

Seeds of Success: 2014 Field Season Report



Photo: Chicago Botanic Garden intern, Bonnie Bernard, collecting seed at the Mystery Mountain site near McGrath.

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Introduction

In 2000, the Bureau of Land Management (BLM) engaged in a collaborative effort to establish a seed collection for native plants nationwide. The seed collection was specifically intended for conservation purposes, particularly for restoration and emergency fire rehabilitation projects, but also intended to bank seeds for future needs. To meet these goals protocols for documentation and methodologies were established for seed collection at the population level. This effort was part of a nationwide, interagency program known as “Seeds of Success” (SOS), and for several years was also a part of the international “Millennium Seed Bank Partnership” of the Royal Botanic Gardens, Kew in the United Kingdom.

Since 2007, the BLM Alaska State Office has partnered with the Alaska Natural Heritage Program (AKNHP), University of Alaska Anchorage to collect seeds from targeted populations of Alaska native plants. To date AKNHP has made 636 SOS collections from 281 different species (Figure 1). This report summarizes the 2014 SOS Field season where SOS collections were made, comments on complications encountered at sites, and potential future SOS collection sites.

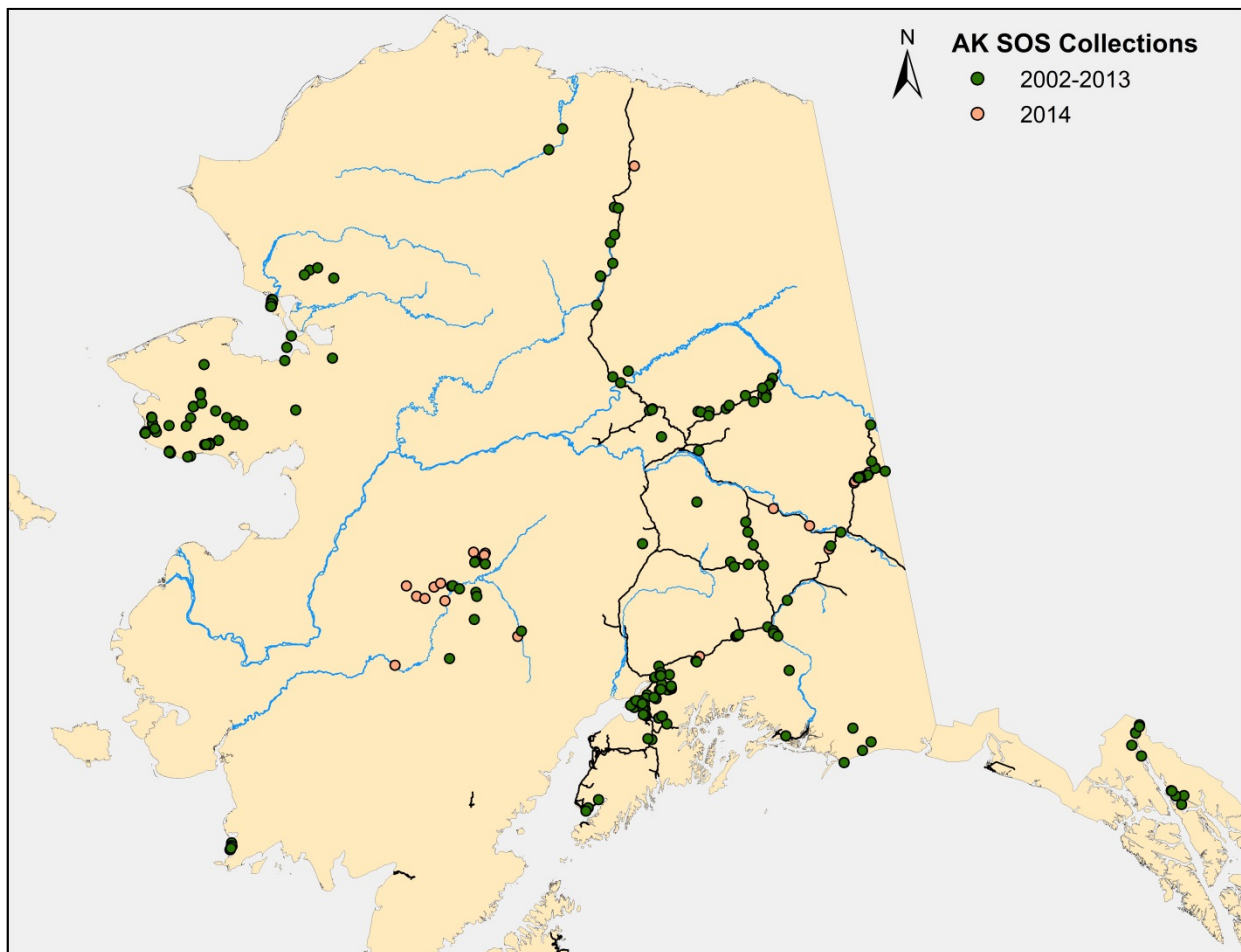


Figure 1. Alaska SOS collection sites since 2002.

Methods

The seed collecting team used the SOS national protocol to make collections of 10,000 to 20,000 seeds from specimens of a given plant population. However, 6,000 viable seeds at minimum are required for the SOS program. Seeds were gathered from at least 50 individual plants to maximize genetic diversity and collectors did not gather more than 20% of the seed produced by a population. Species of conservation concern, agricultural species, and species with recalcitrant seeds were not within the scope of the project; these, as well as non-native species, were not collected. Collecting efforts were focused on species with traits that would provide advantages in the contexts of stabilization, restoration, and rehabilitation. Seed collections were transferred to the Alaska Plant Materials Center, Division of Natural Resources, for processing, storage, and in some cases grown for an increase of seed quantity.

In addition to the seed collections, digital photographs and data on the location, habitat, associated species, landform, land use, geology, and soil type were recorded for each collection site. These data were submitted to the national program offices in Washington DC and copies are kept at AKNHP in Anchorage. Photographs are located in Appendix A and scanned data sheets are in Appendix B. Three voucher specimens were taken for each collection. These specimens were sent to the U.S. National Herbarium at the Smithsonian (US), the herbarium of the Museum of the North at the University of Alaska Fairbanks (ALA), and the herbarium the University of Alaska Anchorage (UAAH). Herbarium vouchers from UAAH can be viewed online at: <http://www.pnwherbaria.org/>. This project fell within the State of Alaska guidelines for non-commercial harvesting, and thus did not require a permit for collections on state land. Permits were acquired and are on file from MTNT Limited, a Native Corporation managing land around McGrath. For the 2014 field season, SOS AK930 had a goal of 40–50 collections. The scope of work was focused in Interior Alaska, concentrating on the areas around McGrath and Chicken. Since reseeding and restoration activities using cultivated material typically occurs on the road system in Alaska, collections were focused away from the road system when possible to capture a diversity of genotypes that have not been subject to artificial selection and genetic drift during seed increase. Helicopter assistance aided this effort in the McGrath area. Collections were made from 7 August to 4 September 2014. Two Chicago Botanic Garden interns aided AKNHP staff for the Seeds of Success project this season.

Results

A total of 66 seed collections were made and composed of 41 different species (Table 1). Three collections (AK930-578, 584, and 591) were removed from the final collection list because they were identified as *Poa pratensis*, a species group that consists of native and non-native subspecies. The identification to the subspecies level is difficult since diagnostic characteristics between the subspecies are not well defined and individual plants will often display characteristics of more than one subspecies. While the collections were in remote settings and

appeared to be the native subspecies, they were removed from the SOS collection as a precaution and seed were destroyed. A collection of *Elymus* (AK930-583) was removed from the final collection list because the vouchers consisted of two different species, *Elymus trachycaulus* ssp. *trachycaulus* and *Elymus macrourus*. Both *Elymus* species are native and target workhorse species; however the seed collection is most likely a mix of the two species together and therefore not consistent with the SOS guidelines. The seed would be useful for direct application in seed mixes and should be retained for an internal collection. A collection of *Trisetum spicatum* (AK930-602) from Whirlwind Mountain was removed from the final collection list because the specimen vouchers were missing and therefore not within SOS guidelines. We are confident on the species identification for this collection and due to similar environmental and locality proximity to the Nixon Fork Mine, we recommend the collection be retained as an internal collection and used for direct application in seed mixes.

Collections were heavily concentrated in the McGrath region, Interior Seed Zone, with a total of 39 seed collections. Scouting and minor collections from the previous year facilitated finding new suitable locations. This area included sites along the Nixon Fork River, Mystery Mountain, Sunshine Mountain, Takotna River, Beaver Mountain, Lincoln Mountain, and Red Devil Mine (Figure 2; Table 1). There were 18 seed collections made in the Chicken and Tok region, the Interior Seed Zone. This area included various areas along the Taylor Highway and Wade Creek, where a new mining site is located (Figure 3; Table 1). Two collections were made in the Matanuska Glacier area, the Interior Seed Zone, and two collections from the North Slope, the Arctic Seed Zone (Figure 1; Table 1). Scouting visits were done at the Red Devil Mine and along the Richardson Highway and are summarized in Appendix C and D, respectively.

McGrath Area Collections

Potential collecting sites in the McGrath region were scouted in 2013 and through satellite imagery. Within the McGrath region, site locations were near Rohn Cabin, Kuskokwim River, Nixon Fork River area, Takotna River, Beaver Mountains, and the Red Devil Mine. One opportunistic collection of *Oxytropis campestris* (AK930-577) was made near Egypt Mountain, just north of Rohn Cabin. The location is listed as the most desirable route for the Donlin Gold natural gas pipeline, making AK930-577 an excellent collection for future revegetation. The habitat along the potential pipeline route north of Rohn Cabin is a floodplain with a braided stream. The vegetation community is tall scrub composed of willows. Grass species such as *Elymus* and *Bromus* were abundant for collecting here but most contained smut or were too early. *Hedysarum* was also observed but not in a large enough quantity for a quick collection.

A site along the Kuskokwim River south of McGrath appeared desirable on satellite imagery, however only one collection (AK930-579, Kuskokwim River Bar) was made since it did not contain appropriate or large enough populations of workhorse taxa (Figure 2). The habitat 1 km

north of collection AK930-579 contained many large wet and dry graminoid meadows of filled in oxbow lakes with mixed alder and spruce patches. These small patches were not explored on the ground due to time constraints, but this area should be considered in future collection efforts.

The Nixon Fork River contained numerous dry and moist herbaceous gravel point bars, filled meadows, and open willow scrub habitat above the confluence with Mystery Creek (Figure 2). The large open marsh valley holding the Nixon Fork River is composed of wet graminoid herbaceous tundra, bog oxbow lakes, and open black spruce forest. Our scouting observations this year and in 2013 found few work-horse species or target habitats in areas away from the river. Sunshine and Mystery Mountain provided a total of six seed collections of subalpine grasses and forbs (Table 1). Seed had already dispersed from a very large viable population of *Festuca altaica* at Mystery Mountain but would make an excellent future collection. These collections are located approximately 30 km north of the Nixon Fork Mine with the same elevation making them a priority to increase for future reclamation of the mine.

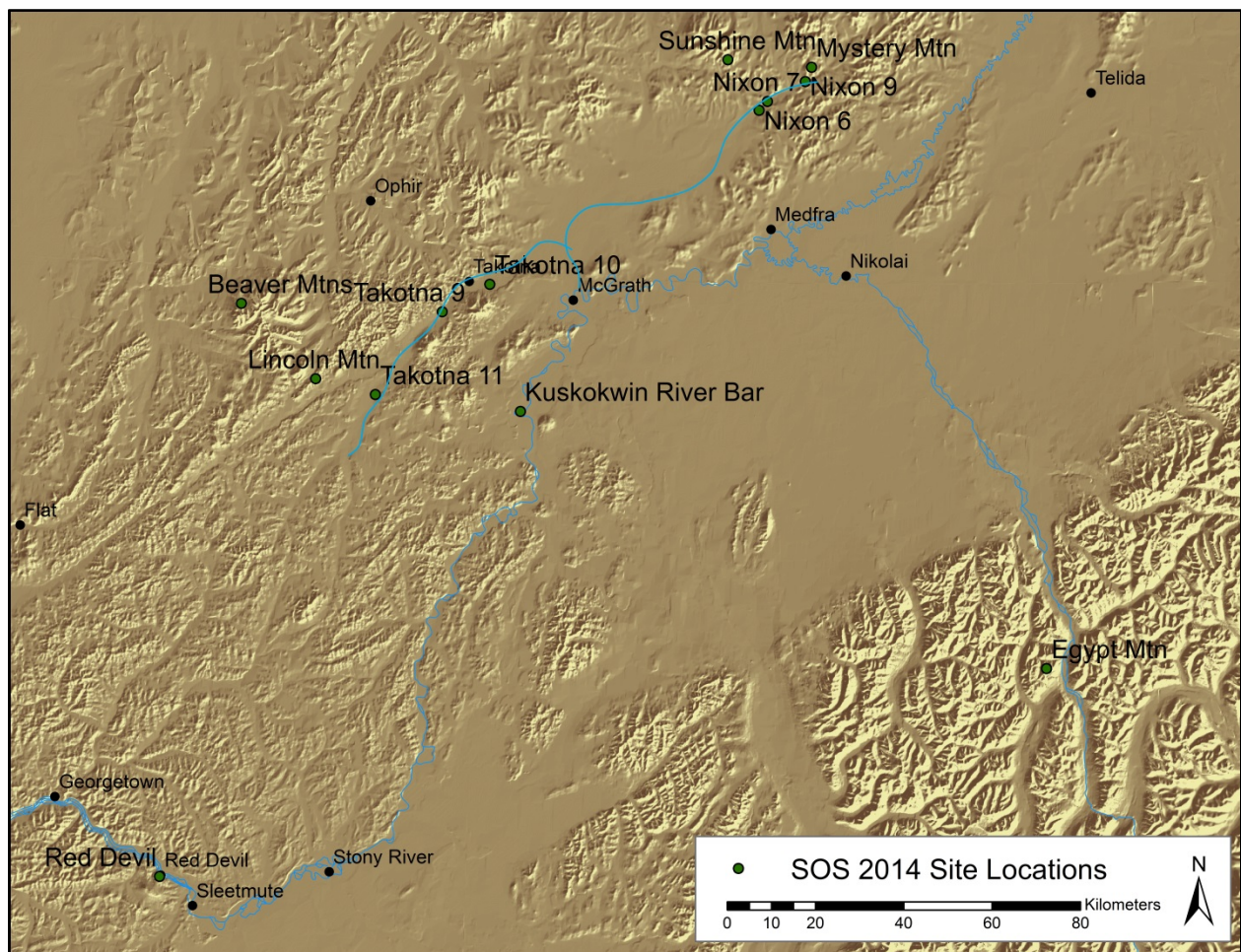


Figure 2. SOS collection sites near McGrath.

Sites along the Takotna River were similar in species composition to the Nixon Fork River sites, but contained larger and more kinds of habitat and therefore larger plant populations. The Takotna River had additional habitats that the Nixon Fork lacked such as beaver ponds, large wet and dry meadows, larger river benches and sloughs, and sand bars. Eleven SOS collections were made along various locations of the Takotna River (Figure 2). Non-native species (*Plantago major*, *Matricaria discoidea*, and *Trifolium repens*) were encountered on the Takotna River (Takotna 10) closest to the village of Takotna. The Beaver Mountain and Lincoln Mountains provided some subalpine species collections, but many target species were not yet ripe for collection in mesic to wet habitat or populations were too small for collection. Conversely, in the dry graminoid-forb alpine sites of these mountains, seed was already dispersed from target species. However, five subalpine grasses and forbs were collected and would be suitable for the Nixon Fork Mine.

The BLM and Army Corps of Engineers are in the process of reclamation of the Red Devil Mine. A crew of various federal agency officials and Native Corporations was sent to the mine in early September for a presentation on the future plans of the project. The BLM provided AKNHP with travel for the site visit. Due to time constraints only one SOS collection, *Calamagrostis canadensis* ssp. *langsдорffii* (AK930-642), was made but scouting was performed for future visits and detailed in Appendix C. Seven species with sufficiently large populations for future SOS collections were identified.

Wade Creek and Chicken Collections

BLM is in the process of restoring the banks of Wade Creek in the vicinity of Taylor Highway milepost 85 where past placer mining activity and rerouting of the road have caused substantial disturbance. The banks along this stretch of Wade Creek were sparsely vegetated and both sides of the road had disturbed wet depressions. A total of 19 SOS collections were made along the Taylor Highway near Chicken (Figure 3). Wetland species were focused on for the partially inundated creek banks and depressions. Seed from upland species were collected for the drier creek banks and disturbed slopes. Collection sites included subarctic lowland sedge meadows, subarctic lowland sedge-shrub wet meadows, seral herb, sagebrush-grass, and open low shrub birch–willow shrub. Numerous potential wet meadows and graminoid-rich upland habitat are present for future collection efforts; however there was a low diversity of work-horse taxa. Some less common species, however, are present in suitable populations for collection in this region such as *Carex bonanzensis*.

Other Collections

There were opportunities to collect in other areas after other AKNHP projects had ended. These collections were from the Matanuska Glacier area (Keith Road; Table 1), Gerstle and Tok rivers (Figure 3), and the Lupine River (Table 1). The Lupine River collection were made from the

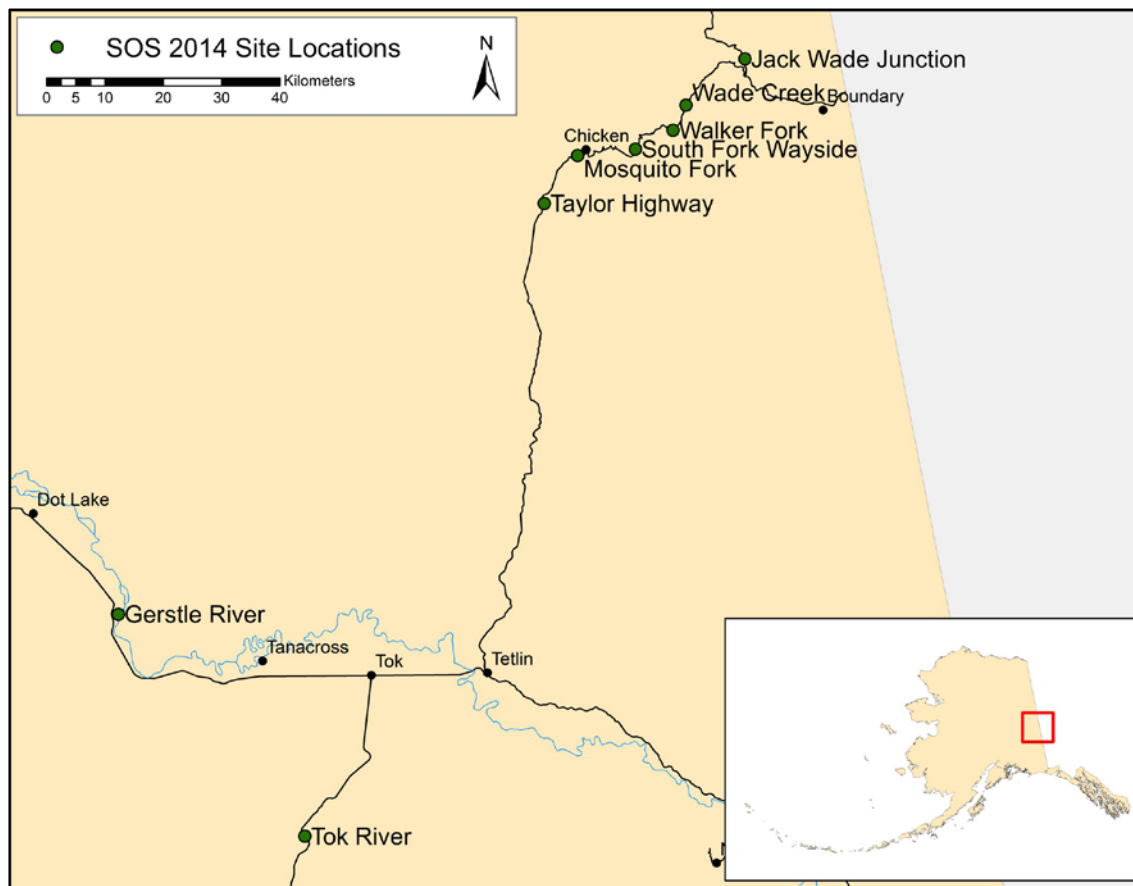


Figure 3. SOS collection sites in Wade Creek area.

Arctic Seed Zone and will greatly enhance the Galibraith Lake collections made in 2013 for any restoration needed in the area. The Chicago Botanic Garden interns made a scouting trip along the Richardson Highway and the Copper River Basin area which is summarized in Appendix D.

Conclusion

In total, SOS AK930 made 66 collections for the 2014 field season. A majority of the collections were made off the road system, reducing the chance of collecting reclaimed seed. Additionally, numerous collections were made within three mining locations, providing a diverse amount of seed for future reclamation. Seed collected within the McGrath region will also be suitable for the future Donlin pipeline corridor. Seed has been delivered to the Palmer Plant Materials Center and should be finished processing by early spring of 2015. Herbarium voucher specimens have been dispersed to appropriate herbaria and those held at UAAH are available online at www.pnwherberia.org. Several new populations have been identified for future seed collection efforts and AKNHP staff are working on plans for the 2015 field collecting season.

Table 1. SOS collection for 2014

SOS #	Scientific Name	Plant Family	Site Location	Seed Zone
AK930-572	<i>Bromus pumpellianus</i> ssp. <i>pumpellianus</i>	Poaceae	Keith's Road	Interior
AK930-573	<i>Oxytropis campestris</i>	Fabaceae	Keith's Road	Interior
AK930-574	<i>Hedysarum boreale</i> ssp. <i>mackenziei</i>	Fabaceae	Gerstle River	Interior
AK930-575	<i>Hedysarum alpinum</i>	Fabaceae	Gerstle River	Interior
AK930-576	<i>Elymus sajanensis</i>	Poaceae	Tok River	Interior
AK930-577	<i>Oxytropis campestris</i>	Fabaceae	Egypt Mtn	Interior
AK930-579	<i>Elymus macrourus</i>	Poaceae	Kuskokwin River Bar	Interior
AK930-580	<i>Calamagrostis canadensis</i> ssp. <i>langsdorfii</i>	Poaceae	Nixon 6	Interior
AK930-581	<i>Agrostis scabra</i>	Poaceae	Nixon 6	Interior
AK930-582	<i>Chamerion latifolium</i>	Onagraceae	Nixon 6	Interior
AK930-585	<i>Galium boreale</i>	Rubiaceae	Nixon 6	Interior
AK930-586	<i>Trisetum spicatum</i>	Poaceae	Mystery Mtn	Interior
AK930-587	<i>Calamagrostis canadensis</i>	Poaceae	Mystery Mtn	Interior
AK930-588	<i>Luzula confusa</i>	Juncaceae	Mystery Mtn	Interior
AK930-589	<i>Spirea stevenii</i>	Rosaceae	Mystery Mtn	Interior
AK930-590	<i>Chamerion latifolium</i>	Onagraceae	Nixon 7	Interior
AK930-592	<i>Agrostis scabra</i>	Poaceae	Nixon 7	Interior
AK930-593	<i>Hedysarum alpinum</i>	Fabaceae	Nixon 7	Interior
AK930-594	<i>Calamagrostis canadensis</i>	Poaceae	Nixon 7	Interior
AK930-595	<i>Arcagrostis latifolia</i> ssp. <i>arundinacea</i>	Poaceae	Nixon 7	Interior
AK930-596	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	Poaceae	Nixon 7	Interior
AK930-597	<i>Carex utriculata</i>	Cyperaceae	Nixon 9	Interior
AK930-598	<i>Carex aquatilis</i>	Cyperaceae	Nixon 9	Interior
AK930-599	<i>Sanguisorba canadensis</i>	Rosaceae	Nixon 9	Interior
AK930-600	<i>Geum macrophyllum</i> ssp. <i>pernicicum</i>	Rosaceae	Nixon 9	Interior
AK930-601	<i>Calamagrostis canadensis</i>	Poaceae	Nixon 9	Interior
AK930-603	<i>Poa glauca</i> ssp. <i>glauca</i>	Poaceae	Sunshine Mtn	Interior
AK930-604	<i>Festuca altaica</i>	Poaceae	Sunshine Mtn	Interior
AK930-605	<i>Calamagrostis canadensis</i>	Poaceae	Takotna 9	Interior
AK930-606	<i>Beckmannia syzigachne</i>	Poaceae	Takotna 9	Interior
AK930-607	<i>Chamerion latifolium</i>	Onagraceae	Takotna 9	Interior
AK930-608	<i>Achillea sibirica</i>	Asteraceae	Takotna 9	Interior
AK930-609	<i>Artemisia tilesii</i>	Asteraceae	Takotna 9	Interior
AK930-610	<i>Beckmannia syzigachne</i>	Poaceae	Takotna 10	Interior
AK930-611	<i>Achillea sibirica</i>	Asteraceae	Takotna 10	Interior
AK930-612	<i>Carex microchaeta</i> ssp. <i>nesophila</i>	Cyperaceae	Beaver Mtns	Interior
AK930-613	<i>Rhodiola integrifolia</i>	Crassulaceae	Beaver Mtns	Interior
AK930-614	<i>Festuca altaica</i>	Poaceae	Beaver Mtns	Interior

AK930-615	<i>Trisetum spicatum</i>	Poaceae	Lincoln Mtns	Interior
AK930-616	<i>Carex microchaeta</i> ssp. <i>nesophila</i>	Cyperaceae	Lincoln Mtns	Interior
AK930-617	<i>Polygonum alpinum</i>	Polygonaceae	Takotna 11	Interior
AK930-618	<i>Calamagrostis canadensis</i> ssp. <i>langsдорffii</i>	Poaceae	Takotna 11	Interior
AK930-619	<i>Carex aquatilis</i>	Cyperaceae	Takotna 11	Interior
AK930-620	<i>Glyceria grandis</i>	Poaceae	Takotna 11	Interior
AK930-621	<i>Beckmannia syzigachne</i>	Poaceae	Wade Creek	Interior
AK930-622	<i>Carex saxatilis</i>	Cyperaceae	Wade Creek	Interior
AK930-623	<i>Calamagrostis strica</i> ssp. <i>inexpansa</i>	Poaceae	Wade Creek	Interior
AK930-624	<i>Calamagrostis purpurascens</i>	Poaceae	Wade Creek	Interior
AK930-625	<i>Calamagrostis canadensis</i>	Poaceae	Wade Creek	Interior
AK930-626	<i>Festuca altaica</i>	Poaceae	Jack Wade	Interior
AK930-627	<i>Carex saxatilis</i>	Cyperaceae	Walker Fork	Interior
AK930-628	<i>Carex bonanzensis</i>	Cyperaceae	Walker Fork	Interior
AK930-629	<i>Juncus arcticus</i>	Juncaceae	Walker Fork	Interior
AK930-630	<i>Geum macrophyllum</i> ssp. <i>pernicicum</i>	Rosaceae	South Fork Wayside	Interior
AK930-631	<i>Carex crawfordii</i>	Cyperaceae	South Fork Wayside	Interior
AK930-632	<i>Beckmannia syzigachne</i>	Poaceae	South Fork Wayside	Interior
AK930-633	<i>Parnassia palustris</i>	Saxifragaceae	South Fork Wayside	Interior
AK930-634	<i>Arabis holboellii</i> var. <i>retrofracta</i>	Brassicaceae	Taylor Highway	Interior
AK930-635	<i>Chamerion angustifolium</i>	Onagraceae	Taylor Highway	Interior
AK930-636	<i>Festuca saximontana</i>	Poaceae	Taylor Highwa	Interior
AK930-637	<i>Chamerion latifolium</i>	Onagraceae	Taylor Highway	Interior
AK930-638	<i>Carex utriculata</i>	Cyperaceae	Mosquito Fork	Interior
AK930-639	<i>Calamagrostis strica</i> ssp. <i>inexpansa</i>	Poaceae	Mosquito Fork	Interior
AK930-640	<i>Leymus innovatus</i>	Poaceae	Lupine River	Arctic
AK930-641	<i>Eurybia sibirica</i>	Asteraceae	Lupine River	Arctic
AK930-642	<i>Calamagrostis canadensis</i> ssp. <i>langsдорffii</i>	Poaceae	Red Devil	Interior
NO SOS # (formerly AK930-578)	<i>Poa</i> spp.	SEED DESTROYED		
NO SOS # (formerly AK930-584)	<i>Poa pratensis</i> ssp. <i>pratensis</i>			
NO SOS # (formerly AK930-591)	<i>Poa pratensis</i> ssp. <i>alpigena</i>			
NO SOS # (formerly AK930-583)	<i>Elymus macrourus</i>	Poaceae	Keith's Road	
NO SOS # (formerly AK930-583)	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	Poaceae	Keith's Road	
NO SOS # (formerly AK930-602)	<i>Trisetum spicatum</i>	Poaceae	Whirlwind Mtn	

Appendix A. Photos

On USB Device

Appendix B. Scanned Data Sheets and Data Spreadsheet

On USB Device

Appendix C. Scouting Summary of Red Devil

Background on Red Devil Mine

Located 1.5 miles downstream from the village of Red Devil on the Kuskokwim River, Red Devil Mine operated as a cinnabar mining and mercury processing facility from 1933 until 1971. During its operation, the mine disposed of tailings and waste on-site, as was permitted by then-current 1872 mining laws. Under the Alaska Native Claims Settlement Act, the mine's surface and subsurface estates will be conveyed to the Kuskokwim and Callista Corporations, respectively, once the BLM has satisfactorily mitigated any environmental and human health hazards.

Reclamation began in 1987 with removal of remaining processing chemicals, and backfilling of open mine shafts. On-site landfills were constructed in 2002 to contain the ruins of demolished mining and processing facilities. In 2003, the BLM began cleaning up petroleum spilled from the mine's aboveground fuel storage tanks. In 2009, acting in coordination with the EPA and AK DEC, the BLM initiated a Remedial Investigation and Feasibility Study to determine the extent of soil and water contamination. The investigation concluded that tailings eroding into Red Devil Creek contain high concentrations of mercury, arsenic, and antimony and consequently leech into the Kuskokwim River.

Since then, the BLM, in conjunction with the Army Corps of Engineers, has rerouted Red Devil Creek away from the tailings to minimize stream contamination. Three plans for preventing the tailings from further migrating were proposed and the BLM chose the option to excavate Red Devil Creek sediments. After excavating approximately 5,000 cubic yards of tailings and sediment, the stockpiles would undergo erosion control measures such as seeding or implementing soil cover and revegetation.

In early September, one Chicago Botanic Garden Intern and one AKNHP technician visited the Red Devil for potential seed sources for the SOS program. Early-seral and riparian species were of primary interest, as two of the rehabilitation alternatives would involve seeding bare, rocky soils near the creek. *Calamagrostis canadensis* ssp. *langsдорffii* (AK930-642) was made from a moist meadow adjacent to Red Devil Creek,



Agrostis scabra along roadside.

but time constraints prevented additional SOS collections. Seven species with sufficient population size for future SOS collections were identified. Other target species present on site included *Achillea* sp. and *Juncus castaneus* but population sizes were inadequate for seed collecting and present along potentially-reseeded roadways. Vouchers of target species were collected and deposited at UAAH. According to Mike McCrum, BLM Environmental Engineer, reseeded efforts have taken place in several sites at the mine in the past,



Artemisia tilesii (along with grasses, willows, alders, and cottonwoods) at Red Devil Creek.



Calamagrostis canadensis ssp. *langsdorfii* observed at Red Devil Mine area.

Associated species/community assemblages include: *Alnus tenuifolia-Salix* spp. shrub layer and *Chamerion angustifolium-Equisetum arvense-Agrostis scabra* forb-graminoid layer.

Calamagrostis canadensis ssp. *langsdorfii*, *Carex lyngbyei*, and *Carex utriculata*: Found approximately 100 m northwest of the confluence of Red Devil Creek and the Kuskokwim River in loamy sand soil, with some gravel, and evidence of periodic flooding. Associated species included *Salix*

mostly around the bridges. The origin or species composition is unknown and we therefore recommend areas upstream of Red Devil Creek, specifically above the containment pond, for seed collection.

SOS Workhorse Species Found

Agrostis scabra: Present along roadsides; however, proximity of populations to road may make them unsuitable for collection due to potential reseeding of the site. On the site visit, approximately 50% of seed was not dispersed.

Artemisia tilesii: Found at confluence of Red Devil Creek and the Kuskokwim River, and further southeast along the bank of the Kuskokwim River. Approximately 1,000 individuals present in sandy gravel soils. Site was approximately 40% vegetated, with a northwest aspect and 10% slope. Associated species/community assemblages include *Alnus tenuifolia-Salix* spp. shrub layer and *Chamerion angustifolium-Equisetum arvense-Parnassia palustris-Agrostis scabra* forb-graminoid layer.

Galium boreale: Approximately 500 individuals were present 100 m southeast of the confluence of Red Devil Creek and the Kuskokwim River in sandy gravel soils. The site was approximately 40% vegetated, with NW aspect and 10% slope.



Habitat of *Carex utriculata* and *Carex lyngbyei* on the Kuskokwim River.

spp. shrubs and *Polemonium acutiflorum*-*Potentilla egedii*-*Equisetum fluviatile* forbs.

Spirea stevenii: Abundant along forest edges throughout region near the mine, often on *Betula neolalaskana*-dominated slopes. Loamy sand soils with some gravel. Associated species/communities include *Betula glandulosum*-*Ledum palustre*-*Vaccinum uliginosum*-*Empetrum nigrum* subshrub layer and abundant understory of *Pleurozium schreberi*.



Spirea stevenii and associated habitat at Red Devil Mine.



Red Devil Mine, with a single 2014 collection (AK930-642) and potential 2015 collection sites shown.

Locations, phenology, and estimated population sizes of potential SOS Red Devil Collections.

Latitude	Longitude	Species	Phenology	Approx. Pop. Size	Voucher Collector No.
61.75741	-157.31952	<i>Calamagrostis canadensis ssp. langsdorfii</i>	Seed	5000	BLB14-025
61.75932	-157.31438	<i>Agrostis scabra</i>	Past seed	10000	BLB14-026
61.76149	-157.31155	<i>Artemisia tilesii</i>	Seed	1000	BLB14-027
61.76120	-157.31076	<i>Galium boreale</i>	Seed	500	BLB14-028
61.7622	-157.31245	<i>Calamagrostis canadensis ssp. langsdorfii</i>	Seed	5000	BLB14-029
61.7622	-157.31245	<i>Carex lyngbyei</i>	Seed	1000	BLB14-030
61.7622	-157.31245	<i>Carex utriculata</i>	Seed	1000	BLB14-031
61.7587	-157.31358	<i>Spirea stevenii</i>	Seed	2500	BLB14-032

Appendix D. Scouting Summary of Richardson Highway

Six sites were visited along the Richardson Highway on 2-3 July 2014 by both Chicago Botanic Garden interns. Some site locations were previous SOS collection sites in 2010 and 2011. The goal was to determine population sizes and phenology of workhorse taxa in the area for Copper River Basin collections. Habitat included riparian gravel bars, wetland meadows, and roadsides. Seed was too early to make collections but observations were made for future collections.

Richardson 1: A large gravel bar on the west bank of Delta River next to Donnelly State Recreational Area (63.674444, -145.887778).

Richardson 2: Gravel bar on the northwest bank of Gunnysack Creek. Some SOS target species were only found on the southwest side of the creek such as *Castilla caudata*. This species was collected in a past SOS year but now the population seems to only be 100 individuals (63.525556, -145.856389).

Richardson 3: Ditch slope along the Richardson Highway past milepost 212 across from Phelan Creek to the east of the roadway (63.326944, -145.728333).

Richardson 4: Wet valley meadow west of the highway, about 3.2 km from the road. Collections were made about 0.8 km west of the road due to length of the walk (62.033889, -146.595).

Richardson 5: A roadside meadow adjoining the Forestry Headquarters entryway and field made by the powerline. There is an abundant population of *Castilleja caudata* (no GPS coordinates recorded).

Table of species encountered on Richardson Highway scouting trip on 2-3 July 2014.

Species Name	Site	Notes
<i>Carex aurea</i>	Richardson 1	Collector No.: CMC14-019
<i>Hedysarum boreale</i>	Richardson 1	Pop. size approx. 2000
<i>Hedysarum alpinum</i>	Richardson 1	
<i>Castilleja caudata</i>	Richardson 1	
<i>Oxytropis deflexa</i>	Richardson 1	Good potential collection
<i>Parnassia kotzebue</i>	Richardson 1	
<i>Artemisia borealis</i>	Richardson 2	Good potential collection
<i>Calamagrostis purpurascens</i>	Richardson 2	Collector No.: CMC14-005
<i>Castilleja caudata</i>	Richardson 2	Good potential collection
<i>Eurybia sibirica</i>	Richardson 2	
<i>Elymus alaskanus</i>	Richardson 2	Collector No.: CMC14-015
<i>Heracleum maximum</i>	Richardson 3	Collector No.: CMC14-014
<i>Artemesia tilesii</i>	Richardson 3	Collector No.: CMC14-003
<i>Carex aquatilis</i>	Richardson 4	Good potential collection
<i>Castilleja caudata</i>	Richardson 5	Good potential collection