

NATIVE SEED COLLECTION PROJECT
BOISE NATIONAL FOREST

Jennifer J. Miller
Steven K. Rust

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Conservation Data Center
Idaho Department of Fish and Game
600 South Walnut, P.O. Box 25
Boise, Idaho 83707

Steve Huffacker, Director

Cooperative Challenge Cost-Share Project
Idaho Department of Fish and Game
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 completed for Boise National Forest which is working in conjunction with the Lucky Peak Nursery and Boise Forest Sciences Laboratory, Rocky Mountain Research Station. The project objective is to identify seed collection sites, document species habitat relations, and to collect seed of 23 native species targeted for propagation at Lucky Peak Nursery. The list of targeted species was compiled by U.S. Forest Service staff involved in the project. Targeted species include native graminoids, shrubs and forbs. The seed was to be collected, properly identified, and delivered to Lucky Peak Nursery for processing.

This report provides documentation of seed collection protocols, a list of species collected, location of seed collection sites and species habitats. Native seed was collected from targeted species that are essential to the ecosystem, but are not well represented after fire due to the decreased regeneration from competing with exotic species. Sixteen of the 23-targeted species were collected. A combined weight of all graminoids, shrubs and forbs totaled 272.800 pounds. The combined weight was then divided into the total weight of each life form 3.475, 192.331, and 76.994 pounds respectively, and the individual weights of each species were documented. Also provided are voucher specimens and slides of each species and its associated habitat.

Methods:

Seed collecting for this project was conducted July through November of 2002. Ample supplies of seed from targeted species were collected from a representative cross-section of each species' environmental distribution. The area of consideration for this project was Boise National Forest and adjacent land, giving priority to predetermined areas designated for prescribed burning, either in the fall of 2002 or spring of 2003. Prescribed burn areas in the Idaho City vicinity were surveyed and collected from intensely.

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 Boise National Forest or adjacent land. It was our intent to offer a good representation of each species through distribution and elevation on and off the forest. Field reconnaissance was conducted to locate seed collection sites, on the ground, and to monitor plant phenology. A minimum of 50 plants of a species was required to be present for collection at a site. Sites were also selected on the basis of accessibility and the presence of multiple targeted species.

An objective of the project was to document species habitat relations. Species composition and environmental relations of selected seed sites were documented 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. We felt that it was important to document species habitat and identify associated vegetation. Each seed collection site was documented 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. To the extent possible, 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. Collected species were keyed for proper identification using Flora of the Pacific Northwest (Hitchcock and Cronquist 1973).

Seed was collected by Idaho Department of Fish and Game (IDFG) employees and volunteers. It was then delivered to the Lucky Peak Nursery in bulk for drying, cleaning and storage.

Results:

Twenty-three native species were targeted for this project, and classified as graminoid, shrub or forb life forms. Seed was collected from 16 of the 23-targeted species. Table 2 provides a summary of the native plant seed collected. Three of 7 targeted graminoids were collected including *Agropyron spicatum* (bluebunch wheatgrass), *Festuca idahoensis* (Idaho Fescue), and *Bromus carinatus* (California / mountain brome). Five of 8 targeted shrubs were collected including *Artemisia tridentata vaseyana* (mountain big sagebrush), *Purshia tridentata* (bitterbrush), *Cornus stolonifera* (red-osier dogwood), *Prunus virginiana* (chokecherry), and *Prunus emarginata* (bittercherry). All targeted forb species were collected including *Balsamorhiza sagittata* (arrowleaf balsamroot), *Lupinus* spp. (lupine), *Astragalus* spp. (milkvetch), *Lomatium* spp. (bisquitroot), *Geranium* spp. (geranium), *Eriogonum* spp. (buckwheat), *Achillea millefolium* (yarrow), and *Penstemon* spp. (penstemon). Multiple species of the genera *Penstemon*, *Lupinus*, *Eriogonum* were collected. Forbs were separated into two arbitrary elevation divisions: low-and mid-elevation. On Boise National Forest, sagebrush/shrubland and lower-forested sites were considered low-elevation. Montane to subalpine forested sites were considered to occur at mid-elevations. *Lupinus* spp. is the only forb seed that was listed under both divisions, however it was only collected at mid-elevation ranging from 5,445 to 7,620 ft. (Table 3). Table 3 documents species seed collected, individual seed weights (oz and/or lbs), total seed weight per life form, combined total weight, elevation and collection date.

Seeds were collected from June 28, 2002 through November 26, 2002. Collection dates for individual species differ within life forms. A targeted combined bulk weight of all seed to be collected was approximately 150 pounds. The total combined weight of seed collected is 272.800 pounds, and the total weight of each life form is: graminoids, 3.475; shrubs, 192.331; and forbs, 76.994 pounds.

Priority was given to areas designated for prescribed burning (especially in the Idaho City area). They were identified by the following site names: Gregory Johnson, Hoodoo II, and Lower Tollgate. The total combined weight of seed collected from prescribed burn areas was 63.556 lbs (Table 5). Three of 8 targeted shrubs and 7 of 9 targeted forbs were collected from these areas. Consequently, no graminoids were collected from any prescribed burn area. The majority of seed collected from areas designated for prescribed burn was from the Gregory Johnson area.

Figure 1 shows the distribution of plots located at seed collection sites on and off the forest. There were 34 seed collection sites recorded for the project. Five of those plots were found outside the boundaries of Boise National Forest (Stewart gulch (2), Highland Summit, Ola and Dry Creek). The distribution shows that all species were collected from Boise foothills area, Idaho City area or the area east of Mountain Home. Table 4 provides a tabular summary of Figure 1.

Festuca idahoensis and *Agropyron spicatum* were collected at both low- and high-elevation sites (Table 4, Figure 2). *Festuca idahoensis* was collected from Stewart Gulch at 3,360 ft. and from House Mountain at 7,420 ft., and *Agropyron spicatum* was collected from Windy Gap at 5,120 to 5,300 ft. and from House Mountain at 6,110 to 7,420 ft. *Bromus carinatus* was collected at 3 sites, 2 from Little Deer Point and 1 from House Mountain, all relatively close in elevation (6,125 ft., 6,560 ft., and 7,330 ft).

Purshia tridentata was collected at 5 sites differing slightly in elevation, 3,835 to 5,360 ft. (Table 4, Figure 1). Four sites are located in the Gregory Johnson area. Eighty-one pounds, of *Purshia tridentata* (Plot ID 020725-0849) seed, were collected in the area east of Mountain Home (Tables 3 and 4). Other shrubs collected in the Gregory Johnson area were *Cornus stolonifera* and *Prunus virginiana* (Table 5). *Prunus emarginata* was collected along Bogus Basin Road, inside the Forest boundary, at 2 sites close in proximity and elevation (4,800 ft. and 5,020 ft) (Table 4). *Artemisia tridentata vaseyana* was collected in late November (Table 3). A total of 58 pounds were collected from 2 sites relatively close in elevation (3, 845 ft. and 3,310 ft). Both sites, Highland Summit and Ola, are located off of the Forest (Table 4).

All targeted forb species were collected from the 3 areas of consideration (Boise Foothills, Idaho City area, and east of Mountain Home) (Table 4, Figure 3). *Balsamorhiza sagittata* was the lowest elevation forb, gathered at 3,360 ft. from Stewart Gulch and *Lupinus argenteus* was collected at the highest elevation, 7,620 ft. from House Mountain. *Lomatium dissectum* was collected at 3 sites with the bulk of the weight gathered from the Wilderness Ranch location. *Eriogonum* spp, *Penstemon* spp and *Lupinus* spp were collected from 7, 8, and 5 sites respectively. *Astragalus eremiticus* was the only *Astragalus* seed collected, and it was obtained from the Gregory Johnson area. *Geranium viscosissimum* was seen throughout the Forest, but not in abundance at any one location. Seed was collected, however, from 3 sites: two from the Sinker Creek area and the other from Lower Point. *Achillea millefolium* seed was collected from 2 prescribed burning areas, Gregory Johnson and Hoodoo II, and Sinker Creek. The elevation range was 3,950 ft., 4,600 ft. and 5,445 ft. respectively.

Seed collected from each species is documented to its associated habitat, elevation, slope, and aspect in Table 7. Seed was collected from 25 associations ranging from forested to grassland habitats. The highest elevation ecological plot is a FEID-CAGE/LUAR association at 7,420 ft. and the lowest elevation ecological plot is an ARTRV/FEID association at 3,360 ft.

Recommendations:

The initial goal for this project was to collect from the geographic range of the species of interest on Boise National Forest and adjacent land, including the northern half of the forest as well as the southern half. This goal was not achieved for several reasons involving time required for reconnaissance and the logistics of using volunteers. Planned field reconnaissance to locate sites and monitor phenology took time, and subsequent unplanned visits to further monitor plant phenology were necessary and also time consuming.

There are several reasons that can contribute to the success or failure of seed ripening. The 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. There may also be competition for the seed of 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.

The seed collection phase also took more time than originally anticipated. Volunteers should definitely be part of the equation, and used when collecting seed. However, the disadvantage of using a team of volunteers is trying to anticipate seed development and coordinating seed collection. We used a group of volunteers located in the Boise area. We tried to locate seed collection sites that could be visited on a day trip from Boise. This approach worked favorably when the potential collection sites required little travel time from Boise, and when we were traveling in the area of already chosen seed collection sites. Considering reconnaissance time associated with the project and the logistics of using volunteers to collect seed, widening the geographic scope of this project would prove to be very difficult.

It would be advantageous to start this project prior to the 2002 start dates (Table 3), in order to gather seed from species whose seed ripens early in the year and/or those species that can be collected at the lower rangeland elevations. *Balsamorhiza sagittata* should be collected before late June. It was evident, at the elevation where we had plotted sites to collect *B. sagittata*, that a significant amount of seed had already dispersed leaving the solitary flower heads $\frac{1}{4}$ to $\frac{1}{2}$ filled with seed.

Agropyron spicatum and *Festuca idahoensis* may have fallen into this same scenario. It appears that low seed set in these species resulted from interrupted weather patterns and rapid change of seasons experienced at the lower elevations. It was originally planned, while doing field reconnaissance, that both species would be collected at the Stewart Gulch site, Plot ID 020701-1145 (Table 4). However, upon closer examination of the

seed it was apparent that most, if not all, of the seed had aborted. A minimal amount, 0.70oz, of *Festuca idahoensis* seed was collected, but no *Agropyron spicatum* seed was taken from the site. This is contrary to Bradley (1986) who states *Festuca idahoensis* “seed collected from sagebrush-grassland habitat types maintained higher and faster germination rates over a wider temperature and moisture regime than seed collected in a forest type. Thus reflecting the greater range of temperatures and moistures that occur on the harsher sagebrush sites.” We determined that *Agropyron spicatum* and *Festuca idahoensis* yielded a greater quantity of viable seed at the higher elevation seed collection sites. Due to delayed phenology associated with higher elevations these populations may have avoided extreme swings in temperature and precipitation experienced at the lower elevations.

Desirable seed of particular graminoids, shrubs or forbs should be reviewed for practicality. Some seed is not easily collectable in the field for reasons such as, location, abundance of plants, low seed production, and/or seed dispersal. Targeted species that might have warranted considerations for practicality are: *Carex rossii* (Ross’ sedge), *C. geyeri* (elk sedge), *Calamagrostis rubescens* (pinegrass), and *Geranium viscosissimum*. *C. rossii* and *C. geyeri* tend to be poor seed producers in the field. Both reproduce by rhizome growth and seed reproduction. Production of seed is usually extremely low and can lay dormant in the soil for long periods of time prior to germination. Equally, these sedges seem to have a higher germination rate after disturbance (Cope 1992; Snyder 1992). *Calamagrostis rubescens* also follows these same characteristics by reproducing through rhizome extensions and rarely flowering (Matthews 2000). Negligible seed production was evident when assessing seed collection sites during field reconnaissance. Reproduction of these graminoids can be successful and produce a higher yield if cared for in a controlled irrigated environment. *Geranium viscosissimum* seed was 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 lengthy and less productive.

Seed from *Prunus emarginata* was collected along Bogus Basin Road and seed from *Prunus virginiana* was collected along a roadside in the Gregory Johnson area. Several large stands of each species were located throughout the forest. Most of the stands had little or no berry production making seed collection unproductive. It is possible that lack of seed production may have been due to early frost. Some plants had no seed and some evidenced frosted inflorescences. The timing in seed collection for both species is critical. Seed must be fully ripe before picking to ensure good germination. If seed is picked prematurely the seed may not developed into a sound condition (Grisez 1974).

Amelanchier alnifolia (serviceberry) was also commonly found throughout the Forest, but was not collected for two reasons: A large substantial stand was never located and shrubs that were found showed little or no reproduction. *A. alnifolia* could have also been subjected to early frost. *Rosa* (rose) spp, *Alnus sinuata* (alder), *A. rubra* and *Betula occidentalis* (birch), were located sporadically on and off of the Forest with no stands being of recommended size or seed production.

A factor for consideration is the difficulty of finding stands of 50 or more individuals of selected species in one area. In order to obtain seed from select species, this parameter was set aside, and seed was collected from plots that had less than 50 plants (Table 6).

Seed collection sites were carefully considered and chosen for *Artemisia tridentata* varieties. *A. tridentata* varieties can be found in abundance at the lower rangeland elevations such as areas off of Highway 21, near the Boise Wildlife Management Area and lower, and the southern end of Bogus Basin Rd on land adjacent to the Boise National Forest. However, these areas were purposely avoided due to the following parameters: these locations are at elevations that could possibly be transition zones of one subspecies to another (i.e. *A. tridentata wyomingensis* to *A. tridentata vaseyana*), the concern of hybridization between multiple subspecies, and that a significant amount of this area has been burned in previous years. Collecting from areas that had already been seeded was also a concern. It gave rise to the question of whether or not the seed was native. Final considerations were the requirements of being able to properly identify the subspecies in such locations and to make sure that only one subspecies was being collected. With these factors in mind, the decision was made to avoid such areas and collect from sites that promised more certainty in identification. Another area that would possibly promise a good seed harvest of *A. tridentata* is in the Anderson Ranch vicinity east of Mountain Home.

Bromus carinatus, *Lomatium dissectum*, *Penstemon* spp, *Achillea millefolium* and *Lupinus argenteus* 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. The opportunity to collect seed from multiple targeted species, in one area, increased efficiency of both field reconnaissance and collection efforts.

The information regarding associated habitat, elevation, slope, and aspect for each collected species should prove valuable for planting (Table 7). Knowing the type of habitat (i.e. shrubland/grassland or forested area), aspect, slope, and elevation in which a species thrives in is extremely helpful especially in the preliminary stages of reconnaissance. Having such data will provide a useful foundation to future seed collection projects.

Two critical aspects of this project are species practicality and project flexibility. Species practicality and outside influences demand project flexibility. An example would be, the latitude to replace non-seed producing species with an abundant seed producing species. However, the consideration of species importance needs to be heavily considered and whether or not a desired species is feasible may not be an issue. If the objective is to collect seed from species that are not well represented then species practicality must not be discarded. On the other hand, if practicality and flexibility are contributing factors then they can be controlled and/or adjusted to overcome uncontrollable outside influences in order to make the overall project successful.

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Figure 1. Location of seed collection sites.

Figure 2. Location of shrub and grass species.

Figure 3. Location of forb species.

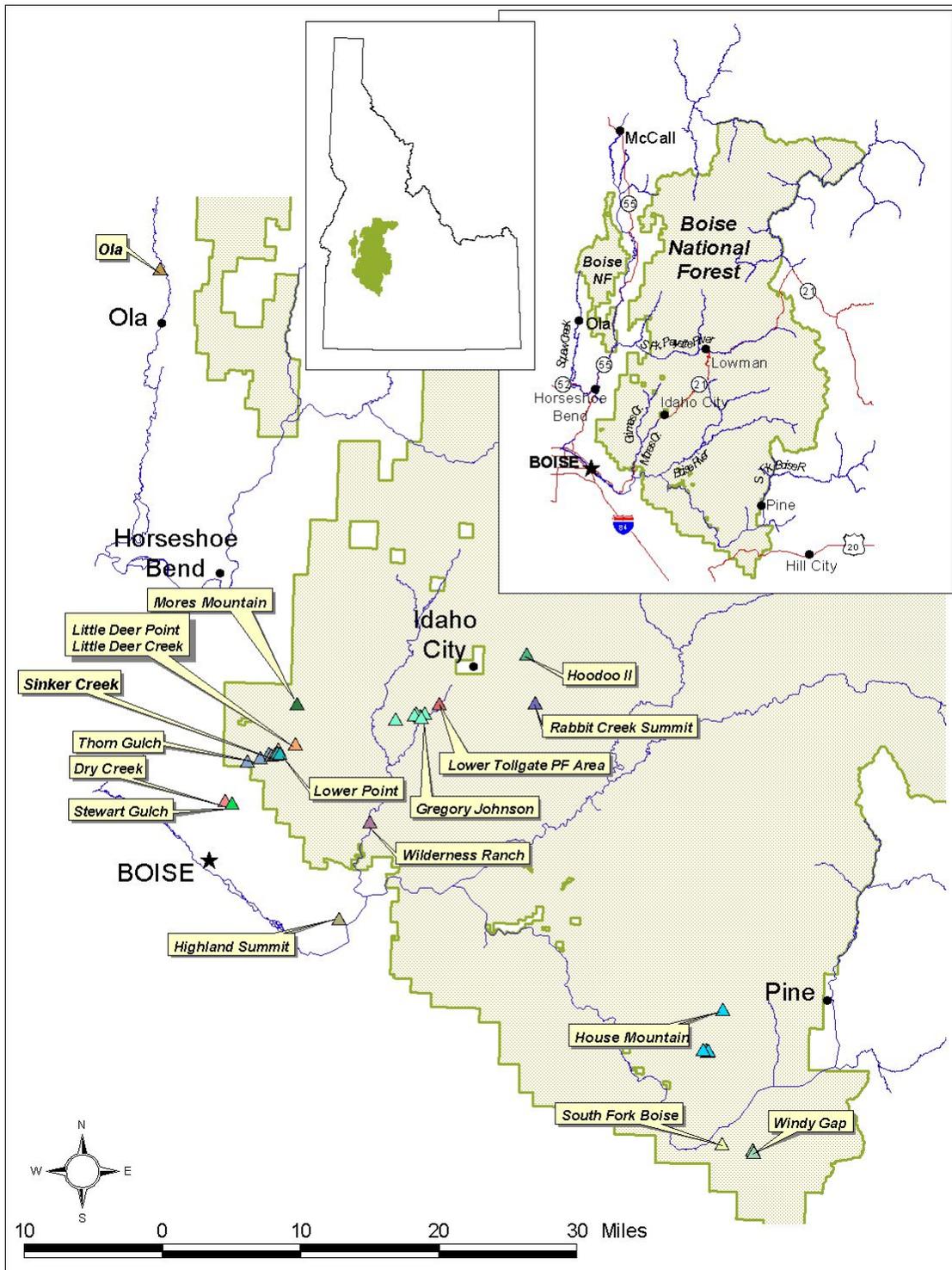


Figure 1. Location of seed collection sites.

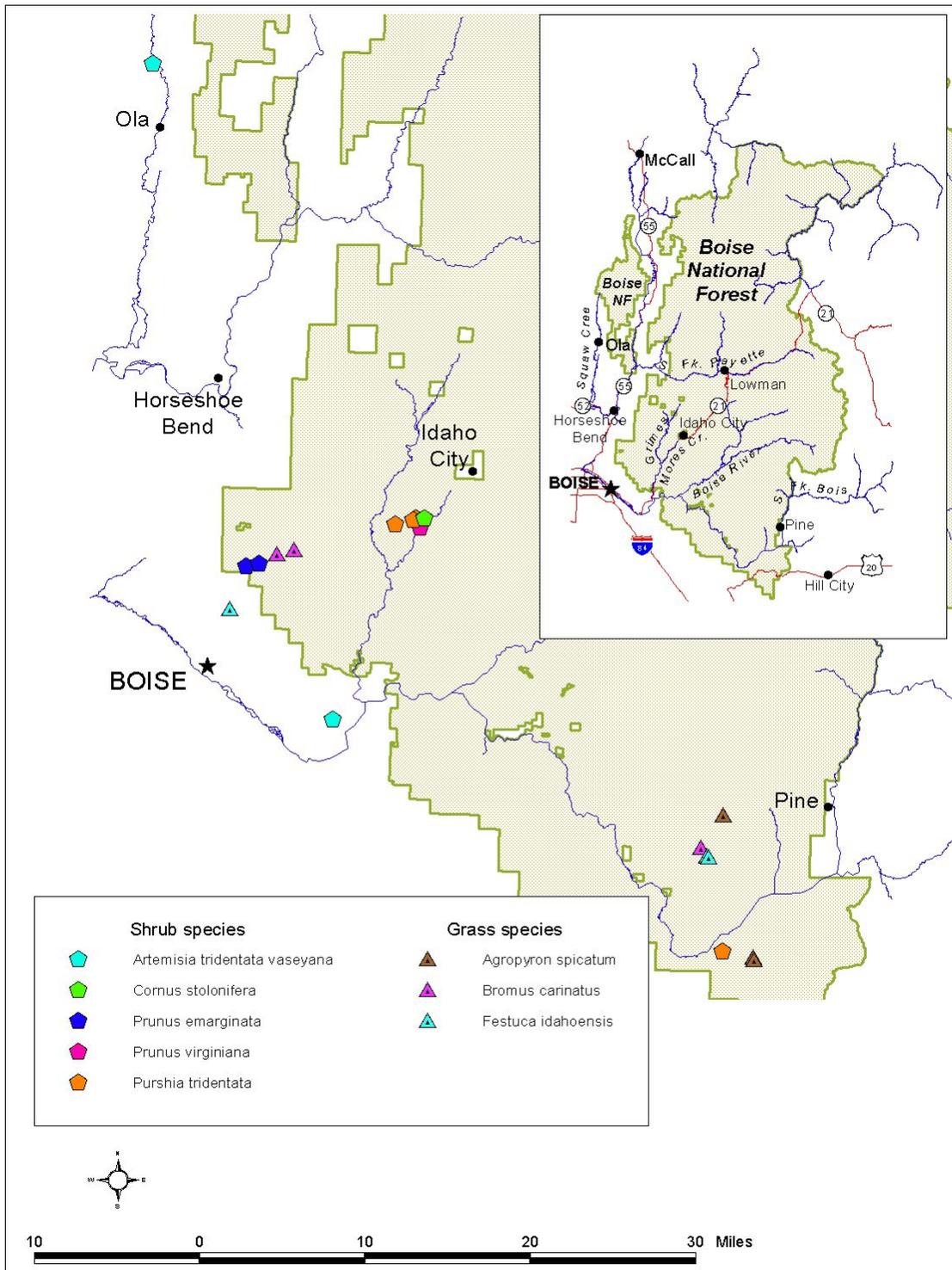


Figure 2. Location of shrub and grass species.

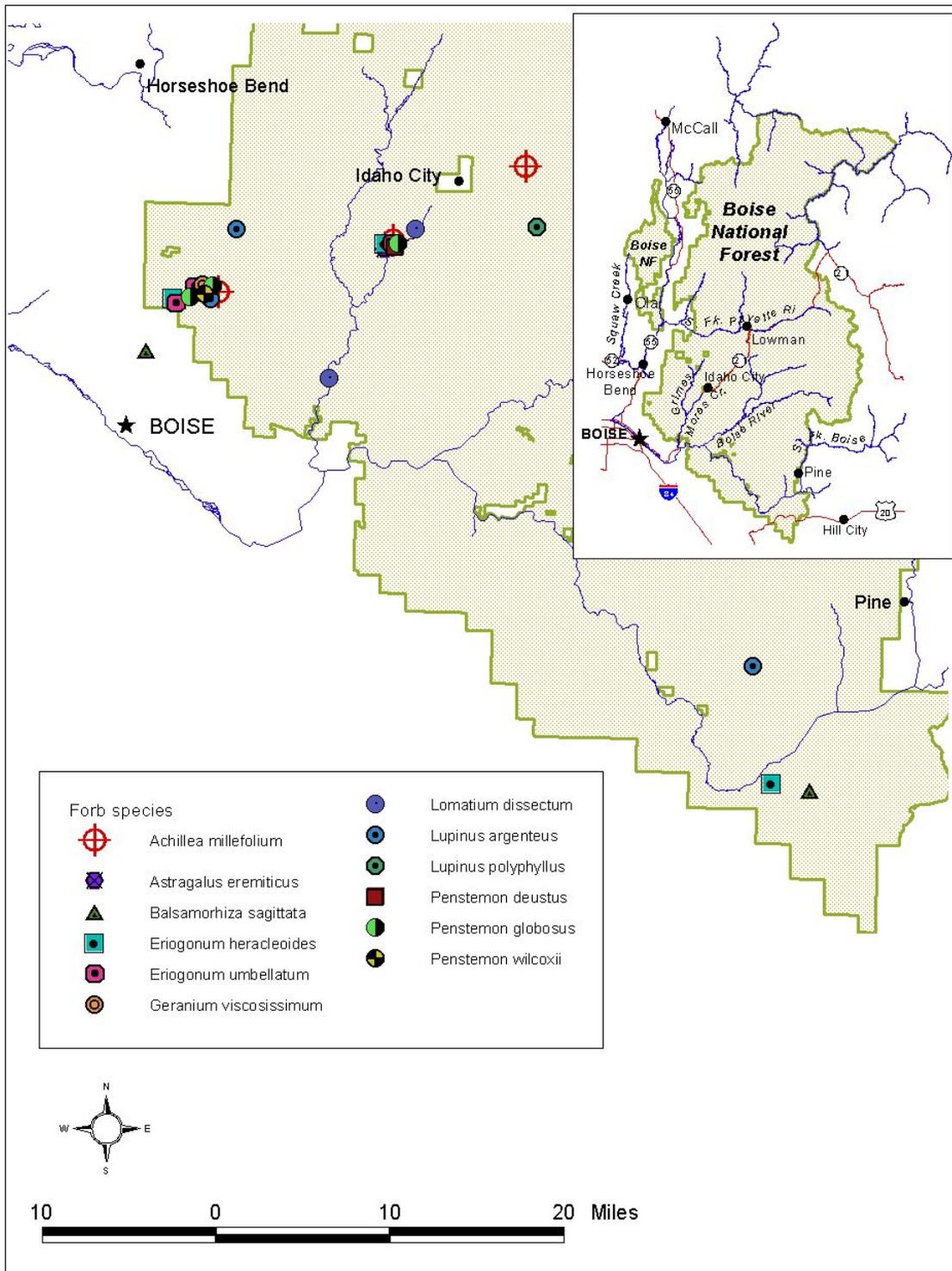


Figure 3. Location of forb species.

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Table 1. List of targeted species.

Table 2. List of targeted species and species collected.

Table 3. Documentation of species seed collected, individual seed weights, total weight per life form, combined total weight, elevation and collection dates. The “Plot ID” number identifies all species in Table 3 and 4.

Table 4. Documentation of species collected, elevation, location and quadrangle map. The “Plot ID” number identifies all species in Table 3 and 4. The “Site Name” is the most distinguishable land feature near the seed collection site that is recognized on each quadrangle map or the name of a designated prescribed burn area.

Table 5. Documentation of seed collected from areas designated for prescribed burning near Idaho City.

Table 6. Documentation of seed collected from species with less than the recommended 50 plants per seed collection site.

Table 7. Documentation of species seed collected, elevation, slope, aspect, and associated habitat.

Table 1. List of targeted species.

TARGETED SPECIES LIST

Graminoids-

Agropyron spicatum (bluebunch wheatgrass)
Elymus glaucus (blue wildrye)
Festuca idahoensis (Idaho fescue)
Carex rossii (Ross' sedge)
Carex geyeri (elk sedge)
Bromus carinatus (California / mountain brome)
Calamagrostis rubescens (pinegrass)

Shrubs-

Purshia tridentata (bitterbrush)
Artemisia tridentata (sagebrush - various varieties)
Cornus stolonifera (red-osier dogwood)
Rosa spp. (wild rose)
Alnus sinuata, *A. rubra* (alder) and/or *Betula occidentalis* (birch)
Amelanchier alnifolia (serviceberry)
Prunus virginiana (chokecherry)
Prunus emarginata (bittercherry/pin cherry)

Forbs-

Low-elevation Rangeland forbs:

Balsamorhiza sagittata (arrowleaf balsamroot)
Lupinus spp. (lupine)
Astragalus spp. (milkvetch)
Lomatium spp. (biscuitroot)

Mid-elevation forbs:

Geranium spp. (geranium)
Eriogonum spp. (buckwheat)
Achillea millefolium (yarrow)
Penstemon spp. (penstemon)
Lupinus spp. (lupine)

Table 2. List of targeted species and species collected.

TARGETED SPECIES

Graminoids-

Agropyron spicatum (bluebunch wheatgrass)
Elymus glaucus (blue wildrye)
Festuca idahoensis (Idaho Fescue)
Carex rossii (Ross' sedge)
Carex geyeri (elk sedge)
Bromus carinatus (California / mountain brome)
Calamagrostis rubescens (pinegrass)

Shrubs-

Purshia tridentata (bitterbrush)
Artemisia tridentata (sagebrush-various varieties)
Cornus stolonifera (red-osier dogwood)
Rosa spp. (rose)
Alnus sinuata, *A. rubra* and/or *Betula occidentalis*
(alder and birch)
Amelanchier alnifolia (serviceberry)
Prunus virginiana (chokecherry)
Prunus emarginata (bittercherry)

Forbs-

Low-elevation Rangeland forbs:

Balsamorhiza sagittata (arrowleaf balsamroot)
Lupinus spp. (lupine)
Astragalus spp.
Lomatium spp.

Mid-elevation forbs:

Geranium spp. (geranium)
Eriogonum spp. (buckwheat)
Achillea millefolium (yarrow)
Penstemon spp. (penstemon)
Lupinus spp. (lupine)

COLLECTED SPECIES

Graminoids-

Agropyron spicatum
Festuca idahoensis
Bromus carinatus

Shrubs-

Purshia tridentata
Artemisia tridentata vaseyana
Cornus stolonifera
Prunus virginiana
Prunus emarginata

Forbs-

Low-elevation Rangeland forbs:

Balsamorhiza sagittata
Astragalus eremiticus (milkvetch)
Lomatium dissectum (bisquitroot)

Mid-elevation forbs:

Geranium viscosissimum
Eriogonum heracleoides, *E. umbellatum*
Achillea millefolium
Penstemon deustus, *P. wilcoxii*, *P. globosus*
Lupinus argenteus, *L. polyphyllus*

Table 3. Documentation of species seed collected, individual seed weights, total weight per life form, combined total weight, elevation and collection dates. The “Plot ID” number identifies all species in Tables 3 and 4.

Date Collected	Target Species	Plot ID	Elevation (ft)	Wt lb	Wt oz	Total lbs
GRAMINOIDS						
07-01-2002	<i>Festuca idahoensis</i>	020701-1145	3,360		0.70	0.044
07-15-2002	<i>Agropyron spicatum</i>	020715-1247	5,120		2.60	0.163
07-15-2002	<i>Agropyron spicatum</i>	020715-1541	5,300		10.20	0.638
08-08-2002	<i>Bromus carinatus</i>	020806-1153	6,125		2.00	0.125
08-08-2002	<i>Bromus carinatus</i>	020806-1400	6,560		7.70	0.481
08-08-2002	<i>Bromus carinatus</i>	020808-1930	7,330		7.90	0.494
08-08-2002	<i>Festuca idahoensis</i>	020808-1720	7,440		4.90	0.306
08-08-2002	<i>Agropyron spicatum</i>	020808-2040	6,110		4.20	0.263
08-27-2002	<i>Festuca idahoensis</i>	020808-1435	7,420		6.70	0.419
08-27-2002	<i>Agropyron spicatum</i>	020808-1435	7,420		8.70	0.544
Total Graminoid Lbs						3.475
SHRUBS						
07-23-2002	<i>Purshia tridentata</i>	020723-1224	3,960	3.00	4.50	3.281
07-24-2002	<i>Purshia tridentata</i>	020719-1318	3,835	1.00	15.20	1.950
07-24-2002	<i>Purshia tridentata</i>	020724-1323	4,120	12.50		12.500
07-25-2002	<i>Purshia tridentata</i>	020725-0849	4,840	81.00		81.000
07-26-2002	<i>Purshia tridentata</i>	020726-1315	5,360	4.50		4.500
08-07-2002	<i>Prunus emarginata</i>	020722-1000	4,800	6.00		6.000
08-08-2002	<i>Prunus emarginata</i>	020807-1002	5,020	4.50		4.500
08-08-2002	<i>Prunus emarginata</i>	020807-1002	5,020	2.00		2.000
08-12-2002	<i>Cornus stolonifera</i>	020719-1318	3,835	5.00		5.000
08-12-2002	<i>Prunus virginiana</i>	020809-1705	3,680	13.00	9.60	13.600
11-25-2002	<i>Artemisia tridentata vaseyana</i>	021112-1427	3,845	5.5		5.500
11-26-2002	<i>Artemisia tridentata vaseyana</i>	021126-1022	3,310	52.5		52.500
Total Shrub Lbs						192.331
FORBS						
06-28-2002	<i>Balsamorhiza sagittata</i>	020628-1215	3,753		9.60	0.600
07-01-2002	<i>Balsamorhiza sagittata</i> *	020701-1145	3,360		14.60	0.913
07-03-2002	<i>Lomatium dissectum</i> *	020703-1620	3,950		0.80	0.050
07-13-2002	<i>Lomatium dissectum</i>	020713-0846	3,200	5.00		5.000
07-15-2002	<i>Balsamorhiza sagittata</i>	020715-1247	5,120		8.70	0.544
07-20-2002	<i>Astragalus eremiticus</i>	020703-1340	3,950	2.00		2.000
07-22-2002	<i>Geranium viscosissimum</i>	020722-1110	5,640		0.60	0.038
07-24-2002	<i>Eriogonum heracleoides</i> ^	020719-1318	3,835	2.00	2.80	2.175
07-25-2002	<i>Eriogonum heracleoides</i> ^	020725-0849	4,840	0.50		0.500
07-26-2002	<i>Eriogonum heracleoides</i>	020703-1340	3,950	2.50		2.500

08-07-2002	<i>Eriogonum heracleoides</i>	020722-1000	4,800	1.00	9.70	1.606
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Table 3. Continued.

Date Collected	Target Species	Plot ID	Elevation (ft)	Wt lb	Wt oz	Total lbs
08-07-2002	<i>Eriogonum umbellatum</i>	020722-1000	4,800	1.00	6.30	1.394
08-07-2002	<i>Eriogonum heracleoides</i>	020807-1002	5,020		15.90	0.994
08-07-2002	<i>Penstemon globosus</i> [^]	020807-1002	5,020		1.20	0.075
08-07-2002	<i>Penstemon wilcoxii</i>	020807-1332	5,480		10.40	0.650
08-07-2002	<i>Penstemon globosus</i>	020807-1332	5,480		5.30	0.331
08-07-2002	<i>Achillea millefolium</i>	020807-1332	5,480		10.30	0.644
08-07-2002	<i>Geranium viscosissimum</i> [^]	020807-1332	5,480		0.40	0.025
08-07-2002	<i>Achillea millefolium</i> [^]	020807-1428	5,445		11.30	0.706
08-07-2002	<i>Lupinus argenteus</i> [^]	020807-1428	5,445		13.40	0.838
08-07-2002	<i>Penstemon globosus</i> [^]	020807-1428	5,445		6.20	0.388
08-07-2002	<i>Lomatium dissectum</i>	020807-1428	5,445		1.30	0.081
08-08-2002	<i>Penstemon wilcoxii</i>	020808-1402	5,600		4.10	0.256
08-08-2002	<i>Achillea millefolium</i>	020808-1402	5,600	1.00	5.70	1.356
08-08-2002	<i>Penstemon globosus</i>	020808-1402	5,600		5.80	0.363
08-08-2002	<i>Lupinus argenteus</i>	020808-1204	5,520	3.00	2.40	3.150
08-08-2002	<i>Lupinus argenteus</i> [^]	020807-1428	5,445		12.00	0.750
08-08-2002	<i>Geranium viscosissimum</i> [^]	020807-1428	5,445		0.90	0.056
08-08-2002	<i>Penstemon globosus</i>	020807-1332	5,480	1.00	5.30	1.331
08-08-2002	<i>Achillea millefolium</i> [^]	020807-1428	5,445		8.60	0.538
08-08-2002	<i>Penstemon globosus</i>	020808-1538	5,840	2.00	3.90	2.244
08-08-2002	<i>Penstemon globosus</i>	020808-1520	5,690		9.40	0.588
08-08-2002	<i>Achillea millefolium</i>	020712-1510	4,600	3.00		3.000
08-09-2002	<i>Eriogonum heracleoides</i>	020703-1340	3,950	2.00		2.000
08-09-2002	<i>Eriogonum umbellatum</i>	020703-1340	3,950	3.50		3.500
08-09-2002	<i>Achillea millefolium</i>	020703-1340	3,950	0.50		0.500
08-11-2002	<i>Lupinus polyphyllus</i>	020811-1415	~6,000		8.90	0.556
08-12-2002	<i>Eriogonum umbellatum</i>	020809-1705	3,680	3.50		3.500
08-12-2002	<i>Eriogonum heracleoides</i> [^]	020809-1705	3,680	2.00		2.000
08-12-2002	<i>Penstemon globosus</i>	020809-1705	3,680	0.50		0.500
08-12-2002	<i>Penstemon deustus</i>	020809-1705	3,680	1.00		1.000
08-16-2002	<i>Penstemon globosus</i>	020806-1153	6,125		15.20	0.950
08-17-2002	<i>Eriogonum umbellatum</i>	020722-1110	5,640	11.00	6.00	11.375
08-17-2002	<i>Lupinus argenteus</i>	020722-1352	6,930	13.00	8.20	13.513
08-27-2002	<i>Lupinus argenteus</i>	020808-1650	7,620	1.00	14.70	1.919

Total Forbs Lbs. 76.994

Combined Total Lbs. 272.800

* No suitable voucher specimen collected.

[^] No suitable photograph obtained.

Table 4. Documentation of species collected, elevation, location and quadrangle map. The “Plot ID” number identifies all species in Tables 3 and 4. The “Site Name” is the most distinguishable land feature near the seed collection site that is recognized on each quadrangle map or the name of a designated prescribed burn area.

Target Species	Plot ID	Elevation (ft)	Site Name	Quad Map
GRAMINOIDS				
<i>Festuca idahoensis</i>	020701-1145	3,360	Stewart Gulch	Boise North
<i>Agropyron spicatum</i>	020715-1247	5,120	Windy Gap	Anderson Ranch Dam
<i>Agropyron spicatum</i>	020715-1541	5,300	Windy Gap	Anderson Ranch Dam
<i>Bromus carinatus</i>	020806-1153	6,125	Little Deer Point	Robie Creek
<i>Bromus carinatus</i>	020806-1400	6,560	Little Deer Point	Robie Creek
<i>Bromus carinatus</i>	020808-1930	7,330	House Mountain	House Mountain
<i>Festuca idahoensis</i>	020808-1720	7,440	House Mountain	House Mountain
<i>Agropyron spicatum</i>	020808-2040	6,110	House Mountain	House Mountain
<i>Festuca idahoensis</i>	020808-1435	7,420	House Mountain	House Mountain
<i>Agropyron spicatum</i>	020808-1435	7,420	House Mountain	House Mountain
SHRUBS				
<i>Purshia tridentata</i>	020723-1224	3,960	Gregory Johnson	Warm Springs Pt
<i>Purshia tridentata</i>	020719-1318	3,835	Gregory Johnson	Warm Springs Pt
<i>Purshia tridentata</i>	020724-1323	4,120	Gregory Johnson	Warm Springs Pt
<i>Purshia tridentata</i>	020725-0849	4,840	SouthFork Boise	Anderson Ranch Dam
<i>Purshia tridentata</i>	020726-1315	5,360	Gregory Johnson	Warm Springs Pt
<i>Prunus emarginata</i>	020722-1000	4,800	Thorn Gulch	Boise North
<i>Prunus emarginata</i>	020807-1002	5,020	Thorn Gulch	Boise North
<i>Prunus emarginata</i>	020807-1002	5,020	Thorn Gulch	Boise North
<i>Cornus stolonifera</i>	020719-1318	3,835	Gregory Johnson	Warm Springs Pt
<i>Prunus virginiana</i>	020809-1705	3,680	Gregory Johnson	Warm Springs Pt
<i>Artemisia tridentata vaseyana</i>	021112-1427	3,845	Highland Summit	Lucky Peak
<i>Artemisia tridentata vaseyana</i>	021126-1022	3,310	Ola	Ola
FORBS				
<i>Balsamorhiza sagittata</i>	020628-1215	3,753	Dry Creek	Boise North
<i>Balsamorhiza sagittata</i>	020701-1145	3,360	Stewart Gulch	Boise North
<i>Lomatium dissectum</i>	020703-1620	3,950	Lower Tollgate	Warm Springs Pt
<i>Lomatium dissectum</i>	020713-0846	3,200	Wilderness Ranch	Dunnigan Creek
<i>Balsamorhiza sagittata</i>	020715-1247	5,120	Windy Gap	Anderson Ranch Dam
<i>Astragalus eremiticus</i>	020703-1340	3,950	Gregory Johnson	Warm Springs Pt
<i>Geranium viscosissimum</i>	020722-1110	5,640	Lower Point	Robie Creek
<i>Eriogonum heracleoides</i>	020719-1318	3,835	Gregory Johnson	Warm Springs Pt
<i>Eriogonum heracleoides</i>	020725-0849	4,840	SouthFork Boise	Anderson Ranch Dam
<i>Eriogonum heracleoides</i>	020703-1340	3,950	Gregory Johnson	Warm Springs Pt
<i>Eriogonum heracleoides</i>	020703-1340	3,950	Gregory Johnson	Warm Springs Pt
<i>Eriogonum umbellatum</i>	020703-1340	3,950	Gregory Johnson	Warm Springs Pt
<i>Achillea millefolium</i>	020703-1340	3,950	Gregory Johnson	Warm Springs Pt

Table 4. Continued

Target Species	Plot ID	Elevation (ft)	Site Name	Quad Map
<i>Eriogonum heracleoides</i>	020722-1000	4,800	Thorn Gulch	Boise North
<i>Eriogonum umbellatum</i>	020722-1000	4,800	Thorn Gulch	Boise North
<i>Eriogonum heracleoides</i>	020807-1002	5,020	Thorn Gulch	Boise North
<i>Penstemon globosus</i>	020807-1002	5,020	Thorn Gulch	Boise North
<i>Penstemon wilcoxii</i>	020807-1332	5,480	Sinker Creek	Boise North
<i>Penstemon globosus</i>	020807-1332	5,480	Sinker Creek	Boise North
<i>Achillea millefolium</i>	020807-1332	5,480	Sinker Creek	Boise North
<i>Geranium viscosissimum</i>	020807-1332	5,480	Sinker Creek	Boise North
<i>Achillea millefolium</i>	020807-1428	5,445	Sinker Creek	Boise North
<i>Lupinus argenteus</i>	020807-1428	5,445	Sinker Creek	Boise North
<i>Penstemon globosus</i>	020807-1428	5,445	Sinker Creek	Boise North
<i>Lomatium dissectum</i>	020807-1428	5,445	Sinker Creek	Boise North
<i>Penstemon wilcoxii</i>	020808-1402	5,600	Little Deer Point	Robie Creek
<i>Achillea millefolium</i>	020808-1402	5,600	Little Deer Point	Robie Creek
<i>Penstemon globosus</i>	020808-1402	5,600	Little Deer Point	Robie Creek
<i>Lupinus argenteus</i>	020808-1204	5,520	Little Deer Point	Robie Creek
<i>Lupinus argenteus</i>	020807-1428	5,445	Sinker Creek	Boise North
<i>Geranium viscosissimum</i>	020807-1428	5,445	Sinker Creek	Boise North
<i>Penstemon globosus</i>	020807-1332	5,480	Sinker Creek	Boise North
<i>Achillea millefolium</i>	020807-1428	5,445	Sinker Creek	Boise North
<i>Penstemon globosus</i>	020808-1538	5,840	Lower Point	Robie Creek
<i>Penstemon globosus</i>	020808-1520	5,690	Lower Point	Robie Creek
<i>Achillea millefolium</i>	020712-1510	4,600	Hoodoo II	Idaho City
<i>Lupinus polyphyllus</i>	020811-1415	~6,000	Rabbit Summit	Rabbit Creek Summit
<i>Eriogonum umbellatum</i>	020809-1705	3,680	Gregory Johnson	Warm Springs Pt
<i>Eriogonum heracleoides</i>	020809-1705	3,680	Gregory Johnson	Warm Springs Pt
<i>Penstemon globosus</i>	020809-1705	3,680	Gregory Johnson	Warm Springs Pt
<i>Penstemon deustus</i>	020809-1705	3,680	Gregory Johnson	Warm Springs Pt
<i>Penstemon globosus</i>	020806-1153	6,125	Little Deer Point	Robie Creek
<i>Eriogonum umbellatum</i>	020722-1110	5,640	Lower Point	Robie Creek
<i>Lupinus argenteus</i>	020722-1352	6,930	Mores Mountain	Shafer Butte
<i>Lupinus argenteus</i>	020808-1650	7,620	House Mountain	House Mountain

Table 5. Documentation of seed collected from areas designated for prescribed burning near Idaho City.

Date Collected	Target Species	Plot ID	Site Name	Elevation (ft)	Wt lb	Wt oz	Total lbs
SHRUBS							
07-23-2002	<i>Purshia tridentata</i>	020723-1224	Gregory Johnson	3,960	3.00	4.50	3.281
07-24-2002	<i>Purshia tridentata</i>	020719-1318	Gregory Johnson	3,835	1.00	15.20	1.950
07-24-2002	<i>Purshia tridentata</i>	020724-1323	Gregory Johnson	4,120	12.50		12.500
07-26-2002	<i>Purshia tridentata</i>	020726-1315	Gregory Johnson	5,360	4.50		4.500
08-12-2002	<i>Cornus stolonifera</i>	020719-1318	Gregory Johnson	3,835	5.00		5.000
08-12-2002	<i>Prunus virginiana</i>	020809-1705	Gregory Johnson	3,680	13.00	9.60	13.600
Total Shrub Lbs							40.831
FORBS							
07-03-2002	<i>Lomatium dissectum</i>	020703-1620	Lower Tollgate	3,950		0.80	0.050
07-20-2002	<i>Astragalus eremiticus</i>	020703-1340	Gregory Johnson	3,950	2.00		2.000
07-24-2002	<i>Eriogonum heracleoides</i>	020719-1318	Gregory Johnson	3,835	2.00	2.80	2.175
07-26-2002	<i>Eriogonum heracleoides</i>	020703-1340	Gregory Johnson	3,950	2.50		2.500
08-08-2002	<i>Achillea millefolium</i>	020712-1510	Hoodoo II	4,600	3.00		3.000
08-09-2002	<i>Eriogonum heracleoides</i>	020703-1340	Gregory Johnson	3,950	2.00		2.000
08-09-2002	<i>Eriogonum umbellatum</i>	020703-1340	Gregory Johnson	3,950	3.50		3.500
08-09-2002	<i>Achillea millefolium</i>	020703-1340	Gregory Johnson	3,950	0.50		0.500
08-12-2002	<i>Eriogonum umbellatum</i>	020809-1705	Gregory Johnson	3,680	3.50		3.500
08-12-2002	<i>Eriogonum heracleoides</i>	020809-1705	Gregory Johnson	3,680	2.00		2.000
08-12-2002	<i>Penstemon globosus</i>	020809-1705	Gregory Johnson	3,680	0.50		0.500
08-12-2002	<i>Penstemon deustus</i>	020809-1705	Gregory Johnson	3,680	1.00		1.000
Total Forbs Lbs							22.725
Combined Total Lbs							63.556

Table 6. Documentation of seed collected from species with less than the recommended 50 plants per seed collection site.

Target Species	Plot ID	Site Name	Elevation (ft)	Total lbs	Comments
SHRUBS					
<i>Prunus emarginata</i>	020807-1002	Thorn Gulch	5,020	4.500	< 50 shrubs; Bogus Basin Rd
<i>Prunus emarginata</i>	020722-1000	Thorn Gulch	4,800	6.000	< 50 shrubs; Bogus Basin Rd
<i>Cornus stolonifera</i>	020719-1318	Gregory Johnson	3,835	5.000	< 50 shrubs Idaho City area
<i>Prunus virginiana</i>	020809-1705	Gregory Johnson	3,680	13.600	< 50 shrubs Idaho City area
Total Shrub Lbs				29.100	
FORBS					
<i>Lomatium dissectum</i>	020703-1620	Lower Tollgate	3,950	0.050	5 plants; Idaho City area
<i>Geranium viscosissimum</i>	020722-1110	Thorn Gulch	5,640	0.038	15 plants; Bogus Basin Rd
<i>Penstemon wilcoxii</i>	020807-1332	Sinker Creek	5,480	0.650	25 plants; Bogus Basin Rd
<i>Geranium viscosissimum</i>	020807-1332	Sinker Creek	5,480	0.025	4 Plants; Bogus Basin Rd
<i>Penstemon globosus</i>	020807-1428	Sinker Creek	5,445	0.388	23 Plants; Bogus Basin Rd
<i>Lomatium dissectum</i>	020807-1428	Sinker Creek	5,445	0.081	6 Plants; Bogus Basin Rd
<i>Penstemon wilcoxii</i>	020808-1402	Little Deer Point	5,600	0.256	36 Plants; Bogus Basin Rd
<i>Penstemon globosus</i>	020808-1402	Little Deer Point	5,300	0.363	15 Plants; Bogus Basin Rd
<i>Geranium viscosissimum</i>	020807-1428	Sinker Creek	5,445	0.056	14 Plants; Bogus Basin Rd
<i>Penstemon globosus</i>	020808-1538	Lower Point	5,840	2.244	49 Plants; Bogus Basin Rd
Total Forb Lbs				4.151	
Combined Total Lbs				33.251	

Table 7. Documentation of species seed collected, elevation, slope, aspect, and associated habitat.

Target Species	Plot ID	Elevation (ft)	Slope	Aspect	Association
Graminoids					
<i>Festuca idahoensis</i>	020701-1145	3,360	68	8	ARTRW/FEID
<i>Agropyron spicatum</i>	020715-1247	5,120	30	284	ARTRV-PUTR/AGSP
<i>Agropyron spicatum</i>	020715-1541	5,300	55	235	ARTRV-PUTR/AGSP
<i>Bromus carinatus</i>	020806-1153	6,125	59	105	PSME/PREM
<i>Bromus carinatus</i>	020806-1400	6,560	15	48	PSME/PREM
<i>Bromus carinatus</i>	020808-1930	7,330	40	324	ARTRV-SYOR/FEID
<i>Festuca idahoensis</i>	020808-1720	7,440	30	355	FEID/LUAR
<i>Agropyron spicatum</i>	020808-2040	6,110	50	260	ARTRV-SYOR/AGSP
<i>Festuca idahoensis</i>	020808-1435	7,420	44	29	FEID-CAGE/LUAR
<i>Agropyron spicatum</i>	020808-1435	7,420	44	29	FEID-CAGE/LUAR
Shrubs					
<i>Purshia tridentata</i>	020723-1224	3,960	47	110	PIPO/PUTR-AGSP
<i>Purshia tridentata</i>	020719-1318	3,835	60	85	PIPO/PUTR-AGSP
<i>Purshia tridentata</i>	020724-1323	4,120	43	40	PUTR/AGSP
<i>Purshia tridentata</i>	020725-0849	4,840	10	250	ARTRV-PUTR/POSE
<i>Purshia tridentata</i>	020726-1315	5,360	55	260	PUTR/AGSP
<i>Prunus emarginata</i>	020722-1000	4,800	38	268	PREM/POBU
<i>Prunus emarginata</i>	020807-1002	5,020	55	90	PIPO/PREM
<i>Prunus emarginata</i>	020807-1002	5,020	55	90	PIPO/PREM
<i>Cornus stolonifera</i>	020719-1318	3,835	60	85	PIPO/PUTR-AGSP
<i>Prunus virginiana</i>	020809-1705	3,680	65	128	PIPO/PUTR
<i>Artemisia tridentata vaseyana</i>	021112-1427	3,845	40	34	ARTRV/FEID
<i>Artemisia tridentata vaseyana</i>	021126-1022	3,310	45	357	ARTRV/POSE
Forbs					
<i>Balsamorhiza sagittata</i>	020628-1215	3,753	65	70	PUTR/FEID
<i>Balsamorhiza sagittata</i>	020701-1145	3,360	68	8	ARTRW/FEID
<i>Lomatium dissectum</i>	020703-1620	3,950	24	104	PIPO/SYOR
<i>Lomatium dissectum</i>	020713-0846	3,200	35	206	PIPO/PRVI
<i>Balsamorhiza sagittata</i>	020715-1247	5,120	30	284	ARTRV-PUTR/AGSP
<i>Astragalus eremiticus</i>	020703-1340	3,950	15	212	PIPO/PUTR
<i>Geranium viscosissimum</i>	020722-1110	5,640	45	220	PRVI/ERUM
<i>Eriogonum heracleoides</i>	020719-1318	3,835	60	85	PIPO/PUTR-AGSP
<i>Eriogonum heracleoides</i>	020725-0849	4,840	10	250	ARTRV-PUTR/POSE
<i>Eriogonum heracleoides</i>	020703-1340	3,950	15	212	PIPO/PUTR
<i>Eriogonum heracleoides</i>	020722-1000	4,800	38	268	PREM/POBU
<i>Eriogonum umbellatum</i>	020722-1000	4,800	38	268	PREM/POBU
<i>Eriogonum heracleoides</i>	020807-1002	5,020	55	90	PIPO/PREM
<i>Penstemon globosus</i>	020807-1002	5,020	55	90	PIPO/PREM
<i>Penstemon wilcoxii</i>	020807-1332	5,480	80	230	PIPO/PREM
<i>Penstemon globosus</i>	020807-1332	5,480	80	230	PIPO/PREM

Table 7. Continued.

Target Species	Plot ID	Elevation (ft)	Slope	Aspect	Association
<i>Achillea millefolium</i>	020807-1332	5,480	80	230	PIPO/PREM
<i>Geranium viscosissimum</i>	020807-1332	5,480	80	230	PIPO/PREM
<i>Achillea millefolium</i>	020807-1428	5,445	82	206	PIPO/PREM
<i>Lupinus argenteus</i>	020807-1428	5,445	82	206	PIPO/PREM
<i>Penstemon globosus</i>	020807-1428	5,445	82	206	PIPO/PREM
<i>Lomatium dissectum</i>	020807-1428	5,445	82	206	PIPO/PREM
<i>Penstemon wilcoxii</i>	020808-1402	5,600	120	150	PSME/PHMA
<i>Achillea millefolium</i>	020808-1402	5,600	120	150	PSME/PHMA
<i>Penstemon globosus</i>	020808-1402	5,600	120	150	PSME/PHMA
<i>Lupinus argenteus</i>	020808-1204	5,520	33	132	PSME/PRVI
<i>Lupinus argenteus</i>	020807-1428	5,445	82	206	PIPO/PREM
<i>Geranium viscosissimum</i>	020807-1428	5,445	82	206	PIPO/PREM
<i>Penstemon globosus</i>	020807-1332	5,480	80	230	PIPO/PREM
<i>Achillea millefolium</i>	020807-1428	5,445	82	206	PIPO/PREM
<i>Penstemon globosus</i>	020808-1538	5,840	90	100	PSME/PRVI
<i>Penstemon globosus</i>	020808-1520	5,690	90	243	PSME/PREM
<i>Achillea millefolium</i>	020712-1510	4,600	10	229	PIPO/SYOR
<i>Eriogonum heracleoides</i>	020703-1340	3,950	15	212	PIPO/PUTR
<i>Eriogonum umbellatum</i>	020703-1340	3,950	15	212	PIPO/PUTR
<i>Achillea millefolium</i>	020703-1340	3,950	15	212	PIPO/PUTR
<i>Lupinus polyphyllus</i>	020811-1415	~6,000	56	213	PSME/PUTR
<i>Eriogonum umbellatum</i>	020809-1705	3,680	65	128	PIPO/PUTR
<i>Eriogonum heracleoides</i>	020809-1705	3,680	65	128	PIPO/PUTR
<i>Penstemon globosus</i>	020809-1705	3,680	65	128	PIPO/PUTR
<i>Penstemon deustus</i>	020809-1705	3,680	65	128	PIPO/PUTR
<i>Penstemon globosus</i>	020806-1153	6,125	59	105	PSME/PREM
<i>Eriogonum umbellatum</i>	020722-1110	5,640	45	220	PRVI/ERUM
<i>Lupinus argenteus</i>	020722-1352	6,930	25	132	LUAR/PEGL
<i>Lupinus argenteus</i>	020808-1650	7,620	18	85	STOC/LUAR