

BOTANICAL SURVEY
CRATERS OF THE MOON
NORTH UNIT

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Introduction

The Craters of the Moon (CRMO) Management Plan recognized the lack of basic plant inventory information, especially for threatened, endangered and sensitive species. The monument is known to potentially contain habitat for several sensitive species (Table 1), but no survey work has been done.

It was also recognized that poor quality botanical work in the past (Whipple, 1992), combined with limited field surveys generally, resulted in a species list for CRMO replete with contradictions and unlikely species.

The survey work initiated in 1993 thus had two objectives: 1) locate and assess any rare plant populations; 2) supplement and correct the CRMO plant species list, collecting voucher specimens to ensure correct identification. In 1993 this work was begun in the North Unit of the monument, chosen because of the potential for rare species in this area and the habitat diversity.

Methodology

Survey work was implemented to encompass two phenological periods -- early and late summer (June 8-11, July 27-31). Because of the high precipitation and cool temperatures in 1993, the flowering and fruiting period of many species was extended, increasing the likelihood of correctly identifying species. The unusually wet and cool spring also promoted the expression of ephemeral desert annuals. Some of these species, such as *Gymnosteris nudicaulis*, a sensitive species, were observed in extremely high numbers near the monument (Popovich, pers comm). This expression was especially important to this survey because one of the target inventory species, the obscure phacelia (*Phacelia inconspicua*) is often unapparent at known sites after a dry hot spring.

The survey of the North Unit was not a complete inventory of the area. Lava flow areas were largely ignored, due to the low likelihood of finding rare species or species previously unknown from the monument. On the remainder of the area, the survey path, illustrated on Enclosure 1, focused on potential habitat for sensitive species and habitats (such as riparian areas) likely to result in additions or corrections to the species list.

All unknowns were collected and pressed using standard techniques. Some common species were also collected to fill voids in the CRMO herbarium. Nomenclature generally follows Hitchcock and Cronquist (1973), except for those species not included in that flora. For these species, the three available volumes of the **Intermountain Flora** (Cronquist, et al) were used. Common names follow Hitchcock and Cronquist (1973).

Sensitive Species

Table 1 summarizes the sensitive species potentially occurring within the CRMO. One species, the pine needlegrass (*Stipa pinetorum*), has been added to the list given in the CRMO management plan. Most of the species listed are unlikely to occur within the North Unit. Others, for which there is potential habitat in the North Unit, were surveyed for with no success:

Meadow pussytoes. This species is known in Idaho only from a privately owned meadow near the town of Carey. None of the wetland/riparian areas occurring in the North Unit contain the wet meadow habitat of the Carey site.

Picabo milkvetch. The distribution of this species is very limited, occurring only near the town of Picabo. There is some potential for this species at the south end of the monument, but no habitat was observed in the North unit.

Wing-seed evening primrose. This species is known from open calcareous slopes near Arco and Howe. I looked for it on open slopes in the North Unit with no success, but the substrate in that area is volcanic, not calcareous. Since this species is not always apparent, it should not be removed from the list of potential sensitive species within the monument, but it is unlikely that it occurs there.

Large flowered gymnostris. Although this species can be unapparent for many years, 1993 was a year of exceptional expression. If the species

occurs in the North Unit, it would have been found. Since the North Unit also lacks habitat for the species (Wyoming sagebrush and sandy soils), it is unlikely it occurs there. It is more likely that it occurs in the southern part of the monument.

King's bladderpod. I have surveyed extensively for this species in another study, and can recognize the distinctive habitat. I found no potential habitat in the North Unit. The flat, shallow soil, playa areas are distinguishable from a distance, and would have been observable from vantage points achieved while surveying higher elevation areas. It may occur in other areas of the CRMO.

Tree-like oxytheca. I found none of the sandy loess soils that is habitat for this species. It may occur in other parts of the CRMO.

Scapose silene. If this species does occur in the monument, it will be found in the North Unit. I searched for this species in both sagebrush and wooded areas, but found only common *Silenes*.

Webber's needlegrass, Pine needlegrass. A collection of a needlegrass made on the open ridge above Cottonwood Draw most easily keys to pine needlegrass (*Stipa pinetorum*), which is a sensitive species not previously known from the Monument. It may, however, be another needlegrass, or even Webber's needlegrass. I have surveyed for the latter near the INEL a few years ago, and found it on very different habitat than the collected needlegrass. The habitat for known locations -- shallow soils over lava, often associated with the edges of playas containing king's bladderpod -- does not occur in the North Unit. I'm inclined to think that the collection made is likely the pine needlegrass, and that webber's needlegrass, if it occurs within the monument, would be found out on the flows toward the east and south ends. The collection has been sent for verification, and certain identification will be available at a later date.

Sensitive Species - The obscure phacelia

One sensitive species, the obscure phacelia (*Phacelia inconspicua*) was suspected to occur within the monument. The 1993 survey confirmed the suspicion by locating several small population areas of the species. These are mapped on Enclosure 1.

This species is known from only three distribution centers: the type locality in Nevada, Big Southern Butte and some of the nearby smaller buttes and depressions, and the foothills of the Pioneers. It is this latter area that the North Unit is a part of. In Idaho, there is a large population on Big Southern Butte, a small population on Pratt Butte, a small population on an un-named depression near Big Southern Butte, and a small population just northeast of the park in the Pioneer foothills. The location of the species within the North Unit was thus not unexpected, but it is significant.

Population areas are generally on north to east facing slopes, in mountain sage/ bluebunch wheatgrass range sites. Associated species are mountain sage (*A. tridentata vaseyana*), bluebunch (*Agropyron spicatum*), chokecherry (*Prunus virginiana*), snowberry (*Symphoricarpos oreophilus*), bitterbrush (*Purshia tridentata*), yellow lupine (*Lupinus arbustus*). The obscure phacelia is found in open microsites with other annual species such as cut-leaf nightshade (*Solanum triflorum*) and *Cryptantha*.

Population sizes ranged from a single individual to approximately 200. Estimations of population size, however, are of limited usefulness. Since the object of the 1993 survey was to locate as many population areas as possible, each population was assessed rapidly. The population estimates are based on a quick search of the immediate area, once an individual or pocket of individuals was found. It is thus likely that the estimates are low.

Monitoring of the Obscure Phacelia

Estimates of populations sizes are also of limited usefulness because of the wide annual fluctuations in population size. The species thus poses the monitoring challenge of all rare annuals - how to monitor population trend of a species that varies annually in above ground expression due to weather. Populations of most annuals can vary from zero to densities of 100s of individuals per square meter. How monitor a species like that? How manage it?

Most of the population of annuals exists below the ground, in the form of a seedbank. Sampling this below-ground population is extremely difficult, although it can be done. What has not been done is relating seedbank sampling to resource monitoring-- the measurement of change in a population over time.

During the teaching of a national BLM course on rare plant monitoring, I and many students have wrestled with the question of annuals. The conclusion I have come to is that it is difficult if not impossible to actually monitor the species itself- we simply do not have the theoretical tools. What we can monitor effectively, however, is the habitat and the expression of individual populations in comparison with each other. It is these two approaches that I would recommend taking in the CRMO.

Habitat. Clearly, open microsites are critical to the above ground expression of the species. Since CRMO is not grazed, nor actively burned, there is a possibility that succession over time will result in closure of the canopy and the elimination of microsites. The percent of the ground left open in microsites can be measured by line-intercept transects. To measure a line intercept transect, a tape is stretched between two permanently monumented endpoints (like fenceposts) and the area of the tape that intercepts open areas is added up (eg, 0-3m cover is mountain sage; 3-4.3m cover is bare ground with annuals). Transects for which you only measure the bare ground+annuals area will be very quick. The technique can also be used, however, to measure everything- grasses, forbs and shrubs- so that the component that is increasing and encroaching on the open areas can be identified. Measuring a transect in that manner would take about three times as long as simply measuring the percent of bare ground/annuals intercepted. CRMO will need to decide how much time and effort such

transects deserve, which will control how detailed the measurements and how many the transects. CRMO may be able to utilize the information for other purposes as well as for monitoring obscure phacelia habitat. I would recommend maximizing the number of transects rather than the detail of each one, unless there is another use for the data. Several photographs at each transect can often identify the changing component as well as actually measuring it along a transect.

Comparison. Trends of particular population areas can be monitored by comparison with other known sites under the same weather conditions. If, for example, all of the populations within the monument express on a particular year, while the Foothills population is unapparent, there is cause for concern over the Foothills site. While it is unlikely that the CRMO would monitor the Foothills site, the dispersion of population areas and potential population areas within the monument lends itself to a comparative technique for these population areas.

There are three benefits to this approach. Implementing this monitoring over several years identifies the boundary of the population areas, since it is likely that during some year of monitoring there will be maximal expression. This monitoring can be used to identify the elimination of a population area, and perhaps lead to hypotheses to explain the loss. Finally, since this monitoring includes all of the population areas, if a burn occurs over some of the population areas there will be a pre-established monitoring within and outside of the burn area.

Population areas, as identified on Enclosure 1, and potential population areas should be surveyed at least once every three years (preferably every 2) and the population perimeters mapped on aerial photographs. At least 6 photographs, taken in such a way that they can be relocated (containing horizon or some other stable identifiable feature), should be taken of the habitat for each population area.

Management of Obscure Phacelia

The habitat available at CRMO differs from that observed at Big Southern Butte, Pratt Butte and the Foothills site (near the monument boundary). At all of these other sites, vegetation, especially graminoids, is less dense, and there are more of the open microsites available for colonization by annuals. The cause of this is likely livestock grazing, or perhaps fire (the Foothills site appears to have burned within the last 15 years). Yet the community in which the species occurs at CRMO appears successional stable, it is probable that the rate of patch opening due to small mammal disturbance and frost heaving will remain constant, thus providing a continual supply of habitat for the obscure phacelia. It is unlikely that any active management is necessary. If monitoring identifies a closure of canopy, however, some management action may be needed, and will need to be designed at that time.

CRMO Species List

Forty new species, not previously known from CRMO, were collected during the 1993 survey. Twenty three species which were included on the species list but given low confidence ratings (Whipple, 1992), were located and collected. These species are listed in Table 2.

Recommendations for Future Survey Work

Twenty nine of the taxa rated as unlikely for CRMO in Whipple's assessment occur on the Carey Kipuka. Many of these are species from SCS data sheets that were likely incorrectly identified. A complete and correct species listing for the Kipuka would clear up many of the uncertainties within the CRMO plant species list.

Rare species surveys should focus on the south end of the monument and the Picabo milkvetch.

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Table 1. Sensitive plant species with occurrence potential on the Craters of the Moon National Monument.

Scientific Name	Common Name
<i>Antennaria arcuata</i>	Meadow pusseytoes
<i>Astragalus oniciformis</i>	Picabo milkvetch
<i>Gymnosteris nudicaulis</i>	Large-flowered gymnosteris
<i>Lesquerella kingii</i> var. <i>cobrensis</i>	King's lesquerella
<i>Oenothera</i> sp. nov	Wing-seed evening primrose
<i>Oryzopsis webberi</i>	Webber's needlegrass
<i>Oxytheca dendroides</i>	Tree-like oxytheca
<i>Phacelia inconspicua</i>	Obscure phacelia
<i>Silene scaposa</i> var. <i>lobata</i>	Scapose silene
<i>Stipa pinetorum</i> *	Pine needlegrass

*May have been found during 1993 survey. Collection has been sent for verification.

Table 2. New and suspected species found on the North Unit during the 1993 survey.

Scientific Name	Common Name	Whipple Rating*
Anaphalis margaritacea	Pearly everlasting	3
Angelica pinnata	Pinnate leaved angelica	4
Antennaria dimorpha	Low pussytoes	NEW
Arabis lyalli	Lyall's rockcress	NEW
Arenaria aculeata	Needle leaf sandwort	4
Arenaria congesta	Ballhead sandwort	NEW
Arenaria kingii	King's sandwort	NEW
Aster modestus	Great northern aster	NEW
Aster perelegans	Elegant aster	NEW
Astragalus canadensis	Canada milkvetch	2
Astragalus lentiginosus	Freckled milkvetch	NEW
Astragalus miser	Weedy milkvetch	NEW
Astragalus purshii	Pursh's milkvetch	2
Astragalus terminalis	Railhead milkvetch	NEW
Astragalus whitneyi	Balloon milkvetch	2
Carex hoodii	Hood's sedge	2
Carex microptera*	Small-winged sedge	2
Carex petasata	Liddon's sedge	NEW
Carex vallicola	Valley sedge	NEW
Chenopodium chenopodioides	Red goosefoot	NEW
Collomia tenella	Diffuse collomia	4
Corallorhiza maculata	Spotted coralroot	4
Cordylanthus capitatus	Clustered birdbeak	NEW
Crepis atrabarba	Slender hawksbeard	NEW
Cryptantha interrupta	Bristly cryptantha	NEW
Descurainia recharsonii	Tansy mustard	2
Eleocharis palustris	Common spikerush	NEW
Elymus glaucus	Blue wildrye	NEW
Epilobium glandulosum*	Common willow herb	NEW
Epilobium paniculatum var. paniculatum	Autumn willow herb	NEW
Erigeron bloomeri	Scabland fleabane	NEW
Eriogonum cespitosum	Matted buckwheat	3
Eriogonum chrysops	Golden buckwheat	NEW
Eriogonum ovalifolium var. celsum	Oval-leaf buckwheat	NEW
Erysimum occidentale	Pale wallflower	NEW
Festuca idahoensis	Idaho fescue	3
Gilia leptomeria	Great basin gilia	4
Glyceria grandis	Reed manna grass	NEW
Glyceria striata	Fowl manna grass	NEW
Habenaria hyperborea	Green bog orchid	NEW
Happlopappus acaulis	Stemless goldenweed	2
Huechera grossulariifolia	Gooseberry leaf alumroot	NEW

Table 2. Continued

Scientific Name	Common Name	Whipple
<i>Juncus ensifolius</i>	Dagger-leaf rush	3
<i>Lactuca serriola</i>	Prickly lettuce	3
<i>Lesquerella occidentalis</i>	Western bladderpod	NEW
<i>Lomatium gormanii</i> *	Gorman's desert parsley	NEW
<i>Lupinus leucophyllus</i>	White-leaf lupine	2
<i>Montia perfoliata</i>	Miner's lettuce	NEW
<i>Muhlenbergia richardsonis</i>	Mat muhly	NEW
<i>Penstemon radicans</i>	Mat root penstemon	NEW
<i>Phacelia inconspicua</i>	Obscure phacelia	NEW
<i>Phlox hoodii</i>	Hood's phlox	3
<i>Poa nevadensis</i>	Nevada bluegrass	3
<i>Poa nervosa</i>	Wheeler's bluegrass	NEW
<i>Saxifraga occidentalis</i>	Western saxifrage	2
<i>Scirpus acutus</i>	Hardstem bullrush	NEW
<i>Sedum lanceolatum</i>	Lance-leaved stonecrop	2
<i>Senecio cymbalaroides</i> *	Few-leaved groundsel	NEW
<i>Solanum triflorum</i>	Cutleaf nightshade	NEW
<i>Typha latifolia</i>	Cattail	NEW
<i>Veronica anagallis-aquatica</i>	Water pimpernel	NEW
<i>Viola nuttallii</i> var. <i>vallicola</i>	Yellow violet	NEW
<i>Zigadenus venenosus</i>	Meadow deathcamas	4

(*Rating given by Jennifer Whipple in the CRMO plant database)