Native Seed Collection Project
Boise National Forest

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Introduction:
Native species are essential to our environment and without them we lose the true identity of natural ecosystems. Today it is all too common to see the landscape filled with exotic species instead of native species. A significant number of native species have a difficult time reestablishing after disturbance, therefore allowing more invasive exotic species to flourish in areas of popular recreation, common roadsides, or previously burned areas.

This project was conducted by Idaho Department of Fish and Game (IDFG), Idaho Conservation Data Center (IDCDC) as part of a larger ongoing vegetation restoration program by the U S Forest Service (USFS), Boise National Forest (BNF), Lucky Peak Nursery, and Boise Forest Sciences Laboratory, Rocky Mountain Research Station. The objectives are to (1) identify seed collection sites, (2) document species habitat relations, (3) collect seed of native species targeted for propagation at Lucky Peak Nursery, and (4) collect 100 pounds of seed. Seed collected on this project is intended to be used on a road decommissioning project in the Rabbit Creek area of the BNF.

Seed was collected by IDFG employees and volunteers, and delivered to the Lucky Peak Nursery in bulk for drying, cleaning and storage.

Methods:
USFS staff in consultation with IDCDC compiled a targeted list of native species. These species are important to the ecosystem and may be out competed by exotics following disturbance. Targeted species include native grasses and sedges, shrubs, and forbs.

Seed was collected on BNF with an emphasis in the Rabbit Creek drainage approximately 9 miles northeast of Idaho City, Idaho, June through October 2003. Ample supplies of seed from targeted species were collected from a representative cross-section of each species' environmental distribution.

Potential native seed collection sites were identified by evaluating the habitat relations of targeted species (Table 1), and evaluating the distribution of appropriate habitats on BNF within the Rabbit Creek drainage area. It was our intent to offer a good representation of each species through distribution and elevation on the forest. Field reconnaissance was conducted to locate seed collection sites and monitor plant phenology. A minimum of 50 plants of a species was required to be present at a site. Sites were also selected on the basis of access and presence of multiple targeted species.

To document species habitat relations we recorded plant composition and environmental relations at selected sites on 0.1 acre fixed-area plots using standard plant community ecology methods (Bourgeron et al. 1991; USDA Forest Service 1992) and on stand level point observation plots. These techniques identified plant associations within their respective community for each potential native seed collection site. The location of sites were determined in the field using navigation grade geographical positioning system (GPS) units (e.g., Garmin 12XL) and by hand on 1:24,000 USGS quadrangles.

Collection and documentation protocols identified by Boise National Forest, Rocky Mountain Research Station, or Lucky Peak Nursery were employed. Voucher specimens were collected in both flower and fruit, and photographs of each targeted species and its associated habitat were taken at each collection site. Subsequent visits to each collection site were made to monitor the status of seed ripening and for seed collection. Species were identified using Hitchcock and Cronquist 1973.

Results:
Seeds from 34 species (3 each grasses and sedges, 9 shrubs, and 19 forbs) were collected (Table 1). A combined weight (unprocessed seed) of all grasses and sedges, shrubs, and forbs

totaled 376.33 pounds. The combined weight was then divided into the total weight of each life form; 24.02, 254.24, and 98.08 lbs respectively, and the individual weights of each species were documented.

A detailed list of species collected, individual seed weights, total seed weight per life form, combined total weight, and collection site are documented in Table 2. Seeds were collected from June 30, 2003 through October 06, 2003. Collection dates for individual species differ within life forms.

Figure 1 shows the location of the Rabbit Creek area on BNF. There were 24 seed collection sites recorded for the project. Five of those plots are located outside the boundaries of Rabbit Creek drainage study area (Granite Creek (1) and west of Rabbit Creek Summit (4)). The distribution shows that all species were collected from BNF in or near Rabbit Creek drainage. Table 3 provides a tabular summary of Figure 1.

Species collected from the Rabbit Creek project area ranged in elevation from 4,640 ft. to 6,010 ft. The collection site with the lowest elevation was on Rabbit Creek, and the collection site with the highest elevation was in the area North Fork of Rabbit Creek. Numerous targeted species of all life forms were collected from multiple collection sites, however the elevation of collection sites, in and out of the project area, does not differ greatly. Species that were collected from multiple collection sites are shown in Table 3. Four of 6 grasses and sedges, 5 of 9 shrubs, and 6 of 19 forbs were not collected at multiple sites.

Three sedges were collected for this project *Carex hoodii* (Hood's sedge), *C*. *cusickii* (Cusick's sedge, Figure 5), and *C. geyeri* (elk sedge). *C*. *cusickii* is mostly found in wet meadows and seeps, and *C. hoodii* and *C. geyeri* are more widespread from foothills to mountains and dry to moist areas. Seeds and vegetative clumps of *C. geyeri* were collected. The vegetative clumps will be used for growing plugs at Lucky Peak Nursery. *Agropyron spicatum* (bluebunch wheatgrass) was collected at 3 sites all close in elevation (5,240 ft., 4,960 ft., and 4,900 ft.). *Elymus glaucus* (blue wildrye) and *Bromus carinatus* (mountain brome) were each collected at one site only. *Elymus glaucus* was collected at a lower elevation (4,880 ft.) than the other grasses, and is located in a dispersed campsite area along Rabbit Creek (Table 5, Figure 2).

Purshia tridentata (bitterbrush) was collected at 3 sites differing slightly in elevation, 4, 960 ft. to 5,320 ft. (Table 5, Figure 2). One collection site is outside of the project area. *Cornus sericea* (red-osier dogwood) was collected at 2 sites, one on Granite Creek and the other on Rabbit Creek. Both sites are at < 5,000 ft. in elevation. *Prunus emarginata* (bittercherry) was also collected at 2 sites and *Lonicera involucrata* (black twin-berry), *Acer glabrum* (Rocky Mountain maple), and *Spiraea betulifolia* (white spiraea) were collected at one site each. The majority of the total shrub weight collected was from *Sorbus scopulina* (mountain ash), *Sambucus cerulea* (blue elderberry), and *Prunus virginiana* (chokecherry). Fifty-four and one half, 77, and 70 pounds were collected from each species respectively (Table 2).

The total weight collected of targeted forb species was 98.08 lbs. Most forbs were collected from within the study area. The few exceptions were *Balsamorhiza sagittata* (arrowleaf balsamroot, Figure 4), *Eriogonum umbellatum* (buckwheat), and *Lupinus polyphyllus* (lupine), which were collected west of Rabbit Creek Summit (Table 3 and 5, Figure 3). Collection site, Plot id 030612-1404, at 4,680 ft. was the lowest elevation from which multiple forb species were collected (*Penstemon fruticosus, P. deustus* (penstemon spp.), *Achillea millefolium* (yarrow), *Potentilla glandulosa* (sticky cinquefoil), and *Geranium viscosissimum* (geranium, Figure 7)). *Balsamorhiza sagittata* was the highest elevation forb, gathered at 6,320 ft. from west of Rabbit Creek Summit. Multiple species of forbs were collected from the following: 2 *Eriogonum* spp, 5 *Penstemon* spp and 2 *Lupinus* spp. These forbs are most plentiful throughout the study area. Each genus was collected from 4, 11, and 6 sites respectively. Three other forbs that are plentiful throughout the project area are *Potentilla glandulosa* (7 sites), *Achillea millefolium* (9 sites), and *Balsamorhiza*

sagittata (3 sites). *Geranium viscosissimum* was seen throughout the Forest, but not in abundance at any one location, however seed was collected from 5 sites ranging in elevation from 4,680 ft to 5,380 ft. (Table 5).

Seed collected from each species is documented to its associated habitat, elevation, slope, and aspect in Table 5. Seed was collected from15 associations ranging from forested to perennial forb habitats. The highest elevation ecological plot is a PIPO/AGSP association at 6,320 ft. and the lowest elevation ecological plot is a COSE association at 4,640 ft.

Discussion:

Several factors can contribute to the success or failure of seed collection. Weather elements can delay and/or speed up seed dispersal or cause seed to abort. Seed collection sites for our initial field reconnaissance proved to inhabit targeted species however some of them had very little or no seed production. Competition may exist for certain species from domestic stock, wildlife, and commercial pickers. These factors contributed to the need to check and re-check the status of native plant populations selected for seed collection.

In August, there were over 15 consecutive days where the temperature was greater than 100° F. This intense heat affected the phenology of many targeted species. Some were collected at the same time or prior to collection last year, although last years collections where at lower elevations. On August 22, 2003 an extreme rainstorm caused damage to several gravel roads within the study area. Seed collections from certain sites (North Fork of Rabbit Creek) were delayed until the road damage was repaired. The North Fork of Rabbit Creek Road was cleared upon request, and seed that had not already been collected from other collection sites, was collected.

Volunteers play a large role in seed collection. Since the Rabbit Creek project area could be visited on a day trip from Boise, our approach to use a group of volunteers located in the Boise area worked favorably. However, the mileage from Boise to the project area is a distance where day trips are not entirely practical, especially during field reconnaissance. Volunteers are most helpful in collecting seed from collection sites that inhabit numerous targeted species and/or collection sites with a targeted species in abundance. It is also important to select collection sites that have gentle slopes and that are near a road. Figures 2 and 3 show that most collection sites were located next to an established Forest Service road.

Limitations to consider when using volunteers are length of workday, weather, and environmental factors of collection sites. These factors where taken into account during the field reconnaissance phase. The extreme heat made seed collection more difficult this year, and the length of workday was shortened because of the high temperatures. Again, coordination between volunteers and plant phenology can be challenging but having alternative sites to collect from on any given day proved extremely valuable. This strategy was used after the severe rainstorm on August 22, 2003.

The start date for this project was appropriate. The average elevation for the study area is 5,200 ft., and targeted species such as *Balsamorhiza sagittata,* whose seed ripens early in the year, was collected in abundance (16.2 lbs). At some collection sites we found that the solitary flower heads of *B. sagittata* were completely gone and/or the majority of seed had already dispersed.

Each of the shrubs *Prunus emarginata, P. virginiana, Sorbus scopulina,* and *Sambucus cerulea* produced abundant fruit. The weight collected for each species was 17, 70, 41.5, and 77 pounds, respectively.

Amelanchier alnifolia (serviceberry) was also commonly found throughout BNF, but was not collected for two reasons: A large substantial stand was never located and shrubs that were

found showed little or no reproduction. These are the same difficulties that we encountered last season at lower elevations. *Fragaria vesca* (strawberry) was targeted and found in relative abundance at two collection sites, but little or no fruit was produced. Perhaps vegetative runners of *F. vesca* should be collected instead of seed.

Purshia tridentata was affected by the extreme heat and offered a very short collection time window. It was collected earlier than last season, from a higher elevation, and had already dropped a majority of its seeds.

It was often difficult to find stands of greater than 50 plants of a selected species in one area. In order to obtain seed from these select species, this parameter was set aside, and seed was collected from plots that had less than 50 plants (Table 4).

Agropyron spicatum is the abundant grass species in the study area. It is primarily found on south easterly to south westerly aspects in the understory of open canopies. *A. spicatum* did appear to have low seed set. This may have been a result of the extreme high temperatures that were encountered over several consecutive days and/or because *A. spicatum* does not flower every year. Furthermore *A. spicatum* typically reproduces by tillers (Zlatnik 1999). The collection time window was less strict than experienced at lower elevations last season.

Carex geyeri is a species that is not easily collected in the field for reasons such as, location, abundance of plants, low seed production, and/or seed dispersal. It tends to be a poor seed producer in the field and primarily reproduces by rhizome growth. Production of seed is usually extremely low and can lay dormant in the soil for long periods of time prior to germination. Equally, this sedge seems to have a higher germination rate after disturbance (Snyder 1992). Because of these limitations on *C. geyeri*, vegetation of the species was collected for Lucky Peak Nursery. Lucky Peak Nursery will then grow *C. geyeri* plugs in a controlled environment. Another species that poses the question of practicality is *Geranium viscosissimum*. Seed of this species is difficult to collect because of its rate of seed dispersal. Seed was observed in all stages, not ripe to dispersed, on individual plants. This situation proved to make seed collection extremely time consuming and less productive.

Bromus carinatus, *Elymus glaucus*, *Penstemon* spp., *Achillea millefolium*, *Lupinus sericeus, Agastache urticifolia* (horsemint) were found in (but not limited to) highly disturbed areas and road cuts. These areas were chosen as seed collection sites due to the ease of access and plant abundance. Some road cuts within the study area were steeper than desired which made some species difficult to collect. However, the opportunity to collect seed from multiple targeted species, in one area, increased efficiency of both field reconnaissance and collection efforts.

Several collection sites on the German Creek Loop were not collected from for two reasons; either the seed was not ripe when visited at an appropriate time to collect or F.S. Road 321 (German Creek Loop) was blocked by fallen trees. This did not pose a serious problem because adequate amounts of seed had already been collected from targeted species at other selected collection sites.

The information regarding associated habitat, elevation, slope, and aspect for each collected species should prove valuable for planting (Table 5). Knowing the type of habitat (i.e. shrubland/grassland or forested area), aspect, slope, and elevation in which a species thrives, is extremely helpful especially in the preliminary stages of reconnaissance. Having such data will provide a useful foundation to future seed collection projects.

Targeted species collected this field season within the Rabbit Creek study area that were not collected last year in the southern half of the BNF are the following: Grasses and sedges: *Carex cusickii, C. hoodii, C. geyeri, Elymus glaucus*; Shrubs: *Acer glabrum, Lonicera involucrata, Sorbus scopulina, Spiraea betulifolia, Sambucus cerulea*; Forbs: *Agastache urticifolia, Arnica*

cordifolia (heart leaf arnica, Figure 6)*, Aster integrifolius* (aster), *Crepis acuminata* (hawkweed)*, Frasera montana* (white frasera, Figure 9)*, Iliamna rivularis* (globe-mallow)*, Lupinus sericeus, Penstemon fruticosus, P. humilis* (Figure 8)*, P. attenuatus* var. *militaris,* and *Potentilla glandulosa.* A total of 20 new species were collected.

Native species have difficulty competing with exotics and often lose in post disturbance competition. A variety of species within each life form were collected in the Rabbit Creek study area. The objective weight of 100 pounds was exceeded by 276.33 pounds resulting in the total weight of 376.33 pounds. Species flexibility contributed greatly to species diversity and to the success of this project.

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Figures

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Figure 1. Study area, Boise National Forest, 2003.

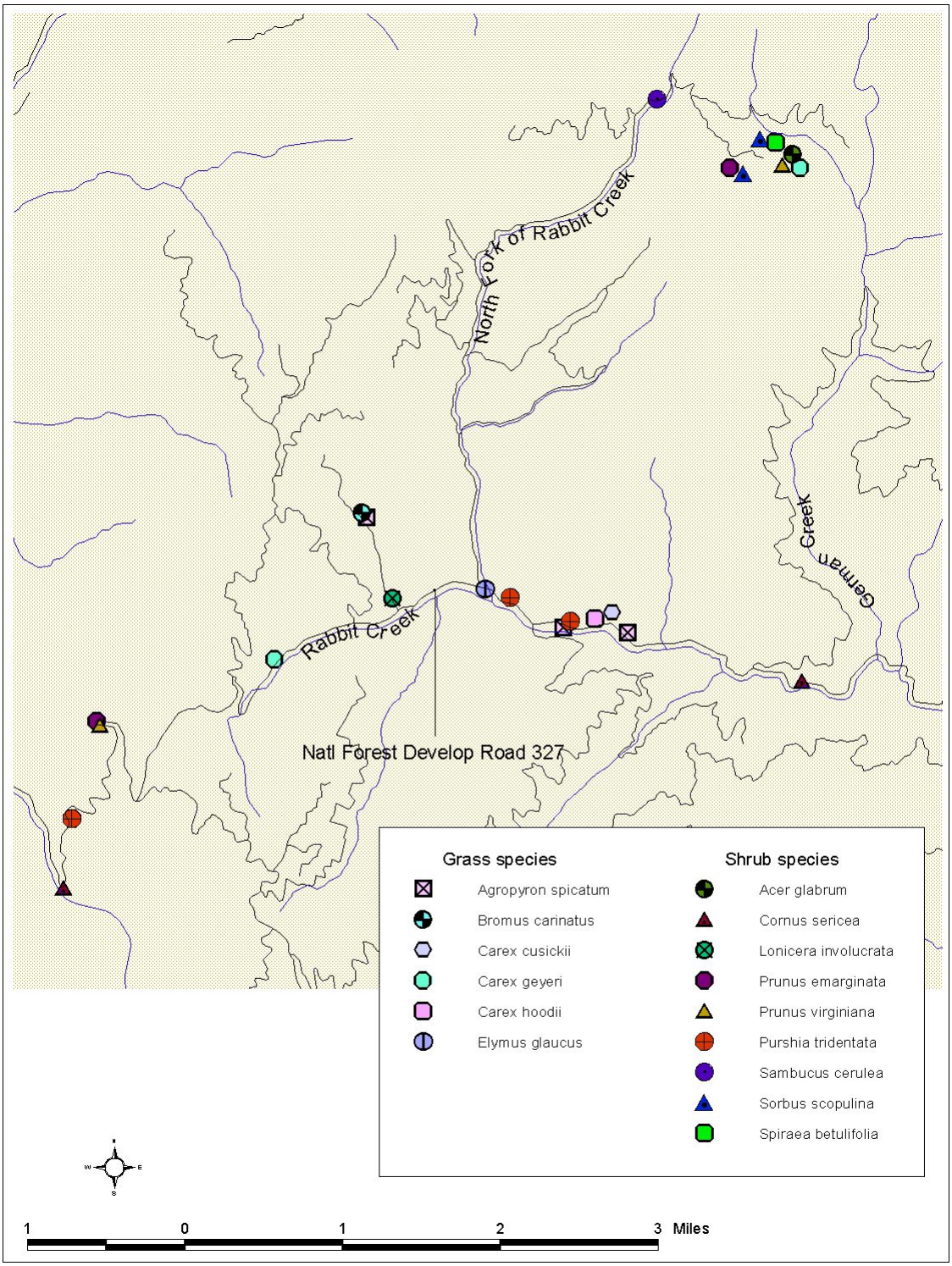

Figure 2. Study area, location of collection sites of shrub and grass species.

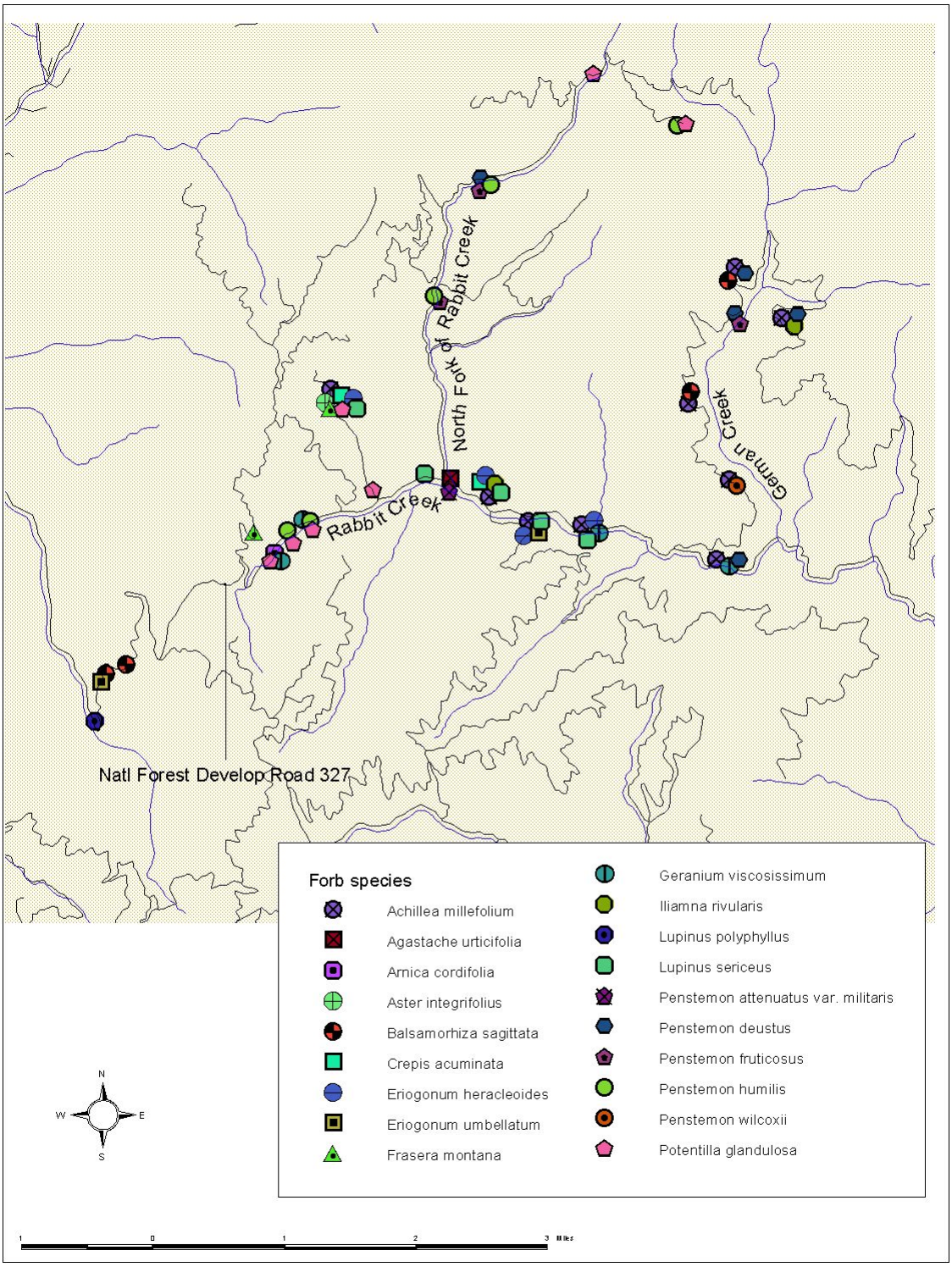

Figure 3. Study area, location of collection sites of forb species.

Figure 4. *Balsamorhiza sagittata* from collection site 030609-1325 on Rabbit Creek Summit. This species is found in abundance within the study area.

Figure 5. *Carex cusickii* from collection site 030612-1220 on Rabbit Creek. This species is in a seep on a south-facing slope.

Figure 6. A PIPO/CARU association with *Arnica cordifolia* included.

Figure 7. *Geranium viscosissimum* within the Rabbit Creek study area.

Figure 8. *Penstemon humilis* found along roadsides in the study area.

Figure 9. *Frasera montana.*

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Table1. Summary of targeted species and species collected.

TARGETED SPECIES	COLLECTED SPECIES
Graminoids-	**Graminoids-**
Agropyron spicatum (bluebunch wheatgrass)	*Agropyron spicatum*
Elymus glaucus (blue wildrye)	*Carex cusickii* (Cusick's sedge)
Festuca idahoensis (Idaho Fescue)	*Elymus glaucus* (blue wildrye)
Carex rossii (Ross' sedge)	*Carex hoodii* (Hood's sedge)
Carex geyeri (elk sedge)	*Carex geyeri*
Bromus carinatus (California / mountain brome)	*Bromus carinatus*
Calamagrostis rubescens (pinegrass)	
Shrubs-	**Shrubs-**
Purshia tridentata (bitterbrush)	*Purshia tridentata*
Artemisia tridentata (sagebrush-various varieties)	*Lonicera involucrata* (black twin-berry)
Cornus sericea (red-osier dogwood)	*Cornus sericea*
Rosa spp. (rose)	*Acer glabrum* (Rocky Mountain maple)
Alnus sinuata, A. rubra and/or *Betula occidentalis* (alder and birch)	*Sorbus scopulina* (mountain ash)
	Spiraea betulifolia (white spiraea)
Amelanchier alnifolia (serviceberry)	*Sambucus cerulea* (blue elderberry)
Prunus virginiana (chokecherry)	*Prunus virginiana*
Prunus emarginata (bittercherry)	*Prunus emarginata*
Forbs-	**Forbs-**
Balsamorhiza sagittata (arrowleaf balsamroot)	*Balsamorhiza sagittata*
Lupinus spp. (lupine)	*Agastache urticifolia* (horsemint)
Astragalus spp.	*Arnica cordifolia* (heart leaf arnica)
Lomatium spp.	*Aster integrifolius* (aster)
Geranium spp. (geranium)	*Geranium viscosissimum*
Eriogonum spp. (buckwheat)	*Eriogonum heracleoides, E. umbellatum*
Achillea millefolium (yarrow)	*Achillea millefolium*
Penstemon spp. (penstemon)	*Penstemon deustus, P. wilcoxii, P. humilis, P. fruticosus, P. attenuatus* var. *militaris*
Lupinus spp. (lupine)	*Lupinus sericeus*, *L. polyphyllus*
	Crepis acuminata (hawkweed)
	Iliamna rivularis (globe-mallow)
	Potentilla glandulosa (sticky cinquefoil)
	Frasera montana (white frasera)

Table 2. Detailed list of species collected, weights, total weight per life form, combined total weight, and collection date.

Date collected	Targeted Species	Plot id	Individual weights
	GRASSES AND SEDGES		
7/31/2003	*Agropyron spicatum*	030715-1549	0.35625
8/4/2003	*Agropyron spicatum*	030715-1549	0.4125
8/11/2003	*Agropyron spicatum*	030715-1638	0.575
8/2/2003	*Agropyron spicatum*[2]	030609-1524	0.51875
8/2/2003	*Bromus carinatus*[2]	030609-1524	0.0625
7/10/2003	*Carex cusickii*	030630-1514	0.4625
7/21/2003	*Carex cusickii*[1]	030630-1514	0.15625
6/30/2003	*Carex geyeri*	030610-1111	0.0625
10/6/2003	*Carex geyeri*	030610-1111	4.5
10/6/2003	*Carex geyeri*[2]	030611-1326	16
7/10/2003	*Carex hoodii*[2]	030826-1615	0.325
7/10/2003	*Carex hoodii*[2]	030826-1615	0.33125
8/9/2003	*Elymus glaucus*[2]	030715-1440	0.25625
			Total weight **24.02**
	SHRUBS		
9/8/2003	*Acer glabrum*[2]	030611-1326	2.6125
10/6/2003	*Acer glabrum*[2]	030611-1326	1
8/16/2003	*Cornus sericea*	030609-1130	6.5
8/26/2003	*Cornus sericea*[2]	030612-1340	9.7875
7/31/2003	*Lonicera involucrata*[2]	030731-1514	1.03125
9/8/2003	*Prunus emarginata*	030611-1407	10
8/16/2003	*Prunus emarginata*[2]	030609-1409	7
8/16/2003	*Prunus virginiana*	030609-1409	70
7/21/2003	*Purshia tridentata*	030612-1055	8.05
7/21/2003	*Purshia tridentata*	030609-1218	0.46875
7/21/2003	*Purshia tridentata*[2]	030715-1638	6.0375
10/6/2003	*Sambucus cerulea*	030727-1150	77
9/8/2003	*Sorbus scopulina*[2]	030611-1326	41.5
9/8/2003	*Sorbus scopulina*[2]	030611-1407	13
10/6/2003	*Spiraea betulifolia*[2]	030611-1326	0.25
			Total weight **254.237**
	FORBS		
8/2/2003	*Achillea millefolium*	030609-1524	0.3
8/4/2003	*Achillea millefolium*	030715-1549	0.46875
8/11/2003	*Achillea millefolium*	030715-1638	0.38125
8/18/2003	*Achillea millefolium*[1,2]	030616-1354	0.5875
8/11/2003	*Achillea millefolium*[2]	030612-1055	0.625
8/11/2003	*Achillea millefolium*[2]	030612-1404	1.1
8/18/2003	*Achillea millefolium*[2]	030616-1156	0.9
8/18/2003	*Achillea millefolium*[2]	030616-1514	1.2875
8/18/2003	*Achillea millefolium*[2]	030616-1009	0.35625
8/26/2003	*Achillea millefolium*[2]	030612-1404	0.76875
8/4/2003	*Agastache urticifolia*[2]	030715-1440	0.46875
8/26/2003	*Agastache urticifolia*[2]	030715-1440	1.29375
6/30/2003	*Arnica cordifolia*	030610-1111	0.05625
8/18/2003	*Aster integrifolius*[2]	030609-1524	1.66875

Date collected	Targeted Species	Plot id	Individual weights
	FORBS (continued)		
7/9/2003	*Balsamorhiza sagittata*	030609-1218	10.8125
7/9/2003	*Balsamorhiza sagittata*	030609-1325	5.23125
7/9/2003	*Balsamorhiza sagittata*	030616-1156	0.1625
7/21/2003	*Crepis acuminata*[2]	030609-1524	0.2125
8/2/2003	*Crepis acuminata*[2]	030609-1524	0.59375
8/11/2003	*Crepis acuminata*[2]	030612-1055	0.51875
7/31/2003	*Eriogonum heracleoides*	030715-1549	0.85625
8/2/2003	*Eriogonum heracleoides*	030609-1524	4.2875
8/4/2003	*Eriogonum heracleoides*	030715-1549	0.44375
8/11/2003	*Eriogonum heracleoides*	030715-1638	1.23125
8/11/2003	*Eriogonum heracleoides*[2]	030612-1055	1.4
8/11/2003	*Eriogonum umbellatum*	030715-1638	2.41875
8/18/2003	*Eriogonum umbellatum*	030609-1218	1.3875
7/31/2003	*Frasera montana*	030715-1130	0.56875
8/2/2003	*Frasera montana*	030609-1524	0.2375
7/31/2003	*Geranium viscosissimum*	030610-1215	0.05625
8/4/2003	*Geranium viscosissimum*	030715-1549	0.3
7/31/2003	*Geranium viscosissimum*[2]	030610-1305	0.05
7/31/2003	*Geranium viscosissimum*[2]	030610-1111	0.0375
8/11/2003	*Geranium viscosissimum*[2]	030612-1404	0.0375
8/11/2003	*Iliamna rivularis*[2]	030612-1055	0.85
8/18/2003	*Iliamna rivularis*[2]	030616-1514	0.56875
8/9/2003	*Lupinus polyphyllus*[2]	020811-1415	3.8
8/4/2003	*Lupinus sericeus*	030715-1549	0.7125
8/9/2003	*Lupinus sericeus*	030611-1051	5.4
8/11/2003	*Lupinus sericeus*	030715-1638	0.3375
8/16/2003	*Lupinus sericeus*	030611-1051	4
8/2/2003	*Lupinus sericeus*[2]	030609-1524	0.35625
8/11/2003	*Lupinus sericeus*[2]	030612-1055	3.50625
8/4/2003	*Penstemon attenuatus var. militaris*	030715-1440	1.7125
8/16/2003	*Penstemon attenuatus var. militaris*	030715-1440	3
8/26/2003	*Penstemon attenuatus var. militaris*	030715-1440	5.38187
8/18/2003	*Penstemon deustus*[1]	030616-1321	2.61875
8/26/2003	*Penstemon deustus*[1]	030612-1404	3.3825
8/18/2003	*Penstemon deustus*[1,2]	030616-1514	1.20625
8/18/2003	*Penstemon deustus*[2]	030616-1354	0.8125
8/26/2003	*Penstemon deustus*[2]	030611-1519	1.3125
8/2/2003	*Penstemon fruticosus*	030611-1213	0.55625
8/2/2003	*Penstemon fruticosus*	030611-1519	1.60625
8/9/2003	*Penstemon fruticosus*	030611-1519	6.525
8/18/2003	*Penstemon fruticosus*[1]	030616-1321	0.5125
8/11/2003	*Penstemon fruticosus*[1,2]	030612-1404	0.91875
7/31/2003	*Penstemon humilis*	030610-1215	0.5
7/31/2003	*Penstemon humilis*	030610-1305	0.71875
8/2/2003	*Penstemon humilis*	030611-1213	0.3375
8/2/2003	*Penstemon humilis*	030611-1519	0.44375
8/9/2003	*Penstemon humilis*	030611-1519	0.41875
7/21/2003	*Penstemon humilis*[2]	030611-1407	0.225
8/18/2003	*Penstemon wilcoxii*[1,2]	030616-1009	1.18125
7/21/2003	*Potentilla glandulosa*	030610-1305	0.50625

Date collected	Targeted Species	Plot id	Individual weights	
	FORBS			
7/27/2003	*Potentilla glandulosa*	030727-1150	1.79375	
8/2/2003	*Potentilla glandulosa*	030609-1524	0.31875	
7/31/2003	*Potentilla glandulosa*[1]	030610-1305	0.1625	
7/15/2003	*Potentilla glandulosa*[2]	030610-1111	0.21875	
7/21/2003	*Potentilla glandulosa*[2]	030610-1215	0.46875	
7/21/2003	*Potentilla glandulosa*[2]	030611-1407	0.26875	
7/31/2003	*Potentilla glandulosa*[2]	030731-1514	0.33125	
			Total weight	**98.08**
			GRAND TOTAL	**376.33**

[1]No suitable voucher specimen collected.
[2]No suitable photograph taken.

Table 3. Detailed list of collection sites with species collected. The “Site Name” is the most distinguishable land feature near the seed collection site that is recognized on the Rabbit Creek Summit quadrangle map from which all sites are located.

Site Name	Plot Id	UTM X	UTM Y	Targeted Species
Rabbit Creek	030715-1549	0606777	4852318	*Achillea millefolium, Agropyron spicatum, Eriogonum heracleoides, Geranium viscosissimum, Lupinus sericeus*
	030715-1638	0606193	4852416	*Achillea millefolium, Agropyron spicatum, Eriogonum heracleoides, Lupinus sericeus, Purshia tridentata*
	030630-1514	0606598	4852463	*Carex cusickii*
	030610-1111	0603219	4851912	*Arnica cordifolia, Carex geyeri, Geranium viscosissimum, Potentilla glandulosa*
	030826-1615	0606442	4852453	*Carex hoodii*
	030715-1440	0605311	4852717	*Agastache urticifolia, Elymus glaucus, Penstemon attenuatus var. militaris*
	030612-1340	0608600	4851884	*Cornus sericea*
	030612-1055	0605598	4852634	*Achillea millefolium, Crepis acuminata, Eriogonum heracleoides, Iliamna rivularis, Lupinus sericeus, Purshia tridentata*
	030610-1215	0603365	4852056	*Geranium viscosissimum, Penstemon humilis, Potentilla glandulosa*
	030610-1305	0603551	4852194	*Geranium viscosissimum, Penstemon humilis, Potentilla glandulosa*
	030715-1130	0603127	4851942	*Frasera montana*
	030611-1051	0605018	4852802	*Lupinus sericeus*
	030612-1404	0608618	4851892	*Achillea millefolium, Geranium viscosissimum, Penstemon deustus, Penstemon fruticosus*
Rabbit Creek (FS Rd 327J)	030609-1524	0604100	4853390	*Achillea millefolium, Agropyron spicatum, Aster integrifolius, Bromus carinatus, Crepis acuminata, Eriogonum heracleoides, Frasera montana, Lupinus sericeus, Potentilla glandulosa*
	030731-1514	0604369	4852588	*Lonicera involucrata, Potentilla glandulosa*
N. F. Rabbit Creek	030611-1326	0607956	4857213	*Acer glabrum, Carex geyeri, Sorbus scopulina, Spiraea betulifolia*
	030611-1407	0607948	4857177	*Penstemon humilis, Potentilla glandulosa, Prunus emarginata, Sorbus scopulina*
	030727-1150	0606885	4857774	*Potentilla glandulosa*
	030611-1213	0605007	4854868	*Penstemon fruticosus, Penstemon humilis*
	030611-1519	0605570	4856445	*Penstemon deustus, Penstemon fruticosus, Penstemon humilis*
	030727-1150	0606885	4857774	*Sambucus cerulea*
Granite Creek	030609-1130	0601149	4849505	*Cornus sericea*
Rabbit Creek Summit	030609-1409	0601427	4851217	*Prunus emarginata, Prunus virginiana*
	030609-1218	0601208	4850218	*Balsamorhiza sagittata, Eriogonum umbellatum, Purshia tridentata*
	030609-1325	0601456	4850336	*Balsamorhiza sagittata*
	020811-1415	0601094	4849629	*Lupinus polyphyllus*
German Creek Loop	030616-1009	0608741	4852866	*Achillea millefolium, Penstemon wilcoxii*
	030616-1156	0608214	4853777	*Achillea millefolium, Balsamorhiza sagittata*
	030616-1514	0609331	4854812	*Achillea millefolium, Penstemon deustus, Iliamna rivularis*
	030616-1354	0608855	4855249	*Achillea millefolium, Penstemon deustus*
	030616-1321	0608744	4854902	*Penstemon deustus, Penstemon fruticosus*

Table 4. Documentation of seed collected from species with < 50 plants per seed collection site.

Target Species	Plot Id	Site Name	Elev. (ft)	Total lbs	Comments
SEDGES					
Carex geyeri	030610-1111	Rabbit Creek	5,380	4.5	vegetation for plugs
Carex geyeri	030611-1326	N. F. Rabbit Creek	6,010	16	vegetation for plugs
		Total sedge lbs		**20.5**	
SHRUBS					
Acer glabrum	030611-1326	NF Rabbit Creek	6,010	2.6	< 50 plants
Lonicera involucrata	030731-1514	Rabbit Creek (FS Rd 327J)	5,040	1.5	< 50 plants
Prunus emarginata	030609-1409	Rabbit Creek Summit	5,360	7	< 50 plants
Prunus emarginata	030611-1407	NF Rabbit Creek	6,000	10	< 50 plants
Sambucus cerulea	030727-1150	NF Rabbit Creek	5,800	77	< 50 plants
Sorbus scopulina	030611-1407	NF Rabbit Creek	6,000	13	< 50 plants
		Total shrub lbs		**111.1**	
FORBS					
Balsamorhiza sagittata	030616-1156	German Creek Loop	5,040	0.163	< 50 plants; 41 plants
Frasera montana	030609-1524	Rabbit Creek (FS Rd 327J)	5,240	0.237	< 50 plants
Geranium viscosissimum	030612-1404	Rabbit Creek	4,680	0.038	< 50 plants; 7 plants
Penstemon fruticosus	030616-1321	German Creek Loop	5,160	0.513	< 50 plants
		Total forb lbs		**0.951**	
		Combined Total Lbs		**132.551**	

Table 5. Documentation of species seed collected, plot id, elevation, slope, aspect, and associated habitat.

Targeted Species	Plot Id	Elevation ft.	Slope %	Aspect	Association
GRASSES AND SEDGES					
Agropyron spicatum	030715-1549	4,900	68	212	PIPO/AGSP
Agropyron spicatum	030609-1524	5,240	25	165	AGSP/ERHE
Agropyron spicatum	030715-1638	4,960	54	202	PIPO/AGSP
Bromus carinatus	030609-1524	5,240	25	165	AGSP/ERHE
Carex cusickii	030630-1514	4,890	40	178	*Carex cusickii*
Carex geyeri	030610-1111	5,380	29	115	PSME/CARU
Carex geyeri	030611-1326	6,010	45	28	PSME/ACGL
Carex hoodii	030826-1615	4,930	5	142	*Salix*/Mesic graminoid
Elymus glaucus	030715-1440	4,880	2	227	PIPO/STCO
SHRUBS					
Acer glabrum	030611-1326	6,010	45	28	PSME/ACGL
Cornus sericea	030609-1130	4,880	2	40	COSE
Cornus sericea	030612-1340	4,640	55	185	COSE
Lonicera involucrata	030731-1514	5,040	14	189	ALIN/Mesic Forb
Prunus emarginata	030609-1409	5,360	49	175	PIPO/SYOR
Prunus emarginata	030611-1407	6,000	60	130	PSME/AGSP
Prunus virginiana	030609-1409	5,360	49	175	PIPO/SYOR
Purshia tridentata	030612-1055	5,000	45	138	PIPO/PUTR
Purshia tridentata	030715-1638	4,960	54	202	PIPO/AGSP
Purshia tridentata	030609-1218	5,320	60	195	PIPO/AGSP
Sambucus cerulea	030727-1150	5,800	44	233	PSME/CAGE
Sorbus scopulina	030611-1326	6,010	45	28	PSME/ACGL
Sorbus scopulina	030611-1407	6,000	60	130	PSME/AGSP
Spiraea betulifolia	030611-1326	6,010	45	28	PSME/ACGL
FORBS					
Achillea millefolium	030609-1524	5,240	25	165	AGSP/ERHE
Achillea millefolium	030715-1549	4,900	68	212	PIPO/AGSP
Achillea millefolium	030612-1055	5,000	45	138	PIPO/PUTR
Achillea millefolium	030612-1404	4,680	70	195	PSME/CAGE
Achillea millefolium	030715-1638	4,960	54	202	PIPO/AGSP
Achillea millefolium	030616-1354	5,200	70	206	PSME/AGSP
Achillea millefolium	030616-1156	5,040	75	142	PIPO/AGSP
Achillea millefolium	030616-1514	5,450	65	210	PSME/AGSP
Achillea millefolium	030616-1009	5,060	55	90	PSME/SPBE, PIPO
Agastache urticifolia	030715-1440	4,880	2	227	PIPO/STCO
Arnica cordifolia	030610-1111	5,380	29	115	PSME/CARU
Aster integrifolius	030609-1524	5,240	25	165	AGSP/ERHE
Balsamorhiza sagittata	030609-1218	5,320	60	195	PIPO/AGSP
Balsamorhiza sagittata	030609-1325	6,320	72	204	PIPO/AGSP
Balsamorhiza sagittata	030616-1156	5,040	75	142	PIPO/AGSP
Crepis acuminata	030609-1524	5,240	25	165	AGSP/ERHE
Crepis acuminata	030612-1055	5,000	45	138	PIPO/PUTR
Eriogonum heracleoides	030715-1549	4,900	68	212	PIPO/AGSP
Eriogonum heracleoides	030609-1524	5,240	25	165	AGSP/ERHE
Eriogonum heracleoides	030612-1055	5,000	45	138	PIPO/PUTR
Eriogonum heracleoides	030715-1638	4,960	54	202	PIPO/AGSP
Eriogonum umbellatum	030715-1638	4,960	54	202	PIPO/AGSP

Targeted Species	Plot Id	Elevation ft.	Slope %	Aspect	Association
FORBS (continued)					
Eriogonum umbellatum	030609-1218	5,320	60	195	PIPO/AGSP
Frasera montana	030715-1130	5,480	40	54	PSME/PHMA/CARU
Frasera montana	030609-1524	5,240	25	165	AGSP/ERHE
Geranium viscosissimum	030610-1215	5,200	20	128	PSME/CAGE
Geranium viscosissimum	030610-1305	5,200	60	135	PSME/CAGE
Geranium viscosissimum	030610-1111	5,380	29	115	PSME/CARU
Geranium viscosissimum	030715-1549	4,900	68	212	PIPO/AGSP
Geranium viscosissimum	030612-1404	4,680	70	195	PSME/CAGE
Iliamna rivularis	030612-1055	5,000	45	138	PIPO/PUTR
Iliamna rivularis	030616-1514	5,450	65	210	PSME/AGSP
Lupinus polyphyllus	020811-1415	5,000	56	213	PSME/PUTR
Lupinus sericeus	030609-1524	5,240	25	165	AGSP/ERHE
Lupinus sericeus	030715-1549	4,900	68	212	PIPO/AGSP
Lupinus sericeus	030612-1055	5,000	45	138	PIPO/PUTR
Lupinus sericeus	030715-1638	4,960	54	202	PIPO/AGSP
Lupinus sericeus	030611-1051	5,000	40	165	LUSE
Penstemon attenuatus var. *militaris*	030715-1440	4,880	2	227	PIPO/STCO
Penstemon deustus	030616-1354	5,200	70	206	PSME/AGSP
Penstemon deustus	030616-1321	5,160	80	145	PSME/CAGE
Penstemon deustus	030616-1514	5,450	65	210	PSME/AGSP
Penstemon deustus	030612-1404	4,680	70	195	PSME/CAGE
Penstemon deustus	030611-1519	5,538	60	185	PSME/CAGE
Penstemon fruticosus	030611-1213	5,160	70	156	PSME/CAGE
Penstemon fruticosus	030611-1519	5,538	60	185	PSME/CAGE
Penstemon fruticosus	030612-1404	4,680	70	195	PSME/CAGE
Penstemon fruticosus	030616-1321	5,160	80	145	PSME/CAGE
Penstemon humilis	030611-1407	6,000	60	130	PSME/AGSP
Penstemon humilis	030610-1215	5,200	20	128	PSME/CAGE
Penstemon humilis	030610-1305	5,200	60	135	PSME/CAGE
Penstemon humilis	030611-1213	5,160	70	156	PSME/CAGE
Penstemon humilis	030611-1519	5,538	60	185	PSME/CAGE
Penstemon wilcoxii	030616-1009	5,060	55	90	PSME/SPBE, PIPO
Potentilla glandulosa	030610-1111	5,380	29	115	PSME/CARU
Potentilla glandulosa	030610-1215	5,200	20	128	PSME/CAGE
Potentilla glandulosa	030610-1305	5,200	60	135	PSME/CAGE
Potentilla glandulosa	030611-1407	6,000	60	130	PSME/AGSP
Potentilla glandulosa	030727-1150	5,800	44	233	PSME/CAGE
Potentilla glandulosa	030731-1514	5,040	14	189	ALIN/Mesic Forb
Potentilla glandulosa	030609-1524	5,240	25	165	AGSP/ERHE