courtesy of Herd Seeder

3.5.2 Drop Spreaders

Drop application methods rely on gravity feed, are simple in design and easy to use. Two problems can occur with this method; stripes can appear if the drop pattern is not overlapped and the equipment will corrode if it is not thoroughly cleaned after applying fertilizer. Stripes in lawn areas can be avoided by setting the spreader at 1/2 the recommended application rate and running two tracks perpendicular to each other over the site. Drop spreaders tend to be more precise than broadcast seeders.

Figure 3.5.4 Push Type Spreader, Drop Spreader
Photograph Courtesy of Gandy Corporation

Figure 3.5.5 Small Pull Type Drop Spreader

Photograph Courtesy of Gandy Corporation

3.5.3 Drill Seeders

Drill seeders, most often are used in agricultural settings. Only one drill seeder, the Brillion, has been used for revegetation of mine and construction sites. This seeder has been used on most soil types except very gravelly soils. Fertilizer cannot be applied with this seeder, however, the unit incorporates the seed into the soil, packs the seed in place and provides accurate application rates. The seeding rate can be reduced 50 percent.

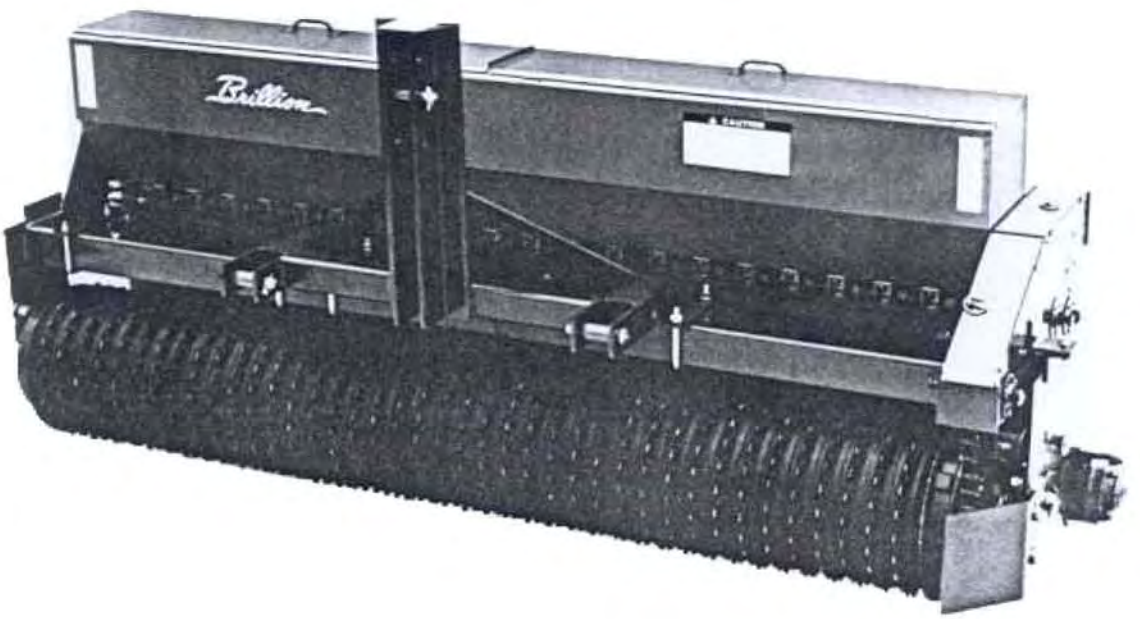


Figure 3.5.6 3-Point Brillion Drill Seeder

Photograph Courtesy of Brillion Iron Works

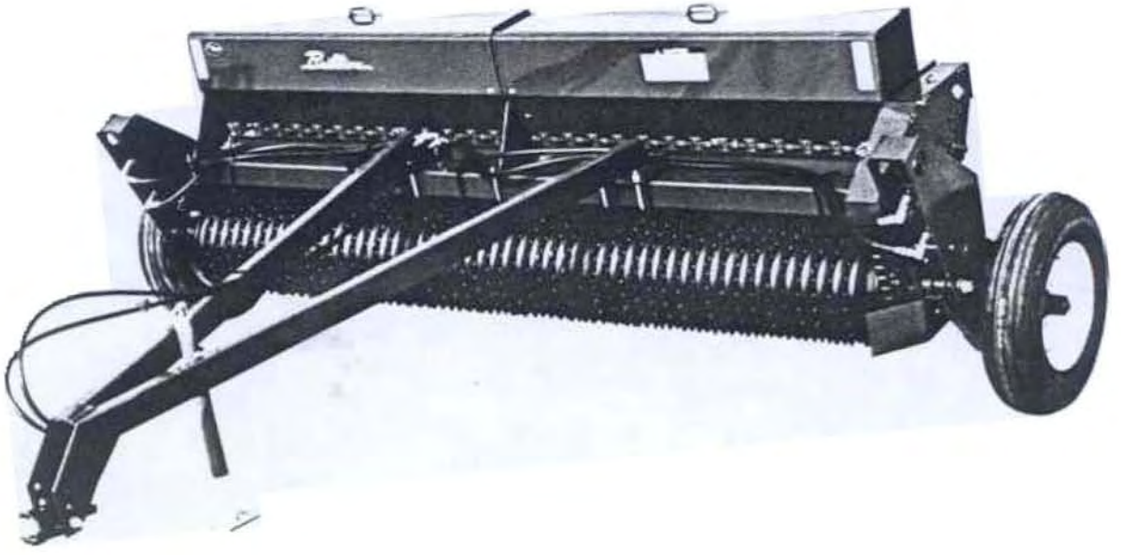


Figure 3.5.7 Pull Type Drill Seeder

Photograph Courtesy of Brillion Iron Works

3.5.4 Hydroseeding

In recent years, hydroseeding has been portrayed as the most effective means for revegetating an area. However, many professionals are finding that this claim is overstated. Hydroseeders are well suited for seeding steep slopes and rocky areas; and they apply mulch, seed, and fertilizer in one step. The primary disadvantage is the requirement for large quantities of water, which at times can result in numerous trips across the land that is being revegetated. The equipment is complex and mechanical problems can result in delays. Hydroseeder manufacturers have claimed that hydroseeding promotes more vigorous plant growth, however that claim has not proven to be true. Grass growth can be inhibited if too much mulch is applied.

Hydroseeders come in truck-mounted and trailer form. Major contractors either have a hydroseeder or can easily subcontract for one.

Hydroseeders are often used as supplemental watering trucks once seed has been applied. Additional watering is not always necessary to produce a good stand of vegetation; and it does cost more. Without additional watering, the seed will wait until there is sufficient moisture to germinate.

A hydroseeding contract should state that seed will not remain in the hydroseeder for more than one hour. This practice will prevent seed from absorbing excessive water and being damaged by the dissolved fertilizer.

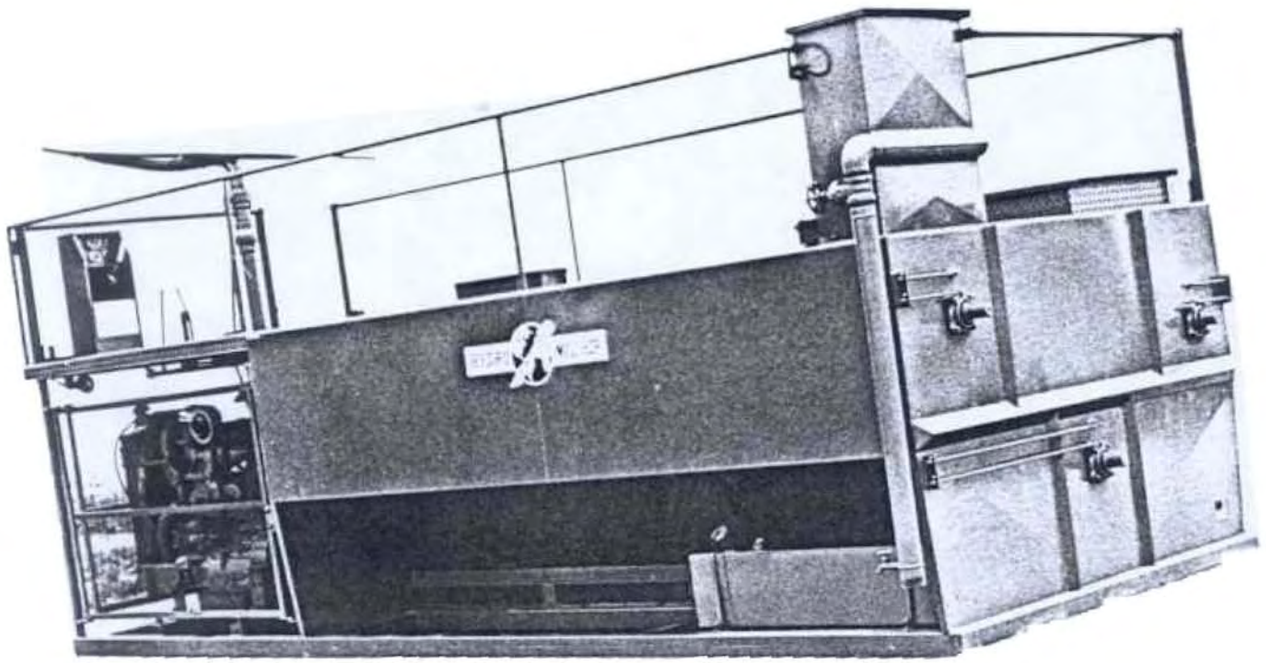


Figure 3.5.8 Truck mounted Hydroseeder Assembly

Photograph Courtesy of Bowie Hydroseeder

Figure 3.5.9 Trailer Type Hydroseeder

Photograph Courtesy of Bowie Hydroseeder

Table 3.5.1 Characteristics of Various Spreading Equipment*

Type	Advantages	Disadvantages
Hand-held Spinner Type Spreader	° Inexpensive ° Simple to use & repair ° Can apply both fertilizer & seed ° No special training needed	° Slow ° High labor use ° Skip & overlap possible ° Seed may need to be incorporated into the soil following application
Mechanical Spinner Type Spreaders	° Fast ° Can apply both seed & fertilizer ° Relative low cost equipment	° Skip & overlap possible ° Seed may need to be incorporated into the soil following application
Drop Type Spreaders	° Fast ° Simple ° Can be used to apply both fertilizer & seed	° Skip & overlap a serious problem if care is not taken ° Hard to calibrate ° Equipment needs high degree of care
Drill Type Seeders**	° Seed incorporation not needed as a separate step ° Precise application ° Skip not a problem ° Uses only half the seed	° Does not apply fertilizer ° Equipment more costly ° Needs higher degree of seedbed preparations
Hydroseeders	° Degree of slope not a problem ° Skips not a problem ° Can apply both seed & fertilizer	° Equipment costly ° Needs water source ° Complex equipment

* The type of machinery used to apply seed and fertilizer should be the choice of the contractor. It is often based on local availability. The method should be noted in the bid response so accurate comparison can be made by the contracting officer.

** Note: If drill seeders are employed, only use 1/2 the recommended seeding rates.

3.6 Mulch & Erosion Matting

Mulches and erosion matting are only appropriate or necessary if erosion potential is significant. Erosive forces can be either wind or water. However, when hydroseeders are used, mulch is standard. The mulch fiber forms a slurry that acts as a carrier for the seed and fertilizer. Without the mulch, seed and fertilizer would not suspend in solution and uniform distribution would be impossible. The mulch also marks the area that has been sprayed.

When deciding on the use of a mulch such as straw or an erosion matting, several factors should be considered; erosion potential is the first consideration. If the soil does not have a high erosion potential, then mulch and/or matting should be skipped. The second consideration is cost. Application of mulch and matting add significant costs to a project, not only in materials, but also in labor. The third consideration is safety. The concern with netting is the potential of sections coming loose and causing hazards to aircraft. A final concern is that straw may introduce unwanted noxious weeds.

The above concerns do not apply to wood fiber or similar products used in hydroseeders.

Table 3.6.1. Mulch & Netting Comparison Chart

Mulch/ Netting	Difficulty In Use	Erosion Resistance	Cost	Cost to Apply	Environment Restrictions in Use	Most Effective on Soil Type
Wood Fiber	N	Low	Low	Low	Few	All
Straw	N	Medium	Low	Moderate	High Winds Hamper Use	Fine Grain
Jute Mesh	Y	Medium	Moderate	High	None	Course Grain
Tack Netting	Y	Low	Moderate	High	None	Course Grain
Excelcior	Y	High	High	High	None	All
Chemical Stabilizer	N	Varies	Varies	Low	Temperature Requirement	Course Grain

3.7 Transplanting and Sprigging (Advanced Techniques)

Of all revegetation techniques, the use of living plants or parts of living plants is the most labor intensive. However, there are times when the most appropriate revegetation method is planting transplants or sprigs (cuttings).

The most common and longest used method of vegetative plantings in Alaska is the use of willow cuttings. Another more recent method of transplanting was developed and proven effective on the Aleutians under various Department of Defense contracts and studies. This technique relies on planting sprigs of Beach wildrye (*Elymus mollis*) (*Leymus mollis*).

Revegetation techniques with vegetative material require a great deal of planning and should not be attempted without consulting with experienced persons. Transplanting whole plants is not covered in this report.

3.7.1 Willow and Other Woody Cuttings

The use of willow cuttings has been proven successful throughout areas of Alaska where willow occur naturally. Timing is critical to both collection and planting. Prior planning is an absolute necessity. For directions, please refer to the manual in Appendix E.

3.7.2 Beach Wildrye Sprigging

This technique was initially developed and proven effective on Shemya Island. The species can be used anywhere in coastal and insular Alaska, however, dune areas adjacent to shorelines are ideal. Sand is the ideal medium for planting, but gravels and rocky soil will also support the species. For directions, please refer to the Beach Wildrye Manual located in Appendix E.

3.8 Natural Revegetation (Do Nothing)

Natural revegetation relies on the tendency of vegetation to move into a disturbed area. Most disturbances, whether natural or man-made, will eventually be recolonized by plants. The conditions that determine the length of time needed to produce a cover of vegetation depends upon several factors, including proximity of viable seed sources, surface conditions of the disturbed area, and local environmental conditions.

In time vegetation will return. Problems arise when natural revegetation does not occur rapidly enough to prevent erosion, sedimentation and improve the appearance of the site. Natural revegetation is a valid approach and should be employed when conditions and politics allow.

REVEGETATION SPECIFICATIONS

FOR EARECKSON AFS

SECTION 4

4.0 Shemya Island Eareckson Air Force Station

4.1 History of PMC Involvement

The Alaska Plant Materials Center has been developing and assessing revegetation on Shemya Island since 1984. The initial efforts revolved around the revegetation on the Lateral Clear Zone (LCZ) adjacent to the active runway. Since that time, additional work has been accomplished on the LCZ. Variety trials have occurred, numerous seedings have occurred and natural revegetation techniques have been tested.

4.2 Types of Disturbances

Eareckson AFS has a limited number of types of disturbances. The most common type of revegetation follows construction of a new structure, and this disturbance is seeded for lawns.

Recently, cleanup of contaminated sites has become a more common reason for revegetation. These disturbances are usually best revegetated with native species.

The most recent large-scale disturbance occurred when peat was placed on abandoned roads. This material was erodible and created a visual disturbance.

Other small disturbances occur which include driving on tundra areas.

4.2.1 Species to be Avoided

Clover should not be used on Shemya Island. Initial surveys indicate the species is spreading into areas where it was not planted and into areas that have not been disturbed.

4.2.2 Native Species

In 1993, a collection of native species was initiated on Shemya Island. This effort was funded by the 11th CEOS and is expected to result in new commercial species in 1996. When an updated list of species becomes available, it should be included in Appendix D of this report.

4.3 Revegetation Regions of Shemya Island

Shemya Island is a relatively small area with harsh environmental conditions. The island has been divided into five revegetation zones, which are based on soil type or conditions.

Fortunately, many adapted species are available for use on Shemya. Revegetation efforts are simplified because only one land user is present and multiple revegetation demands are rare. If this guide is used, greater continuity should occur even though staff is rotated on a regular basis.

SHEMYA REVEGETATION ZONES

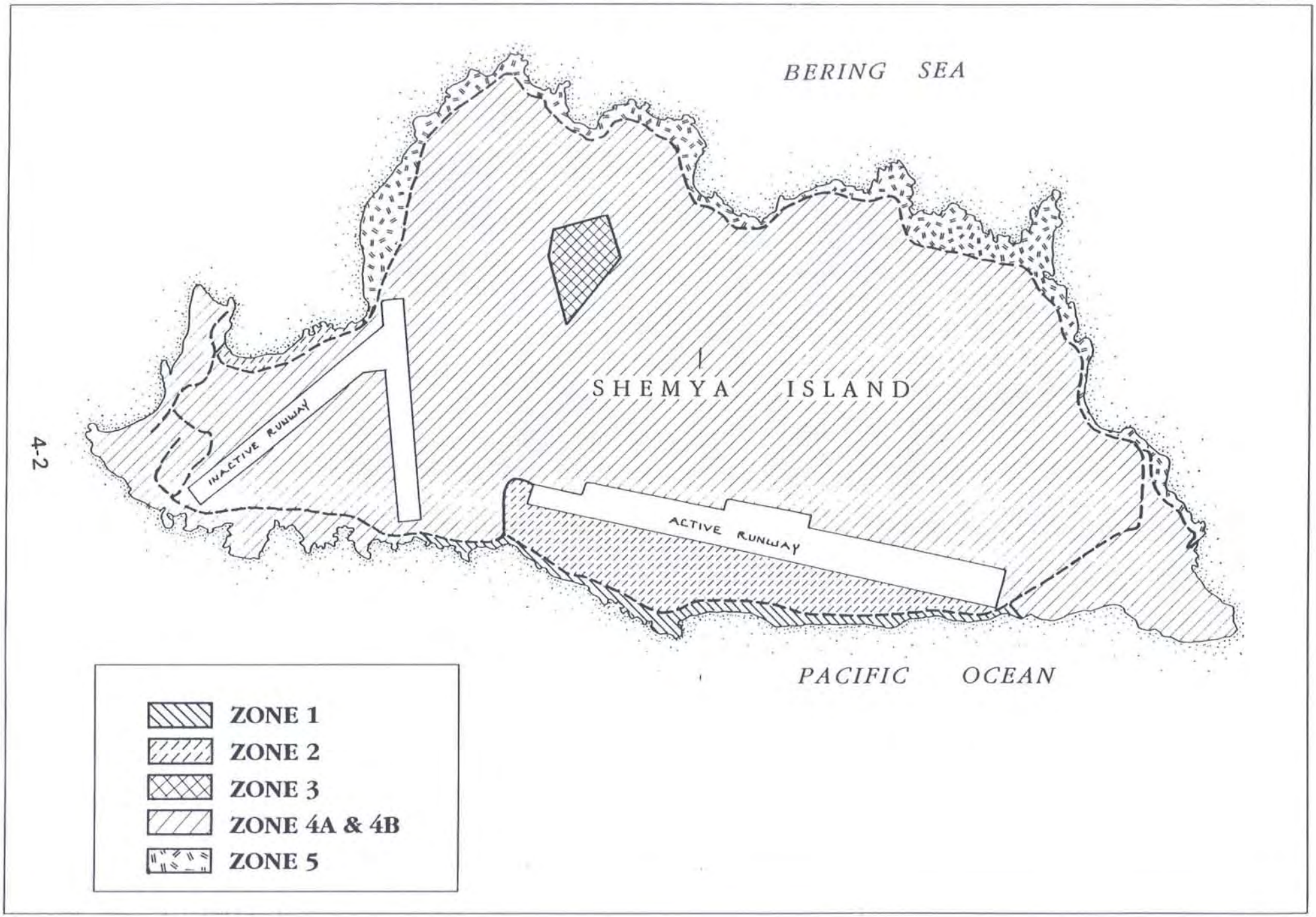
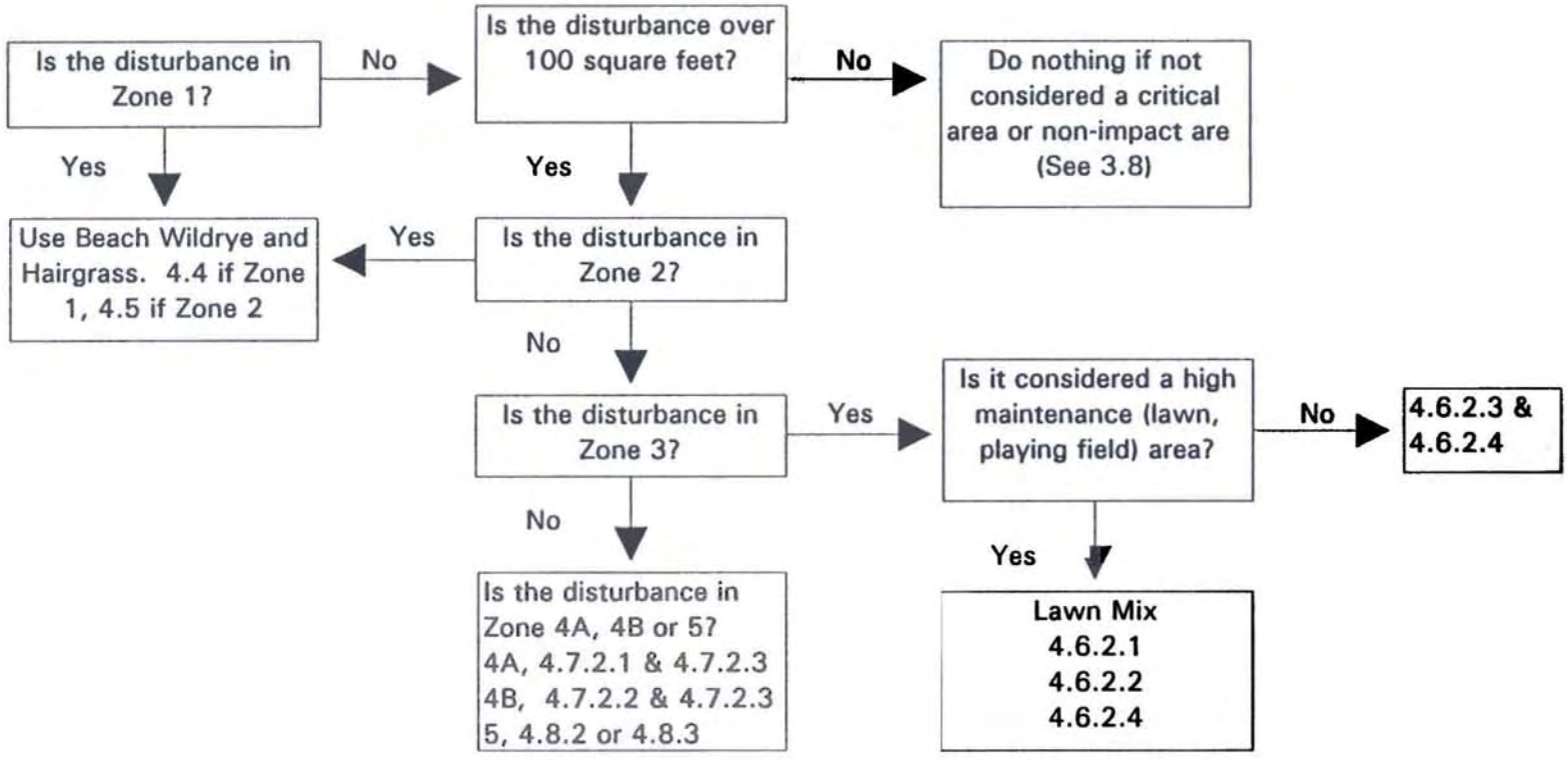


Table 4.1 Mix Selection Chart



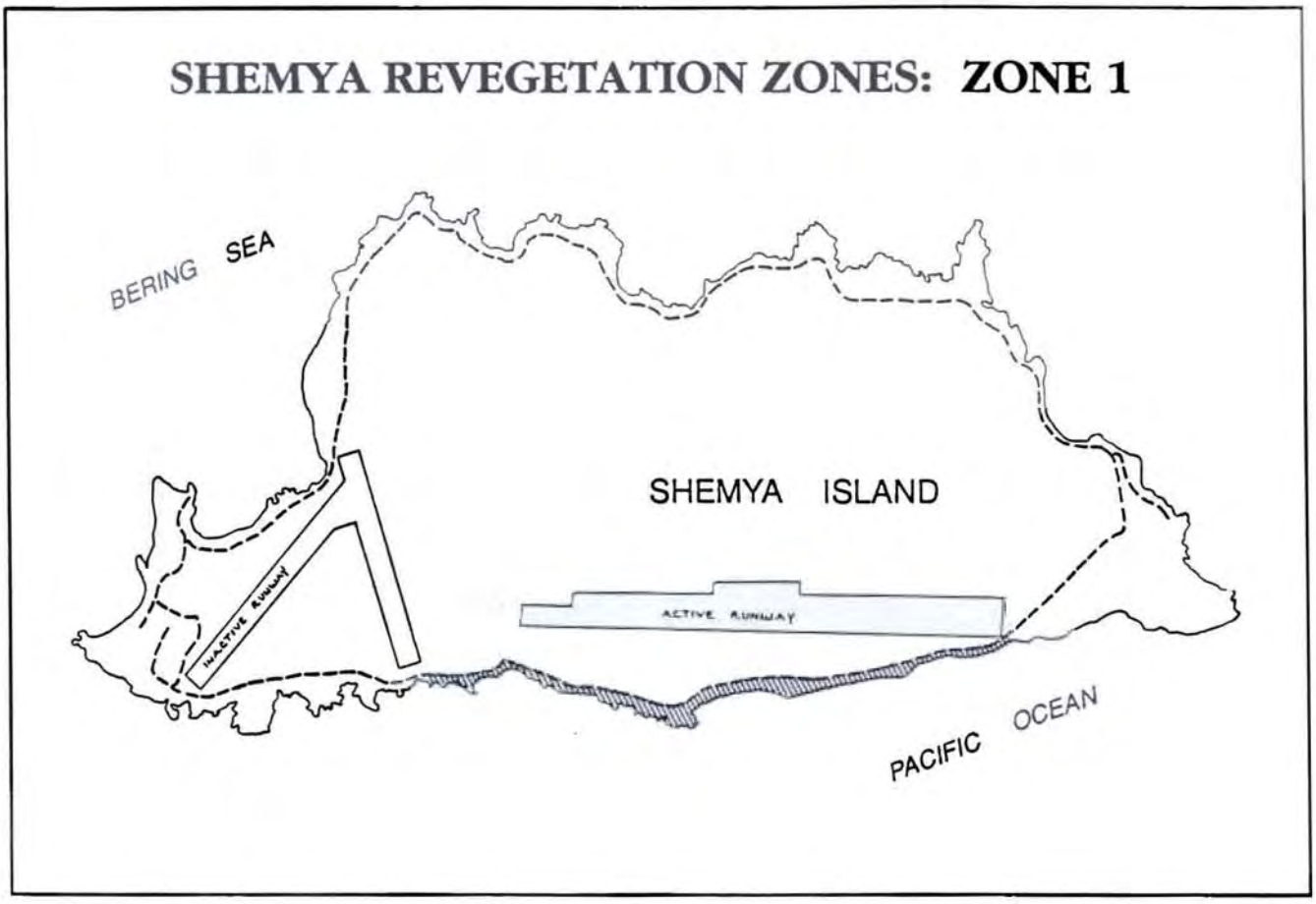


Figure 4.4.1

4.4 Revegetation Recommendations for Zone 1

4.4.1 Zone 1 lies between the south beach road and the shoreline. This is a very critical area of the foredune zone. No disturbances should occur in the area and any damage should be promptly repaired with native species only. Mulch netting may be appropriate.

4.4.2 Revegetation

1. Prevent any disturbance in the area. If a disturbance occurs, use the following recommendation.
2. Seed, Fertilizer and/or Revegetation Treatment

Seed:
60% 'Norcoast' Bering Hairgrass, or 'Nortran' Tufted Hairgrass
30% 'Boreal' Red Fescue
10% Annual Ryegrass
Seed Rate: 20 pounds per acre
Fertilizer: 600 pounds of 20-20-10 per acre
Beach Wildrye Sprigging: As per 3.7, spaced on 18" centers
Mulch: If deemed necessary, use excelsior blankets

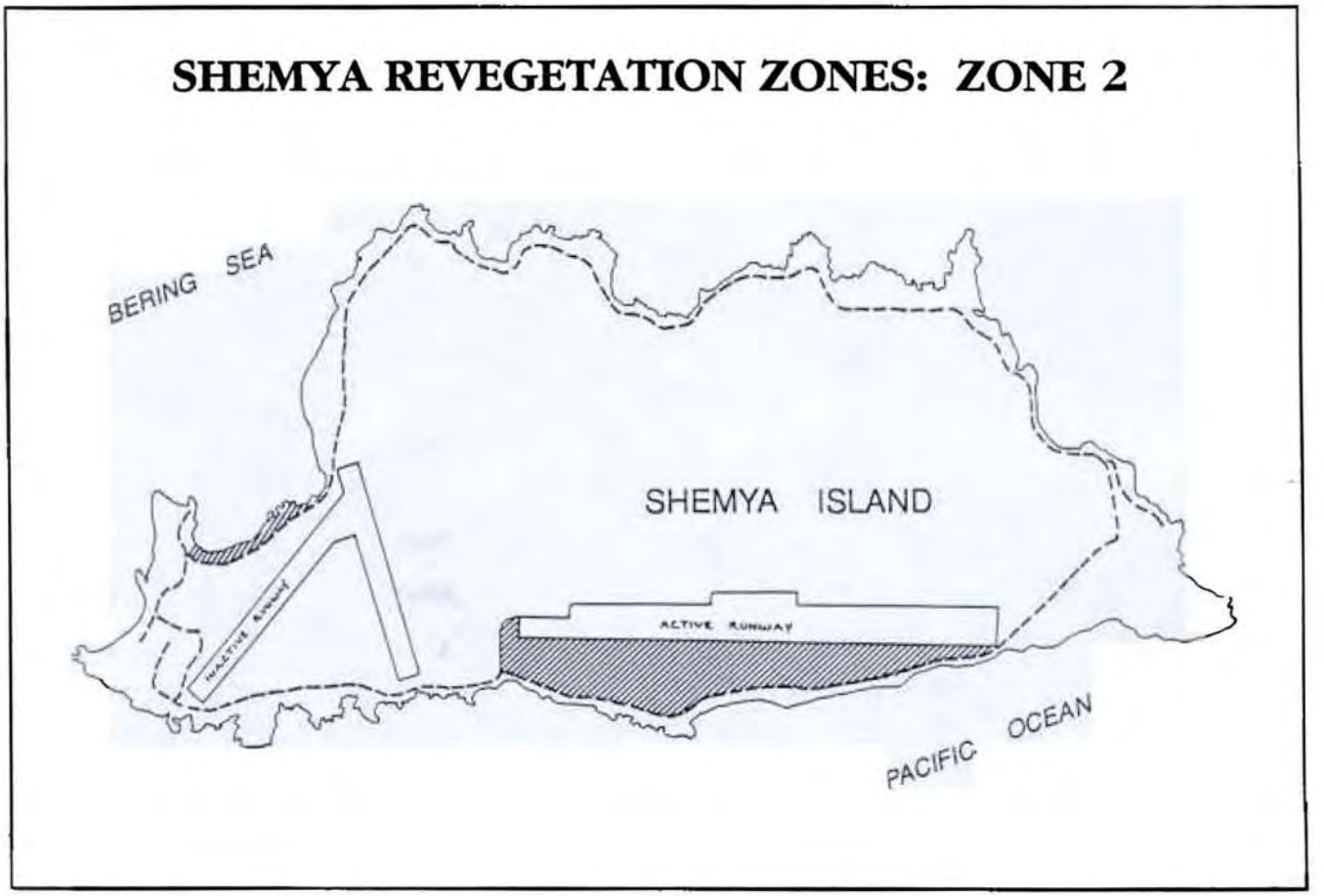


Figure 4.5.1

4.5 Revegetation Recommendations for Zone 2

4.5.1 Description

These areas are composed of erodible sand. The largest area is immediately south of the active runway extending to the south beach road. The second area is in the vicinity of the dock. Extreme care should be used in this area if any construction is planned.

4.5.2 Revegetation

Seed:

60% Norcoast Bering Hairgrass, or Nortran Tufted Hairgrass
15% Arctared Red Fescue
15% Boreal Red Fescue
10% Annual Ryegrass

Seed Rate: 40 pounds per acre

Fertilizer: 800 pounds per acre of 20-20-10

Beach Wildrye Sprigging: As per 3.7, spaced on 36 to 48" centers

Mulch: None needed unless a hydroseeder is used.

4.5.2 Photograph Showing Typical Site in Zone 2.

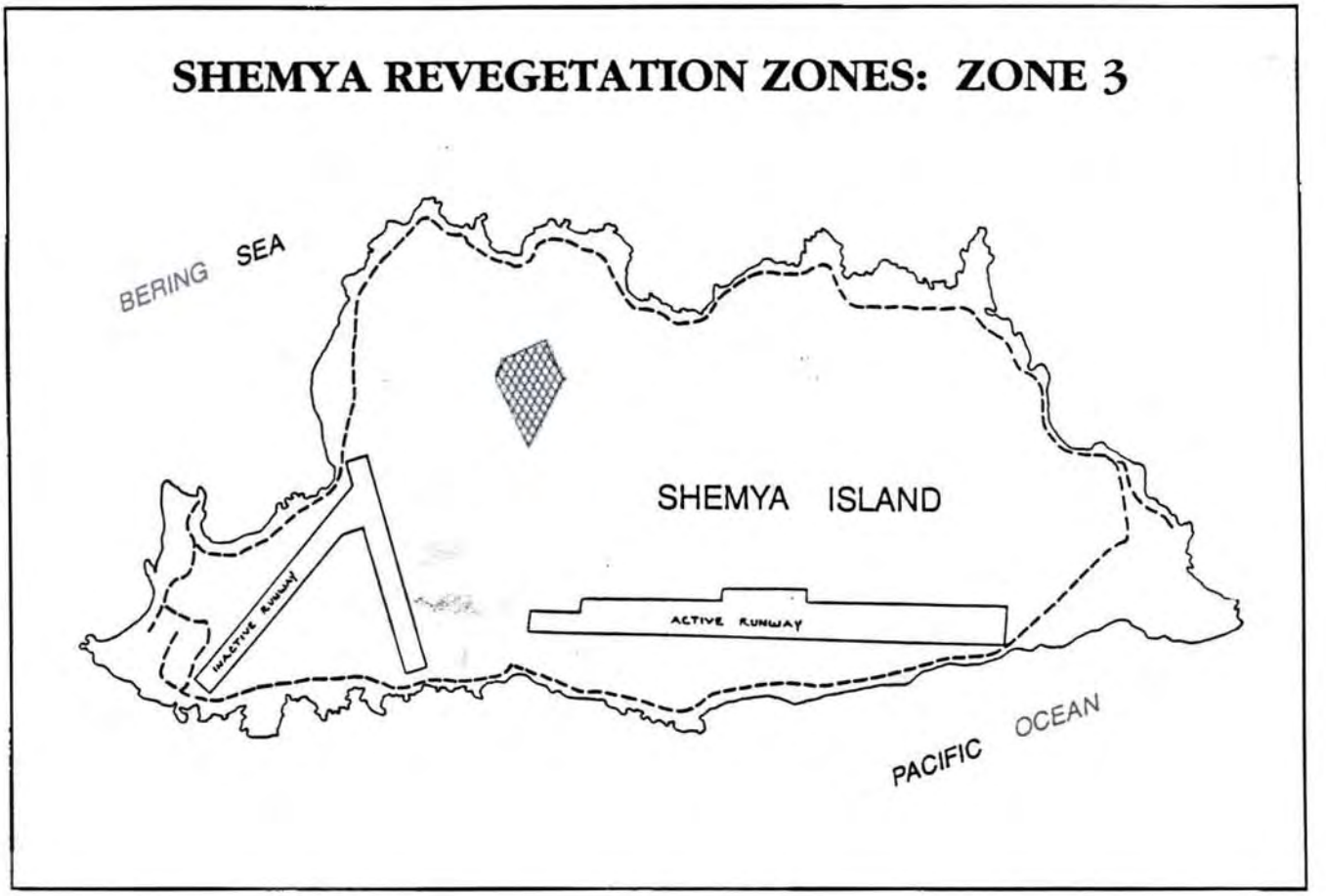


Figure 4.6.1

4.6 Revegetation Recommendations for Zone 3 Based on Types of Final Use

4.6.1 Description

Land area around the buildings near the main administration complex. In these areas, non-native species are appropriate, as much of the vegetation will be managed as lawns or playing fields.

4.6.2 Revegetation:

Seed Mix - Lawn Areas:
40% Nugget Kentucky Bluegrass
20% Merion Kentucky Bluegrass
30% Boreal Red Fescue
10% Perennial Ryegrass

Seed Mix - Athletic Fields:
60% Arctared Red Fescue
20% Boreal Red Fescue
20% Merion Kentucky Bluegrass

Seed Mix - Low Maintenance Areas:
40% Boreal Red Fescue
40% Norcoast Bering Hairgrass
20% Meadow Foxtail

Seeding Rates: 60 pounds per acre

Fertilizer: 500 pounds per acre of 20-20-10 at planting; 20 pounds per acre of 20-20-10 annually thereafter, except low maintenance areas

Mulch: As determined locally

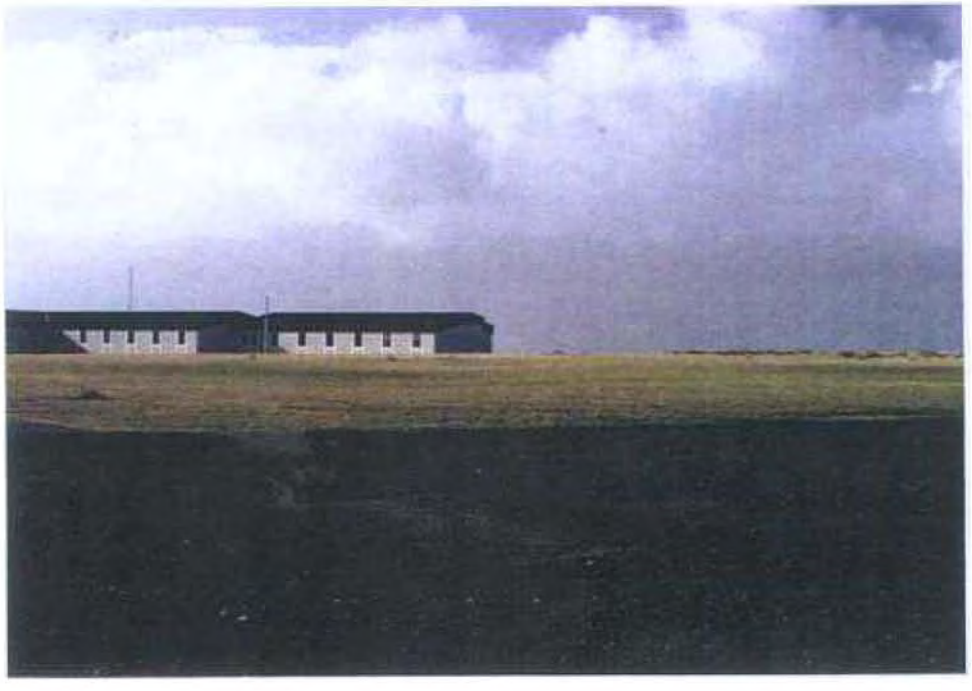


Figure 4.6.2 Photograph Showing Typical Site in Zone 3.

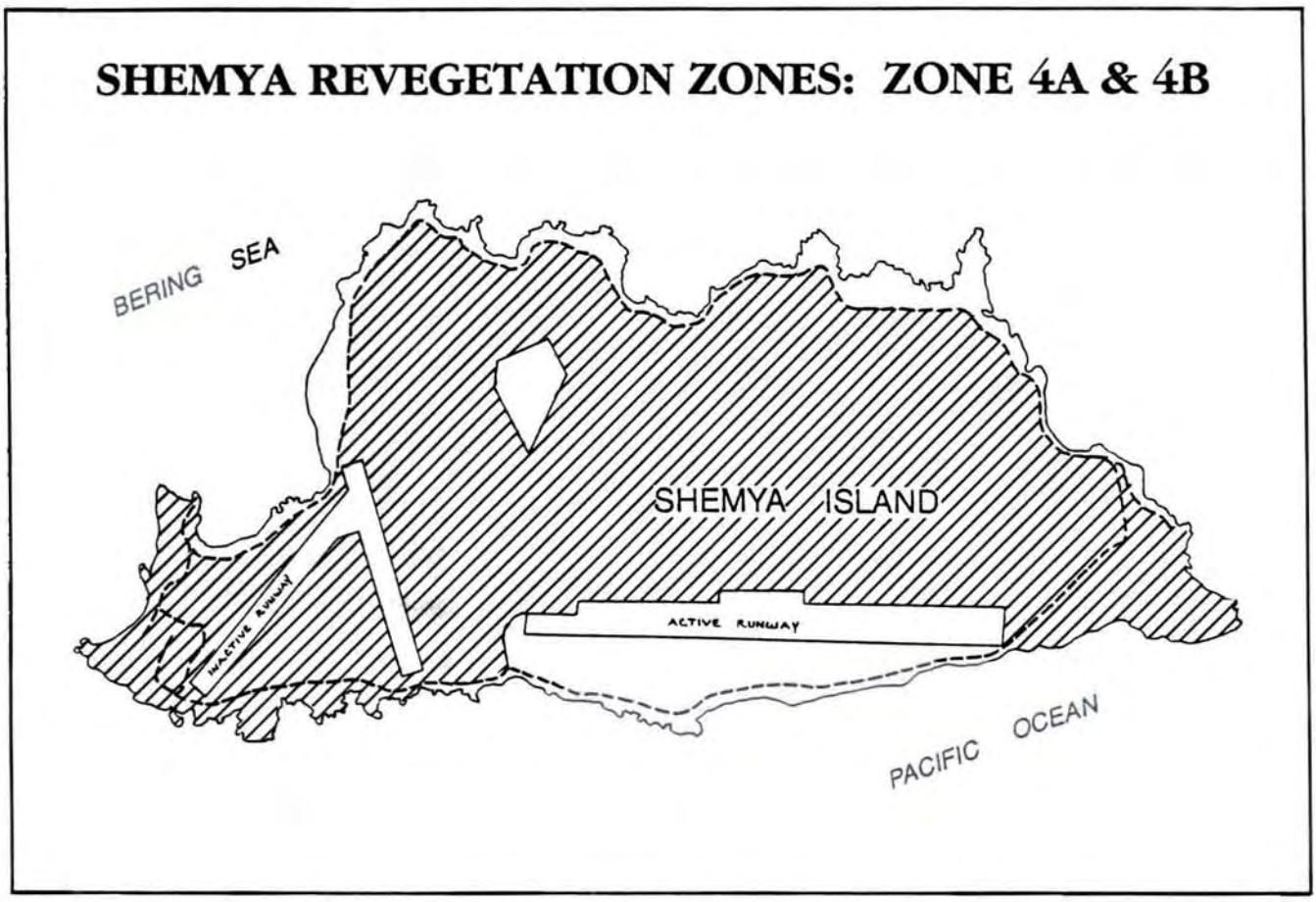


Figure 4.7.1

4.7 Revegetation Recommendations for Zone 4 in Areas 4A and 4B

4.7.1 Description

This area encompasses most of Shemya Island. This zone is divided into A and B regions. A represents mineral soils, and B, organic soils. These soil types are not designated on the zone maps, and will need to be determined in the field.

4.7.2 Revegetation

Seed Mix - Region A:
70% Norcoast Bering Hairgrass or Nortran Tufted Hairgrass
30% Boreal Red Fescue
Seed Mix - Region B:
50% Norcoast Bering Hairgrass or Nortran Tufted Hairgrass
30% Boreal Red Fescue
20% Kenai Polargrass, or if not available, Arctared Red Fescue
Seed Rate: 40 pounds per acre
Fertilizer: 600 pounds per acre of 20-20-10
Mulch: As determined locally, not really needed.

Figure 4.7.2 Photograph Showing Typical Site in Zone 4A

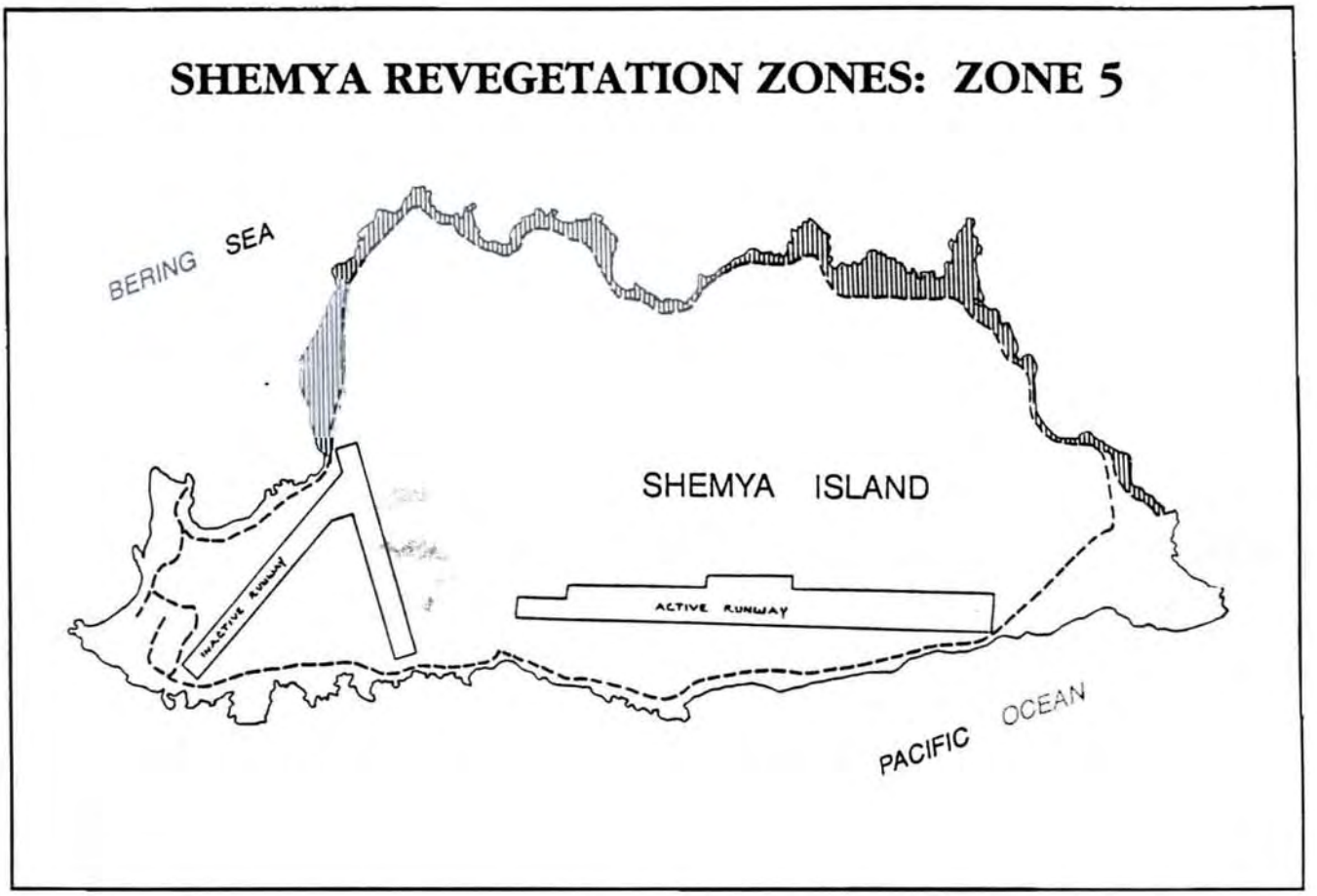


Figure 4.8.1

4.8 Revegetation Recommendations for Zone 5

4.8.1 Description

Zone 5 is the area between the bluff and the north coastline. This is a relatively non-erosive area and is the least critical of all sites on the island. If a natural revegetation program is ever attempted on Shemya Island, this area would be most suitable.

4.8.2 Revegetation

Seed Mix:
100% Norcoast Bering Hairgrass or Nortran Tufted Hairgrass
Seed Rate: 15 pounds per acre
Fertilizer: 450 pounds 20-20-10 per acre
Mulch: None

4.8.3 Or, allow natural revegetation.

Figure 4.8.2 Photograph Showing Typical Site in Zone 5.

Figure 4.8.3 Typical Area Where Natural Revegetation Would Apply.