

**THE CONSERVATION STATUS OF
PHACELIA INCONSPICUA
(OBSCURE SCORPION PLANT)
IN IDAHO—AN UPDATE**

By

**Chris Murphy
Assistant Botanist
Conservation Data Center**

January 2002

**Idaho Department of Fish and Game
Natural Resources Bureau
600 S. Walnut, P.O. Box 25
Boise, Idaho 83707
Rod Sando, Director**



**Challenge Cost-Share Project
Upper Snake River District, Bureau of Land Management
Idaho Department of Fish and Game
(Task Order #DAF010051)**

ABSTRACT

Phacelia inconspicua (obscure scorpion plant) is a diminutive annual species with populations that fluctuate widely from year to year in response to climatic and habitat conditions. The species is only known from a limited portion of the Humboldt Mountains of Pershing County, Nevada, and a portion of western Butte and adjacent Blaine Counties in Idaho. There are four known occurrences in Nevada and six occurrences in Idaho. *Phacelia inconspicua* was observed at four Idaho occurrences during field surveys conducted in 2001. One new occurrence was discovered at Quaking Aspen Butte. Approximately 1,000 plants, covering about two acres, were observed in 2001. The largest number of plants was observed at the Big Southern Butte (001) occurrence. In Idaho, *Phacelia inconspicua* is found on the volcanic buttes and foothills of the Upper Snake River Plain and adjacent Pioneer Mountains. It often grows on concave, moderately steep and sheltered, northeast to east facing aspects where snowdrifts persist late into the spring. Microsites supporting *Phacelia inconspicua* are open and often have scarified or loose loamy soil lacking significant perennial vegetation and surface litter. The microsites typically occur as small gaps within vegetation dominated by deciduous mountain shrubs or mountain big sagebrush. It frequently grows on soil disturbed by animal activity. The species probably requires low-level soil disturbance and occasional fire (to remove overstory woody vegetation) to persist. No imminent, high magnitude threats to occupied habitat were observed, but monitoring low level or potential threats, including invasion by cheatgrass, trampling by livestock, and long-term vegetation changes, is recommended.

ACKNOWLEDGEMENTS

Many thanks to Karen Gray of the Idaho Conservation Data Center who assisted with field work, as well as John Apel and staff at Craters of the Moon National Monument for their assistance and use of camping facilities. Steve Popovich, of Wildhorse Consulting, provided valuable insights, data, and photos. The Upper Snake River District of the Bureau of Land Management provided Challenge Cost Share funding for this inventory through the assistance of Cleve Davis.

TABLE OF CONTENTS

ABSTRACT AND ACKNOWLEDGEMENTS.....	i
TABLE OF CONTENTS.....	ii
LISTS OF TABLES, FIGURES, AND APPENDICES.....	iii
INTRODUCTION.....	1
METHODS.....	1
RESULTS.....	3
TAXONOMY.....	4
LEGAL OR OTHER FORMAL STATUS.....	5
DESCRIPTION AND IDENTIFICATION.....	6
DISTRIBUTION.....	7
HABITAT.....	9
POPULATION BIOLOGY.....	12
LAND OWNERSHIP AND THREATS.....	15
ASSESSMENT AND RECOMMENDATIONS.....	17
REFERENCES.....	20

LIST OF TABLES

Table 1. Summary of past systematic inventories and monitoring of *Phacelia inconspicua*.....5

Table 2. Summary of environmental features and plant communities at *Phacelia inconspicua* occurrences.....10

Table 3. Summary of population information, land uses, and threats at *Phacelia inconspicua* occurrences.....14

LIST OF FIGURES

Figure 1. Photos of *Phacelia inconspicua*.....6

Figure 2. Map of the Idaho distribution of *Phacelia inconspicua*.....8

Figure 3. Photos of *Phacelia inconspicua* habitat.....10

LIST OF APPENDICES

Appendix 1. Element Occurrence Records for *Phacelia inconspicua* in Idaho.

Appendix 2. Maps of the locations of *Phacelia inconspicua* occurrences in Idaho.

Appendix 3. Maps of surveyed areas where no *Phacelia inconspicua* was found in 2001.

INTRODUCTION

Phacelia inconspicua (obscure scorpion plant) is a diminutive annual species in the Hydrophyllaceae (waterleaf) family. It blooms for a short period in late spring and population numbers fluctuate widely from year to year, apparently in response to climatic and microsite conditions. The combination of its small size, short flowering period, and tendency to blend in with surrounding soil and associated species, makes the species truly inconspicuous. *Phacelia inconspicua* was first collected in Idaho, at Webb Spring, on the north side of Big Southern Butte, in 1967. Prior to this, the species was known only from the Humboldt Mountains of Pershing County, Nevada (Holland 1996). The species is still known only from a limited portion of the Humboldt Mountains, Nevada and a portion of western Butte and adjacent Blaine Counties in Idaho. There are four known occurrences in Nevada and six occurrences in Idaho. *Phacelia inconspicua* is listed as an endangered species in Nevada and one of Idaho's rarest plants. It is also a Bureau of Land Management (BLM) Sensitive species in both Nevada and Idaho.

In Idaho, *Phacelia inconspicua* grows at elevations ranging from about 5400 to 6200 feet on the volcanic foothills and buttes in the northwestern portion of the "Big Desert," and at the foot of the Pioneer Mountains, on the Upper Snake River Plain. *Phacelia inconspicua* is often restricted to concave, moderately steep, and sheltered northeast to east facing aspects. Snowdrifts form on these concave lee-slopes and persist late into the spring. *Phacelia inconspicua* is typically found growing in small gaps within shrubby vegetation dominated by *Prunus virginiana* (chokecherry), *Symphoricarpos oreophilus* (mountain snowberry), *Leymus cinereus* (Great Basin wildrye), and *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush). Microsites supporting *Phacelia inconspicua* are often open and have scarified or loose loamy soil lacking significant perennial vegetation and surface litter. It often grows on disturbed soil associated with older cattle trails, native ungulate trails, and gopher diggings. The species probably requires low-level soil disturbance and occasional fire (to remove overstory woody vegetation) for persistence. More information regarding *Phacelia inconspicua* reproduction and ecology is needed to make proper land management decisions regarding conservation of this species (Popovich 2001).

METHODS

The Conservation Data Center (CDC) conducted field surveys for *Phacelia inconspicua* in southern Idaho between June 11 and June 22, 2001. The triangular shaped study area stretched from the foothills of the Pioneer Mountains at Craters of the Moon National Monument, east-southeast to Big Southern Butte, and southwest to Split Top; an area of approximately 600 square miles. Potential habitat, determined from prior status reports and occurrence data, was searched on foothills and buttes between about 5300 and 6300 feet elevation. Potential habitat was surveyed by following a tightly meandering transect. This method was time-consuming, but necessary, for finding the cryptic *Phacelia inconspicua* plants. The total area surveyed was not as large as desired due to extensive time requirements for searching relatively small areas. Plants were identified using Cronquist (1984) and checked against other descriptions (e.g., Mozingo and Williams 1980; Moseley 1989; Holland 1996). Plants could be identified by a combination of seed and vegetative characteristics, though dried flowers were also useful. Voucher specimens were collected at each occurrence with over 20 flowering plants. Nomenclature for all species in the report follows the PLANTS Database (National Resources Conservation Service 2001). The field survey project had four main goals:

- 1) To re-locate all previously reported occurrences of *Phacelia inconspicua*. At each occurrence, the following information was documented or updated:

- a) exact location of occurrence (using a navigation grade GPS unit (map datum NAD27) and topographic maps)
- b) occurrence size
- c) habitat and substrate features
- d) associated communities and species (including other rare species)
- e) current land uses and threats

This information was entered into the CDC database and detailed Element Occurrence Records were generated (Appendix 1). An occurrence is standard database tool used throughout the Natural Heritage/Conservation Data Center network for tracking rare species (Conservation Data Center 2001). An occurrence represents a specific geographic location and their delineation is based predominantly on biological data, but it also accounts for geographic factors. An occurrence is not always equivalent to the biological definition of a population. A three-digit identifier code is assigned to each occurrence that corresponds to the reference number used by the CDC database. The precise locations of *Phacelia inconspicua* occurrences observed in 2001 were also mapped (Appendix 2). Areas searched where no *Phacelia inconspicua* was found, including the Split Top (004) and Craters of the Moon National Monument (006) occurrences, are mapped in Appendix 3.

- 2) To establish photo-monitoring stations at all occurrences where *Phacelia inconspicua* was observed. Permanent photo-monitoring stations were marked with “potato digger” re-bar and their location recorded using a navigation grade GPS unit. Plant community information was collected using a 10 x 5 m vegetation plot centered at each photo-monitoring station. The rectangular plots were oriented with the long side perpendicular to the slope and the size chosen to accurately capture the microsites supporting the species, rather than the general community. Cover of all species in the vegetation plot was estimated using methods modified from Bourgeron et al. (1992). At each station, photos were taken at 0, 45, 90, 135, 180, 225, 270, and 315 degrees from the re-bar (if practical) to provide a panoramic view of the monitoring area. For all compass bearings, the declination was corrected according to the topographic map used. A 35 mm camera with a wide-angle lens was used. Photos and plot data are on file at the Upper Snake River District BLM and the CDC. *Phacelia inconspicua* photo-point monitoring station locations were mapped (Appendix 2) and directions described in the following:

a) Big Southern Butte (001): Two stations were established at the following UTM’s: 335992 E, 4808385 N and 336597 E; 4808291 N. The first photo-point monitoring station re-bar is located about 150 m south-southwest of Webb Spring, along the western fenceline of the exclosure. From the northwest corner post of the exclosure, walk 27 posts south to the station re-bar (it is adjacent to a gate in the fence). The second photo-point monitoring station is located on a slope above and to the northwest of the third draw to the east of Webb Spring draw. This slope is about one third mile south of the road. The re-bar stake marking the station is 25 m below a steep ridgeline. Reference bearings: from the stake to the large, northernmost rock spire is 174 degrees; from the stake to the top of Middle Butte is 70 degrees; from the stake to the nearest INEEL structures is 356 degrees.

b) Pratt Butte (002): The station is located at 314500 E, 4798617 N. Re-bar marking the photo-point monitoring station is located in a 2 x 2 m gap on an east-facing slope between boulders and chokecherry. It is about 15 m below the rim of the butte top and about 51 degrees and 150 m from the stake to the center of the cattle pond dam. Reference bearings: 70 degrees from the stake to an old water trough; 44 degrees from the stake to the round top

of a low butte on the northeast side of the road/reservoir. The stake is not in the dense chokecherry draw to the west.

c) Quaking Aspen Butte (003): The station is located at 321772 E, 4806729 N. There is a re-bar marking the photo-point monitoring station in a gap on the east-facing slope above the road. The gap is at the base of a small chokecherry (flagged). It is about 90 m from the road to the stake. Reference bearings: from the stake to the top of Middle Butte is 75 degrees; from the stake to the south summit of Big Southern Butte is 90 degrees.

d) North of Sunset Cone (005): The station is located at 292905 E, 4818178 N. There is a re-bar marking the photo-point monitoring station in the middle of an old cow-elk trail on the upper edge of a small, decadent aspen stand in the draw. Go to the old water trough below the spring, follow bearing 155 degrees for about 25 m until you reach the cow trail, then follow the trail to the stake. Reference bearing: from the stake to the rock outcrop on top of the ridge to the northeast is 17 degrees and about 100 m. The monitoring station is located about 50+ m southeast of the spring, near the draw and at the edge of a small aspen grove, 10 m up from the drainage bottom.

- 3) To search public land for new occurrences. Surveys were performed both at the margins of, and within, the known range of *Phacelia inconspicua* so that its actual range and habitat requirements could be better defined. Surveys concentrated on the following areas: Fingers Butte, Quaking Aspen Butte, Serviceberry Butte, and five areas in the foothills of the Pioneer Mountains (see also Table 1). Location, population, habitat, and threat data were also collected at any newly discovered occurrences.
- 4) To assess the conservation status of *Phacelia inconspicua* and make recommendations regarding its conservation.

RESULTS

Phacelia inconspicua was observed at three of the occurrences known prior to 2001, and at one new site at Quaking Aspen Butte. Despite extensive surveys of potential habitat at the Split Top (004) and Craters of the Moon (006) occurrences, no plants were observed at these sites. Additional areas of potential habitat in the foothills of the Pioneer Mountains northwest of Craters of the Moon National Monument were also searched in 2001, but no new occurrences were found. Several other sites searched by Moseley in 1989 were re-surveyed without success. Maps of areas surveyed by the CDC in 2001, but where no plants were found, are located in Appendix 3. In 2001, we observed slightly over 1,000 *Phacelia inconspicua* plants, covering about two acres. Most of these plants were observed at the Big Southern Butte (001) occurrence. Plants were found in typical habitats. We collected additional vegetation information to more thoroughly describe habitat attributes. No imminent, high magnitude threats to occupied habitat were observed, but low level impacts and potential threats, including invasion by *Bromus tectorum* (cheatgrass), trampling by livestock, and long-term vegetation changes, should be closely monitored. *Phacelia inconspicua* remains one of Idaho's rarest plant species. Crucial data regarding its ecology are still lacking. The following report discusses our knowledge of this species in Idaho. It builds on prior status reports by Moseley (1989) and Holland (1996), and other survey and monitoring reports (e.g., Elzinga 1993, Popovich 2001), by adding new information collected this year.

TAXONOMY

Scientific name: *Phacelia inconspicua* E. L. Greene

Common name: obscure scorpion plant; obscure phacelia

Pertinent synonyms: none

Family name: Hydrophyllaceae (waterleaf family)

No known changes or updates to the taxonomy of *Phacelia inconspicua* have occurred since the Nevada status report was completed (Holland 1996). Refer to Holland (1996) for a complete description of the classification and systematics of *Phacelia inconspicua*.

History of knowledge of taxon in Idaho and synopsis of past inventories: On June 13, 1967, Duane Atwood made the first collection of *Phacelia inconspicua* in Idaho, at Webb Spring, on the north side of Big Southern Butte. Prior to this, the species was known only from the Humboldt Mountains of Pershing County, Nevada, from the type specimen collected by Greene in 1894 (Holland 1996). *Phacelia inconspicua* was again collected in Nevada by Tiehm and Williams in 1978. The Webb Spring population was again observed by Pat Packard and James Grimes in 1980. In Idaho, *Phacelia inconspicua* went unreported for another nine years until systematic and extensive field surveys were conducted by Robert Moseley, of the Idaho CDC. Moseley re-located and expanded the Webb Spring occurrence and discovered another population at Pratt Butte, about 15 miles west-southwest of Big Southern Butte (Moseley 1989). Duane Atwood also collected *Phacelia inconspicua* in 1989, north of Sunset Cone, just outside the northeast boundary of the Craters of the Moon National Monument. Additional surveys were performed in Idaho the following year and again in 1993 by Caryl Elzinga (Elzinga 1990 and 1993). She discovered a single plant at Split Top in 1990, and a larger population north-northwest of Grassy Cone within Craters of the Moon National Monument in 1993 (Conservation Data Center 2001).

Between 1992 and 1997, Steve Popovich, with the assistance of National Park Service personnel (including, John Apel, Natalene Cummings, and Vicki Snitzler-Neeck) and others, annually monitored two *Phacelia inconspicua* occurrences in the foothills north of the Craters of the Moon National Monument (Conservation Data Center 2001). Popovich and assistants re-visited these occurrences north of Craters of the Moon National Monument in late spring 2001 (Popovich 2001). From late June to mid July 1999, Brian Schuetz and Jayne Chipman revisited all of the previously documented *Phacelia inconspicua* occurrences in Idaho, but did not find any *Phacelia inconspicua* (Schuetz and Chipman 1999). The CDC re-visited all known *Phacelia inconspicua* occurrences and surveyed additional potential habitat between June 11 and June 22, 2001. Table 1 summarizes the history of *Phacelia inconspicua* inventories and monitoring in Idaho, as well as the general areas surveyed. Undocumented and cursory site visits are not included in the table.

Table 1. Summary of past systematic inventories and monitoring of *Phacelia inconspicua*.

Principle Investigators	Year of Survey	General Areas Surveyed
Moseley (CDC)	1989	Antelope Butte; Big Southern Butte; Cedar Butte; China Cup Butte; Fingers Butte; Mule Butte; Quaking Aspen Butte; Pratt Butte; Rattlesnake Butte; Serviceberry Butte; Sixmile Butte; Split Top; Table Legs Butte; Tea Kettle Butte; Tin Cup Butte; Wildhorse Butte
Elzinga (BLM)	1990	Big Southern Butte (Webb Spring); Box Canyon; Little Butte; Pratt Butte; Snowdrift Crater; Split Top
Elzinga (Alderspring Consulting)	1993	Craters of the Moon National Monument—North Unit
Popovich & Craters of the Moon N.M. personnel (BLM & NPS)	1992-1997 (annual monitoring)	North of Sunset Cone (005); Craters of the Moon National Monument (006)
Schuetz and Chipman (Schuetz Consulting)	1999	all prior known occurrences & immediately adjacent potential habitat
Popovich (Wildhorse Consulting)	2001	North of Sunset Cone (005); Craters of the Moon National Monument (006)
Murphy (CDC)	2001	all prior known occurrences; Fingers Butte; Quaking Aspen Butte; Serviceberry Butte; 5 areas in the foothills of the Pioneer Mountains within portions of T. 1N, R. 24E: S. 5, S. 8, and S. 18

LEGAL OR OTHER FORMAL STATUS

National

U.S. Fish and Wildlife Service: From 1983 to 1996, *Phacelia inconspicua* was a Category 2 candidate for federal listing under the Endangered Species Act (Holland 1996). Since the Category 2 candidate list was abolished in 1996, the species has had no formal status with the U.S. Fish and Wildlife Service. *Phacelia inconspicua* is currently a “species of concern” with the Fish and Wildlife Service.

Bureau of Land Management: *Phacelia inconspicua* is on Idaho BLM’s Sensitive species list.

Other current formal status: NatureServe, representing the network of Natural Heritage Programs and Conservation Data Centers, has assigned *Phacelia inconspicua* a global rank of G2 (imperiled throughout its range because of rarity or other factors that make it very vulnerable to extinction (Conservation Data Center 2001).

State

Idaho Conservation Data Center: The CDC has assigned *Phacelia inconspicua* a state conservation rank of S1 (critically imperiled in the state because of extreme rarity or because some other factor makes it especially vulnerable to extinction; Conservation Data Center 2001).

Idaho Native Plant Society: The INPS currently tracks *Phacelia inconspicua* as a Global Priority 1 species (same as the CDC state rank; critically imperiled because of extreme rarity) with a “threat rank” of 5 (a taxon with high, but non-imminent, threats) (Idaho Native Plant Society 2001).

Nevada: *Phacelia inconspicua* is currently listed as a critically endangered species protected under Nevada statutes. It is on the Northern Nevada Native Plant Society’s Endangered list (Nevada Natural Heritage Program 2001).

DESCRIPTION AND IDENTIFICATION

Technical and non-technical descriptions: Refer to prior *Phacelia inconspicua* status reports (Moseley 1989; Holland 1996) for complete technical and non-technical descriptions of *Phacelia inconspicua*.

Local field characters: *Phacelia inconspicua* is a branching annual forb less than 15 cm tall with tubular whitish to pale bluish flowers up to 4 mm long arranged in a helicoid cyme (Cronquist 1984). Its pubescent elliptical leaves are entire, non-glandular, and often exceed the leaves. In Idaho, two other diminutive annual species of *Phacelia*, with similar growth form and leaf shape, could be confused with *Phacelia inconspicua*. However, these two species, *Phacelia incana* (hoary phacelia) and *P. minutissima* (small phacelia), differ from *Phacelia inconspicua* by having glandular hairs and producing many more than four seeds and ovules per fruit (Cronquist 1984). *Phacelia inconspicua* is not at all glandular and produces only two to four seeds and four ovules per fruit. *Phacelia incana* is reportedly sympatric with *P. inconspicua* (at Big Southern Butte (001) and Pratt Butte (002); Moseley 1989), but it was not observed in 2001. *Phacelia inconspicua* usually grows mixed with other vernal annuals. As these annuals mature and dry out, it can be difficult to see *Phacelia inconspicua* and distinguish it from annual *Cryptantha* species (e.g., *C. torreyana* (Torrey's cryptantha)). The pubescence of *Phacelia inconspicua* is shorter and much softer than the pubescence of associated annual *Cryptantha* species.

Photos and line drawings: See prior status reports (Moseley 1989, Holland 1996), Mozingo and Williams (1980), Cronquist (1984), Nevada Natural Heritage Program (2001), and Popovich (2001) for illustrations and photos of *Phacelia inconspicua*. Figure 1 includes photos of *Phacelia inconspicua*.

Figure 1. Photos of *Phacelia inconspicua* taken at North of Sunset Cone (005) on June 9, 2001 (courtesy of Steve Popovich, Wildhorse Consulting).



DISTRIBUTION

Global distribution: *Phacelia inconspicua* is known from a limited portion of the Humboldt Mountains of Pershing County, Nevada, and a portion of western Butte County and adjacent Blaine County in Idaho. There are four known occurrences in Nevada, three of which are found along in an area only 2.7 miles in length.

Idaho distribution: *Phacelia inconspicua* grows at elevations ranging from about 5400 to 6200 feet on the volcanic foothills and buttes in the northwestern portion of the “Big Desert,” on the Upper Snake River Plain. Populations lie in a triangular area stretching from the foothills of the Pioneer Mountains (on the north side of the original Craters of the Moon National Monument), 40 miles southeast to Split Top, and 30 miles east to Big Southern Butte (Figure 2).

Idaho occurrences: Population, location, habitat, threat, and other conservation data for each occurrence are detailed in the Element Occurrence Records (Appendix 1; Conservation Data Center 2001). Precise occurrence locations are mapped in Appendix 2. The three-digit code labeling each occurrence is a reference number assigned by the CDC. The six Idaho occurrences are summarized below:

Big Southern Butte (Webb Spring) (001): This occurrence was re-located in 2001. It is composed of roughly nine large sub-populations located on the north-northeast flank of Big Southern Butte, within a one-mile radius of Webb Spring. The sub-populations are located both northwest and southeast of Webb Spring. Big Southern Butte is a large rhyolitic volcano located about 20 miles southeast of Arco, in Butte County. The sub-populations are found on northeast to east facing slopes of spur ridges between 5500 and 6000 feet elevation. Eight of the nine sub-populations were surveyed in 2001.

Pratt Butte (002): This occurrence was re-located in 2001. It is located on a northeast slope just below the eastern summit of Pratt Butte. Pratt Butte is a small basaltic fissure volcano located about 25 miles south of Arco, in Butte County.

Quaking Aspen Butte (003): This occurrence was discovered in 2001. It is located in an east facing bowl below the eastern summit of the butte. Quaking Aspen Butte is a large basaltic shield volcano located about 20 miles south-southeast of Arco, in Butte County.

Split Top (004): Despite a thorough search, this occurrence was not re-located in 2001. Split Top is a basaltic crater located about 35 miles south-southeast of Arco and 40 miles northeast of Minidoka, in Blaine County. Only one *Phacelia inconspicua* individual has ever been observed at Split Top (in 1990). The location of this plant was apparently accurately mapped. Potential habitat was searched on the northeast-facing slope within the main craters and an adjacent crater.

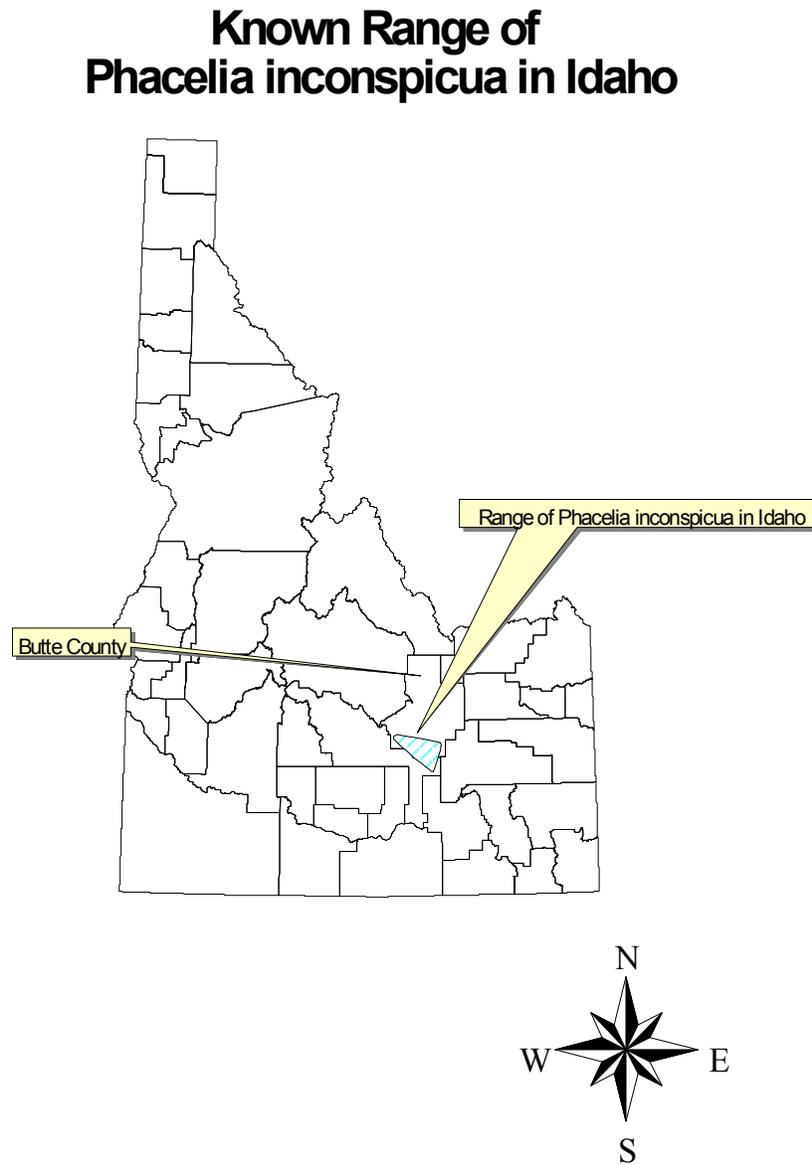
North of Sunset Cone (005): This occurrence was re-located in 2001. The occurrence is located on a north-northeast facing toeslope within an unnamed drainage in the foothills of the Pioneer Mountains. The site is located about 1.75 miles north of Sunset Cone and two miles north of the headquarters of Craters of the Moon National Monument, in Butte County. The site is apparently on a small parcel of private land within the expanded Craters of the Moon National Monument. Steve Popovich (2001) found *Phacelia inconspicua* plants during surveys of the site in late spring. He directed the CDC to the precise location.

Craters of the Moon National Monument (006): Thorough searches of prior mapped sub-population locations, as well as adjacent potential habitat, were conducted by Steve Popovich

(2001) and the CDC. No *Phacelia inconspicua* plants were observed in 2001. This occurrence is located on north to east facing lower slopes of the foothills of the Pioneer Mountains, north-northwest of Grassy Cone within Craters of the Moon National Monument, in Butte County.

Unverified/undocumented reports: The Roger Rosentreter collection of a plant resembling *Phacelia inconspicua* from the Danskin Mountains of Elmore County, Idaho, has apparently never been positively identified or re-located (Moseley 1989).

Figure 2. Map of the Idaho distribution of *Phacelia inconspicua*.



HABITAT

General habitat description: Four occurrences of *Phacelia inconspicua* in Idaho are known from basaltic and rhyolitic buttes located along the eastern side of the Great Rift of the upper Snake River Plain. Two other Idaho occurrences are located in the foothills of the nearby Pioneer Mountains, also on substrates of volcanic origin. The northern part of the Great Rift area has wide seasonal and daily temperature fluctuations. Precipitation is variable year to year. Overall, the climate is relatively cool and dry (cooler than lower elevations on the Snake River Plain and drier than adjacent mountains). Precipitation is characterized by two peaks—one in December and January, occurring as snow, and another in May in June. See Moseley (1989) and Holland (1996) for detailed descriptions of the climate within the range of *Phacelia inconspicua*. In Idaho, *Phacelia inconspicua* is known from a narrow elevation range (5390 feet at Pratt Butte (002) to 6200 feet at Craters of the Moon (006)). The highest elevation documented in 2001 was 6000 feet, on the flanks of Big Southern Butte (001).

Based on observations throughout its range, *Phacelia inconspicua* is restricted to northeast to east facing aspects. We observed *Phacelia inconspicua* on aspects ranging from 45 to 95 degrees, with the average being about 60 degrees. This aspect represents the lee slopes of prevailing winter winds, as well as the most shaded slopes. In general, sites supporting *Phacelia inconspicua* are concave, lower- to mid-slopes lying below the rimrock of butte tops or foothill ridgetops. Snowdrifts form on these concave lee-slopes and persist late into the spring. *Phacelia inconspicua* is also occasionally observed on toe-slopes immediately above ephemerally moist drainages, but never on rimrock, ridgetops, or adjacent flats. Slopes are generally moderately steep (averaging about 32%), though some microsites supporting *Phacelia inconspicua* were nearly flat, sheltered terraces. The microtopography is often undulating due to numerous large boulders and stones deposited from the rimrock or ridges above. *Phacelia inconspicua* grows in the depressions between boulders. The environmental setting of occurrences in foothills of the Pioneer Mountains (North of Sunset Cone (005) and Craters of the Moon (006)) is similar to that of Big Southern Butte (001). All of these occurrences are located on lee slopes of spur ridges radiating out from the flanks of mountainous foothills.

Phacelia inconspicua typically grows in small gaps (one to five square meters each) within shrubby vegetation. Microsites range from partially shaded to full sunlight. *Phacelia inconspicua* is occasionally observed under, or adjacent to, shrubs, but rarely grows where completely shaded. Individuals are always observed on scarified or loose loamy soil lacking significant perennial vegetation and surface litter. *Phacelia inconspicua* often grows on disturbed soil associated with older cattle trails, native ungulate trails, and gopher diggings. Subpopulations occupy transitional areas between mesic, dense vegetation dominated by *Populus tremuloides* (quaking aspen), *Prunus virginiana*, or *Leymus cinereus*, and open, xeric vegetation dominated by *Artemisia tridentata* ssp. *vaseyana* with *Purshia tridentata* (bitterbrush), *Pseudoroegneria spicata* (bluebunch wheatgrass), and *Balsamorhiza sagittata* (arrowleaf balsamroot). Table 2 summarizes the environmental features at Idaho occurrences, as well as the plant communities supporting *Phacelia inconspicua*. Figure 3 includes photos of *Phacelia inconspicua* habitat.

Table 2. Summary of environmental features and plant communities at *Phacelia inconspicua* occurrences.

Occurrence (#)	Elevation (feet)	Aspect (avg. °)	Slope (avg. %)	Plant Communities
Big Southern Butte (001)	5640-6000	79	31	1) <i>Prunus virginiana</i> / <i>Leymus cinereus</i> 2) <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Symphoricarpos oreophilus</i> / <i>Leymus cinereus</i>
Pratt Butte (002)	5390-5410	65	28	1) <i>Prunus virginiana</i> / <i>Leymus cinereus</i>
Quaking Aspen Butte (003)	5760-5780	70	30	1) <i>Prunus virginiana</i> / <i>Leymus cinereus</i>
Split Top (004)*	5440	45	30	1) <i>Prunus virginiana</i> - <i>Symphoricarpos oreophilus</i> 2) <i>Populus tremuloides</i> / <i>Symphoricarpos oreophilus</i> ?
North of Sunset Cone (005)	5800-5820	55	39	1) <i>Prunus virginiana</i> - <i>Symphoricarpos oreophilus</i> / <i>Pseudoroegneria spicata</i> 2) <i>Populus tremuloides</i> / <i>Symphoricarpos oreophilus</i>
Craters of the Moon (006)*	6100-6200	0-90	n/a	1) <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Agropyron spicatum</i> 2) <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Symphoricarpos oreophilus</i> / <i>Leymus cinereus</i> ?

* = not re-located in 2001; habitat data from previous observations; ? = tentative determination

Figure 3. Photos of *Phacelia inconspicua* habitat.

a) Microsite supporting *Phacelia inconspicua* at North of Sunset Cone (005), June 20, 2001.



b) Mountain shrubs in concave snow drift sites supporting *Phacelia inconspicua* at Big Southern Butte (001), June 21, 2001.



Geology and soils: In Nevada *Phacelia inconspicua* has been found only on limestone substrates (Holland 1996). In contrast, *Phacelia inconspicua* is known only from volcanic substrates in Idaho. The Pioneer Mountain foothills, where the North of Sunset Cone (005) and Craters of the Moon (006) occurrences are located, are composed of rhyolite and other Challis Volcanic rocks of Eocene age (Moseley 1989). In contrast, Big Southern Butte (001) is a rhyolite dome volcano about 300,000 years old that is surrounded by Quaternary basalt flows (Hughes et al. 1999). The other occurrences are on the slopes of Quaternary basaltic eruptive centers. For example, Pratt Butte (002) and Quaking Aspen Butte (003) are on fractured basalt shield volcanoes while the Split Top (004) occurrence is within a collapse pit crater of a shield volcano.

In Idaho, *Phacelia inconspicua* typically grows on dark-colored silt-loam soil with varying amounts of sand, gravel, and cobble, stone, and boulder colluvium intermixed. Although the upper soil layers have moderate amounts of organic matter, the surface usually lacks litter accumulation. Although sites are mesic (relative to the surrounding sagebrush-steppe) due to late lying snow drifts, soils are coarse enough in texture to be well drained. Soils supporting *Phacelia inconspicua* are always relatively loose or scarified (due to animal and erosion disturbance), and lack dense perennial vegetation. The soil depth varies from shallow (over boulders) to moderately deep. Popovich (2001) describes the soil at the North of Sunset Cone occurrence as “dark and cindery.” Across all occurrences we observed, most microsites supporting *Phacelia inconspicua* were not cindery or extremely gravelly.

Plant communities: Microsites supporting *Phacelia inconspicua* most often occurred within *Prunus virginiana* dominated communities with *Leymus cinereus*, *Symphoricarpos oreophilus*, and *Bromus tectorum* (cheatgrass) in the understory. Table 2 lists the plant communities supporting *Phacelia inconspicua* at each occurrence. At North of Sunset Cone (005), *Pseudoroegneria spicata* was locally the dominant perennial understory grass. *Phacelia inconspicua* was also observed on the edges of *Populus tremuloides*/*Symphoricarpos oreophilus* communities (described by Mueggler 1988), but not under the canopy of *Populus tremuloides* stands. At Big Southern Butte (001), *Phacelia inconspicua* was observed within *Artemisia tridentata* ssp. *vaseyana*-*Symphoricarpos oreophilus*/*Leymus cinereus* communities (similar to Hironaka et al. 1983; Rust et al. 2001). *Phacelia inconspicua* has been found within *Artemisia tridentata* ssp. *vaseyana*/*Pseudoroegneria spicata* communities (described by Hironaka et al. 1983; Day and Wright 1985; Rust et al. 2001) at Craters of the Moon (006) (Elzinga 1993). Rust et al. (2001) described a community similar to the *Prunus virginiana*-*Symphoricarpos oreophilus* type, but the *Prunus virginiana*/*Leymus cinereus* community is undescribed in the literature.

Vegetation at *Phacelia inconspicua* occurrences was often heterogeneous and plant communities were sometimes difficult to delineate. *Phacelia inconspicua* sub-populations often occupy transitional areas between mesic, dense vegetation dominated by *Populus tremuloides*, *Prunus virginiana*, or *Leymus cinereus*, and open, xeric vegetation dominated by *Artemisia tridentata* ssp. *vaseyana* with *Purshia tridentata*, *Pseudoroegneria spicata*, and *Balsamorhiza sagittata* (Popovich 2001). For example, at Pratt Butte (002) and Quaking Aspen Butte (003), *Phacelia inconspicua* was observed in the transition zone between deeper soil sites below, supporting *Leymus cinereus* dominated vegetation, and rockier soil sites above, dominated by *Prunus virginiana*. At Big Southern Butte (001) and North of Sunset Cone (005), the situation was sometimes reversed; denser shrubby vegetation was located in draws below *Phacelia* sites.

Associated species: The following species were associated with *Phacelia inconspicua* at all sub-populations surveyed: *Prunus virginiana*, *Symphoricarpos oreophilus*, *Leymus cinereus*, and *Bromus tectorum*. The most frequently associated species (at over 50% of the sub-populations) in microsites supporting *Phacelia inconspicua* were ephemeral annual forbs, including *Cryptantha*

species (e.g., *C. torreyana*), *Collinsia parviflora* (blue-eyed Mary), *Collomia* species (e.g., *C. linearis* (tiny trumpet) and *C. tenella* (diffuse collomia)), *Gayophytum* species (groundsmoke), and *Mentzelia albicaulis* (whitestem blazingstar). The following shrubs, perennial grasses, and perennial forbs were associated at 50% to 80% of the sub-populations: *Artemisia tridentata* var. *vaseyana*, *Chrysothamnus viscidiflorus* (green rabbitbrush), *Purshia tridentata*, *Pseudoroegneria spicata*, *Melica bulbosa* (oniongrass), *Balsamorhiza sagittata*, *Lupinus* species (e.g., *L. wyethii* (Wyeth's lupine) and *L. arbustus* (longspur lupine)), and *Lithospermum ruderales* (western stoneseed). Other commonly associated perennial species (but at less than 50% of the sub-populations) were *Populus tremuloides*, *Ribes* species (*R. aureum* (golden currant) and *R. cereum* (wax currant)), *Poa secunda* (Sandberg's bluegrass), *Crepis acuminata* (tapertip hawkbeard), and *Viola* species (e.g., *Viola nuttallii* (Nuttall's violet)).

Numerous other species were occasionally associated with *Phacelia inconspicua*, especially annual forbs such as, *Amsinkia* species (fiddleneck), *Galium bifolium* (twinleaf bedstraw), *Lappula occidentalis* (flatspine stickseed), *Mimulus nanus* (dwarf purple monkeyflower), and *Polygonum douglasii* (Douglas' knotweed). Perennial grasses indicative of productive soils were also observed such as, *Elymus trachycaulus* (slender wheatgrass), *Carex vallicola* (valley sedge), *Festuca idahoensis* (Idaho fescue), and *Poa pratensis* (Kentucky bluegrass). Other associated perennial forbs were those typical of more mesic sites and productive soils. They included *Agastache urticifolia* (nettleleaf giant hyssop), *Agoseris glauca* (pale agoseris), *Eriogonum heracleoides* (Wyeth's buckwheat), *Hackelia micrantha* (Jessica sticktight), *Mertensia oblongifolia* (oblongleaf bluebells), *Senecio integerrimus* (lambstongue ragwort), and *Maianthemum racemosum* (feathery false lily of the valley). Occasionally associated shrubs included *Amelanchier utahensis* (Utah serviceberry), *Artemisia tridentata* ssp. *tridentata* (basin big sagebrush), and *Rosa woodsii* (Wood's rose). Moseley (1989) reported *Achnatherum lettermanii* (Letterman's needlegrass) as an important associated species, but we did not observe it in the immediate vicinity of *Phacelia inconspicua*.

Other rare species: No other rare plant species are known to co-occur with *Phacelia inconspicua* in Idaho.

POPULATION BIOLOGY

Population size and condition: *Phacelia inconspicua* is an annual and the number of plants observed varies widely each year in response to the timing and level of soil moisture (Holland 1996; Popovich 2001). It is possible that *Phacelia inconspicua*, like other desert annuals, can have many years where few plants germinate, maintaining the soil seed bank until ideal conditions arise and large populations are observed. It is a diminutive species, with a short blooming season, that blends in with the soil and associated annuals (Popovich 2001). For these reasons, *Phacelia inconspicua* is difficult to observe in the field, even under ideal conditions at proper phenological times. Although 2001 was apparently a good year for observing *Phacelia inconspicua*, our population estimates are most likely low.

Phacelia inconspicua is currently known from six occurrences in Idaho. We observed plants at four of these occurrences in 2001. Table 3 outlines population information collected in 2001. One new occurrence was discovered at Quaking Aspen Butte (003), a site surveyed without success by Moseley in 1989. No *Phacelia inconspicua* were observed at Split Top (004) and Craters of the Moon (006) in 2001, though much suitable habitat was surveyed at both sites. Both of these occurrences are considered extant, though only one *Phacelia inconspicua* individual has ever been observed at the Split Top occurrence (in 1990). The four occurrences observed in 2001 supported approximately 1000 individuals in 12 or so sub-populations covering about 2.1 acres.

Nearly half of the total number of plants was observed at Big Southern Butte (001), which also had 75% of the sub-populations. Plant numbers observed in 2001 do not reflect the total population size, a portion of which remains cryptic in the seed bank (Elzinga 1993; Popovich 2001). The following is a summary of occurrence population data collected from 2001. The Element Occurrence Records in Appendix 1 contain additional population information.

Big Southern Butte (001): Plants were observed in 2001 at this occurrence for the first time since 1989. In 1989, Moseley estimated that this occurrence had 10,000 plants at nine sub-populations, covering 32 acres (probably inclusive of some unoccupied habitat). In 2001, we observed far fewer plants (about 460), covering only about 1.3 acres at eight of the nine original sub-populations. This occurrence is still Idaho's largest. Due to time constraints, the outlying sub-population to the southeast was not re-visited. The sub-population at Webb Spring could actually be divided into two sub-populations separated by a small section of less ideal habitat. Overall, habitat conditions appeared good and native vegetation was intact. Microsites were occasionally disturbed by minor amounts of animal trailing and *Bromus tectorum* was locally common.

Pratt Butte (002): Plants were observed at this occurrence for the first time since 1989. Approximately 205 plants were observed in 2001, in one sub-population covering only about 0.1 acres. Microsites supporting *Phacelia inconspicua* are probably being kept open by a combination of ungulate and livestock trailing. The surrounding landscape is burnt, heavily grazed by livestock, and has high cover of *Bromus tectorum*.

Quaking Aspen Butte (003): This occurrence was discovered in 2001. Approximately 265 plants were observed in one sub-population covering about 0.2 acres. Overall, habitat conditions were good, though *Bromus tectorum* and *Poa pratensis* were locally common. Elk were observed at the site; their trailing and browsing help keep microsites open. Livestock use appeared minimal.

Split Top (004): Despite a thorough search of potential habitat within the Split Top crater, no *Phacelia inconspicua* plants were observed in 2001. *Populus tremuloides* was associated when the occurrence was discovered (and last observed) in 1990, but no aspen were observed within the crater. It has apparently died out.

North of Sunset Cone (005): Popovich and National Park Service assistants observed about 70 individuals, in several small clusters scattered over about 0.5 acres (Popovich 2001). Adjacent potential habitat was thoroughly surveyed by the CDC and Popovich, but no additional plants were observed. Habitat conditions were mostly good, though livestock and ungulate trailing was locally heavy.

Craters of the Moon (006): Popovich, with the assistance of National Park Service personnel, thoroughly searched all areas known to support *Phacelia inconspicua* in 1993 (Popovich 2001). The CDC, as well as Popovich, also surveyed adjacent potential habitat in 2001. Despite these extensive searches, no *Phacelia inconspicua* plants were observed. Two of the areas mapped as supporting plants in 1993 were extremely dry this year.

Table 3. Summary of population information at *Phacelia inconspicua* occurrences.

Occurrence (#)	Last Observation (prior to 2001)	# of Plants Observed in 2001	# of Sub-populations	Area Occupied (acres)
Big Southern Butte (001)	1989	461+	9	1.3 (32 ac in 1989)
Pratt Butte (002)	1989	205+	1	0.1 (<0.5 ac in 1989)
Quaking Aspen Butte (003)*	new	266+	1	0.1 to 0.2
Split Top (004)	1990	0	1	unknown
North of Sunset Cone (005)	1998	71+	1	0.5 (>2 ac in 1989)
Craters of the Moon (006)	1993	0	3	unknown
Totals		1003+	16	ca 2.1 ac

*discovered in 2001

Phenology: The flowering period of *Phacelia inconspicua* ranges from late May to late June, although it varies year to year in response to climatic conditions (Holland 1996). The flowering period, when plants are most easily identified, appears very short and proper timing of surveys is difficult. For example, Popovich (2001) conducted surveys at North of Sunset Cone (005) on May 24 and June 9 and found that 90% of the plants observed at this time were flowering. When we visited the same site on June 20, nearly all *Phacelia inconspicua* were setting or dispersing seeds. In general, all plants observed during our surveys between June 11 and June 20 had dried up flowers and were either setting or dispersing seeds. Nevertheless, plants were still recognizable at this state.

Reproductive biology and biological interactions: No systematic studies of the reproduction of *Phacelia inconspicua* have been conducted. Holland (1996) hypothesizes that because *Phacelia inconspicua* produces few seeds per plant (two to four, which is low for an annual species), its reproductive strategy may be to maintain low population levels during periods of less than ideal habitat conditions (e.g., mid- to late-seral vegetation, inadequate or excessive soil moisture, etc.). This maintains or slowly increases the soil seed bank. When climatic and habitat conditions are ideal, such as a moist spring after vegetation or soil disturbance (e.g., fire, animal activity, etc.), a mass germination may occur and the seed bank replenished. No studies on the pollination ecology of *Phacelia inconspicua* have been conducted. It is possible that the species is insect pollinated, though reduced flower size may indicate a tendency toward self-pollination (Holland 1996). Holland (1996) also hypothesizes that seed dispersal occurs by gravity and water, insect transport, and wind (when capsules or whole plants break off and blow away). Our observations support the possibility of wind transport, as well as potential transport by mammals. For example, we observed many *Phacelia inconspicua* plants where the fruit capsule, combined with the surrounding bristly calyx, easily broke off drying plants as one unit. The bristly calyx and capsule can then stick to mammal fur or blow away.

Competition and response to disturbance: *Phacelia inconspicua* is hypothesized to be an early to mid-seral species adapted to fire and low-level soil disturbance (Moseley 1989; Elzinga 1993; Holland 1996; Popovich 2001). The species probably requires occasional fire to open the woody

overstory, combined with soil disturbance on the microsite level, for germination and reproduction. Although shrub communities, especially deciduous mountain shrubs, contribute organic matter to the soil that is important for desert annuals, the dense overstory may competitively limit *Phacelia inconspicua*. In Nevada, for example, a large flush of over 20,000 *Phacelia inconspicua* was observed within habitat burned in the early 1980's. When Holland (1996) revisited the occurrence five years later in 1994, he found only 400 *Phacelia inconspicua* and a closed shrub canopy. A similar pattern was observed in Idaho at the North of Sunset Cone (005) occurrence. When Duane Atwood first collected *Phacelia inconspicua* at this occurrence in 1989, he observed over 1,000 plants within a recently burned area (Popovich 2001). Observations in 1995, 1998, and 2001 have each counted less than 100 plants at this occurrence.

While fire may be an important influence for reducing canopy cover and releasing nutrients, it is probably not too frequent in the sheltered, and more mesic settings supporting *Phacelia inconspicua*. The vegetation at Idaho occurrences appears successional stable (Moseley 1989; Elzinga 1993). None of the microsites supporting *Phacelia inconspicua* observed in 2001 had any signs of fire within about the last 10 years (no charred stumps were observed). The density of *Bromus tectorum* and weedy annual forbs often increases after fire, especially on disturbed soil. However, the absence of fire can lead to increased fuel loads that when burned, may radically alter soil conditions and kill the seed bank (Holland 1996). Competition from annual forbs and grasses, especially *Bromus tectorum*, is a concern at some *Phacelia inconspicua* occurrences.

During the period between fires, low-level soil disturbance from ungulate and livestock trailing is probably the most important factor in creating and maintaining open microsites preferred by *Phacelia inconspicua* (Popovich 2001). Natural soil creep on steep slopes, frost heaving, and small mammal disturbances are also important for open microsites (Elzinga 1993). Gopher diggings were an important cause of localized soil disturbance at several sub-populations observed in 2001. In addition, ungulate browsing may be important for decreasing woody species canopy cover, while livestock may reduce perennial grass cover in *Phacelia inconspicua* habitat (Moseley 1989).

Herbivory, disease, or other interactions: No observations of direct livestock or wildlife herbivory have been recorded in Nevada or Idaho (Holland 1996). Any grazing by larger herbivores is probably occasional or incidental. No diseases or other naturally occurring threats are known.

LAND OWNERSHIP AND THREATS

Land ownership and management responsibility: Five of the six known *Phacelia inconspicua* occurrences in Idaho are on public land. The Big Southern Butte (001) occurrence is located on BLM land. The eastern sub-populations at Big Southern Butte (001) are immediately north of (but not within) the Big Southern Butte Research Natural Area. Big Southern Butte is also recognized as a National Natural Landmark for its archeological and geological qualities (Scott 1978). The occurrence is located within the National Natural Landmark boundaries. In 2000, the boundaries of Craters of the Moon National Monument were significantly expanded by executive order to include nearly all of the Great Rift region. Within the expanded monument, management responsibility for lava flow areas, as well as the Pioneer Mountain foothills, was given to the National Park Service, while the BLM manages surrounding sagebrush-steppe. A revised monument management plan has not been written yet. Due to monument boundary expansion, the Pratt Butte (002) occurrence, on BLM land, gained protection. The Quaking Aspen Butte (003) and Split Top (004) occurrences are on BLM land outside the expanded boundaries of

Craters of the Moon National Monument, an area with no special protection. North of Sunset Cone (005) is on a small parcel of private land within the expanded boundaries of the Craters of the Moon National Monument. The Craters of the Moon (006) occurrence is within the original boundaries of the Craters of the Moon National Monument on land managed by the National Park Service. This area is not grazed by livestock, has limited public access, and is managed for maintenance of natural values.

Land use, threats, and protections: In general, the habitat supporting *Phacelia inconspicua* is intact and in good ecological condition. All occurrences except Craters of the Moon (006) are in areas open to livestock grazing, but utilization is generally low within the steep and shrubby habitat. Varying levels of trailing and browsing by ungulates was observed at all occurrences, and combined with light livestock use, may be beneficial for maintaining and creating open microsites for *Phacelia inconspicua*. Heavy livestock use may lead to trampling of plants and promote invasion by competitive exotic species. *Bromus tectorum* was usually present in low to moderate levels within *Phacelia inconspicua* habitat, but had greater cover and density in the surrounding sagebrush-steppe areas, especially where disturbed by livestock and fire. No noxious weeds were observed. No off-highway vehicle (OHV) use was documented at any occurrence, though dirt roads were located within one-quarter to one-third mile of all occurrences. Mining claim stakes were observed at Big Southern Butte (001), but the risk of future mining is unknown. Below is a more detailed account of current land use, threats, and protections at each occurrence.

Big Southern Butte (001): This occurrence is within the Big Southern Butte National Natural Landmark (Scott 1978). Although management is not oriented toward preservation of native vegetation, the BLM has placed some limits on OHV travel in the area. Cattle graze the general area, but they utilize the gentle flats near water tanks (fed by a pipeline from Webb Spring) more than the steeper flanks of the butte. There is an enclosure around Webb Spring and a few *Phacelia inconspicua* plants were found within the enclosure. *Bromus tectorum* is noticeable within the general area, especially on exposed or disturbed soil. Its current impacts on *Phacelia inconspicua* are unknown. The flats below experienced a mosaic burn within the last 10 years and are degraded. In contrast, the late seral vegetation on the butte flanks is in good to excellent condition and unburned. Several mining claim stakes were observed in the vicinity, but no recent exploration or road building has occurred. Future threats from mining or road building are unknown. The intact sagebrush-steppe vegetation along the road below Webb Spring, tracing the northern toe of the butte (about one-quarter to one-third mile north of *Phacelia inconspicua* sub-populations), has been considered for replacement. Native vegetation would be removed by the BLM and exotic species would be planted to form a firebreak, or “green strip.”

Pratt Butte (002): This occurrence is within the Craters of the Moon National Monument. The area is used for livestock grazing, though adjacent water catchments do not appear to be maintained. The nearby flats are heavily grazed by sheep and less intensively by cattle. These flats had a mosaic burn within the last 10 years, but the vegetation of Pratt Butte did not appear burnt. A 2-track road leads to a water development about 100 m downslope of the occurrence. No OHV travel was observed in the area. Elk, as well as livestock, occasionally trail through the shrubby habitat supporting *Phacelia inconspicua*.

Quaking Aspen Butte (003): This occurrence is on BLM land used for livestock grazing. Cattle and sheep grazing is apparently light within *Phacelia inconspicua* habitat. Elk were observed in the vicinity and their browsing, bedding, and trailing evident within the occurrence. The area surrounding the occurrence had some signs of an old burn (over 10 years ago), especially upslope where *Populus tremuloides* and *Salix scouleriana* (Scouler’s willow) snags were observed. The vegetation in the occurrence area was intact and appeared unburned in recent times. *Bromus*

tectorum was present in the surrounding area, while *Poa pratensis* was present within the occurrence. *Poa pratensis* was most common upslope, in an open, concave, area lacking shrub cover. Its threat to *Phacelia inconspicua* habitat is unknown.

Split Top (004): No *Phacelia inconspicua* were observed at this occurrence in 2001. Sheep occasionally graze the area. Although *Bromus tectorum* was common in the surrounding area, no immediate threats to potential habitat were observed. Numerous open microsites were observed, but shrub cover was locally high and the dense canopy may limit *Phacelia inconspicua* numbers.

North of Sunset Cone (005): The drainage supporting *Phacelia inconspicua* is occasionally grazed by cattle and sheep, as well as native ungulates. Current livestock use is heaviest around a dug out spring located about 150 m upslope from the occurrence. Livestock and ungulate trails traverse habitat occupied by *Phacelia inconspicua*. Although a few plants were trampled, animal trailing apparently helps maintain and create openings in the vegetation utilized by the species (Popovich 2001). Excessive use by livestock or wildlife, however, may lead to dislodging and trampling of *Phacelia inconspicua*, as well as invasion by competitive, exotic species such as *Bromus tectorum*. The current effects of animal activity are probably net-positive, though more monitoring of correlations between habitat changes and population levels is necessary to confirm this (Elzinga 1993; Popovich 2001). The area upslope and immediately to the east has burned within the last 15 years and apparently supported *Phacelia inconspicua* in the past. The vegetation in the occurrence area observed is intact.

Craters of the Moon (006): No *Phacelia inconspicua* were observed at this occurrence in 2001. The occurrence is within the Craters of the Moon National Monument in an area managed by the National Park Service for natural ecosystem values. The area is not grazed by livestock and is lightly utilized by ungulates. The native vegetation is intact and in good to excellent ecological condition. However, Elzinga and Popovich (2001) hypothesize that the lack of disturbance and closure of the shrub canopy in this area may explain why no *Phacelia inconspicua* have been observed since 1993. This may be only a partial explanation, however. Based on our observations, there is much potential habitat at this occurrence nearly identical to habitat supporting *Phacelia inconspicua* in 2001. The areas searched at this occurrence did not differ greatly from other occurrences in terms of shrub canopy cover. However, soil disturbance at the microsite level was generally lower at this occurrence than in other areas. Possibly, the seed bank is limited at this occurrence and dispersal into suitable microsites has not occurred.

ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

Conservation assessment: *Phacelia inconspicua* is one of Idaho's rarest plants, known from only six occurrences in the entire state. Two occurrences were observed for the first time since 1989. One new occurrence was found in 2001. Slightly more than 1,000 plants, covering only about two acres, were observed in 2001. In contrast, over 10,000 plants were observed at three occurrences in 1989 (Moseley 1989). The species is also very rare in Nevada, where it is listed as an endangered species (Holland 1996). Although *Phacelia inconspicua* is difficult to observe, the lack of its collection from extensive areas of potential habitat between northern Nevada and southern Idaho help confirm the species' rarity (Popovich 2001). Due to the extent of potential habitat that remains inadequately surveyed, it is likely that some additional sites will be found in both Idaho and Nevada.

Overall, the imminency of threats to *Phacelia inconspicua* is mixed, but threats are of low magnitude. Direct negative impacts from livestock (e.g., direct trampling) are possible at all occurrences except Craters of the Moon (006), but adverse impacts from livestock are currently

minimal. *Bromus tectorum* may pose a competitive threat to *Phacelia inconspicua* at all occurrences, but the cover and density of this highly competitive annual is currently low within occupied habitat. Elzinga (1993) and Popovich (2001) believe that the greatest long-term threat may be exclusion of fire, preventing the removal of woody species canopies and causing loss of open microsites. Based on limited data, this scenario may be true. However, active vegetation management decisions on behalf of *Phacelia inconspicua* must carefully consider the species rarity and risk of invasion by *Bromus tectorum* or other weeds. Natural soil disturbances caused by ungulates, small mammals, erosion, or other processes are probably sufficient in the short term for maintaining and creating open microsites (Elzinga 1993).

Recommendations: Many hypotheses regarding the ecology of this annual species have been put forth, but no experimental research testing these hypotheses has been conducted. The rarity of *Phacelia inconspicua*, and lack of quantitative data regarding its ecological requirements, demand more rigorous monitoring and study. The following are recommendations for its conservation.

Monitoring, Inventory, and Research: Occasional monitoring of *Phacelia inconspicua* numbers at each occurrence is of limited value without also studying potential correlations between population levels and changes to habitat (Popovich 2001). Elzinga (1993) developed a practical, easily repeatable monitoring plan for the Craters of the Moon (006) occurrence that could be applied to all occurrences. It involves the establishment of permanent habitat monitoring transects traversing habitat occupied by *Phacelia inconspicua*. Important habitat data, such as canopy cover of woody species and area of bare ground with annuals, could be measured along the transect using a line intercept method. Permanent photo monitoring points could also be established. Habitat data can then be paired with demographic information to test for correlations, understanding that other factors (e.g., climate) also play a role in observable populations. The monitoring objective would be to better understand the relationships between *Phacelia inconspicua* and vegetation conditions in order to aid land manager decisions regarding vegetation management and conservation of this rare species. Habitat and population monitoring of all known occurrences should initially be conducted at least every two years. In addition, additional field surveys of potential habitat are needed in southern Idaho. Vast areas of un-surveyed potential habitat for *Phacelia inconspicua* exists, ranging from the Jarbidge Mountain foothills, east to the South Hills, north to the Bennett Hills, and east to the foothills of the Pioneer Mountains. Furthermore, studies on the ecology of *Phacelia inconspicua* are needed, especially relating to fire, pollination and reproduction, and competition with exotic species.

Conservation Status and Actions: *Phacelia inconspicua* should remain on the Idaho BLM Sensitive species list. Due to conservation concerns for the species, activities that would adversely affect *Phacelia inconspicua* habitat (i.e., causing severe soil and vegetation disturbance) should be avoided. I agree with a prior conservation status report recommendation (Holland 1996) that any post-fire or firebreak re-seeding/re-vegetation projects in, or adjacent to, occupied *Phacelia inconspicua* habitat be prohibited. Any future mineral exploration or developments, including access road construction, should not be allowed within occupied habitat. Similarly, salt blocks, water developments, or other range projects that would concentrate large numbers of livestock within or adjacent to occupied habitat should be prohibited. If any future monitoring reveals a clear population decline due to habitat changes, then land use activities may need to be modified in order to maintain *Phacelia inconspicua* and its habitat.

REFERENCES

- Bourgeron, P. S., R. L. DeVelice, L. D. Engeling, G. Jones, and E. Muldavin. 1992. Site and community survey manual, Version 92B. Western Heritage Task Force, Boulder, CO. 24 pp.
- Conservation Data Center, Idaho Department of Fish and Game. 2001. *Phacelia inconspicua* occurrences in Idaho. Idaho Dept. of Fish and Game, Conservation Data Center, Boise.
- Cronquist, A. 1984. *Phacelia*. Pages 157-192 in A. Cronquist, A. H. Holmgren, N. H. Holmgren, J. L. Reveal, and P. K. Holmgren, eds. Intermountain Flora: Vascular Plants of the Intermountain West, U.S.A., Vol. 4. New York Botanical Garden, Bronx.
- Day, T. A., and Wright, R. G. 1985. The vegetation types of Craters of the Moon National Monument. College of Forestry, Wildlife and Range Sciences Bulletin 38, University of Idaho, Moscow. 5 pp. plus appendices.
- Elzinga, C. L. 1990. TES plant species observation reports and field data reports for work done on the Big Butte Resource Area. Idaho Falls District, BLM.
- Elzinga, C. L. 1993. Botanical survey: Craters of the Moon, North Unit. Unpublished report prepared for National Park Service, Craters of the Moon Natl. Mon. by Alderspring Consulting.
- Hironaka, M., M. A. Fosberg, and A. H. Winward. 1983. Sagebrush-grass habitat types of southern Idaho. Forest, Wildlife, and Range Experiment Station Bulletin 35, University of Idaho, Moscow. 44 pp.
- Holland, R. F. 1996. Current knowledge and conservation status of *Phacelia inconspicua* E. Greene (Hydrophyllaceae), the obscure scorpion plant, in Nevada. Unpublished report prepared for the U.S. Fish and Wildlife Service by Nevada Natural Heritage Program, Nevada Dept. of Conservation and Natural Resources, Carson City. 30 pp. plus appendices.
- Hughes, S. S., R. P. Smith, W. R. Hackett, and S. R. Anderson. 1999. Mafic volcanism and environmental geology of the eastern Snake River Plain. Pages 143-168 in Hughes, S. S., and G. D. Thackray, editors. 1999. Guidebook to the geology of eastern Idaho. Idaho Museum of Natural History and Idaho State University Press, Pocatello.
- Idaho Native Plant Society. 2001. Results of the 17th annual Idaho Rare Plant Conference (<http://www.idahonativeplants.org/rarelist.htm>). Boise.
- Moseley, R. K. 1989. Report on the conservation status of *Phacelia inconspicua* in Idaho. Unpublished report prepared for the Idaho Dept. of Parks and Recreation by Idaho Dept. of Fish and Game, Natural Heritage Section, Boise. 18 pp. plus appendices.
- Mozingo, H. N., and M. Williams. 1980. Threatened and endangered plants of Nevada: An illustrated manual. U.S. Fish and Wildlife Service, Portland, OR. 268 pp.
- Mueggler, W. F. 1988. Aspen community types of the Intermountain Region. Intermountain Research Station General Technical Report INT-250, U. S. Forest Service, Ogden, UT. 135 pp.

- Natural Resources Conservation Service. 2001. The PLANTS Database, Version 3.1 (<http://plants.usda.gov>). U.S. Dept. of Agriculture, Natl. Plant Data Center, Baton Rouge, LA.
- Nevada Natural Heritage Program. 2001. Rare plant fact sheet: *Phacelia inconspicua* E. Greene obscure scorpion plant (www.state.nv.us/nvnhp/atlas/phaceincon.pdf). In J. D. Morefield, ed. Nevada Rare Plant Atlas. Nevada Dept. of Conservation and Natural Resources, Carson City.
- Popovich, S. 2001. *Phacelia inconspicua* resurvey, spring 2001, Craters of the Moon National Monument. Unpublished report prepared for National Park Service, Craters of the Moon National Monument by Wildhorse Consulting, Shoshone, ID. 6 pp.
- Rust, S. K., C. J. Murphy, C. L. Coulter, A. G. Tackett, and G. B. Easdale. 2001. Inventory and assessment of upland vegetation on the Pioneer Mountain Ranch. Unpublished report prepared for Lava Lake Land & Livestock (in cooperation with The Nature Conservancy and BLM) by the Idaho Dept. of Fish and Game, Conservation Data Center, Boise. 62 pp.
- Scott, F. W. 1978. Potential natural landmarks, geologic themes, on the Columbia Plateaus. Report prepared for the Heritage Conservation and Recreation Service, U. S. Dept. of Interior by Washington State University. 288 pp.
- Schuetz, B. K., and J. Chipman. 1999. Threatened and endangered species survey/inventory for the globally rare *Phacelia inconspicua* and *Muhlenbergia racemosa* in southeastern Idaho. Unpublished report prepared for the Upper Snake River District, BLM by Schuetz Consulting. 45 pp. plus maps.

APPENDIX 1

Element Occurrence Records for *Phacelia inconspicua* in Idaho.

APPENDIX 2

Maps of the locations of *Phacelia inconspicua* occurrences in Idaho.

APPENDIX 3

Maps of surveyed areas where no *Phacelia inconspicua* was found in 2001.

Submitted by:

Chris Murphy
Assistant Botanist
Conservation Data Center
Idaho Department of Fish and Game

Approved by:

Tracey Trent, Chief
Natural Resources Bureau
Idaho Department of Fish and Game