

Phacelia formosula
(North Park Phacelia)

**5-Year Review
Summary and Evaluation**



Phacelia formosula
North Park Phacelia

Carol Till, copyright 2008
Used with permission

**U.S. Fish and Wildlife Service
Western Colorado Field Office
Grand Junction, Colorado**

December 2011

5-YEAR REVIEW

***Phacelia formosula* (North Park Phacelia)**

1. GENERAL INFORMATION

1.1 Purpose of 5-Year Reviews

The U.S. Fish and Wildlife Service (Service or USFWS) is required by Section 4(c)(2) of the Endangered Species Act (ESA) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing as endangered or threatened is based on the species' status considering the five threat factors described in Section 4(a)(1) of the ESA. These same five factors are considered in any subsequent reclassification or delisting decisions. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process including public review and comment.

1.2 Reviewers

Lead Regional Office: Mountain-Prairie Regional Office
Bridget Fahey, Regional Endangered Species Chief, 303/236-4258
Seth Willey, Regional Recovery Coordinator, 303/236-4257

Lead Field Office: Western Colorado Ecological Services Field Office
Susan Linner, Project Leader for the Colorado Field Office, 303/236-4774
Ellen Mayo, Botanist, 970/243-2778, ext. 14
Gina Glenne, Botanist, 970/243-2778, ext. 20

1.3 Methodology Used to Complete the Review

Materials used as the basis for information contained in this review included field survey results, GIS maps, occurrence records, monitoring data, and threats assessments provided by the Colorado Natural Heritage Program (CNHP), Bureau of Land Management (BLM) Kremmling Field Office, Colorado Natural Areas Program (CNAP), Colorado Rare Plant Conservation Initiative (CRPCI), The Nature Conservancy (TNC), Arapaho National Wildlife Refuge (Arapaho NWR), Denver Botanic Garden (DBG), the Service, private consultants, and others. We also used Biological Assessments from Section 7 consultations. A public comment period and request for information extended from October 6 to December 6, 2008. The Center for Native Ecosystems and the Colorado BLM State botanist responded with recent information from their files.

1.4 Background

1.4.1 FR Notice Citation Announcing Initiation of This Review

73 FR 58261; October 6, 2008

1.4.2 Listing History

Original Listing

FR notice: 47 FR 38540; September 1, 1982

Entity listed: Species

Classification: Endangered range-wide

1.4.3 Associated Rulemakings

Not Applicable

1.4.4 Review History

Phacelia formosula was included in a cursory 5-year review of all species listed before 1987 and 1991 (52 FR 25523; July 7, 1987 and 56 FR 56882; November 6, 1991). Neither of these reviews recommended a change to the species' status. The species' status also was considered in the 1986 *P. formosula* Recovery Plan (USFWS 1986).

1.4.5 Species' Recovery Priority Number at Start of This 5-year Review

At the start of this review, the recovery priority number for *Phacelia formosula* was 8, indicating that: 1) populations face a moderate degree of threat; 2) recovery potential is high; and 3) the entity is listed at the species level.

1.4.6 Current Recovery Plan or Outline

Name of plan: North Park *Phacelia* (*Phacelia formosula*) Recovery Plan

Date approved: March 21, 1986

Degree of Threat	Recovery Potential	Taxonomy	Priority	Conflict
High	High	Monotypic Genus	1	1C
		Species	2	2C
		Subspecies/DPS	3	3C
	Low	Monotypic Genus	4	4C
		Species	5	5C
		Subspecies/DPS	6	6C
Moderate	High	Monotypic Genus	7	7C
		Species	8	8C
		Subspecies/DPS	9	9C
	Low	Monotypic Genus	10	10C
		Species	11	11C
		Subspecies/DPS	12	12C
Low	High	Monotypic Genus	13	13C
		Species	14	14C
		Subspecies/DPS	15	15C
	Low	Monotypic Genus	16	16C
		Species	17	17C
		Subspecies/DPS	18	18C

The above ranking system for determining Recovery Priority Numbers was established in a September 21, 1983 Federal Register notice (48 FR 43098 as corrected in 48 FR 51985; November 15, 1983).

2. REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment Policy

This section of the 5-year review is not applicable to this species because the ESA precludes listing Distinct Population Segments (DPS) of plants. For more information, see our 1996 DPS policy (61 FR 4722; February 7, 1996).

2.2 Recovery

2.2.1 Adequacy of Recovery Plan

The recovery plan has not been updated since 1986 and no longer represents the best available and up-to-date information on the biology of the species and its habitat. New research on the life history and habitat of the species is now available and should be incorporated into the plan.

While the final recovery plan does not use the word “criteria,” it does include demographic “objectives” (described in detail in section 2.2.2 below) that indicate when downlisting and delisting may be considered. We no longer view these objectives as objective and measurable because terms like “occurrences,” “secure,” “low plant numbers,” and “areas of suitable habitat,” are not further defined or quantified (USFWS 1986, p. 9).

Additionally, the recovery criteria are no longer believed adequate to gauge the status of the species relative to the ESA’s definition of threatened or endangered. For example, none of the threats that led to listing have corresponding criteria or objectives. Instead, the recovery plan includes only demographic-based recovery objectives. Such information does not allow us to determine long-term trends or determine whether population levels are likely to be maintained in the face of existing or projected threats (particularly after the ESA’s protections are removed should recovery be achieved and delisting occur). The recovery plan calls for 5 to 15 populations with 500 reproductive individuals per occurrence. This criterion was chosen because, at the time, it was believed 500 reproductive individuals in an area was a minimum viable population size (based upon science summarized in Schonewald-Cox et al. 1983, p. 392). This standard minimum was used in the absence of a population viability analysis specific to *Phacelia formosula*. A population viability analysis is typically based on basic information such as how long seeds remain in a seed bank. This type of information is presently not available for this species. Thus, it is unclear whether it was appropriate for the plan to use this standard minimum.

Therefore, we believe the recovery plan should be revised (see section 4.0 below). Regardless, the species’ status relative to these criteria are discussed below so as to show progress, or lack thereof, toward recovery.

2.2.2 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.

Objective for Downlisting

The recovery plan indicates that the species can “possibly” be downlisted when we have located and secured 5 occurrences of approximately 500 mature flowering individuals each, based on years when plant numbers are low. The 1986 recovery plan reported 2,538 plants occurring on about 203 acres (ac) (82.15 hectares (ha)) in North Park (USFWS 1986, p. 4). At that time, there were nine occurrences; however, it is unclear how occurrences were defined. Only 1 of the 9 occurrences contained more than 500 plants. These 9 occurrences have since been consolidated into 6 occurrences and 3 more occurrences were discovered between 1995 and 2010. An occurrence is now defined as those populations that are separated by either: 1 mile (mi) (1.6 kilometer (km)) or more across unsuitable habitat or altered and unsuitable areas; or 2 mi (3.2 km) or more across apparently suitable habitat not known to be occupied (CNHP 2010b, p. 1).

Surveys have not been done by consistent methods that allow us to compare years or occurrences or track a trend. The data below reflects what is available.

Of the 9 known occurrences, none have had “low” plant counts over 500; 6 have more than 500 plants that were counted in good years. One occurrence that almost meets the numeric objective contains a population that ranges between a minimum count of 375 plants and a maximum of 2,000 plants (CNHP 2010a, pp. 8-10). This occurrence has some protections as it has been designated as a BLM Research Natural Area (RNA) and State Natural Area (SNA). The area is closed to off-road vehicles (ORVs), grazing effects are monitored, and a “no surface occupancy” (NSO) stipulation applies to new mineral leases, which limits the creation of new pad sites (BLM 1986, pp. 1-32; CNAP 1987, pp. 1-6). The stipulation will not apply to pipelines that could be proposed in the future. The BLM Habitat Management Plan and the Natural Area Articles of Designation recommend protection and monitoring for the plants, but contain no additional regulations or protection guidelines. The Natural Area agreement between the CNAP and BLM can be terminated by either party with 90-day notice. A revised recovery plan should provide a more measurable and definitive downlisting criterion other than “secured.”

In summary, the downlisting criteria have not been met. Nine occurrences have been located, but only one comes close to meeting the minimum number of plants standard, and it is unclear whether this occurrence is secure.

Objective for Recovery

The recovery plan indicates that the species can be delisted when 15 occurrences are identified and determined to be secure, each containing at least 500 mature flowering individuals, based on years when plant numbers are low. This objective has not been met in terms of number of occurrences or number of plants.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology, life history, demographic features.

Phacelia formosula is a biennial plant that occurs at elevations of about 7,940 to 8,260 feet (2,420 to 2,517 meters). This plant only produces flowering plants from the previous year's rosettes (young non-flowering plants), resulting in yearly fluctuation in the number of flowering individuals. Successful reproduction depends on variations in temperature and precipitation during the previous 2 years when: 1) seeds are produced in autumn; 2) seedlings emerge and grow into rosettes in the spring or fall; 3) the rosettes overwinter; and 4) the critical transition from rosettes into mature plants occurs during the following summer (McCormick and Wu 1999, p. 5). Persistence of the rosette stage provides population stability and is the key to survival of this species. The transition from rosette to flowering stage occurs during the driest time of the year; therefore, abundance of *P. formosula* is dependent on the amount of precipitation during the transition from rosettes to flowering plants (McCormick and Wu 1999, p. 1).

Phacelia formosula plants can self-pollinate, but are typically pollinated by a variety of bees. *P. formosula* has a lower reproductive rate than the similar common species, *P. glandulosa* (glandular phacelia) (Warren 1990, p. iii). Most seedlings germinate in the spring; however, a second recruitment event can occur in the fall, if there is enough rain. Seeds are small, about 0.098 to 0.122 inch (2.5 to 3.1 millimeters) long (Atwood 2010, p. 1), and poorly dispersed (Warren 1990, p. 3). Viability of collected seeds is about 50%, but they do not germinate well in the laboratory (Warren 1990, p. iv); therefore, propagation may not be a good tool for *P. formosula*. Seeds and plants are highly responsive to weather conditions. Thousands of seedlings may emerge during a wet spring and die, along with many adult plants, during a severe drought later in the summer (CNAP 1994, p. 1; Von Loh 1994, pers. comm.).

Fluctuating population sizes in response to extreme weather cycles at 8,000 feet elevation are not unusual for biennial plants. However, life studies illustrate that *Phacelia formosula* needs protection at all of the known occurrences to provide a buffer that will allow plants to recover from extreme weather events.

2.3.1.2 Distribution, abundance, and trends.

Phacelia formosula is a narrow endemic found only in a valley called North Park in northern Colorado's Jackson County. The species is limited to specific soil outcrops composed of barren, raw exposures of the Coalmont Formation, a coal-bearing substrate that is susceptible to erosion (CNHP 2010b, p. 1).

In years when data were collected, the total number of plants counted in North Park ranged between 908 and 17,750 plants, depending on weather conditions during the current and previous year, and on whether rosettes were counted along with flowering plants (see TABLE 1). Reliable range-wide data are not available to compare the range of numbers from year to year because survey data have not been collected every year nor at every occurrence. Six years of monitoring plants on 3.8 ac (1.54 ha) at Arapaho NWR indicate a stable or slightly expanding population of plants at this specific location (Arapaho NWR 2004, p. 6).

Additionally, three occurrences of an undetermined *Phacelia* plant were discovered in 2004 approximately 20 mi (~30 km) from the North Park plants. These three occurrences in the Laramie River Valley form a disjunct population separated from the North Park plants by the Medicine Bow Mountain range (CNHP 2010b, p. 2). The Laramie River Valley plants are growing on the Niobrara formation instead of the Coalmont formation. Duane Atwood, expert on the genus *Phacelia* (Atwood 1975, pp. 170-190), collected and examined specimens in 2009 to determine whether these newly found plants are the same species as *Phacelia formosula*. Atwood has determined that the Laramie River Valley plants show a number of measurable differences in growth forms of flowers, leaves, and seeds to distinguish them as a separate species from *P. formosula*. He proposes to name the new species *Phacelia scullyi* (Atwood 2010, pp. 1-3). Additionally, the DBG is conducting a genetic comparison (see section 2.3.1.3 below). We are not including the Laramie River Valley plants in our review of *P. formosula* in North Park because the best available information at the time of this review indicates that the Laramie River plants are not *P. formosula*.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.).

No genetic research was done prior to 2009. Research was initiated by the DBG in 2009 to determine genetic diversity among six of the occurrences in North Park, and to determine the genetic relationship between North Park occurrences and the three disjunct occurrences found in the Laramie River Valley in 2004. DBG's results are not yet available (Neale 2011, pp. 1-2).

2.3.1.4 Taxonomic classification or changes in nomenclature.

No changes have been made to the taxonomy or nomenclature of this species.

TABLE 1. *Phacelia formosula* occurrences and associated threats in North Park.

Occurrence Name	Plant #s ^{1, 2} Low to High	ORV	Cattle	Weeds	Road	Rank ³	Acres ² (Hectares)	Owner ⁴	Source
Airport	17 to 1,000+	X	X	X	X	C	78.4 (31.7)	PVT CDOW	CNHP 2010a, pp. 1-3
Verner & Brownlee	31 to 350	X	X		X	B	81.4 (32.9)	BLM SWA PVT	CNHP 2010a, pp. 4-7
North Park RNA ACEC ⁴	375 to 2,000	X	X			B	46.8 (18.9)	BLM PVT	CNHP 2010a, pp. 8-10
Diamond J Ranch	150+ to 6,000+	X	X	X		A	94.5 (38.2)	BLM PVT	CNHP 2010a, pp. 11-13
California Gulch	125 to 500				X	B	67.6 (27)	BLM	CNHP 2010a, pp. 14-16
Case Flats - Potter Creek/Rockwell	200 to 5,500	X	X			A/B	85.2 (34)	BLM Arapaho NWR	CNHP 2010a, pp. 17-19
California Gulch NE	10 to NA		X			H	7.4 (2.9)	PVT	CNHP 2010a, pp. 20-21
Diamond J SWA ⁴	NA to 2,000		X	X		NA	50.4 (20.3)	BLM SWA PVT	Langton 2010a
Battleship Oil Field	NA to 400					NA	6.8 (2.7)	BLM	Langton 2010b
TOTALS	908 to 17,750						518.5 (209.8)		

(CNHP 2010a, pp. 1-21; Langton 2010a, 2010b; USFWS 2011, p. 1)

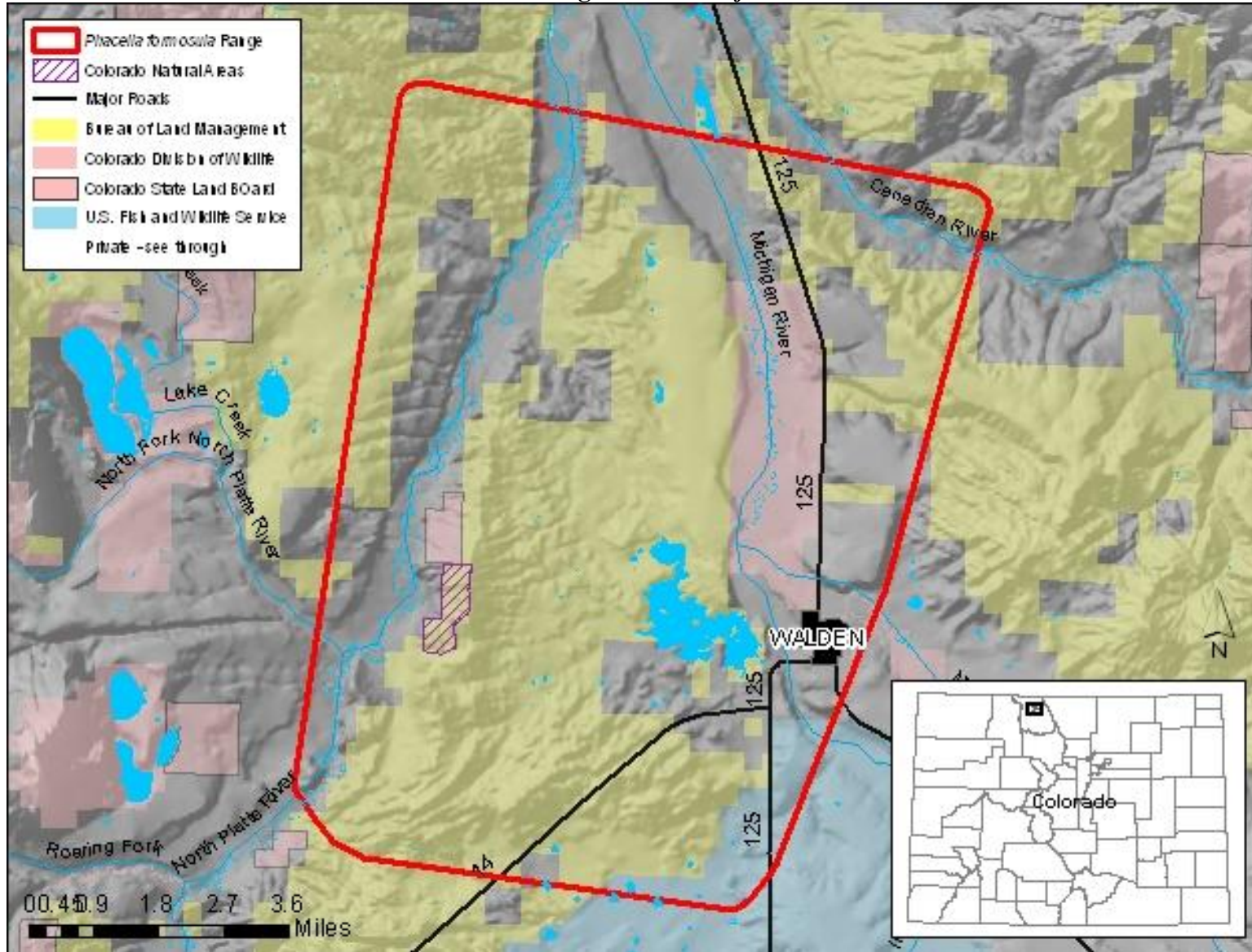
¹ The number of plants is estimated based on sample counts.

² Surveys have not been done using consistent methods. For example, some surveys counted rosettes (young non-flowering plants), while others did not. Furthermore, surveys have not been conducted routinely, thus, the available data does not allow us to compare years or occurrences or track a trend. Nevertheless, the data presented in this table reflects what is available.

³ The A rank represents *P. formosula* occurrences with the largest size, highest number of individuals, and the best quality habitat while D represents occurrences with the smallest area, low number of individuals, and the worst quality habitat (CNHP 2010b, pp. 1-2). The historical rank (H) represents an occurrence that has not been resurveyed for 20 years or more, but the habitat appears extant.

⁴ ACEC=Area of Critical Environmental Concern; CDOW=Colorado Division of Wildlife; PVT=Private; SWA=State Wildlife Area

FIGURE 1. Occurrence range of *Phacelia formosula* in Colorado.



2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms).

2.3.2.1 Factor A. Present or threatened destruction, modification or curtailment of its habitat or range.

The final listing rule and the recovery plan cite livestock grazing, trampling and trailing, motorcycle and ORV use, oil, gas and coal development, and range improvements as threats to the species.

Cattle Grazing: Grazing by cattle is ubiquitous across the range of *Phacelia formosula*. Cattle trampling and compaction of the soil and trampling of rosettes and mature plants is an ongoing threat because *P. formosula*, like most small herbaceous plants, can be severely damaged in heavily travelled areas, such as around watering areas and fences and along trails (CNAP 1996, p. 5). A few heavily impacted sites have been documented (CNHP 2010a, pp. 1, 4, 5, 9, 11, 18).

The deleterious effects of livestock on western arid ecosystems are well documented (Milchunas et al. 1992, pp. 520–531; Jones 2000, pp. 155-164). Some of the adverse effects from livestock include changes in the timing and availability of pollinator food plants (Kearns and Inouye 1997, pp. 298–299); changes to insect communities (Kearns and Inouye 1997, pp. 298–299; Debano 2006, pp. 2547–2564); damage to ground-nesting pollinators and their nests (Sugden 1985, p. 309); changes in water infiltration due to soil compaction (Jones 2000, Table 1); disturbance to soil microbiotic crusts (Belnap et al. 1999, p. 167; Jones 2000, Table 1); subsequent nonnative invasive plant invasions (Parker et al. 2006, pp. 1459–1461); and soil erosion from hoof action (Jones 2000, Table 1). Our understanding of actual grazing impacts on *Phacelia formosula* is mostly observational in nature.

At Arapaho NWR, cattle have been removed from the occupied habitat for the plants, and the plants are monitored annually. Plant numbers on monitored plots fluctuated widely between 2005 and 2011 (Johnson 2011, p. 1), probably because most of the individuals counted were rosettes, many of which do not survive through the summer. Although monitoring results show an overall decrease in plant numbers, we have no evidence that links the decrease with removal of cattle from the habitat, nor with competition from other plants. Many new plants were observed outside of the monitoring plots, so the decrease of plants in the monitoring plots may be due to the way these biennial plants emerge in new sites each year (Johnson 2011, pers. comm.).

For plants monitored on the RNA, light grazing activity does not appear to be correlated with population fluctuations (CNAP 1987, p. 4).

The holding pens and development on the private lands of Diamond J Ranch cover about 8 acres of land. About 0.35 ac (0.14 ha) of *Phacelia formosula* habitat are under this development, and these areas were presumably lost to the holding area. There is a substantial impact from livestock around the holding pen area, but the other lands on the Ranch are not heavily impacted (Glennie 2011, pers. comm.). On the Diamond J Ranch SWA (a different occurrence), “heavy grazing” was observed at seven sites within the occurrence, but the effect on plants was not documented (USFWS 2011, p. 1; Langton 2010a, pp. 1-4). Information on quantified response of *Phacelia formosula* in all growth stages to impacts from cattle trampling on plants and soil is not available. The ongoing level of threat from grazing (trampling) appears to be moderate, overall, in the entire range of *P. formosula* on private, State, and Federal lands for which we have observations available (CNHP 2010a, pp. 1-21).

Range Improvements: The recovery plan cites the potential for range improvements, such as vegetation manipulation or spraying and changing water source locations, to affect the species, although no examples were available. The effects of range improvements on occurrences of *Phacelia formosula* on private lands have not been documented due to lack of access. Weed control and its effects have not been cited as an issue on BLM or on Arapaho NWR occurrences. We consider range improvements a potential threat because future changes (such as altering water sources which forces cattle to congregate in certain areas) could impact the species.

Off-Road Vehicle: ORV use is another factor impacting *Phacelia formosula*. Other vegetation within *P. formosula* habitat is generally sparse and short, therefore presenting few barriers to ORVs. ORV tracks have been noted at five of the nine occurrences. The Airport occurrence is the most heavily impacted by ORV use. Plants still exist at this occurrence, but its viability is ranked as poor because the habitat is disturbed by ORVs and other general public uses that facilitate the introduction of nonnative invasive plants that can compete with *P. formosula* (CNHP 2010a, pp. 1-3). As on other BLM lands in western Colorado, ORV use is likely to increase (Colorado Off-Highway Vehicle Coalition 2009, p. 1-2). These activities can destroy more plants and damage habitat for *P. formosula*.

Unpaved access roads on BLM and private land cause habitat fragmentation because they create abrupt transitions in vegetation; are sources of pollutants; and act as filters (allowing some species to cross but not others) and barriers (prohibiting movement) (Spellerberg 1998, pp. 317–333). Road networks contribute to nonnative plant invasions via introduced road fill, vehicle transport of plant parts, and road maintenance

activities (Forman and Alexander 1998, p. 210; Gelbard and Belnap 2003, p. 426). Many of these invasive species are not limited to roadsides, but also encroach into surrounding habitats (Forman and Alexander 1998, p. 210; Forman 2000, p. 33; Gelbard and Belnap 2003, p. 427).

Arapaho NWR does not allow ORV use on the refuge, including the 3.8 acres of occupied habitat for *Phacelia formosula*.

The BLM Kremmling Field Office is revising their Resource Management Plan (RMP) to expand Areas of Critical Environmental Concern (ACECs) in the North Valley to protect *Phacelia formosula*. The ACEC expansion and designation would increase protection from 320 acres to more than 4,000 acres and would include four of the nine occurrences of the plant in North Park. Stipulations in the new ACEC's designation would prohibit new motorized routes (McGuire 2009b, pers. comm.) and limit ORV use to existing routes. ACECs are designated because "special status species" need special management (BLM 2007, pp. 7-8). Delisted species are kept on the BLM sensitive species list for 5 years.

Threats to plants and habitat from ORV use are ongoing at a low to moderate level (CNHP 2010a, pp. 1-13, 17-19). Impacts will likely increase with the general trend of increasing ORV use, including on BLM land if the potential ACECs are not designated to limit motorized use.

Oil and Gas Development: BLM lands in North Park have been leased for oil, gas, and coal development since before the implementation of the ESA (USFWS 1986, p. 6). Three *Phacelia formosula* occurrences have oil and gas leases that have been issued since 2001. The leases include 144.3 ac (58.4 ha) of occupied habitat for the species. Of these occupied acres, 41.3 ac (16.7 ha) are within 500 meters of wells (Glennie 2011a, pers. comm.). We do not have any indication of recent activity at these wells or leases (no Section 7 consultations).

BLM offered seven oil and gas lease parcels for sale in November 2007 that overlapped *Phacelia formosula* occurrences (Corrigan 2007, pers. comm.). The leases were subsequently deferred to protect the plants (McGuire 2009a, pers. comm.). We have not conducted Section 7 consultation on effects to the plants because no actual oil and gas development has occurred since the deferral. Currently, the level of threat from energy development in North Park is low (McGuire 2011, pers. comm.). The potential new ACEC designation in North Park proposed to protect *P. formosula* would include stipulations for NSO (McGuire 2009b, pers. comm.). This stipulation would protect the species in four occurrences from the threat of future oil and gas development. Current leases may be deferred until the BLM's RMP is in place. However, NSO stipulations may allow for exceptions. The BLM field manager can

consider exceptions to the stipulations but only for activities that would not cause adverse impacts or by its nature must be done to benefit the resource (San Juan Public Lands 2006, pp. 1-3).

Disturbance from oil and gas development is low to moderate at this time, and depends on the changing market. Six of the nine occurrences include private lands that could be open to development and would not receive protection from ACEC designation. BLM ACECs (if they are approved) and Arapaho NWR could offer protection while the species remains listed and for at least 5 years thereafter as a sensitive species. In the absence of the ESA's protections, this threat would be of higher imminence and magnitude.

Residential Development: Development of home sites on ranch land has been cited as a threat to *Phacelia formosula* (Kram et. al. 2008, p. 4). TNC has secured a conservation agreement for the species that allows a home to be built on a parcel that also has a protected area of plant habitat (Handwerk 2009, pers. comm.). Residential development is a potential threat of low magnitude that is likely to increase as more development occurs in North Park, depending on the economy.

Summary: Habitat impacts are ongoing at a high level at one occurrence, a moderate level at seven occurrences, and a low level at one occurrence (CNHP 2010a, pp. 1-21). The ongoing level of threat from grazing (trampling) appears to be moderate overall on the entire range of private, State, and Federal lands. Threats to plants and habitat from ORV use are ongoing at a low to moderate level. Energy development is currently a low level threat that could escalate rapidly. Residential development is a potential threat that also could escalate depending on the housing market. The occupied habitat on Arapaho NWR, 1% of the total occupied acreage, is the only area protected from ORV use, grazing, and residential or energy development. Overall, *Phacelia formosula* is moderately threatened by ongoing and potential impacts to more than 90% of its limited habitat.

2.3.2.2 Factor B. Overutilization for commercial, recreational, scientific, or educational purposes.

No utilization was identified in the final listing rule or the recovery plan and none is known at this time.

2.3.2.3 Factor C. Disease or predation.

The final listing rule and recovery plan state that trampling, rather than herbivory by livestock, appears to impact the species. The plant is very glandular, toxic to some human skin, has a strong odor, and probably not palatable to cattle. Herbivory on *Phacelia formosula* has not been observed during field surveys.

Seed predation by insect larvae was observed in 1980. In 1990, lepidopteran larvae were reportedly destroying half of the seed pods that were inspected. In 1993, many seed pods were destroyed by unidentified insect predation (CNAP 1994, p. 4). No information is currently available to indicate the level of threat from insect predation on seeds of *Phacelia formosula*. We find that the level of threat from seed predators is likely ongoing at a low level.

2.3.2.4 Factor D. Inadequacy of existing regulatory mechanisms.

Federal: The ESA is the primary Federal law that provides protections for *Phacelia formosula*. The ESA provides several tools to conserve the species. These are discussed below. Section 7(a)(2) requires Federal agencies to consult with the USFWS to ensure any project funded, authorized, or carries out by such agency does not jeopardize the continuing existence of a listed species, or result in the destruction or adverse modification of designated critical habitat for the species.

Section 6 of the ESA allows for cooperation between the USFWS and States in the management and funding of projects designed to enhance the conservation of federally listed species. To date, numerous research and conservation projects involving *Phacelia formosula* have been funded through Section 6 including captive propagation, status surveys, genetics research, and habitat and life history research.

The Federal Land Policy and Management Act (FLPMA) requires that the BLM prepare land use plans to manage the “use, occupancy, and development” of Federal lands, and that such planning should be done in a “periodic and systematic” manner consistent with National Environmental Policy Act (NEPA) guidelines. These FLPMA based plans are called RMPs. The FLPMA also mandates the designation of ACECs to manage areas containing truly unique and significant resource values.

The BLM Kremmling Field Office is revising their RMP to expand ACECs in the North Valley to protect *Phacelia formosula*. The ACEC expansion and designation would increase protection from 320 acres to more than 4,000 acres, and would include four of the nine occurrences of the plant in North Park. Stipulations in the new ACECs’ designation would prohibit new motorized routes (McGuire 2009b, pers. comm.). Travel would then be restricted to existing routes, which would retain ORV activity at the current low to moderate level of impact on the ACECs. ACECs are designated because “special status species” need special management (BLM 2007, pp. 7-8).

If new ACECs are created, development could still occur under approved operating plans or with exceptions, after consultation with the Service.

Under these new plans proposed by BLM, protection for *Phacelia formosula* plants and habitat is likely to increase, but the outcome of these plans is uncertain at this time.

The Arapaho NWR currently does not allow ORV use or cattle grazing on the 3.8 ac (1.5 ha) of occupied habitat that are on the refuge (Johnson 2011, p. 1; Johnson 2011, pers. comm.). This is the best known level of current protection for the species. The Comprehensive Conservation Plan for the refuge includes general management goals for *Phacelia formosula*, but no specific management plan for the species. The objective is to “Manage known populations of North Park phacelia to ensure its continued existence” (Arapaho NWR 2004, p. 68). Special management “may require fencing and plans to minimize disturbance and ensure the survival and recovery of the species” (Arapaho NWR 2004, p. 53).

In the absence of the ESA’s protections, it is unclear what level of consideration and protection Federal agencies would provide through the NEPA process.

If *Phacelia formosula* were removed from the list of threatened and endangered species, it would no longer be afforded the protections of Section 7 of the ESA. Other Federal agencies, in this case the BLM, would no longer consult with the Service on actions that could affect *P. formosula*. Threats from ORV use would likely increase because travel restrictions would not be applied specifically to protect the plant occurrences. If delisted, the species would be transferred to the BLM sensitive species list for 5 years and be protected under the guidelines of their Manual 6840 – Special Status Species Management (BLM 2008, pp. 1-48). The level of species protection offered by BLM if *P. formosula* is delisted is unclear. Experience with other sensitive species managed by the BLM has shown widely differing conservation scenarios for special status species compared to federally listed species.

State: The State of Colorado has no laws protecting rare plant species. Plants also are not included in the Colorado Wildlife Action Plan and so do not qualify for funding under the State Wildlife Grant Program. CDOW is currently working with stakeholders to consider potential revisions to the plan that may include plants (Colorado Department of Natural Resources 2009, p. 2). The Verner-Brownlee and Diamond J SWA occurrences includes three SWAs that are located on BLM and private lands to allow access for fishing and hunting (CNHP 2010a, pp. 4-7; Langton 2010a, pp. 1-4; CDOW 2009, p. 1), but they offer no additional protection for the plants.

The State of Colorado has a Natural Areas Program that works to protect special resources in the State. CNAP has provided qualitative and quantitative monitoring, research, and management recommendations for the RNA/ACEC/SNA (CNAP 1994, pp. 1-13; 1996, pp. 1-9). This support from CNAP would likely continue after delisting, dependent on

the State of Colorado’s budget and priorities. SNA agreements are voluntary and can be terminated at any time.

Private: A portion of one occurrence on private land is now in a permanent conservation easement with TNC. In 2009, an estimated 200 *Phacelia formosula* plants were found on the lands under the conservation easement (Handwerk 2009, pers. comm.). Other occurrences located on private lands have no protection unless Federal funding or permitting is involved. Without listed status, no permits would be needed and the impetus to develop additional conservation easements could be low.

Summary: Prior to listing, *Phacelia formosula* had no significant State or Federal protections. Listing enabled the USFWS to provide review of Federal actions potentially impacting the species. Much of the habitat occupied by *P. formosula* is under private ownership, and long-term impacts from ranching land use and land cover changes persist.

2.3.2.5 Factor E. Other natural or manmade factors affecting its continued existence.

Rarity: The final listing rule and the recovery plan state that any human threats to this species would exacerbate the possibility of small populations going extinct through natural population fluctuations. They also cite lack of species occurrence and environmental data and uninformed land managers, administrators, and landowners as contributing to risk factors. Given current population levels, these factors remain a concern.

Climate change: Climate change is a potential threat to *Phacelia formosula* because the species is highly sensitive to changes in precipitation and temperature. Typical future summer monthly temperatures will be as warm as or warmer than the hottest 10% of summers that occurred between 1950 and 1999 (CWCB 2009, p. 1).

TABLE 2. Climate Trends at the Walden Weather Station (1897-2010)

Data Period(s)	1897-1905; 1938-2010
Change in Average Annual Temperature (°F)	+ 1.3
Approximate Change in Temperature per Century	+ 1.1
Change in Average Annual Precipitation (inches)	+ 5
Approximate Change in Precipitation per Century	+ 4.4

(High Plains Regional Climate Center 2011, pp. 1-34; USFWS 2011d, pp. 1-72)

No consistent long-term trends in annual precipitation have been detected in all parts of Colorado. Variability is high, which makes detection of trends difficult (CWCB 2009, p. 1). Climate model projections do not agree as to whether annual mean precipitation will increase or decrease by 2050 (CWCB 2009, p. 1).

Current climate modeling is not accurate to the level that we can predict the amount of temperature and precipitation change within the limited range of *Phacelia formosula*. Therefore, this discussion generally addresses what could happen under the current general predictions. However, we would need refinement of the current predictions to draw more reliable conclusions concerning the effects of climate change on the species.

Phacelia formosula is particularly sensitive to precipitation and temperature during germination, seedling and rosette growth, and especially while developing into flowering adults at the height of summer heat and drought (McCormick and Wu 1999, p. 5). Thousands of seedlings germinated in the RNA in 1993 after a very wet spring, but were destroyed by drought during the summer along with many mature plants. Fall recruitment of new seedlings was low (CNAP 1994, p. 1; Von Loh 1994, pers. comm.). *P. formosula* also is sensitive to extreme weather events, such as the thunderstorms that are common in North Park which can cause rill and sheet erosion and carry away the *P. formosula* plants. These events tend to be localized, devastating one site without damaging others. After observing the effects of such a storm, CNAP researchers recommend protective management for all occurrences of *P. formosula* as a buffer against losing many plants in one area (CNAP 1994, p. 1). *P. formosula* also will be affected by climate change indirectly because the seeds do not disperse widely and the plants only grow on specific soil types within a small geographic range. *P. formosula* is typically unable to colonize other habitats that separate occurrences.

In short, *Phacelia formosula* biological traits suggest a natural vulnerability to climate change that warrants further monitoring.

2.4 Synthesis

We conclude that *Phacelia formosula* should remain listed as endangered under the ESA. *P. formosula* is restricted to outcrops of the Coalmont formation. Only nine occurrences totaling 518 ac (209 ha) are known, and all are smaller than 95 ac (38 ha). Furthermore, most of these occurrences support small populations and none of the 9 known occurrences have satisfied the recovery plan's requirement of "low" plant counts at least 500 individuals. Most importantly, all of the known occurrences face meaningful threats.

The original recovery plan lists livestock grazing, trampling and trailing, motorcycle and ORV use, and oil, gas and coal development as the primary threats to the species. These threats are ongoing. Livestock uses disturb the soil and destroy plants at varying times and locations on all but 1% of the occupied habitat. Oil and gas development is currently slow in North Park, but more than 28% of the occupied habitat have been leased for oil development since 2001 (Glennie 2011, pers. comm.). ORV use within occupied habitat remains a low-level threat across nearly all of the species' range. Overall, *Phacelia*

formosula is moderately threatened by ongoing and potential impacts to more than 90% of its limited habitat.

Climate change is another concern. *Phacelia formosula* populations are known to fluctuate dramatically from year to year because young plants are highly sensitive to North Park weather extremes, and mature plants die after producing seeds. Pollinators help to increase seed production, and seeds do not disperse widely. These traits make climate change a concern because fewer recruits are likely to survive extremes of heat and precipitation to replenish the population each year. Specific soil requirements increase vulnerability to these threats because populations cannot migrate between occurrences.

However, some progress has been made toward recovery. For example, in 2009 TNC recorded a conservation easement on a 1-mile stretch of private property along a Coalmont outcrop that supports about 200 plants. Similarly, on the Arapaho NWR 3.8 ac (1.5 ha) of occupied habitat are currently protected from ORV use and cattle grazing. Finally, the BLM is proposing two new ACECs for *Phacelia formosula* in a draft RMP revision, which would include four of the nine North Park occurrences. However, the protections offered by ACECs are subject to exceptions and are only currently envisioned to remain in effect while the species is listed and for 5 years thereafter. Nevertheless, these protections are advancing recovery.

Research on the biology and habitat needs of *Phacelia formosula* has been supported, gathered, and used by BLM, CNAP, CNHP, Arapaho NWR, TNC, DBG, and the Service. The CRPCI was recently formed to facilitate recovery planning and outreach to private landowners and local governments. This new initiative has identified North Park as a Priority Action Area needing immediate conservation action to address threats to prevent extinction or curtail further losses of imperiled plant species (Kram et al. 2008, pp. 1-17). The welcome increase in research efforts carried out by involved parties should lead to improved recovery status for the species in the future. While ongoing recovery efforts are encouraging, the species has not achieved recovery and remains endangered.

3. RESULTS

3.1 Recommended Classification

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

3.2 New Recovery Priority Number: 8 (no change)

Brief Rationale: Threats facing the species are moderate and ongoing across the entire range of the species. Recovery potential is high because: we understand the biological

and ecological limiting factors; and recovery will depend primarily on protecting habitat at known occurrences without the need for intensive intervention such as propagation and assisted migration. The species is impacted by cattle production and energy development, but not to the extent of conflicting with these economic activities.

4. RECOMMENDATIONS FOR FUTURE ACTIONS

Partners (acronym used below): Private land owners, BLM, USFWS, CDOW, CNAP, NRCS, National Center for Genetic Resources Preservation (NCGRP), TNC, Land Trusts, CNHP; DBG, and Arapaho NWR.

Administrative Actions (USFWS)

- The recovery plan for *Phacelia formosula* should be revised so that it reflects the best scientific and commercial information available. The revised recovery plan should include objective, measurable criteria which, when met, will result in a determination that the species be removed from the Federal List of Endangered and Threatened Plants. Recovery criteria should address all threats impacting the species. The recovery plan also should estimate the time required and the cost to carry out those measures needed to achieve the goal for recovery and delisting. Finally, the recovery plan should evaluate and map geographic areas essential for the conservation of *P. formosula*.

Conservation Actions (all partners)

- Work with the CRPCI to develop a list of recovery priorities and implement conservation actions.
- Develop conservation agreements and easements with partners such as land trusts, TNC, NRCS, CNAP, and Partners for Fish and Wildlife to protect *Phacelia formosula* on private lands across the entire range of the species.

Surveys and Monitoring

- Inventory unsurveyed suitable and potential habitat for *Phacelia formosula* on public and private lands. Report results to CNHP, BLM, and USFWS. These surveys will provide better information to guide recovery and conservation actions as well as project planning. (all partners)
- Monitor phenology of the plants and log weather patterns to inform climate change studies. (all partners)
- Develop and implement a long-term range management monitoring plan to guide grazing management for protection of *Phacelia formosula* habitat. (all partners, BLM lead)
- Establish and implement a range-wide trend monitoring protocol. (all partners, BLM lead)

Threats Abatement

- Control the location and timing of livestock movement and concentration to minimize impacts to the species. (BLM)
- Regularly monitor impacts from ORV use. If impacts from ORV use are detected, work with the land manager on reducing those effects. (BLM, USFWS, CNAP, CNHP)

Management Actions

- BLM plans to expand the existing ACEC and create new ACECs to include contiguous occupied and suitable habitat for the plant and its pollinators. Oil leases have been deferred within the potential ACECs until the new RMP is final. (BLM)
- Work with the BLM Kremmling Field Office to develop and implement consistent conservation measures in the RMP revision that will avoid and minimize impacts to *Phacelia formosula* and its habitat from livestock trampling, ORV activities, and energy development. (USFWS)

Research (unless otherwise noted, partners and contractors are to be determined)

- Continue ongoing seed collection, germination testing, and long-term storage and preservation of seeds. (DBG, NCGRP)
- Undertake a study to improve understanding of dormancy characteristics in *Phacelia formosula* seed banks.
- Conduct a study to identify pollinators and their habitat needs.
- Perform long-term study of local changes in weather patterns and effects on plants.
- Study livestock impacts on plants and habitat.
- Complete the analysis of the genetic relationship between *Phacelia formosula* and *Phacelia scullyi* (the population of *Phacelia* discovered in the Laramie River Valley approximately 20 mi (~30 km) north of known *Phacelia formosula* populations). (DBG)

Outreach

- Reach out to Jackson County, the town of Walden, the State of Colorado, applicable Federal agencies, and other potential stakeholders with information about the plants, habitat requirements, and known locations in order to proactively engage partners to ensure that projects avoid impacts to *Phacelia formosula*.
- Educate private landowners about the plant and how they can help protect the species.

5. REFERENCES

Arapaho National Wildlife Refuge. 2004. Comprehensive Conservation Plan. Walden, CO. 183 pp.

Atwood, N.D. 1975. A Revision of the *Phacelia Crenulatae* Group (Hydrophyllaceae) for North America. Great Basin Naturalist 35(2):127-190.

Atwood, N.D. 2010. Unpublished Progress Report on *Phacelia formosula* in North Park, Jackson County, Colorado and the Scully *Phacelia* in Larimer County, Colorado. Prepared for U.S. Fish and Wildlife Service, Grand Junction, CO. 3 pp.

Belnap, J., J. Williams, and J. Kaltenecker. 1999. Structure and Function of Biological Soil Crusts. Pacific Northwest Forest and Rangeland Soil Organisms Symposium, Technical Report. 18 pp.

Bureau of Land Management. 1986. North Park *Phacelia* Research Natural Area Habitat Management Plan. Kremmling Resource Area. 32 pp. including appendices.

Bureau of Land Management. 2007. Draft Resource Management Plan Revision, Areas of Critical Environmental Concern, Glenwood Springs and Kremmling Field offices. 71 pp.

Bureau of Land Management. 2008. Manual 6840 Special Status Species Management. Revised December 12, 2008. 48 pp.

Colorado Department of Natural Resources. 2009. Colorado Wildlife Action Plan. Accessed online at: <http://wildlife.state.co.us/WildlifeSpecies/ColoradoWildlifeActionPlan/> on September 9, 2009. 2 pp.

Colorado Division of Wildlife. 2009. State Wildlife Areas-Brownlee and Verner. Accessed online at: <http://wildlife.state.co.us/LandWater/StateWildlifeAreas/> on September 18, 2009.

Colorado Natural Areas Program. 1987. *Phacelia formosula* 1987 Performance Report. Denver, CO. 6 pp.

- Colorado Natural Areas Program. 1994. Population Ecology of *Phacelia formosula* - 1993 Performance Report. Denver, CO. 13 pp.
- Colorado Natural Areas Program. 1996. Population Ecology of *Phacelia formosula* - 1995 Performance Report. Denver, CO. 9 pp.
- Colorado Natural Heritage Program. 2010a. *Phacelia formosula* Element Occurrence Records. Biological and Conservation Data System, Fort Collins, CO. 21 pp.
- Colorado Natural Heritage Program. 2010b. Element Global Rank Report for *Phacelia formosula*. Colorado State University, Fort Collins. 4 pp.
- Colorado Off-Highway Vehicle Coalition. 2009. Economic Contribution of Off-Highway Vehicle Recreation in Colorado, Lakewood, CO. Executive summary. 6 pp. Accessed online at: https://cohvco.org/forms/2009_Economic_Contribution_Exec_Summary.pdf, on July 10, 2011.
- Colorado Water Conservation Board. 2009. Climate Change in Colorado. Accessed online at: http://wwa.colorado.edu/CO_Climate_Report/CO_Climate_Report_onepager.pdf, on September 15, 2009.
- Debano, S.J. 2006. Effects of livestock grazing on aboveground insect communities in semi-arid grasslands of southeastern Arizona. *Biodiversity and Conservation* 15:2547-2564.
- Forman, R.T.T. 2000. Estimate of the Area Affected Ecologically by the Road System in the United States. *Conservation Biology*, Vol. 14, No. 1, pp. 31-35.
- Forman, R.T.T., and L.E. Alexander. 1998. Roads and their major ecological effects. *Annual Review of Ecology and Systematics* 29:207-231 plus C2.
- Gelbard, J.L., and J. Belnap. 2003. Roads as conduits for exotic plant invasions in a semiarid landscape. *Conservation Biology* 17:420-432.
- Jones, A. 2000. Effects of cattle grazing on North American arid ecosystems: a quantitative review. *Western North American Naturalist* 60:155-164.
- Kearns, C.A., and W. Inouye. 1997. Pollinators, flowering plants, and conservation biology. *BioScience* 47:297-307.
- Kram, M., B. Neely, and S. Panjabi. 2008. Rare Plant Conservation Planning Workshop: North Park Priority Action Area. Prepared by The Nature Conservancy and the Colorado Natural Heritage Program. Unpublished report prepared for the National Fish and Wildlife Foundation. 17 pp.
- Langton, A. 2010a. *Phacelia formosula* survey at Diamond J State Wildlife Area. Colorado Natural Heritage Program Plant Element Occurrence Field Form. 4 pp.

- Langton, A. 2010b. *Phacelia formosula* survey at Battleship Oil Field. Colorado Natural Heritage Program Plant Element Occurrence Field Form. 4 pp.
- McCormick, J.F., and X. Wu. 1999. Population Dynamics of *Phacelia formosula* and Hypotheses Regarding the Narrow Endemism of This Endangered Species. Unpublished report prepared for Colorado Natural Areas Program, Denver, CO. 31 pp.
- Milchunas, D.G., W.K. Lauenroth, and P.L. Chapman. 1992. Plant competition, abiotic, and long- and short-term effects of large herbivores on demography of opportunistic species in a semiarid grassland. *Oecologia* 92:520-531.
- Neale, J. 2011 *Phacelia formosula*: Surveys, Population Assessment, and Assessment of Genetic Diversity. Annual report to U.S. Fish and Wildlife Service under Agreement No. 601819J312. 2 pp.
- Parker, J.D., D.E. Burkepile, and M.E. Hay. 2006. Opposing effects of native and exotic herbivores on plant invasions. *Science* 311:1459-1461.
- San Juan Public Lands. 2006. San Juan Plan Revision, Public Lands Oil and Gas Leasing Analysis Overview. Prepared for Public Meetings, May 2006. 3 pp.
- Schonewald-Cox, C.M., S.M, Chambers, B. MacBryde, and L. Thomas. 1983. Genetics and Conservation. A reference for managing wild animal and plant populations. 469 pp.
- Spellerberg, I.F. 1998. Ecological effects of roads and traffic: A literature review. *Global Ecology and Biogeography Letters* 7:317-333.
- Sugden, E.A. 1985. Pollinators of *Astragalus monoensis* Barneby (Fabaceae): new host records; potential impact of sheep grazing. *Great Basin Naturalist* 45:299-312.
- U.S. Fish and Wildlife Service. 1986. North Park Phacelia (*Phacelia formosula*) Recovery Plan. U.S. Fish and Wildlife Service, Denver, CO. 28 pp.
- U.S. Fish and Wildlife Service. 2008. 73 FR 58261 Endangered and Threatened Wildlife and Plants; 5-Year Reviews of Three Wildlife Species and Eight Plant Species in the Mountain-Prairie Region, October 6, 2008. 2 pp.
- Warren, K.D. 1990. A Comparative Study of the Reproductive Biology of a Rare and a Common Phacelia Species. M.S. Thesis, Biology Department, Colorado State University, Fort Collins. 60 pp.
- U.S. Global Change Research Program. 2011. Global Climate Change Impacts in the U.S. <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/full-report/regional-climate-change-impacts>. Accessed July 7, 2011.

Personal Communications

- Corrigan, M. 2007. Center for Native Ecosystems, Denver, CO. E-mail: List of oil and gas lease parcels on *Phacelia formosula* habitat in North Park. Received by U.S. Fish and Wildlife Service, Western Colorado Field Office, October 22, 2007.
- Glenne, G. 2011a. U.S. Fish and Wildlife Service Western Colorado Field Office. E-mail: GIS analysis of aerial imagery of holding pens and development on the private lands of the Diamond J Ranch. April 6, 2011.
- Glenne, G. 2011b. U.S. Fish and Wildlife Service Western Colorado Field Office. E-mail: GIS analysis of oil and gas lease parcels on *Phacelia formosula* habitat in North Park, using information from Corrigan and McGuire. April 4, 2011.
- Handwerk, J. 2009. Colorado Natural Heritage Program, Colorado State University, Fort Collins. E-mail; conservation easement by The Nature Conservancy. Received by U.S. Fish and Wildlife Service, Western Colorado Field Office, August 6, 2009.
- Johnson, P. 2011. Arapaho National Wildlife Refuge, Walden, CO. E-mail: Grazing on Arapahoe at the *Phacelia formosula* populations, shapefiles. Received by U.S. Fish and Wildlife Service, Western Colorado Field Office, April 6, 2011.
- McGuire, M. 2009a. Bureau of Land Management Kremmling Field Office, Colorado. E-mail: deferred oil and gas leases. Received by U.S. Fish and Wildlife Service, Western Colorado Field Office, August 24, 2009.
- McGuire, M. 2009b. Bureau of Land Management Kremmling Field Office, Colorado. E-mail: ACEC stipulations. Received by U.S. Fish and Wildlife Service, Western Colorado Field Office, August 27, 2009.
- McGuire, M. 2011. Bureau of Land Management Kremmling Field Office, Colorado. E-mail: Geospatial data on grazing allotments and water sources, oil and gas leases and wells. Received by U.S. Fish and Wildlife Service, Western Colorado Field Office, April 8, 2011.
- Von Loh, J.D. 1994. Colorado Natural Areas Program, Denver, CO. Letter: summary 1993 results from research at North Park Natural Area. Received by U.S. Fish and Wildlife Service, Colorado Field Office, January 7, 1994.

**U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Phacelia formosula* (North Park Phacelia)**

Current Classification: Endangered range-wide


Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Review Conducted By: Ellen Mayo, Western Colorado Ecological Services Office

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve: 
Field Supervisor, Colorado Ecological Services Office

Date 1/3/12

REGIONAL OFFICE APPROVAL:

Lead Assistant Regional Director, Fish and Wildlife Service

Approve: 
Assistant Regional Director-Ecological Services, Region 6

Date 1/11/12