



SEEDS
OF
SUCCESS

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



A report submitted to
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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. macrorurus*, 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>Hierochloe 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.

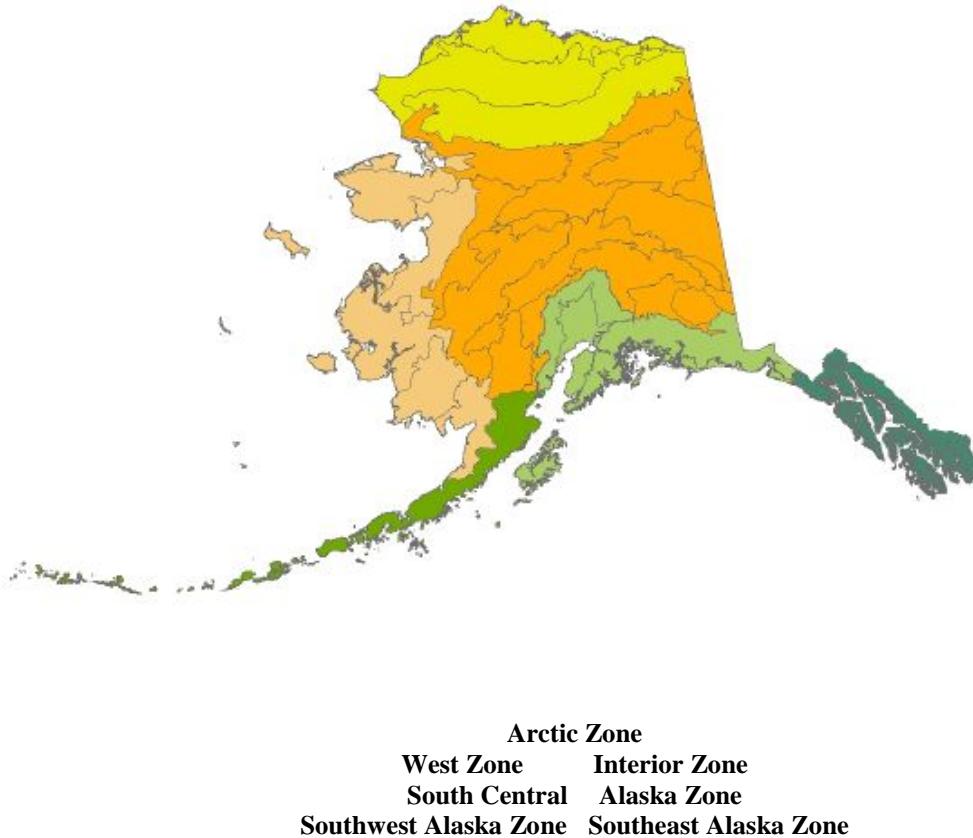
The remaining plants on our target list are of a lower priority but could still be collected if the opportunity arises during collecting trips. One of the goals of the SOS program is to bring new species, especially forbs, into commercial production. The continued availability of seeds for agricultural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



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.
[\(<http://www.nativeseednetwork.org>\)](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/climatic 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.

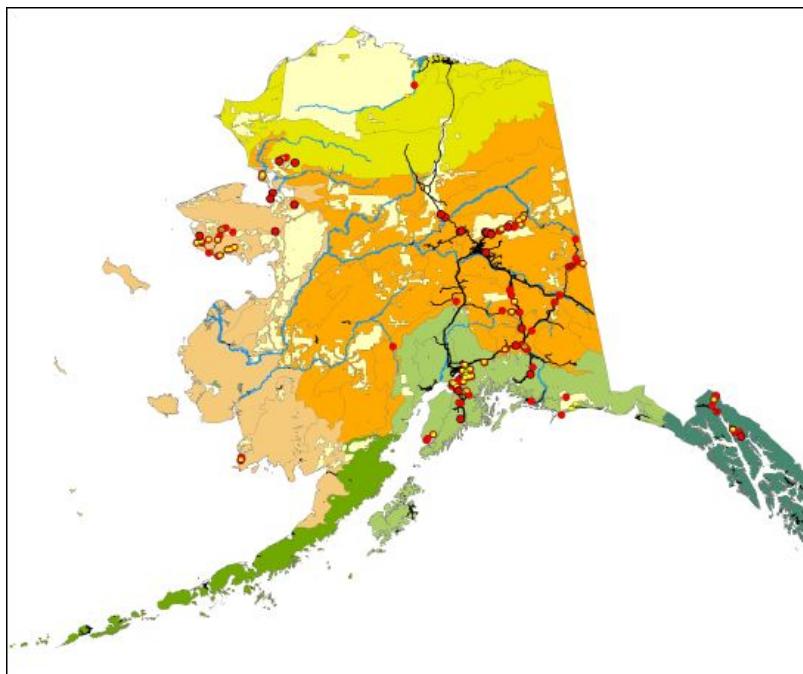
Table 3. Seed collections made in each Seed Zone, 2002-2012.

Seed Zone	Number of seed collections	Number of taxa collected
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*

<i>Leymus innovatus</i>	<i>Oxytropis deflexa</i>
<i>Leymus mollis</i>	<i>Poa alpina</i>
<i>Lupinus arcticus</i>	<i>Poa arctica</i>
<i>Oxytropis borealis</i>	<i>Poa glauca</i>
<i>Oxytropis campestris</i>	<i>Trisetum spicatum</i>

PMC cultivar available commercially:

Poa glauca ('Tundra' glaucus bluegrass)

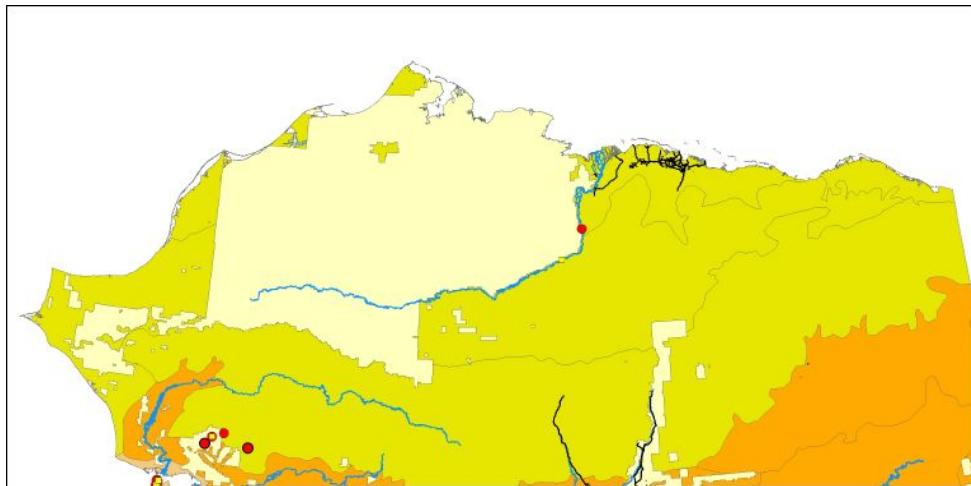
The origin of the seed for this cultivar was the Sagavanirktok River. Availability is 'fair.'

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)

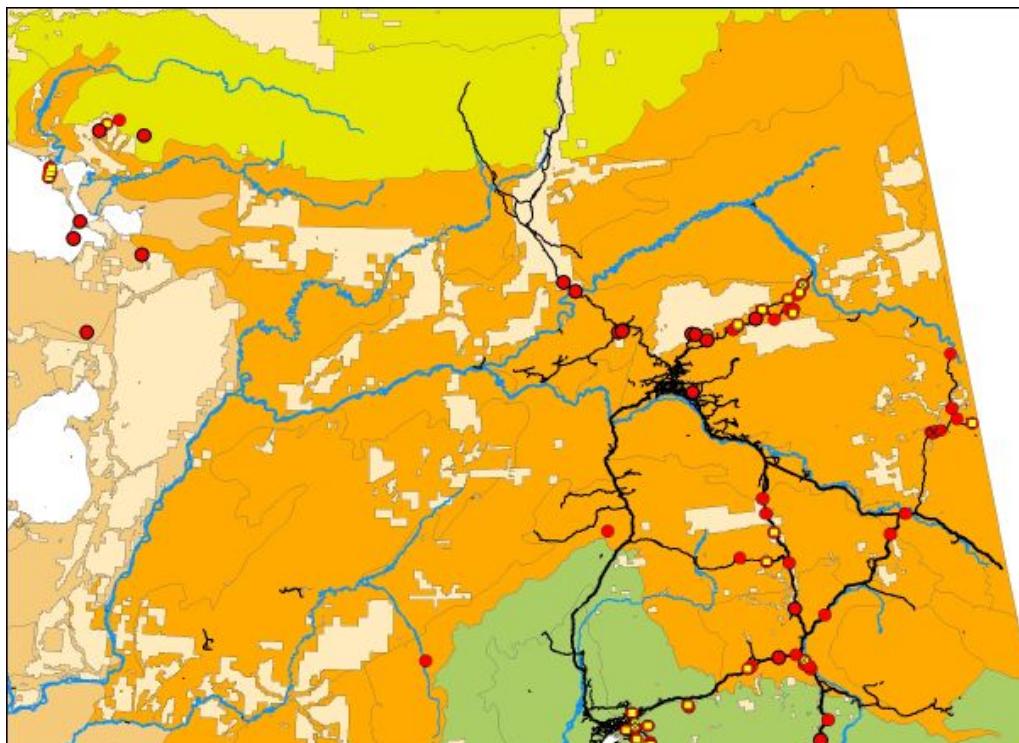
These are commercially available cultivars, both originating in the Fairbanks area. Availability is 'good' for the sloughgrass and 'excellent' for the wheatgrass. There are two additional cultivars available: *Arctagrostis latifolia* ('Alyeska' polargrass) and *Calamagrostis canadensis* ('Sourdough' 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 macrorurus (Tufed wheatgrass- Slana Germplasm)
Hedysarum alpinum (Alpine sweetvetch- Paxson Germplasm)
Leymus innovatus (Downy wildrye- Cantwell Germplasm)
Oxytropis campestris (Field oxytrop- Black Rapids Germplasm)
Potentilla bimundorum (Staghorn cinqufoil- 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 cnidiifolium
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 lonchophyllum
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*

<i>Spiraea stevenii</i>	<i>Typha latifolia</i>
<i>Tanacetum bipinnatum</i> ssp. <i>huronense</i>	<i>Veronica americana</i>
<i>Tofieldia coccinea</i>	<i>Veronica wormskjoldii</i> var. <i>wormskjoldii</i>
<i>Tofieldia pusilla</i> (2)	<i>Wilhelmsia physodes</i>
<i>Trichophorum alpinum</i>	

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**:

<i>Achillea sibirica</i>	<i>Delphinium glaucum</i>
<i>Anemone multifida</i> var. <i>multifida</i>	<i>Dryas octopetala</i> ssp. <i>alaskensis</i>
<i>Artemisia frigida</i>	<i>Dryas octopetala</i> ssp. <i>octopetala</i>
<i>Carex saxatilis</i>	<i>Erigeron acris</i> ssp. <i>kamtschaticus</i> (2)
<i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>	<i>Eurybia sibirica</i>
<i>Galium boreale</i>	<i>Festuca altaica</i>
<i>Aconitum delphiniiifolium</i> ssp. <i>delphiniiifolium</i>	<i>Galium boreale</i>
<i>Anemone narcissiflora</i> var. <i>monantha</i>	<i>Hedysarum alpinum</i>
<i>Anthoxanthum monticola</i> ssp. <i>alpinum</i> (2)	<i>Hierochloe odorata</i>
<i>Arctagrostis latifolia</i> ssp. <i>arundinacea</i>	<i>Lupinus arcticus</i>
<i>Arnica angustifolia</i> ssp. <i>angustifolia</i>	<i>Luzula parviflora</i>
<i>Astragalus alpinus</i> var. <i>alpinus</i> (2)	<i>Parrya nudicaulis</i>
<i>Calamagrostis canadensis</i> var. <i>langsdorffii</i> (2)	<i>Pedicularis sudetica</i> s.l. (ssp. <i>interior</i> ?)
<i>Calamagrostis purpurascens</i> var. <i>purpurascens</i> (2)	<i>Polemonium acutiflorum</i>
<i>Carex diandra</i>	<i>Polemonium pulcherrimum</i>
<i>Carex norvegica</i> ssp. <i>inferalpina</i>	<i>Potentilla hookeriana</i> ssp. <i>hookeriana</i>
<i>Carex podocarpa</i>	<i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>
<i>Carex scirpoidea</i>	<i>Saussurea angustifolia</i> var. <i>angustifolia</i> (2)
<i>Castilleja caudata</i>	<i>Saxifraga tricuspidata</i>
<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i>	<i>Senecio lugens</i>
<i>Chamerion latifolium</i>	<i>Solidago multiradiata</i> (2)
<i>Crepis elegans</i>	<i>Stellaria calycantha</i>
	<i>Taraxacum officinale</i> ssp. <i>ceratophorum</i>
	<i>Trisetum spicatum</i>
	<i>Veronica wormskjoldii</i> var. <i>wormskjoldii</i>
	<i>Viola langsdorffii</i>

(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 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*

<i>Calamagrostis canadensis</i>	<i>Heracleum maximum</i>
<i>Calamagrostis purpurascens</i>	<i>Iris setosa</i>
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	<i>Leymus mollis</i>
<i>Carex aquatilis</i>	<i>Ligusticum scoticum</i>
<i>Carex aquatilis</i> var. <i>dives</i>	<i>Lupinus arcticus</i>
<i>Carex lyngbyei</i>	<i>Lupinus nootkatensis</i>
<i>Cnidium cnidiifolium</i>	<i>Oxytropis borealis</i>
<i>Deschampsia cespitosa</i>	<i>Phleum alpinum</i>
<i>Dupontia fisheri</i>	<i>Poa alpina</i>
<i>Elymus alaskanus</i>	<i>Poa arctica</i>
<i>Festuca altaica</i>	<i>Poa glauca</i>
<i>Festuca rubra</i>	<i>Polygonum alpinum</i>
<i>Hedysarum alpinum</i>	<i>Rhinanthus minor</i>
<i>Hedysarum boreale</i> ssp. <i>mackenziae</i>	<i>Trisetum spicatum</i>

PMC cultivars available commercially:

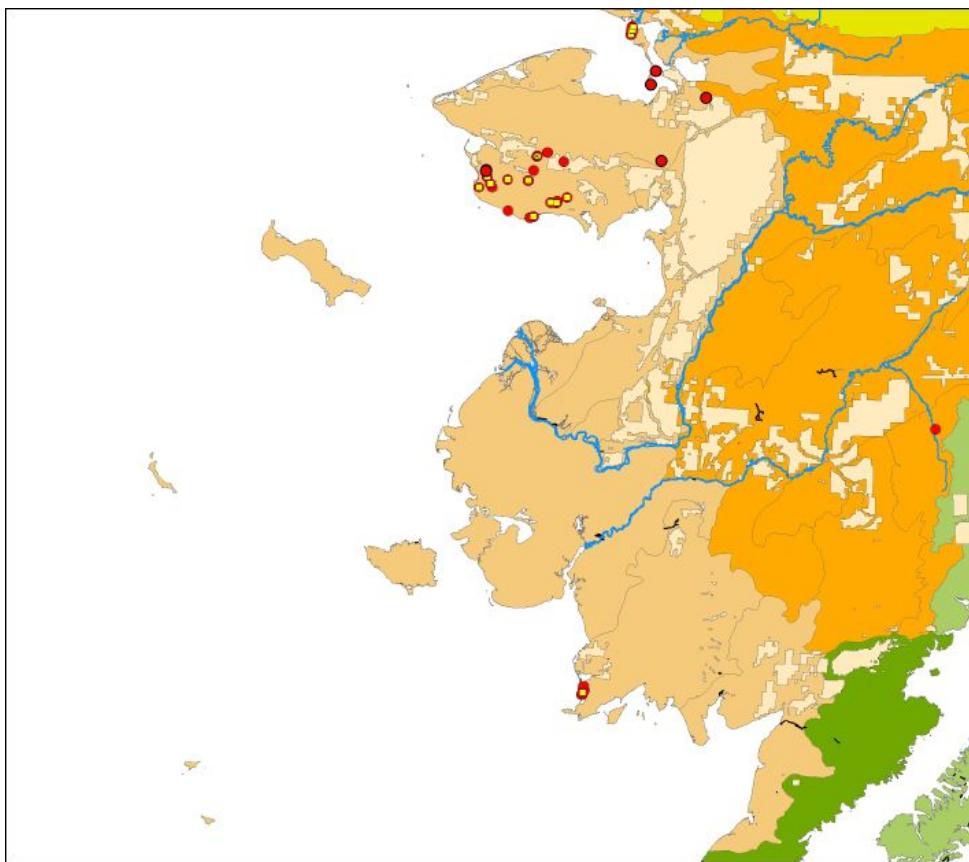
Currently there are no commercially available cultivars that originated wholly in the West Alaska Seed Zone. Two cultivars were derived from plants collected in different seed zones- *Arctagrostis latifolia* ('Alyeska' polargrass) from the interior and western zones, and *Calamagrostis canadensis* ('Sourdough' 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 macrorurus* (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 10,000 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

<i>Carex gmelinii</i>	<i>Luzula multiflora</i> ssp. <i>frigida</i>
<i>Carex lachenalii</i>	<i>Parnassia kotzebuei</i> (2)
<i>Carex saxatilis</i>	<i>Parnassia palustris</i> (2)
<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i>	<i>Pedicularis langsdorffii</i>
<i>Chamerion latifolium</i> (2)	<i>Pedicularis verticillata</i>
<i>Chrysanthemum arcticum</i>	<i>Petasites frigidus</i> var. <i>frigidus</i>
<i>Cnidium cnidiifolium</i>	<i>Poa alpina</i>
<i>Comarum palustre</i> (2)	<i>Poa eminens</i> (2)
<i>Deschampsia cespitosa</i> (2)	<i>Polemonium acutiflorum</i> (3)
<i>Dryas octopetala</i> ssp. <i>octopetala</i>	<i>Potentilla villosa</i>
<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i>	<i>Primula borealis</i>
<i>Erigeron humilis</i>	<i>Rhinanthus minor</i>
<i>Eriophorum angustifolium</i> ssp. <i>angustifolium</i>	<i>Rhodiola integrifolia</i> ssp. <i>integrifolia</i>
<i>Eriophorum scheuchzeri</i>	<i>Rhododendron camtschaticum</i> ssp. <i>glandulosum</i>
<i>Festuca rubra</i> ssp. <i>arctica</i>	<i>Rorippa palustris</i> ssp. <i>palustris</i>
<i>Gentianella propinqua</i> ssp. <i>propinqua</i>	<i>Rumex arcticus</i> (2)
<i>Heracleum maximum</i>	<i>Saxifraga oppositifolia</i> ssp. <i>smalliana</i>
<i>Honckenya peploides</i> ssp. <i>diffusa</i>	<i>Senecio congestus</i>
<i>Juncus arcticus</i>	<i>Senecio lugens</i>
<i>Juncus arcticus</i> ssp. <i>littoralis</i> (2)	<i>Senecio pseudoarnica</i>
<i>Juncus castaneus</i> (2)	<i>Spiraea stevenii</i> (2)
<i>Lathyrus japonicus</i> var. <i>maritimus</i>	<i>Tofieldia coccinea</i>
<i>Leymus mollis</i>	<i>Tripleurospermum maritima</i> ssp. <i>phaeocephala</i>
<i>Leymus mollis</i> ssp. <i>vilosissimus</i>	<i>Trisetum spicatum</i>
<i>Ligusticum scoticum</i> ssp. <i>hultenii</i>	<i>Vahlodea atropurpurea</i>
<i>Loiseleuria procumbens</i>	<i>Wilhelmsia physodes</i>
<i>Luzula multiflora</i>	

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.

<i>Agrostis mertensii</i>	<i>Artemisia arctica</i> (2)
<i>Alopecurus alpinus</i>	<i>Astragalus alpinus</i>
<i>Anemone parviflora</i>	<i>Astragalus umbellatus</i>
<i>Anemone richardsonii</i>	<i>Betula nana</i>
<i>Antennaria alpina</i>	<i>Bromus inermis</i> ssp. <i>pumpellianus</i>
<i>Anthoxanthum monticola</i> ssp. <i>alpinum</i>	<i>Cardamine bellidifolia</i> var. <i>bellidifolia</i>
<i>Arctagrostis latifolia</i> ssp. <i>arundinacea</i>	<i>Carex aquatilis</i> var. <i>aquatilis</i>
<i>Arctagrostis latifolia</i> ssp. <i>latifolia</i>	<i>Carex bigelowii</i>
<i>Argentina egedii</i> ssp. <i>groenlandica</i>	<i>Carex chordorrhiza</i>
<i>Armeria maritima</i> ssp. <i>sibirica</i>	<i>Carex gmelinii</i>
<i>Arnica lessingii</i>	<i>Carex mackenziei</i>

<i>Carex membranacea</i>	<i>Leymus mollis</i> ssp. <i>vilosissimus</i>
<i>Carex podocarpa</i>	<i>Ligusticum scoticum</i> ssp. <i>hultenii</i>
<i>Carex rotundata</i>	<i>Lloydia serotina</i> var. <i>serotina</i>
<i>Cerastium beeringianum</i> var. <i>grandiflorum</i>	<i>Lupinus nootkatensis</i>
<i>Chamerion angustifolium</i> ssp. <i>circumvagum</i>	<i>Luzula wahlenbergii</i>
<i>Dryas integrifolia</i>	<i>Minuartia arctica</i>
<i>Dryas integrifolia</i> ssp. <i>integrifolia</i>	<i>Oxytropis arctica</i> var. <i>koyukukensis</i>
<i>Dryas octopetala</i> ssp. <i>alaskensis</i>	<i>Papaver macounii</i> ssp. <i>discolor</i>
<i>Eriophorum chamissonis</i>	<i>Parrya nudicaulis</i>
<i>Eurybia sibirica</i>	<i>Primula tschuktschorum</i>
<i>Eurybia sibirica</i>	<i>Rhodiola integrifolia</i> ssp. <i>integrifolia</i>
<i>Festuca altaica</i>	<i>Rhododendron camtschaticum</i> ssp. <i>glandulosum</i>
<i>Galium boreale</i>	<i>Rumex arcticus</i>
<i>Gentiana glauca</i>	<i>Saussurea nuda</i>
<i>Hierochloe odorata</i>	<i>Saxifraga tricuspidata</i>
<i>Honckenya peploides</i>	<i>Sibbaldia procumbens</i>
<i>Hulteniella integrifolia</i>	<i>Silene acaulis</i>
<i>Iris setosa</i> var. <i>setosa</i>	<i>Silene acaulis</i> var. <i>subacaulescens</i>
<i>Juncus triglumis</i>	<i>Solidago multiradiata</i>
<i>Lathyrus japonicus</i> var. <i>maritimus</i>	<i>Taraxacum officinale</i> ssp. <i>ceratophorum</i>
<i>Leymus mollis</i>	<i>Trisetum spicatum</i>

(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

<i>Achillea millefolium</i> var. <i>borealis</i>	<i>Cnidium cnidiifolium</i>
<i>Agrostis mertensii</i> *	<i>Dupontia fisheri</i>
<i>Bromus inermis</i> ssp. <i>pumpellianus</i> *	<i>Elymus alaskanus</i>
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	<i>Festuca altaica</i> *
<i>Carex aquatilis</i> *	<i>Hedysarum alpinum</i>
<i>Carex aquatilis</i> var. <i>dives</i>	<i>Hedysarum boreale</i> ssp. <i>mackenziei</i>
<i>Carex lyngbyei</i>	<i>Iris setosa</i> *

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:

<i>Achillea millefolium</i> var. <i>borealis</i>	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i> *
<i>Agrostis exarata</i>	<i>Carex aquatilis</i>
<i>Agrostis mertensii</i>	<i>Carex aquatilis</i> var. <i>dives</i>
<i>Agrostis scabra</i> *	<i>Carex lyngbyei</i>
<i>Angelica lucida</i>	<i>Carex macrochaeta</i>
<i>Arctagrostis latifolia</i> *	<i>Carex mertensii</i> *
<i>Artemisia tilesii</i>	<i>Deschampsia cespitosa</i>
<i>Calamagrostis canadensis</i>	<i>Festuca altaica</i> *

<i>Festuca rubra</i>	<i>Lupinus nootkatensis</i>
<i>Heracleum maximum</i>	<i>Phleum alpinum</i>
<i>Hordeum brachyantherum</i>	<i>Poa arctica</i>
<i>Iris setosa</i>	<i>Poa glauca*</i>
<i>Leymus mollis</i>	<i>Rhinanthus minor</i>
<i>Ligusticum scoticum</i>	<i>Trisetum spicatum</i>

* 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 Rainforests 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

<i>Calamagrostis canadensis</i>	<i>Hordeum brachyantherum</i>
<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	<i>Iris setosa</i>
<i>Carex aquatilis</i>	<i>Leymus mollis</i>
<i>Carex aquatilis</i> var. <i>dives</i>	<i>Ligusticum scoticum</i>
<i>Carex lyngbyei</i>	<i>Lupinus nootkatensis</i>
<i>Carex macrochaeta</i>	<i>Oxytropis campestris</i>
<i>Carex mertensii</i>	<i>Oxytropis deflexa</i>
<i>Carex praticola</i>	<i>Phleum alpinum</i>
<i>Deschampsia cespitosa</i>	<i>Poa alpina</i>
<i>Elymus alaskanus</i>	<i>Poa arctica</i>
<i>Festuca altaica</i>	<i>Poa glauca</i>
<i>Festuca rubra</i>	<i>Rhinanthus minor</i>
<i>Hedysarum alpinum</i>	<i>Trisetum spicatum</i>
<i>Heracleum maximum</i>	

PMC cultivars available commercially:

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

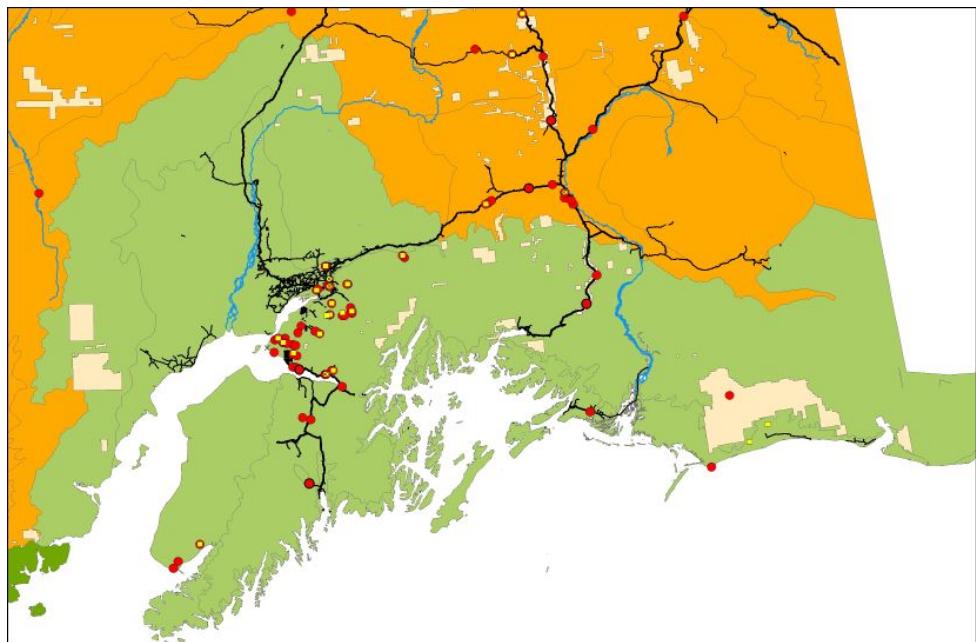
Availability is ‘fair’ for the polargrass, which originated in the Sterling Highway area, ‘good’ for the hairgrass which is from Cook Inlet, ‘very good’ for the fescue, originating in Palmer, and ‘poor’ for the beachrye which came from Kodiak. Note that two other cultivars have their origin in south 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 nutkensis* (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**:

<i>Alnus incana</i> ssp. <i>tenuifolia</i>	<i>Carex mertensii</i> (2)
<i>Amelanchier alnifolia</i>	<i>Carex pachystachya</i> (2)
<i>Androsace septentrionalis</i>	<i>Carex phaeocephala</i>
<i>Anemone multifida</i> var. <i>saxicola</i>	<i>Carex pluriflora</i>
<i>Angelica lucida</i>	<i>Castilleja unalaschcensis</i>
<i>Aquilegia formosa</i>	<i>Cerastium arvense</i>
<i>Artemisia tilesii</i>	<i>Chamerion angustifolium</i>
<i>Aruncus dioicus</i> var. <i>acuminatus</i>	<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i>
<i>Beckmannia syzigachne</i>	<i>Chamerion angustifolium</i> ssp. <i>circumvagum</i>
<i>Betula nana</i>	<i>Chamerion latifolium</i> (2)
<i>Boykinia richardsonii</i>	<i>Chrysanthemum arcticum</i>
<i>Carex brunescens</i>	<i>Crepis elegans</i>
<i>Carex canescens</i> ssp. <i>canescens</i>	
<i>Carex lyngbyei</i> (2)	

<i>Draba aurea</i>	<i>Lupinus nootkatensis</i>
<i>Dryas drummondii</i> (3)	<i>Luzula parviflora</i> (2)
<i>Dryas octopetala</i> ssp. <i>octopetala</i>	<i>Mimulus guttatus</i>
<i>Epilobium ciliatum</i> ssp. <i>glandulosum</i>	<i>Parnassia kotzebuei</i>
<i>Epilobium palustre</i>	<i>Parnassia palustris</i>
<i>Erigeron peregrinus</i>	<i>Phleum alpinum</i>
<i>Erysimum inconspicuum</i>	<i>Phyllodoce glanduliflora</i>
<i>Festuca altaica</i>	<i>Plantago canescens</i>
<i>Fragaria chiloensis</i> ssp. <i>pacifica</i>	<i>Potentilla pensylvanica</i> var. <i>litoralis</i>
<i>Fritillaria camschatcensis</i>	<i>Primula exima</i>
<i>Gentianella amarella</i> ssp. <i>acuta</i>	<i>Rhinanthus minor</i> (2)
<i>Geum macrophyllum</i> var. <i>macrophyllum</i> (2)	<i>Rhodiola integrifolia</i>
<i>Harrimanella stelleriana</i>	<i>Sambucus racemosa</i>
<i>Heracleum maximum</i> (3)	<i>Sanguisorba canadensis</i>
<i>Hieracium triste</i>	<i>Saxifraga lyallii</i>
<i>Honckenya peploides</i>	<i>Saxifraga tricuspidata</i>
<i>Juncus castaneus</i>	<i>Sisyrinchium littorale</i>
<i>Juncus drummondii</i>	<i>Spiraea stevenii</i> (2)
<i>Juncus mertensianus</i>	<i>Tellima grandiflora</i>
<i>Lathyrus palustris</i>	<i>Veratrum viride</i> (2)
<i>Leymus mollis</i> ssp. <i>mollis</i>	<i>Viola adunca</i>
<i>Luetkea pectinata</i>	<i>Zigadenus elegans</i>

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

<i>Aconitum delphiniiifolium</i> ssp. <i>delphiniiifolium</i>	<i>Eriophorum chamissonis</i>
<i>Anemone narcissiflora</i>	<i>Eriophorum vaginatum</i>
<i>Anemone parviflora</i>	<i>Gentiana glauca</i>
<i>Antennaria monocephala</i>	<i>Gentianella propinqua</i>
<i>Anthoxanthum monticola</i> ssp. <i>alpinum</i>	<i>Geum macrophyllum</i>
<i>Arnica lessingii</i> ssp. <i>lessingii</i>	<i>Geum rossii</i>
<i>Artemisia arctica</i> ssp. <i>arctica</i>	<i>Hedysarum alpinum</i>
<i>Calamagrostis canadensis</i>	<i>Honckenya peploides</i>
<i>Campanula rotundifolia</i>	<i>Hordeum brachyantherum</i>
<i>Carex macrochaeta</i>	<i>Hordeum brachyantherum</i> ssp.
<i>Carex magellanica</i> ssp. <i>irrigua</i>	<i>brachyantherum</i>
<i>Castilleja unalaschcensis</i>	<i>Juncus alpinoarticulatus</i>
<i>Comarum palustre</i> (2)	<i>Lupinus nootkatensis</i>
<i>Dryas drummondii</i> (2)	<i>Microseris borealis</i>
<i>Dryas octopetala</i> ssp. <i>octopetala</i>	<i>Oxyria digyna</i>
<i>Elaeagnus commutata</i>	<i>Oxytropis campestris</i>
<i>Epilobium lactiflorum</i>	<i>Petasites frigidus</i> var. <i>frigidus</i>
<i>Epilobium luteum</i>	<i>Phleum alpinum</i>
	<i>Platanthera dilatata</i> sl.

<i>Potentilla drummondii</i> ssp. <i>drummondii</i>	<i>Solidago multiradiata</i> var. <i>multiradiata</i>
<i>Potentilla uniflora</i> sl.	<i>Taraxacum phymatocarpum</i>
<i>Rosa acicularis</i>	<i>Valeriana sitchensis</i>
<i>Sanguisorba canadensis</i> (3)	<i>Veronica americana</i>
<i>Saxifraga bronchialis</i>	<i>Veronica wormskjoldii</i>
<i>Saxifraga nelsoniana</i> ssp. <i>nelsoniana</i>	

(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

<i>Achillea millefolium</i> var. <i>borealis</i>	<i>Elymus alaskanus</i>
<i>Agrostis exarata</i>	<i>Festuca rubra</i>
<i>Agrostis mertensii</i>	<i>Hedysarum alpinum</i> *
<i>Agrostis scabra</i>	<i>Hordeum brachyantherum</i> *
<i>Arctagrostis latifolia</i>	<i>Iris setosa</i>
<i>Calamagrostis canadensis</i> *	<i>Ligusticum scoticum</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>Poa alpina</i>
<i>Carex macrochaeta</i> *	<i>Poa arctica</i>
<i>Carex praticola</i>	<i>Poa glauca</i>
<i>Deschampsia cespitosa</i>	<i>Trisetum spicatum</i>

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:

<i>Achillea millefolium</i> var. <i>borealis</i>	<i>Carex macrochaeta</i>
<i>Agrostis exarata</i>	<i>Carex mertensii</i>
<i>Agrostis mertensii</i>	<i>Deschampsia cespitosa</i>
<i>Agrostis scabra</i>	<i>Festuca rubra</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>Calamagrostis canadensis</i>	<i>Leymus mollis</i>
<i>Carex aquatilis</i>	<i>Ligusticum scoticum</i>
<i>Carex aquatilis</i> var. <i>dives</i>	<i>Lupinus nootkatensis</i>
<i>Carex lyngbyei</i>	<i>Oxytropis campestris</i>

Phleum alpinum
Poa alpina
Poa arctica

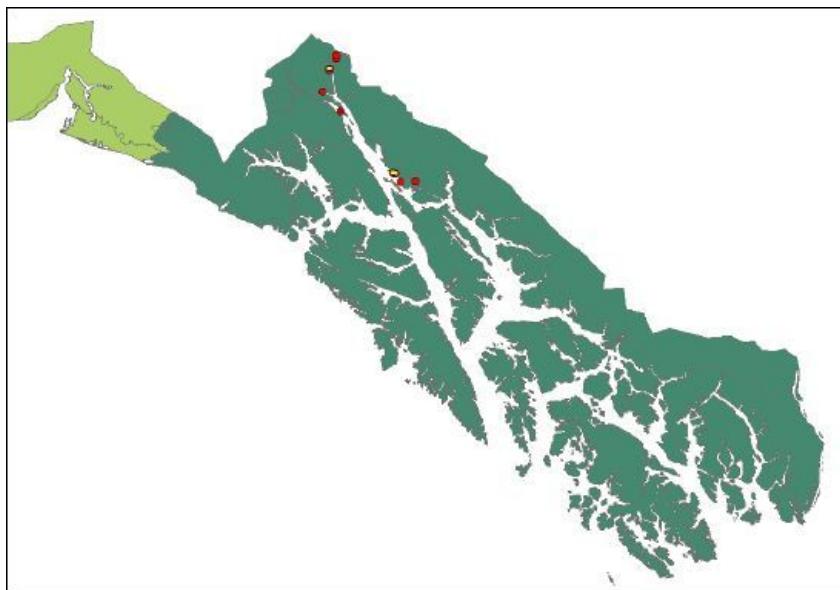
Rhinanthus minor
Trisetum spicatum

(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**:

<i>Agrostis exarata</i>	<i>Geum macrophyllum</i> (3)
<i>Anaphalis margaritaceae</i>	<i>Heracleum maximum</i> (2)
<i>Arabis kamchatica</i>	<i>Heuchra glabra</i>
<i>Argentina egedii</i>	<i>Hierochloe odorata</i>
<i>Aruncus dioicus</i> var. <i>acuminatus</i>	<i>Iris setosa</i> (2)
<i>Barbarea orthoceras</i> (2)	<i>Leymus mollis</i>
<i>Calamagrostis canadensis</i>	<i>Orthilia secunda</i>
<i>Carex gmelinii</i> (2)	<i>Plantago macrocarpa</i>
<i>Carex mertensii</i> (2)	<i>Plantago maritima</i>
<i>Castilleja unalaschensis</i>	<i>Pyrola asarifolia</i>
<i>Chamerion angustifolium</i> (2)	<i>Rhinanthus minor</i> (2)
<i>Chamerion latifolium</i>	<i>Tellima grandiflora</i>
<i>Dodecatheon pulchellum</i> (2)	<i>Trientalis europaea</i>
<i>Fritillaria camschatcensis</i> (2)	<i>Trisetum canescens</i>

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

<i>Hordeum brachyantherum</i>	<i>Parnassia palustris</i>
<i>Lathyrus japonicus</i>	<i>Prenanthes alata</i>
<i>Lupinus nootkatensis</i>	<i>Sympyotrichum subspicatum</i>
<i>Luzula multiflora</i>	<i>Triglochin maritima</i>

Five collections (*Carex lyngbyei*, *Ledum groenlandicum*, *Nephrophyllidium crista-galli*, *Sympyotrichum 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

<i>Achillea millefolium</i> var. <i>borealis</i>	<i>Carex lyngbyei</i> *
<i>Agrostis mertensii</i>	<i>Carex macrochaeta</i>
<i>Agrostis scabra</i>	<i>Deschampsia cespitosa</i>
<i>Angelica lucida</i>	<i>Festuca rubra</i>
<i>Arctagrostis latifolia</i>	<i>Hordeum brachyantherum</i>*
<i>Artemisia tilesii</i>	<i>Ligusticum scoticum</i>
<i>Carex aquatilis</i>	<i>Lupinus nootkatensis</i> *
<i>Carex aquatilis</i> var. <i>dives</i>	<i>Oxytropis campestris</i>

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>Hultenella 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.**

Year	SOS number	Name (number of seeds collected)
2002	AK040-029	<i>Aconitum delphiniiifolium</i> ssp. <i>delphiniiifolium</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 unalaschensis</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	Hulteniall 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 tricuspidata (?)
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	Tripleurospermum maritima ssp. phaeocephala (11033)
2002	AK040-039	Valeriana sitchensis (3303)
2002	AK040-036	Veratrum viride (45178)
2002	AK040-026	Veronica wormskjoldii (3302)
2002	AK040-034	Zigadenus elegans (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.)

Year	SOS number	Name (number of seeds collected)
2009	AK930-083	Achillea sibirica (0)
2009	AK930-089	Achillea sibirica (33150)
2010	AK930-273	Achillea sibirica (82729)
2012	AK930-482	Achillea sibirica (not yet processed)
2010	AK930-163	Aconitum delphinifolium ssp. delphinifolium (3211)
2011	AK930-431	Agrostis exarata (71280)
2009	AK930-091	Agrostis mertensii (13940)
2010	AK930-209	Agrostis mertensii (3356)
2009	AK930-087	Agrostis scabra (11970)
2011	AK930-390	Agrostis scabra (82908)
2009	AK930-073	Alnus incana ssp. tenuifolia (19000)
2010	AK930-317	Alnus incana ssp. tenuifolia (37069)
2010	AK930-153	Alopecurus aequalis var. aequalis (10180)
2010	AK930-253	Alopecurus alpinus (1243)
2010	AK930-128	Amelanchier alnifolia (10716)
2011	AK930-446	Anaphalis margaritaceae (73200)
2011	AK930-345	Androsace septentrionalis (29169)
2011	AK930-352	Androsace septentrionalis (41754)
2010	AK930-108	Androsace septentrionalis (50252)
2010	AK930-111	Anemone multifida var. multifida (0)
2011	AK930-350	Anemone multifida var. multifida (10894)
2011	AK930-362	Anemone multifida var. multifida (17723)
2010	AK930-116	Anemone multifida var. saxicola (19152)
2011	AK930-366	Anemone narcissiflora var. monantha (26432)
2010	AK930-279	Anemone narcissiflora var. monantha (6170)
2012	AK930-479	Anemone narcissiflora var. monantha (not yet processed)
2010	AK930-254	Anemone parviflora (3065)
2010	AK930-257	Anemone richardsonii (521)
2011	AK930-449	Angelica lucida (60960)
2010	AK930-335	Angelica lucida (64687)
2010	AK930-235	Angelica lucida (65520)
2010	AK930-194	Antennaria alpina (4133)
2010	AK930-166	Anthoxanthum monticola ssp. alpinum (1907)
2010	AK930-193	Anthoxanthum monticola ssp. alpinum (2666)
2010	AK930-303	Anthoxanthum monticola ssp. alpinum (3342)
2010	AK930-320	Aquilegia formosa (17313)
2011	AK930-375	Arabis holboellii (53526)
2010	AK930-112	Arabis holboellii var. retrofracta (98637)
2011	AK930-413	Arabis kamchatica (13695)
2011	AK930-392	Arabis kamchatica (142656)
2010	AK930-299	Arctagrostis latifolia ssp. arundinacea (16666)
2010	AK930-258	Arctagrostis latifolia ssp. arundinacea (6078)
2010	AK930-165	Arctagrostis latifolia ssp. arundinacea (9318)
2012	AK930-465	Arctagrostis latifolia ssp. arundinacea (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>langsdoeffii</i> (3046)
2010	AK930-144	<i>Calamagrostis canadensis</i> var. <i>langsdoeffii</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	Campanula lasiocarpa (14615)
2010	AK930-168	Campanula lasiocarpa (15882)
2010	AK930-306	Campanula lasiocarpa (30303)
2010	AK930-319	Campanula rotundifolia (9737)
2010	AK930-231	Cardamine bellidifolia var. bellidifolia (912)
2010	AK930-151	Carex arcta (11070)
2011	AK930-356	Carex atratiformis (24813)
2010	AK930-102	Carex aurea (21039)
2011	AK930-447	Carex brunescens (146160)
2010	AK930-113	Carex canescens ssp. canescens (31032)
2010	AK930-172	Carex diandra (14103)
2010	AK930-302	Carex diandra (4976)
2011	AK930-441	Carex gmelinii (18573)
2010	AK930-236	Carex gmelinii (21314)
2011	AK930-406	Carex gmelinii (28833)
2010	AK930-101	Carex krausei (69908)
2010	AK930-230	Carex lachenalii (21030)
2011	AK930-421	Carex lyngbyei (0)
2010	AK930-119	Carex lyngbyei (14832)
2009	AK930-055	Carex lyngbyei (17870)
2010	AK930-123	Carex macrochaeta (8360)
2010	AK930-313	Carex membranacea (11766)
2009	AK930-062	Carex mertensii (16600)
2010	AK930-121	Carex mertensii (35820)
2011	AK930-416	Carex mertensii (41345)
2011	AK930-424	Carex mertensii (60964)
2010	AK930-106	Carex norvegica ssp. inferalpina (11883)
2010	AK930-132	Carex norvegica ssp. inferalpina (36232)
2009	AK930-088	Carex norvegica ssp. inferalpina (4392)
2010	AK930-114	Carex pachystachya (32136)
2010	AK930-161	Carex pachystachya (35191)
2010	AK930-122	Carex pachystachya (37022)
2010	AK930-117	Carex phaeocephala (32333)
2010	AK930-282	Carex podocarpa (1079)
2010	AK930-226	Carex podocarpa (6450)
2012	AK930-470	Carex podocarpa (not yet processed)
2010	AK930-190	Carex praticola (18687)
2012	AK930-484	Carex praticola (not yet processed)
2011	AK930-368	Carex saxatilis (0)
2010	AK930-150	Carex saxatilis ssp. laxa (10880)
2010	AK930-281	Carex scirpoidea (7713)
2010	AK930-152	Carex stylosa (14548)
2010	AK930-293	Carex utriculata (34151)
2010	AK930-191	Castilleja caudata (33316)
2010	AK930-148	Castilleja caudata (8358)
2010	AK930-341	Castilleja unalaschcensis (321)
2011	AK930-433	Castilleja unalaschcensis (59303)
2011	AK930-460	Cerastium arvense (15976)
2010	AK930-241	Cerastium beeringianum var. grandiflorum (4852)
2011	AK930-404	Chamerion angustifolium (40227)
2011	AK930-428	Chamerion angustifolium (44000)
2011	AK930-359	Chamerion angustifolium (49311)
2009	AK930-058	Chamerion angustifolium (55500)
2010	AK930-304	Chamerion angustifolium (78571)
2010	AK930-143	Chamerion angustifolium ssp. angustifolium (4865)
2012	AK930-464	Chamerion angustifolium ssp. angustifolium (not yet processed)

2012	AK930-494	Chamerion angustifolium ssp. angustifolium (not yet processed)
2012	AK930-499	Chamerion angustifolium ssp. angustifolium (not yet processed)
2010	AK930-224	Chamerion angustifolium ssp. circumvagum (5333)
2010	AK930-338	Chamerion angustifolium ssp. circumvagum (70300)
2011	AK930-391	Chamerion latifolium (14043)
2010	AK930-136	Chamerion latifolium (15998)
2009	AK930-071	Chamerion latifolium (19480)
2011	AK930-414	Chamerion latifolium (19743)
2010	AK930-199	Chamerion latifolium (37577)
2009	AK930-082	Chamerion latifolium (4460)
2009	AK930-079	Chrysanthemum arcticum (16390)
2010	AK930-239	Chrysanthemum arcticum (29926)
2011	AK930-384	Cnidium cnidiifolium (36608)
2010	AK930-210	Comarum palustre (24163)
2009	AK930-059	Comarum palustre (9800)
2012	AK930-475	Comarum palustre (not yet processed)
2011	AK930-371	Cornus sericea (16170)
2011	AK930-343	Crepis elegans (36500)
2011	AK930-374	Crepis elegans (8834)
2010	AK930-155	Danthonia intermedia (17170)
2011	MD11-112	Dasiphora fruticosa ssp. floribunda (0)
2010	AK930-182	Delphinium glaucum (17949)
2010	AK930-173	Delphinium glaucum (6117)
2010	AK930-250	Deschampsia cespitosa (15575)
2011	AK930-452	Deschampsia cespitosa (81229)
2010	AK930-159	Deschampsia cespitosa (95179)
2010	AK930-310	Dodecatheon frigidum (11175)
2011	AK930-436	Dodecatheon pulchellum (16918)
2011	AK930-411	Dodecatheon pulchellum (48787)
2011	AK930-396	Draba aurea (61558)
2010	AK930-292	Dracocephalum parviflorum (21804)
2010	AK930-097	Dryas drummondii (13011)
2009	AK930-080	Dryas drummondii (14930)
2009	AK930-074	Dryas drummondii (1560)
2010	AK930-098	Dryas drummondii (27305)
2011	AK930-351	Dryas drummondii (29347)
2010	AK930-110	Dryas drummondii (30623)
2010	AK930-115	Dryas drummondii (32249)
2011	AK930-365	Dryas drummondii (38143)
2011	AK930-347	Dryas integrifolia (16970)
2010	AK930-103	Dryas integrifolia ssp. integrifolia (19234)
2010	AK930-215	Dryas integrifolia ssp. integrifolia (4050)
2010	AK930-283	Dryas octopetala ssp. alaskensis (3955)
2010	AK930-220	Dryas octopetala ssp. alaskensis (7465)
2010	AK930-120	Dryas octopetala ssp. octopetala (11491)
2010	AK930-274	Dryas octopetala ssp. octopetala (2533)
2012	AK930-462	Dryas octopetala ssp. octopetala (not yet processed)
2009	AK930-072	Elaeagnus commutata (0)
2011	AK930-458	Elaeagnus commutata (7600)
2010	AK930-138	Epilobium ciliatum ssp. ciliatum (16217)
2011	AK930-453	Epilobium ciliatum ssp. ciliatum (57332)
2012	AK930-491	Epilobium ciliatum ssp. ciliatum (not yet processed)
2010	AK930-325	Epilobium ciliatum ssp. glandulosum (26517)
2010	AK930-323	Epilobium luteum (4479)
2009	AK930-060	Epilobium palustre (19500)
2011	AK930-380	Erigeron acris (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 lonchophyllum</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>vilosissimus</i> (10797)
2010	AK930-238	<i>Leymus mollis</i> ssp. <i>vilosissimus</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	Packera pauciflora (13690)
2011	AK930-379	Papaver nudicaule ssp. americanum (176633)
2010	AK930-221	Parnassia kotzebuei (12500)
2010	AK930-232	Parnassia kotzebuei (17619)
2009	AK930-068	Parnassia palustris (181800)
2010	AK930-222	Parnassia palustris (35000)
2011	AK930-407	Parnassia palustris (5854)
2010	AK930-192	Parnassia palustris (66521)
2011	AK930-451	Parnassia palustris (72917)
2011	AK930-381	Parnassia palustris (74584)
2010	AK930-267	Parnassia palustris (80527)
2010	AK930-278	Parrya nudicaulis (148)
2011	AK930-387	Pedicularis langsdorffii (52920)
2010	AK930-309	Pedicularis sudetica s.l. (ssp. interior?) (9678)
2011	AK930-386	Pedicularis verticillata (17490)
2010	AK930-287	Penstemon gormanii (11766)
2011	AK930-360	Penstemon gormanii (21943)
2010	AK930-099	Petasites frigidus var. frigidus (13389)
2011	AK930-461	Phacelia mollis (233149)
2010	AK930-329	Phleum alpinum (25681)
2009	AK930-064	Phleum alpinum (9326)
2011	AK930-399	Plantago canescens (74027)
2011	AK930-445	Plantago macrocarpa (10479)
2011	AK930-410	Plantago maritima (19974)
2010	AK930-201	Poa alpina (16207)
2010	AK930-162	Poa alpina (21950)
2009	AK930-092	Poa alpina (38640)
2010	AK930-248	Poa eminens (19975)
2011	AK930-376	Poa glauca (36421)
2010	AK930-227	Polemonium acutiflorum (11211)
2010	AK930-237	Polemonium acutiflorum (14823)
2010	AK930-164	Polemonium acutiflorum (6681)
2012	AK930-472	Polemonium acutiflorum (not yet processed)
2010	AK930-181	Polemonium pulcherrimum (4060)
2011	AK930-372	Polygonum alpinum (177030)
2012	AK930-487	Polygonum alpinum (not yet processed)
2012	AK930-501	Polygonum alpinum (not yet processed)
2011	AK930-383	Potentilla bimundorum (138756)
2010	AK930-131	Potentilla bimundorum (23972)
2010	AK930-330	Potentilla drummondii ssp. drummondii (3065)
2010	AK930-177	Potentilla hookeriana ssp. hookeriana (9535)
2010	AK930-269	Potentilla norvegica (57951)
2009	AK930-094	Potentilla norvegica ssp. monspeliensis (59400)
2012	AK930-483	Potentilla norvegica ssp. monspeliensis (not yet processed)
2011	AK930-398	Potentilla pensylvanica var. litoralis (60438)
2010	AK930-178	Potentilla pensylvanica var. pensylvanica (158751)
2010	AK930-288	Potentilla pensylvanica var. pensylvanica (16648)
2011	AK930-395	Potentilla villosa (59888)
2011	AK930-426	Prenanthes alata (1469)
2010	AK930-290	Pseudoroegneria spicata ssp. spicata (1747)
2011	AK930-348	Pulsatilla patens ssp. multifida (18121)
2011	AK930-444	Pyrola asarifolia (1000000)
2010	AK930-314	Pyrola asarifolia ssp. asarifolia (400000)
2010	AK930-315	Pyrola minor (380000)
2011	AK930-455	Rhinanthus minor (10842)
2011	AK930-438	Rhinanthus minor (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)

Scientific Name	Cultivar Name	Seed Zone	Availability	Origin of Germplasm
<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)
<i>Arctagrostis latifolia</i>	('Alyeska' polargrass)	mixed	fair	NOTE: DERIVED FROM ONE PLANT
<i>Calamagrostis canadensis</i>	('Sourdough' bluejoint reedgrass)	mixed	fair	interior and western AK (before 1980)
<i>Deschampsia cespitosa</i>	('Nortran' tufted hairgrass)	NOT AK	good	interior, western and south cental AK (before 1971)
<i>Festuca rubra</i>	('Boreal' red fescue)	NOT AK	excellent	NOT AK (AK and Iceland)
<i>Festuca rubra</i>	('Pennlawn' red fescue)	NOT AK	excellent	NOT AK
<i>Leymus mollis</i>	('Reeve' beach wildrye)	NOT AK	poor	NOT AK
<i>Lolium multiflorum</i>	(annual ryegrass)	NOT AK	excellent	NOT AK (Norway)
<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)

Scientific Name	Germplasm Name	Seed Zone	Availability	Origin of Germplasm
<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 macrorurus</i>	(Tufed 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 oxytropis- Black Rapids Germplasm)	interior	poor	Black Rapids (1995)
<i>Potentilla bimundorum</i>	(Staghorn cinqufoil- 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 nutkataensis</i>	(Nootka alkalaiglass- Ninilchik Germplasm)	south central	poor	Ninilchik (1996)
<i>Artemesia stelleriana</i>	(Dusty Miller Artemesia- 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 macrorurus</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 (note proximity to eastern interior) before 1979)

Appendix 3. Alaska SOS Target List update.

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

Species	Common Name
<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 tundragrass
<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

Species	Common Name
<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>infernalis</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>Hierochloe 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

<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass
<i>Rumex aquaticus</i> var. <i>fenestratus</i>	western dock
<i>Rumex arcticus</i>	arctic dock
<i>Sanguisorba canadensis</i>	Canadian burnet
<i>Sanguisorba officinalis</i>	official burnet
<i>Saxifraga hieracifolia</i>	Stiff stem saxifrage
<i>Schoenoplectus tabernaemontani</i>	softstem bulrush
<i>Senecio congestus</i>	marsh fleabane
<i>Trisetum canescens</i>	Tall Trisetum

3. Appropriate for opportunistic collections

Species	Common Name
<i>Aconitum delphiniiifolium</i>	larkspurleaf monkshood
<i>Allium schoenoprasum</i>	wild chives
<i>Alopecurus aequalis</i>	shortawn foxtail
<i>Alopecurus alpinus</i>	boreal alopecurus
<i>Anaphalis margaritaceae</i>	Western Pearly Everlasting
<i>Androsace septentrionalis</i>	pygmyflower rockjasmine
<i>Anemone narcissiflora</i>	Narcissus anemone
<i>Anemone narcissiflora</i> var. <i>monantha</i>	Narcissus anemone
<i>Anemone parviflora</i>	smallflowered anemone
<i>Anemone richardsonii</i>	Richardson anemone
<i>Antennaria alpina</i>	alpine pussytoes
<i>Antennaria friesiana</i>	Fries' pussytoes
<i>Antennaria rosea</i>	rosy pussytoes
<i>Anthoxanthum monticola</i>	alpine sweetgrass
<i>Apocynum androsaemifolium</i>	spreading dogbane
<i>Argentina egedii</i> ssp. <i>egedi</i>	Pacific silverweed
<i>Argentina egedii</i> ssp. <i>groenlandica</i>	Pacific silverweed
<i>Armeria maritima</i>	thrift seapink
<i>Arnica frigida</i>	snow arnica
<i>Arnica latifolia</i>	broadleaf arnica
<i>Astragalus alpinus</i>	alpine milkvetch
<i>Astragalus eucosmus</i> ssp. <i>sealei</i>	elegant milkvetch
<i>Braya humilis</i>	low alpine rockcress
<i>Campanula aurita</i>	Yukon Bellflower
<i>Campanula lasiocarpa</i>	mountain harebell
<i>Campanula rotundifolia</i>	bluebell bellflower
<i>Carex arcta</i>	northern cluster sedge
<i>Carex atratiformis</i>	Polar sedge
<i>Carex aurea</i>	golden sedge
<i>Carex brunescens</i>	Brownish Sedge
<i>Carex canescens</i>	silvery sedge
<i>Carex crawfordii</i>	Crawford's sedge
<i>Carex diandra</i>	lesser panicled sedge
<i>Carex krausei</i>	Krause's sedge
<i>Carex lachenalii</i>	arctic hare-foot sedge
<i>Carex lasiocarpa</i>	woollyfruit sedge
<i>Carex membranacea</i>	fragile sedge
<i>Carex microchaeta</i>	smallawned sedge
<i>Carex nardina</i>	spike sedge
<i>Carex obtusata</i>	obtuse sedge
<i>Carex podocarpa</i>	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 unalaschensis</i>	Alaskan indian paintbrush
<i>Cerastium arvense</i>	Field Chickweed
<i>Cerastium beerigianum</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 hawksbeard
<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 macrorurus</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 lanophyllum</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>Heuchera 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>Menyanthes 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 oxytropre
<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 langsdorffii</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>Symphytum boreale</i>	northern bog aster
<i>Symphytum subspicatum</i>	Douglas aster
<i>Taraxacum officinale</i> ssp. <i>ceratophorum</i>	common dandelion (native)
<i>Tellima grandiflora</i>	bigflower tellima
<i>Tephroseris 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.

Species	Common Name
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	thinleaf alder
<i>Alnus rubra</i>	red alder
<i>Alnus viridis</i> ssp. <i>crispia</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.

Species	Common Name
<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 oxytropae
<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

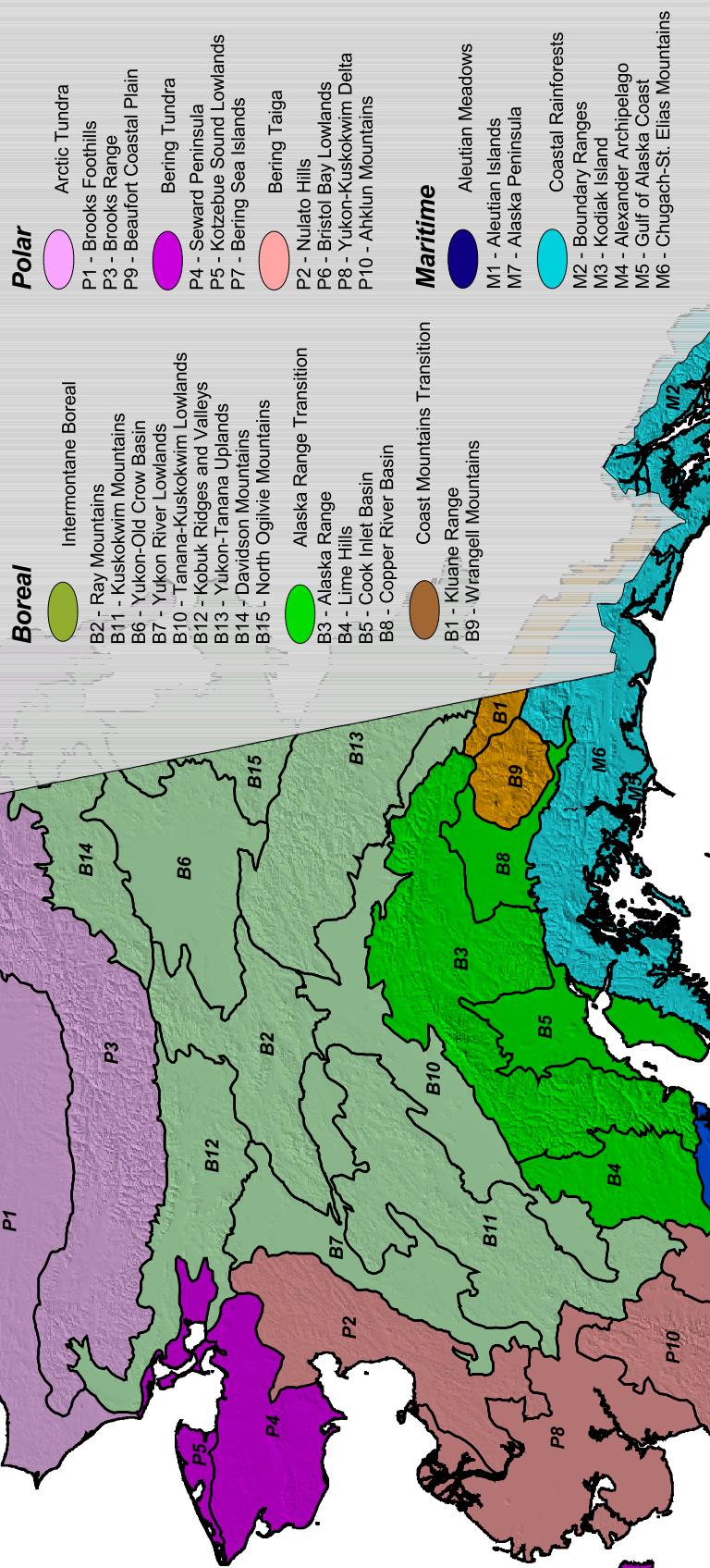
N not yet collected in that zone

---- 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 / map (in press)."

Alaska Ecoregions



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



SEEDS
of SUCCESS

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

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);
- 增加 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.



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 :

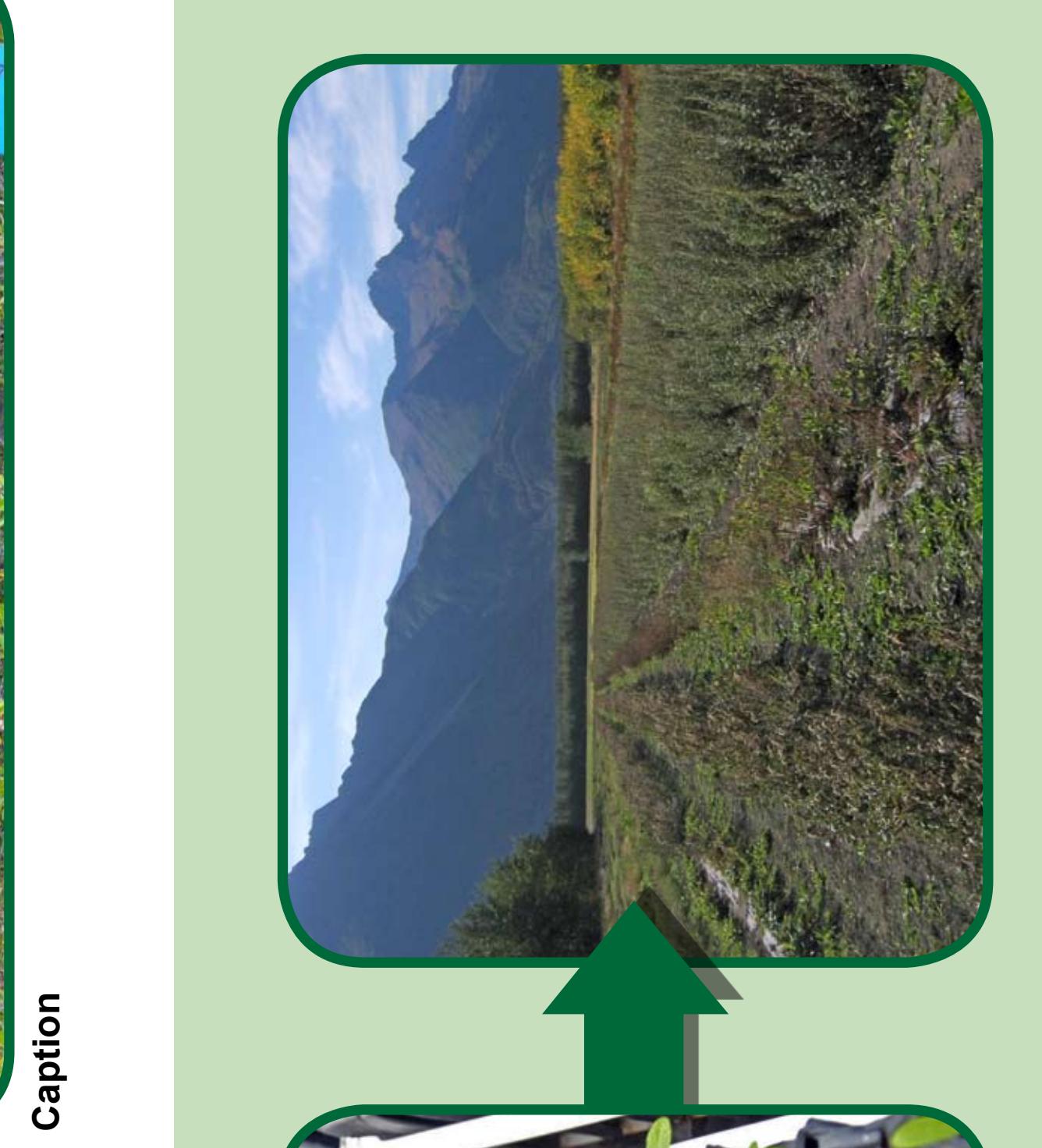
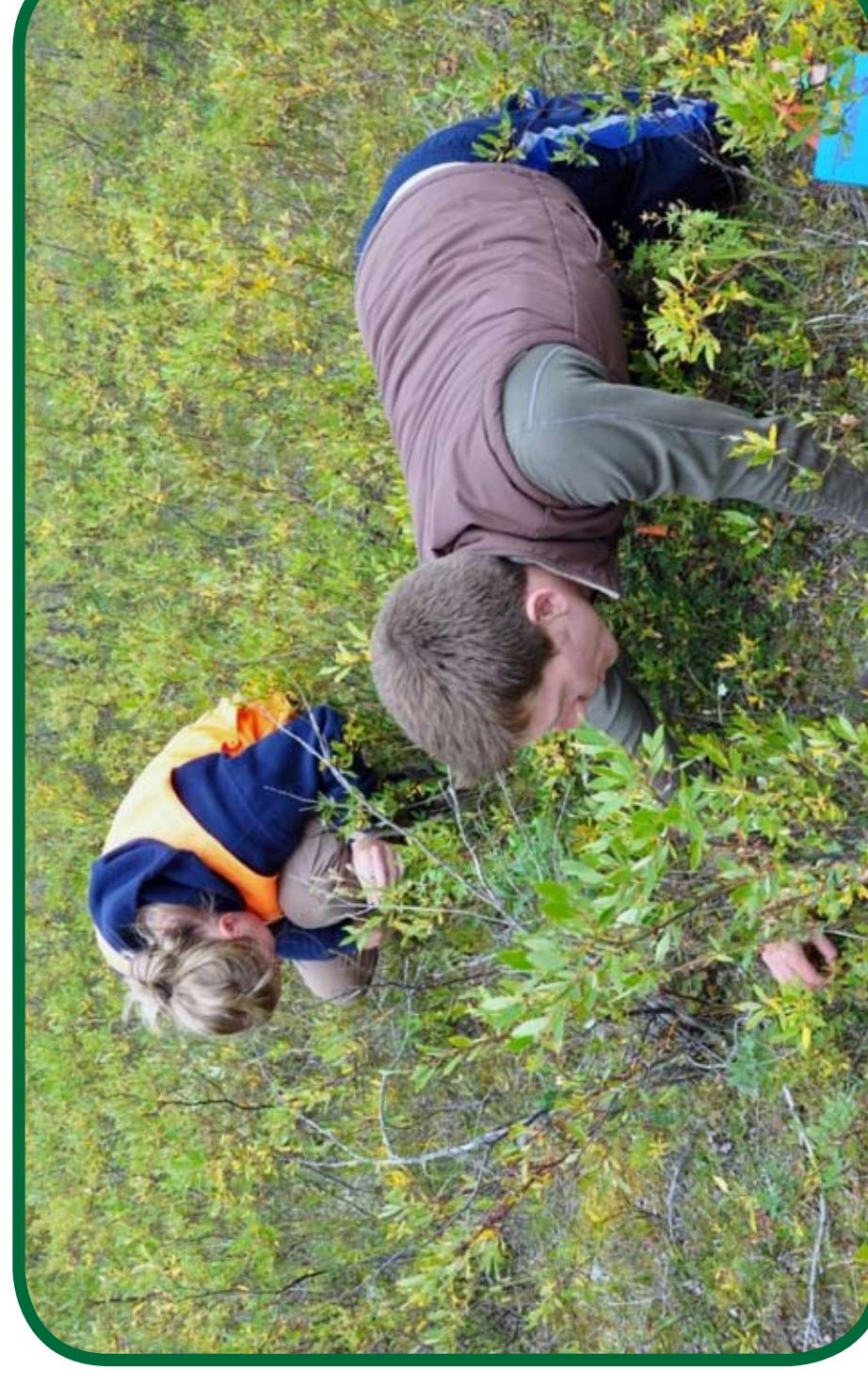
Agrostis scabra
Achillea sibirica
Agrostis mertensii
Poa alpina
Hebsarum alpinum

Carex mertensii
Chamerion latifolium
Artemisia tilesii
Oxytropis campestris
Sanguisorba canadensis
Wilhelmsia physodes

Caption

The 2010 Field Season

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

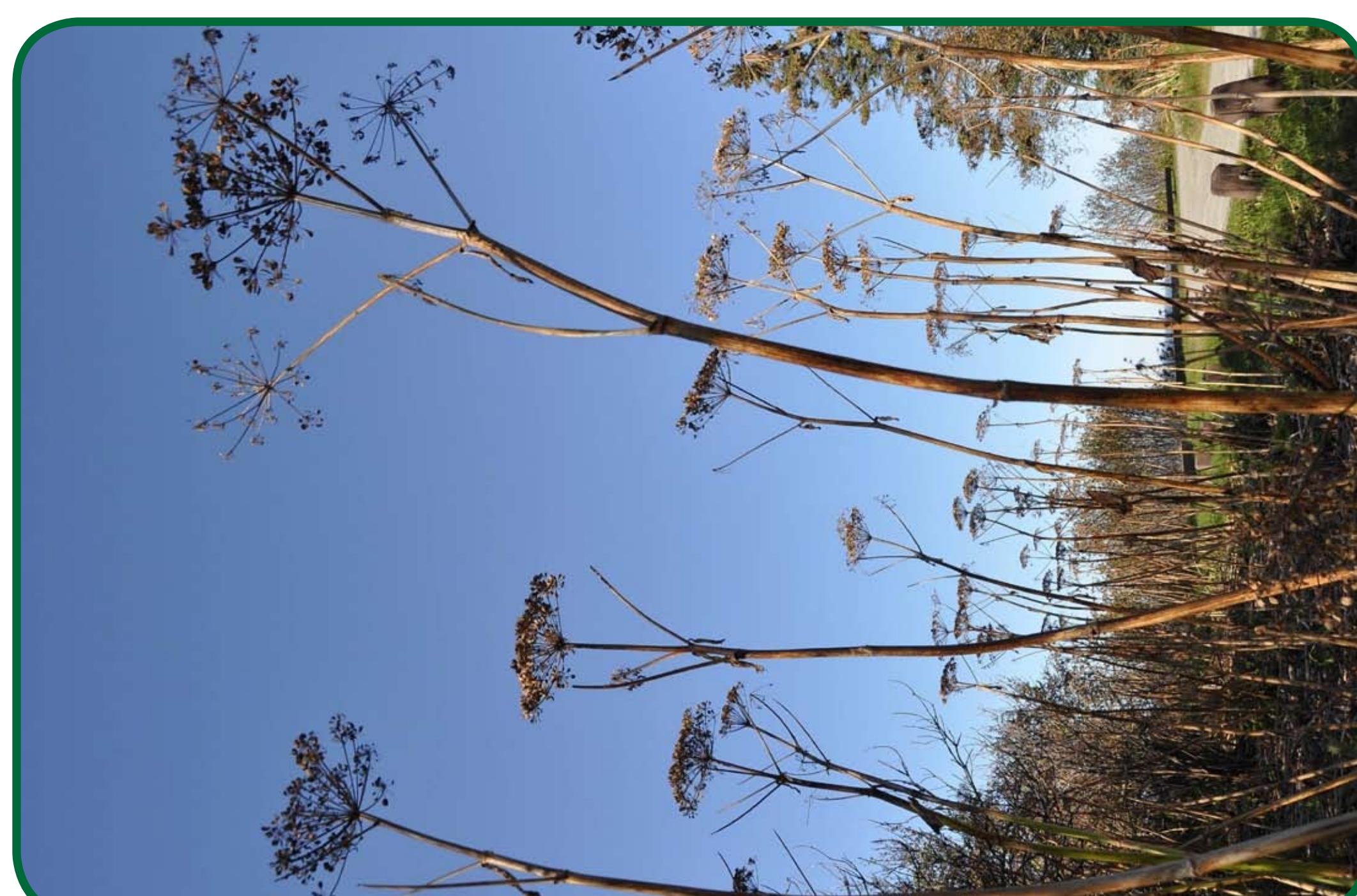


Caption

Over 150 species on early serial collection list

Hordeum brachyantherum
Juniperus communis
Lathyrus japonicus
Lathyrus palustris
Leymus mollis
Loiseleuria procumbens
Lupinus arcticus
Lupinus nootkatensis
Mimulus guttatus
Orthilia secunda
Oxytropis borealis

Oxytropis campestris
Oxytropis nigrescens
Parnassia kotzebuei
Parnassia palustris
Pedicularis labradorica
Pedicularis langsdorffii
Pedicularis parviflora
Petasites frigidus
Petasites sagittatus = Petasites frigidus var. sagittatus
Phleum alpinum



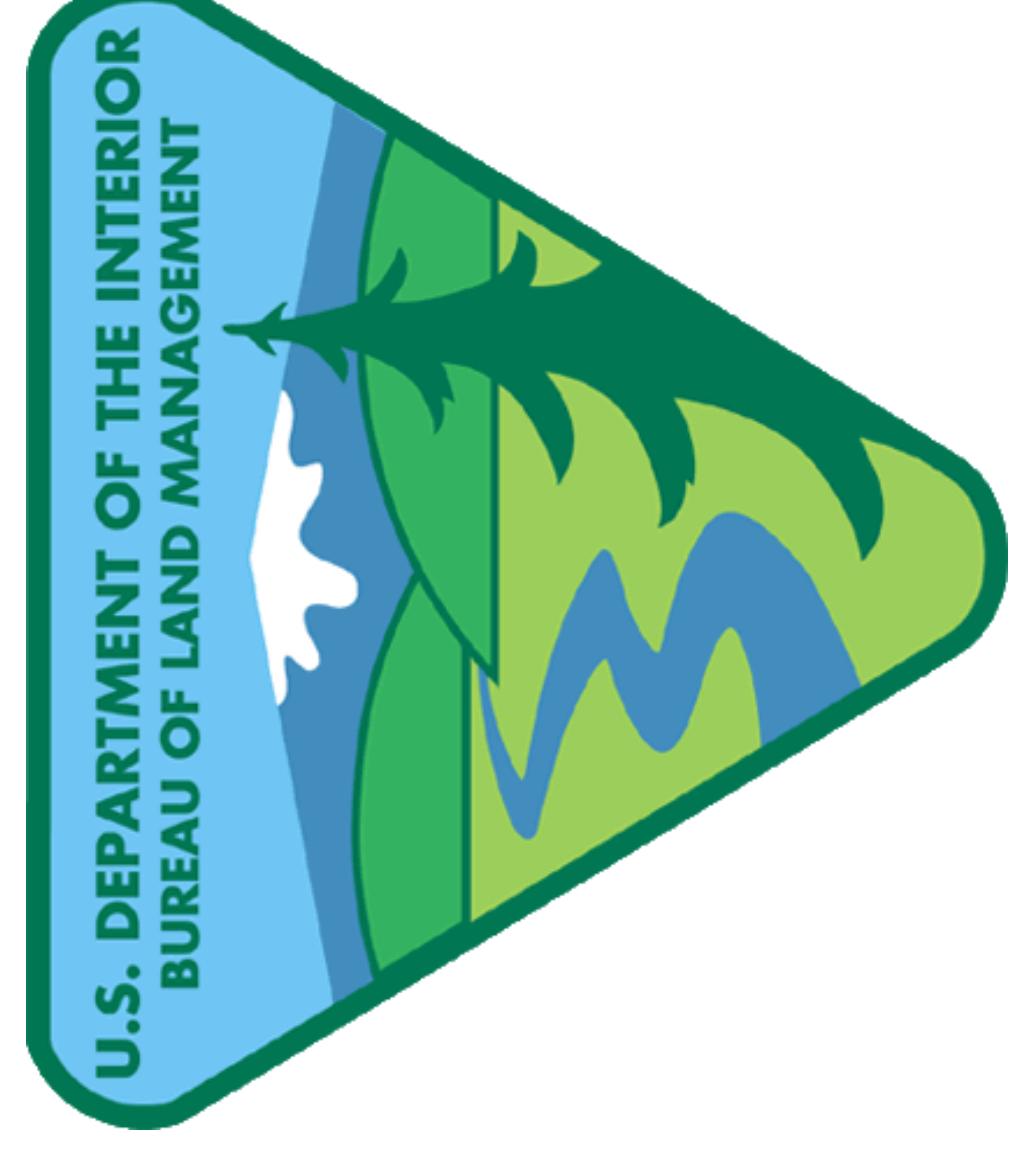
Caption





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

Mentors: Mike Duffy and Paul Krabacher
Interns: Alyssa Epstein and Emily Capelin

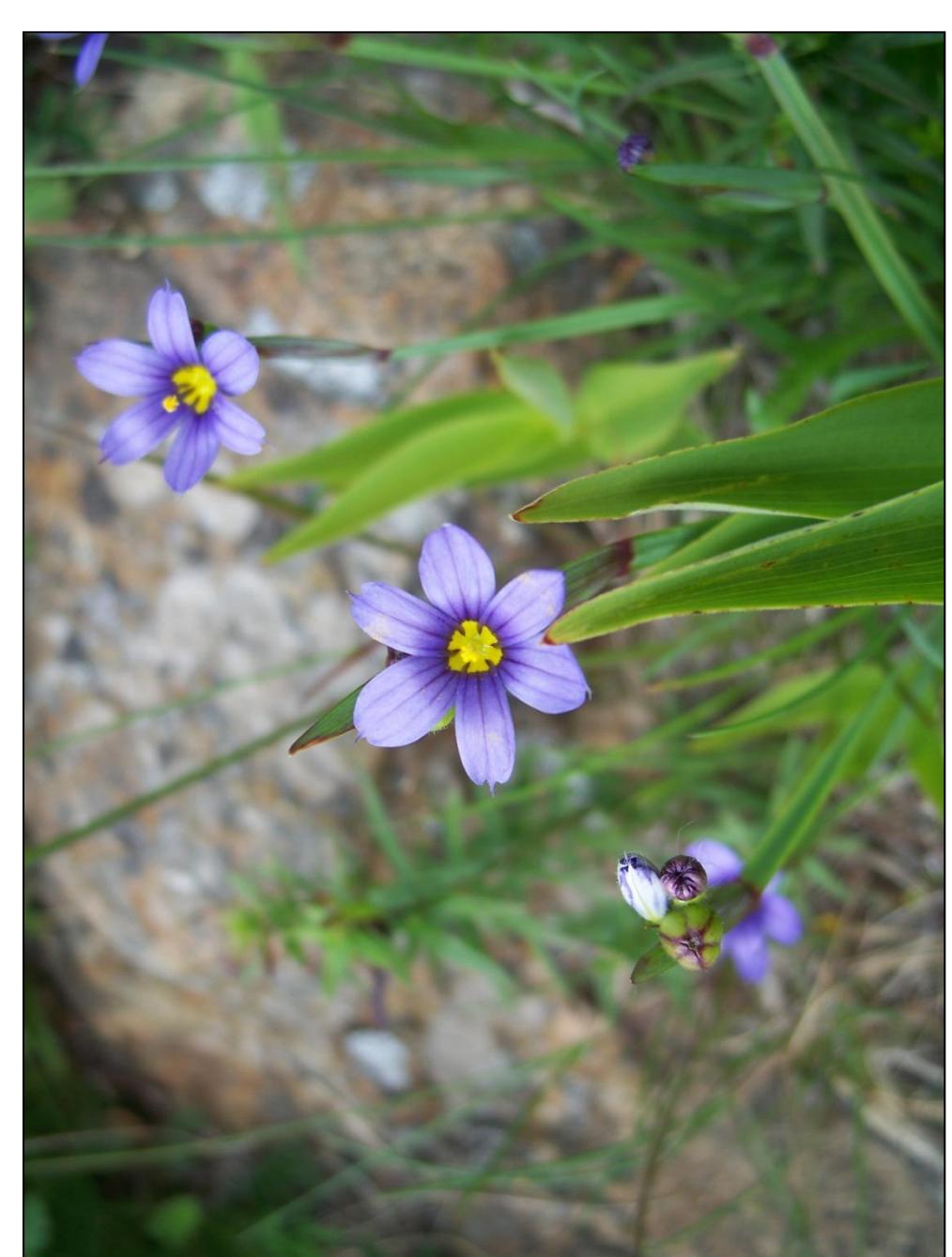


Native Plant Materials Development Program

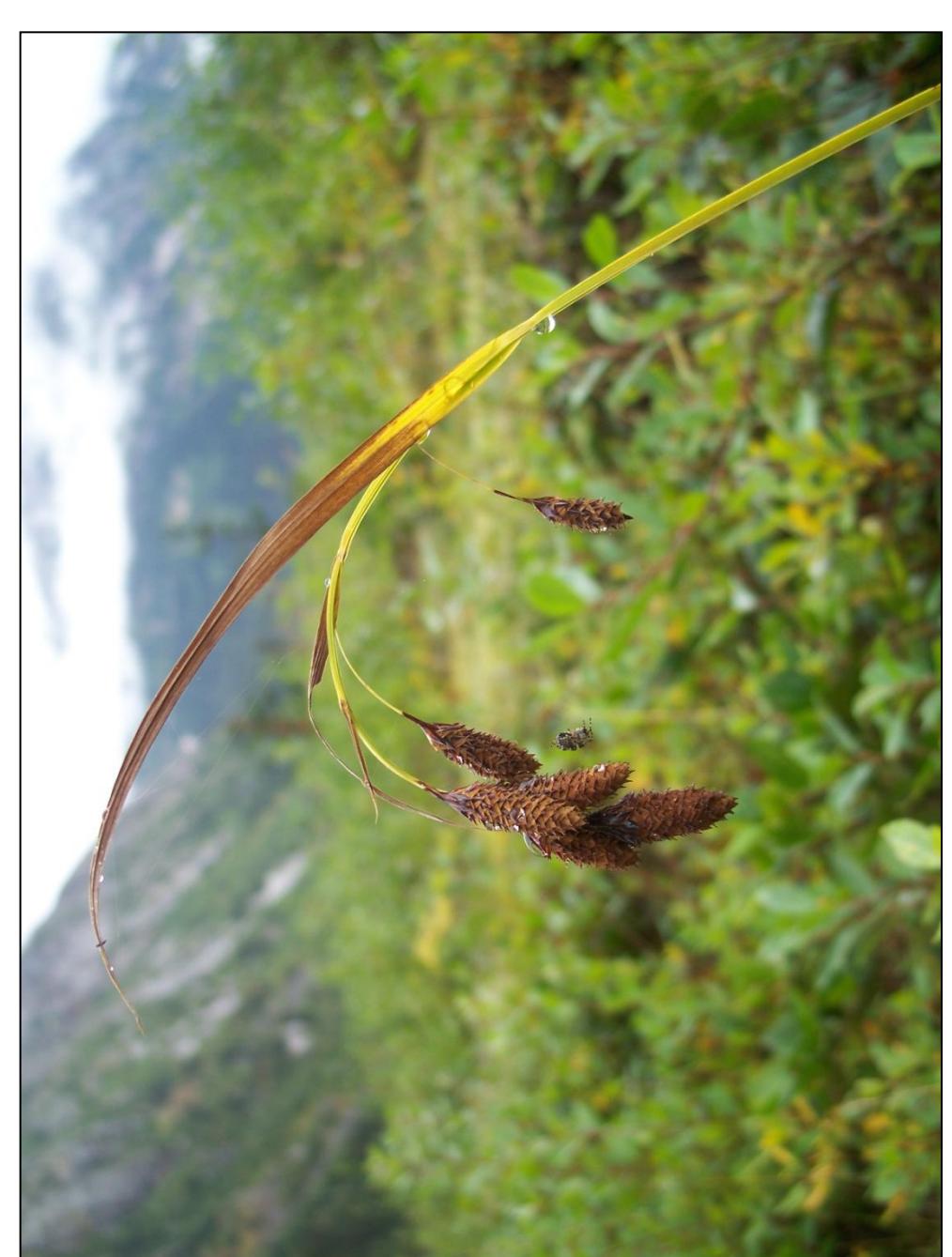
Mission: Increase the diversity and amount of native seed available for stabilization, rehabilitation, and restoration efforts on various federal management lands.

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.



Sisyrinchium littorale from Turnagain Arm



Carex mertensii from the Klondike Highway



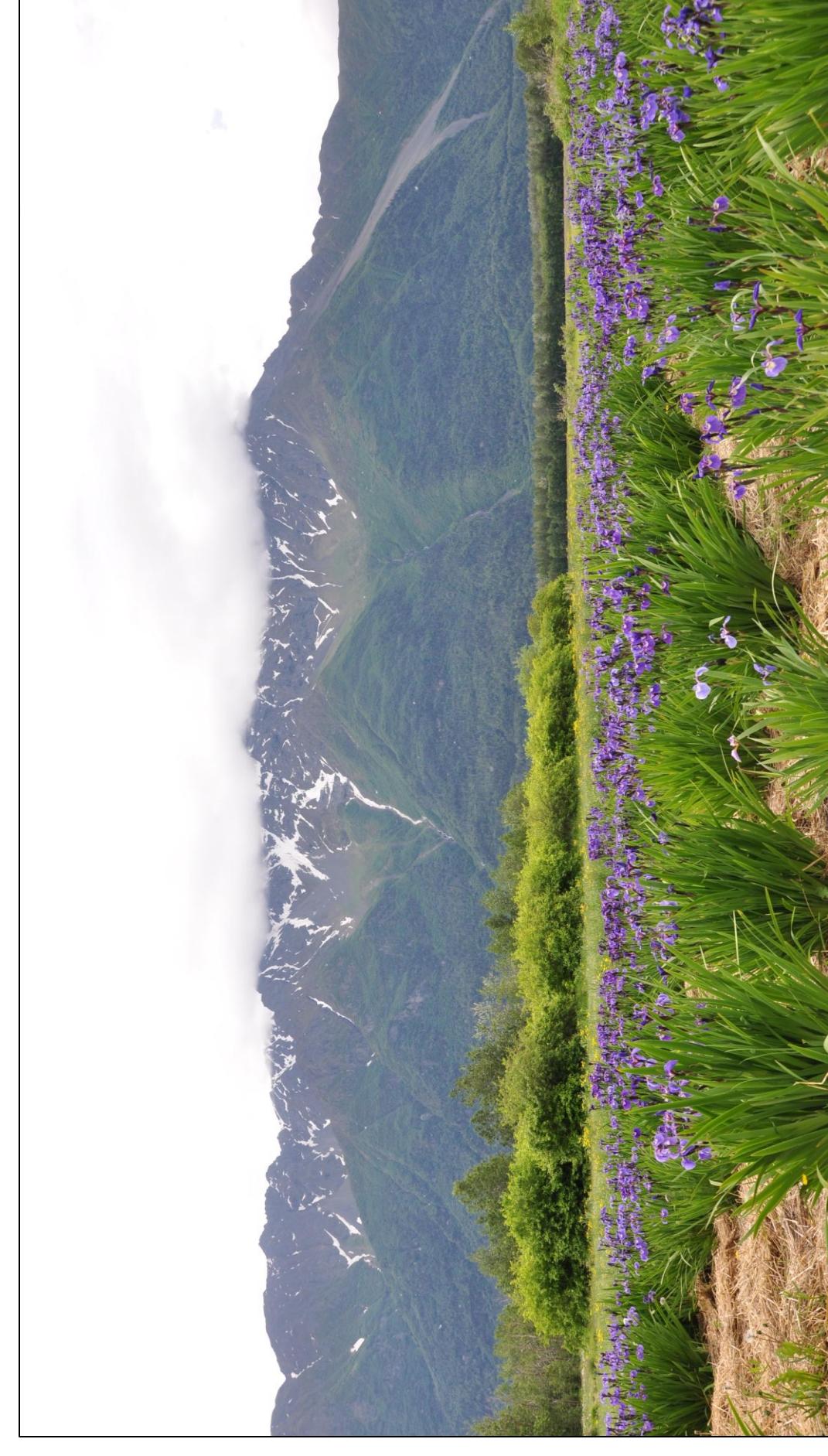
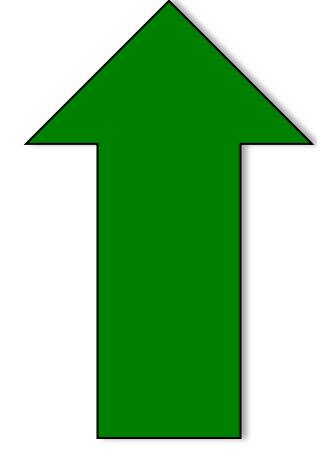
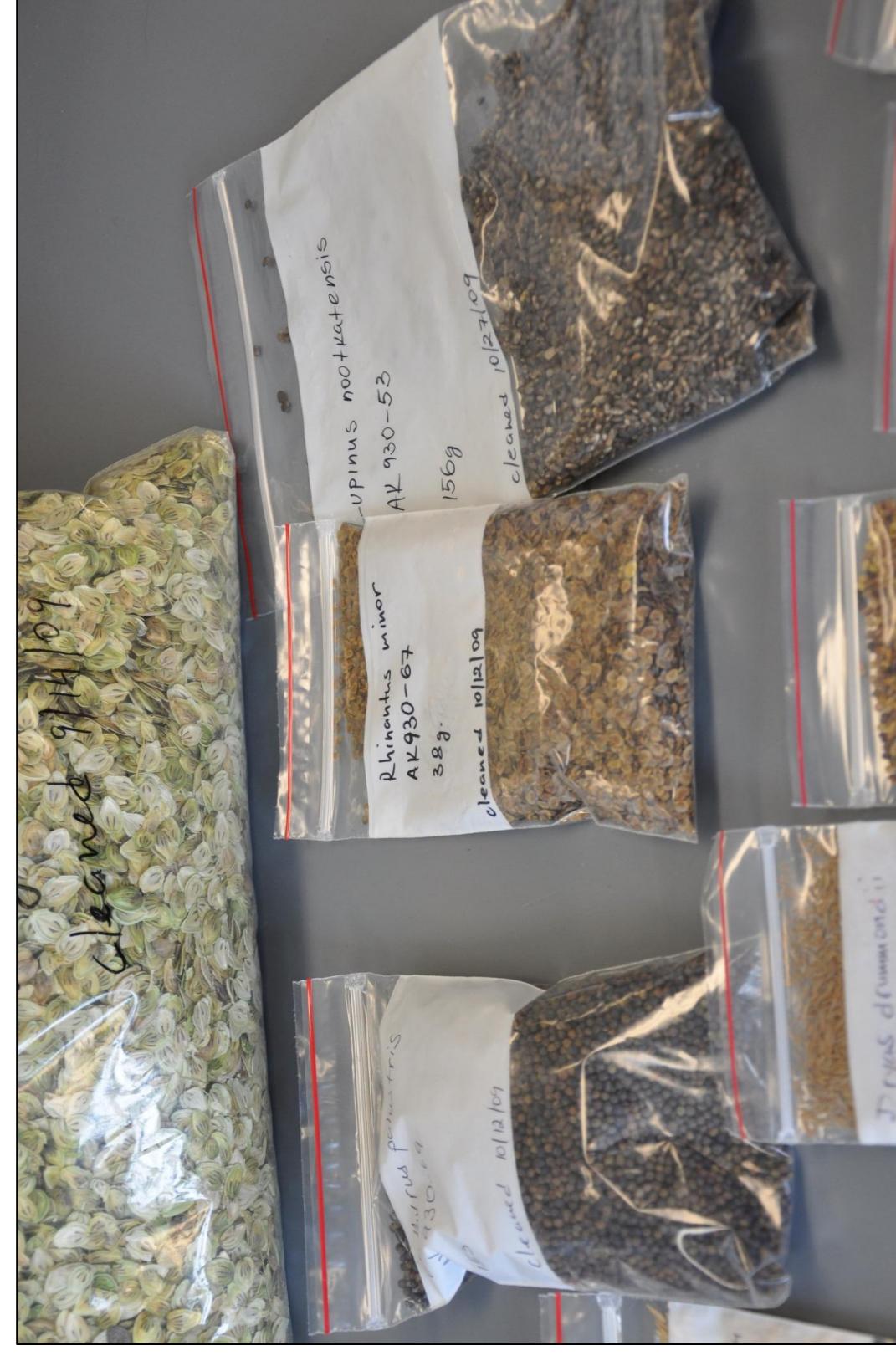
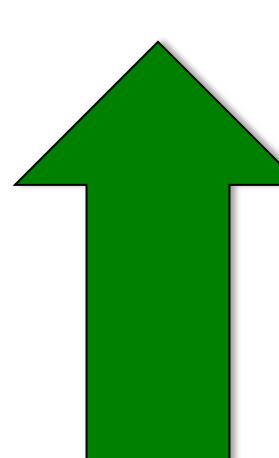
Collecting seeds near Chicken, AK

The 2011 Field Season

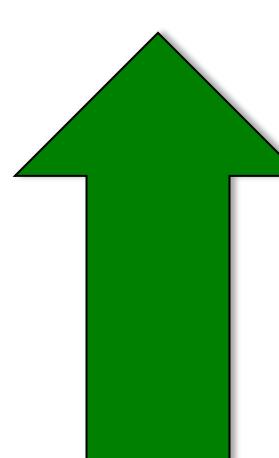
In partnership with the Chicago Botanic Garden and the Alaska Natural Heritage Program, the BLM Alaska State Office hired two interns and a professional botanist to collect seed throughout the state. Approximately 125 collections were made in such diverse locales as Chicken, Platinum on the Southwest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



Collecting seeds near Chicken, AK



Seed collection

Seed cleaned and ready for storage or use

Seed planted for increase at PMC

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

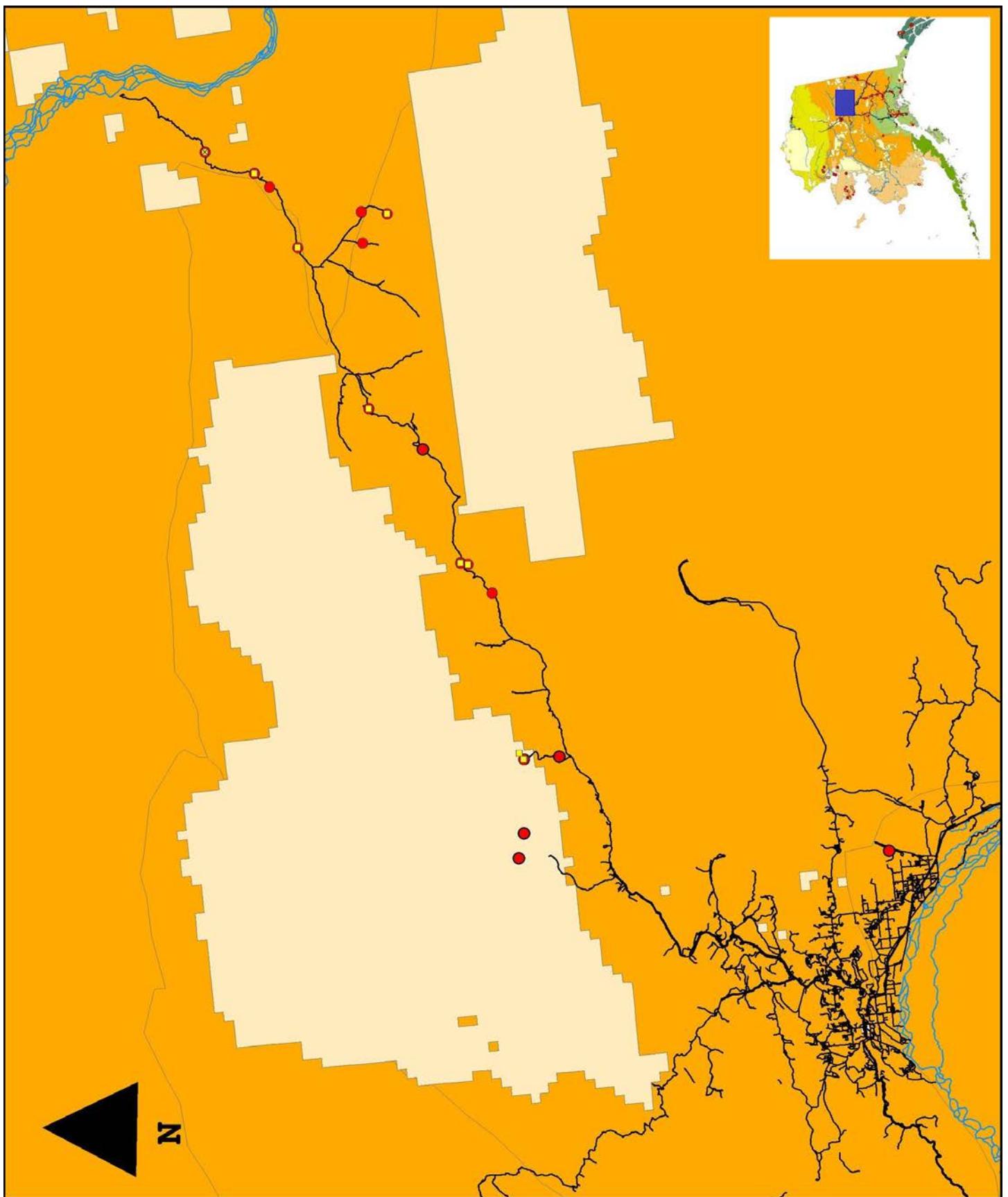
Alaska Plant Materials Center

- 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*.

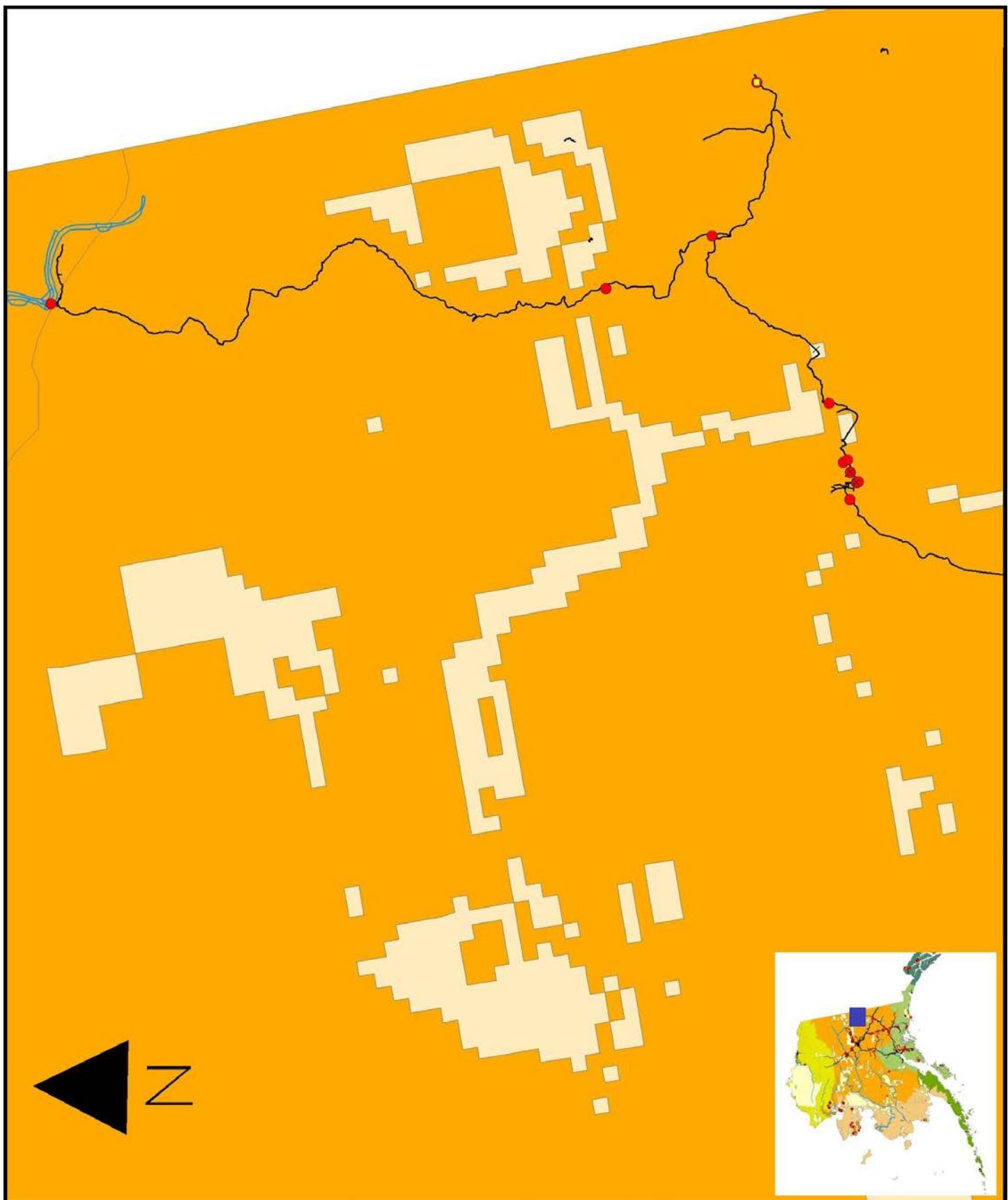
Acknowledgements

- 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.

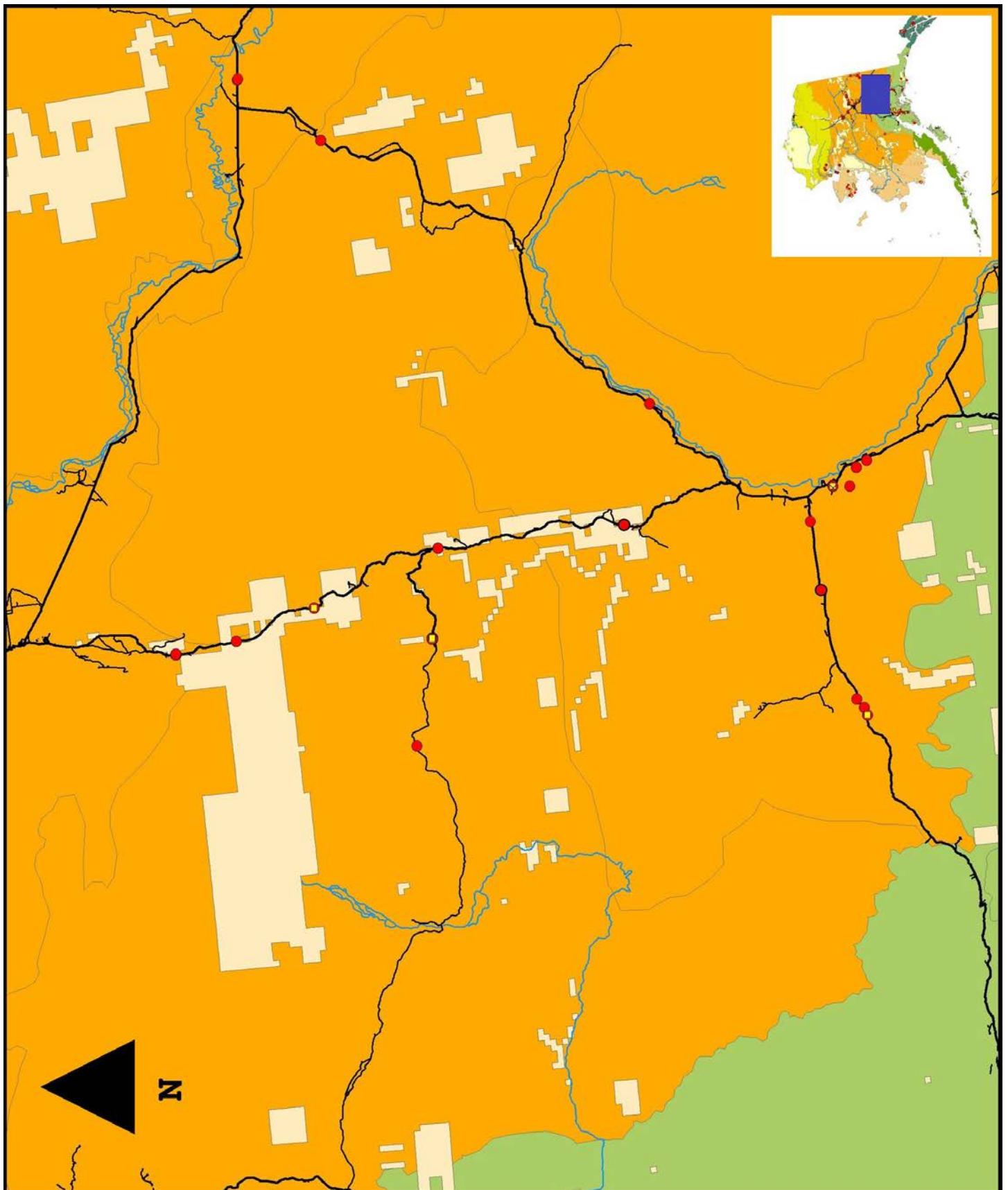
Seed viability and germination test at PMC



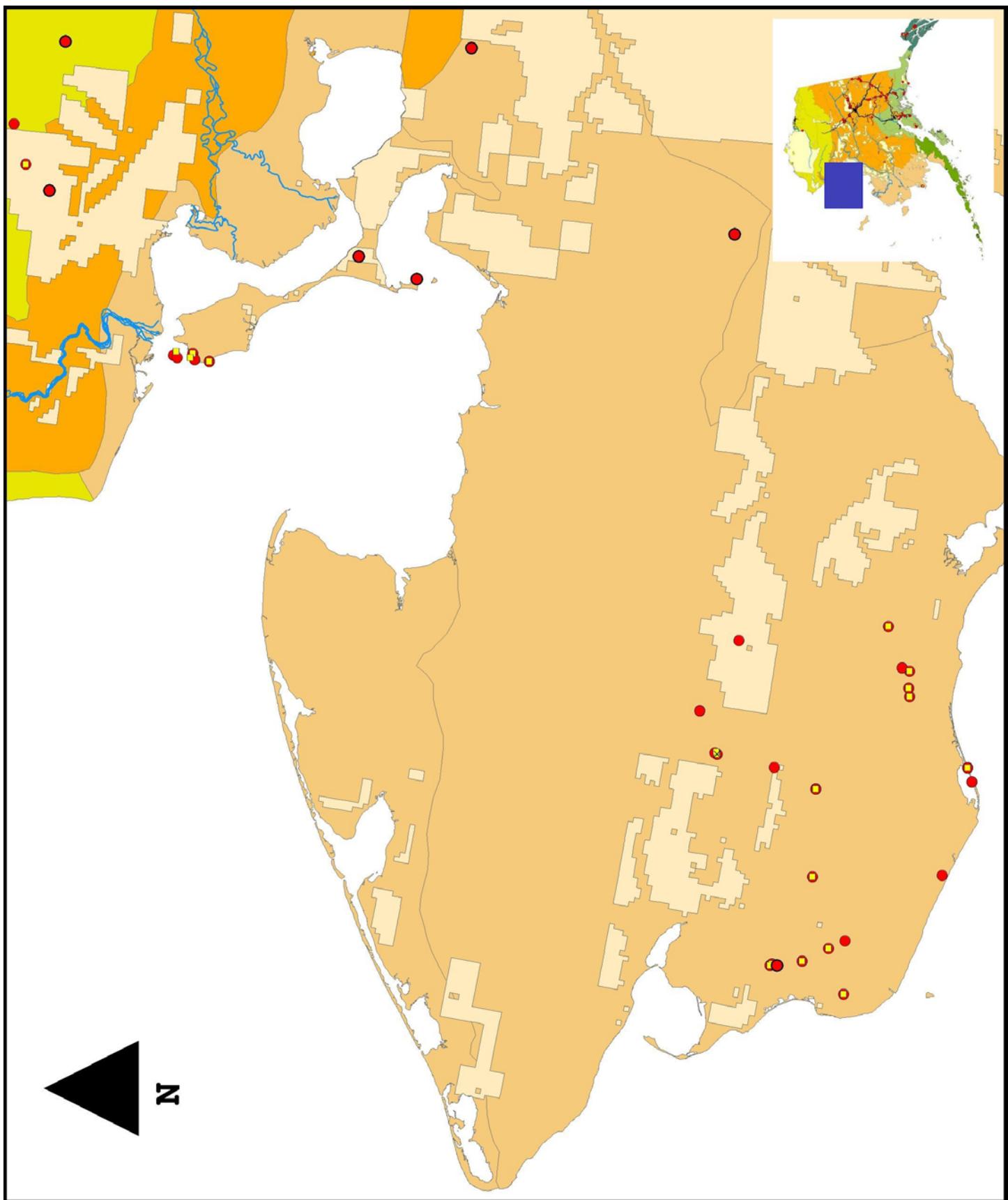
Appendix 7 Additional maps. Detail of Steese Highway collections.



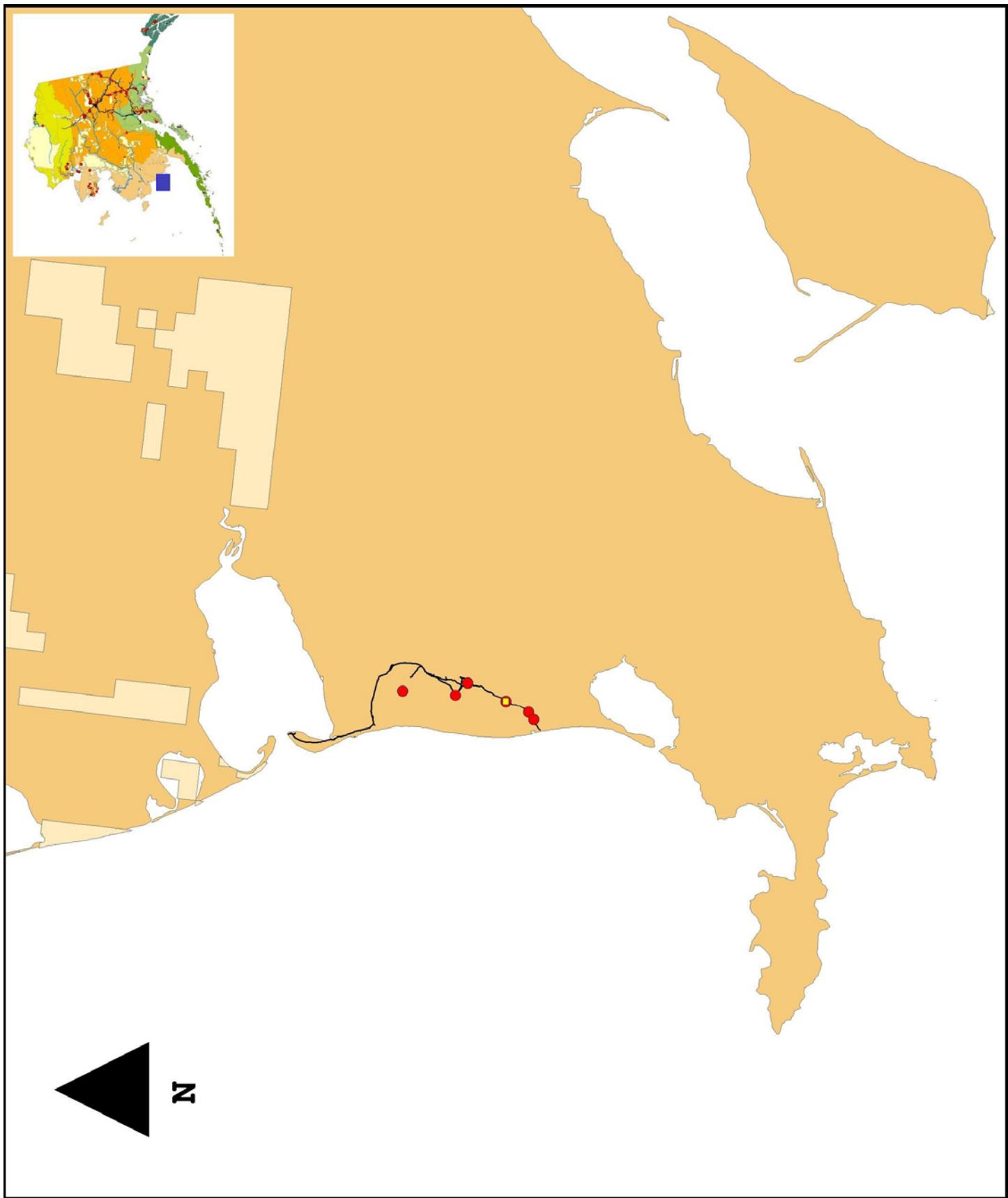
Appendix 7 Additional maps. Detail of Chicken and Eagle collections.



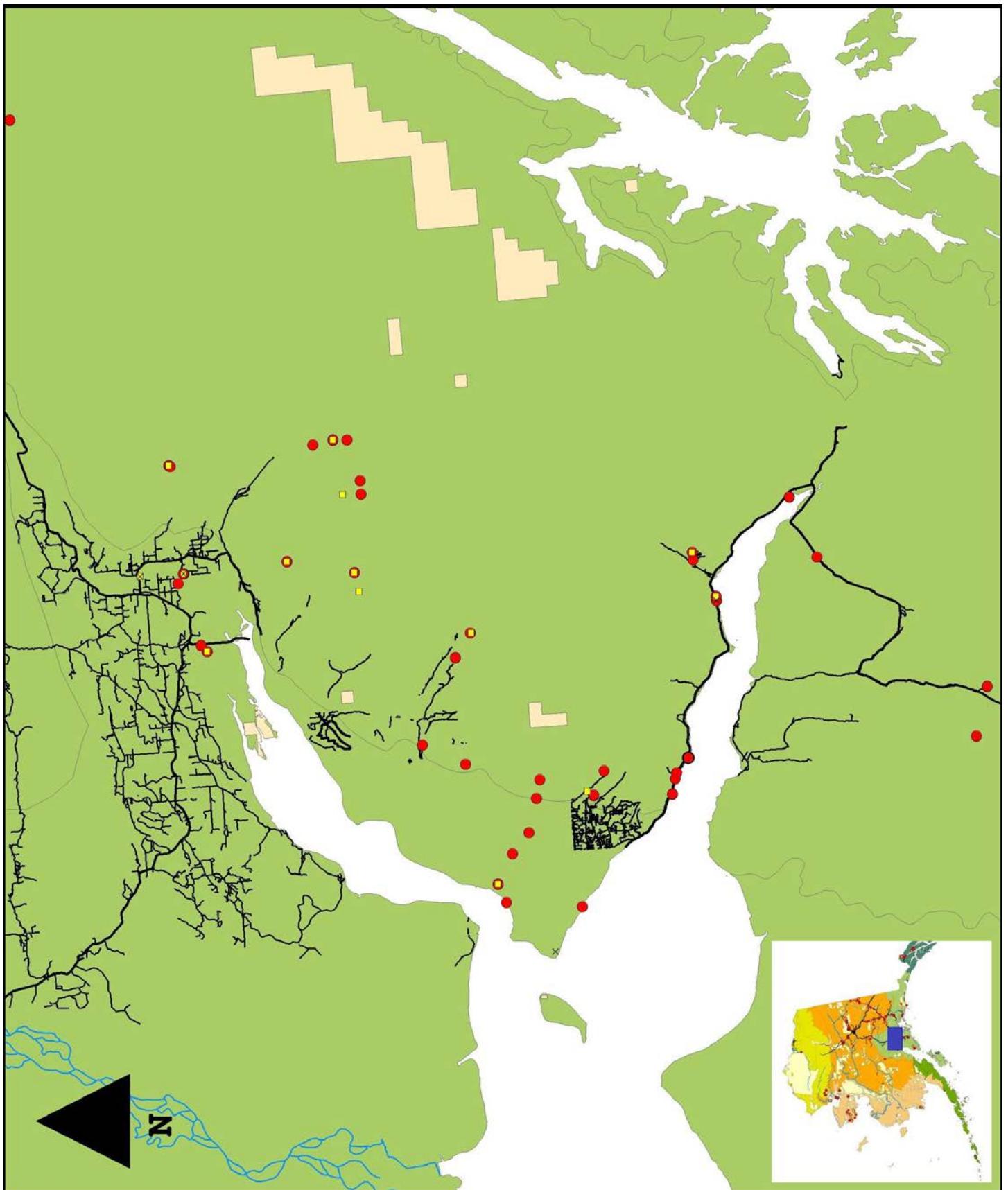
Appendix 7 Additional maps. Detail of Copper Basin collections.



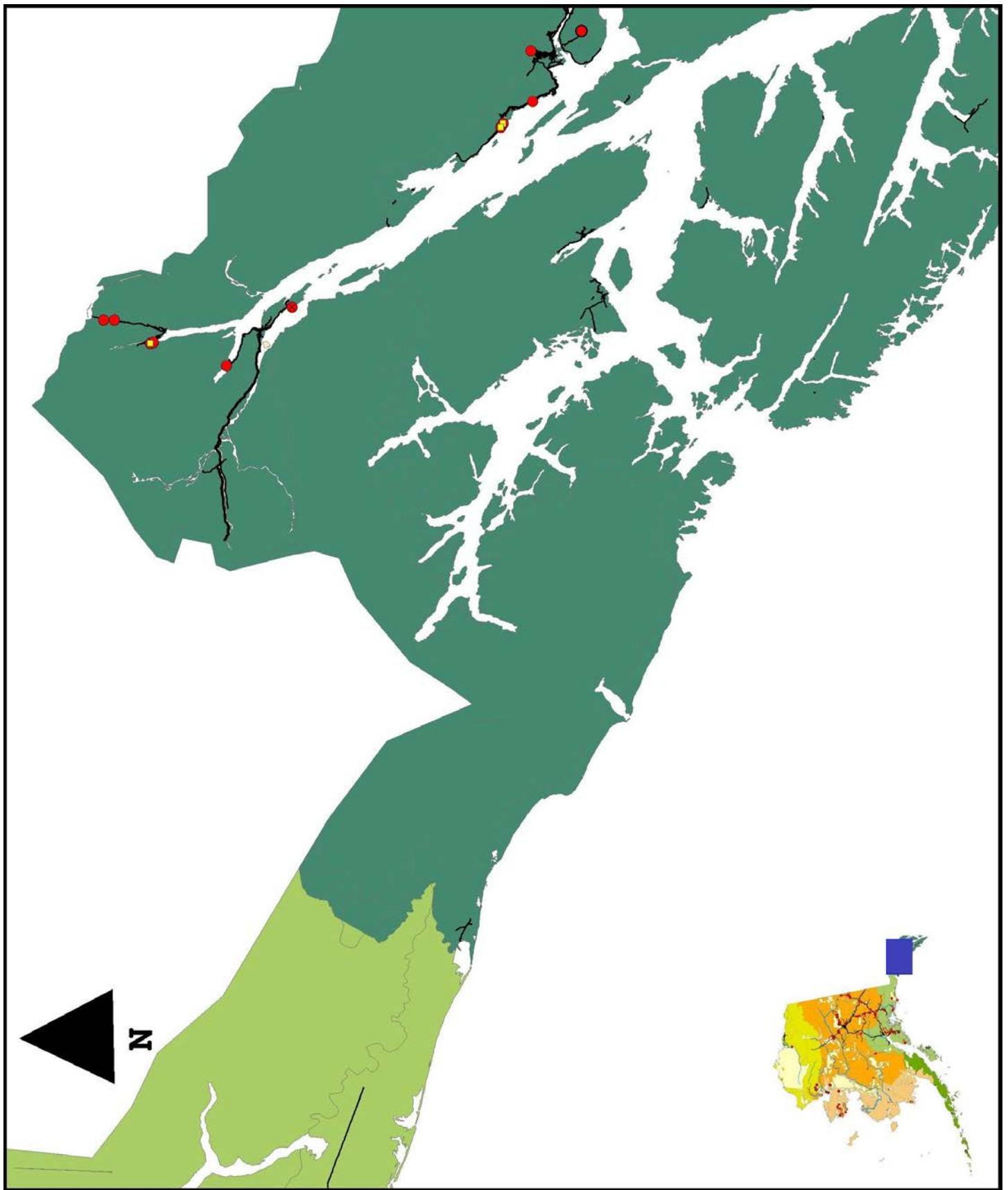
Appendix 7 Additional maps. Detail of Seward Peninsula collections.



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.