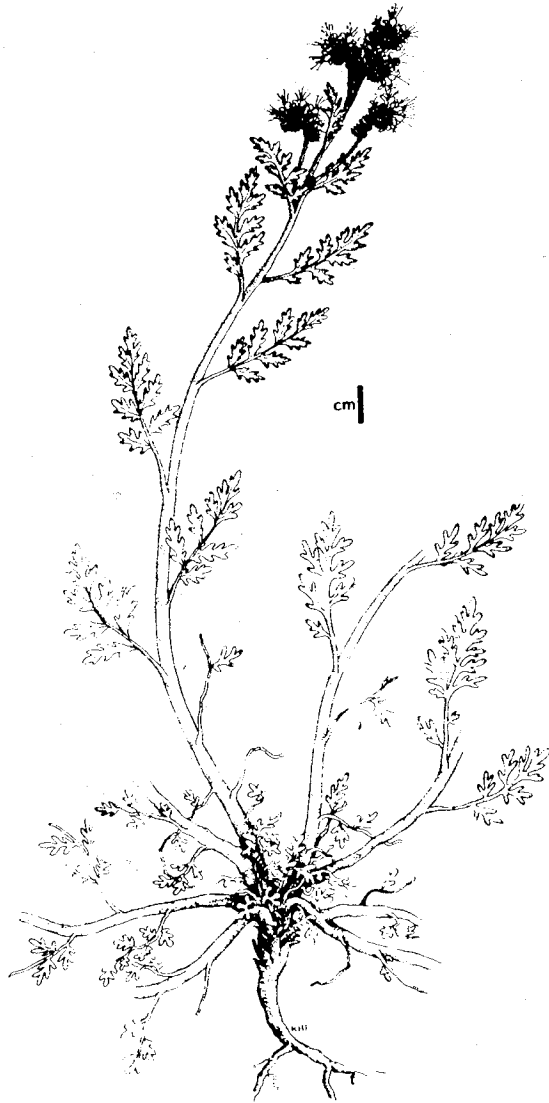


NORTH PARK PHACELIA

(Phacelia formosula)

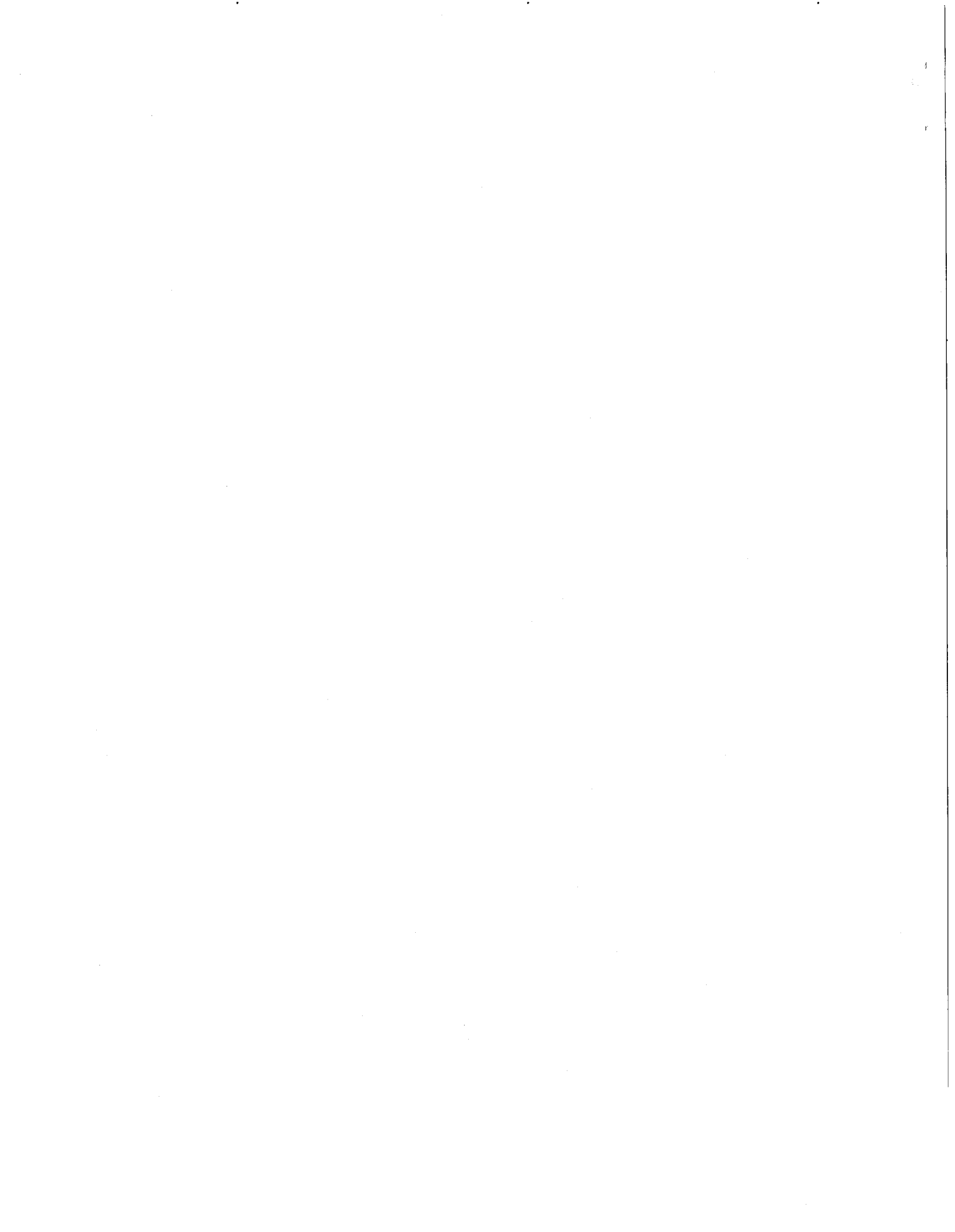
RECOVERY PLAN



U.S. FISH AND WILDLIFE SERVICE

DENVER, COLORADO

1986



NORTH PARK PHACELIA

Phacelia formosula

RECOVERY PLAN

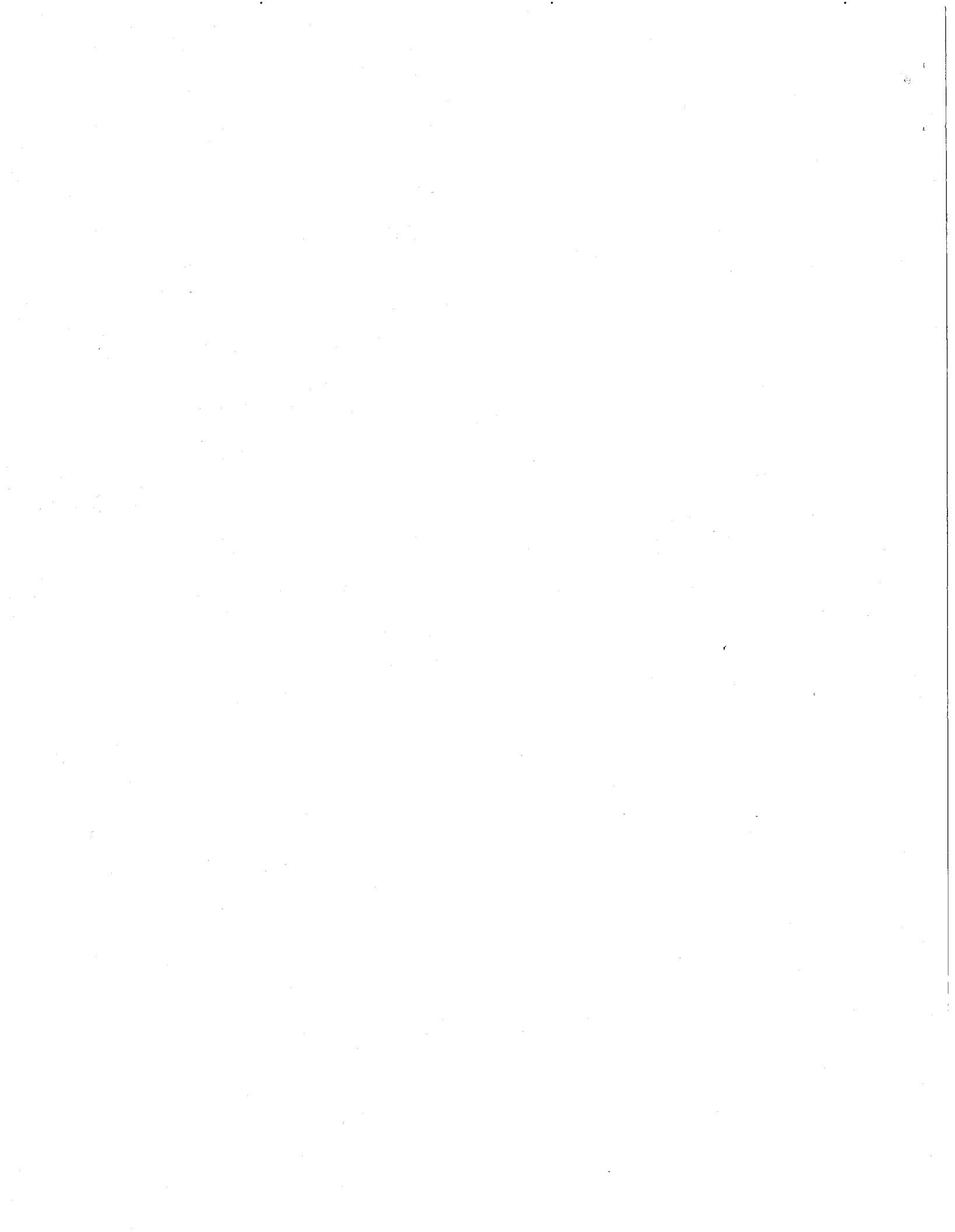
Prepared by  
Region 6  
U.S. Fish and Wildlife Service  
Denver, Colorado

APPROVED:

*Robert B. Entelkamp*

Regional Director, Region 6, U.S. Fish & Wildlife Service

DATE: 3-21-86



This is the completed North Park Phacelia Recovery Plan. It has been approved by the U.S. Fish and Wildlife Service. It does not necessarily represent official positions or approvals of cooperating agencies and does not necessarily represent the views of all who played a role in preparing this plan. This plan is subject to modification as dictated by new findings, changes in species status, and completion of tasks described in the plan. Goals and objectives will be attained and funds expended contingent upon appropriations, priorities, and other constraints.

Acknowledgements should read as follows:

The North Park Phacelia Recovery Plan, dated March 21, 1986, prepared by the U.S. Fish and Wildlife Service, Grand Junction Field Office, Grand Junction, Colorado, in cooperation with J. Scott Peterson of the Colorado Natural Heritage Inventory, Karen L. Wiley-Eberle of the Bureau of Land Management, and the North Park Phacelia Recovery Committee.

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Susan Martin, Chairperson	Colorado Native Plant Society
Sydney Macy	The Nature Conservancy
Prill Mecham	Bureau of Land Management
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Merle Moore	Denver Botanic Gardens
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Literature Citations should read as follows:

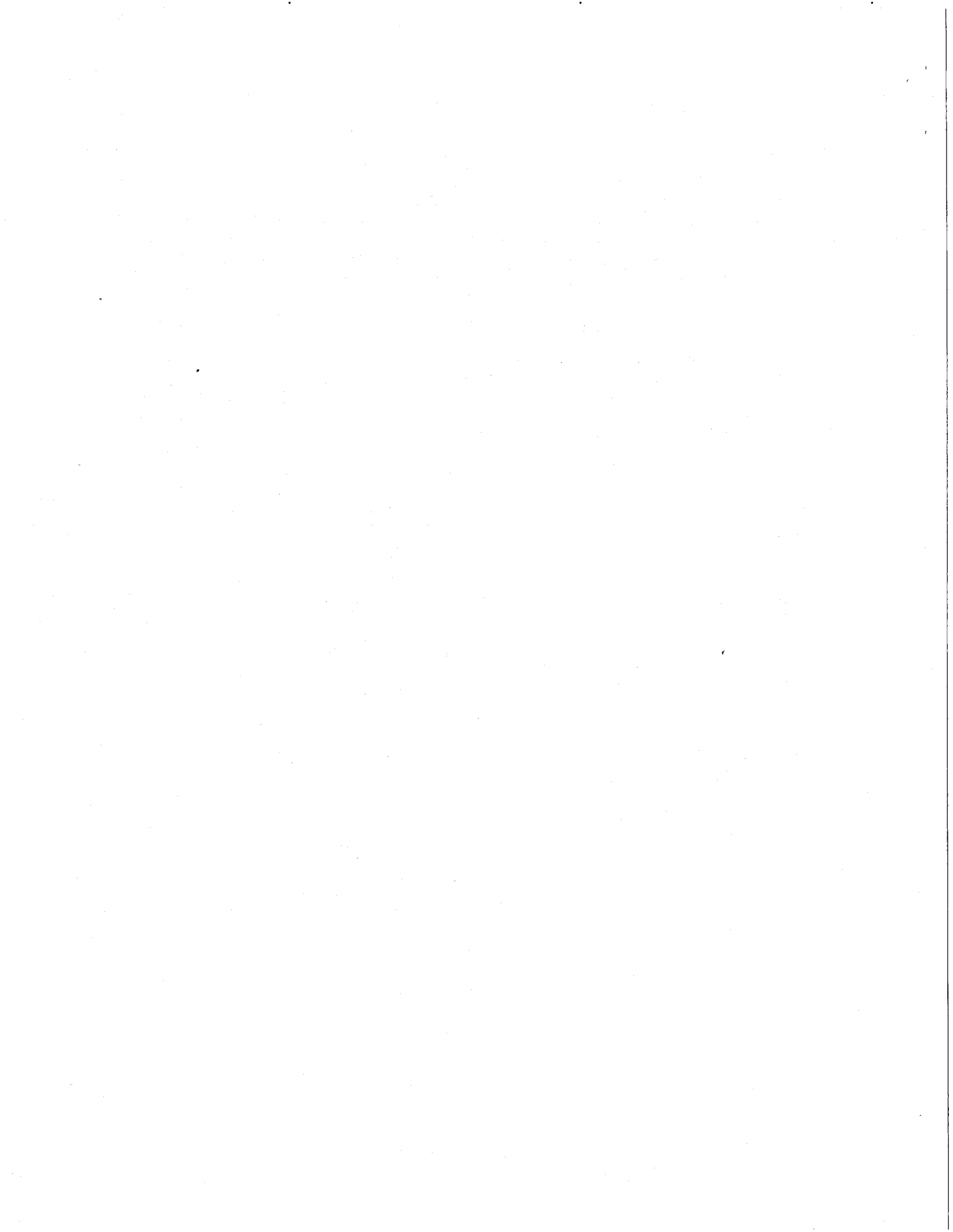
U.S. Fish and Wildlife Service. 1986. North Park Phacelia Recovery Plan. U.S. Fish and Wildlife Service, Denver, Colorado. 28 pp.

Additional copies may be purchased from:

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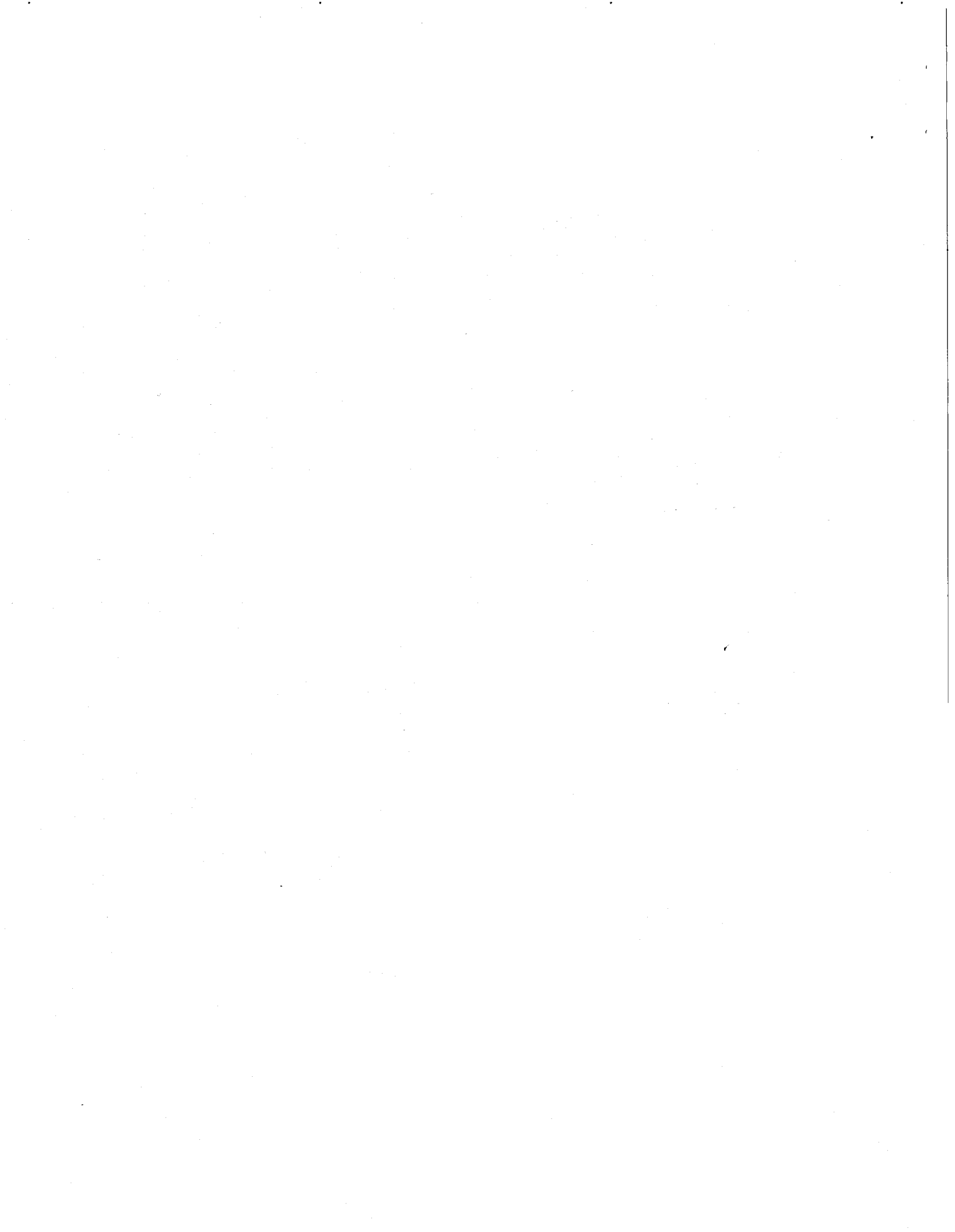
Cover drawing by Kaye H. Thorne, Brigham Young University, Utah.



## ACKNOWLEDGEMENTS

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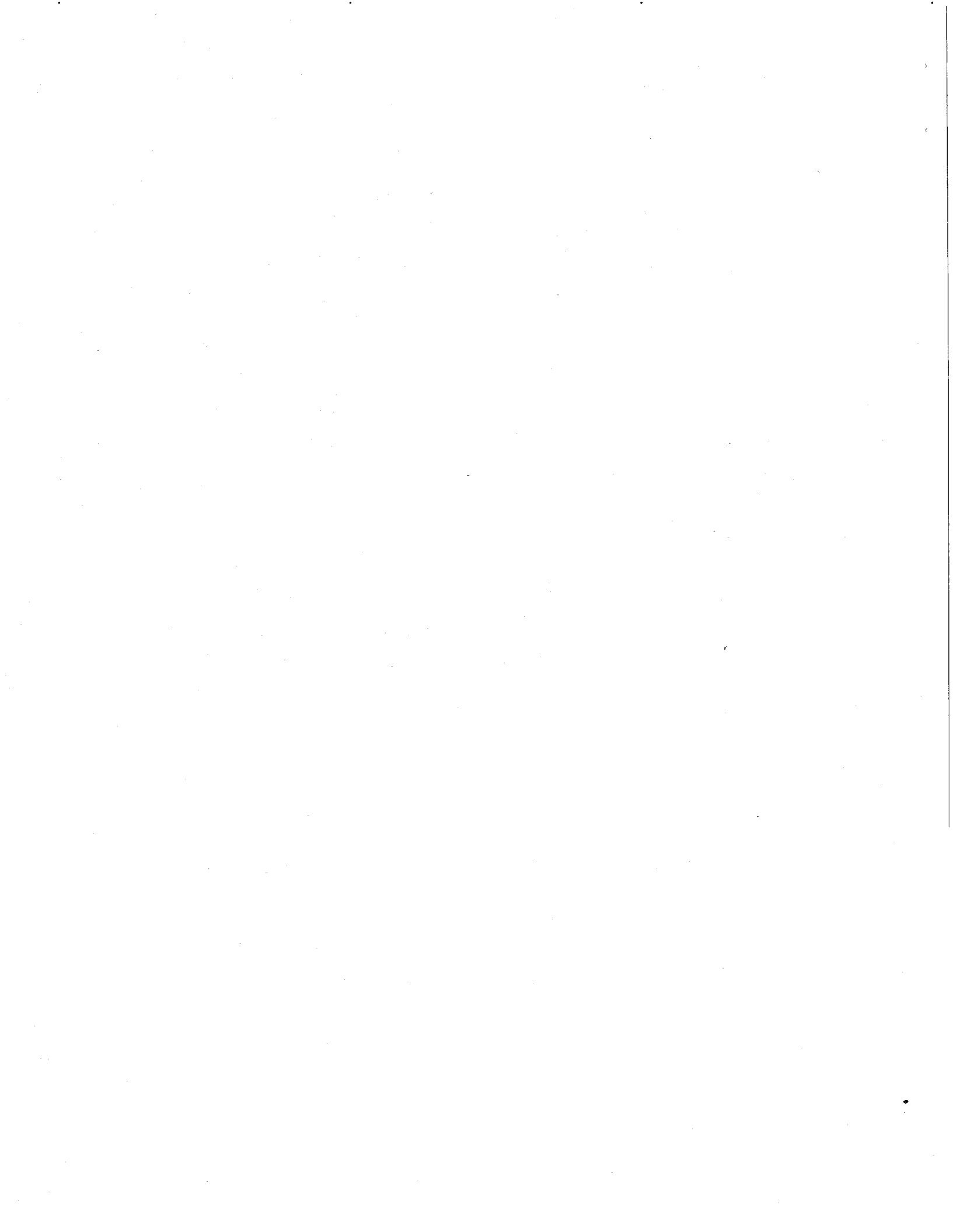
We gratefully acknowledge the contributions of the many individuals who have contributed toward the knowledge and conservation of the North Park phacelia and its habitat. These include the following people: George Osterhout, Harold Belisle, William L. Baker, William A. Weber, Susan Allard, John Anderson, Miriam Denham, Carol Russell, Joyce Walker, Ralph and Olive Swift, the Recovery Committee members, and reviewers.





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## PART I

### INTRODUCTION

#### History

George Osterhout, an early Colorado botanist from Windsor, Colorado, collected the type specimen of Phacelia formosula on August 6, 1918, near Walden, Colorado (Jackson County), along the road descending to Michigan Creek (Osterhout 1919). This locality corresponds to Occurrence 001 (Figure 1). Later collections were made here by Osterhout, D. Keck, H. Ripley, and R. Barneby. P. formosula was treated as a full species in the most recent monograph of the Phacelia Crenulatae Group (Atwood 1975).

In 1979, Karen L. Wiley-Eberle of the Bureau of Land Management (Bureau), and William A. Weber (University of Colorado) collected at the type locality and searched Michigan Creek southeast of Walden. As a result of this work, Karen L. Wiley-Eberle compiled a status report (Wiley 1979) for the U.S. Fish and Wildlife Service (Service). This status report was updated by Anderson (1982) based on the following field work prior to the final listing of the taxon.

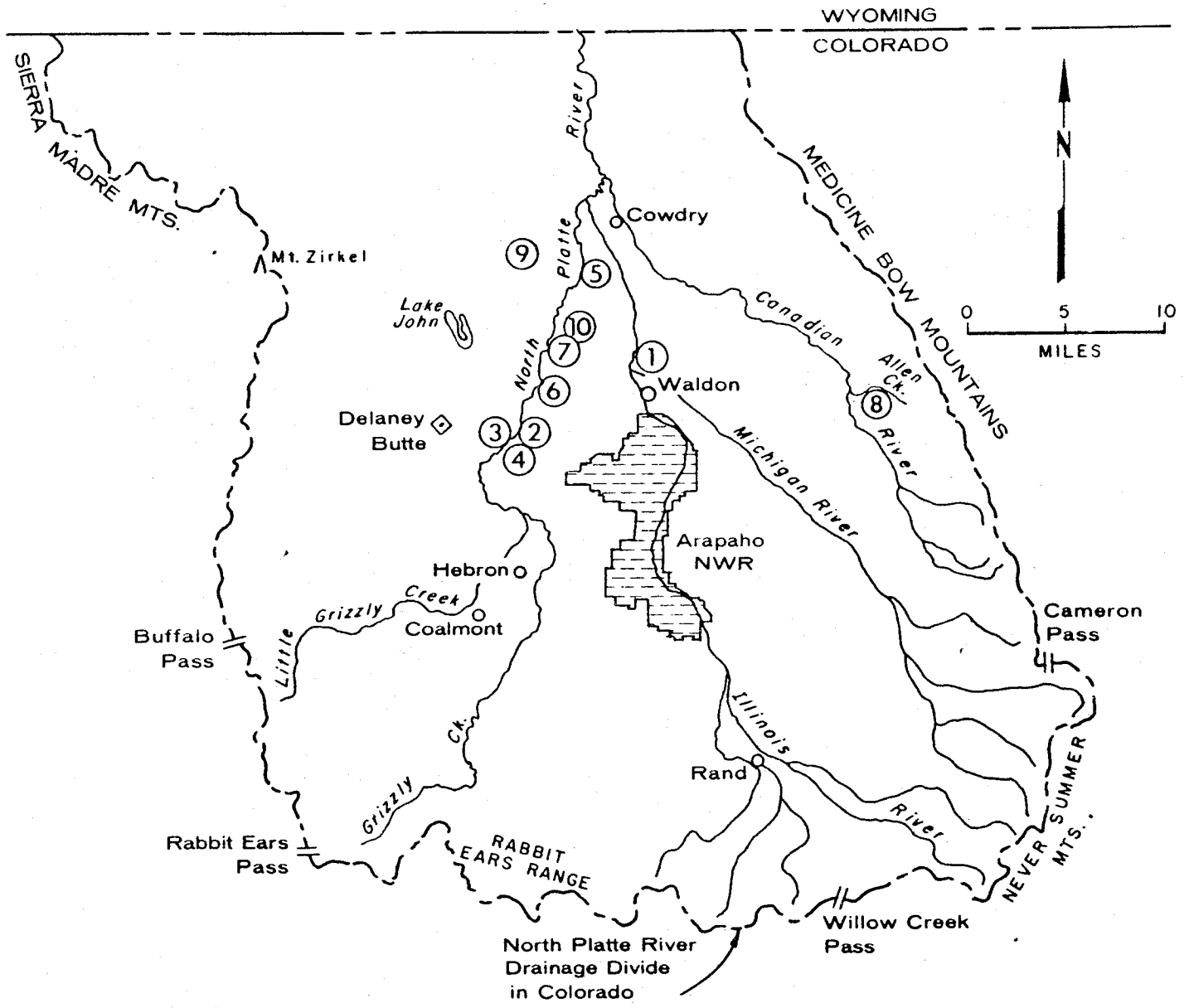
In June 1981, a field survey team consisting of J. Scott Peterson and William L. Baker (Colorado Natural Heritage Inventory), Karen L. Wiley-Eberle, and John Anderson (Service) located sites 002-004 on exposures of the Coalmont formation along the North Platte River near Delaney Buttes based on a report by Miriam Denham (pers. comm. 1981). In August of 1981, Joyce Walker and Susan Allard (Bureau) conducted some additional surveys and located Occurrences 005-007 and additional potential habitat. In October, Peterson, Baker, Allard, and Anderson mapped all presently known occurrences and gathered data for a preserve design (Baker 1981).

In the September 2, 1980, Federal Register (45 FR 58168-58171), the Service published a proposed rule for this species. The Service published the final rule determining that P. formosula was an endangered species on September 1, 1982 (47 FR 38540-38543).

#### Description

P. formosula appears to be most closely related to P. glandulosa Nutt., but can be distinguished from that species by its usually much-branched, erect to spreading habit, less exerted stamens and style, darker seeds, narrower calyx lobes, and more pubescent style (Atwood 1975).

P. formosula is a biennial (or possible short-lived perennial), 15-22 cm high, up to 30 cm broad; stems single from the base or branched throughout (especially at base), glandular and hirsute, somewhat grayish; leaves lanceolate or elliptical, 3-7 cm long, 1-3 cm wide, pinnately divided, strigose, hirsute and glandular; inflorescence of compound helicoid cymes, cymes up to 5 cm long in fruit, and more densely glandular than the stems; sepals 3.2-3.8 mm long, 0.5-0.8 mm wide, glandular and hirsute; corolla



○ Occurrence of North Park Phacelia

**Fig. 1 DISTRIBUTION OF NORTH PARK PHACELIA**

campanulate, violet, 6 mm long, 6 mm wide, slightly glandular and pilose; stamens and style long-exserted; style approximately 2 mm longer than the stamens and puberulent throughout; capsule oblong to oval, 3.5 mm long, glandular and hirsute; mature seeds 4, oblong, dark brown, 2.5-3 mm long, 1.2-1.4 mm wide, excavated ventrally on each side of the ridge, pitted on both surfaces, margins rounded and smooth (Atwood 1975).

### Past and Present Distribution

The species was first collected in 1918 along Michigan Creek and collected again at the same site (the type locality) by other botanists in following years. It was not until 63 years later, in 1981, that additional localities along the North Platte River were discovered (Figure 1). Presently, there are nine known locations for this plant. Only two of the nine sites apparently harbor significant numbers, as shown in Table 1.

Individuals at each site are found in groups or clusters with several meters between groups. The known geographical distribution of the species is within the State of Colorado, County of Jackson, North Park region, from Michigan Creek west to the North Platte River.

The floor of North Park occupies about 600 square miles. Approximately 100 person-days have been spent by numerous botanists in the past 5 years on the general collection of the flora and specific searches for P. formosula habitat. Though this represents a considerable effort, the data should not be considered as conclusive.

When the first status report for P. formosula was written in 1979, the only known occurrence was Occurrence 001. At the time of listing, the knowledge of the species encompassed Occurrences 001-007. During a conversation with Carol Russell (Colorado Mined Land Reclamation Board) in 1984, Peterson learned that there might be an additional locality (008) on the Coalmont formation at Allen Creek about 8 miles east of Walden. This site was searched for by Steve O'Kane of the Colorado Natural Areas Program and was not located. Additional searches during July 1985 by O'Kane of the Canadian, Michigan, and North Platte River areas yielded one new population (009) southwest of Cowdrey to the west of the North Platte River.

### Habitat and Biology

Other than general field inventory of this species, no research is known to have been conducted on its biology or habitat. All such data gathered have been incidental to field surveys. It is believed that this species is a biennial or short-lived perennial. The number of individuals found flowering at any specific occurrence fluctuates annually. The causes for these observations demonstrated an increased number of seedlings; however, this was attributed to a sudden increase in precipitation. Allard visited the site in

Table 1: Occurrence Data

Site Number	Date Located	Number of Individuals	Estimated Acreage	Management Responsibility
001	1918	1000	10	County of Jackson Brownlee Cattle Company
002	1981	12	6	Private Verner State Wildlife Area
003	1981	10	5	Private Verner State Wildlife Area
004	1981	15	3	Bureau of Land Management
005	1981	15	1	Bureau of Land Management Private
006	1981	1200	18	Bureau of Land Management R. Swift
007	1981	11	57	Bureau of Land Management Private
008	Unverified (not located in 1985)			
009	1985	125	20	Bureau of Land Management
010	1981	150	83	Bureau of Land Management Private

1980 and counted 117 mature individuals and 3 seedlings. During the fall of 1981 surveys, over 1,000 mature individuals and rosettes were estimated. This was a summer of high, effective precipitation. O'Kane in 1985 found rosettes to be very scarce. However, these counts have usually not distinguished between rosettes and mature flowering plants. Undoubtedly, many rosettes do not survive to produce mature flowering individuals and the true number of mature plants producing seeds and perpetuating the species is much lower than these higher numbers indicate.

The species has been observed flowering from July through August. Mature seeds were collected by Weber in late August of 1979. Young rosettes have been observed from June through September. This apparent fluctuation of flowering and fruiting times appears to be a result of precipitation and other environmental factors that are currently unknown.

P. formosula has been found to occur only on raw exposures of the Coalmont formation. This formation is overlain in some areas by alluvium and Pierre shale with exposures of the Coalmont appearing along watercourses (North Platte and Michigan Rivers, and reported along the Canadian River). These outcrops appear as rust to yellow sandstone and sandy areas along steep slopes. These outcrops appear very susceptible to erosion and are dissected by ravines. These areas are the most sparsely vegetated and the most subject to erosion. Judging by the number of individuals, the steep-sided ravines provide the most "productive" habitat for this species. These soils would be considered as Lithic Torriorthent inclusions if they were large enough to be recognized as soil mapping units.

Genera that are found in association with the North Park phacelia include Mentzelia, Chrysothamnus, Oryzopsis, Arenaria, Eriogonum, and Rosa. The vegetation is very sparse on the exposed Coalmont formation with the North Park phacelia being the most noticeable plant during the fall growing season.

### Threats

The following list is a brief summary of the current and potential threats to the species.

1. Motorcycle and off-road vehicle (ORV) activity
2. Livestock grazing, trampling, and trailing
3. Coal development
4. Oil and gas exploration and development
5. Range improvements
6. Lack of occurrence knowledge by the land owner or administrator

The two most significant occurrences (001 and 006), which harbor 92 percent of the known individuals of the species (based on a high year count for 001), are being affected by either motorcycle/ORV use and/or domestic livestock trampling/trailing and possibly grazing. Occurrence 001 (Figure 2) has experienced both extensive motorcycle and ORV activity on those lands administered by the County, and grazing/livestock trampling on the privately

owned portion of the site. The motorcycle trails and ORV roads monopolize the plant's habitat. The privately owned portion of the bluff is used by cattle as they trail across the bluff to water. This hoof action and ORV activity have caused many individuals to be uprooted and caused the sandy soils of the bluff to shift and loosen, resulting in accelerated erosion beyond that occurring naturally.

Occurrence 006 (Figure 3) is within an allotment being grazed by domestic livestock and receives a considerable amount of trampling on the exposed sandstone ridges and loose sandy soils of nearby drainages. Much of the Bureau land east of the North Platte River is managed for the production of livestock forage.

These two sites (Occurrences 001 and 006) contain almost all of the known individuals of P. formosula and the largest exposures of habitat and are crucial to the continued existence of this endangered species.

Occurrences 002 through 005 and 007 are presently in areas being grazed by domestic livestock and are receiving a considerable amount of trampling. The steep exposures of the Coalmont formation habitat are very susceptible to erosion. Erosion is being accelerated by the trampling on these occurrences as cattle trail across these areas. However, the North Park phacelia sites themselves produce very little forage.

The Bureau-administered land between the Michigan and Canadian Rivers is leased for coal development or has been identified by the Bureau as suitable for future coal leasing.

Essentially, all Bureau-administered lands in North Park have been leased for oil and gas development. Though much of this area has not been developed for oil and gas, seismic exploration activity constitutes a present and active threat. The majority of these leases were issued prior to the Federal Land Policy Management Act and may not be subject to stipulations of the Endangered Species Act (Act) that would provide for the conservation of the species. However, the Bureau is subject to Section 7 of the Act and is required to consult with the Service if a project may affect any listed species.

Exploration for geothermal resources also is occurring in North Park. This may affect known and potential habitat for the species.

The potential exists for the development of range improvements, such as vegetation manipulation and/or spraying. However, no plans for range improvements have been made by the Bureau (Belisle pers. comm. 1984).

As with other rare plant taxa throughout the world, one of the major threats to the long-term recovery and survival of this particular species is the lack of adequate data on its occurrences and its environmental requirements. Other resource activities, inadvertently, could also extirpate current or potential habitat of this species since these areas have not been inventoried and the Coalmont formation outcrops documented. Also, Coalmont exposures where plants



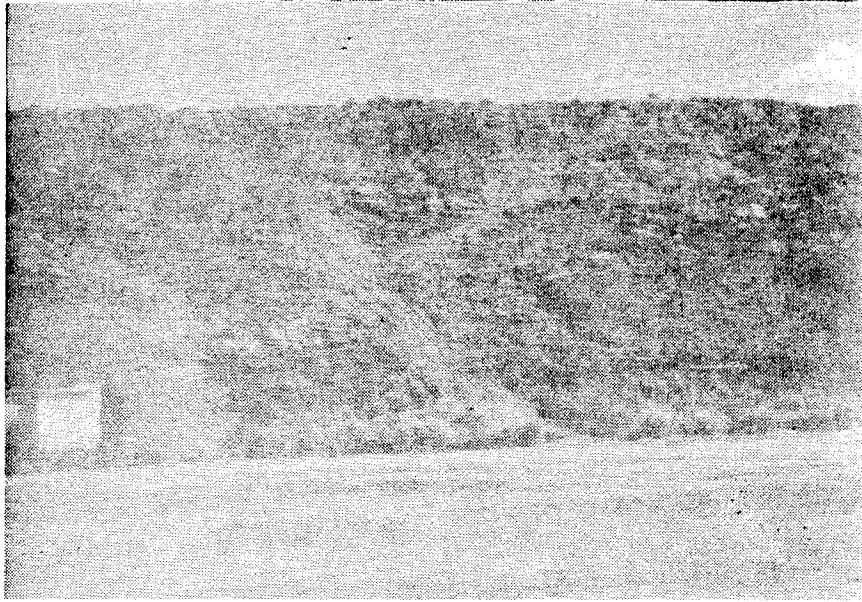


Figure 2: Phacelia formosula habitat - Occurrence 001



Figure 3: Phacelia formosula habitat - Occurrence 006

are not seen may still contain unseen seed banks needing protection. A period of 3 years should be used to determine if a particular exposure contains the North Park phacelia.

## PART II

### RECOVERY

#### OBJECTIVE

For long-term survival of the species and to ensure that one or two catastrophic events at particular occurrences do not pose jeopardy to P. formosula, the objective will be to locate and secure five occurrences of approximately 500 mature flowering individuals each. Since the number of mature plants varies considerably from year-to-year, the figure should be based on low number years. Once this objective is achieved, the North Park phacelia can possibly be downlisted. North Park phacelia may be considered recovered when 10 other areas of suitable habitat are identified and secured with 500 mature flowering individuals each. This may allow for the continued population dynamics and fluctuations characteristic of this species.

#### STEPDOWN OUTLINE

1. Disseminate information on the known occurrences and potential occurrences of P. formosula habitat.
  - 1.1. Inform Federal agencies having jurisdiction in North Park of precise locations.
  - 1.2. Incorporate occurrence information into the Bureau's planning and decision-making process.
  - 1.3. Inform State agencies of the known occurrences and areas of potential habitat.
  - 1.4. Inform private landowners and the County of Jackson of occurrences on their lands, including the importance of these sites.
2. Implement conservation strategies for the perpetuation of the essential habitat of the species.
  - 2.1. Develop a Bureau Habitat Management Plan for the North Platte Research Natural Area (Occurrence 006) and other occurrences on Bureau lands.
  - 2.2. Service review of the Habitat Management Plan for P. formosula.
  - 2.3. Review potential for establishment of critical habitat on five widely dispersed occurrences of approximately 500 mature individuals each.

- 2.4. Review all present oil and gas leases on known and potential species habitat for expiration dates, and inform present lessees of planning and recovery needs.
- 2.5. Review activities on Known Recoverable Coal Resource Areas and inform lessees of planning and recovery needs.
- 2.6. Establish ORV designations, such as "Closed Areas," on the known and potential habitat of the species.
- 2.7. Review applications for mineral withdrawal by the managing agency on the known habitat of the species.
- 2.8. Federal agencies should work with private land conservation organizations and the Colorado Natural Areas Program to implement habitat protection and conservation measures.
- 2.9. In compliance with the Endangered Species Act of 1973, as amended, Section 7 consultation procedures will be discussed with the appropriate Federal agencies.
3. Develop strategies to assist in the perpetuation of the essential habitat and the species.
  - 3.1. Arrange for periodic visits to the known occurrences by Bureau personnel.
  - 3.2. Arrange for periodic visits to the known sites by Service personnel.
  - 3.3. Provide locality information to Service Law Enforcement personnel for periodic surveillance of the North Park phacelia habitat, as necessary.
4. Initiate scientific research on known and potential habitat and the biology of the species.
  - 4.1. Conduct field surveys in unsurveyed areas.
  - 4.2. Establish a monitoring program on Occurrence 006 and other comparable areas.
  - 4.3. Study the reproductive biology/ecology of the species.
    - 4.3.1. Determine mechanisms involved in seed dispersal.
    - 4.3.2. Determine flower visitors and pollinating agents.
    - 4.3.3. Determine germination rate and requirements of seeds and the species' reproductive success.

- 4.3.4. Determine factors that influence seedling establishment, survival, and ecology.
- 4.3.5. Determine population trends of various sites and the life cycle of the species.
- 4.3.6. Determine whether or not the species is monocarpic.
- 4.4. Collect seed of the species and deposit them in the U.S. Department of Agriculture National Seed Laboratory, Fort Collins, Colorado.
- 4.5. Study the autecological and synecological relationships.
- 4.6. Establish seeds and seedlings in the natural setting, if necessary.
- 5. Publicize as appropriate the value of the North Park phacelia and the recovery effort.
- 6. Investigate the advantages of habitat acquisition and/or conservation easements.
  - 6.1. Work with private land conservation organizations and the Service on habitat acquisition and/or conservation easements.
  - 6.2. Work with the Bureau and private landowners on a land exchange program to place present and potential habitat under Federal ownership.

## NARRATIVE

The recovery of a particular taxon, besides being the subject of traditional conservation measures, should be addressed by innovative and creative solutions to this important effort. The point-by-point discussions that follow attempt to address cooperative efforts among all of those concerned with the perpetuation of the North Park phacelia. If completed, these steps should lead to the long-term survival of the species and allow the objectives of this plan to be met. The initial objective for downlisting is to locate and secure five occurrences of approximately 500 flowering mature individuals each. The objective to recover this species is to secure 10 additional occurrences of 500 mature flowering individuals on suitable habitat. This may allow for self-sustaining populations and will take into consideration the natural fluctuations of occurrences of this plant.

1. Disseminate information on the known occurrences and potential occurrences of P. formosula habitat. Federal, State, County, and private entities should be informed of known and potential occurrences of the species so that conflicts and disturbances to the plant can be avoided where possible.
  - 1.1. Inform Federal agencies having jurisdiction in North Park of precise locations. Conservation of the known sites and conflict resolution associated with other resource uses can only be addressed if the administering agency has precise and up-to-date information. It should be the responsibility of the Service's Endangered Species Program to provide the Bureau's Kremmling Resource Area, the Service's Division of Law Enforcement, and the Arapahoe National Wildlife Refuge at Walden with updated information at least annually. This update could be accomplished through the Colorado Natural Heritage Inventory via the Section 6 agreement with the Colorado Department of Natural Resources, Colorado Natural Areas Program.
  - 1.2. Incorporate occurrence information into the Bureau's planning and decision-making process. Known occurrences and habitat data should be an integral part of all Bureau planning documents for the North Park area in order that they be given consideration in multiple-use management decisions. Such documents include Resource Management Plans, Environmental Impact Statements, Allotment Management Plans, Habitat Management Plans, Umbrella Oil & Gas Environmental Assessments, Recreation Management Plans, and Environmental Assessments.
  - 1.3. Inform State agencies of the known occurrences and areas of potential habitat. It should be the responsibility of the Colorado Natural Areas Program, pursuant to the Section 6 agreement, to inform the Colorado Mined Land Reclamation Board, Colorado Department of Highways, and the agencies in the Colorado Department

of Natural Resources of known occurrences of the species. This will allow these agencies to plan their projects to avoid conflicts or disruption to the plant species and its known and potential habitat.

- 1.4. Inform private landowners and the County of Jackson of occurrences on their lands, including the importance of these sites. It should be the responsibility of the Colorado Natural Areas Program, as set forth in the Section 6 agreement, to inform the private landowners and the County of Jackson, Colorado, of the known occurrences on their lands, to communicate the importance of these occurrences, and to obtain their cooperation to protect the species on their lands. This should be done by registering and designating all of these occurrences as State Natural Areas. Registration and designation of these State Natural Areas would be accomplished by the Colorado Natural Areas Program. This activity could also be accomplished by The Nature Conservancy's Landowner Contact Program. Designation would include a mutual agreement between the State and the landowner/administrator on the management of the site for the conservation of the species. Registration of the habitat would recognize the importance of the habitat and its potential for maintaining the species.
2. Implement conservation strategies for the perpetuation of the essential habitat of the species. Various protective strategies involving the Federal and State agencies that have responsibility for the continued existence of the species will need to be considered and, where appropriate, carried out.
  - 2.1. Develop a Bureau Habitat Management Plan for the North Platte Research Natural Area (Occurrence 006) and other occurrences on Bureau lands. The North Platte/Phacelia Habitat Management Plan will address the management objectives and planned actions on the Bureau's North Platte Research Natural Area and other P. formosula occurrences. It is anticipated that the Habitat Management Plan will be made final in 1985.

Examples of possible planned actions include the construction of fences to eliminate livestock grazing from the entire proposed North Platte Research Natural Area to protect the values for which the site was designated, restrictions on ORV activity, no action, establishment of monitoring programs, research on population dynamics, and/or studies relating to the biology of the species. Management responsibility options also could be explored, including possible Cooperative Management Agreements or cooperative agreements between the Bureau and The Nature Conservancy, and/or the Bureau and the Service. Monitoring programs could be established for all other known occurrences of the taxon to ensure protection of these sites from surface-disturbing activities (see Task 3).

2.2. Service review of the Habitat Management Plan for P. formosula. The Service should review the Habitat Management Plan and make applicable recommendations since it pertains to the management of this federally listed endangered species.

2.3. Review potential for establishment of critical habitat on five widely dispersed occurrences of approximately 500 mature individuals each. While all known occurrences and potential habitat should be maintained and considered in land use planning, and since monetary resources will undoubtedly be limited, the major recovery efforts should be directed toward those occurrences that provide the greatest potential for the long-term perpetuation of the species. Since very little is known about its biology and environmental requirements, the optimum occurrences are expected to be the larger areas of known habitat containing a high number of individuals.

Preservation of widely dispersed habitat for the species is the best defense against any particular catastrophic event jeopardizing the species and hindering the recovery effort. Critical habitat was not proposed at the time the species was proposed for listing because of the sensitivity of the then single-known site. Two occurrences with relatively high numbers of individuals are now known. Additional surveys could possibly increase this by a few more. The Service believes that designating critical habitat may now be prudent for the two largest known occurrences and those that might be found with additional field surveys. Following a complete field inventory, critical habitat may be considered and will receive a complete review, since there may not be five relatively large, widely-dispersed sites.

After a complete review of potential critical habitat has been completed, and if a determination is made not to designate critical habitat, the designation and registration of State Natural Areas need to be considered (see Task 1.4).

2.4. Review all present oil and gas leases on known and potential species habitat for expiration dates, and inform present lessees of planning and recovery needs. Much of the area in North Park has been leased for oil and gas development. Inquiries and reviews should be made to determine expiration dates on these leases and inform the lessees of potential conflicts involving the known occurrences. After these reviews, leases could possibly be terminated or no-surface-occupancy stipulations applied to assure protection to the Phacelia. Negotiations both by the Bureau and/or The Nature Conservancy concerning relinquishment of leases should occur where appropriate.

2.5. Review activities on Known Recoverable Coal Resource Areas and inform lessees of planning and recovery needs. Known Recoverable Coal Resource Areas occur throughout the North Park area. These areas should be reviewed to determine if they coincide with existing or potential habitat of the species. If the Known Recoverable Coal



Resource Areas coincide with the Phacelia, the lessees should be informed of potential conflicts through management agencies such as the Bureau, the Office of Surface Mining, and Colorado Mined Land Reclamation Board.

- 2.6. Establish ORV designations, such as "Closed Areas," on the known and potential habitat of the species. In order to maintain the habitat and provide for the future perpetuation of the Phacelia, it will be necessary to restrict or close occurrences and seed banks, where known, from ORV activity. The need for this designation is very apparent on Occurrence 001, which is owned by Jackson County. This habitat has been devastated by motorcycle activity and the construction of gravel roads.
- 2.7. Review applications for mineral withdrawal by the managing agency on the known habitat of the species. The areas that may be identified as essential or critical habitat (see Task 2.3) for P. formosula should be withdrawn from mineral entry to provide long-term protection. This action would assist in providing for the future perpetuation of the species and its essential habitat.
- 2.8. Federal agencies should work with private land conservation organizations and the Colorado Natural Areas Program to implement habitat protection and conservation measures. The lack of adequate Federal funding for the implementation of recovery plans for plants calls for creative solutions to implementing recovery measures. The Bureau, Service, Colorado Native Plant Society, The Nature Conservancy, Colorado Natural Areas Program, and other interested parties need to implement and fund this plan to assist in the perpetuation of this species. The Service and the Bureau should continue their working relationships with organizations whose goals will assist in the recovery effort. A Cooperative Management Agreement or other cooperative agreement could be entered into between the Bureau, Service, The Nature Conservancy, and Colorado Native Plant Society. Cooperative management efforts for the essential habitat, including fencing and monitoring activities, could be addressed between all four of the above entities. Fencing labor may possibly be provided by the Colorado Native Plant Society as a Society activity.

Additional sources of funding may be obtained, such as grants from the Audubon Society, Colorado Natural Areas Program, and other organizations whose goals will assist in recovery efforts. Though the conservation and recovery of the North Park phacelia is a primary responsibility of the Federal agencies, in accordance with the Endangered Species Act, it would benefit all and should be addressed as a cooperative effort. Other cooperative measures that could assist in the recovery effort include investigating the possibility of The Nature Conservancy assisting in (1) monetary or

taxation compensation for adjustment of livestock grazing privileges and oil and gas leases, (2) development of conservation easements, or (3) property acquisition of essential habitat.

One of the significant sites (Occurrence 001) of this species is located on a park administered by the County of Jackson and on land owned by the Brownlee Cattle Company. ORV activity is allowed on this parkland and has significantly affected this occurrence. The ORV activity, which has the potential to jeopardize the species, might be addressed through a cooperative agreement, memorandum of understanding, easement, or acquisition (Land and Water Conservation Funds). Other occurrences and potential habitat also may receive further protection through similar actions.

- 2.9. In compliance with the Endangered Species Act of 1973, as amended, Section 7 consultation procedures will be discussed with the appropriate Federal agencies. The Service should initiate informative discussions with the appropriate Federal agencies concerning the Section 7 process. Discussions will center on those actions that may affect the essential habitat and long-term perpetuation of the species. The agencies involved will include the Bureau, Office of Surface Mining, National Park Service (Land and Water Conservation Funds), Federal Highway Administration, Federal Aviation Administration, Soil Conservation Service, Farmers Home Administration, Department of Energy, Agricultural Stabilization and Conservation Service, and the U.S. Geological Survey.
3. Develop strategies to assist in the perpetuation of the essential habitat and the species. Known localities harboring the species should be monitored on a periodic basis to detect any change in the status of individual populations.
  - 3.1. Arrange for periodic visits to the known occurrences by Bureau personnel. All but one known occurrence are situated on Bureau-administered lands. Therefore, the major land management responsibility for this federally endangered plant species lies with the Bureau. The Bureau's Kremmling Resource Area field personnel should periodically visit the occurrences to determine if any resource conflicts are occurring and initiate Section 7 consultation with the Service if there is a "may affect" situation.
  - 3.2. Arrange for periodic visits to the known sites by Service personnel. As Service employees are stationed in the vicinity of the North Park phacelia's known habitat, coordination between the Bureau and the Service could provide for the periodic visiting of identified occurrences by Service personnel to assist the Bureau in monitoring essential habitat sites. Periodic checks could be made by Service personnel from Arapahoe National Wildlife Refuge and/or the Endangered Species Field Office in Grand Junction, Colorado.

- 3.3. Provide locality information to Service law enforcement personnel for periodic surveillance of the North Park phacelia habitat, as necessary. In accordance with the Service's responsibility to protect federally listed species, Service law enforcement personnel will periodically visit the known occurrences, as necessary.
4. Initiate scientific research on known and potential habitat and the biology of the species. Continued investigation is needed into the biological characteristics, habitat requirements, and limiting factors of the species. The specific impacts occurring to each population should be determined. The potential for laboratory propagation to augment the current population should be investigated.
- 4.1. Conduct field surveys in unsurveyed areas. A phacelia has been reported occurring on the Coalmont formation near the Canadian River and Allen Creek, east of Walden, and may be P. formosula (reported Occurrence 008). Although this occurrence could not be verified by O'Kane in 1985, the area should be more intensively inventoried. The area from Johnny Moore Mountain/Meadow Creek and the Canadian River north and west to Cowdrey should also be more intensively inventoried. This is an area of active oil and gas development. Potential habitat is scattered infrequently throughout this area. No inventories have been conducted here. Other areas that need more inventory include Rand, Coalmont, Cowdrey, and Hebron. Inventories need to be done over a 3-year period to see if a seed bank is present since seeds may germinate only in "favorable" years. In many instances, potential habitat for a species has been found, upon subsequent inventory, to actually harbor that species, after it had been previously surveyed for that species. Therefore, we should establish a monitoring program for potential habitat and attempt to document other occurrences of this species. This effort could be conducted by the Colorado Natural Areas Program through a Section 6 agreement with the Service, by the Bureau via a cooperative agreement, by the Rocky Mountain Regional Heritage Task Force, or by the Service's Endangered Species Field Office in Grand Junction, Colorado.

The long-term population dynamics of any particular taxon generally are not addressed since this type of study would encompass several decades. Establishing a monitoring program of potential habitat that would investigate and document the existence of germinating individuals every 10 years would provide valuable data for future management. When considering measures that would provide for the perpetuation of the species with the least amount of active input by society, the protection of habitat for natural perpetuation provides the most efficient measure that can be implemented.

- 4.2. Establish a monitoring program on Occurrence 006 and other comparable areas. Long-term studies should be conducted to document the effect of livestock grazing on the species and its habitat. The Occurrence 006 site, a Research Natural Area of the Bureau (see Task

2.1), should be managed as the control or baseline example for such studies to monitor the ecology of the species. The Directory of Research Natural Areas on Federal Lands of the United States of America by the Federal Committee on Ecological Reserves (U.S. Forest Service 1977) states that a Research Natural Area is defined "as a physical or biological unit in which current natural conditions are maintained insofar as possible. These conditions are ordinarily achieved by allowing natural physical and biological processes to prevail without human intervention." It further states that, "The unique value of Research Natural Areas is their utility to serve as baseline standard for comparable ecosystems which through man's activities have been altered."

The primary goal in the management of a Research Natural Area is to maintain, in as near a presettlement state as possible, the ecological conditions of the area for which the site was designated. Other known occurrences should be monitored for effects of livestock grazing and a comparative analysis made from these sites and Occurrence 006, which should serve as the baseline area. Monitoring programs should follow a regular schedule, since sampling on an irregular basis may lead to erroneous conclusions concerning the status of a particular occurrence. Any projected study of occurrence demography also must follow a plan for censusing in consecutive seasons to establish a type pattern associated with replacement and recruitment at any stage of the life cycle. This should include following marked individuals from season to season.

4.3. Study the reproductive biology/ecology of the species. Additional research studies are needed to enhance our knowledge of the species and aid in our recovery activities (see Tasks 4.3.1-4.3.6). These studies would encompass the known sites and should be done in conjunction with other monitoring efforts (Task 4.2).

4.3.1. Determine mechanisms involved in seed dispersal. Other than general field surveys for this species, no research has been conducted on its biology. The species is believed to be a biennial or short-lived perennial. The specifics of its seed dispersal are unknown. This knowledge may be necessary for future recovery activities (see Tasks 4.4, 4.5, and 4.6).

4.3.2. Determine flower visitors and pollinating agents. The species has been observed during field surveys to flower from July through August. However, during field surveys no insects or other pollinators have been observed visiting the species. This knowledge is necessary for a better understanding of its biology and distribution. This information will also assist in accomplishing Tasks 4.4, 4.5, and 4.6.

- 4.3.3. Determine germination rate and requirements of seeds and the species' reproductive success. Since little is known about this species' biology, knowledge is needed on its germination rate, seed requirements, and reproductive success. This basic information will be needed prior to the initiation of Tasks 4.4 and 4.6.
- 4.3.4. Determine factors that influence seedling establishment, survival, and ecology. The number of individuals found flowering on a specific occurrence fluctuates annually, and there appear to be fluctuations in flowering and fruiting times. These fluctuations and variations appear to be the result of changes in frequency and intensity of precipitation and other environmental factors. The influence of these and other factors on this species need to be determined prior to the initiation of some recovery activities. Simple experimental watering could be an initial study on precipitation requirements.
- 4.3.5. Determine population trends of various sites and the life cycle of the species. There are presently nine known locations of this species found on raw exposures of the Coalmont formation. Individuals at each site are found in groups or clusters with several meters between groups. The species' reproductive success has been found to be very poor and to have low vigor. Information initiated in Tasks 4.3.1-4.3.4 should aid in the determination of the species' life cycle and population cycle and population trends. This information is necessary and critical to the initiation of other recovery activities (Tasks 4.4-4.6).
- 4.3.6. Determine whether or not the species is monocarpic. *P. formosula* may be monocarpic, as are some of the other taxa in the Crenulatae group. Additional studies are needed to determine whether or not this is true. It is possible that censuses of species occurrences may be biased. Occurrences may show large numbers of individuals in a particular year, dependent upon local climatic conditions imposed by occurrences in proceeding years. Background information on the basic biology of this species will be obtained through completion of Tasks 4.3.1-4.3.6.
- 4.4. Collect seed of the species and deposit them in the U.S. Department of Agriculture National Seed Laboratory, Fort Collins, Colorado. A seed source should be maintained to ensure viable populations will exist and continue to grow in the wild. Seeds should be deposited at the National Seed Laboratory in order to provide a seed source should a catastrophic event affect either of the two known major occurrences. The preservation of the genetic material for recovery

efforts is of considerable importance. Specific collecting procedures should be developed in accordance with accepted standards or standards developed as the result of information gained in the completion of Tasks 4.3.1-4.3.6.

- 4.5. Study the autecological and synecological relationship. The soil properties of the exposures it occupies should be analyzed for correlations. Associated species and possible interspecific interactions should also be analyzed.
- 4.6. Establish seeds and seedlings in the natural setting, if necessary. Establishment/enhancement of populations in the natural setting will be used to meet the objectives of this recovery plan if other strategies fail. Multiplication of the seed source will be via techniques developed under Task 4.3. New populations may be established in strict accordance with Service policy and known occurrences may be supplemented to assist in meeting the plan objectives. Field tests will need to be conducted in known and potential habitats. Cooperation with local landowners and managers will be needed to establish additional populations on their lands. These populations will be monitored to assure they are self-sustaining over an agreed-upon period prior to downlisting or delisting actions.
5. Publicize as appropriate the value of the North Park phacelia and the recovery effort. Provide appropriate news releases and brochures addressing the North Park phacelia, the value of Research Natural Areas and special management areas, research activities, and other conservation needs. The Service may cooperate with public institutions, such as the Denver Botanic Gardens, to provide educational curricula to educate the public about the North Park phacelia and the recovery effort.
6. Investigate the advantages of habitat acquisition and/or conservation easements. Further protection may be offered to those occurrences of this species that occur on nongovernment land by the use of habitat acquisition and/or conservation easements by the Federal government or private land conservation organizations.
  - 6.1. Work with private land conservation organizations and the Service on habitat acquisition and/or conservation easements. Private land conservation organizations, such as The Nature Conservancy, could work with the Service to acquire habitat and/or conservation easements on habitat occurring on private lands. These lands could eventually be placed under the authority of a Federal agency for long-term stewardship.

- 6.2. Work with the Bureau and private landowners on a land exchange program to place present and potential habitat under Federal ownership. Land exchanges could provide an effective tool for placing habitat under the management of Federal agencies. This could provide for all of the occurrences to be under one ownership, which would facilitate management.

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**PART III**  
**IMPLEMENTATION SCHEDULE**

**Definition of Priorities**

- Priority 1: An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
- Priority 2: An action that must be taken to prevent a significant decline in a species' population/habitat quality, or some other significant negative impact short of extinction.
- Priority 3: All other actions necessary to provide for full recovery of the species.

**Abbreviations Used in Implementation Schedule**

BLM	Bureau of Land Management
SE	Endangered Species, U.S. Fish and Wildlife Service
LE	Law Enforcement, U.S. Fish and Wildlife Service
PAO	Public Affairs, U.S. Fish and Wildlife Service
OSM	Office of Surface Mining
CNAP	Colorado Natural Areas Program
CMLRB	Colorado Mined Land Reclamation Board
TNC	The Nature Conservancy
CONPS	Colorado Native Plant Society
DBG	Denver Botanic Garden
WR	Wildlife Resources, U.S. Fish and Wildlife Service
USDA	U.S. Department of Agriculture
JACKSON	Jackson County, Colorado
AUDUBON	National Audubon Society

**Other Definitions**

Annual - Task which must be completed each year.

Biennial - Task which must be completed every 2 years.

Continuous - Task which will be required over a very long or undetermined period of time.

## GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES

### Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

### Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

### Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

### Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

North Park Phacelia Implementation Schedule

GENERAL CATEGORY (1)	PLAN TASK (2)	TASK DURATION (3)	PRIORITY (4)	TASK DURATION (5)	RESPONSIBLE AGENCY FWS REGION (6)	PROGRAM (6A)	OTHER (7)	FISCAL YEAR COSTS (EST.)			COMMENTS/NOTES (9)
								FY 01	FY 02	FY 03	
04	Inform Federal agencies of occurrences.	1.1	1	continuous	6	SE		500		200	
04	Incorporate data into BLM planning process.	1.2	1	continuous			BLM				
01	Inform State agencies of occurrences.	1.3	2	continuous	6	SE	CNAP	200 200		200 200	
01	Inform private landowners and local governments	1.4	2	continuous	6	SE	CNAP TNC	500 500 500		200 200 200	
M7	Develop BLM Habitat Management Plan.	2.1	2	annual			BLM				
M7	FWS review of BLM Habitat Management Plan.	2.2	2	annual	6	SE		500			
I2	Evaluate Critical Habitat Designation.	2.3	2	annual	6	SE		1,000	1,000		
I14	Review O&G leases.	2.4	2	continuous			BLM CMLRB				
I14	Review KRCRAS.	2.5	2	continuous			BLM OSM CMLRB				

North Park Phacelia Implementation Schedule (Cont.)

GENERAL CATEGORY (1)	PLAN TASK (2)	TASK NUMBER (3)	PRIORITY (4)	TASK DURATION (5)	RESPONSIBLE AGENCY FWS REGION (6)	OTHER PROGRAM (6A)	FISCAL YEAR COSTS (EST.) FY 01 FY 02 FY 03	COMMENTS/NOTES (9)	
									BLM JACKSON
I4	ORV designations.	2.6	2	annual					
A5	Mineral withdrawal	2.7	2	annual					
A7	Federal co-operation with private land conservation.	2.8	2	continuous	6	SE	1,000		
03	Section 7 consultations.	2.9	1	continuous	6	SE	500	500	
I1	BLM personnel visits.	3.1	2	continuous				BLM	
I1	FWS personnel visits.	3.2	2	continuous	6	SE WR	500	500	
02	FWS undercover law enforcement.	3.3	2	continuous	6	LE	1,000	1,000	
I14	Conduct field surveys.	4.1	1	continuous	6	SE	2,000	2,000	
R6	Monitor known occurrences.	4.2	1	continuous	6	SE	1,000	1,000	
R14	Study the reproductive	4.3	2	continuous	6	SE	5,000	5,000	

North Park Phacelia Implementation Schedule (Cont)

GENERAL CATEGORY (1)	PLAN TASK (2)	TASK CATEGORY (3)	PRIORITY (4)	TASK DURATION (5)	RESPONSIBLE AGENCY FWS REGION (6)	PROGRAM (6A)	OTHER (7)	FISCAL YEAR COSTS (EST.)			COMMENTS/NOTES (9)
								FY 01	FY 02	FY 03	
M7	Collect seed.	4.4	2	annual	6	SE	USDA	500	500		
R3	Study the habitat ecology.	4.5	2	continuous	6	SE	CNAP BLM	3,000 500	3,000 500	3,000 500	
M1	Establishment of seeds and seedlings.	4.6	3	continuous	6	SE	CNAP	1,000	1,000	1,000	
01	Information and education.	5	3	continuous	6	PAO	BLM CNAP DBG	500 500 500	500 500 500	500 500 500	
A7	Habitat acqui- sition/conservation easements.	6	2	continuous	6	SE	TNC BLM	500 500	500 500	500 500	

PART IV

APPENDIX

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