



**SEEDS  
OF  
SUCCESS**

**Summary of Alaska  
Collections 2002-2012  
AK025, AK040, AK930**



**A report submitted to  
BLM Alaska State Office  
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# INTRODUCTION

The Bureau of Land Management Seeds of Success Program (SOS) has been collecting native plant seeds in Alaska for over a decade. Beginning in 2002, collections have been made by staff from three offices: the Northern Field Office (whose SOS abbreviation is AK025), the Anchorage Field Office (AK040), and the Alaska State Office (AK930). Most of the AK025 and AK040 collections were made in partnership with the Kew Millennium Seed Bank Project (<http://www.kew.org/science-conservation/save-seed-prosper/millennium-seed-bank/index.htm>). Collecting trips over the period 2002-2007 produced 108 collections, and were made with the assistance of contract botanists from University of Alaska and the Alaska Plant Materials Center.

With the conclusion of the Millennium Seed Bank partnership, the state program has focused on obtaining native plant seed to be stored and increased, with the objective of providing greater seed availability for restoration efforts. From 2007-2012, AK930 has partnered with the Alaska Plant Materials Center (PMC), the University of Alaska Anchorage/Alaska Natural Heritage Program (AKNHP) and the Chicago Botanical Garden/Conservation and Land Management internship program. Together they have made collections across the state. Four hundred and fifty collections, totalling over 25 pounds of cleaned seed, were made between 2009 and 2011. An additional 41 collections were made in 2012. These seed collections were processed by the PMC. Some seeds are currently being stored there and some are being stored at the USDA Agricultural Research station in Pullman, Washington. About a dozen species are currently being grown and increased by the PMC.

This report summarizes the SOS efforts to date and presents:

1. Results of all collections made in the state to date
2. Revised target species list, with an emphasis on workhorse species
3. Revised preliminary Seed Zone classification
4. Maps of seed collections from data that have been entered into a geospatial format and created in ArcView
5. Recommendations for future collecting work

## Partnerships

All of the SOS collections have been accomplished with the participation and assistance of many BLM programs and field offices within the state- from staff directly collecting seeds in the field to regional offices providing logistical support. Collecting on BLM land is a challenge in Alaska, since most BLM units are roadless, remote, and access is difficult and expensive. Partnerships with other organizations have benefited the SOS program not only materially, through the assistance of the partner organization, but also in spreading interest in native seed collection and cooperation on management issues important to all those involved.

A first level of partnering is sharing information. Tongass National Forest has several small-scale seed collecting projects but would like to begin gathering seeds with small harvesting machines on Prince of Wales Island. They have expressed interest in developing a relationship with AK930 that would involve the sharing of methods and techniques. This might involve SOS staff training a team of Forest Service seed collectors in the SOS project protocol, and having the AK930 team trained in seed harvesting equipment.

Since much of BLM land in Alaska is quite remote, much collecting has been done on land outside of BLM jurisdiction but accessible by the Alaska highway system. A second level of partnership involves the SOS team obtaining permission to collect seeds on lands managed by a variety of organizations. SOS has obtained permits from Chugach National Forest, Alaska State Parks, Alaska Department of Natural Resources and Alaska Maritime National Wildlife Refuge, among others. The ability to collect on many different landscapes benefits not only SOS, but also the permitting agency, which can draw on the seed collections for local projects.

A third level of partnership involves significant project support and a common goal. XS-Platinum provided access and logistical support, including room, board and the use of a vehicle, for two collecting trips in 2011. Native plant seed was collected from the area in which it will be used. Collections will be increased while the site work is underway, and the resulting seed will be ready for use when restoration begins. This approach would be beneficial at many developments across the state- for example the Red Dog Mine, the Nixon Fork mine and the Donlin development. SOS also received significant logistical support from the National Park Service for collecting trips based in Nome and Skagway.

The Conservation and Land Management Internship Program, through the Chicago Botanical Garden (CBG), provided four interns in 2010 and two in 2011 who greatly benefited the project. The internships were four months long and devoted full-time to seed collection. They were based in Anchorage and made collecting trips to different parts of the state. The interns gained experience in field botany and ecology as well as a range of resource management issues faced by agencies across the state of Alaska.

## Summary of Alaska Collection Efforts

To date, 563 collections have been made of 281 taxa. A full list of these collections is presented in Appendix 1. The following summary for the AK025 and AK040 collections came from the SOS website (<http://www.nps.gov/plants/sos/>). Details of the AK930 collections are from AKNHP files. All available collection information has been entered into an ArcMap database.

### AK025

**Total:** At least 38 collections were made from 2002-2006, numbering AK025-01 through AK025-42. The next collection made will use the number AK025-43.

**Collection data:** Available for numbers 01-25, 29-31, 33-37, 39-42 and 001A. No data were found for numbers 25-28, 32 and 38 (possibly they were used immediately and records never kept). There are 8 photos on the SOS website, though not the seed documentation photos. None found in BLM files.

**Location of seed collections and availability:** All collections were supposedly destined for Kew; and some of this material was returned to the US. Megan Haidet of the national SOS office said that there are seeds from collections 01-15 at Pullman; the others are not at Pullman and are presumed to be at Kew (personal communication). No indication of how many seeds are available. Contact Pullman for details.

**Collections were made at:** Kotzebue, Umiat, Circle Hot Springs, the Bering Glacier and the Seward Peninsula.

**Collectors:** Randy Meyers, J. Cole, K. Sonnen, K. Joly, Dave Yokel, Marilyn Barker, Ann Claerbout, D. Hunt, J. Dau, S. Steinacher, J. Magee, L. Billingsley, I. McSweeny

### AK040

**Total:** At least 61 collections were made from 2002-2003, numbering AK040-01 through AK040-64. The next collection made will use the number AK040-65.

**Collection data:** available for numbers 01-24, 26-46, 48-53 and 55-64. No data were found for numbers 25, 47 or 54 (possibly they were used immediately and records never kept). No photos were found on the SOS website or in BLM files.

**Location of seed collections and availability:** All collections were supposedly destined for Kew; and some of this material was returned to the US. Megan Haidet of the national SOS office said that seeds from all of the AK040 collections are at Pullman. No indication of how many seeds are available. Contact Pullman for details.

**Collections were made at:** Eklutna, the Matanuska Valley, the Bering Glacier, the Seward Peninsula, Anchorage and Eagle River.

**Collectors:** Debbie Blank, M. McWhorter, Marilyn Barker, Nancy Moore, A. Pasch, Carolyn Parker, K. Beattie, K. Lynch

## **AK930**

**Total:** Nothing is known about the first 43 AK930 collections. Between 2007-2012, 463 collections were made, numbering AK930-044 through AK930-502. Of these, 450 are accounted for and 9 are missing. Note: the number AK930-096 was never used, and 6 small collections were not given an SOS number. The next collection made will use the number AK930-503.

**Collection data:** available for numbers 044-502 (and for 6 collections with no SOS number). Photos are archived at the Alaska Natural Heritage Program at the University of Alaska Anchorage and at the BLM Alaska State Office. Over 1,000 collection documentation photos are on the SOS website. No data or photos were found for numbers 001-043.

**Location of seed collections and availability:** Nothing is known of numbers 1-43 and they are presumed lost. Numbers 44-51 were delivered to BLM in 2007 but have not been located and are presumed lost. Numbers 52-502 were processed at the Alaska Plant Materials Center. Most of the seeds from the years 2009 and 2010 were shipped to Pullman. A sample of 500 seeds was retained at PMC for the collections totaling more than 6,000 seeds. All of the seeds from 2011 and 2012 are still at the PMC. 2012 collections have not yet been cleaned and processed. The total amounts of seeds in collections 52-461 are in the AKNHP-SOS database. Data from collections 462-502 will be added when they become available.

**Collections were made at:** Anchorage, Eagle River, the Matanuska Valley, Turnagain Arm, the Kenai Peninsula, the Alaska Range, Copper Basin, Chicken, Fairbanks, the Elliot, southern Dalton and Steese Highways, the Seward Peninsula, the Kotzebue area, Platinum, Cordova, Haines, Skagway and Juneau.

**Collectors:** Matthew L. Carlson, Robert Lipkin, Helen Cortes-Burns, Robert Pattison, Lindsey Flagstad, Paul Krabacher, Michael Duffy, Tina Boucher, Carolyn Parker, Al Batten, Christine Balk, Daniel Brickley, Vania Chan, Jordan Schoonover, Carl Norlen, Kelly Walton, Erin Cooper, Dan Fehringer, Emily Capelin, Alyssa Epstein, Joe Rosselli, Jonathan Happ, Abraham Schmidt, Zachary Goodrich, Justin Fulkerson, Brian Heitz, Casey Greenstein



## SEED COLLECTION STORAGE AND INCREASE

The Alaska seed collections have been processed at several different facilities. AK930 has not been able to locate all collections; some have evidently gone missing, and some may have already been used for various projects. Almost all of the seeds from the 2002-2006 collections of AK025 and AK040 went to the Kew Millennium Seed Bank (Randy Meyers, personal communication). While some of this seed may have been returned to the US and may be available, the bulk of the Alaska collections that are currently available (those made from 2009-2012) are stored at Pullman and the PMC.

### **The Alaska Plant Materials Center**

The PMC has a long history of providing expertise and plant materials to Alaskans. They have collected seed from all over the state, developed cultivars used in restoration and reclamation projects, and offer germplasm to commercial growers for development of new cultivars useful to revegetation efforts. The plants offered by the PMC compliment the SOS collection efforts. In the summaries of SOS collections that follow, cultivars and germplasm that are currently available to land managers, appropriate to each seed zone, are listed.

Many useful publications are described and are available on the PMC website (<http://plants.alaska.gov/>). Two of these are particularly helpful for this project: **A Revegetation Manual for Alaska** (Wright, 2008) and **The Alaska Coastal Revegetation and Erosion Guide** (Wright & Czalpa, 2011). These describe plant materials that PMC has developed, suggestions for their use, and case studies of projects throughout the state. A list of the cultivars and germplasm bases described in these publications is presented in Appendix 2.

AK930 began a more in-depth partnership with the PMC in 2009, when they took the lead in cleaning and processing all Alaska seed collections. In addition to processing these collections, PMC has performed germination tests on about a dozen species and has planted these for seed increase. Most of the plants are presently being grown in raised beds. These include *Achillea sibirica*, *Artemisia borealis*, *Artemisia tilesii* (AK930-075), *Carex mertensii* (AK930-062), *Chamerion latifolium*, *Hedysarum alpinum* (AK930-077), *Oxytropis campestris* (AK930-076), *Sanguisorba canadensis* (AK930-081) and *Wilhelmsia physodes* (AK930-085).



On the left are cleaned packets of seeds in the seed lab. On the right, *Achillea sibirica* sprouts grown in the greenhouse and awaiting transplantation to the raised bed garden.

Seeds from SOS collections are initially sprouted in the greenhouse and transplanted outdoors to raised beds or directly to fields. The raised beds are a good way of increasing certain species that would not, for many reasons, do well when grown in large fields.



Raised bed gardens at the Plant Material Center. A crop of *Carex mertensii* is pictured on the right.

Some grass species have been grown in fields. *Deschampsia cespitosa*, *Leymus mollis* and *Trisetum spicatum* have been grown from the Platinum collections, and *Agrostis mertensii*, *Agrostis scabra* and *Poa alpina* are from Nome Creek collections. Yields have been good; the 2012 harvest is currently being processed. The amount produced is not yet known for all species, but *Chamerion latifolium* produced 7.5 grams of seed (roughly 50,000 seeds) from a small raised bed garden a few meters square. It was found that both species of *Agrostis* over-wintered poorly and need to be treated as annuals. The other grass species are expected to do well as perennials.



Fields of grasses being grown at the Plant Materials Center. On the left, *Poa alpina* culms stand bare, just after the July 2012 harvest. On the right, *Leymus mollis* and *Trisetum spicatum* starts have just been set out.

## TARGET LIST: PROPOSED WORKHORSE TAXA

The SOS collection target list of native plant species has been modified and expanded through the course of the project. The original focus was twofold: to target early seral plants appropriate to restoration projects, and to target selected Alaska plants for the Millennium Seed Bank Project. Plant taxa were added to the list by a number of different botanists, and since collecting began in 2002, additions have been made to include a number of different objectives: ‘iconic’ species, ‘peripheral’ species, etc. The national SOS program has provided direction to include more forbs, further expanded the list (and also prompted recalcitrant and rare species to be removed). The list grew in size to accommodate these varied interests. From that list, the BLM was interested in a subset of plants dubbed ‘workhorse species’ that are good choices for restoration projects and which can be increased by local growers easily and cheaply to provide large quantities of seed.

The AKNHP SOS group discussed the criteria important to growing and harvesting the seed collections at a meeting with PMC staff in 2012. Not all ecologically useful restoration plants can be easily grown using current agricultural techniques. Methods and technology used to grow, tend, harvest and process crops favor those species that are large and out-compete weeds, produce large quantities of seeds that are easily separated from other plant parts, and are easily processed by machines. Many restoration projects will require very large numbers of seeds. Species whose seed can be increased quickly, easily and inexpensively will be preferentially chosen by managers to stabilize broken soil.

The target list plants were ranked based on those and other criteria, such as whether native plant cultivars are already available. The AK PMC has produced a number of widely used cultivars, and the SOS effort should compliment what’s available by focusing on species not yet collected. For example, the PMC has already worked with *Elymus trachycaulus* and *E. macrourus*, so *E. alaskanus* was put on the target list. (It should be noted that even if the PMC has a cultivar or germplasm for a given species, most likely there would only be one or two varieties available. Collections of the same species from many parts of the state will continue to be important to offer a diverse representation of genetic material.)

The existing list was divided into several parts. Shrubs and trees were removed as a group, since ours are generally slow growing and not appropriate to present agricultural techniques. The herbs most valuable to restoration projects were separated from rest and considered high priority. Of these, the plants most easily increased on a large scale formed the ‘workhorse’ list. They are presented below in Table 1. A few of the wetland species may present special challenges to field production.

**Table 1. Workhorse taxa, appropriate to large-scale commercial production**

The following plants would be fairly easy to produce using conventional equipment and methods, and increase programs could yield substantial quantities of seeds.

<i>Achillea millefolium</i> var. <i>borealis</i> *	<i>Elymus alaskanus</i>
<i>Achillea sibirica</i>	<i>Festuca altaica</i>
<i>Agrostis exarata</i>	<i>Festuca rubra</i> * +
<i>Agrostis mertensii</i>	<i>Hedysarum alpinum</i> *
<i>Agrostis scabra</i>	<i>Hedysarum boreale</i> ssp. <i>mackenziei</i>
<i>Angelica lucida</i>	<i>Heracleum maximum</i>
<i>Arctagrostis latifolia</i> +	<i>Hordeum brachyantherum</i> *
<i>Artemisia tilesii</i> +	<i>Iris setosa</i> *
<i>Astragalus americanus</i>	<i>Leymus innovatus</i> *
<i>Astragalus williamsii</i>	<i>Leymus mollis</i> +
<i>Beckmannia syzigachne</i> +	<i>Ligusticum scoticum</i> *
<i>Boykinia richardsonii</i>	<i>Linum lewisii</i>
<i>Bromus inermis</i> ssp. <i>pumpellianus</i>	<i>Lupinus arcticus</i>
<i>Calamagrostis canadensis</i> +	<i>Lupinus nootkatensis</i>
<i>Calamagrostis purpurascens</i>	<i>Oxytropis borealis</i>
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	<i>Oxytropis campestris</i> *
<i>Carex aquatilis</i>	<i>Oxytropis deflexa</i>
<i>Carex aquatilis</i> var. <i>dives</i>	<i>Phleum alpinum</i>
<i>Carex lyngbyei</i>	<i>Poa alpina</i> * +
<i>Carex macrochaeta</i> *	<i>Poa arctica</i> *
<i>Carex mertensii</i>	<i>Poa glauca</i> * +
<i>Carex praticola</i>	<i>Polygonum alpinum</i>
<i>Cnidium cnidiifolium</i>	<i>Rhinanthus minor</i>
<i>Deschampsia cespitosa</i> +	<i>Trisetum spicatum</i> *
<i>Dupontia fisheri</i>	

+ denotes cultivar available

\* denotes germplasm available from PMC.

(Note: PMC has a cultivar available for *Elymus trachycaulus* and germplasm of *E. macrourus*. I've prioritized *E. alaskanus* since they do not have material of this species, but all species of *Elymus* would be good targets **if collected away from areas where cultivars have been planted, especially roadsides**. They also have a cultivar of *Deschampsia beringensis*.)

Many other plants on our list are excellent early seral species, but are too low growing, have seeds too small or too brittle to be easily harvested and processed, or otherwise create huge challenges to large scale commercial production. This is especially true of wetland species like tall cottongrass (*Eriophorum angustifolium*) and plants like the fireweeds (*Chamerion angustifolium*, *Chamerion latifolium*) and mastodon flower (*Senecio congestus*). Although these are excellent and desirable early seral plants, their

small seeds with fluffy appendages make them very difficult to harvest and process. *Luzula* spp. are often low growing and susceptible to competition by weeds. But all of these species could be produced on a smaller scale. Production costs would be higher and overall seed production might be low compared to field-grown seed, but adding them to seed mixes even in small quantities would improve species composition. Like the shrubs, they could also be collected in quantity for direct application. These plants are listed after the workhorse species, in Table 2.

**Table 2. Priority taxa appropriate to small-scale production**

The following plants would require more labor-intensive care to produce, such as the use of garden boxes or landscaping cloth.

<i>Anemone multifida</i>	<i>Eriophorum russeolum</i>
<i>Aquilegia formosa</i>	<i>Eriophorum scheuchzeri</i>
<i>Arabis hirsuta</i>	<i>Eriophorum vaginatum</i>
<i>Arabis holboellii</i>	<i>Erysimum inconspicuum</i>
<i>Arabis kamchatica</i>	<i>Gentianella propinqua</i> ssp. <i>propinqua</i>
<i>Arabis x divaricarpa</i>	<i>Gentianopsis detonsa</i> ssp. <i>yukonensis</i>
<i>Arctophila fulva</i>	<i>Geum macrophyllum</i>
<i>Arnica angustifolia</i>	<i>Glyceria grandis</i>
<i>Artemisia arctica</i>	<i>Hierochloa odorata</i>
<i>Artemisia campestris</i> ssp. <i>borealis</i>	<i>Juncus castaneus</i>
<i>Aruncus dioicus</i>	<i>Juncus filiformis</i>
<i>Astragalus laxmannii</i> var. <i>tananaicus</i>	<i>Lathyrus japonicus</i>
<i>Barbarea orthoceras</i>	<i>Lathyrus palustris</i>
<i>Carex bigelowii</i>	<i>Luzula multiflora</i>
<i>Carex gmelinii</i>	<i>Luzula parviflora</i>
<i>Carex lenticularis</i> var. <i>lipocarpa</i>	<i>Packera pauciflora</i>
<i>Carex norvegica</i> ssp. <i>inferalpina</i>	<i>Papaver lapponicum</i>
<i>Carex pachystachya</i>	<i>Papaver nudicaule</i> ssp. <i>americanum</i>
<i>Carex saxatilis</i>	<i>Plantago canescens</i>
<i>Carex scirpoidea</i>	<i>Poa pratensis</i> ssp. <i>alpigena</i>
<i>Carex utriculata</i>	<i>Potentilla bimundorum</i>
<i>Chamerion angustifolium</i>	<i>Pseudoroegneria spicata</i>
<i>Chamerion latifolium</i> *	<i>Rumex aquaticus</i> var. <i>fenestratus</i>
<i>Comarum palustre</i>	<i>Rumex arcticus</i>
<i>Corydalis sempervirens</i>	<i>Sanguisorba canadensis</i>
<i>Danthonia intermedia</i>	<i>Sanguisorba officinalis</i>
<i>Delphinium glaucum</i>	<i>Saxifraga hieracifolia</i>
<i>Dodecatheon pulchellum</i>	<i>Schoenoplectus tabernaemontani</i>
<i>Draba aurea</i>	<i>Senecio congestus</i>
<i>Erigeron acris</i>	<i>Trisetum canescens</i>
<i>Eriophorum angustifolium</i>	

\* denotes germplasm available from PMC.

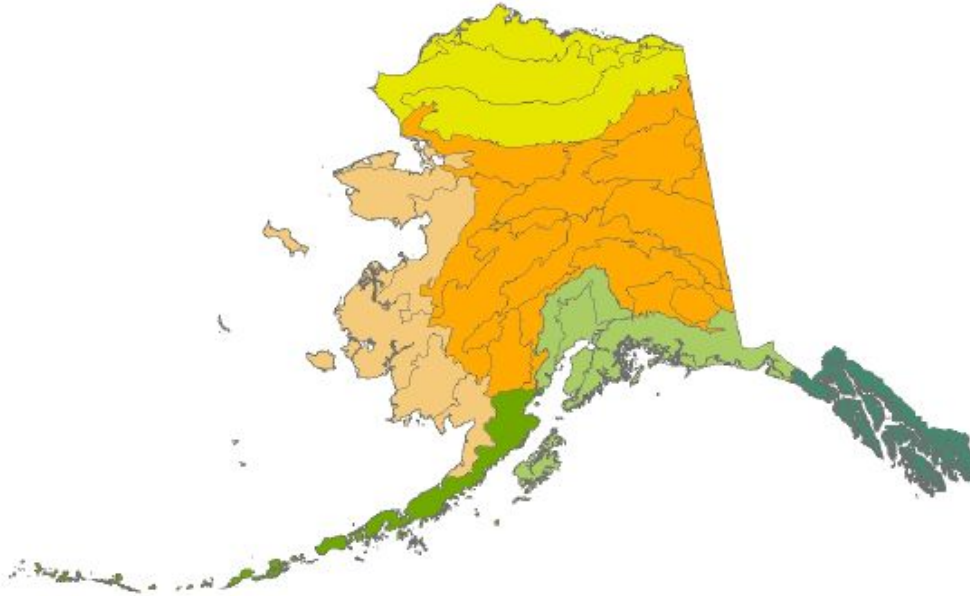
The remaining plants on our target list are of a lower priority but could still be collected if the opportunity arises during collecting trips. One of the goals of the SOS program is to bring new species, especially forbs, into commercial production. The continued availability of seeds for agricultural experimentation could promote the development of new techniques and equipment.

The full target list is in Appendix 3, ranked in five groups. Group 1 contains the workhorse species and Group 2 contains other priority plants. Group 3 are plants from earlier lists that are still appropriate for opportunistic collections. Group 4 are shrub and tree species. Some of these are excellent for reclamation projects, but generally shrubs are not grown as seed crops. These species can be targeted for specific projects and their seed gathered in great quantity for direct application. Group 5 contains plants that might be dropped from the list. Some of these plants were added to the list during the partnership with the Millennium Seed Bank; most are too small and have too limited a distribution to be useful in reclamation efforts. The PMC has asked us to remove some, like *Potentilla norvegica*, from the list because of its weedy habit (there is also some question as to whether all populations of this plant are native to the state. Collections that have already been made may be useful to researchers interested in resolving this issue).

Although rare plants are specifically excluded from the SOS protocol, AKNHP did make one collection of a northern endemic that is worth noting. *Phacelia mollis* was collected in Chicken, AK from a dry bluff population that was literally hours away from destruction by a road-widening project. Although focused on the workhorse and primary target species, seed collection crews should always be ready for any appropriate opportunistic collection.

A table of the workhorse species collections made so far, showing the Seed Zones in which they have been collected, is included as Appendix 4. The seed zones are very large and, as noted above, a single collection should not be seen as sufficient. Workhorse species should be collected from not only all six seed zones, but in many different areas within the zones as well. The optimal approach is the Platinum Mine model- to collect seeds from a specific area, increase these, and then use these seeds at the original collection site. In lieu of that, providing as much material as possible will give managers many more options to obtain plants best suited to a specific geographic area.

## DEVELOPMENT OF PRELIMINARY SEED ZONES



**Arctic Zone**  
**West Zone      Interior Zone**  
**South Central      Alaska Zone**  
**Southwest Alaska Zone      Southeast Alaska Zone**

Compared to many areas in the contiguous 48 states, Alaska's SOS collecting effort is in its early stages. 'Natural' revegetation is a far more extensively used option for disturbed areas here than in the other states. Many western states have developed very specific seed transfer zones based on criteria such as ecosystem boundaries, precipitation gradients and elevation. In some cases these zones can be very small. The great distances and huge management units in Alaska create many challenges for managers, and have necessitated an initially broad approach to seed transfer zones. This will hopefully be refined in the future as our knowledge of population dynamics within the state increases.

In 2010, with the help of interns from the Chicago Botanical Garden, a preliminary review of literature about seed transfer zones was performed and the results documented in a report (Brickley, 2010). In lieu of hard data, the Alaska Unified Ecosystem units have been used as interim seed zones by AK930 collecting teams. This is also the approach recommended by the organization Native Seed Network:



### **Ecoregions as a resource for restoration**

*At the Native Seed Network, we find ecoregion maps to be a very useful landscape-level framework for organizing ecosystems and addressing native plant materials issues. In the absence of genetic data guiding movement of native plant materials, we consider ecoregions practical seed transfer zone boundaries.*  
(<http://www.nativeseednetwork.org>)

In 2012, BLM Alaska State Office decided to use the seed zone map used by the Plant Material Center, which divided the state into six general geographic/climactic regions: Arctic, Interior, West, Southwest, South Central and Southeast

The PMC zones are very general geographic regions of the state. To prepare maps for the seed zones, we used the Unified Ecoregions map as our base. (Although the national SOS protocol uses the Omernick system (Gallant et al, 1995), the Unified system (Nowacki et al, 2001) is preferred by many in this state and we were requested to follow it by the Alaska State Office in 2010, so we have used it as the basis for our proposed seed zones. See Appendix 5.) To create the preliminary AK SOS Seed Zones, we grouped ecoregions whose boundaries roughly corresponded to the PMC regional boundaries. These seed zones approximate the major ecoregion groups of the Unified map.

Assigning some of the ecoregions to seed zones was a relatively straightforward task. In the Polar domain, the Arctic Tundra Ecoregion Group corresponds to the Arctic Seed Zone, while the Bering Tundra and Bering Taiga Ecoregion groups were combined to form the Western Seed Zone. In the Maritime domain, the Aleutian Meadows Ecoregion group corresponds to the Southwest Seed Zone. But the other portion of the Maritime domain is problematic: the Coastal Rainforests Ecoregion Group encompasses both a portion of the South Central and all of the Southeast Seed Zones. They can be split at the Alsek River, where the greater portion of the M5 Gulf of Alaska Coast ecosystem ends. Everything southeast of that river is the Southeast Seed Zone.

A greater problem was the boundary between the South Central and Interior Seed Zones. In the Unified map, the Alaska Range Transition Ecoregion Group straddles the Alaska Range and puts dissimilar places like Anchorage, Healy and Glennallen in the same unit. For the purposes of the Seeds of Success project, we split the Unified B3 Alaska Range Ecoregion into two sections. To do this, we used the Land Resource Areas map prepared by Natural Resources Conservation Service (USDA, 2002). The boundary between NRCS 228 Interior Alaska Mountains and 223 Cook Inlet Mountains will be the boundary that divides the northern section of the B3 Alaska Range from the southern B3 Alaska Range.

The South Central Seed Zone encompasses this southern section of B3 Alaska Range, B5 Cook Inlet, and the northern portion of the Coastal Rainforests Ecoregion Group. The Interior Seed Zone encompasses the northern section of B3 Alaska Range, B4 Lime Hills, B8 Copper River Basin, B1 Kluane Range, B9 Wrangell Range and all of the ecoregions of the Boreal Ecoregion Group.

Our proposed Seed Zones provide a good fit to the PMC regions, though they are not exactly the same. For example Kodiak is grouped by PMC with the Southwest, while the ecoregion maps group it with south central/southeast. To date there have been no seed collections made in Kodiak and no plans for collections are anticipated in the near future, so for now we have included it in South Central until we have more information. As we learn more about the genetic boundaries of plant populations within the state, this map will evolve and further changes will be made.

Though the Seed Zones are very large, they are based on the ecoregion units themselves, and so can be divided into these smaller units in the future if studies indicate a division is necessary. More detailed seed transfer zones may be based on even finer divisions of the ecoregions themselves (based on precipitation, elevation, etc.). A good example for the need for smaller zones would be in the subunits of the Arctic Tundra Ecoregion Group/Arctic Seed Zone. All of the ecoregions follow the Brooks Range, running east-west from one side of the state to the other. Seeds from either end of these long, thin units should probably not be mixed, though studies to support that assertion have not yet been undertaken. The isolation of island populations is a very important factor in determining seed transfer zones. The islands of the Bering sea and the Aleutian, Kodiak and Alexander archipelagoes will no doubt require more study before being assigned to seed zones.

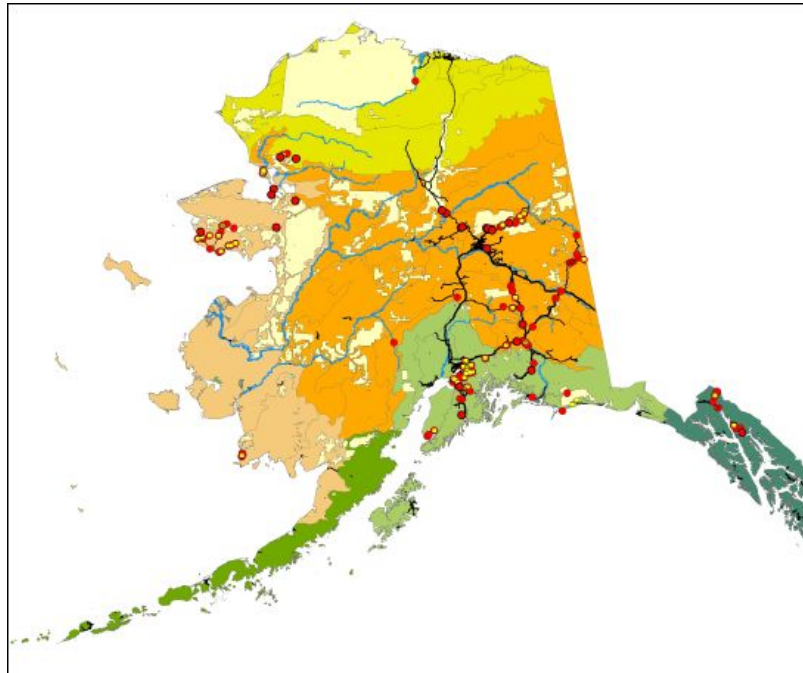
**Table 3. Seed collections made in each Seed Zone, 2002-2012.**

<b>Seed Zone</b>	<b>Number of seed collections</b>	<b>Number of taxa collected</b>
Arctic Zone	12	12
Interior Zone	209	133
West Zone	147	111
Southwest Zone	0	0
South Central Zone	144	113
Southeast Zone	50	39

## SUMMARY OF COLLECTIONS BY SEED ZONE

As part of this summary report we have created a geographic database for all years of SOS collection data. We have developed a data layer to delineate the six Alaska Seed Zones, based on the boundaries of the Alaska Unified Ecoregions described above.

The 563 SOS collections have been made in every seed zone except the Southwest. The following sections of this report summarize the collections made in each zone and present a map of the collections derived from the collections database. The ArcMap database contains all the data gathered for each seed collection, and is a useful tool for managers.



In the maps generated by the ArcMap database, the six seed zones are color-coded. BLM land (light yellow), roads, major rivers, and seed collections were added to the map on top of the seed zones. Red circles represent large seed collections (mostly >10,000 seeds) and yellow squares are smaller collections.

Each section begins with a brief geographic description of the Seed Zone and its boundaries, the ecosystems within it, and BLM land found in the unit. If there are major development projects in the zone, they are described here. Workhorse species useful to the seed zone are listed (slightly different for each zone), as are any cultivars or germplasm bases already commercially available that originated in that zone. SOS collections to date are then listed, with workhorse species highlighted. Suggestions for future collecting work are described, with potential partnerships of other agencies, and a list of workhorse species not yet collected in the seed zone.

## ARCTIC ALASKA SEED ZONE



The Arctic Seed Zone comprises northernmost Alaska, including the Brooks Range and the Arctic Coastal Plain. It is bounded by the Arctic Ocean to the north and west, the Yukon Territory to the east, and the Interior Seed Zone to the south. In the west it borders a small portion of the Western Seed Zone and excludes the lower Noatak drainage. Ecoregions within the Arctic Seed Zone include P3 Brooks Range, P1 Brooks Foothills and P9 Beaufort Coastal Plain.

The most significant BLM management area in this zone is the National Petroleum Reserve. Additional units include land around the Dalton Highway, north of the Squirrel River and the western Delong Mountains. Major projects in the area include the Red Dog Mine, and the NPR will see increased development activity in the coming years.

### **Workhorse species appropriate to the Arctic Seed Zone:**

*Achillea millefolium* var. *borealis*  
*Calamagrostis canadensis*  
*Festuca altaica*  
*Arctagrostis latifolia*  
*Artemisia tilesii*  
*Boykinia richardsonii*  
*Bromus inermis* ssp. *pumpellianus*  
*Calamagrostis purpurascens*

*Carex aquatilis*  
*Cnidium cnidiifolium*  
*Deschampsia cespitosa*  
*Dupontia fisheri*  
*Elymus alaskanus*  
*Festuca rubra*  
*Hedysarum alpinum*  
*Hedysarum boreale* ssp. *mackenziei*

*Leymus innovatus*  
*Leymus mollis*  
*Lupinus arcticus*  
*Oxytropis borealis*  
*Oxytropis campestris*

*Oxytropis deflexa*  
*Poa alpina*  
*Poa arctica*  
*Poa glauca*  
*Trisetum spicatum*

**PMC cultivar available commercially:**

*Poa glauca* ('Tundra' glaucus bluegrass)

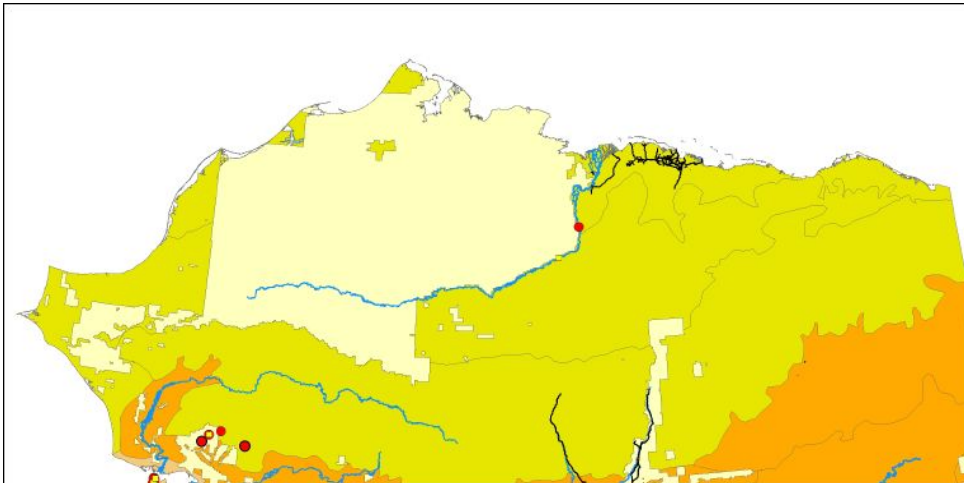
The origin of the seed for this cultivar was the Sagavanirktok River. Availability is 'fair.'

**PMC germplasm base available:**

*Oxytropis deflexa* (Nodding Locoweed- Franklin Bluffs Germplasm)

This plant has been released for commercial seed production as 'Selected Class Pre-certified Germplasm' seed. Currently, availability is poor.

**SOS collections made so far:**



Very few collections have been made in this zone. The Dalton Highway- not completely shown on the map- is the only extensive road system in the entire area (except for the restricted roads within the Prudhoe Bay-Colville Delta petroleum extraction region). Most access is by fixed wing or helicopter. Twelve collections of twelve different taxa have been made to date, nine of these totaling more than 10,000 seeds. Meyers, Cole and Yokel made collections in the Squirrel River area northeast of Kotzebue and near Umiat

in 2002 and 2004. Duffy, Fulkerson and Heitz made several collections in the upper reaches of Timber Creek, north of the Squirrel River, and the mountains west of the headwaters of the Squirrel River in 2012

*Anemone narcissiflora* var. *monantha*  
*Arnica lessingii*  
*Artemisia arctica*  
***Bromus inermis* ssp. *pumpellianus***  
***Boykinia richardsonii***  
*Carex podocarpa*  
*Galium boreale*  
***Hedysarum alpinum***  
*Sanguisorba officinalis*

The following collections totaled less than 10,000 seeds- less than the minimum called for by SOS protocol, but sufficient for other projects within the zone.

*Astragalus australis*  
*Lagotis minor*  
***Lupinus arcticus***

#### **Location and availability of seeds collected in this zone:**

The early collections were part of the Millennium Seed Project and the seeds were sent to Kew. Some of these may have been returned to the US. The 2012 collections are currently at PMC. Contact PMC and Pullman for details.

#### **Workhorse taxa not yet collected in the Arctic Seed Zone**

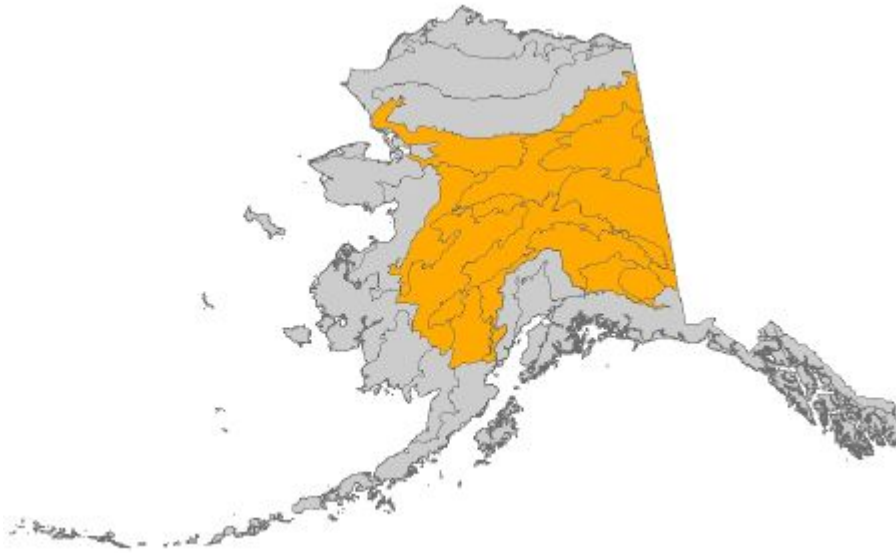
<i>Achillea millefolium</i> var. <i>borealis</i>	<i>Hedysarum alpinum</i>
<i>Calamagrostis canadensis</i>	<i>Hedysarum boreale</i> ssp. <i>mackenziei</i>
<i>Festuca altaica</i>	<i>Leymus innovatus</i>
<i>Arctagrostis latifolia</i>	<i>Leymus mollis</i>
<i>Artemisia tilesii</i>	<i>Lupinus arcticus</i> *
<i>Calamagrostis purpurascens</i>	<i>Oxytropis borealis</i>
<i>Carex aquatilis</i>	<i>Oxytropis campestris</i>
<i>Cnidium cnidiifolium</i>	<i>Oxytropis deflexa</i>
<i>Deschampsia cespitosa</i>	<i>Poa alpina</i>
<i>Dupontia fisheri</i>	<i>Poa arctica</i>
<i>Elymus alaskanus</i>	<i>Poa glauca</i>
<i>Festuca rubra</i>	<i>Trisetum spicatum</i>

Plants marked with an asterisk have been collected in the Arctic Zone, but amounted to fewer than 10,000 seeds.

**Recommended Geographic locations for future seed collections:**

Throughout the National Petroleum Reserve, along the Dalton Highway, and in the area of the Red Dog Mine. Partnerships could be created with the National Park Service, the University of Alaska Fairbanks/Toolik Lake Research Station, and the North Slope Borough as well as Regional and Village Corporations.

## Interior Alaska Seed Zone



The Interior Seed Zone encompasses the central portion of the state. It extends south from the Brooks Range, west from the border of the Yukon Territory, east from the Nulato Hills, and north of the Alaska Range. The Copper Basin, though a transition zone, has strong affinities to the central part of the state. It is included in the Interior Zone with the eastern Talkeetnas. The forested valleys of the Noatak, Squirrel and Kobuk Rivers, though surrounded by the Arctic and Western Seed Zones, are part of the Interior Zone.

The Interior Seed Zone includes the following ecoregions from the Intermontane Boreal, Alaska Range Transition and Coast Mountains Transition Ecoregion Groups: B1 Kluane Range, B2 Ray Mountains, the northern section of B3 Alaska Range, B4 Lime Hills, B6 Yukon-Old Crow Basin, B7 Yukon River Lowlands, B8 Copper River Basin, B9 Wrangell Mountains, B10 Tanana-Kuskokwim Lowlands, B11 Kuskokwim Mountains, B12 Kobuk Ridges and Valleys, B13 Yukon-Tanana Uplands, B14 Davidson Mountains and B15 North Ogilvie Mountains.

BLM has large units of land around the Dalton, the Richardson and the Steese Highways, as well as substantial acreage in the northeast, northwest and southwest portions of this seed zone. BLM manages several Wild and Scenic Rivers in this zone, notably the Gulkana and Forty Mile. BLM holdings are managed for a wide variety of activities, from mineral extraction like the Nixon Fork Mine to recreation and conservation.

Most SOS seed collections have come from the Interior Zone. Because of the road system, much of the central and eastern portion of the state is fairly accessible.



### Workhorse species appropriate to the Interior Seed Zone:

<i>Achillea millefolium</i> var. <i>borealis</i>	<i>Elymus alaskanus</i>
<i>Achillea sibirica</i>	<i>Festuca altaica</i>
<i>Agrostis mertensii</i>	<i>Festuca rubra</i>
<i>Agrostis scabra</i>	<i>Hedysarum alpinum</i>
<i>Angelica lucida</i>	<i>Hedysarum boreale</i> ssp. <i>mackenziei</i>
<i>Arctagrostis latifolia</i>	<i>Heracleum maximum</i>
<i>Artemisia tilesii</i>	<i>Iris setosa</i>
<i>Astragalus americanus</i>	<i>Leymus innovatus</i>
<i>Astragalus williamsii</i>	<i>Linum lewisii</i>
<i>Beckmannia syzigachne</i>	<i>Lupinus arcticus</i>
<i>Boykinia richardsonii</i>	<i>Oxytropis borealis</i>
<i>Bromus inermis</i> ssp. <i>pumpellianus</i>	<i>Oxytropis campestris</i>
<i>Calamagrostis canadensis</i>	<i>Oxytropis deflexa</i>
<i>Calamagrostis purpurascens</i>	<i>Phleum alpinum</i>
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	<i>Poa alpina</i>
<i>Carex aquatilis</i>	<i>Poa arctica</i>
<i>Carex praticola</i>	<i>Poa glauca</i>
<i>Cnidium cnidiifolium</i>	<i>Polygonum alpinum</i>
<i>Deschampsia cespitosa</i>	<i>Trisetum spicatum</i>

### PMC cultivars available commercially:

*Beckmannia syzigachne* ('Egan' American sloughgrass)  
*Elymus trachycaulus* (slender wheatgrass- Wainright germplasm)

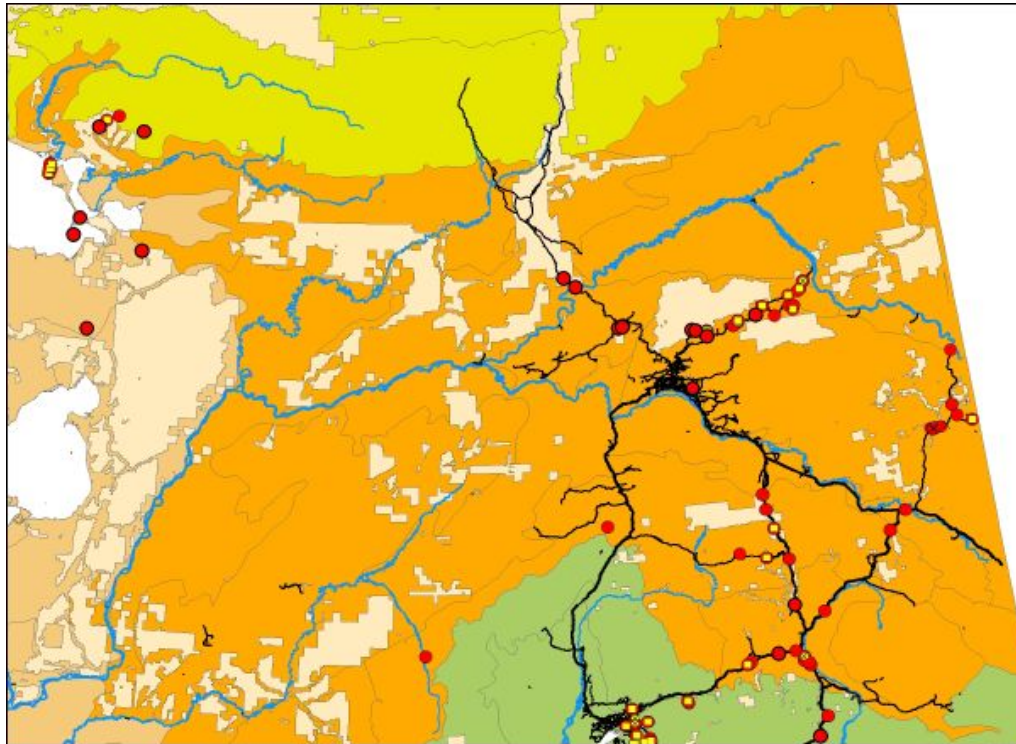
These are commercially available cultivars, both originating in the Fairbanks area. Availability is 'good' for the sloughgrass and 'excellent' for the wheatgrass. There are two additional cultivars available: *Arctagrostis latifolia* ('Alyeska' polargrass) and *Calamagrostis canadensis* ('Sourdough' bluejoint reedgrass), but note that these were derived from plants collected in more than one zone (the polargrass in the interior and western zones, and the bluejoint reedgrass in western, interior and south central) and do not fit SOS guidelines.

### PMC germplasm bases available:

*Cnidium cnidiifolium* (Jakutsk snow parseley- Tok Germplasm)  
*Elymus macrourus* (Tufted wheatgrass- Slana Germplasm)  
*Hedysarum alpinum* (Alpine sweetvetch- Paxson Germplasm)  
*Leymus innovatus* (Downy wildrye- Cantwell Germplasm)  
*Oxytropis campestris* (Field oxytrope- Black Rapids Germplasm)  
*Potentilla bimundorum* (Staghorn cinquefoil- Mentasta Germplasm)  
*Trisetum spicatum* (Spike trisetum- Nelchina Germplasm)

These plants have been released for commercial seed production as ‘Selected Class Pre-certified Germplasm’ seed. Currently, availability is poor for all taxa.

### SOS collections made to date in the Interior Seed Zone:



Many BLM and AKNHP staff members and interns from the Chicago Botanical Garden, made the collections from 2009 to 2012. A complete list of collectors is found in the introduction. Major collecting trips were conducted along the southern Dalton Highway, the West Fork of the Tolovana area, the Steese Highway from the Nome Creek area to just west of Circle, in the Alaska Range along the Richardson and eastern Denali Highways, the Chicken and Eagle areas, Tok, and the Copper Basin.

The following 209 collections, representing 133 taxa, have been made in the Interior Seed Zone. 154 of these collections totaled well above the 10,000 seeds required by the national SOS protocol requirements and are listed below. Some taxa were collected in more than one location or season (the number of collections is in parenthesis). Workhorse species are in **bold**:

*Achillea sibirica* (3)  
*Agrostis mertensii*  
*Agrostis scabra*  
*Alnus incana* ssp. *tenuifolia*

*Alopecurus aequalis* var. *aequalis*  
*Androsace septentrionalis* (2)  
*Anemone multifida* var. *multifida* (2)  
*Anemone narcissiflora* var. *monantha*

*Arabis holboellii* var. *retrofracta* (2)  
***Arctagrostis latifolia***  
     *ssp. arundinacea* (3)  
*Arctophila fulva*  
*Artemisia campestris* ssp. *borealis*  
***Astragalus americanus***  
*Astragalus sealei*  
***Astragalus williamsii***  
*Barbarea orthoceras*  
***Beckmannia syzigachne* (3)**  
*Betula glandulosa*  
***Calamagrostis canadensis* (4)**  
***Calamagrostis purpurascens* (2)**  
*Campanula aurita*  
*Campanula lasiocarpa* (2)  
*Carex arcta*  
*Carex atratiformis*  
*Carex aurea*  
*Carex diandra*  
*Carex krausei*  
*Carex membranacea*  
*Carex norvegica* ssp. *inferalpina* (2)  
*Carex pachystachya*  
***Carex praticola* (2)**  
*Carex saxatilis* ssp. *laxa*  
*Carex stylosa*  
*Carex utriculata*  
*Castilleja caudata*  
*Chamerion angustifolium*  
     *ssp. angustifolium* (4)  
*Chamerion latifolium*  
***Cnidium cniidifolium***  
*Cornus sericea*  
*Danthonia intermedia*  
*Delphinium glaucum*  
***Deschampsia cespitosa***  
*Dodecatheon frigidum*  
*Dracocephalum parviflorum*  
*Dryas drummondii* (4)  
*Dryas integrifolia* ssp. *integrifolia* (2)  
*Epilobium ciliatum* ssp. *ciliatum* (2)  
*Erigeron acris* ssp. *kamtschaticus* (3)  
*Erigeron lonchophyllus*  
*Erigeron purpuratus*  
*Eriophorum scheuchzeri*  
*Euphrasia disjuncta*

***Festuca altaica* (2)**  
***Festuca rubra***  
*Gentianella propinqua* (2)  
*Gentianopsis detonsis* ssp. *yukonensis*  
*Geum macrophyllum* var. *perincisum*  
*Glyceria grandis* ssp. *grandis*  
***Hedysarum alpinum* (2)**  
***Hedysarum boreale* ssp. *mackenziei***  
***Heracleum maximum***  
***Iris setosa* var. *interior***  
*Juncus alpinoarticulatus*  
*Juncus bufonius* var. *bufonius*  
*Juncus castaneus* (2)  
*Juncus filiformis* (2)  
*Ledum groenlandicum*  
*Ledum palustre* ssp. *decumbens*  
***Linum lewisii* var. *lewisii***  
*Luzula parviflora* (2)  
*Moneses uniflora*  
***Oxytropis campestris* (3)**  
***Oxytropis deflexa* var. *sericea* (2)**  
*Packera pauciflora*  
*Papaver nudicaule* ssp. *americanum*  
*Parnassia palustris* (3)  
*Penstemon gormanii* (2)  
*Phacelia mollis*  
***Poa alpina* (2)**  
***Poa glauca***  
***Polygonum alpinum* (4)**  
*Potentilla bimundorum* (2)  
*Potentilla norvegica*  
*Potentilla norvegica*  
     ssp. *monspeliensis* (2)  
*Potentilla pensylvanica* var.  
*pensylvanica* (2)  
*Pulsatilla patens* ssp. *multifida*  
*Pyrola asarifolia* ssp. *asarifolia*  
*Pyrola minor*  
*Rhinanthus minor* ssp. *borealis* (2)  
*Rhododendron lapponicum*  
*Saxifraga hieracifolia*  
*Saxifraga tricuspidata*  
*Senecio congestus* (2)  
*Silene menziesii* ssp. *williamsii*  
*Silene taimyrensis* (2)  
*Solidago simplex* ssp. *simplex* var. *nana*

*Spiraea stevenii*  
*Tanacetum bipinnatum* ssp. *huronense*  
*Tofieldia coccinea*  
*Tofieldia pusilla* (2)  
*Trichophorum alpinum*

*Typha latifolia*  
*Veronica americana*  
*Veronica wormskjoldii* var. *wormskjoldii*  
*Wilhelmsia physodes*

Forty-nine collections made in the Interior Zone totaled less than 10,000 seeds, too few to fit SOS protocol requirements, but still useful for projects within the state. These are listed below. Some taxa were collected in more than one location or season (the number of collections is in parenthesis). Workhorse species are in **bold**:

***Achillea sibirica***  
*Anemone multifida* var. *multifida*  
*Artemisia frigida*  
*Carex saxatilis*  
*Dasiphora fruticosa* ssp. *floribunda*  
*Galium boreale*  
*Aconitum delphiniifolium*  
    ssp. *delphiniifolium*  
*Anemone narcissiflora* var. *monantha*  
*Anthoxanthum monticola*  
    ssp. *alpinum* (2)  
***Arctagrostis latifolia* ssp. *arundinacea***  
*Arnica angustifolia* ssp. *angustifolia*  
*Astragalus alpinus* var. *alpinus* (2)  
***Calamagrostis canadensis***  
    **var. *langsdorffii* (2)**  
***Calamagrostis purpurascens***  
    **var. *purpurascens* (2)**  
*Carex diandra*  
*Carex norvegica* ssp. *inferalpina*  
*Carex podocarpa*  
*Carex scirpoidea*  
*Castilleja caudata*  
*Chamerion angustifolium*  
    ssp. *angustifolium*  
*Chamerion latifolium*  
*Crepis elegans*

*Delphinium glaucum*  
*Dryas octopetala* ssp. *alaskensis*  
*Dryas octopetala* ssp. *octopetala*  
*Erigeron acris* ssp. *kamtschaticus* (2)  
*Eurybia sibirica*  
***Festuca altaica***  
*Galium boreale*  
***Hedysarum alpinum***  
*Hierochloa odorata*  
***Lupinus arcticus***  
*Luzula parviflora*  
*Parrya nudicaulis*  
*Pedicularis sudetica* s.l. (ssp. *interior*?)  
*Polemonium acutiflorum*  
*Polemonium pulcherrimum*  
*Potentilla hookeriana* ssp. *hookeriana*  
*Pseudoroegneria spicata* ssp. *spicata*  
*Saussurea angustifolia*  
    var. *angustifolia* (2)  
*Saxifraga tricuspidata*  
*Senecio lugens*  
*Solidago multiradiata* (2)  
*Stellaria calycantha*  
*Taraxacum officinale* ssp. *ceratophorum*  
***Trisetum spicatum***  
*Veronica wormskjoldii* var. *wormskjoldii*  
*Viola langsdorffii*

(Six collections were made where the resulting seeds were not viable, or were lost or damaged. Although the seeds are not available, the data remain and the sites can be revisited to obtain new collections: *Achillea sibirica*, *Anemone multifida* var. *multifida*, *Artemisia frigida*, *Carex saxatilis*, *Dasiphora fruticosa* ssp. *floribunda*, and *Galium boreale*. The *Anemone* population was collected again the following season, and *Achillea*

*sibirica* has been collected several other times in the Interior Zone. Additionally, *Geum macrophyllum* var. *perincisum* was collected near Chicken; the seeds were numerous and viable, but were collected from fewer than 50 plants.)

### **Location and availability of seeds collected in this zone:**

The collections made in 2009 and 2010 are stored at Pullman (with small samples of some of these collections retained at PMC). 2011 and 2012 collections are at PMC. Contact PMC and Pullman for details. Note that *Agrostis mertensii*, *Agrostis scabra* and *Poa alpina* from Nome Creek have been increased by PMC in 2011 and 2012.

### **Workhorse taxa not yet collected in the Interior Seed Zone**

<i>Achillea millefolium</i> var. <i>borealis</i>	<i>Leymus innovatus</i>
<i>Angelica lucida</i>	<i>Lupinus arcticus</i> *
<i>Artemisia tilesii</i>	<i>Oxytropis borealis</i>
<i>Boykinia richardsonii</i>	<i>Phleum alpinum</i>
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	<i>Poa arctica</i>
<i>Carex aquatilis</i>	<i>Trisetum spicatum</i> *
<i>Elymus alaskanus</i>	

*Achillea millefolium* var. *borealis* is abundant in the Interior Zone, but the national SOS program asked teams not to collect it in recent years since they felt it had been over-collected. This isn't the case for Alaska populations, and it should be collected in as many parts of the state as possible in future seasons. The plants marked with an asterisk have been collected in the Interior Zone, but the collections totaled less than 10,000 seeds and should be collected again. Consult the database for specific information on the collection locations.

### **Recommended Geographic locations for future seed collections in the Interior Seed Zone:**

BLM lands lying beyond the easy reach of the highway system, especially in the western half of the Interior Seed Zone, have not been collected in. Projects in the western half of the zone include the Donlin Pipeline project and the Nixon Fork Mine. These areas should be high priority collecting sites. It should be noted, however, that seed collection costs would be higher in these areas than in previous trips due to remoteness and logistical challenges. Partnerships with both the Nixon Fork mine and the Donlin project would be beneficial in addressing logistical issues. Additional partners could include the National Park Service, US Fish and Wildlife Service, Forts Wainwright and Greely and Eielson Airforce Base, Alaska State Forests and Parks, the Denali, Fairbanks-North Star and part of the Northwest Arctic Boroughs, and Regional and Village Corporations.

## West Alaska Seed Zone



The Western Seed Zone is the home of the AK025 collecting team. It includes the Baldwin and Seward Peninsulas and the coastal area south through the Yukon-Kuskokwim Delta to a small portion of the Bristol Bay shoreline of the Alaska Peninsula, where it borders the Southwest Seed Zone. It borders a small portion of the Arctic Seed Zone in the north. It borders the Interior Seed Zone on the east and north. It is bounded on the west by the Bering Sea and includes the islands of St. Lawrence, St. Matthew, Nunivak, and the Pribilofs.

The Western Seed Zone includes the all the ecoregions of the Bering Tundra and Bering Taiga Ecoregion Groups: P2 Nulato Hills, P4 Seward Peninsula, P5 Kotzebue Sound Lowlands, P6 Bristol Bay Lowlands, P7 Bering Sea Islands, P8 Yukon-Kuskokwim Delta and P10 Ahklun Mountains.

BLM management areas include rangelands on the Seward Peninsula, large areas north and south of the Nulato Hills and smaller units in the southern part of the zone. Activities include large mineral extraction projects such as the X/S Platinum Mine, reindeer herding, recreation along wild and scenic rivers east of Unalakleet and the Iditarod Trail.

### Workhorse species appropriate to the Western Seed Zone:

*Achillea millefolium* var. *borealis*

*Agrostis mertensii*

*Agrostis scabra*

*Angelica lucida*

*Arctagrostis latifolia*

*Artemisia tilesii*

*Boykinia richardsonii*

*Bromus inermis* ssp. *pumpellianus*

*Calamagrostis canadensis*  
*Calamagrostis purpurascens*  
*Calamagrostis stricta* ssp. *inexpansa*  
*Carex aquatilis*  
*Carex aquatilis* var. *dives*  
*Carex lyngbyei*  
*Cnidium cnidiifolium*  
*Deschampsia cespitosa*  
*Dupontia fisheri*  
*Elymus alaskanus*  
*Festuca altaica*  
*Festuca rubra*  
*Hedysarum alpinum*  
*Hedysarum boreale* ssp. *mackenziei*

*Heracleum maximum*  
*Iris setosa*  
*Leymus mollis*  
*Ligusticum scoticum*  
*Lupinus arcticus*  
*Lupinus nootkatensis*  
*Oxytropis borealis*  
*Phleum alpinum*  
*Poa alpina*  
*Poa arctica*  
*Poa glauca*  
*Polygonum alpinum*  
*Rhinanthus minor*  
*Trisetum spicatum*

### **PMC cultivars available commercially:**

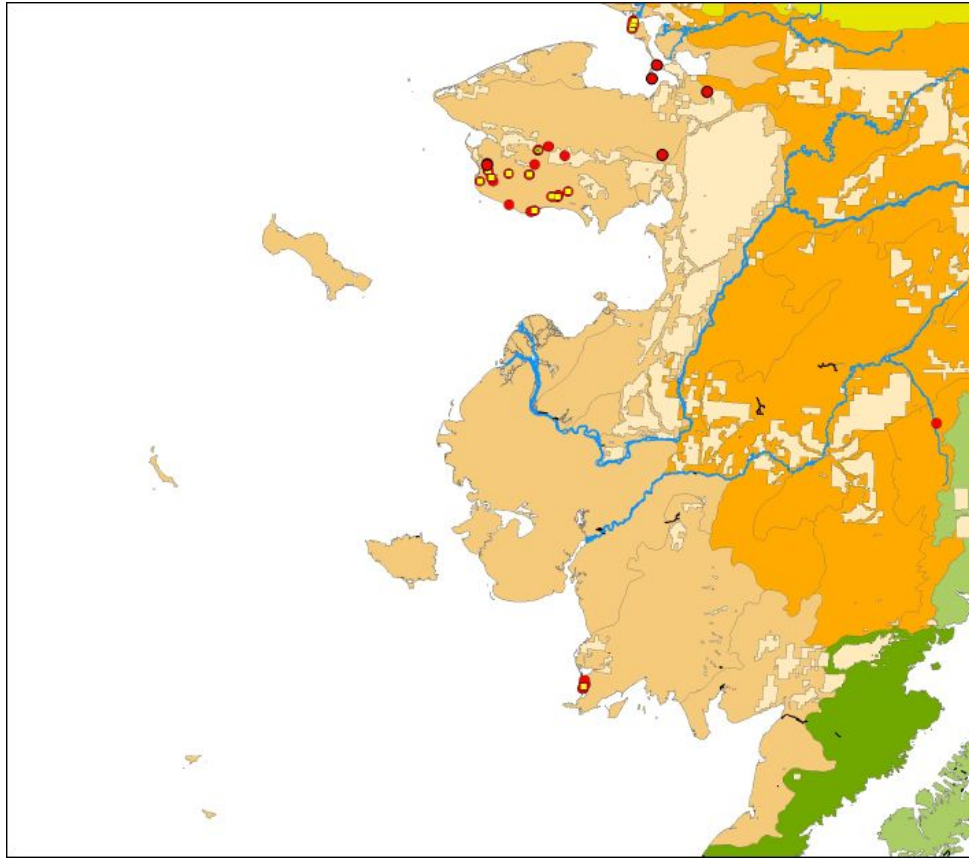
Currently there are no commercially available cultivars that originated wholly in the West Alaska Seed Zone. Two cultivars were derived from plants collected in different seed zones- *Arctagrostis latifolia* ('Alyeska' polargrass) from the interior and western zones, and *Calamagrostis canadensis* ('Sourdough' bluejoint reedgrass) from interior, western and south central. Since they were developed from populations in different zones, they do not conform to SOS guidelines.

### **PMC germplasm bases available:**

*Chamerion latifolium* (Dwarf Fireweed- Kobuk Germplasm)  
*Elymus macrourus* (Thickspike wheatgrass- Solomon Germplasm)  
*Festuca viviparoidea* (Viviparous fescue- Safety Germplasm)  
*Poa alpina* (Alpine bluegrass- Teller Germplasm)  
*Poa arctica* (Arctic bluegrass- Council Germplasm)  
*Poa arctica*, viviparous form (Arctic bluegrass- Tin City Germplasm)  
*Poa eminens* (Largeflower speargrass- Port Clarence Germplasm)  
*Poa glauca* (Glaucus bluegrass- Nome Germplasm)  
*Tripleurospermum maritima* (Arctic wild chamomile- Kotzebue Germplasm)

These plants have been released for commercial seed production as 'Selected Class Pre-certified Germplasm' seed. Currently, availability is poor for all taxa (they are not available commercially).

## SOS collections made to date in the Western Seed Zone:



Previous collections include Randy Meyers et al in the Kotzebue area, and Debbie Blank, Carolyn Parker and others in the Seward Peninsula area from 2002-2006. In 2010, Mike Duffy, Kelly Walton and CBG interns Jordan Schoonover, Dan Brickley, Chrissy Balk and Vanya Chan collected along the road system out of Nome. In 2011, Duffy and CBG interns Emily Capelin and Alissa Epstein collected in the Platinum area, near Goodnews Bay.

147 collections of 111 taxa have been made in the Western Zone. Eighty-one of the collections had more than 10,00 seeds (the total amount for many of the 2002-2006 collections is unknown). Some plants were collected in more than one location or season (the number of collections are in parenthesis); workhorse species are in **bold**:

*Agrostis scabra*

*Angelica lucida* (2)

*Arabis kamchatica*

*Arctagrostis latifolia* ssp. *arundinacea*

*Argentina egedii* ssp. *groenlandica*

*Artemisia tilesii*

*Artemisia tilesii* ssp. *elatior*

*Barbarea orthoceras* (2)

***Boykinia richardsonii***

*Calamagrostis canadensis* (3)

*Calamagrostis purpurascens*

*Campanula lasiocarpa*



*Carex gmelinii*  
*Carex lachenalii*  
*Carex saxatilis*  
*Chamerion angustifolium* ssp.  
     *angustifolium*  
*Chamerion latifolium* (2)  
*Chrysanthemum arcticum*  
***Cnidium cnidiifolium***  
*Comarum palustre* (2)  
***Deschampsia cespitosa* (2)**  
*Dryas octopetala* ssp. *octopetala*  
*Epilobium ciliatum* ssp. *ciliatum*  
*Erigeron humilis*  
*Eriophorum angustifolium* ssp.  
     *angustifolium*  
*Eriophorum scheuchzeri*  
***Festuca rubra* ssp. *arctica***  
*Gentianella propinqua* ssp. *propinqua*  
***Heracleum maximum***  
*Honckenya peploides* ssp. *diffusa*  
*Juncus arcticus*  
*Juncus arcticus* ssp. *littoralis* (2)  
*Juncus castaneus* (2)  
*Lathyrus japonicus* var. *maritimus*  
***Leymus mollis***  
***Leymus mollis* ssp. *villosissimus***  
***Ligusticum scoticum* ssp. *hultenii***  
*Loiseleuria procumbens*  
*Luzula multiflora*

*Luzula multiflora* ssp. *frigida*  
*Parnassia kotzebuei* (2)  
*Parnassia palustris* (2)  
*Pedicularis langsдорфii*  
*Pedicularis verticillata*  
*Petasites frigidus* var. *frigidus*  
***Poa alpina***  
*Poa eminens* (2)  
*Polemonium acutiflorum* (3)  
*Potentilla villosa*  
*Primula borealis*  
*Rhinanthus minor*  
*Rhodiola integrifolia* ssp. *integrifolia*  
*Rhododendron camtschaticum* ssp.  
     *glandulosum*  
*Rorippa palustris* ssp. *palustris*  
*Rumex arcticus* (2)  
*Saxifraga oppositifolia* ssp. *smalliana*  
*Senecio congestus*  
*Senecio lugens*  
*Senecio pseudoarnica*  
*Spiraea stevenii* (2)  
*Tofieldia coccinea*  
*Tripleurospermum maritima* ssp.  
     *phaeocephala*  
***Trisetum spicatum***  
*Vahlodea atropurpurea*  
*Wilhelmsia physodes*

Sixty-five collections totaled less than 10,000 seeds. Many of these are from 2002-2006, and the number of seeds in these collections is unknown. As in other seed zones, these collections can still be used for other projects.

***Agrostis mertensii***  
*Alopecurus alpinus*  
*Anemone parviflora*  
*Anemone richardsonii*  
*Antennaria alpina*  
*Anthoxanthum monticola* ssp. *alpinum*  
***Arctagrostis latifolia* ssp. *arundinacea***  
***Arctagrostis latifolia* ssp. *latifolia***  
*Argentina egedii* ssp. *groenlandica*  
*Armeria maritima* ssp. *sibirica*  
*Arnica lessingii*

*Artemisia arctica* (2)  
*Astragalus alpinus*  
*Astragalus umbellatus*  
*Betula nana*  
***Bromus inermis* ssp. *pumpellianus***  
*Cardamine bellidifolia* var. *bellidifolia*  
***Carex aquatilis* var. *aquatilis***  
*Carex bigelowii*  
*Carex chordorrhiza*  
*Carex gmelinii*  
*Carex mackenziei*

*Carex membranacea*  
*Carex podocarpa*  
*Carex rotundata*  
*Cerastium beeringianum* var.  
     *grandiflorum*  
*Chamerion angustifolium* ssp.  
     *circumvagum*  
*Dryas integrifolia*  
*Dryas integrifolia* ssp. *integrifolia*  
*Dryas octopetala* ssp. *alaskensis*  
*Eriophorum chamissonis*  
*Eurybia sibirica*  
*Eurybia sibirica*  
***Festuca altaica***  
*Galium boreale*  
*Gentiana glauca*  
*Hierochloa odorata*  
*Honckenya peploides*  
*Hulteniella integrifolia*  
***Iris setosa* var. *setosa***  
*Juncus triglumis*  
*Lathyrus japonicus* var. *maritimus*  
***Leymus mollis***

***Leymus mollis* ssp. *villosissimus***  
***Ligusticum scoticum* ssp. *hultenii***  
*Lloydia serotina* var. *serotina*  
***Lupinus nootkatensis***  
*Luzula wahlenbergii*  
*Minuartia arctica*  
*Oxytropis arctica* var. *koyukukensis*  
*Papaver macounii* ssp. *discolor*  
*Parrya nudicaulis*  
*Primula tschuktschorum*  
*Rhodiola integrifolia* ssp. *integrifolia*  
*Rhododendron camtschaticum* ssp.  
     *glandulosum*  
*Rumex arcticus*  
*Saussurea nuda*  
*Saxifraga tricuspidata*  
*Sibbaldia procumbens*  
*Silene acaulis*  
*Silene acaulis* var. *subacaulescens*  
*Solidago multiradiata*  
*Taraxacum officinale* ssp. *ceratophorum*  
***Trisetum spicatum***

(One additional collection of *Calamagrostis purpurascens* was made but the seeds were not viable)

### Location and availability of seeds collected in this zone:

Collections from 2002-2006 went to Kew, but some of these were returned to the US. The collections made in 2009 and 2010 are stored at Pullman (with small samples of some of these collections retained at PMC). The 2011 and 2012 collections are at PMC. Contact PMC and Pullman for details. Note that *Deschampsia cespitosa*, *Leymus mollis* and *Trisetum spicatum* from Platinum have been increased by PMC in 2012.

### Workhorse taxa not yet collected in the Western Seed Zone

*Achillea millefolium* var. *borealis*  
*Agrostis mertensii*\*  
*Bromus inermis* ssp. *pumpellianus*\*  
*Calamagrostis stricta* ssp. *inexpansa*  
*Carex aquatilis*\*  
*Carex aquatilis* var. *dives*  
*Carex lyngbyei*

*Cnidium cnidiifolium*  
*Dupontia fisheri*  
*Elymus alakanus*  
*Festuca altaica*\*  
*Hedysarum alpinum*  
*Hedysarum boreale* ssp. *mackenziei*  
*Iris setosa*\*

*Lupinus arcticus*  
*Lupinus nootkatensis*\*  
*Oxytropis borealis*  
*Phleum alpinum*

*Poa arctica*  
*Poa glauca*  
*Polygonum alpinum*

(Plants marked with an asterisk have been collected in the Western Zone but in quantities less than 10,000 seeds.)

**Recommended Geographic locations for future seed collections:**

Two productive collecting trips have been made at Platinum. Some of these collections are currently being increased at PMC. XS-Platinum was not able to partner with us in 2012 but there are a number of additional species that could be collected there if a trip can be arranged. The next priority should be for collections in the Nulato Hills area. Additional partners could include the National Park Service, US Fish and Wildlife Service, Alaska State Parks, the Northwest Arctic, Bristol Bay and Lake and Peninsula Boroughs, as well as Regional and Village Corporations.

## Southwest Alaska Seed Zone



The Southwest Seed Zone begins in the Iliamna area and extends through the Alaska Peninsula to Attu, the westernmost island of the Aleutian chain. This zone contains both ecoregions in the Aleutian Meadows Ecoregion Group: M1 Aleutian Islands and M7 Alaska Peninsula. Note that a very strong floristic division exists between the Aleutians and the Alaska Peninsula. These could easily be considered separate seed zones. Although no collections have been made here and there are no immediate plans to collect, the region's unique flora and management issues indicate it would be beneficial to consult with regional experts to further refine the workhorse list and to suggest target priorities.

BLM has very little land along the Peninsula and in the Aleutians, but has holdings in the very northern part of this Seed Zone around Lake Iliamna. The Pebble Mine project is being developed just north of Lake Iliamna.

### **Workhorse species appropriate to the Southwestern Seed Zone:**

*Achillea millefolium* var. *borealis*  
*Agrostis exarata*  
*Agrostis mertensii*  
*Agrostis scabra*\*  
*Angelica lucida*  
*Arctagrostis latifolia*\*  
*Artemisia tilesii*  
*Calamagrostis canadensis*

*Calamagrostis stricta* ssp. *inexpansa*\*  
*Carex aquatilis*  
*Carex aquatilis* var. *dives*  
*Carex lyngbyei*  
*Carex macrochaeta*  
*Carex mertensii*\*  
*Deschampsia cespitosa*  
*Festuca altaica*\*

*Festuca rubra*  
*Heracleum maximum*  
*Hordeum brachyantherum*  
*Iris setosa*  
*Leymus mollis*  
*Ligusticum scoticum*

*Lupinus nootkatensis*  
*Phleum alpinum*  
*Poa arctica*  
*Poa glauca\**  
*Rhinanthus minor*  
*Trisetum spicatum*

\* Plants marked with an asterisk have little or no natural distribution in the Aleutians.

### **PMC cultivars available commercially:**

Currently there are no commercially available cultivars that originated in the Southwest Alaska Seed Zone.

### **PMC germplasm bases available:**

*Artemisia stelleriana* (Dusty Miller Artemisia- Shemya Germplasm)  
*Carex macrochaeta* (Longawn sedge- Attu Germplasm)  
*Festuca rubra* (Red fescue- Henderson Ridge Germplasm)  
*Ligusticum scoticum* (Beach lovage- Casco Cove Germplasm)  
*Poa arctica* (Arctic bluegrass- Adak Germplasm)  
*Poa macrocalyx* (Large-glume bluegrass- Andrew Bay Germplasm)  
*Senecio pseudoarnica* (Beach fleabane- Clam Lagoon Germplasm)

These plants have been released for commercial seed production as ‘Selected Class Pre-certified Germplasm’ seed. Currently, availability is poor for all taxa.

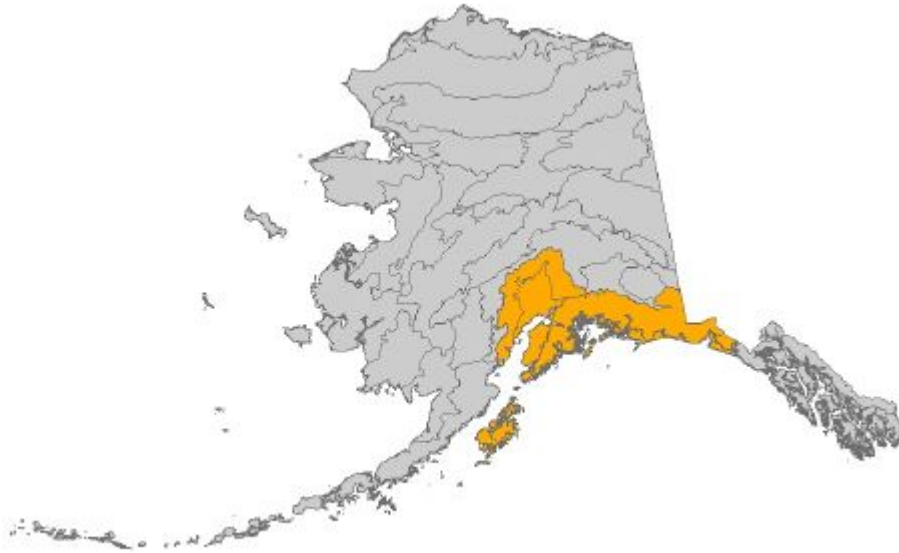
### **SOS collections made to date in the Southwestern Seed Zone:**

No collections have been made in the Southwest Zone.

### **Recommended Geographic locations for future seed collections:**

BLM manages very little land in the Southwest Seed Zone except for the area around Lake Iliamna, near the Pebble Mine Project. The zone has been given low priority due to the scarcity of BLM land. However, the extent of this proposed mine on nearby state land, and the national attention that it attracts, should greatly increase the priority of the Southwest Seed Zone. Additional partners in this zone could include the National Park Service, Alaska State Parks, the Boroughs of Aleutians East, Lake and Peninsula, Kodiak Island and Kenai Peninsula, Regional and Village Corporations, and especially the US Fish and Wildlife Service which manages (along with Regional and Village Corporations) almost all of the Aleutians.

## South Central Seed Zone



The South Central Seed Zone is bounded by the Alaska Range on the west and north, the eastern Talkeetna Mountains, the Copper Basin and the Chitina River. To the south is the Gulf of Alaska, and Kodiak is included in this zone. It is bordered by the Interior Seed Zone on the north, by a small portion of the Southwest Seed Zone on the west, and by Canada on the east. It extends through the Yakutat Forelands to the Alsek River where the Southeast Seed Zone begins.

The seed zone includes a portion of the Alaska Range Transition Ecoregion Group (the southern section of B3 Alaska Range and all of B5 Cook Inlet Basin) and a portion of the Coastal Ranforests Ecoregion Group (M3 Kodiak Island, almost all of M5 Gulf of Alaska Coast, and most of M6 Chugach-St. Elias Mountains).

The largest area of BLM land in this seed zone is in the Bering Glacier area. BLM also manages land on the west side of Cook inlet, small areas around Prince William Sound and land around the southern stretch of the Richardson Highway. The South Central Seed Zone is the base of operations for the AK930 and AK040 collecting teams.

### Workhorse species appropriate to the South Central Seed Zone:

*Achillea millefolium* var. *borealis*

*Agrostis exarata*

*Agrostis mertensii*

*Agrostis scabra*

*Angelica lucida*

*Arctagrostis latifolia*

*Artemisia tilesii*

*Beckmannia syzigachne*

*Calamagrostis canadensis*  
*Calamagrostis stricta* ssp. *inexpansa*  
*Carex aquatilis*  
*Carex aquatilis* var. *dives*  
*Carex lyngbyei*  
*Carex macrochaeta*  
*Carex mertensii*  
*Carex praticola*  
*Deschampsia cespitosa*  
*Elymus alaskanus*  
*Festuca altaica*  
*Festuca rubra*  
*Hedysarum alpinum*  
*Heracleum maximum*

*Hordeum brachyantherum*  
*Iris setosa*  
*Leymus mollis*  
*Ligusticum scoticum*  
*Lupinus nootkatensis*  
*Oxytropis campestris*  
*Oxytropis deflexa*  
*Phleum alpinum*  
*Poa alpina*  
*Poa arctica*  
*Poa glauca*  
*Rhinanthus minor*  
*Trisetum spicatum*

**PMC cultivars available commercially:**

*Arctagrostis latifolia* ('Kenai' polargrass)  
*Deschampsia beringensis* ('Norcoast' Bering hairgrass)  
*Festuca rubra* ('Arctared' red fescue)  
*Leymus mollis* ('Benson' beach wildrye)

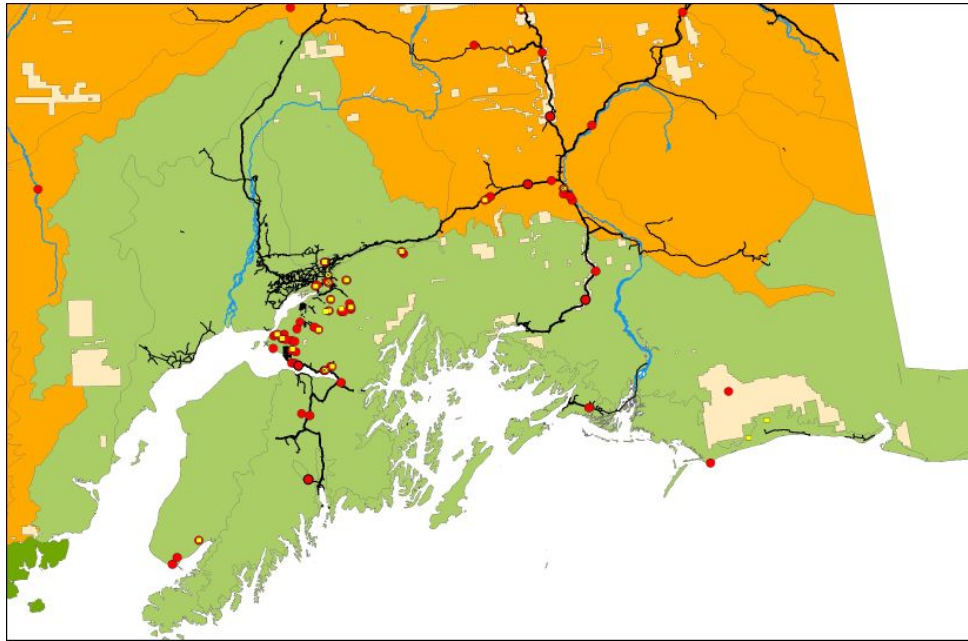
Availability is 'fair' for the polargrass, which originated in the Sterling Highway area, 'good' for the hairgrass which is from Cook Inlet, 'very good' for the fescue, originating in Palmer, and 'poor' for the beachrye which came from Kodiak. Note that two other cultivars have their origin in south central: *Artemisia tilesii* ('Caiggluk' Tilesius' wormwood) is derived from only one individual plant from Homer and does not conform to SOS guidelines; *Calamagrostis canadensis* ('Sourdough' bluejoint reedgrass) was derived from plants collected in three different zones- western, interior and south central.

**PMC germplasm bases available:**

*Achillea millefolium* (Boreal yarrow- Twenty Mile Germplasm)  
*Calamagrostis nutkaensis* (Nootka reedgrass- Pioneer Peak Germplasm)  
*Hordeum brachyantherum* (Meadow barley- Lowell Point Germplasm)  
*Iris setosa* (Wild iris- Knik Germplasm)  
*Polemonium pulcherrimum* (Beautiful Jacob's ladder- Butte Germplasm)  
*Puccinellia nutkatensis* (Nootka alkalaigrass- Ninilchik Germplasm)

These plants have been released for commercial seed production as 'Selected Class Pre-certified Germplasm' seed. Currently, availability is poor for all taxa.

## SOS collections made to date in the South Central Seed Zone:



Debbie Blank, Marilyn Barker and others have made collections in the Eklutna and Matanuska areas, Anchorage/Eagle River, and the Bering Glacier area from 2002-2006. AKNHP staff and interns have made collections in the Matanuska Valley, Anchorage/Eagle River, Turnagain Arm, the Exit Glacier, Homer and northern Kenai Peninsula areas from 2007-2011.

144 collections of 113 taxa have been made in the South Central Zone. Of these, 84 collections had more than 10,000 seeds. Some plants were collected in more than one location or season (the number of collections are in parenthesis); workhorse species are in **bold**:

*Alnus incana* ssp. *tenuifolia*  
*Amelanchier alnifolia*  
*Androsace septentrionalis*  
*Anemone multifida* var. *saxicola*  
***Angelica lucida***  
*Aquilegia formosa*  
***Artemisia tilesii***  
*Aruncus dioicus* var. *acuminatus*  
***Beckmannia syzigachne***  
*Betula nana*  
***Boykinia richardsonii***  
*Carex brunescens*  
*Carex canescens* ssp. *canescens*  
***Carex lyngbyei* (2)**

***Carex mertensii* (2)**  
*Carex pachystachya* (2)  
*Carex phaeocephala*  
*Carex pluriflora*  
*Castilleja unalaschcensis*  
*Cerastium arvense*  
*Chamerion angustifolium*  
*Chamerion angustifolium* ssp.  
*angustifolium*  
*Chamerion angustifolium* ssp.  
*circumvagum*  
*Chamerion latifolium* (2)  
*Chrysanthemum arcticum*  
*Crepis elegans*



*Draba aurea*  
*Dryas drummondii* (3)  
*Dryas octopetala* ssp. *octopetala*  
*Epilobium ciliatum* ssp. *glandulosum*  
*Epilobium palustre*  
*Erigeron peregrinus*  
*Erysimum inconspicuum*  
***Festuca altaica***  
*Fragaria chiloensis* ssp. *pacifica*  
*Fritillaria camschatcensis*  
*Gentianella amarella* ssp. *acuta*  
*Geum macrophyllum* var.  
     *macrophyllum* (2)  
*Harrimanella stelleriana*  
***Heracleum maximum* (3)**  
*Hieracium triste*  
*Honckenya peploides*  
*Juncus castaneus*  
*Juncus drummondii*  
*Juncus mertensianus*  
*Lathyrus palustris*  
***Leymus mollis* ssp. *mollis***  
*Luetkea pectinata*

***Lupinus nootkatensis***  
*Luzula parviflora* (2)  
*Mimulus guttatus*  
*Parnassia kotzebuei*  
*Parnassia palustris*  
***Phleum alpinum***  
*Phyllodoce glanduliflora*  
*Plantago canescens*  
*Potentilla pensylvanica* var. *litoralis*  
*Primula exima*  
***Rhinanthus minor* (2)**  
*Rhodiola integrifolia*  
*Sambucus racemosa*  
*Sanguisorba canadensis*  
*Saxifraga lyallii*  
*Saxifraga tricuspidata*  
*Sisyrinchium littorale*  
*Spiraea stevenii* (2)  
*Tellima grandiflora*  
*Veratrum viride* (2)  
*Viola adunca*  
*Zigadenus elegans*

Fifty-one collections totaled fewer than 10,000 seeds. As in other seeds zones, these small collections are still useful for local projects.

*Aconitum delphiniifolium* ssp.  
     *delphiniifolium*  
*Anemone narcissiflora*  
*Anemone parviflora*  
*Antennaria monocephala*  
*Anthoxanthum monticola* ssp. *alpinum*  
*Arnica lessingii* ssp. *lessingii*  
*Artemisia arctica* ssp. *arctica*  
***Calamagrostis canadensis***  
*Campanula rotundifolia*  
***Carex macrochaeta***  
*Carex magellanica* ssp. *irrigua*  
*Castilleja unalaschcensis*  
*Comarum palustre* (2)  
*Dryas drummondii* (2)  
*Dryas octopetala* ssp. *octopetala*  
*Elaeagnus commutata*  
*Epilobium lactiflorum*  
*Epilobium luteum*

*Eriophorum chamissonis*  
*Eriophorum vaginatum*  
*Gentiana glauca*  
*Gentianella propinqua*  
*Geum macrophyllum*  
*Geum rossii*  
***Hedysarum alpinum***  
*Honckenya peploides*  
***Hordeum brachyantherum***  
***Hordeum brachyantherum* ssp.**  
     ***brachyantherum***  
*Juncus alpinoarticulatus*  
***Lupinus nootkatensis***  
*Microseris borealis*  
*Oxyria digyna*  
***Oxytropis campestris***  
*Petasites frigidus* var. *frigidus*  
***Phleum alpinum***  
*Platanthera dilatata* sl.

*Potentilla drummondii* ssp. *drummondii*  
*Potentilla uniflora* sl.  
*Rosa acicularis*  
*Sanguisorba canadensis* (3)  
*Saxifraga bronchialis*  
*Saxifraga nelsoniana* ssp. *nelsoniana*

*Solidago multiradiata* var. *multiradiata*  
*Taraxacum phymatocarpum*  
*Valeriana sitchensis*  
*Veronica americana*  
*Veronica wormskjoldii*

(Note that several collections were lost or not viable, including *Alnus viridis* ssp. *sinuata*, *Calamagrostis canadensis*, *Eurybia sibirica*, *Elaeagnus commutata*, *Ledum palustre* ssp. *decumbens*, *Rumex aquaticus* var. *fenestratus*, *Sambucus racemosa*, *Senecio lugens*, *Thalictrum sparsiflorum*. The *Elaeagnus* was collected the following season, though totaling less than 10,000 seeds, and there is another collection of *Sambucus* from South Central.)

#### **Location and availability of seeds collected in this zone:**

Collections from 2002-2006 went to Kew, but some of these were returned to the US. The collections made in 2009 and 2010 are stored at Pullman (with small samples of some of these collections retained at PMC). 2011 collections are at PMC. Contact PMC and Pullman for details. Note that some collections from the Anchorage and Palmer areas have been planted in raised bed gardens by PMC.

#### **Workhorse taxa not yet collected in the South Central Seed Zone**

*Achillea millefolium* var. *borealis*  
*Agrostis exarata*  
*Agrostis mertensii*  
*Agrostis scabra*  
*Arctagrostis latifolia*  
*Calamagrostis canadensis*\*  
*Calamagrostis stricta* ssp. *inexpansa*  
*Carex aquatilis*  
*Carex aquatilis* var. *dives*  
*Carex macrochaeta*\*  
*Carex praticola*  
*Deschampsia cespitosa*

*Elymus alaskanus*  
*Festuca rubra*  
*Hedysarum alpinum*\*  
*Hordeum brachyantherum*\*  
*Iris setosa*  
*Ligusticum scoticum*  
*Oxytropis campestris*\*  
*Oxytropis deflexa*  
*Poa alpina*  
*Poa arctica*  
*Poa glauca*  
*Trisetum spicatum*

Plants marked with an asterisk have been collected in the South Central Zone but these totaled fewer than 10,000 seeds.

**Recommended Geographic locations for future seed collections:**

As the home of two collecting teams, many collections have been made in South Central. Most of these have been along the highway system. Only a few collections have been made in the area of the Bering Glacier. Compared to other parts of the state this seed zone might have a lower priority. Within the seed zone itself, priority should be given to more remote areas of BLM land like the Bering Glacier. Partnerships could be created with Chugach National Forest, the National Park Service, US Fish & Wildlife Service, Municipality of Anchorage, the Matanuska-Susitna, Kenai Peninsula, Kodiak Island and Yakutat Boroughs, as well as Regional and Village Corporations and Tongass National Forest, which manages the Yakutat Forelands. The forelands are similar to the Bering Glacier area in many ways, but are easier (and less costly) to access.

## Southeast Seed Zone



The Southeast Seed Zone encompasses the Alaska panhandle. Ecologically, it is very similar to South Central and the two are grouped together in the Unified Ecoregions map (the Coastal Rainforests Ecoregion Group), though floristically there are significant distinctions. Its boundaries are the Pacific Ocean and the Canadian border, and it borders with the South Central Seed Zone at the Alsek River. It includes very small portions of the M5 Gulf of Alaska Coast, a small portion of the M6 Chugach-St. Elias Mountains, all of the M2 Boundary Ranges and all of the M4 Alexander Archipelago.

BLM has very few holdings in southeast- one unit is situated between Haines and Skagway.

### Workhorse species appropriate to the Southeast Seed Zone:

*Achillea millefolium* var. *borealis*

*Agrostis exarata*

*Agrostis mertensii*

*Agrostis scabra*

*Angelica lucida*

*Arctagrostis latifolia*

*Artemisia tilesii*

*Calamagrostis canadensis*

*Carex aquatilis*

*Carex aquatilis* var. *dives*

*Carex lyngbyei*

*Carex macrochaeta*

*Carex mertensii*

*Deschampsia cespitosa*

*Festuca rubra*

*Heracleum maximum*

*Hordeum brachyantherum*

*Iris setosa*

*Leymus mollis*

*Ligusticum scoticum*

*Lupinus nootkatensis*

*Oxytropis campestris*

*Phleum alpinum*  
*Poa alpina*  
*Poa arctica*

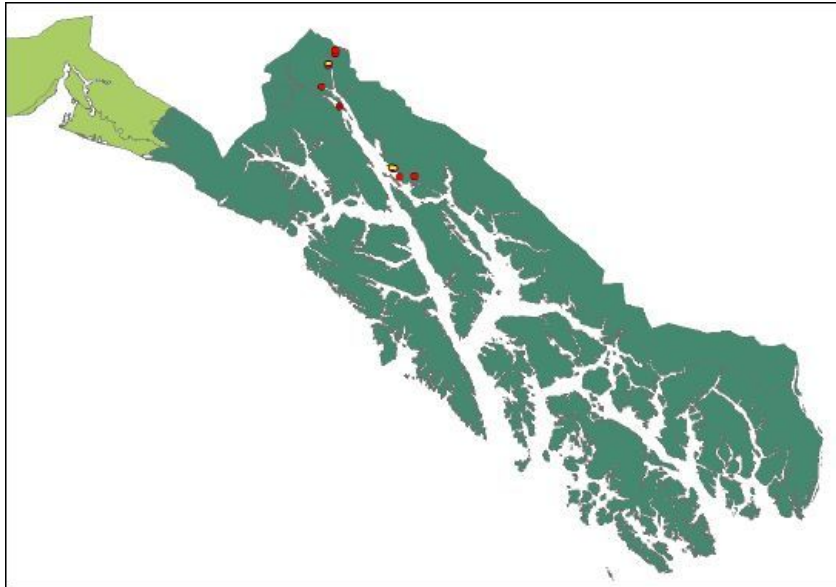
*Rhinanthus minor*  
*Trisetum spicatum*

(Note that *Arctagrostis latifolia* and *Oxytropis campestris* are good workhorse species, but have limited distribution in southeast.)

### PMC commercially available cultivars and germplasm bases:

Currently the PMC has no offerings of either cultivars or germplasm released for commercial seed production that derived from plants collected in the southeast. Descriptions of revegetation efforts in southeast are found in the Alaska Coastal Revegetation & Erosion Control Guide (Wright and Czapla, 2011). These projects used seeds developed in other seed zones as well as locally collected fresh material.

### SOS collections made to date in the Southeast Seed Zone:



Collections were made by Matt Carlson in 2007 in the Juneau and Douglass area, and in 2011 by Mike Duffy, Paul Krabacher, CBG interns Emily Capelin and Alyssa Epstein, and Klondike National Gold Rush technician Zachary Goodrich in the Haines, Skagway and Juneau areas.

Fifty collections have been made of 39 taxa. The following 39 had more than 10,000 seeds. Some were collected in more than one location (the number in parenthesis); workhorse species are in **bold**:

*Agrostis exarata*  
*Anaphalis margaritacea*  
*Arabis kamchatica*  
*Argentina egedii*  
*Aruncus dioicus* var. *acuminatus*  
*Barbarea orthoceras* (2)  
***Calamagrostis canadensis***  
*Carex gmelinii* (2)  
***Carex mertensii* (2)**  
*Castilleja unalaschcensis*  
*Chamerion angustifolium* (2)  
*Chamerion latifolium*  
*Dodecatheon pulchellum* (2)  
*Fritillaria camschatcensis* (2)

*Geum macrophyllum* (3)  
***Heracleum maximum* (2)**  
*Heuchra glabra*  
*Hierochloe odorata*  
***Iris setosa* (2)**  
***Leymus mollis***  
*Orthilia secunda*  
*Plantago macrocarpa*  
*Plantago maritima*  
*Pyrola asarifolia*  
***Rhinanthus minor* (2)**  
*Tellima grandiflora*  
*Trientalis europaea*  
*Trisetum canescens*

The following seven collections totaled fewer than 10,000 seeds. Though less than SOS standards, they can be used for local projects:

***Hordeum brachyantherum***  
*Lathyrus japonicus*  
***Lupinus nootkatensis***  
*Luzula multiflora*

*Parnassia palustris*  
*Prenanthes alata*  
*Symphyotrichum subspicatum*  
*Triglochin maritima*

Five collections (*Carex lyngbyei*, *Ledum groenlandicum*, *Nephrophyllidium crista-galli*, *Symphyotrichum subspicatum* and *Trichophorum caespitosum*) have gone missing. The data on these populations is in the database and can be used to relocate the populations and collect from them in the future.

### **Location and availability of seeds collected in this zone:**

Collections made in 2011 are at PMC. Contact them for details. A small number of our Skagway collections were donated to local groups.

### **Workhorse taxa not yet collected in the Southeast Seed Zone**

*Achillea millefolium* var. *borealis*  
*Agrostis mertensii*  
*Agrostis scabra*  
*Angelica lucida*  
*Arctagrostis latifolia*  
*Artemisia tilesii*  
*Carex aquatilis*  
*Carex aquatilis* var. *dives*

*Carex lyngbyei*\*  
*Carex macrochaeta*  
*Deschampsia cespitosa*  
*Festuca rubra*  
*Hordeum brachyantherum*\*  
*Ligusticum scoticum*  
*Lupinus nootkatensis*\*  
*Oxytropis campestris*

*Phleum alpinum*  
*Poa alpina*

*Poa arctica*  
*Trisetum spicatum*

(Note that the taxa marked with an asterisk have been collected in Southeast Zone, but in quantities less than 10,000 seeds, and should be collected again.)

**Recommended Geographic locations for future seed collections:**

The 2011 collections were made in the northern portions of southeast in areas close to the BLM land. However the BLM unit itself is not road accessible and no collections were made there. This unit could be the focus of future collection efforts, but since this unit is the only BLM land in the Zone it is of lower priority than other zones.

Seeds of Success efforts in the Southeast Zone should focus on partnerships with the National Park Service, the Boroughs of Haines, Skagway, Juneau, Sitka, Wrangell and Ketchikan Gateway, as well as Regional and Village Corporations, and especially Tongass National Forest. Groundwork for cooperative efforts and training of USFS staff in SOS protocols (as well as training of SOS staff in mechanical harvesting techniques) has been laid and should be continued. Any collections in the seed zone could greatly increase the availability of seeds from this major region of Alaska, currently under-represented in cultivars available for restoration work.

## Recommendations

The Alaska Seeds of Success program has lived up to its name. In the past decade, hundreds of collections have been made in many locations across the state. Partnerships have begun to be developed with many other agencies. Program methods and objectives have been refined. Specific recommendations for each Seed Zone have been given in summaries discussed above. In addition, the following recommendations are more general, regarding the Alaska program as a whole.

We were not able to identify the location or availability of the seed collections made between 2002-2007 by the end of the 2012 season. Most of these seeds are presumed to be unavailable. According to the national SOS office, seeds from 79 of those collections were returned to the US from the Millenium Seed Bank at Kew and are stored at Pullman. The AK State Office was able to track down a list of all seed collections presently at Pullman that originated in Alaska. The following SOS collections showed up on that list, and may be available:

AK025-004	<i>Rumex arcticus</i>	AK040-13	<i>Anemone parviflora</i>
AK025-006	<i>Eurybia sibirica</i>	AK040-18	<i>Potentilla ledebouriana</i>
AK025-015	<i>Iris setosa</i> var. <i>setosa</i>	AK040-27	<i>Spiraea stevenii</i>
AK025-016	<i>Primula tschuktschorum</i>	AK040-28	<i>Solidago multiradiata</i>
AK025-020	<i>Primula borealis</i>	AK040-35	<i>Platanthera dilatata</i>
AK025-024	<i>Honckenya peploides</i>	AK040-36	<i>Veratrum viride</i>
AK025-025	<i>Microseris borealis</i>	AK040-40	<i>Juncus mertensianus</i>
AK025-029	<i>Parrya nudicaulis</i>	AK040-44	<i>Primula pumila</i>
AK025-033	<i>Honckenya peploides</i>	AK040-46	<i>Betula nana</i>
AK025-034	<i>Carex membranacea</i>	AK040-50	<i>Hulteniella integrifolium</i>
AK040-06	<i>Eriophorum vaginatum</i>	AK040-57	<i>Anemone narcissiflora</i>
AK040-07	<i>Comarum palustre</i>	AK040-64	<i>Silene acaulis</i>
AK040-09	<i>Luzula parviflora</i>		

The list did not indicate how many seeds they had. Many of these collections are of species that have not been collected elsewhere in the state. While it would be useful to know exactly what seeds are available to restoration managers in Alaska, only one of the plants on this list is a workhorse species. It would probably be more useful to work with the collections made from 2009-2012 and to focus our efforts on making new collections.

The partnership with CBG provided AK930 with enthusiastic work crews and an opportunity to train young biologists in field methods and management issues. These interns were based in Anchorage and supervised by AKNHP. Future internships could follow this model, or be based in different BLM field offices. For flexibility, SOS could be perhaps half of their focus, with other projects benefiting from the interns in between planning trips and collecting seeds. Supervisory structure would need to be identified, and AKNHP could offer project coordination and support such as SOS training in Anchorage, site checks/visits, data processing/PMC liaison work, as well as help with permitting early in the season, ecological, phenological, aerial photo interpretation and site analysis.



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## **APPENDICES**

Appendix 1. List of SOS Seed Collections

Appendix 2. PMC cultivars and germplasm currently available

Appendix 3. SOS 2012 Updated Target List

Appendix 4. Workhorse Species Distribution by Seed Zone

Appendix 5. Alaska Unified Ecoregion map used in the delineation of Preliminary Seed Zones

Appendix 6. The 2010 and 2011 SOS CNIPM conference posters

Appendix 7. Additional maps of selected collecting areas:

- Steese Highway
- Chicken and Eagle area
- Copper Basin
- Seward Peninsula
- Platinum
- Cook Inlet
- Northern southeast

## SEEDS OF SUCCESS PROGRAM- ALASKA COLLECTIONS

**The following collections were made but the seeds themselves have not been located. Data for # of seeds collected was present for some on the SOS website but not all. Most of these seeds went to the Kew Millennium Seed Bank. Portions of some collections may be available through Pullman, but most are probably not.**

<b>Year</b>	<b>SOS number</b>	<b>Name (number of seeds collected)</b>
2002	AK040-029	<i>Aconitum delphiniifolium</i> ssp. <i>delphiniifolium</i> (6222)
2007	AK930-051	<i>Alnus viridis</i> ssp. <i>sinuata</i> (missing)
2003	AK040-057	<i>Anemone narcissiflora</i> (4826)
2002	AK040-013	<i>Anemone parviflora</i> (6305)
2002	AK040-012	<i>Antennaria monocephala</i> (2878)
2003	AK040-060	<i>Anthoxanthum monticola</i> ssp. <i>alpinum</i> (2517)
2006	AK025-042	<i>Arctagrostis latifolia</i> ssp. <i>latifolia</i> (?)
2003	AK025-014	<i>Argentina egedii</i> ssp. <i>groenlandica</i> (6933)
2002	AK040-021	<i>Arnica lessingii</i> ssp. <i>lessingii</i> (3039)
2002	AK040-015	<i>Artemisia arctica</i> ssp. <i>arctica</i> (9683)
2002	AK025-009	<i>Artemisia tilesii</i> ssp. <i>elatior</i> (34484)
2002	AK025-005	<i>Astragalus alpinus</i> (3946)
2004	AK025-018	<i>Astragalus australis</i> (6339)
2003	AK025-012	<i>Astragalus umbellatus</i> (3755)
2003	AK040-046	<i>Betula nana</i> (1436)
2003	AK040-055	<i>Boykinia richardsonii</i> (27224)
2007	AK930-049	<i>Calamagrostis canadensis</i> (missing)
2006	AK025-041	<i>Carex aquatilis</i> var. <i>aquatilis</i> (?)
2006	AK025-037	<i>Carex bigelowii</i> (?)
2006	AK025-035	<i>Carex chordorrhiza</i> (?)
2005	AK025-030	<i>Carex gmelinii</i> (?)
2004	AK025-021	<i>Carex mackenziei</i> (1416)
2002	AK040-004	<i>Carex magellanica</i> ssp. <i>irrigua</i> (?)
2005	AK025-034	<i>Carex membranacea</i> (?)
2003	AK040-059	<i>Carex pluriflora</i> (19408)
2006	AK025-036	<i>Carex rotundata</i> (?)
2004	AK025-019	<i>Carex saxatilis</i> (11826)
2002	AK040-033	<i>Castilleja unalaschcensis</i> (44408)
2003	AK040-061	<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i> (46831)
2002	AK040-043	<i>Chamerion latifolium</i> (35926)
2002	AK025-007	<i>Cnidium cnidiifolium</i> (13282)
2002	AK040-007	<i>Comarum palustre</i> (?)
2002	AK040-030	<i>Dryas drummondii</i> (9844)
2003	AK040-048	<i>Dryas integrifolia</i> (3811)
2002	AK040-010	<i>Dryas octopetala</i> ssp. <i>octopetala</i> (3339)
2002	AK040-019	<i>Epilobium lactiflorum</i> (6861)
2002	AK040-032	<i>Erigeron peregrinus</i> (28890)
2002	AK040-006	<i>Eriophorum vaginatum</i> (?)
2002	AK025-006	<i>Eurybia sibirica</i> (431)
2003	AK040-058	<i>Festuca altaica</i> (10829)
2004	AK025-022	<i>Galium boreale</i> (13767)
2002	AK040-017	<i>Gentiana glauca</i> (3472)
2002	AK040-002	<i>Gentianella propinqua</i> (?)
2002	AK040-011	<i>Geum rossii</i> (1299)
2002	AK040-037	<i>Harrimanella stelleriana</i> (21726)
2002	AK025-002	<i>Hedysarum alpinum</i> (14670)

2002 AK040-022 *Hieracium triste* (24069)  
 2005 AK025-033 *Honckenya peploides* (?)  
 2004 AK025-024 *Honckenya peploides* (7860)  
 2003 AK040-050 *Hulteniella integrifolia* (4765)  
 2003 AK025-015 *Iris setosa* var. *setosa* (5162)  
 2002 AK040-005 *Juncus alpinoarticulatus* (?)  
 2003 AK040-051 *Juncus arcticus* (33452)  
 2002 AK040-031 *Juncus castaneus* (51367)  
 2002 AK040-008 *Juncus drummondii* (34602)  
 2002 AK040-040 *Juncus mertensianus* (36524)  
 2003 AK040-049 *Juncus triglumis* (3748)  
 2002 AK025-001 *Lagotis minor* (1710)  
 2003 AK025-011 *Lathyrus japonicus* var. *maritimus* (5448)  
 2007 AK930-045 *Ledum groenlandicum* (missing)  
 2007 AK930-050 *Ledum palustre* ssp. *decumbens* (missing)  
 2005 AK025-031 *Ligusticum scoticum* ssp. *hultenii* (?)  
 2003 AK040-045 *Loiseleuria procumbens* (52295)  
 2002 AK040-041 *Luetkea pectinata* (47141)  
 2004 AK025-017 *Lupinus arcticus* (1727)  
 2002 AK040-023 *Lupinus nootkatensis* (1703)  
 2002 AK040-009 *Luzula parviflora* (75892)  
 2003 AK040-062 *Luzula wahlenbergii* (9512)  
 2004 AK025-025 *Microseris borealis* (3373)  
 2003 AK040-052 *Minuartia arctica* (896)  
 2007 AK930-046 *Nephrophyllidium crista-galli* (missing)  
 2002 AK040-024 *Oxyria digyna* (1019)  
 2003 AK025-010 *Oxytropis arctica* var. *koyukukensis* (9308)  
 2006 AK025-039 *Papaver macounii* ssp. *discolor* (?)  
 2002 AK040-020 *Parnassia kotzebuei* (24864)  
 2005 AK025-029 *Parrya nudicaulis* (?)  
 2002 AK040-003 *Petasites frigidus* var. *frigidus* (?)  
 2002 AK040-038 *Phyllodoce glanduliflora* (14023)  
 2002 AK040-035 *Platanthera dilatata* sl. (879)  
 2004 AK025-023 *Poa eminens* (43597)  
 2004 AK025-001A *Polygonum alpinum* (24419)  
 2002 AK040-018 *Potentilla uniflora* sl. (2432)  
 2004 AK025-020 *Primula borealis* (11551)  
 2003 AK040-044 *Primula exima* (16625)  
 2004 AK025-016 *Primula tschuktschorum* (9483)  
 2003 AK040-056 *Rhodiola integrifolia* (45394)  
 2002 AK025-003 *Rhododendron camtschaticum* ssp. *glandulosum* (4973)  
 2002 AK025-004 *Rumex arcticus* (9633)  
 2002 AK040-042 *Sanguisorba canadensis* (4729)  
 2003 AK025-013 *Saussurea nuda* (9096)  
 2002 AK040-016 *Saxifraga bronchialis* (8130)  
 2002 AK040-014 *Saxifraga lyallii* (22974)  
 2003 AK040-063 *Saxifraga nelsoniana* ssp. *nelsoniana* (9255)  
 2006 AK025-040 *Saxifraga tricuspida* (?)  
 2003 AK040-053 *Senecio congestus* (11051)  
 2007 AK930-044 *Senecio lugens* (missing)  
 2003 AK040-064 *Silene acaulis* (5578)  
 2002 AK040-028 *Solidago multiradiata* var. *multiradiata* (6209)  
 2002 AK040-027 *Spiraea stevenii* (47007)  
 2002 AK040-001 *Taraxacum phymatocarpum* (?)  
 2007 AK930-048 *Thalictrum sparsiflorum* (missing)  
 2007 AK930-047 *Trichophorum caespitosum* (missing)

2002	AK025-008	<i>Tripleurospermum maritima</i> ssp. <i>phaeocephala</i> (11033)
2002	AK040-039	<i>Valeriana sitchensis</i> (3303)
2002	AK040-036	<i>Veratrum viride</i> (45178)
2002	AK040-026	<i>Veronica wormskjoldii</i> (3302)
2002	AK040-034	<i>Zigadenus elegans</i> (14567)

**The following collections are available from the Alaska Plant Materials Center in Palmer, AK. (Portions of some of these collections have been sent to Pullman.)**

<b>Year</b>	<b>SOS number</b>	<b>Name (number of seeds collected)</b>
2009	AK930-083	<i>Achillea sibirica</i> (0)
2009	AK930-089	<i>Achillea sibirica</i> (33150)
2010	AK930-273	<i>Achillea sibirica</i> (82729)
2012	AK930-482	<i>Achillea sibirica</i> (not yet processed)
2010	AK930-163	<i>Aconitum delphiniifolium</i> ssp. <i>delphiniifolium</i> (3211)
2011	AK930-431	<i>Agrostis exarata</i> (71280)
2009	AK930-091	<i>Agrostis mertensii</i> (13940)
2010	AK930-209	<i>Agrostis mertensii</i> (3356)
2009	AK930-087	<i>Agrostis scabra</i> (11970)
2011	AK930-390	<i>Agrostis scabra</i> (82908)
2009	AK930-073	<i>Alnus incana</i> ssp. <i>tenuifolia</i> (19000)
2010	AK930-317	<i>Alnus incana</i> ssp. <i>tenuifolia</i> (37069)
2010	AK930-153	<i>Alopecurus aequalis</i> var. <i>aequalis</i> (10180)
2010	AK930-253	<i>Alopecurus alpinus</i> (1243)
2010	AK930-128	<i>Amelanchier alnifolia</i> (10716)
2011	AK930-446	<i>Anaphalis margaritacea</i> (73200)
2011	AK930-345	<i>Androsace septentrionalis</i> (29169)
2011	AK930-352	<i>Androsace septentrionalis</i> (41754)
2010	AK930-108	<i>Androsace septentrionalis</i> (50252)
2010	AK930-111	<i>Anemone multifida</i> var. <i>multifida</i> (0)
2011	AK930-350	<i>Anemone multifida</i> var. <i>multifida</i> (10894)
2011	AK930-362	<i>Anemone multifida</i> var. <i>multifida</i> (17723)
2010	AK930-116	<i>Anemone multifida</i> var. <i>saxicola</i> (19152)
2011	AK930-366	<i>Anemone narcissiflora</i> var. <i>monantha</i> (26432)
2010	AK930-279	<i>Anemone narcissiflora</i> var. <i>monantha</i> (6170)
2012	AK930-479	<i>Anemone narcissiflora</i> var. <i>monantha</i> (not yet processed)
2010	AK930-254	<i>Anemone parviflora</i> (3065)
2010	AK930-257	<i>Anemone richardsonii</i> (521)
2011	AK930-449	<i>Angelica lucida</i> (60960)
2010	AK930-335	<i>Angelica lucida</i> (64687)
2010	AK930-235	<i>Angelica lucida</i> (65520)
2010	AK930-194	<i>Antennaria alpina</i> (4133)
2010	AK930-166	<i>Anthoxanthum monticola</i> ssp. <i>alpinum</i> (1907)
2010	AK930-193	<i>Anthoxanthum monticola</i> ssp. <i>alpinum</i> (2666)
2010	AK930-303	<i>Anthoxanthum monticola</i> ssp. <i>alpinum</i> (3342)
2010	AK930-320	<i>Aquilegia formosa</i> (17313)
2011	AK930-375	<i>Arabis holboellii</i> (53526)
2010	AK930-112	<i>Arabis holboellii</i> var. <i>retrofracta</i> (98637)
2011	AK930-413	<i>Arabis kamchatica</i> (13695)
2011	AK930-392	<i>Arabis kamchatica</i> (142656)
2010	AK930-299	<i>Arctagrostis latifolia</i> ssp. <i>arundinacea</i> (16666)
2010	AK930-258	<i>Arctagrostis latifolia</i> ssp. <i>arundinacea</i> (6078)
2010	AK930-165	<i>Arctagrostis latifolia</i> ssp. <i>arundinacea</i> (9318)
2012	AK930-465	<i>Arctagrostis latifolia</i> ssp. <i>arundinacea</i> (not yet processed)

2012	AK930-493	<i>Arctagrostis latifolia</i> ssp. <i>arundinacea</i> (not yet processed)
2012	AK930-498	<i>Arctagrostis latifolia</i> ssp. <i>arundinacea</i> (not yet processed)
2010	AK930-294	<i>Arctophila fulva</i> (27122)
2011	AK930-409	<i>Argentina egedii</i> (13328)
2010	AK930-249	<i>Argentina egedii</i> ssp. <i>groenlandica</i> (12824)
2010	AK930-218	<i>Armeria maritima</i> ssp. <i>sibirica</i> (434)
2011	AK930-349	<i>Arnica angustifolia</i> ssp. <i>angustifolia</i> (9903)
2010	AK930-256	<i>Arnica lessingii</i> (5961)
2012	AK930-478	<i>Arnica lessingii</i> (not yet processed)
2010	AK930-195	<i>Artemisia arctica</i> (2689)
2011	AK930-448	<i>Artemisia arctica</i> (8221)
2012	AK930-468	<i>Artemisia arctica</i> (not yet processed)
2010	AK930-146	<i>Artemisia campestris</i> ssp. <i>borealis</i> (24190)
2010	AK930-289	<i>Artemisia frigida</i> (0)
2009	AK930-075	<i>Artemisia tilesii</i> (46272)
2010	AK930-244	<i>Artemisia tilesii</i> (49024)
2011	AK930-423	<i>Aruncus dioicus</i> var. <i>acuminatus</i> (332385)
2010	AK930-321	<i>Aruncus dioicus</i> var. <i>acuminatus</i> (3959480)
2010	AK930-266	<i>Astragalus alpinus</i> (9367)
2010	AK930-187	<i>Astragalus alpinus</i> var. <i>alpinus</i> (5175)
2010	AK930-186	<i>Astragalus americanus</i> (19367)
2010	AK930-104	<i>Astragalus sealei</i> (12134)
2011	AK930-364	<i>Astragalus williamsii</i> (158256)
2010	AK930-206	<i>Barbarea orthoceras</i> (15410)
2011	AK930-429	<i>Barbarea orthoceras</i> (17141)
2011	AK930-420	<i>Barbarea orthoceras</i> (23391)
2011	AK930-450	<i>Barbarea orthoceras</i> (85792)
2012	AK930-502	<i>Barbarea orthoceras</i> (not yet processed)
2009	AK930-056	<i>Beckmannia syzigachne</i> (13650)
2010	AK930-296	<i>Beckmannia syzigachne</i> (30759)
2010	AK930-140	<i>Beckmannia syzigachne</i> (62308)
2012	AK930-485	<i>Beckmannia syzigachne</i> (not yet processed)
2010	AK930-308	<i>Betula glandulosa</i> (32470)
2010	AK930-334	<i>Betula nana</i> (14655)
2010	AK930-219	<i>Boykinia richardsonii</i> (76934)
2012	AK930-469	<i>Boykinia richardsonii</i> (not yet processed)
2010	AK930-260	<i>Bromus inermis</i> ssp. <i>pumpellianus</i> (1386)
2012	AK930-480	<i>Bromus inermis</i> ssp. <i>pumpellianus</i> (not yet processed)
2010	AK930-223	<i>Calamagrostis canadensis</i> (114036)
2011	AK930-457	<i>Calamagrostis canadensis</i> (23797)
2011	AK930-430	<i>Calamagrostis canadensis</i> (29219)
2010	AK930-333	<i>Calamagrostis canadensis</i> (6092)
2012	AK930-473	<i>Calamagrostis canadensis</i> (not yet processed)
2012	AK930-486	<i>Calamagrostis canadensis</i> (not yet processed)
2012	AK930-492	<i>Calamagrostis canadensis</i> (not yet processed)
2012	AK930-495	<i>Calamagrostis canadensis</i> (not yet processed)
2012	AK930-500	<i>Calamagrostis canadensis</i> (not yet processed)
2010	AK930-297	<i>Calamagrostis canadensis</i> var. <i>langsdorffii</i> (3046)
2010	AK930-144	<i>Calamagrostis canadensis</i> var. <i>langsdorffii</i> (944)
2010	AK930-263	<i>Calamagrostis purpurascens</i> (0)
2011	AK930-363	<i>Calamagrostis purpurascens</i> (53438)
2012	AK930-463	<i>Calamagrostis purpurascens</i> (not yet processed)
2010	AK930-291	<i>Calamagrostis purpurascens</i> var. <i>purpurascens</i> (1560)
2010	AK930-147	<i>Calamagrostis purpurascens</i> var. <i>purpurascens</i> (19751)
2010	AK930-179	<i>Calamagrostis purpurascens</i> var. <i>purpurascens</i> (6534)
2011	AK930-378	<i>Campanula aurita</i> (19140)

2010	AK930-234	<i>Campanula lasiocarpa</i> (14615)
2010	AK930-168	<i>Campanula lasiocarpa</i> (15882)
2010	AK930-306	<i>Campanula lasiocarpa</i> (30303)
2010	AK930-319	<i>Campanula rotundifolia</i> (9737)
2010	AK930-231	<i>Cardamine bellidifolia</i> var. <i>bellidifolia</i> (912)
2010	AK930-151	<i>Carex arcta</i> (11070)
2011	AK930-356	<i>Carex atratiformis</i> (24813)
2010	AK930-102	<i>Carex aurea</i> (21039)
2011	AK930-447	<i>Carex brunescens</i> (146160)
2010	AK930-113	<i>Carex canescens</i> ssp. <i>canescens</i> (31032)
2010	AK930-172	<i>Carex diandra</i> (14103)
2010	AK930-302	<i>Carex diandra</i> (4976)
2011	AK930-441	<i>Carex gmelinii</i> (18573)
2010	AK930-236	<i>Carex gmelinii</i> (21314)
2011	AK930-406	<i>Carex gmelinii</i> (28833)
2010	AK930-101	<i>Carex krausei</i> (69908)
2010	AK930-230	<i>Carex lachenalii</i> (21030)
2011	AK930-421	<i>Carex lyngbyei</i> (0)
2010	AK930-119	<i>Carex lyngbyei</i> (14832)
2009	AK930-055	<i>Carex lyngbyei</i> (17870)
2010	AK930-123	<i>Carex macrochaeta</i> (8360)
2010	AK930-313	<i>Carex membranacea</i> (11766)
2009	AK930-062	<i>Carex mertensii</i> (16600)
2010	AK930-121	<i>Carex mertensii</i> (35820)
2011	AK930-416	<i>Carex mertensii</i> (41345)
2011	AK930-424	<i>Carex mertensii</i> (60964)
2010	AK930-106	<i>Carex norvegica</i> ssp. <i>inferalpina</i> (11883)
2010	AK930-132	<i>Carex norvegica</i> ssp. <i>inferalpina</i> (36232)
2009	AK930-088	<i>Carex norvegica</i> ssp. <i>inferalpina</i> (4392)
2010	AK930-114	<i>Carex pachystachya</i> (32136)
2010	AK930-161	<i>Carex pachystachya</i> (35191)
2010	AK930-122	<i>Carex pachystachya</i> (37022)
2010	AK930-117	<i>Carex phaeocephala</i> (32333)
2010	AK930-282	<i>Carex podocarpa</i> (1079)
2010	AK930-226	<i>Carex podocarpa</i> (6450)
2012	AK930-470	<i>Carex podocarpa</i> (not yet processed)
2010	AK930-190	<i>Carex praticola</i> (18687)
2012	AK930-484	<i>Carex praticola</i> (not yet processed)
2011	AK930-368	<i>Carex saxatilis</i> (0)
2010	AK930-150	<i>Carex saxatilis</i> ssp. <i>laxa</i> (10880)
2010	AK930-281	<i>Carex scirpoidea</i> (7713)
2010	AK930-152	<i>Carex stylosa</i> (14548)
2010	AK930-293	<i>Carex utriculata</i> (34151)
2010	AK930-191	<i>Castilleja caudata</i> (33316)
2010	AK930-148	<i>Castilleja caudata</i> (8358)
2010	AK930-341	<i>Castilleja unalaschcensis</i> (321)
2011	AK930-433	<i>Castilleja unalaschcensis</i> (59303)
2011	AK930-460	<i>Cerastium arvense</i> (15976)
2010	AK930-241	<i>Cerastium beeringianum</i> var. <i>grandiflorum</i> (4852)
2011	AK930-404	<i>Chamerion angustifolium</i> (40227)
2011	AK930-428	<i>Chamerion angustifolium</i> (44000)
2011	AK930-359	<i>Chamerion angustifolium</i> (49311)
2009	AK930-058	<i>Chamerion angustifolium</i> (55500)
2010	AK930-304	<i>Chamerion angustifolium</i> (78571)
2010	AK930-143	<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i> (4865)
2012	AK930-464	<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i> (not yet processed)



2012	AK930-494	<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i> (not yet processed)
2012	AK930-499	<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i> (not yet processed)
2010	AK930-224	<i>Chamerion angustifolium</i> ssp. <i>circumvagum</i> (5333)
2010	AK930-338	<i>Chamerion angustifolium</i> ssp. <i>circumvagum</i> (70300)
2011	AK930-391	<i>Chamerion latifolium</i> (14043)
2010	AK930-136	<i>Chamerion latifolium</i> (15998)
2009	AK930-071	<i>Chamerion latifolium</i> (19480)
2011	AK930-414	<i>Chamerion latifolium</i> (19743)
2010	AK930-199	<i>Chamerion latifolium</i> (37577)
2009	AK930-082	<i>Chamerion latifolium</i> (4460)
2009	AK930-079	<i>Chrysanthemum arcticum</i> (16390)
2010	AK930-239	<i>Chrysanthemum arcticum</i> (29926)
2011	AK930-384	<i>Cnidium cnidiifolium</i> (36608)
2010	AK930-210	<i>Comarum palustre</i> (24163)
2009	AK930-059	<i>Comarum palustre</i> (9800)
2012	AK930-475	<i>Comarum palustre</i> (not yet processed)
2011	AK930-371	<i>Cornus sericea</i> (16170)
2011	AK930-343	<i>Crepis elegans</i> (36500)
2011	AK930-374	<i>Crepis elegans</i> (8834)
2010	AK930-155	<i>Danthonia intermedia</i> (17170)
2011	MD11-112	<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i> (0)
2010	AK930-182	<i>Delphinium glaucum</i> (17949)
2010	AK930-173	<i>Delphinium glaucum</i> (6117)
2010	AK930-250	<i>Deschampsia cespitosa</i> (15575)
2011	AK930-452	<i>Deschampsia cespitosa</i> (81229)
2010	AK930-159	<i>Deschampsia cespitosa</i> (95179)
2010	AK930-310	<i>Dodecatheon frigidum</i> (11175)
2011	AK930-436	<i>Dodecatheon pulchellum</i> (16918)
2011	AK930-411	<i>Dodecatheon pulchellum</i> (48787)
2011	AK930-396	<i>Draba aurea</i> (61558)
2010	AK930-292	<i>Dracocephalum parviflorum</i> (21804)
2010	AK930-097	<i>Dryas drummondii</i> (13011)
2009	AK930-080	<i>Dryas drummondii</i> (14930)
2009	AK930-074	<i>Dryas drummondii</i> (1560)
2010	AK930-098	<i>Dryas drummondii</i> (27305)
2011	AK930-351	<i>Dryas drummondii</i> (29347)
2010	AK930-110	<i>Dryas drummondii</i> (30623)
2010	AK930-115	<i>Dryas drummondii</i> (32249)
2011	AK930-365	<i>Dryas drummondii</i> (38143)
2011	AK930-347	<i>Dryas integrifolia</i> (16970)
2010	AK930-103	<i>Dryas integrifolia</i> ssp. <i>integrifolia</i> (19234)
2010	AK930-215	<i>Dryas integrifolia</i> ssp. <i>integrifolia</i> (4050)
2010	AK930-283	<i>Dryas octopetala</i> ssp. <i>alaskensis</i> (3955)
2010	AK930-220	<i>Dryas octopetala</i> ssp. <i>alaskensis</i> (7465)
2010	AK930-120	<i>Dryas octopetala</i> ssp. <i>octopetala</i> (11491)
2010	AK930-274	<i>Dryas octopetala</i> ssp. <i>octopetala</i> (2533)
2012	AK930-462	<i>Dryas octopetala</i> ssp. <i>octopetala</i> (not yet processed)
2009	AK930-072	<i>Elaeagnus commutata</i> (0)
2011	AK930-458	<i>Elaeagnus commutata</i> (7600)
2010	AK930-138	<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i> (16217)
2011	AK930-453	<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i> (57332)
2012	AK930-491	<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i> (not yet processed)
2010	AK930-325	<i>Epilobium ciliatum</i> ssp. <i>glandulosum</i> (26517)
2010	AK930-323	<i>Epilobium luteum</i> (4479)
2009	AK930-060	<i>Epilobium palustre</i> (19500)
2011	AK930-380	<i>Erigeron acris</i> (46104)

2009	AK930-086	<i>Erigeron acris</i> (9620)
2011	AK930-357	<i>Erigeron acris</i> ssp. <i>kamtschaticus</i> (21964)
2010	AK930-305	<i>Erigeron acris</i> ssp. <i>kamtschaticus</i> (23438)
2010	AK930-130	<i>Erigeron acris</i> ssp. <i>kamtschaticus</i> (5349)
2010	AK930-255	<i>Erigeron humilis</i> (13060)
2011	AK930-355	<i>Erigeron lonchophyllus</i> (30618)
2011	AK930-344	<i>Erigeron purpuratus</i> (43577)
2012	AK930-474	<i>Eriophorum angustifolium</i> ssp. <i>angustifolium</i> (not yet processed)
2010	AK930-118	<i>Eriophorum chamissonis</i> (3086)
2010	AK930-214	<i>Eriophorum chamissonis</i> (635)
2009	AK930-090	<i>Eriophorum scheuchzeri</i> (20650)
2011	AK930-393	<i>Eriophorum scheuchzeri</i> (24051)
2011	AK930-354	<i>Erysimum inconspicuum</i> (54412)
2010	AK930-268	<i>Euphrasia disjuncta</i> (11970)
2009	AK930-078	<i>Eurybia sibirica</i> (0)
2010	AK930-180	<i>Eurybia sibirica</i> (4012)
2010	AK930-196	<i>Eurybia sibirica</i> (789)
2010	AK930-280	<i>Festuca altaica</i> (20934)
2010	AK930-105	<i>Festuca altaica</i> (21163)
2010	AK930-202	<i>Festuca altaica</i> (6512)
2010	AK930-156	<i>Festuca altaica</i> (8776)
2012	AK930-497	<i>Festuca rubra</i> (not yet processed)
2010	AK930-245	<i>Festuca rubra</i> ssp. <i>arctica</i> (19756)
2011	AK930-353	<i>Fragaria chiloensis</i> ssp. <i>pacifica</i> (14543)
2011	AK930-402	<i>Fritillaria camschatcensis</i> (14173)
2011	AK930-435	<i>Fritillaria camschatcensis</i> (15034)
2010	AK930-326	<i>Fritillaria camschatcensis</i> (18569)
2011	AK930-377	<i>Galium boreale</i> (0)
2010	AK930-261	<i>Galium boreale</i> (1572)
2010	AK930-285	<i>Galium boreale</i> (858)
2010	AK930-233	<i>Gentiana glauca</i> (5313)
2011	AK930-397	<i>Gentianella amarella</i> ssp. <i>acuta</i> (45571)
2011	AK930-373	<i>Gentianella propinqua</i> (60105)
2010	AK930-264	<i>Gentianella propinqua</i> ssp. <i>propinqua</i> (13269)
2010	AK930-184	<i>Gentianella propinqua</i> ssp. <i>propinqua</i> (16668)
2011	AK930-361	<i>Gentianopsis detonsis</i> ssp. <i>yukonensis</i> (80681)
2011	AK930-417	<i>Geum macrophyllum</i> (44546)
2010	AK930-129	<i>Geum macrophyllum</i> (9776)
2010	AK930-124	<i>Geum macrophyllum</i> var. <i>macrophyllum</i> (16107)
2011	AK930-422	<i>Geum macrophyllum</i> var. <i>macrophyllum</i> (40511)
2009	AK930-063	<i>Geum macrophyllum</i> var. <i>macrophyllum</i> (41412)
2011	AK930-427	<i>Geum macrophyllum</i> var. <i>macrophyllum</i> (59211)
2011	MD11-099	<i>Geum macrophyllum</i> var. <i>perincisum</i> (17891)
2010	AK930-295	<i>Glyceria grandis</i> ssp. <i>grandis</i> (16793)
2009	AK930-095	<i>Hedysarum alpinum</i> (1840)
2010	AK930-174	<i>Hedysarum alpinum</i> (18944)
2010	AK930-270	<i>Hedysarum alpinum</i> (22617)
2009	AK930-077	<i>Hedysarum alpinum</i> (4900)
2010	AK930-100	<i>Hedysarum boreale</i> ssp. <i>mackenziei</i> (15057)
2011	AK930-418	<i>Heracleum maximum</i> (15707)
2010	AK930-142	<i>Heracleum maximum</i> (27795)
2011	AK930-434	<i>Heracleum maximum</i> (29596)
2010	AK930-339	<i>Heracleum maximum</i> (31065)
2011	AK930-400	<i>Heracleum maximum</i> (71300)
2009	AK930-061	<i>Heracleum maximum</i> (85000)
2012	AK930-466	<i>Heracleum maximum</i> (not yet processed)

2011	AK930-415	<i>Heuchra glabra</i> (318919)
2011	AK930-442	<i>Hierochloe odorata</i> (17088)
2010	AK930-259	<i>Hierochloe odorata</i> (2420)
2010	AK930-298	<i>Hierochloe odorata</i> (86)
2010	AK930-337	<i>Honckenya peploides</i> (10854)
2010	AK930-243	<i>Honckenya peploides</i> ssp. <i>diffusa</i> (12853)
2011	AK930-439	<i>Hordeum brachyantherum</i> (6017)
2009	AK930-052	<i>Hordeum brachyantherum</i> (8900)
2010	AK930-126	<i>Hordeum brachyantherum</i> ssp. <i>brachyantherum</i> (8390)
2011	AK930-437	<i>Iris setosa</i> (19190)
2011	AK930-401	<i>Iris setosa</i> (32190)
2012	AK930-488	<i>Iris setosa</i> var. <i>interior</i> (not yet processed)
2010	AK930-311	<i>Juncus alpinoarticulatus</i> (64737)
2010	AK930-247	<i>Juncus arcticus</i> ssp. <i>littoralis</i> (219143)
2010	AK930-200	<i>Juncus arcticus</i> ssp. <i>littoralis</i> (52129)
2010	AK930-171	<i>Juncus bufonius</i> var. <i>bufonius</i> (27693)
2010	AK930-312	<i>Juncus castaneus</i> (27142)
2011	AK930-394	<i>Juncus castaneus</i> (30454)
2010	AK930-133	<i>Juncus castaneus</i> (43590)
2012	AK930-467	<i>Juncus castaneus</i> (not yet processed)
2010	AK930-160	<i>Juncus filiformis</i> (55000)
2012	AK930-496	<i>Juncus filiformis</i> (not yet processed)
2011	AK930-408	<i>Lathyrus japonicus</i> (9065)
2010	AK930-240	<i>Lathyrus japonicus</i> var. <i>maritimus</i> (15162)
2009	AK930-069	<i>Lathyrus palustris</i> (18500)
2010	AK930-300	<i>Ledum groenlandicum</i> (222222)
2010	AK930-307	<i>Ledum palustre</i> ssp. <i>decumbens</i> (40000)
2011	AK930-412	<i>Leymus mollis</i> (13734)
2011	AK930-456	<i>Leymus mollis</i> (6732)
2012	AK930-477	<i>Leymus mollis</i> (not yet processed)
2010	AK930-336	<i>Leymus mollis</i> ssp. <i>mollis</i> (10872)
2010	AK930-205	<i>Leymus mollis</i> ssp. <i>villosissimus</i> (10797)
2010	AK930-238	<i>Leymus mollis</i> ssp. <i>villosissimus</i> (9520)
2010	AK930-246	<i>Ligusticum scoticum</i> ssp. <i>hultenii</i> (23793)
2010	AK930-176	<i>Linum lewisii</i> var. <i>lewisii</i> (11331)
2010	AK930-216	<i>Lloydia serotina</i> var. <i>serotina</i> (5154)
2011	AK930-367	<i>Lupinus arcticus</i> (4320)
2009	AK930-053	<i>Lupinus nootkatensis</i> (10764)
2011	MD11-201	<i>Lupinus nootkatensis</i> (2367)
2011	MD11-128	<i>Lupinus nootkatensis</i> (4200)
2011	AK930-388	<i>Luzula multiflora</i> (67120)
2011	AK930-440	<i>Luzula multiflora</i> (8357)
2010	AK930-251	<i>Luzula multiflora</i> ssp. <i>frigida</i> (10384)
2010	AK930-141	<i>Luzula parviflora</i> (10418)
2010	AK930-328	<i>Luzula parviflora</i> (11414)
2010	AK930-318	<i>Luzula parviflora</i> (5200)
2011	AK930-369	<i>Luzula parviflora</i> (85658)
2009	AK930-054	<i>Mimulus guttatus</i> (455000)
2010	AK930-316	<i>Moneses uniflora</i> (100000)
2011	AK930-432	<i>Orthilia secunda</i> (125000)
2010	AK930-149	<i>Oxytropis campestris</i> (13936)
2009	AK930-076	<i>Oxytropis campestris</i> (2092)
2010	AK930-271	<i>Oxytropis campestris</i> (20950)
2010	AK930-175	<i>Oxytropis campestris</i> (29088)
2010	AK930-272	<i>Oxytropis deflexa</i> var. <i>sericea</i> (11042)
2010	AK930-188	<i>Oxytropis deflexa</i> var. <i>sericea</i> (26518)

2011	AK930-358	<i>Packera pauciflora</i> (13690)
2011	AK930-379	<i>Papaver nudicaule</i> ssp. <i>americanum</i> (176633)
2010	AK930-221	<i>Parnassia kotzebuei</i> (12500)
2010	AK930-232	<i>Parnassia kotzebuei</i> (17619)
2009	AK930-068	<i>Parnassia palustris</i> (181800)
2010	AK930-222	<i>Parnassia palustris</i> (35000)
2011	AK930-407	<i>Parnassia palustris</i> (5854)
2010	AK930-192	<i>Parnassia palustris</i> (66521)
2011	AK930-451	<i>Parnassia palustris</i> (72917)
2011	AK930-381	<i>Parnassia palustris</i> (74584)
2010	AK930-267	<i>Parnassia palustris</i> (80527)
2010	AK930-278	<i>Parrya nudicaulis</i> (148)
2011	AK930-387	<i>Pedicularis langsdorfii</i> (52920)
2010	AK930-309	<i>Pedicularis sudetica</i> s.l. (ssp. <i>interior</i> ?) (9678)
2011	AK930-386	<i>Pedicularis verticillata</i> (17490)
2010	AK930-287	<i>Penstemon gormanii</i> (11766)
2011	AK930-360	<i>Penstemon gormanii</i> (21943)
2010	AK930-099	<i>Petasites frigidus</i> var. <i>frigidus</i> (13389)
2011	AK930-461	<i>Phacelia mollis</i> (233149)
2010	AK930-329	<i>Phleum alpinum</i> (25681)
2009	AK930-064	<i>Phleum alpinum</i> (9326)
2011	AK930-399	<i>Plantago canescens</i> (74027)
2011	AK930-445	<i>Plantago macrocarpa</i> (10479)
2011	AK930-410	<i>Plantago maritima</i> (19974)
2010	AK930-201	<i>Poa alpina</i> (16207)
2010	AK930-162	<i>Poa alpina</i> (21950)
2009	AK930-092	<i>Poa alpina</i> (38640)
2010	AK930-248	<i>Poa eminens</i> (19975)
2011	AK930-376	<i>Poa glauca</i> (36421)
2010	AK930-227	<i>Polemonium acutiflorum</i> (11211)
2010	AK930-237	<i>Polemonium acutiflorum</i> (14823)
2010	AK930-164	<i>Polemonium acutiflorum</i> (6681)
2012	AK930-472	<i>Polemonium acutiflorum</i> (not yet processed)
2010	AK930-181	<i>Polemonium pulcherrimum</i> (4060)
2011	AK930-372	<i>Polygonum alpinum</i> (177030)
2012	AK930-487	<i>Polygonum alpinum</i> (not yet processed)
2012	AK930-501	<i>Polygonum alpinum</i> (not yet processed)
2011	AK930-383	<i>Potentilla bimundorum</i> (138756)
2010	AK930-131	<i>Potentilla bimundorum</i> (23972)
2010	AK930-330	<i>Potentilla drummondii</i> ssp. <i>drummondii</i> (3065)
2010	AK930-177	<i>Potentilla hookeriana</i> ssp. <i>hookeriana</i> (9535)
2010	AK930-269	<i>Potentilla norvegica</i> (57951)
2009	AK930-094	<i>Potentilla norvegica</i> ssp. <i>monspeliensis</i> (59400)
2012	AK930-483	<i>Potentilla norvegica</i> ssp. <i>monspeliensis</i> (not yet processed)
2011	AK930-398	<i>Potentilla pensylvanica</i> var. <i>litoralis</i> (60438)
2010	AK930-178	<i>Potentilla pensylvanica</i> var. <i>pensylvanica</i> (158751)
2010	AK930-288	<i>Potentilla pensylvanica</i> var. <i>pensylvanica</i> (16648)
2011	AK930-395	<i>Potentilla villosa</i> (59888)
2011	AK930-426	<i>Prenanthes alata</i> (1469)
2010	AK930-290	<i>Pseudoroegneria spicata</i> ssp. <i>spicata</i> (1747)
2011	AK930-348	<i>Pulsatilla patens</i> ssp. <i>multifida</i> (18121)
2011	AK930-444	<i>Pyrola asarifolia</i> (1000000)
2010	AK930-314	<i>Pyrola asarifolia</i> ssp. <i>asarifolia</i> (400000)
2010	AK930-315	<i>Pyrola minor</i> (380000)
2011	AK930-455	<i>Rhinanthus minor</i> (10842)
2011	AK930-438	<i>Rhinanthus minor</i> (11414)

2010	AK930-331	Rhinanthus minor (15708)
2009	AK930-067	Rhinanthus minor (16000)
2011	AK930-403	Rhinanthus minor (19111)
2010	AK930-185	Rhinanthus minor ssp. borealis (13389)
2010	AK930-265	Rhinanthus minor ssp. borealis (16442)
2010	AK930-228	Rhodiola integrifolia ssp. integrifolia (12598)
2010	AK930-208	Rhodiola integrifolia ssp. integrifolia (9841)
2010	AK930-197	Rhododendron camtschaticum ssp. glandulosum (50000)
2010	AK930-134	Rhododendron lapponicum (68000)
2011	AK930-454	Rorippa palustris ssp. palustris (121948)
2009	AK930-057	Rosa acicularis (4148)
2009	AK930-070	Rumex aquaticus var. fenestratus (0)
2010	AK930-207	Rumex arcticus (16107)
2012	AK930-471	Rumex arcticus (not yet processed)
2010	AK930-125	Sambucus racemosa (0)
2010	AK930-127	Sambucus racemosa (0)
2009	AK930-065	Sambucus racemosa (38000)
2009	AK930-081	Sanguisorba canadensis (17500)
2010	AK930-327	Sanguisorba canadensis (4699)
2010	AK930-340	Sanguisorba canadensis (919)
2012	AK930-481	Sanguisorba officinalis (not yet processed)
2010	AK930-277	Saussurea angustifolia var. angustifolia (2580)
2010	AK930-167	Saussurea angustifolia var. angustifolia (5814)
2011	AK930-382	Saxifraga hieracifolia (20110)
2010	AK930-213	Saxifraga oppositifolia ssp. smalliana (14844)
2011	AK930-370	Saxifraga tricuspidata (108182)
2010	AK930-286	Saxifraga tricuspidata (4138)
2011	AK930-459	Saxifraga tricuspidata (59189)
2010	AK930-137	Senecio congestus (16666)
2012	AK930-490	Senecio congestus (not yet processed)
2010	AK930-252	Senecio lugens (16973)
2010	AK930-189	Senecio lugens (4294)
2010	AK930-242	Senecio pseudoarnica (15910)
2010	AK930-225	Sibbaldia procumbens (6131)
2010	AK930-212	Silene acaulis var. subacaulescens (7491)
2010	AK930-284	Silene menziesii ssp. williamsii (22358)
2010	AK930-109	Silene taimyrensis (26563)
2011	AK930-346	Silene taimyrensis (95874)
2011	AK930-385	Sisyrinchium littorale (16650)
2010	AK930-276	Solidago multiradiata (1737)
2010	AK930-158	Solidago multiradiata (3915)
2010	AK930-198	Solidago multiradiata (8865)
2010	AK930-183	Solidago simplex ssp. simplex var. nana (28017)
2009	AK930-084	Spiraea stevenii (188500)
2010	AK930-211	Spiraea stevenii (29474)
2009	AK930-066	Spiraea stevenii (41460)
2012	AK930-476	Spiraea stevenii (not yet processed)
2009	AK930-093	Stellaria calycantha (2250)
2012	AK930-489	Tanacetum bipinnatum ssp. huronense (not yet processed)
2010	AK930-262	Taraxacum officinale ssp. ceratophorum (2318)
2011	MD11-020	Taraxacum officinale ssp. ceratophorum (984)
2010	AK930-324	Tellima grandiflora (165241)
2011	AK930-425	Tellima grandiflora (93835)
2010	AK930-217	Tofieldia coccinea (20000)
2010	AK930-275	Tofieldia coccinea (35357)
2010	AK930-170	Tofieldia pusilla (34445)

2010	AK930-135	<i>Tofieldia pusilla</i> (42647)
2010	AK930-169	<i>Trichophorum alpinum</i> (28320)
2011	AK930-405	<i>Trientalis europaea</i> (15257)
2011	AK930-419	<i>Triglochin maritima</i> (7211)
2011	AK930-443	<i>Trisetum canescens</i> (22786)
2010	AK930-203	<i>Trisetum spicatum</i> (3656)
2011	AK930-389	<i>Trisetum spicatum</i> (58652)
2010	AK930-107	<i>Trisetum spicatum</i> (8124)
2010	AK930-301	<i>Typha latifolia</i> (2300023)
2010	AK930-229	<i>Vahlodea atropurpurea</i> (11126)
2010	AK930-332	<i>Veratrum viride</i> (18564)
2010	AK930-322	<i>Veronica americana</i> (3158)
2010	AK930-139	<i>Veronica americana</i> (52564)
2010	AK930-157	<i>Veronica wormskjoldii</i> var. <i>wormskjoldii</i> (29048)
2010	AK930-145	<i>Veronica wormskjoldii</i> var. <i>wormskjoldii</i> (7692)
2011	AK930-342	<i>Viola adunca</i> (20815)
2010	AK930-154	<i>Viola langsdorffii</i> (3392)
2010	AK930-204	<i>Wilhelmsia physodes</i> (14274)
2009	AK930-085	<i>Wilhelmsia physodes</i> (14600)

**Appendix 2. Plant Material Center offerings: Commercially available species and cultivars (Wright, 2008)**

<b>Scientific Name</b>	<b>Cultivar Name</b>	<b>Seed Zone</b>	<b>Availability</b>	<b>Origin of Germplasm</b>
<i>Poa glauca</i>	('Tundra' glaucus bluegrass)	arctic	fair	Sagavanirktok River (1969, 1970)
<i>Beckmannia syzigachne</i>	('Egan' American sloughgrass)	interior	good	Fairbanks (before 1986)
<i>Elymus trachycaulus</i>	(slender wheatgrass- Wainright germplasm)	interior	excellent	Fairbanks (Ft. Wainwright) (1994)
<i>Arctagrostis latifolia</i>	('Kenai' polargrass)	south central	fair	Kenai and Sterling Highway (before 1987)
<i>Deschampsia beringensis</i>	('Norcoast' Bering hairgrass)	south central	good	Cook Inlet (before 1981)
<i>Festuca rubra</i>	('Arctared' red fescue)	south central	very good	Palmer (1957)
<i>Leymus mollis</i>	('Benson' beach wildrye)	south central	poor	Kodiak (1980)
<i>Artemisia tilesii</i>	('Caiggluk' Tilesius' wormwood)	(south central)	poor	Homer (Clam Gulch) (1974)
				NOTE: DERIVED FROM ONE PLANT
<i>Arctagrostis latifolia</i>	('Alyeska' polargrass)	mixed	fair	interior and western AK (before 1980)
<i>Calamagrostis canadensis</i>	('Sourdough' bluejoint reedgrass)	mixed	fair	interior, western and south central AK (before 1971)
<i>Deschampsia cespitosa</i>	('Nortran' tufted hairgrass)	NOT AK	good	NOT AK (AK and Iceland)
<i>Festuca rubra</i>	('Boreal' red fescue)	NOT AK	excellent	NOT AK
<i>Festuca rubra</i>	('Pennlawn' red fescue)	NOT AK	excellent	NOT AK
<i>Leymus mollis</i>	('Reeve' beach wildrye)	NOT AK	poor	NOT AK (Norway)
<i>Lolium multiflorum</i>	(annual ryegrass)	NOT AK	excellent	NOT AK
<i>Lolium perenne</i>	(perennial ryegrass)	NOT AK	excellent	NOT AK
<i>Poa pratensis</i>	('Merion' Kentucky bluegrass)	NOT AK	excellent	NOT AK
<i>Poa pratensis</i>	('Park' Kentucky bluegrass)	NOT AK	excellent	NOT AK
<i>Poa pratensis</i>	('Nugget' Kentucky bluegrass)	NOT AK?	good	(NOT AK?)
<i>Poa alpina</i>	('Gruening' alpine bluegrass)	unknown	fair	not specified

**Appendix 2. Plant Material Center offerings: Germplasm released for commercial production (Wright, 2008)**

<b>Scientific Name</b>	<b>Germplasm Name</b>	<b>Seed Zone</b>	<b>Availability</b>	<b>Origin of Germplasm</b>
<i>Oxytropis deflexa</i>	(Nodding Locoweed- Franklin Bluffs Germplasm)	arctic	poor	Franklin Bluffs/Prudhoe (1995)
<i>Cnidium cnidiifolium</i>	(Jakutsk snow parseley- Tok Germplasm)	interior	poor	Tok (1995)
<i>Elymus macrourus</i>	(Tufted wheatgrass- Slana Germplasm)	interior	poor	Slana (1995)
<i>Hedysarum alpinum</i>	(Alpine sweetvetch- Paxson Germplasm)	interior	poor	Paxson (1995)
<i>Leymus innovatus</i>	(Downy wildrye- Cantwell Germplasm)	interior	poor	Cantwell (1995)
<i>Oxytropis campestris</i>	(Field oxytrope- Black Rapids Germplasm)	interior	poor	Black Rapids (1995)
<i>Potentilla bimundorum</i>	(Staghorn cinquefoil- Mentasta Germplasm)	interior	poor	Mentasta/Tok (1995)
<i>Trisetum spicatum</i>	(Spike trisetum- Nelchina Germplasm)	interior	poor	Nelchina
<i>Achillea millefolium</i>	(Boreal yarrow- Twenty Mile Germplasm)	south central	poor	Girdwood/Portage (1994)
<i>Calamagrostis nutkaensis</i>	(Nootka reedgrass- Pioneer Peak Germplasm)	south central	poor	Eklutna Flats (2000)
<i>Hordeum brachyantherum</i>	(Meadow barley- Lowell Point Germplasm)	south central	poor	Seward (1996)
<i>Iris setosa</i>	(Wild iris- Knik Germplasm)	south central	poor	Eklutna Flats (1993)
<i>Polemonium pulcherrimum</i>	(Beautiful Jacob's ladder- Butte Germplasm)	south central	poor	Palmer (2000)
<i>Puccinellia nutkatensis</i>	(Nootka alkalaigrass- Ninilchik Germplasm)	south central	poor	Ninilchik (1996)
<i>Artemisia stelleriana</i>	(Dusty Miller Artemisia- Shemya Germplasm)	southwest	poor	Shemya (1995)
<i>Carex macrochaeta</i>	(Longawn sedge- Attu Germplasm)	southwest	poor	Attu (1993)
<i>Festuca rubra</i>	(Red fescue- Henderson Ridge Germplasm)	southwest	poor	Attu (1993)
<i>Ligusticum scoticum</i>	(Beach lovage- Casco Cove Germplasm)	southwest	poor	Attu (1993)
<i>Poa arctica</i>	(Arctic bluegrass- Adak Germplasm)	southwest	poor	Adak (1993)
<i>Poa macrocalyx</i>	(Large-glume bluegrass- Andrew Bay Germplasm)	southwest	poor	Adak (1993)
<i>Senecio pseudoarnica</i>	(Beach fleabane- Clam Lagoon Germplasm)	southwest	poor	Adak (1993)
<i>Chamerion latifolium</i>	(Dwarf Fireweed- Kobuk Germplasm)	west	poor	Kotzebue (1996)
<i>Elymus macrourus</i>	(Thickspike wheatgrass- Solomon Germplasm)	west	poor	Solomon (1995)
<i>Festuca viviparoidea</i>	(Viviparous fescue- Safety Germplasm)	west	poor	Nome (1995)
<i>Poa alpina</i>	(Alpine bluegrass- Teller Germplasm)	west	poor	Teller (1995)
<i>Poa arctica</i>	(Arctic bluegrass- Council Germplasm)	west	poor	Council (1995)
<i>Poa arctica</i> , viviparous form	(Arctic bluegrass, viv. form- Tin City Germplasm)	west	poor	Nome (1995)
<i>Poa eminens</i>	(Largeflower speargrass- Port Clarence Germplasm)	west	poor	Port Clarence/Nome (1995)
<i>Poa glauca</i>	(Glaucus bluegrass- Nome Germplasm)	west	poor	Nome (1995)
<i>Tripleurospermum maritima</i>	(Arctic wild chamomile- Kotzebue Germplasm)	west	poor	Kotzebue (1996)
<i>Poa secunda</i>	(Big bluegrass- "Service" Germplasm)	NOT AK	poor	NOT AK (Whitehorse YK before 1979)



### Appendix 3. Alaska SOS Target List update.

#### 1. Workhorse taxa, appropriate to large-scale commercial production.

<b>Species</b>	<b>Common Name</b>
<i>Achillea millefolium</i> var. <i>borealis</i>	boreal yarrow
<i>Achillea sibirica</i>	Siberian yarrow
<i>Agrostis exarata</i>	spike Bentgrass
<i>Agrostis mertensii</i>	northern bentgrass
<i>Agrostis scabra</i>	rough bentgrass
<i>Angelica lucida</i>	seacoast Angelica
<i>Arctagrostis latifolia</i>	wideleaf polargrass
<i>Artemisia tilesii</i>	Tilesius' wormwood
<i>Astragalus americanus</i>	American milkvetch
<i>Astragalus williamsii</i>	William's milkvetch
<i>Beckmannia syzigachne</i>	American sloughgrass
<i>Boykinia richardsonii</i>	Richardson's brookfoam
<i>Bromus inermis</i> ssp. <i>pumpellianus</i>	Pumpelly's brome
<i>Calamagrostis canadensis</i>	Bluejoint reedgrass
<i>Calamagrostis purpurascens</i>	Purple reedgrass
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	Northern reedgrass
<i>Carex aquatilis</i>	Water sedge
<i>Carex aquatilis</i> var. <i>dives</i>	Sitka sedge
<i>Carex lyngbyei</i>	Lyngbye's sedge
<i>Carex macrochaeta</i>	longawn sedge
<i>Carex mertensii</i>	Mertens' sedge
<i>Carex praticola</i>	meadow sedge
<i>Cnidium cnidiifolium</i>	Jakutsk snowparsley
<i>Deschampsia cespitosa</i>	Bering's tufted hairgrass
<i>Dupontia fisheri</i>	Fisher's tundra grass
<i>Elymus alaskanus</i>	slender wheatgrass
<i>Festuca altaica</i>	Altai fescue
<i>Festuca rubra</i>	red fescue
<i>Hedysarum alpinum</i>	alpine sweetvetch
<i>Hedysarum boreale</i> ssp. <i>mackenziei</i>	northern sweetvetch
<i>Heracleum maximum</i>	common cowparsnip
<i>Hordeum brachyantherum</i>	meadow barley
<i>Iris setosa</i>	Beachhead Iris
<i>Leymus innovatus</i>	downy ryegrass
<i>Leymus mollis</i>	american dunegrass
<i>Ligusticum scoticum</i>	Scottish licorice root
<i>Linum lewisii</i>	Lewis flax
<i>Lupinus arcticus</i>	arctic lupine
<i>Lupinus nootkatensis</i>	Nootka lupine
<i>Oxytropis borealis</i>	boreal locoweed
<i>Oxytropis campestris</i>	field locoweed
<i>Oxytropis deflexa</i>	blue nodding locoweed
<i>Phleum alpinum</i>	alpine timothy
<i>Poa alpina</i>	alpine bluegrass
<i>Poa arctica</i>	Arctic bluegrass
<i>Poa glauca</i>	glaucous bluegrass
<i>Polygonum alpinum</i>	Alaska wild rhubarb
<i>Rhinanthus minor</i>	little yellow rattle
<i>Trisetum spicatum</i>	spike trisetum

## 2. Priority taxa appropriate to small-scale production

<b>Species</b>	<b>Common Name</b>
<i>Anemone multifida</i>	Pacific anemone
<i>Aquilegia formosa</i>	western columbine
<i>Arabis hirsuta</i>	hairy rockcress
<i>Arabis holboellii</i>	Holboell's rockcress
<i>Arabis kamchatica</i>	Kamchatica rockcress
<i>Arabis x divaricarpa</i>	spreadingpod rockcress
<i>Arctophila fulva</i>	pendant grass
<i>Arnica angustifolia</i>	alpine leopardbane
<i>Artemisia arctica</i>	boreal sagebrush
<i>Artemisia campestris</i> ssp. <i>borealis</i>	field sagewort
<i>Aruncus dioicus</i>	bride's feathers
<i>Astragalus laxmannii</i> var. <i>tananaicus</i>	standing milkvetch
<i>Barbarea orthoceras</i>	American yellowrocket
<i>Carex bigelowii</i>	Bigelow sedge
<i>Carex gmelinii</i>	Gmelin's sedge
<i>Carex lenticularis</i> var. <i>lipocarpa</i>	Kellogg's sedge
<i>Carex norvegica</i> ssp. <i>inferalpina</i>	closedhead sedge
<i>Carex pachystachya</i>	Chamisso sedge
<i>Carex saxatilis</i>	rock sedge
<i>Carex scirpoidea</i>	northern singlespike sedge
<i>Carex utriculata</i>	sedge
<i>Chamerion angustifolium</i>	Fireweed
<i>Chamerion latifolium</i>	Dwarf fireweed
<i>Comarum palustre</i>	purple marshlocks
<i>Corydalis sempervirens</i>	rock harlequin
<i>Danthonia intermedia</i>	timber oatgrass
<i>Delphinium glaucum</i>	Sierra larkspur
<i>Dodecatheon pulchellum</i>	Darkthroat Shooting Star
<i>Draba aurea</i>	Golden Draba
<i>Erigeron acris</i>	bitter fleabane
<i>Eriophorum angustifolium</i>	tall cottongrass
<i>Eriophorum russeolum</i>	red cottongrass
<i>Eriophorum scheuchzeri</i>	white cottongrass
<i>Eriophorum vaginatum</i>	tussock cottongrass
<i>Erysimum inconspicuum</i>	Shy Wallflower
<i>Gentianella propinqua</i> ssp. <i>propinqua</i>	fourpart dwarf gentian
<i>Gentianopsis detonsa</i> ssp. <i>yukonensis</i>	windmill fringed gentian
<i>Geum macrophyllum</i>	Largeleaf Avens
<i>Glyceria grandis</i>	American mannagrass
<i>Hierochloa odorata</i>	sweetgrass
<i>Juncus castaneus</i>	chestnut rush
<i>Juncus filiformis</i>	thread rush
<i>Lathyrus japonicus</i>	beach pea
<i>Lathyrus palustris</i>	marsh pea
<i>Luzula multiflora</i>	common woodrush
<i>Luzula parviflora</i>	smallflowered woodrush
<i>Packera pauciflora</i>	Alpine groundsel
<i>Papaver lapponicum</i>	Lapland poppy
<i>Papaver nudicaule</i> ssp. <i>americanum</i>	Iceland Poppy (native)
<i>Plantago canescens</i>	gray pubescent plantain
<i>Poa pratensis</i> ssp. <i>alpigena</i>	Kentucky bluegrass
<i>Potentilla bimundorum</i>	staghorn cinquefoil

*Pseudoroegneria spicata*  
*Rumex aquaticus* var. *fenestratus*  
*Rumex arcticus*  
*Sanguisorba canadensis*  
*Sanguisorba officinalis*  
*Saxifraga hieracifolia*  
*Schoenoplectus tabernaemontani*  
*Senecio congestus*  
*Trisetum canescens*

bluebunch wheatgrass  
western dock  
arctic dock  
Canadian burnet  
official burnet  
Stiff stem saxifrage  
softstem bulrush  
marsh fleabane  
Tall Trisetum

### 3. Appropriate for opportunistic collections

#### Species

*Aconitum delphiniifolium*  
*Allium schoenoprasum*  
*Alopecurus aequalis*  
*Alopecurus alpinus*  
*Anaphalis margaritacea*  
*Androsace septentrionalis*  
*Anemone narcissiflora*  
*Anemone narcissiflora* var. *monantha*  
*Anemone parviflora*  
*Anemone richardsonii*  
*Antennaria alpina*  
*Antennaria friesiana*  
*Antennaria rosea*  
*Anthoxanthum monticola*  
*Apocynum androsaemifolium*  
*Argentina egedii* ssp. *egedii*  
*Argentina egedii* ssp. *groenlandica*  
*Armeria maritima*  
*Arnica frigida*  
*Arnica latifolia*  
*Astragalus alpinus*  
*Astragalus eucosmus* ssp. *sealei*  
*Braya humilis*  
*Campanula aurita*  
*Campanula lasiocarpa*  
*Campanula rotundifolia*  
*Carex arcta*  
*Carex atratiformis*  
*Carex aurea*  
*Carex brunescens*  
*Carex canescens*  
*Carex crawfordii*  
*Carex diandra*  
*Carex krausei*  
*Carex lachenalii*  
*Carex lasiocarpa*  
*Carex membranacea*  
*Carex microchaeta*  
*Carex nardina*  
*Carex obtusata*  
*Carex podocarpa*

#### Common Name

larkspurleaf monkshood  
wild chives  
shortawn foxtail  
boreal alopecurus  
Western Pearly Everlasting  
pygmyflower rockjasmine  
Narcissus anemone  
Narcissus anemone  
smallflowered anemone  
Richardson anemone  
alpine pussytoes  
Fries' pussytoes  
rosy pussytoes  
alpine sweetgrass  
spreading dogbane  
Pacific silverweed  
Pacific silverweed  
thrift seapink  
snow arnica  
broadleaf arnica  
alpine milkvetch  
elegant milkvetch  
low alpine rockcress  
Yukon Bellflower  
mountain harebell  
bluebell bellflower  
northern cluster sedge  
Polar sedge  
golden sedge  
Brownish Sedge  
silvery sedge  
Crawford's sedge  
lesser panicled sedge  
Krause's sedge  
arctic hare-foot sedge  
woollyfruit sedge  
fragile sedge  
smallawned sedge  
spike sedge  
obtuse sedge  
short-stalk sedge

<i>Carex stylosa</i>	variegated sedge
<i>Castilleja caudata</i>	Port Clarence Indian paintbrush
<i>Castilleja parviflora</i>	mountain Indian paintbrush
<i>Castilleja unalaschcensis</i>	Alaskan indian paintbrush
<i>Cerastium arvense</i>	Field Chickweed
<i>Cerastium beeringianum</i>	Bering chickweed
<i>Chenopodium capitatum</i>	blite goosefoot
<i>Chimaphila umbellata</i> ssp. <i>occidentalis</i>	pipsissiwa
<i>Chrysanthemum arcticum</i>	artic daisy
<i>Cicuta virosa</i>	Mackenzie's water hemlock
<i>Conioselinum gmelinii</i>	Pacific hemlockparsley
<i>Cornus canadensis</i>	bunchberry dogwood
<i>Cornus suecica</i>	Lapland bunchberry
<i>Corydalis aurea</i>	scrambled eggs
<i>Crepis elegans</i>	elegant hawkbeard
<i>Descurainia sophioides</i>	northern tansy mustard
<i>Dianthus repens</i>	boreal carnation
<i>Dodecatheon frigidum</i>	Western artic shootingstar
<i>Dracocephalum parviflorum</i>	American dragonhead
<i>Eleocharis kamtschatica</i>	Kamchatka spikerush
<i>Eleocharis palustris</i> s.l.	common spikerush
<i>Elymus macrourus</i>	slender wheatgrass
<i>Elymus trachycaulus</i>	slender wheatgrass
<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i>	fringed willowherb
<i>Epilobium ciliatum</i> ssp. <i>glandulosum</i>	fringed willowherb
<i>Epilobium hornemannii</i>	Hornemann's willow-herb
<i>Epilobium luteum</i>	yellow willowherb
<i>Epilobium palustre</i>	marsh willowherb
<i>Erigeron compositus</i>	Cutleaf daisy
<i>Erigeron humilis</i>	arctic alpine fleabane
<i>Erigeron lonchophyllus</i>	Shortray Fleabane
<i>Erigeron peregrinus</i>	subalpine fleabane
<i>Erigeron purpuratus</i>	Purple Fleabane
<i>Eriophorum brachyantherum</i>	northland cottongrass
<i>Eriophorum viridicarinatum</i>	thinleaf cottonsedge
<i>Erysimum pallasii</i>	Pallas' wallflower
<i>Euphrasia disjuncta</i>	polar eyebright
<i>Eurybia sibirica</i>	arctic aster
<i>Fragaria chiloensis</i> ssp. <i>pacifica</i>	Beach strawberry
<i>Fritillaria camschatcensis</i>	Kamchatka fritillary
<i>Galium boreale</i>	northern bedstraw
<i>Gentiana glauca</i>	pale gentian
<i>Geum glaciale</i>	glacier avens
<i>Geum rossii</i>	Ross' avens
<i>Heuchra glabra</i>	alpine heuchra
<i>Hieracium triste</i>	woolly hawkweed
<i>Honckenya peploides</i> ssp. <i>diffusa</i>	seaside sandplant
<i>Juncus alpinoarticulatus</i>	northern green rush
<i>Juncus arcticus</i> ssp. <i>littoralis</i>	mountain rush
<i>Juncus bufonius</i>	toad rush
<i>Juncus haenkei</i>	Haenke's rush
<i>Maianthemum stellatum</i>	starry false lily of the valley
<i>Menyathes trifoliata</i>	buckbean
<i>Mertensia paniculata</i>	tall bluebells
<i>Mimulus guttatus</i>	seep monkeyflower
<i>Nuphar lutea</i> ssp. <i>polysepala</i>	Rocky Mountain pond-lily

<i>Oxytropis maydelliana</i>	Maydell's oxytrope
<i>Parnassia kotzebuei</i>	Kotzebue's grass of Parnassus
<i>Parnassia palustris</i>	marsh grass of Parnassus
<i>Parrya nudicaulis</i>	nakedstem wallflower
<i>Pedicularis groenlandica</i>	elephanthead lousewort
<i>Pedicularis labradorica</i>	Labrador lousewort
<i>Pedicularis lanata</i>	woolly lousewort
<i>Pedicularis langsдорffii</i>	Langsdorf's lousewort
<i>Pedicularis parviflora</i>	smallflower lousewort
<i>Pedicularis sudetica</i>	sudetic lousewort
<i>Pedicularis verticillata</i>	whorled lousewort
<i>Penstemon gormanii</i>	Gorman's beardtongue
<i>Phlox sibirica</i>	Siberian phlox
<i>Plantago macrocarpa</i>	Seashore Plantain
<i>Plantago maritima</i>	Goose Tongue
<i>Poa eminens</i>	largeflower speargrass
<i>Polemonium acutiflorum</i>	tall Jacob's ladder
<i>Polemonium pulcherrimum</i>	Jacob's ladder
<i>Polygonum caurinum</i>	Alaska knotweed
<i>Polygonum viviparum</i>	alpine bistort
<i>Potamogeton natans</i>	floating pondweed
<i>Potentilla biflora</i>	two-flower cinquefoil
<i>Potentilla drummondii</i> ssp. <i>drummondii</i>	Drummond's cinquefoil
<i>Potentilla hookeriana</i>	Hooker's cinquefoil
<i>Potentilla pensylvanica</i> var. <i>litoralis</i>	Rocky Mountain Cinquefoil
<i>Potentilla pensylvanica</i> var. <i>pensylvanica</i>	Pennsylvania cinquefoil
<i>Potentilla villosa</i>	northern cinquefoil
<i>Prenanthes alata</i>	western rattlesnakeroot
<i>Primula anvilensis</i>	boreal primrose
<i>Primula incana</i>	Silvery primrose
<i>Pulsatilla patens</i> ssp. <i>multifida</i>	Pasqueflower
<i>Ranunculus cymbalaria</i>	alkali buttercup
<i>Ranunculus nivalis</i>	snow buttercup
<i>Ranunculus pallasii</i>	Pallas' buttercup
<i>Rhodiola integrifolia</i>	ledge stonecrop
<i>Rorippa palustris</i> s.l.	bog yellowcress
<i>Rorippa palustris</i> ssp. <i>hispida</i>	hispid yellowcress
<i>Rubus arcticus</i>	nagoonberry
<i>Rubus chamaemorus</i>	cloudberry
<i>Rumex maritimus</i>	golden dock
<i>Saussurea angustifolia</i>	narrowleaf saw-wort
<i>Saxifraga bronchialis</i>	yellowdot saxifrage
<i>Saxifraga ferruginea</i>	russethair saxifrage
<i>Saxifraga hirculus</i>	yellow marsh saxifrage
<i>Saxifraga nivalis</i>	snow saxifrage
<i>Saxifraga oppositifolia</i>	purple mountain saxifrage
<i>Saxifraga tricuspidata</i>	three toothed saxifrage
<i>Schizachne purpurascens</i>	false melic
<i>Schoenoplectus maritimus</i>	cosmopolitan bulrush
<i>Senecio lugens</i>	small blacktip ragwort
<i>Senecio pseudoarnica</i>	seaside ragwort
<i>Sibbaldia procumbens</i>	creeping sibbaldia
<i>Silene acaulis</i>	moss campion
<i>Silene menziesii</i> ssp. <i>williamsii</i>	Menzies' campion
<i>Silene repens</i>	pink campion
<i>Silene taimyrensis</i>	Taimyr catchfly

<i>Silene uralensis</i> ssp. <i>uralensis</i>	apetalous catchfly
<i>Sisyrinchium littorale</i>	Alaska Blue-Eyed Grass
<i>Sium suave</i>	hemlock waterparsnip
<i>Solidago canadensis</i>	Canada golden rod
<i>Solidago multiradiata</i>	Rocky Mountain goldenrod
<i>Solidago simplex</i> ssp. <i>simplex</i> var. <i>nana</i>	dwarf goldenrod
<i>Sparganium angustifolium</i>	narrowleaf bur-reed
<i>Stellaria calycantha</i>	northern starwort
<i>Stellaria longipes</i>	Longstalk starwort
<i>Symphyotrichum boreale</i>	northern bog aster
<i>Symphyotrichum subspicatum</i>	Douglas aster
<i>Taraxacum officinale</i> ssp. <i>ceratophorum</i>	common dandelion (native)
<i>Tellima grandiflora</i>	bigflower tellima
<i>Tephrosia atropurpurea</i>	arctic grousel
<i>Thalictrum alpinum</i>	alpine meadowrue
<i>Thalictrum sparsiflorum</i>	fewflower meadowrue
<i>Tofieldia coccinea</i>	northern asphodel
<i>Tofieldia pusilla</i>	Scotch false asphodel
<i>Trichophorum alpinum</i>	alpine bulrush
<i>Trichophorum cespitosum</i>	tufted bulrush
<i>Trientalis europaea</i>	Arctic Starflower
<i>Triglochin maritima</i>	seaside arrowgrass
<i>Triglochin palustris</i>	marsh arrowgrass
<i>Typha latifolia</i>	broadleaf cattail
<i>Vahlodea atropurpurea</i>	mountain hairgrass
<i>Veratrum album</i>	white false hellebore
<i>Veratrum viride</i>	green false hellebore
<i>Veronica americana</i>	American speedwell
<i>Veronica wormskjoldii</i> var. <i>wormskjoldii</i>	American alpine speedwell
<i>Viola adunca</i>	hookspurred violet
<i>Viola epipsila</i>	dwarf marsh violet
<i>Viola glabella</i>	pioneer violet
<i>Viola langsdorffii</i>	Aleutian violet
<i>Viola renifolia</i>	white violet
<i>Viola selkirkii</i>	Selkirk's violet
<i>Wilhelmsia physodes</i>	merckia

#### **4. Shrubs and trees: appropriate to be collected for direct application at restoration sites, not appropriate for increase.**

<b>Species</b>	<b>Common Name</b>
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	thinleaf alder
<i>Alnus rubra</i>	red alder
<i>Alnus viridis</i> ssp. <i>crispa</i>	mountain alder
<i>Alnus viridis</i> ssp. <i>sinuata</i>	Sitka alder
<i>Amelanchier alnifolia</i>	Saskatoon serviceberry
<i>Arctostaphylos uva-ursi</i>	kinnikinnik
<i>Artemisia frigida</i>	prairie sagewort
<i>Cassiope tetragona</i>	white arctic mountain heather
<i>Cornus sericea</i>	redosier dogwood
<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>	shrubby cinquefoil
<i>Dryas drummondii</i>	Drummond's mountain avens
<i>Dryas integrifolia</i>	entireleaf mountain-avens
<i>Dryas octopetala</i>	eight petal mountain-avens

<i>Dryas octopetala</i> ssp. <i>alaskensis</i>	Alaskan mountain-avens
<i>Elaeagnus commutata</i>	silverberry
<i>Juniperus communis</i>	common juniper
<i>Larix laricina</i>	tamarack
<i>Ledum groenlandicum</i>	bog Labrador tea
<i>Ledum palustre</i> ssp. <i>decumbens</i>	marsh labrador tea
<i>Menziesia ferruginea</i>	rusty menziesia
<i>Myrica gale</i>	sweet gale
<i>Picea glauca</i>	white spruce
<i>Picea mariana</i>	black spruce
<i>Picea sitchensis</i>	Sitka spruce
<i>Rhododendron camtschaticum</i> ssp. <i>glandulosum</i>	Kamchatka rhododendron
<i>Rhododendron lapponicum</i>	Lapland rosebay
<i>Ribes hudsonianum</i>	northern black currant
<i>Ribes triste</i>	red currant
<i>Rosa acicularis</i>	prickly rose
<i>Sambucus racemosa</i>	red elderberry
<i>Shepherdia canadensis</i>	russet buffaloberry
<i>Sorbus scopulina</i>	Greene's mountain ash
<i>Sorbus sitchensis</i>	western mountain ash
<i>Spiraea douglasii</i>	rose spiraea
<i>Spirea stevenii</i>	beauverd spirea
<i>Vaccinium uliginosum</i>	bog blueberry
<i>Vaccinium vitis-idaea</i>	lingonberry
<i>Viburnum edule</i>	squashberry

## 5. Possibly consider removing these from target list.

<b>Species</b>	<b>Common Name</b>
<i>Androsace chamaejasme</i>	sweetflower rockjasmine
<i>Arctostaphylos alpina</i>	black bearberry
<i>Arctostaphylos rubra</i>	red fruit bearberry
<i>Astragalus nutzotinensis</i>	Nutzotin milkvetch
<i>Betula glandulosa</i>	resin Birch
<i>Betula nana</i>	dwarf birch
<i>Betula neoalaskana</i>	paper birch
<i>Caltha palustris</i>	yellow marsh marigold
<i>Cardamine bellidifolia</i>	alpine bittercress
<i>Carex supina</i> var. <i>spaniocarpa</i>	weak arctic sedge
<i>Loiseleuria procumbens</i>	alpine azalea
<i>Luzula rufescens</i>	hairy woodrush
<i>Moneses uniflora</i>	single delight
<i>Orthilia secunda</i>	sidebells wintergreen
<i>Oxytropis nigrescens</i>	blackish oxytrope
<i>Petasites frigidus</i>	arctic sweet coltsfoot
<i>Petasites frigidus</i> var. <i>sagittatus</i>	arrowleaf sweet coltsfoot
<i>Potentilla norvegica</i> ssp. <i>monspeliensis</i>	Norwegian cinquefoil
<i>Pyrola asarifolia</i>	liverleaf wintergreen
<i>Pyrola minor</i>	snowline wintergreen
<i>Ranunculus flammula</i>	greater creeping sandwort
<i>Sagina intermedia</i>	snow pearlwort

## Appendix 4. Workhorse species collects in each Seed Zone.

Workhorse species	SEED ZONE					
	Arctic	Interior	West	South West	South Central	South East
<i>Achillea millefolium</i> var. <i>borealis</i>	N*	N	N	N	N	N
<i>Achillea sibirica</i>	----	Y	----	----	----	----
<i>Agrostis exarata</i>	----	----	----	N	N	Y
<i>Agrostis mertensii</i>	----	Y	(Y)*	N	N	N
<i>Agrostis scabra</i>	----	Y	Y	N	N	N
<i>Angelica lucida</i>	----	N	Y	N	Y	N
<i>Arctagrostis latifolia</i>	N	Y	Y	N	N	N*
<i>Artemisia tilesii</i>	N	N	Y	N	Y	N
<i>Astragalus americanus</i>	----	Y	----	----	----	----
<i>Astragalus williamsii</i>	----	Y	----	----	----	----
<i>Beckmannia syzigachne</i>	----	Y	----	----	Y*	----
<i>Boykinia richardsonii</i>	Y	N	Y	----	----	----
<i>Bromus inermis</i> ssp. <i>pumpellianus</i>	Y	N	(Y)	----	----	----
<i>Calamagrostis canadensis</i>	N*	Y	Y	N	(Y)	Y
<i>Calamagrostis purpurascens</i>	N	Y	Y	----	----	----
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	----	N	N*	N	N	----
<i>Carex aquatilis</i>	N	N	(Y)	N	N	N
<i>Carex aquatilis</i> var. <i>dives</i>	----	----	(N)	N	N	N
<i>Carex lyngbyei</i>	----	----	N	N	Y	(Y)
<i>Carex macrochaeta</i>	----	----	----	N	(Y)	N
<i>Carex mertensii</i>	----	----	----	N*	Y	Y
<i>Carex praticola</i>	----	Y	----	----	N*	----
<i>Cnidium cnidiifolium</i>	N	Y	N	----	----	----
<i>Deschampsia cespitosa</i>	N	Y	Y	N	N	N
<i>Dupontia fisheri</i>	N	----	N	----	----	----
<i>Elymus alaskanus</i>	N	N	N	----	N	----
<i>Festuca altaica</i>	?	Y	(Y)	N	(Y)	----
<i>Festuca rubra</i>	N	(Y)	Y	N	N	N
<i>Hedysarum alpinum</i>	(Y)	Y	N	----	(Y)	----
<i>Hedysarum boreale</i> ssp. <i>mackenziei</i>	X	Y	N	----	----	----
<i>Heracleum maximum</i>	----	Y	Y	N	Y	Y
<i>Hordeum brachyantherum</i>	----	----	----	N	(Y)	(Y)
<i>Iris setosa</i>	----	Y	(Y)	N	N	Y

- Y more than 10,000 seeds have been collected in that zone  
 (Y) fewer than 10,000 seeds have been collected in that zone, or collection has not been located  
 N not yet collected in that zone  
 ---- not found or widespread in that zone  
 \* indicates the taxon has a limited distribution in that zone



## Appendix 4. Workhorse species collects in each Seed Zone.

Workhorse species	SEED ZONE					
	Arctic	Interior	West	South West	South Central	South East
<i>Leymus innovatus</i>	N	N	----	----	----	----
<i>Leymus mollis</i>	N	----	Y	N	Y	Y
<i>Ligusticum scoticum</i>	----	----	Y	N	N	N
<i>Linum lewisii</i>	----	Y	----	----	----	----
<i>Lupinus arcticus</i>	(Y)	(Y)	N	----	----	----
<i>Lupinus nootkatensis</i>	----	----	(Y)	N	Y	(Y)
<i>Oxytropis borealis</i>	N	N	N*	----	----	----
<i>Oxytropis campestris</i>	N	Y	----	----	(Y)	N*
<i>Oxytropis deflexa</i>	N	Y	----	----	N*	----
<i>Phleum alpinum</i>	----	N*	N*	N	Y	N
<i>Poa alpina</i>	N	Y	Y	----	N	N
<i>Poa arctica</i>	N	N	N	N	N	N
<i>Poa glauca</i>	N	Y	N	N*	N	----
<i>Polygonum alpinum</i>	----	Y	N	----	----	----
<i>Rhinanthus minor</i>	----	----	Y	N	Y	Y
<i>Trisetum spicatum</i>	N	(Y)	Y	N	N	N

- Y more than 10,000 seeds have been collected in that zone  
 (Y) fewer than 10,000 seeds have been collected in that zone, or collection has not been located  
 N not yet collected in that zone  
 ---- not found or widespread in that zone  
 \* indicates the taxon has a limited distribution in that zone

Data Source: Nowacki, G.J., P. Spencer, T. Brock, M. Fleming, and T. Jorgenson. 2001. "Ecoregions of Alaska and neighboring Territories. U.S. Geological Survey Miscellaneous Investigations series 1 map (in press).

# Alaska Ecoregions

## Boreal

- Intermontane Boreal
- B2 - Ray Mountains
- B11 - Kuskokwim Mountains
- B6 - Yukon-Old Crow Basin
- B7 - Yukon River Lowlands
- B10 - Tanana-Kuskokwim Lowlands
- B12 - Kobuk Ridges and Valleys
- B13 - Yukon-Tanana Uplands
- B14 - Davidson Mountains
- B15 - North Ogilvie Mountains

## Alaska Range Transition

- B3 - Alaska Range
- B4 - Lime Hills
- B5 - Cook Inlet Basin
- B8 - Copper River Basin

## Coast Mountains Transition

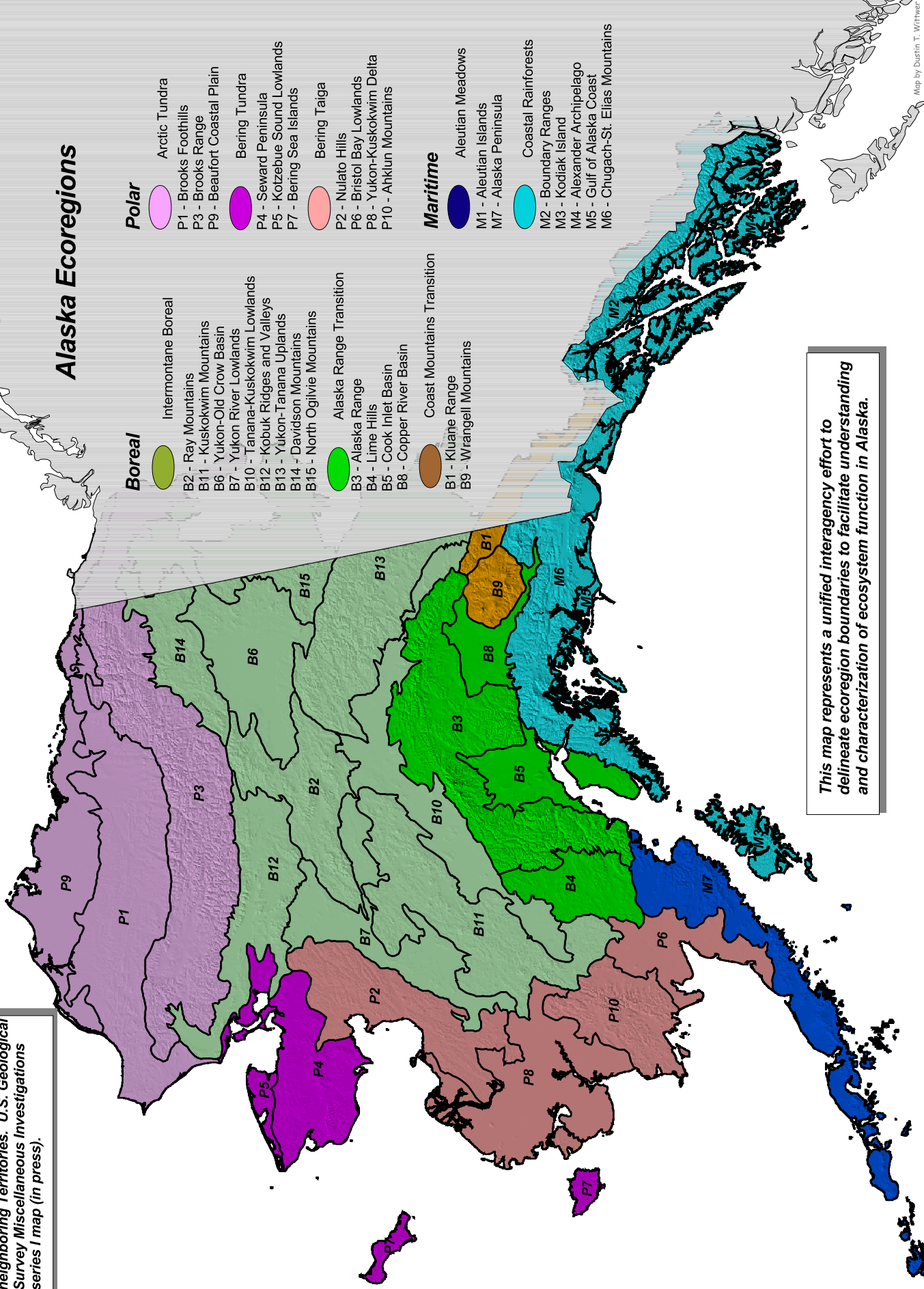
- B1 - Klutane Range
- B9 - Wrangell Mountains

## Polar

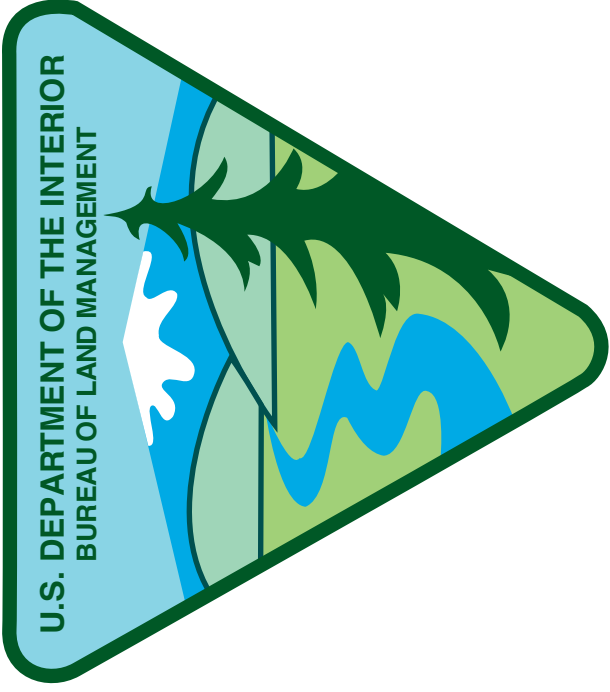
- Arctic Tundra
- P1 - Brooks Foothills
- P3 - Brooks Range
- P9 - Beaufort Coastal Plain
- Bering Tundra
- P4 - Seward Peninsula
- P5 - Kotzebue Sound Lowlands
- P7 - Bering Sea Islands
- Bering Taiga
- P2 - Nulato Hills
- P6 - Bristol Bay Lowlands
- P8 - Yukon-Kuskokwim Delta
- P10 - Ahklun Mountains

## Maritime

- Aleutian Meadows
- M1 - Aleutian Islands
- M7 - Alaska Peninsula
- Coastal Rainforests
- M2 - Boundary Ranges
- M3 - Kodiak Island
- M4 - Alexander Archipelago
- M5 - Gulf of Alaska Coast
- M6 - Chugach-St. Elias Mountains



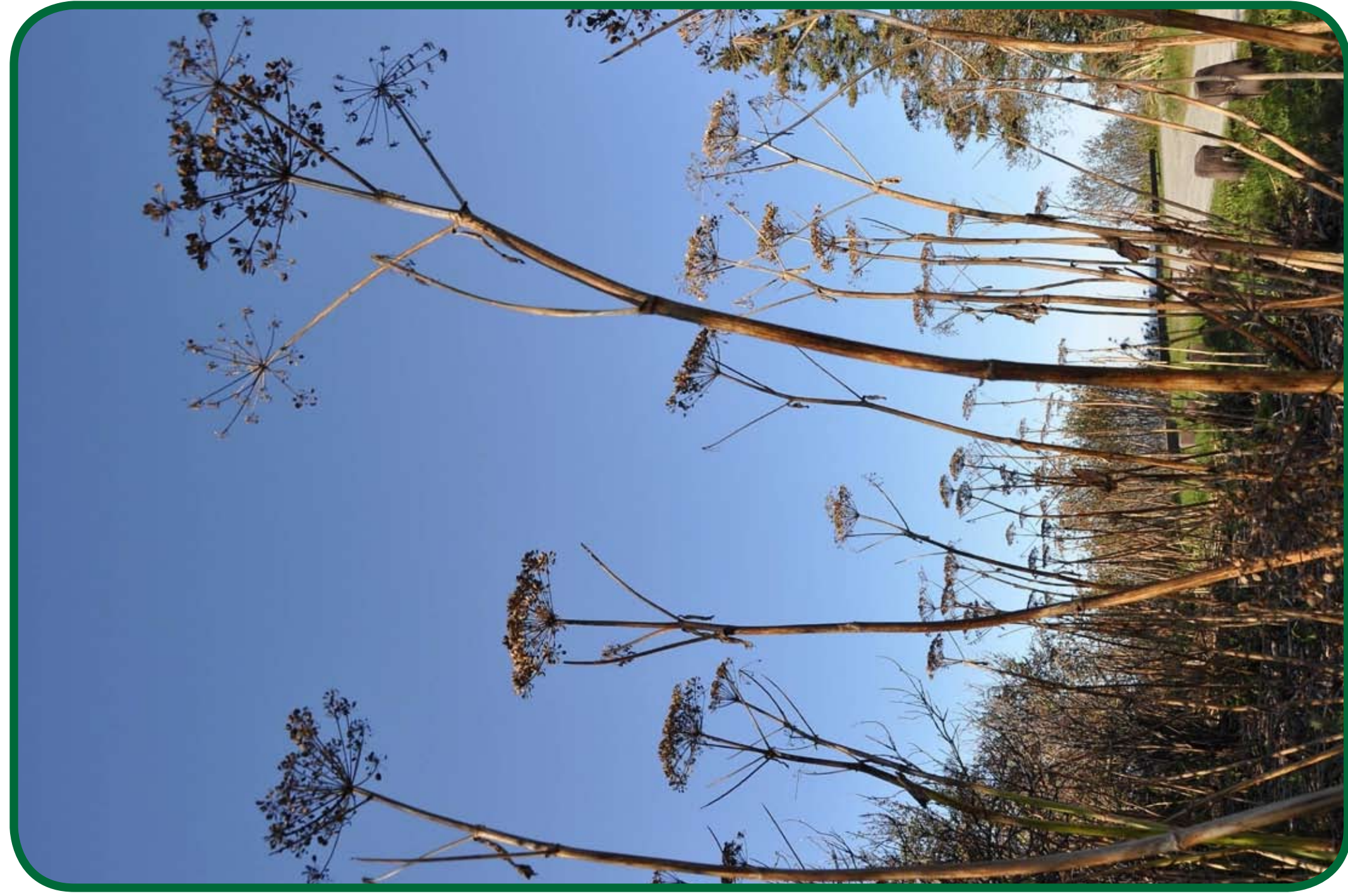
This map represents a unified interagency effort to delineate ecoregion boundaries to facilitate understanding and characterization of ecosystem function in Alaska.



# Native Plant Materials Development Program 2010

## Sprouting potential for stabilization, conservation, and restoration in Alaska

**Mentors:** Mike Duffy and Paul Krabacher  
**Interns:** Christine Balk, Daniel Brickley, Vania Chan, and Jordan Schoonover



Caption

### The Bureau of Land Management's Seeds of Success Project

Seeds of Success is a nationwide interagency program that was founded to establish a meticulously documented collection of seeds from indigenous plants of the United States. A seed bank is being created for future stabilization, restoration, and rehabilitation projects. Collection efforts focus on early seral species that are resilient and can resist noxious introduced species.

### Applications of Seeds of Success in Alaska:

- BLM have developed a source for all anticipated seed needs for project demands and for future needs (mine reclamation, operations/maintenance, etc);
- Increase availability of native Alaskan seeds to promote affordability and accessibility for commercial projects
- Genetic representatives from defined seed transfer zones for keystone species
- Habitat and species composition of collection areas to further knowledge about Alaskan flora and stimulate future research
- Foster partnership and cooperation between agencies, local public and private landowners

### The 2010 Field Season

In partnership with the Chicago Botanic Garden and the Alaska Natural Heritage Program, the BLM Alaska State Office hired four interns and a professional botanist to collect seed throughout the state. Approximately 250 collections were made in such diverse locales as the Seward Peninsula, Copper Basin, Kenai Peninsula, interior highlands near Fairbanks, and the Anchorage area.



Mike Duffy, Christine Balk, Daniel Brickley, Vania Chan, and Jordan Schoonover ???

## Native Plant Materials Development Program

**MISSION:** Increase the diversity and amount of native seed available for stabilization, rehabilitation and restoration efforts on various federal land management lands.

### Palmer Plant Materials Center

Seeds of Success seed is delivered to Palmer for; cleaning, viability and germination tests; and storage per long term recommendation protocol by the Plant Material Center. Current seed increase from SOS collected native plant seed :

- Carex mertensii*
- Chamერთon latifolium*
- Artemisia tilesit*
- Oxytropis campestris*
- Sanguisorba canadensis*
- Wilhelmia physodes*
- Agrostis scabra*
- Achillea sibirica*
- Agrostis mertensii*
- Poa alpina*
- Hedysarum alpinum*



Caption

### Over 150 species on early serial collection list

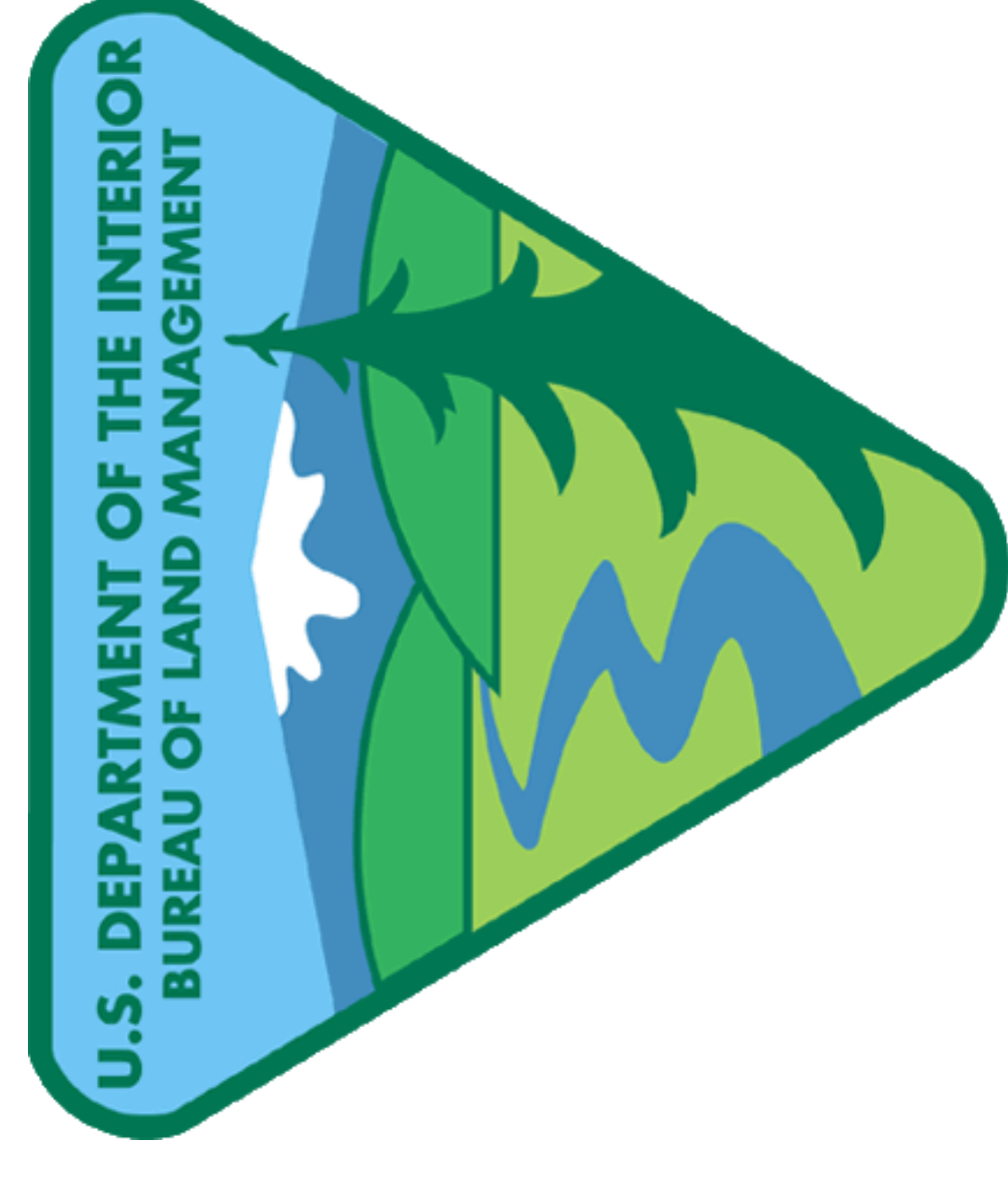
- |                               |   |
|-------------------------------|---|
| <i>Hordeum brachyantherum</i> | <i>Oxytropis campestris</i>   |
| <i>Juniperus communis</i>     | <i>Oxytropis nigrescens</i>   |
| <i>Lathyrus japonicus</i>     | <i>Parnassia katzebuei</i>  |
| <i>Lathyrus palustris</i>     | <i>Parnassia palustris</i>  |
| <i>Leymus mollis</i>          | <i>Pedicularis labradorica</i>  |
| <i>Loiseleuria procumbens</i> | <i>Pedicularis langsdorfii</i>  |
| <i>Lupinus arcticus</i>       | <i>Pedicularis parviflora</i>   |
| <i>Lupinus nootkatensis</i>   | <i>Petasites frigidus</i>   |
| <i>Mimulus guttatus</i>       | <i>Petasites saggittatus</i> = <i>Petasites frigidus</i> var. <i>sagittatus</i> |
| <i>Orthilia secunda</i>       | <i>Phleum alpinum</i>   |
| <i>Oxytropis borealis</i>     |   |





# Native Plant Materials Development Program 2011: Sprouting potential for stabilization, conservation, and restoration in Alaska

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Interns: Alyssa Epstein and Emily Capelin



## Native Plant Materials Development Program

**Mission:** Increase the diversity and amount of native seed available for stabilization, rehabilitation, and restoration efforts on various federal management lands.

## BLM's Seeds of Success Project

Seeds of Success is a nationwide interagency program that was founded to establish a meticulously documented collection of seeds from indigenous plants of the United States. A seed bank is being created for future stabilization, restoration, and rehabilitation projects. Collection efforts focus on early seral species that are resilient and can resist noxious introduced species.

## The 2011 Field Season

In partnership with the Chicago Botanic Garden and the Alaska Natural Heritage Program, the BLM Alaska State Office hired two interns and a professional botanist to collect seed throughout the state. Approximately 125 collections were made in such diverse locales as Chicken, Platinum on the Southwest Coast, Southeast, Chugach State Park, and the Anchorage area.

## Reclamation

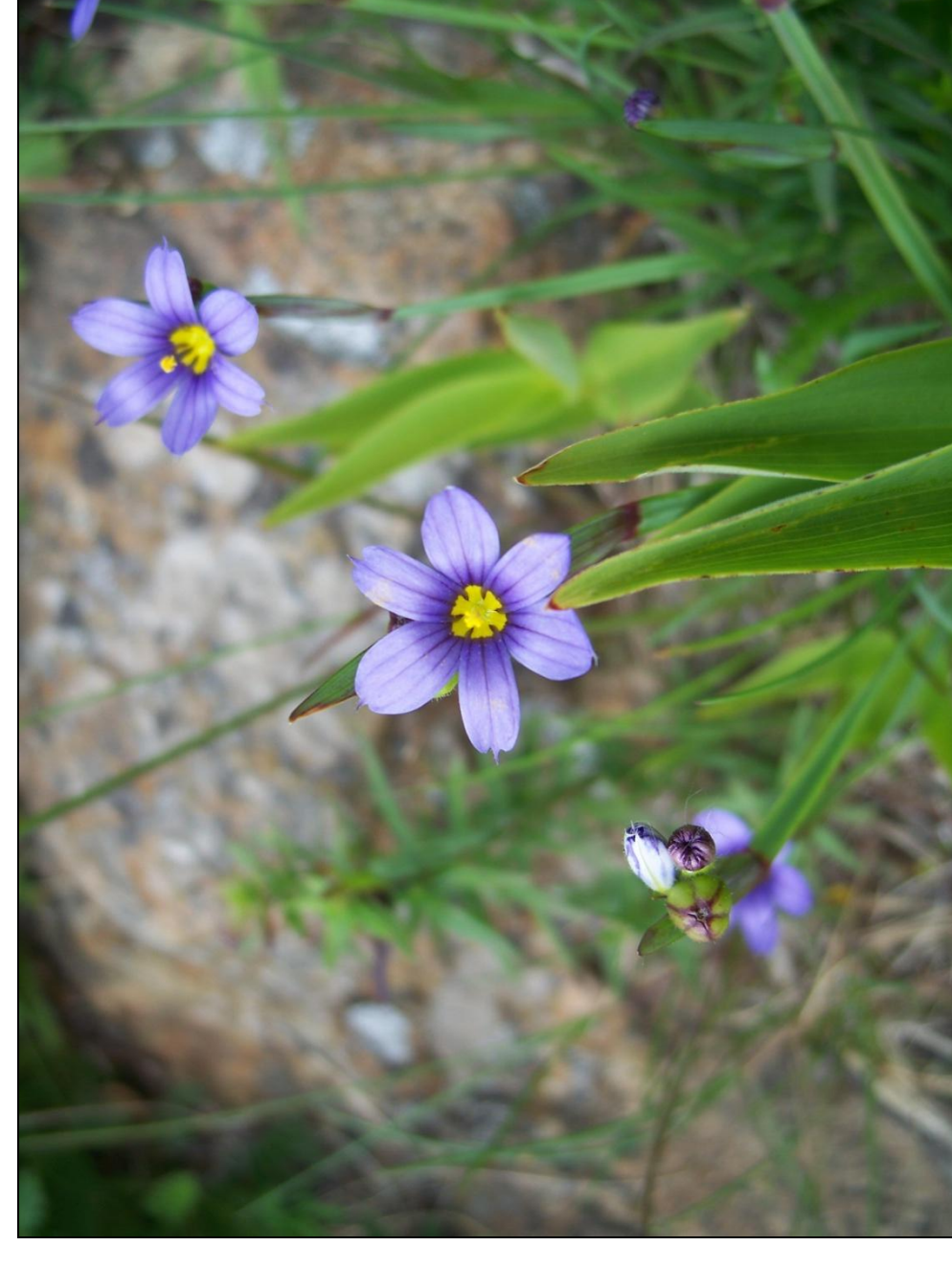
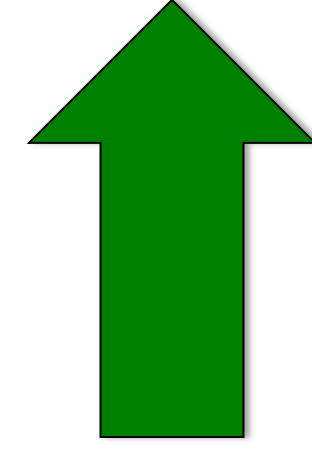
In cooperation with XS Platinum, native seeds were collected around the Platinum mine site including old tailings. These seeds will be increased at the Plant Material Center and used for future reclamation at the Platinum mine site.



Seed collection



Seed viability and germination test at PMC



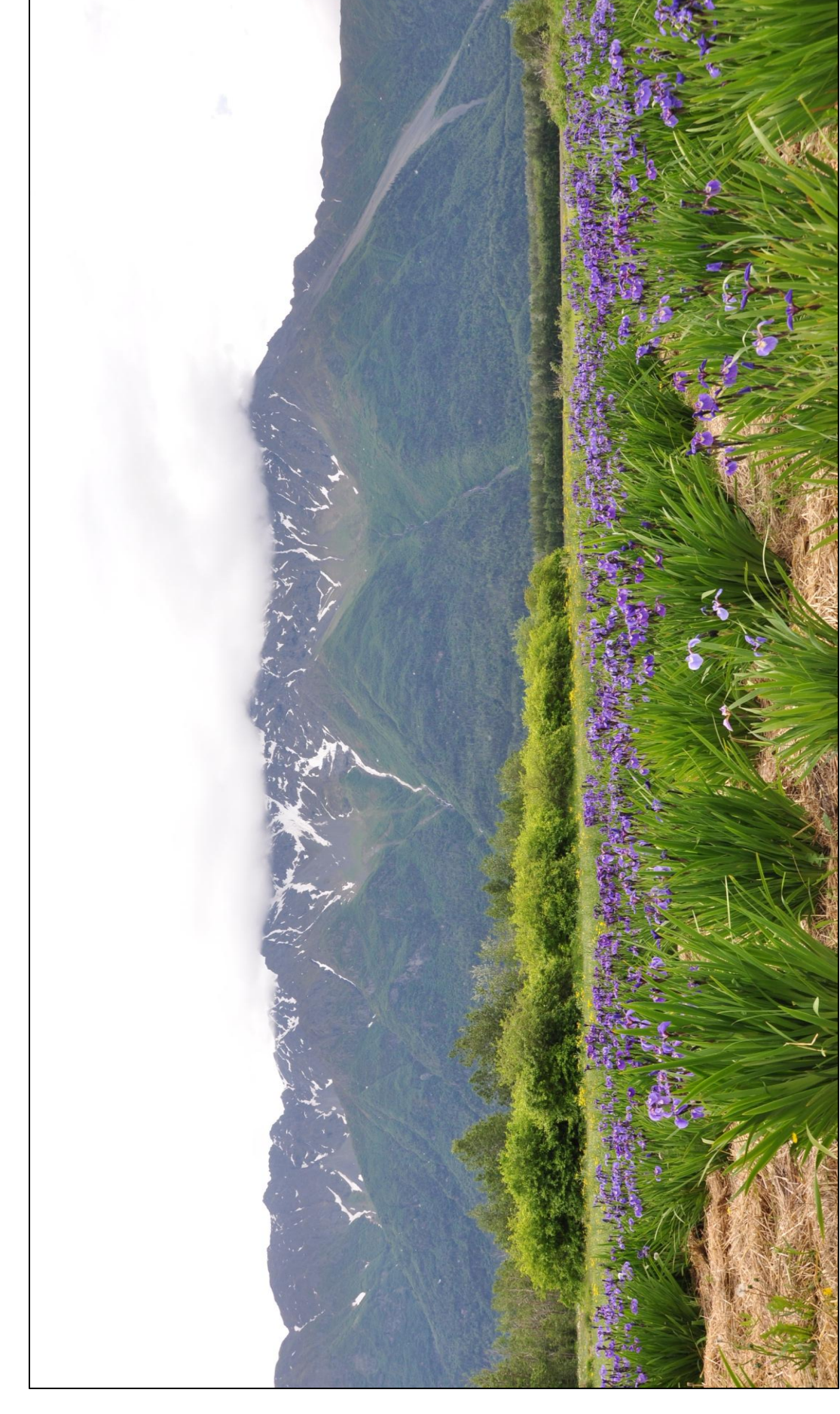
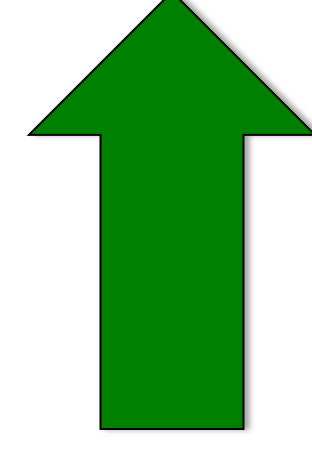
*Sisyrinchium littorale* from Turnagain Arm



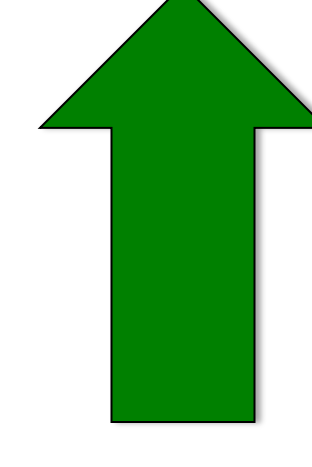
*Carex mertensii* from the Klondike Highway



Collecting seeds near Chicken, AK



Seed planted for increase at PMC



Seed cleaned and ready for storage or use

## Applications and Goals of Seeds of Success in Alaska:

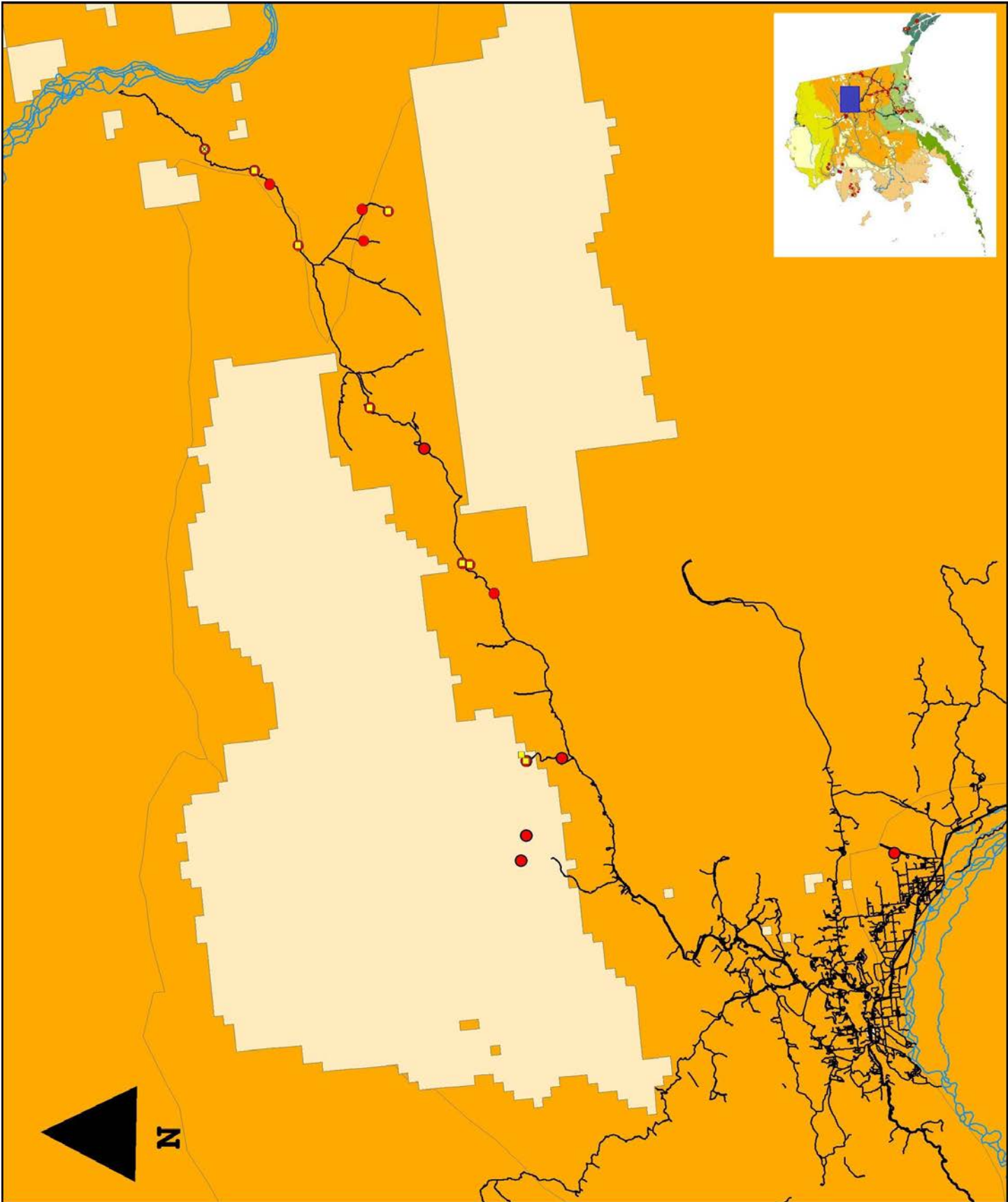
- Develop sources for anticipated seed needs for present project demands and for future needs (mine reclamation, operations/maintenance, etc.) and increase the availability of native Alaskan seeds to promote affordability and accessibility for all projects
- Provide genetic representatives from defined seed transfer zones for keystone species
- Note the habitat and species composition of collection areas to further knowledge about Alaskan flora and stimulate future research
- Foster partnership and cooperation between local public and private landowners

## Alaska Plant Materials Center

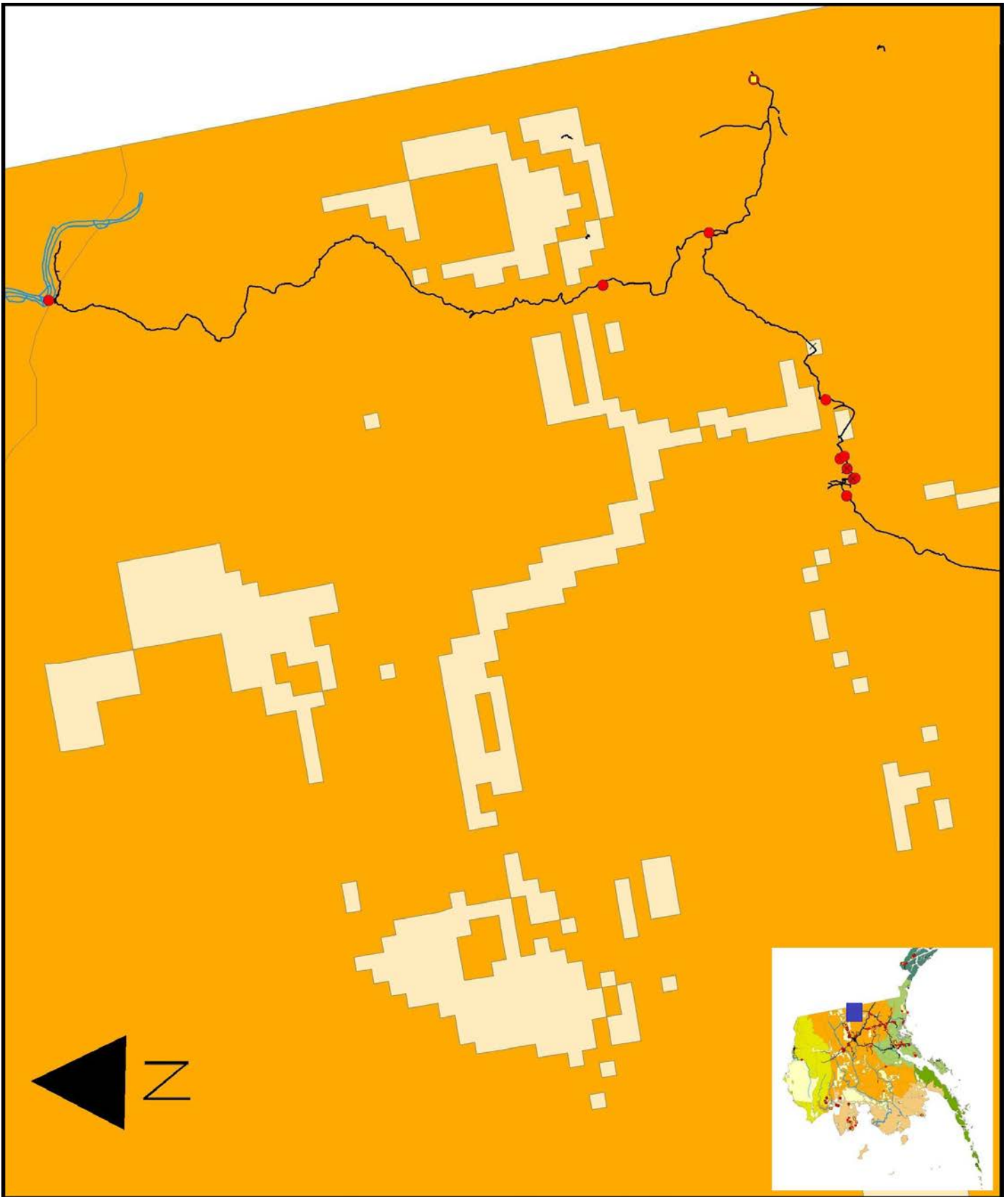
- Seeds of Success seed is delivered to Palmer for cleaning, viability and germination tests, increase, and storage per long term recommendation protocol by the Plant Material Center.
- Current seed increase from SOS-collected native plant seed includes: *Agrostis mertensii*, *Artemisia tilesii*, *Carex mertensii*, *Chamerion latifolium*, *Hedysarum alpinum*, *Oxytropis campestris* and *Poa alpina*.

## Acknowledgements

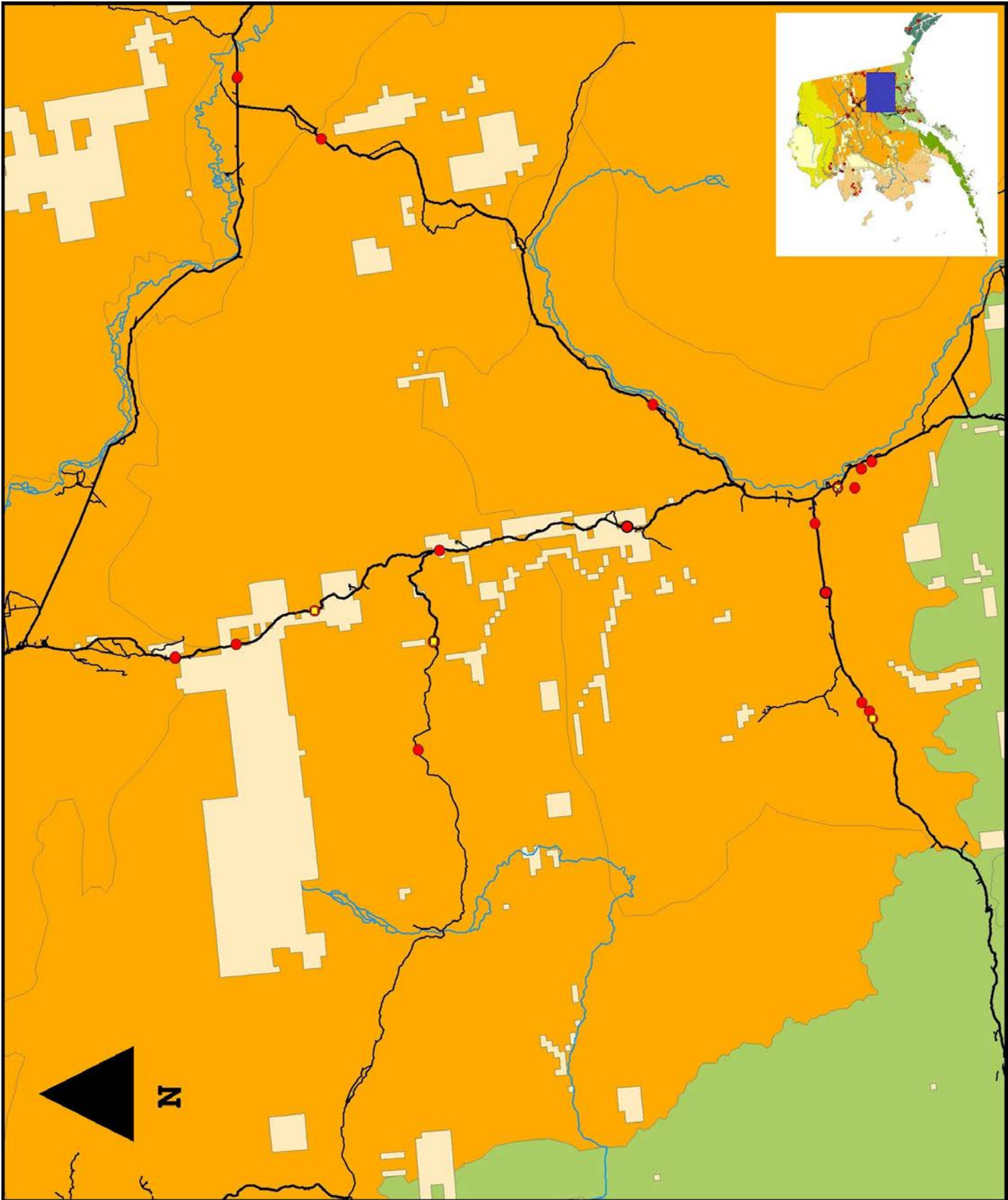
- The Seeds of Success field season was made possible by the support and assistance of staff at BLM Field Offices, The Alaska Natural Heritage Program, Klondike Gold Rush NHP, XS Platinum Mine, Chugach National Forest and The Alaska State Park System.



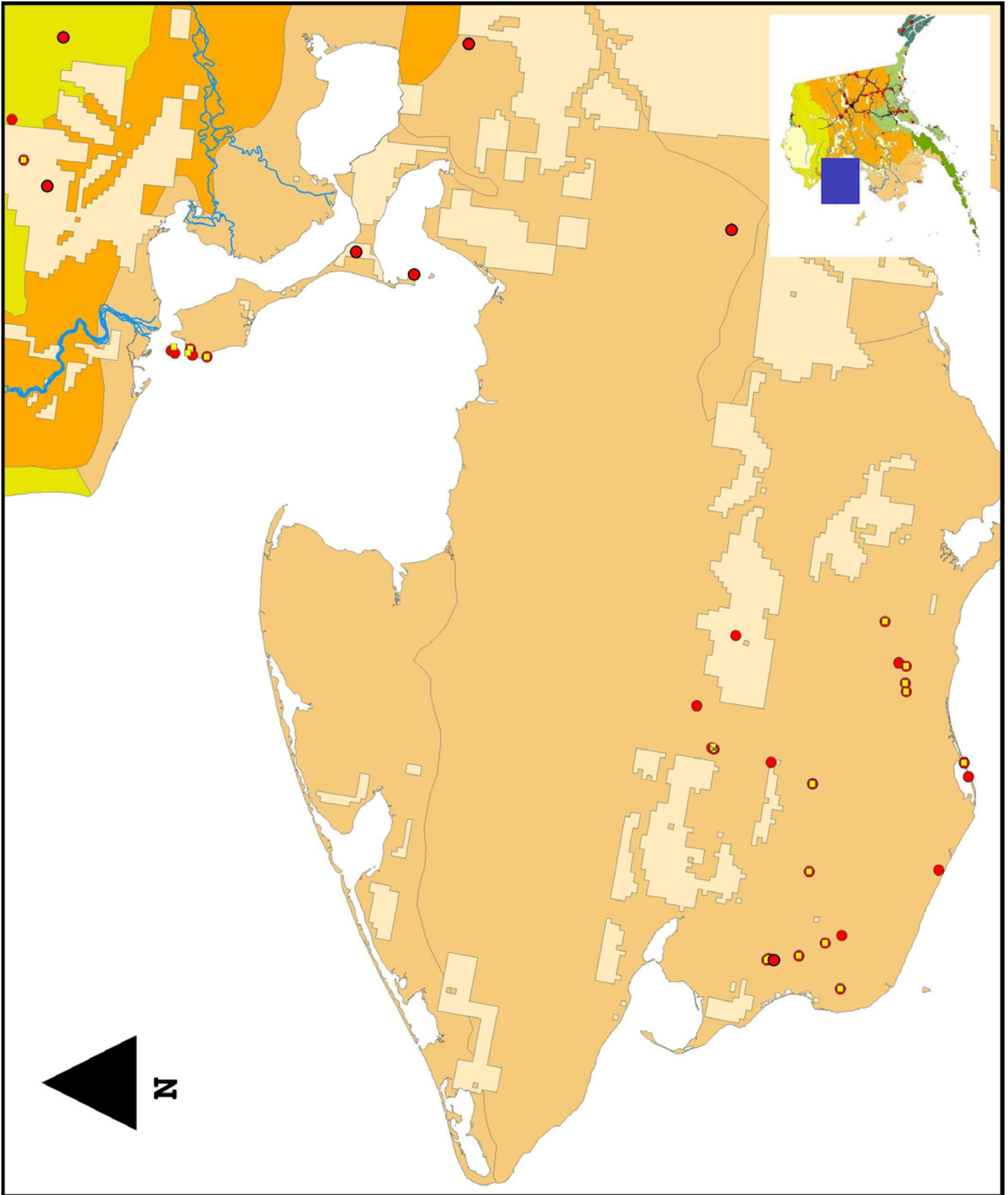
Appendix 7 Additional maps. Detail of Steese Highway collections.



Appendix 7 Additional maps. Detail of Chicken and Eagle collections.

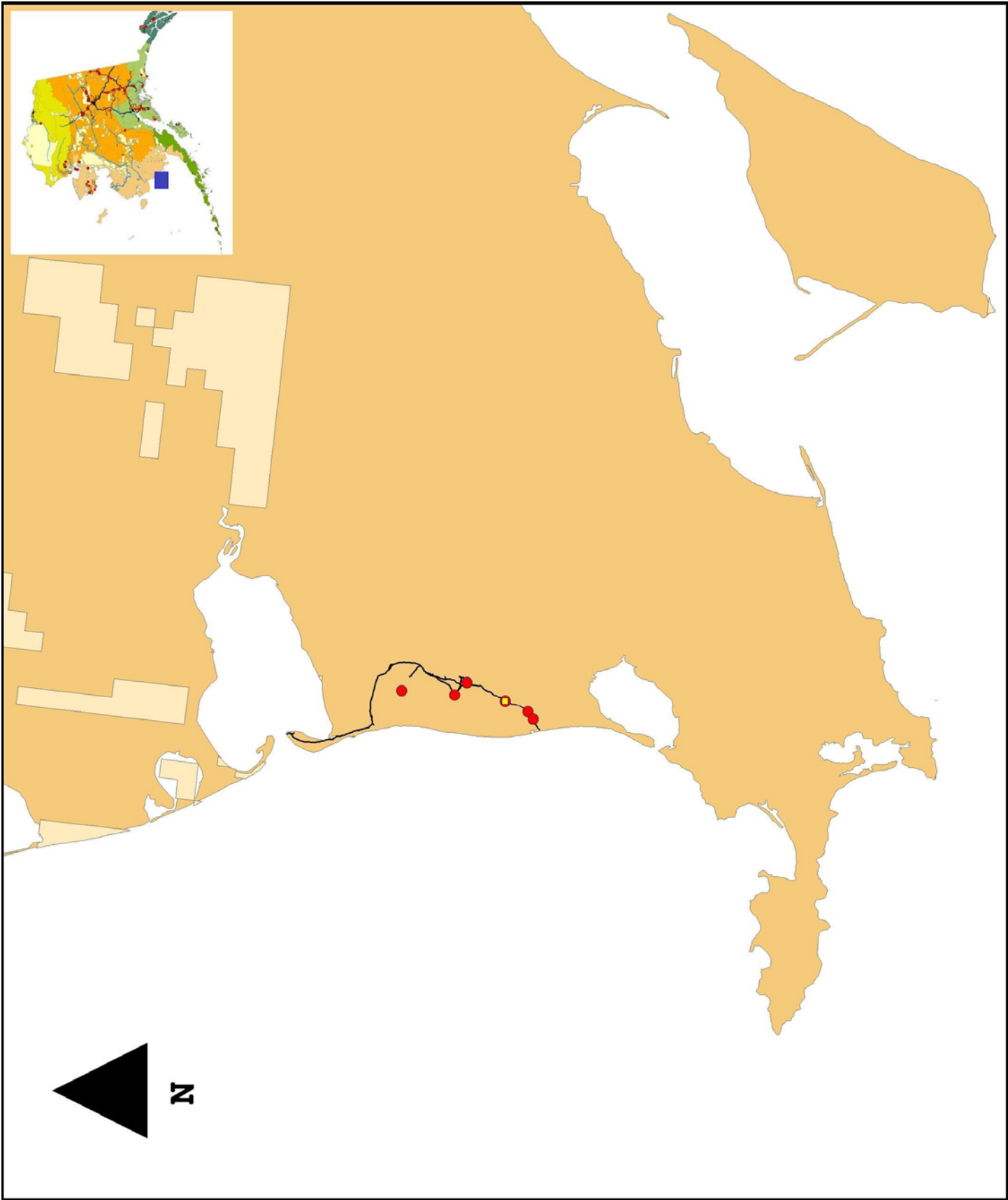


Appendix 7 Additional maps. Detail of Copper Basin collections.

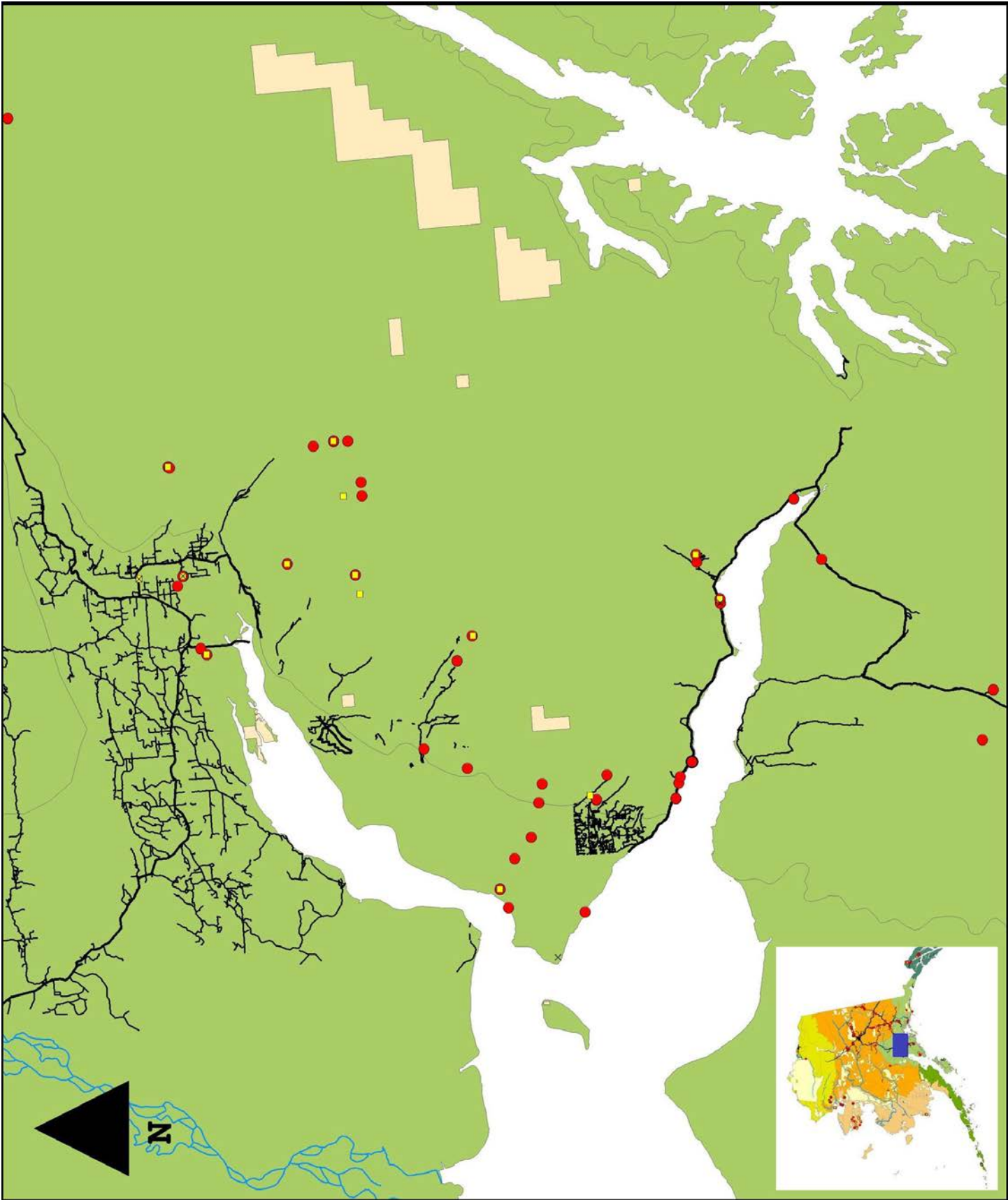


Appendix 7 Additional maps. Detail of Seward Peninsula collections.

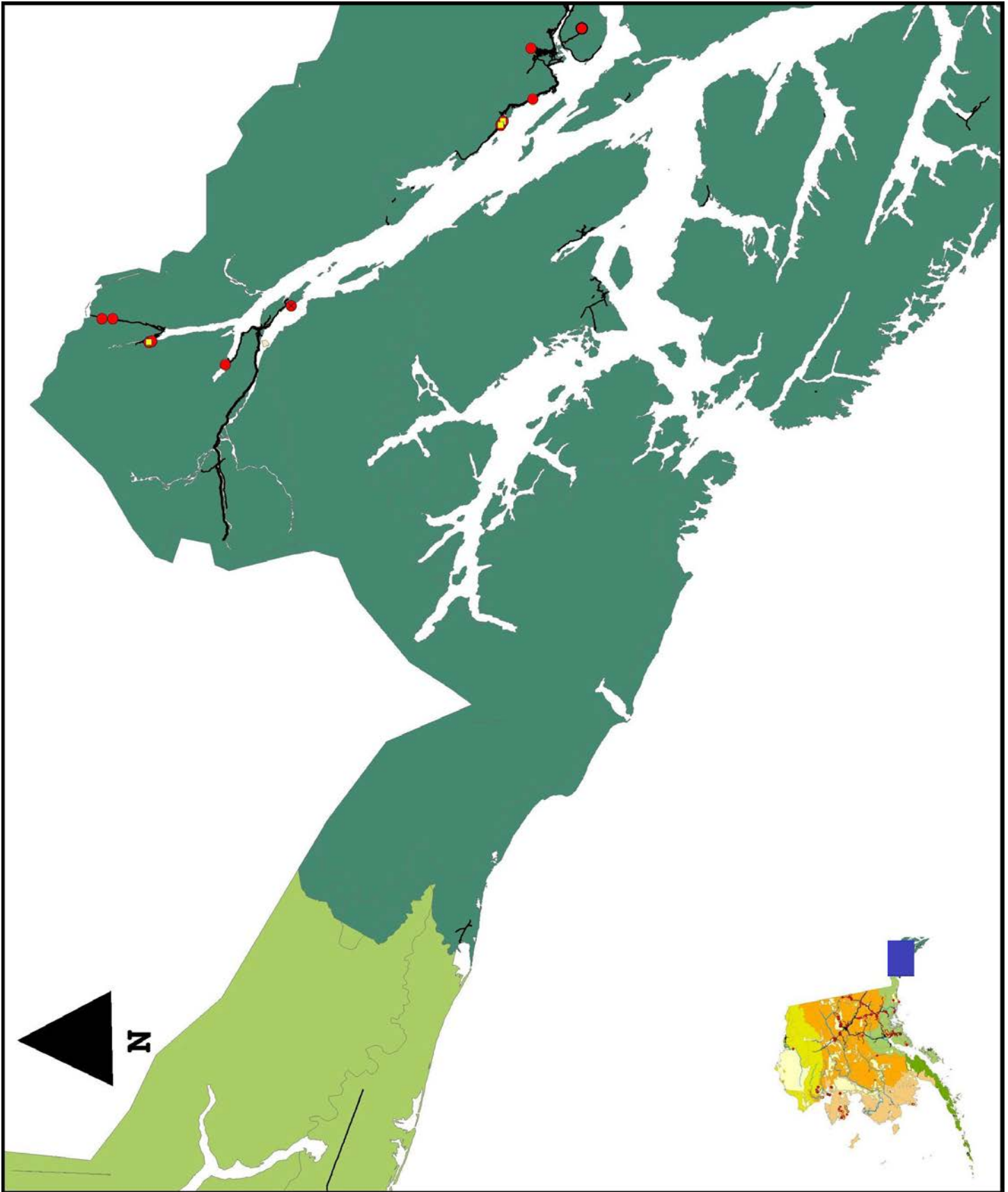




Appendix 7 Additional maps. Detail of Platinum collections.



Appendix 7 Additional maps. Detail of Cook Inlet area collections.



Appendix 7 Additional maps. Detail of Skagway, Haines and Juneau area collections.