

# UTAH REED-MUSTARDS RECOVERY PLAN

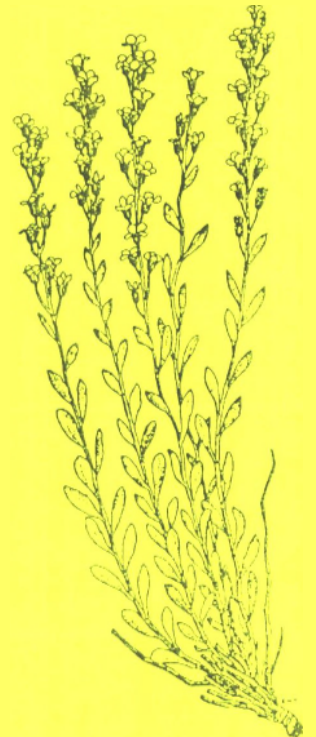
(Schoenocrambe sp.)



**CLAY REED-MUSTARD**  
**arguillacea**



**BARNEBY REED-MUSTARD**  
**(S. barnebyi)**



**SHRUBBY REED-MUSTARD**  
**(S. suffrutescens)**

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U.S. Fish and Wildlife Service

Region 6

1994



UTAH REED-MUSTARDS:

CLAY REED-MUSTARD  
(*SCHOENOCRAMBE ARGILLACEA*)

BARNEBY REED-MUSTARD  
(*SCHOENOCRAMBE BARNEBYI*)

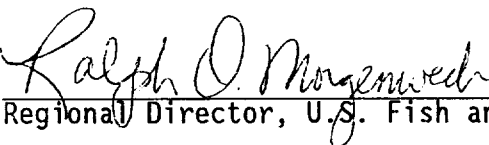
SHRUBBY REED-MUSTARD  
(*SCHOENOCRAMBE SUFFRUTESCENS*)

RECOVERY PLAN

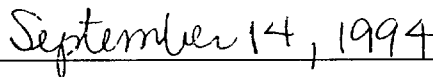
Prepared by

Region 6, U.S. Fish and Wildlife Service

Approved:

  
Regional Director, U.S. Fish and Wildlife Service

Date:

  
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Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect the species. Plans are prepared by the U.S. Fish and Wildlife Service, sometimes with the assistance of recovery teams, contractors, State agencies, and others. Objectives will only be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints. Recovery plans do not necessarily represent the views or the official positions or approvals of any individuals or agencies, other than the U.S. Fish and Wildlife Service, involved in the plan formulation. They represent the official position of the U.S. Fish and Wildlife Service only after they have been signed by the Regional Director or Director as approved. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks.

Literature Citation should read as follows:

U.S. Fish and Wildlife Service. 1994. Utah reed-mustards: clay reed-mustard (*Schoenocrambe argillacea*), Barneby reed-mustard (*Schoenocrambe barnebyi*), shrubby reed-mustard (*Schoenocrambe suffrutescens*) recovery plan. Denver, Colorado. 22 pp.

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## EXECUTIVE SUMMARY

Current Status: The morphology and habitat of *Schoenocrambe argillacea*, *Schoenocrambe barnebyi*, and *Schoenocrambe suffrutescens* are very similar. While not being strictly sympatric, they all occur on fine grained soils in a desert shrub vegetation type in the Colorado River Drainage of eastern Utah. *S. argillacea* and *S. suffrutescens* populations are in close proximity to each other in the south-central Uintah Basin near the Green River in Uintah County, Utah. *S. barnebyi* occurs in two populations, one in the San Rafael Swell of Emery County, Utah, and the other in Capitol Reef National Park in Wayne County, Utah.

*Schoenocrambe argillacea* is known from three populations with a total number of individuals estimated to be about 6,000. The population of *S. argillacea* is experiencing or is vulnerable to activities associated with ongoing and potential oil and gas activity. The species habitat is underlain by oil-shale deposits. Continued development of oil and gas wells and ancillary facilities and future potential oil-shale development is likely to threaten the continued existence of this species unless specific measures are taken to protect the habitat of this species.

*Schoenocrambe barnebyi* is known from two populations. The total number of individuals is estimated to be about 2,000 individuals. The population of *S. barnebyi* is vulnerable to activities associated with mining claim assessment work, to potential uranium mining and processing, and to recreational foot traffic in Capitol Reef National Park. The species extremely small and restricted population makes the species vulnerable to any habitat disturbing activities or events.

*Schoenocrambe suffrutescens* is known from three populations. The total number of individuals is estimated at about 5,000 individuals. The population of *S. suffrutescens* is experiencing or is vulnerable to activities associated with ongoing and potential oil and gas activity. The species habitat is underlain by oil-shale deposits. The species habitat is underlain by volcanic ash deposits that are commercially valuable for use as building stone. Unrestricted off-road vehicle use, extraction of building stone, development of oil and gas wells and ancillary facilities, and potential oil-shale development are likely to endanger the continued existence of this species.

Goal: Delisting or downlisting of *S. barnebyi* to threatened and delisting *S. argillacea*. Downlisting and delisting of *S. suffrutescens* appears unlikely in the near future.

### Downlisting Criteria:

1. Discover or establish a minimum of five separate populations with 2,000 or more individuals per population for each species. These populations must be demonstrated to be at or above minimum viable population levels.

2. Document the presence of or, if necessary, establish formal land management designations which would provide for long-term protection on undisturbed habitat for the above five populations of each species.

Delisting Criteria:

1. Discovery or establishment of a minimum of 10 separate populations with 2,000 or more individuals per population for each species. These populations must be demonstrated to be at or above minimum viable population levels.
2. Document the presence of or, if necessary, establish formal land management designations which would provide for long-term protection on undisturbed habitat for the above 10 populations of each species.

Actions Needed:

1. Inventory suitable habitat for *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* and determine with a reasonable degree of accuracy the population and distribution of each species.
2. Establish and conduct at least three minimum viable population studies on each of at least three different populations of each species.
3. Document the presence of or, if necessary, establish formal land management designations which would provide for long-term protection on undisturbed habitat for each species.
4. Control activities which affect the habitat of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* through sections 7 and 9 of the Endangered Species Act and other relevant laws and regulations.

Date of Recovery: 2010

Total Cost of Recovery: Unknown

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## I. INTRODUCTION

The shrubby reed-mustard, *Schoenocrambe suffrutescens* (Rollins) Welsh and Chatterley, was listed as an endangered species on October 6, 1987, under the name toad-flax cress, *Glaucocarpum suffrutescens* Rollins (52 FR 37416, see 57 FR 1398). The name was changed from toad-flax cress to shrubby reed-mustard, and the genus was changed from *Glaucocarpum* to *Schoenocrambe* on January 14, 1992 (57 FR 1398). The clay reed-mustard, *Schoenocrambe argillacea* (Welsh and Atwood) Rollins, was listed as threatened and the barneby reed-mustard, *Schoenocrambe barnebyi* (Welsh and Atwood) Rollins, was listed as an endangered species under the authority of the Endangered Species Act (Act), as amended, on January 14, 1992 (57 FR 1398).

Little information is available on the historic abundance of *S. barnebyi* and *S. argillacea* because both species were recently discovered. There is historic information on *S. suffrutescens* that demonstrates the decline of the species abundance and distribution. Very little is currently known about the biology and ecology of all three species. Much more research is needed to determine habitat requirements and the species biological needs. Once this information has been acquired, more precise and accurate recovery criteria and needed recovery actions can be developed. The Fish and Wildlife Service (Service) fully expects that this recovery plan will be revised in the future to better accommodate biological and ecological needs of these species.

### A. Description

*Schoenocrambe suffrutescens* was discovered by Edward Graham in 1935 in the southern portion of the Uintah Basin in Uintah County, Utah, and was described by Reed Rollins as *Thelypodium suffrutescens* (Rollins in Graham 1937). Following further taxonomic research, Rollins erected the mono-typic genus *Glaucocarpum* for this species (Rollins 1938). *Schoenocrambe argillacea* was discovered by Duane Atwood in 1976 from a site in the southern portion of the Uintah Basin in Uintah County, Utah, approximately 1 mile from the discovery site of *Schoenocrambe suffrutescens*. Welsh and Atwood (1977) described the species as *Thelypodopsis argillacea*. *Schoenocrambe barnebyi* was discovered by James Harris in 1980 from a site in the southern portion of the San Rafael Swell in Emery County, Utah. Welsh and Atwood (in Welsh 1981) described the species as *Thelypodopsis barnebyi*.

Rollins (1982), in reevaluating the cruciferous genera of *Schoenocrambe* and *Thelypodopsis*, moved *T. argillacea* and *T. barnebyi* from *Thelypodopsis* to *Schoenocrambe* as *S. argillacea* and *S. barnebyi*. Welsh and Chatterley (1985) moved *Glaucocarpum suffrutescens* to the genus *Schoenocrambe* to complete what morphologically appears to be a discrete phylogenetic unit among the Brassicaceae. The genus *Schoenocrambe* currently includes five known species, two (*S. linearifolia* and *S. linifolia*) are abundant wide-ranging species from the dry lower elevations of the interior western Cordilleras. *S. linearifolia* occurs from southern Colorado and northern Arizona southward to western Texas and Durango and Sonora, Mexico. *S. linifolia* occurs from southeastern British Columbia, Canada, and western Montana southward to eastern Nevada and northern New Mexico. The remaining three, *S. argillacea*, *S. barnebyi*, and

*S. suffrutescens*, are rare endemic species from low elevations of the northern and western portions of the Colorado Plateau in the State of Utah (Rollins 1982, Welsh et al. 1987).

*Schoenocrambe argillacea* is a perennial herbaceous plant, with sparsely leafed stems 15 to 30 centimeters (cm) (6 to 12 inches) tall arising from a woody root crown. The leaves are very narrow with a smooth margin, 10 to 35 millimeters (mm) (0.4 to 1.4 inches) long and, usually, less than 2 mm (0.1 inch) wide. The leaf blades are alternately arranged on the stem and, for the most part, are attached directly to the stem without a petiole. The flowers of *S. argillacea* have petals that are pale lavender to whitish with prominent purple veins and measure 8 to 11 mm (0.3 to 0.4 inch) long and 3.5 to 4.5 mm (0.14 to 0.18 inch) wide. The entire flowers are about 1 cm (0.4 inch) across in full anthesis and are displayed in a raceme of 3 to 20 flowers at the end of the plant's leafy stems (Welsh and Atwood 1977, Rollins 1982, Welsh et al. 1987).

*Schoenocrambe barnebyi* is a perennial herbaceous plant with sparsely leafed stems 22 to 35 cm (9 to 15 inches) tall arising from a woody root crown. The leaves are entire with a smooth margin, 1.5 to 5 cm (0.6 to 3 inches) long and 0.5 to 2.5 cm (0.2 to 1 inch) wide. The leaf blades are alternately arranged on the stem and are attached to the stem by a petiole. The flowers of *S. barnebyi* have petals that are light purple with prominent darker purple veins and measure about 12 mm (0.4 inch) long and 2.5 mm (0.1 inch) wide. The entire flowers are about 1 cm (0.4 inch) across in full anthesis and are displayed in a raceme of, commonly, two to eight flowers at the end of the plant's leafy stems (Welsh and Atwood 1980, Rollins 1982, Welsh et al. 1987).

*Schoenocrambe suffrutescens* is a perennial herbaceous plant, with clumped stems 10 to 25 cm (4 to 12 inches) tall arising from a branching woody root crown. The leaves are entire with a smooth margin, 1.0 to 2.5 cm (0.4 to 1 inch) long and 0.3 to 1.0 cm (0.12 to 0.4 inch) wide. The leaf blades are alternately arranged on the stem and are sessile or attached to the stem by a short petiole. The flowers of *S. suffrutescens* have petals that are light yellow or greenish yellow and spatulately shaped measuring about 10 mm (0.4 inch) long and 3 mm (0.12 inch) wide. The entire flowers are about 1 cm (0.4 inch) across in full anthesis and are displayed in a raceme of, commonly, 5 to 20 flowers at the end of the plant's leafy stems (Rollins 1937, Welsh and Chatterley 1985, Welsh et al. 1987)

## B. Habitat and Distribution

*Schoenocrambe argillacea* grows on clay soils rich in gypsum, overlain with sandstone talus, that are derived from a mixture of shales and sandstones from the zone of contact between the Uinta and Green River geologic formations. The species most commonly occurs on steep north-facing slopes. Plant species commonly associated with *S. argillacea* include *Amelanchier utahensis*, *Agropyron smithii*, *Arabis pendulina*, *Arabis pulchra*, *Artemisia nova*, *Astragalus chamaeleuce*, *Astragalus convallarius*, *Atriplex confertifolia*, *Atriplex gardneri cuneata*, *Brickellia oblongifolia*, *Castilleja chromosa*, *Chrysothamnus viscidiflorus*, *Cryptantha rollinsii*, *Cymopterus fendleri*, *Elymus salina*, *Ephedra torreyana*, *Eriogonum corymbosum*, *Eriogonum ovalifolium*,



*Euphorbia fendleri*, *Leptodactylon pungens*, *Penstemon carnosus*, *Petradoria pumila*, *Cymopterus terebinthinus*, *Stipa hymenoides*, *Tetradymia nuttallii*, *Tetradymia spinosa*, and *Thelesperma subnudum* (Shultz and Mutz 1979, Franklin 1992). Three populations of *S. argillacea* are known, all within a limited range of about 30 kilometers (19 miles) across, from the west side of the Green River to the east side of Willow Creek in southwestern Uintah County, Utah. The species' total population is about 6,000 plants (Franklin 1992). All of the three populations occur on land administered by the Bureau of Land Management (BLM) (see range map at Figure 1).

*Schoenocrambe barnebyi* grows on red clay soils rich in selenium and gypsum, overlain with sandstone talus, that are derived from the Moenkopi and Chinle geologic formations. The species populations are on steep slopes generally on northern exposures. Plant species normally associated with *S. barnebyi* include: *Abronia fragrans*, *Amelanchier utahensis*, *Artemisia dracunculus*, *Astragalus brandegei*, *Atriplex confertifolia*, *Chrysothamnus nauseosus*, *Ephedra torreyana*, *Ephedra viridis*, *Eriogonum corymbosum*, *Erioneuron pulchellum*, *Erioneuron pilosum*, *Hilaria jamesii*, *Monolepis nuttalliana*, *Opuntia polyacantha*, *Phacelia rafaensis*, *Sporobolus* spp., *Stanleya pinnata* and *Townsendia incana*. Two populations of *S. barnebyi* are known, one on BLM lands near the Muddy Creek in the southern portion of the San Rafael Swell and one in Capitol Reef National Park in the Fremont River drainage west of Fruita. The species' total known population is about 2,000 plants (Heil and Porter 1992, Spence 1991) (see range map at Figure 2).

*Schoenocrambe suffrutescens* grows on clay soils with chips of white shale and occasionally with tuffaceous clast blocks littered on the ground surface. These soils are derived from the Evacuation Creek member of the Green River geologic formation. The species populations are commonly on level to moderately sloping ground surfaces. *S. suffrutescens* occurs in a desert shrub land with occasional Utah juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus edulis*) trees. The prominent shrub and herbaceous species in the vegetative community include: *Artemisia pygmaea*, *Atriplex* spp., *Cercocarpus montanus*, *Cryptantha barnebyi*, *Cryptantha grahamii*, *Cryptantha rollinsii*, *Elymus salina*, *Ephedra torreyana*, *Ephedra viridis*, *Erigeron pulcherrimus*, *Eriogonum ephedroides*, *Forsellesia meionandra*, *Hymenopappus filifolius*, *Mirabilis alipes*, *Parthenium ligulatum*, *Penstemon pachyphyllus*, *Tetradymia spinosa*, *Townsendia mensana* and *Yucca harrimaniae*. Many of these associated species are local endemics found only in the Uintah Basin.

Three populations of *S. suffrutescens* are known, one centered in the Gray Knolls between the Green River and Hill Creek with about 1,000 plants in three stands, a second centered on Little Pack Mountain and the slopes of Big Pack Mountain between Hill Creek and Willow Creek with about 3,000 plants in 6 stands, and a third about 20 miles west of the Gray Knolls population at the base of the Bad Lands cliff above the Wrinkles Road with about 1,000 scattered plants (Shultz and Mutz 1979, Franklin 1992). The Gray Knolls population is partially on the Uintah and Ouray Reservation of the Ute Indian Tribe and partially on the Naval Oil Shale Reserve No. 2 administered by the Department of Energy. The Pack Mountain population is partially on the Uintah and Ouray Reservation of the Ute Indian Tribe, partially on BLM lands, and partially on private lands. The Bad Lands cliff population is entirely on BLM lands.

POPULATIONS OF  
*SHOENOCRAMBE SUFFRUTESCENS*  
 AND  
*SHOENOCRAMBE ARGILLACEA*

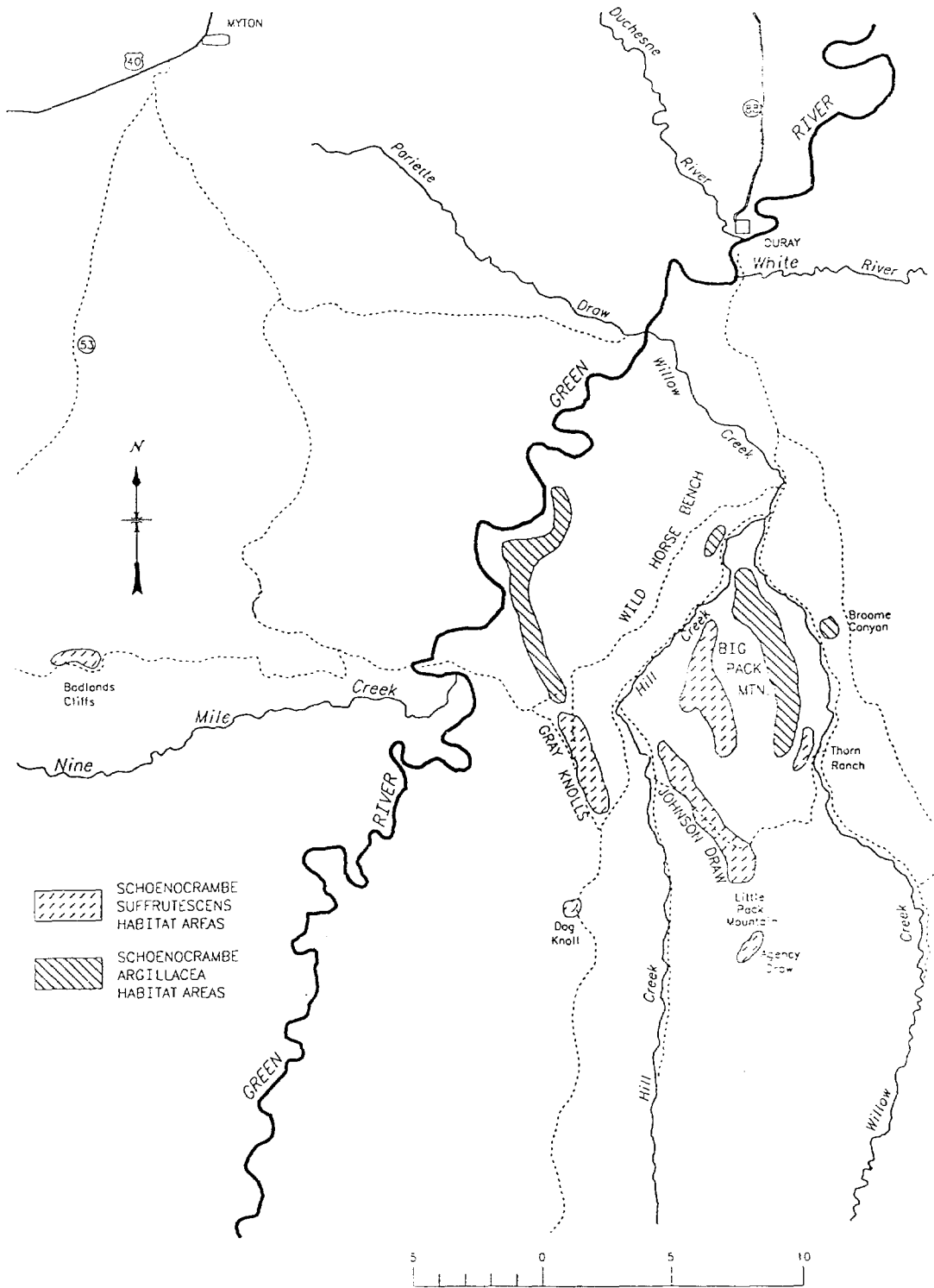


Figure 1. Distribution of *Schoenocrambe argillacea* and *Schoenocrambe suffrutescens* in Duchesne and Uintah Counties, Utah.

POPULATIONS OF  
*SCHOENOCRAMBE BARNEBYI*

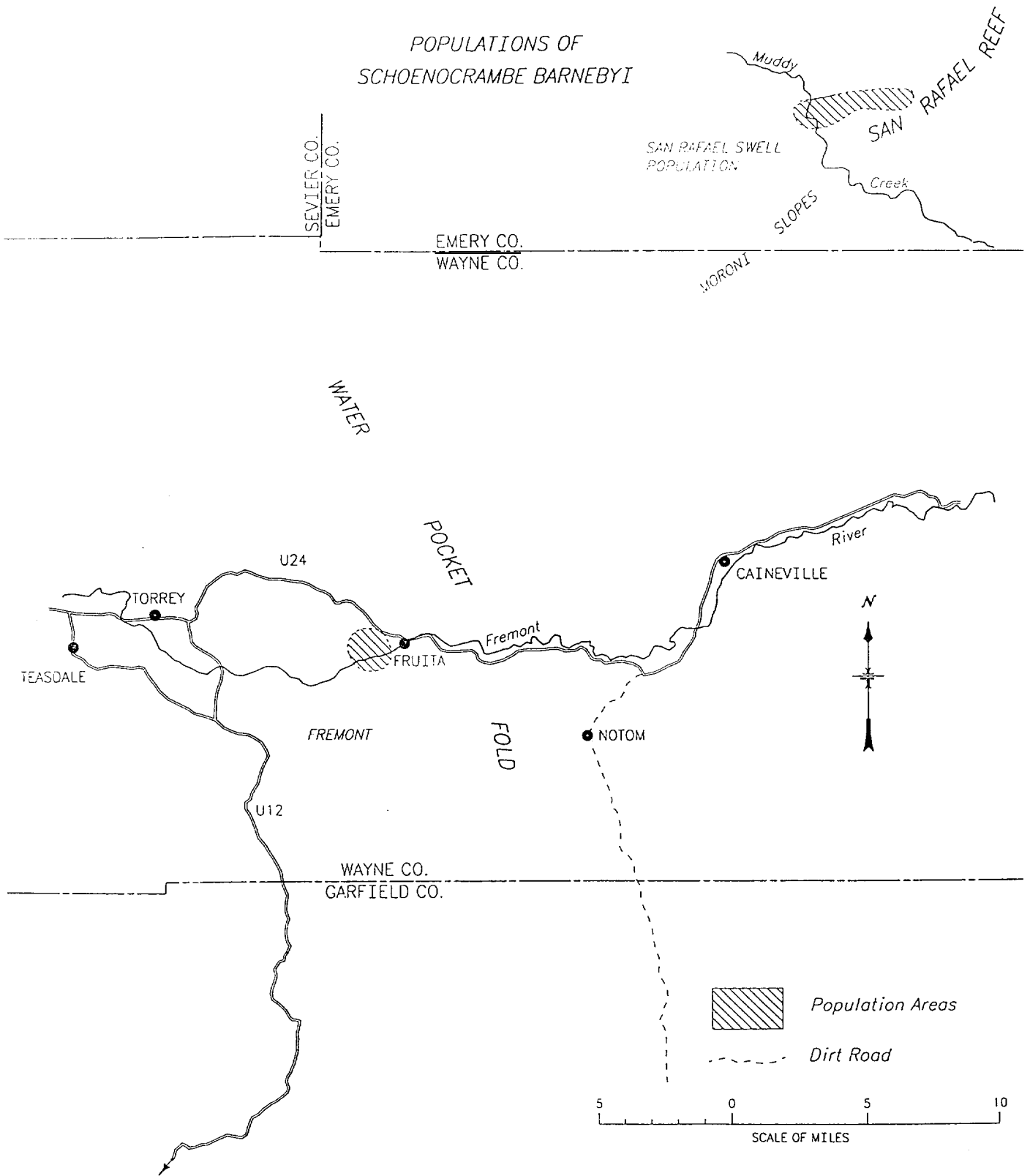


Figure 2. Distribution of *Schoenocrambe barnebyi* in Emery and Wayne Counties, Utah.

State owned sections of land are scattered among the BLM lands, some plants in the Pack Mountain and Bad Land populations occur on State lands.

Historically, this species was apparently more abundant and more continuous in its current range based on the observations of Graham (1937) and Reed Rollins (Harvard University, pers. comm. 1980) who has observed the species over the past 40 years. Various human activities, such as grazing, building stone excavation, and mineral extraction, have degraded and fragmented the species habitat, and reduced the species abundance and distribution (see range map at Figure 1).

The abundance and distribution of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* is limited by very restricted habitat. All three species are vulnerable to any event which could cause the local extirpation of one or more of their isolated populations.

### C. Population Biology

Flowering occurs from April to May and fruiting occurs May to June in all three species. Reproduction in each of the three species is sexual. The factors which govern the distribution of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* are not well known, nor are the long-term population dynamics. The effect of natural factors, such as disease, parasitism, grazing by native species, natural erosion, and vegetative competition, on the viability of the species population is not known.

The specific pollination mechanism and vectors for *S. argillacea* and *S. barnebyi* are not known. The following information on the breeding system and pollinators of *S. suffrutescens* was supplied by V. J. Tepedino and W. R. Bowlin, Bee Biology and Systematics Laboratory, USDA-ARS, Logan, Utah. *Schoenocrambe suffrutescens* plants produce a few (four) to many (over one hundred) inflorescence (5-10 cm length) each year. The five to twenty flowers on each inflorescence open acropetally. Flowers are fragrant in the mornings, but the fragrance declines throughout the day, and over the bloom time of each flower (3-5 days). The stamens are arranged in the typical cross pattern of the Brassicaceae. Anther dehiscence is extrorse on the second day of anthesis. The stigma is slightly below the anthers of the long stamens, and at about the same level of the anthers of the short stamens.

Pollinator exclusion experiments demonstrated that the *S. suffrutescens* is capable of automatic self-pollination (autogamy), but that significantly fewer seeds are set than when open pollination (assumed to be primarily cross-pollination) occurs. The following prospective pollinators, all native bee species, were captured while foraging on the flowers: *Dialictus perdificilis*, *D. sedi*, *Evyllaes pulveris* (all Halictidae), and *Andrena walleyi* (Andrenidae). Nothing is known of species except that all nest in the ground.

### D. Threats

Oil and gas exploration, drilling, and production, oil-shale mining and processing, building stone removal and off-road vehicle use are past, existing

and potential threats to the habitat of *S. argillacea* and *S. suffrutescens*. All known populations of *S. argillacea* and *S. suffrutescens* are on Federal lands leased for oil and gas energy reserves. In addition, the entire range of both species is underlain by oil shale, which may be mined when economic conditions favor it. The two species are vulnerable to surface disturbing activities associated with energy development within their habitats (England 1982, U.S. Fish and Wildlife Service 1990). The habitat of both species is underlain by petroleum deposits; similar deposits are currently being developed in locations adjacent to occupied habitat. The potential for decimation of *S. argillacea* and *S. suffrutescens* populations from petroleum resource development operations is a significant potential threat.

Trampling from off-road vehicles and possibly livestock are, also, active and potential threats. Unrestricted off-road vehicle use and future development of oil and gas wells and ancillary facilities could endanger the continued existence of this species unless appropriate measures are undertaken to protect this species and its habitat.

*S. suffrutescens* habitat is also associated with commercially valuable native building stone composed of clasts of volcanic ash deposited in the prehistoric Uinta Lake during the Eocene epic. Previous commercial stone excavation has apparently caused the extirpation of a portion of the species population in the vicinity of Big and Little Pack Mountains. The most vigorous of this species remaining populations are from areas that have not had the building stone removed.

A threat to *S. barnebyi* is habitat destruction associated with potential uranium mining activity. A large portion of the species San Rafael Swell population lie within six mining claims at Sy's Butte has access roads bulldozed across them. These activities undoubtedly removed some individuals. Portions of the species' habitat. These claims require annual assessment work which would cause the species habitat to be further impacted. The workings of one of the largest uranium mines in the San Rafael Swell are only a mile away on the same exposure of geologic strata as *S. barnebyi* (U.S. Fish and Wildlife Service 1985). The species' highly restricted distribution and very small population make the species particularly vulnerable to any activity which would disturb its habitat (Spence 1991, Heil 1992). Past activities associated with uranium mining during the 1950's and 1960's may have caused the extirpation of a portion of the species population.

The preclusion of such activities within Capitol Reef National Park provides some protection to the parks small *S. barnebyi* population. Even so, the species' population is currently being impacted by foot traffic from park visitors trampling and could be vulnerable to any activity, including road and recreational developments, which may occur on its National Park habitat.

Sheep and cattle grazing may have had an impact on *S. argillacea*, *S. barnebyi* and *S. suffrutescens* historically. Domestic livestock grazing, with current levels of grazing intensity and grazing management by the BLM, is not expected to significantly impact these species on BLM managed lands. The effect of grazing upon *S. suffrutescens* on Ute Indian Lands is unknown.

## II. RECOVERY

### A. OBJECTIVES AND CRITERIA

The immediate objective of this recovery plan is to maintain viable populations of *Schoenocrambe argillacea*, *Schoenocrambe barnebyi*, and *Schoenocrambe suffrutescens*. This objective will be accomplished by ensuring the protection of the current populations and occupied habitat for all three species through enforcing the conservation provisions of sections 7 and 9 of the Act.

The long-term objective is to initiate conservation and recovery measures which may lead to the delisting or downlisting to threatened of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens*.

*Schoenocrambe suffrutescens* is extremely rare and because of its long-term decline and potential threats from all land-disturbing activities, downlisting and delisting is unlikely in the near future. The other two species are less vulnerable, and the potential discovery of additional populations and the protection possible through land designation and other conservation measures may make the downlisting and delisting of these two species possible in the future.

If the inherent vulnerability of the species is decreased to the point that localized threats will not jeopardize the species, the downlisting or delisting of *S. barnebyi* and delisting of *S. argillacea* may be possible. These reclassification activities can be considered when conservation of these species populations and natural habitat is sufficient to ensure their continued existence as a viable self-sustaining population throughout their known ranges. This may occur if (1) the species abundance and distribution is increased by identification of additional stands or by the introduction of additional stands into suitable habitat proximal to the known species range, if determined to be feasible, or (2) minimum viable population studies and other biological information indicates that the species numbers and distribution is sufficient to maintain long-term species viability. Under these conditions, downlisting is anticipated to be possible when:

1. Discovery or establishment of a minimum of 5 separate populations with 2,000 or more individuals per population for each species. These populations must be demonstrated to be at or above minimum viable population levels.
2. Document the presence of or, if necessary, establish formal land management designations which would provide for long-term protection on undisturbed habitat for the above five populations of each species.

Delisting is anticipated to be possible when:

1. Discovery or establishment of a minimum of 10 separate populations with 2,000 or more individuals per population for each species. These populations must be demonstrated to be at or above minimum viable population levels.

2. Document the presence of or, if necessary, establish formal land management designations which would provide for long-term protection on undisturbed habitat for the above 10 populations of each species.

The above objectives and criteria are preliminary and subject to change as more information becomes available. The estimated date for accomplishing the short-term goal of preventing extinction of the species is the year 1997. The estimated date for accomplishing the long-term goal of delisting *S. argillacea* and *S. barnebyi* is 2010.

## B. STEPDOWN OUTLINE

1. Control activities which affect the habitat of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* through section 7 of the Act and other relevant laws and regulations.
  - 1.1 Control mineral development activities.
    - 1.11 Control mineral development activities in *S. argillacea* habitat.
    - 1.12 Control mineral development activities in *S. barnebyi* habitat.
    - 1.13 Control mineral development activities in *S. suffrutescens* habitat.
  - 1.2 Control other activities which may affect *S. argillacea*, *S. barnebyi*, and *S. suffrutescens*.
2. Inventory suitable habitat for each species and determine their population and distribution.
  - 2.1 Inventory suitable habitat for *S. argillacea*.
  - 2.2 Inventory suitable habitat for *S. barnebyi*.
  - 2.3 Inventory suitable habitat for *S. suffrutescens*.
3. Establish and conduct monitoring, biological, ecological, life history, and minimum viable population study for each species.
  - 3.1 Establish and conduct monitoring, life history, and minimum viable population study for *S. argillacea*.
  - 3.2 Establish and conduct monitoring, life history, and minimum viable population study for *S. barnebyi*.
  - 3.3 Establish and conduct monitoring, life history, and minimum viable population study for *S. suffrutescens*.

- 3.4 Evaluate the phylogenetic relationships between *S. argillacea*, *S. barnebyi*, and *S. suffrutescens*
  4. Establish formal land management designations which would provide for habitat protection for each of the three species.
    - 4.1 Land management designations for *S. argillacea*.
    - 4.2 Land management designations for *S. barnebyi*.
    - 4.3 Land management designations for *S. suffrutescens*.
  5. Propagate individuals of each species in horticultural facilities.
  6. Establish new populations/stands.
  7. Develop public awareness, appreciation, and support for the conservation of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens*.
- 

## C. NARRATIVE

1. Control activities which affect the habitat of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* through section 7 of the Act and other relevant laws and regulations.

The majority of the known habitat of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* occurs on federally managed lands. Section 7(a) of the Act, as amended, requires Federal Agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR Part 402. Section 7(a)(1) requires all Federal Agencies to carry out programs for the conservation of endangered and threatened species. Section 7(a)(2) requires Federal Agencies to insure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal Agency must enter into formal consultation with the Service.

Activities undertaken, permitted, or funded by the BLM, Bureau of Indian Affairs (BIA), Department of Energy (DOE) and National Park Service (NPS) have the potential to affect *S. argillacea*, *S. barnebyi*, and *S. suffrutescens*. These Agencies are required to consult with the Service whenever their proposed activities may affect this species or its habitat.

### 1.1 Control Mineral Development Activities.

*Schoenocrambe argillacea*, *S. barnebyi*, and *S. suffrutescens* were listed as threatened and endangered species in part because of



the potential of mineral development actions adversely impacting these species. The BLM will be the Agency primarily responsible to ensure that these mineral development activities do not adversely affect these species.

1.11 Control mineral development activities in *S. argillacea* habitat.

Virtually all of the habitat of *S. argillacea* occurs on federally managed public land under the jurisdiction of the BLM. Mineral and energy development activities on Federal land will require the necessary lease permits, etc., from the BLM before they can proceed.

Since the species was listed, the Vernal District of the BLM has had proposals for drilling projects which could have adversely affected local populations of this species. The BLM, as part of their right-of-way and drilling permitting programs, require an on-the-ground examination of all phases of oil and gas development which could impact *S. argillacea* and have required oil and gas development activities to avoid impacting the species or its habitat. This policy must continue to ensure the protection of *S. argillacea* populations.

Oil shale energy development projects within the range of *S. argillacea* will, in nearly all cases, require an environmental impact statement to meet the requirements of the National Environmental Policy Act of 1970. This will allow for the opportunity for the Service and other Federal Agencies to analyze such projects as to their impact on this species. Those actions which will affect this species will necessitate the preparation of a biological assessment to determine the impact to *S. argillacea* and any other listed species affected by the project. Section 7 of the Act mandates that projects requiring Federal involvement will not jeopardize listed threatened and endangered species.

1.12 Control mineral development activities in *S. barnebyi* habitat.

A threat to *S. barnebyi* is habitat destruction associated with potential uranium mining activity. The Mining Act of 1872 requires on-the-ground mining assessment work on all current claims. Assessment work in connection with mining claims for uranium poses a significant ongoing threat to *S. barnebyi* and its habitat. The BLM requires a mine plan be prepared for mining assessment areas within environmentally critical areas which must provide for the conservation of those environmental values. The BLM should

ensure that such actions are taken within the occupied habitat of *S. barnebyi*.

1.13 Control mineral development activities in *S. suffrutescens* habitat.

The rate of oil and gas development activities in the range of *S. suffrutescens* has been variable; currently oil and gas wells are being developed within the range of *S. suffrutescens*. The specific siting of these wells and other oil and gas field support features, such as roads, pipelines, and storage farms, have the potential of impacting this species. The BIA and BLM, as part of their right-of-way and drilling permitting programs, require an on-the-ground examination of all phases of oil and gas development which could impact a listed threatened or endangered species including *S. suffrutescens* and require oil and gas development activities to avoid individual threatened and endangered plants.

A portion of the Gray Knolls and Pack Mountain populations of *S. suffrutescens* are on the Uintah and Ouray Reservation of the Ute Indian Tribe. Indian reservations are Federal lands held in trust for specific Indian tribes which have a wide latitude of management prerogatives for those reservations. The Federal Government assists the Indian tribes in the management of their reservations through the BIA. Mineral and energy leasing and development activities on the Uintah and Ouray Reservation are administered by the Ute Indian Tribe with assistance from the BIA. The BLM is responsible for reviewing and authorizing proposed operations on a leasehold within the reservation, regardless of whether the lease is Indian or Federal. Both of these Federal Agencies are responsible for ensuring that land actions in general, and those associated with mineral leasing and development specifically, are not likely to jeopardize the continued existence of *S. suffrutescens*. Both agencies are required to consult with the Service whenever mineral development activities under their jurisdiction may affect this species or its habitat.

The remainder of the Gray Knolls population is within Naval Oil Shale Reserve No. 2 administered by the DOE. This agency will be responsible for ensuring that energy development activities within this area do not jeopardize *S. suffrutescens*.

The sale of stone on Federal lands within the habitat of *S. suffrutescens* is regulated by the BLM. The BLM is responsible to ensure that rock collecting and building stone excavation activities conducted on its lands do not jeopardize *S. suffrutescens*. The Service and the BIA will

work with the Ute Indian Tribe to identify and conserve the habitat of *S. suffrutescens* on the Uintah and Ouray Reservation which may be threatened by such mineral activity.

The Service also will work with the State of Utah and private landowners, on whose property the species may occur, to identify and conserve the habitat of *S. suffrutescens*. At present, portions of the habitat of *S. suffrutescens* is closed to rock gathering on BLM land, which protects some of the species populations. Rock gathering should be restricted on the rest of the populations throughout the species range.

1.2 Control other activities which may affect *S. argillacea*, *S. barnebyi*, and *S. suffrutescens*.

The monitoring of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* populations will enable the identification of other activities affecting the species populations. When and if such other activities are identified, they will be evaluated and action implemented to prevent adverse impact to the species population.

2. Inventory suitable habitat for each species and determine their population and distribution.

An inventory of all suitable habitat is needed to identify essential habitat and to verify those stands for which protection is required to best ensure the long-term survival of the species. These surveys will include age class distribution; documentation of habitat losses and population increase or reduction for each population; and quantification of impacts from trampling, grazing, disease, parasitism, etc.

2.1 Inventory suitable habitat for *S. argillacea*.

This activity will be the responsibility of the BLM with assistance from the Service.

2.2 Inventory suitable habitat for *S. barnebyi*.

This activity will be the responsibility of the BLM and NPS with assistance from the Service.

2.3 Inventory suitable habitat for *S. suffrutescens*.

This activity will be the responsibility of the BLM, BIA, and DOE with assistance from the Service.

3. Establish and conduct monitoring, biological, ecological, life history, and minimum viable population study for each species.

Biological and ecological studies are needed for all three species to determine the factors controlling the species distribution, abundance, and its interaction within its ecosystem. Little is known concerning natural threats such as disease, parasitism, and grazing by native species on *S. argillacea*, *S. barnebyi*, and *S. suffrutescens*. No known diseases have been reported in this species. It is not known if the populations of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* are at population levels that will ensure long-term demographic and genetic viability.

A minimum viable population is defined as a demographically stable population that is large enough to maintain genetic variation and to enable it to evolve and successfully respond to natural environmental variation (Menges 1986). Minimum viable population studies are needed to determine at what level the species are demographically stable. These minimum viable population studies will be designed to provide life history knowledge of the species and serve as ongoing monitoring studies for each species. If, as a consequence of these studies, other factors, natural or man caused, are identified as possibly having a detrimental effect on the species population which would preclude its eventual delisting, those factors will be addressed and the recovery plan revised to accommodate them.

3.1 Establish and conduct monitoring, life history, and minimum viable population study for *S. argillacea*.

This activity will be the responsibility of the BLM with assistance from the Service.

3.2 Establish and conduct monitoring, life history, and minimum viable population study for *S. barnebyi*.

This activity will be the responsibility of the BLM and NPS with assistance from the Service.

3.3 Establish and conduct monitoring, life history, and minimum viable population study for *S. suffrutescens*.

This activity will be the responsibility of the BLM, BIA, and DOE with assistance from the Service.

3.4 Evaluate the phylogenetic relationships between *S. argillacea*, *S. barnebyi*, and *S. suffrutescens*

The phylogenetic relationships between the three species is poorly understood. Studies are needed to determine the genetic relationships between the three species and other close relatives. Determination of their genetic similarity is necessary to understand the basic biology and to determine

whether there is any taxonomic uniqueness at the generic level. This is especially true of *S. suffrutescens* which was initially listed as the monotypic genus *Glaucocarpum suffrutescens*. The possibility exists that *S. suffrutescens* should be taxonomically classified as *Glaucocarpum suffrutescens*. If this occurs, greater priority may need to be given to this species, due to its uniqueness as a monotypic genus. This information will be useful in determination of recovery and management strategies for each species.

#### 4. Establish formal land management designations

Formal land management designations need to be established to provide habitat protection for each of the three species. Such designations may include the following: Research Natural Areas, Areas of Critical Environmental Concern, or Designated Wilderness. Special protected areas similar to those mentioned above should ensure the long-term protection of enough populations of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* to ensure its survival as a vigorous reproducing species into to foreseeable future after the possible delisting of the species.

##### 4.1 Land management designations for *S. argillacea*.

This activity will be the responsibility of the BLM with assistance from the Service.

##### 4.2 Land management designations for *S. barnebyi*.

This activity will be the responsibility of the BLM and NPS with assistance from the Service.

##### 4.3 Land management designations for *S. suffrutescens*.

This activity will be the responsibility of the BLM, BIA, and DOE with assistance from the Service.

#### 5. Propagate individuals of each species in horticultural facilities.

The Center for Plant Conservation (CPC) should consider inclusion of individual living specimens of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* into the "National Collection of Endangered Plant Species" and, subsequently, propagation by its member institutions. These collections are for the purpose of maintaining a refuge garden population for those species which are threatened in their natural habitat and for conducting research beneficial to the species conservation and recovery, including techniques necessary for the establishment of additional populations in suitable habitat. This task will be the responsibility of the Service with assistance from the various land managing agencies involved and the CPC.

6. Establish new populations/stands.

Introduction of new stands into or proximal to the species current range may be conducted if suitable habitat is found and if such introduction is determined to be desirable or feasible. Because no reintroductions have previously been undertaken, the success of such reintroductions is uncertain. Reintroductions, however, should be considered for the biological information that would be obtained and for the possibility of successful establishment of viable stands of the species. No populations will be introduced on Ute Tribal lands without the express written request for the introduction of such populations from the Ute Tribal Business Council.

7. Develop public awareness, appreciation, and support for the conservation of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens*.

Education is a vital part of the recovery process. The cooperation of the public is essential in the ultimate success of the above recovery measures. This can be started with educational programs, such as pamphlets and audiovisual programs, for use in schools and groups interested in conservation. The introduction and maintenance of *S. argillacea*, *S. barnebyi*, and *S. suffrutescens* in recognized botanical gardens will assist in public education of the significance and importance of this species and provide for a reserve of seeds and plants for reintroduction into the wild should wild populations be lost. The Service, with assistance from Federal land managing Agencies, and public and private conservation groups, will be responsible for this activity.

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### III. IMPLEMENTATION SCHEDULE

The Implementation Schedule that follows outlines actions and costs for the recovery program. It is a guide for meeting the objectives elaborated under the Recovery section of this plan. This schedule indicates task priorities, task numbers, task descriptions, duration of tasks ("ongoing" denotes a task that once begun should continue on an annual basis), the responsible agencies, and estimated costs. These actions, when accomplished, should bring about the recovery of *Schoenocrambe argillacea*, *Schoenocrambe barnebyi*, and *Schoenocrambe suffrutescens* and protect their habitat.

Priorities in column one of the following implementation schedule are assigned as follows:

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

#### Key to Acronyms Used in Implementation Schedule

UT - State of Utah, including the Utah Natural Heritage Inventory  
UIT - Ute Indian Tribe  
BIA - Bureau of Indian Affairs  
BLM - Bureau of Land Management  
CPC - Center for Plant Conservation  
DOE - Department of Energy  
NPS - National Park Service  
FWS - Fish and Wildlife Service  
ES - Ecological Services  
LE - Law Enforcement

Utah Reed-mustards (Schoenocrambe argillacea, Schoenocrambe barnebyi, and Schoenocrambe suffrutescens) Recovery Implementation Schedule.

| Priority | Task | Task Description   | Task Duration | Responsible Party |       |                        | Cost Estimate |       |       | Comments                        |
|----------|------|--|---------------|-------------------|-------|------------------------|---------------|-------|-------|---------------------------------|
|          |      |  |               | FWS               | Other | Region Program         | FY-01         | FY-02 | FY-03 |                                 |
| 1        | 1.12 | Control mineral development activities in <u>S. barnebyi</u> habitat.      | ongoing       | 6                 | ES    | BLM, NPS               |               |       |       | Part of ongoing agency program. |
| 1        | 1.13 | Control mineral development activities in <u>S. suffrutescens</u> habitat. | ongoing       | 6                 | ES    | BLM, BIA, DOE, UIT     |               |       |       | Part of ongoing agency program. |
| 2        | 1.11 | Control mineral development activities in <u>S. argillacea</u> habitat.    | ongoing       | 6                 | ES    | BLM, DOE               |               |       |       | Part of ongoing agency program. |
| 2        | 2.1  | Inventory suitable habitat for <u>S. argillacea</u> .                      | 2 years       | 6                 | ES    | BLM, DOE, UT           | 5,000         | 5,000 | ----- |                                 |
| 2        | 2.2  | Inventory suitable habitat for <u>S. barnebyi</u> .                        | 2 years       | 6                 | ES    | BLM, NPS, UT           | 5,000         | 5,000 | ----- |                                 |
| 2        | 2.3  | Inventory suitable habitat for <u>S. suffrutescens</u> .                   | 2 years       | 6                 | ES    | BLM, BIA, DOE, UIT, UT | 5,000         | 5,000 | ----- |                                 |
| 2        | 3.1  | Monitoring, biological, and population study for <u>S. argillacea</u> .    | ongoing       | 6                 | ES    | BLM, DOE, UT           | 5,000         | 1,000 | 1,000 |                                 |
| 2        | 3.2  | Monitoring, biological, and population study for <u>S. barnebyi</u> .      | ongoing       | 6                 | ES    | BLM, NPS, UT           | 5,000         | 1,000 | 1,000 |                                 |
| 2        | 3.3  | Monitoring, biological, and population study for <u>S. suffrutescens</u> . | ongoing       | 6                 | ES    | BLM, BIA, DOE, UIT, UT | 5,000         | 1,000 | 1,000 |                                 |
| 3        | 3.4  | Schoenocrambe/Glaucocarpum phylogenetic study                              | 3 years       | 6                 | ES    | BLM                    | 5,000         | 5,000 | 5,000 |                                 |
| 3        | 4.1  | Land management designations for <u>S. argillacea</u> .                    | 2 years       | 6                 | ES    | BLM, DOE               |               |       |       | To be determined.               |
| 3        | 4.2  | Land management designations for <u>S. barnebyi</u> .                      | 2 years       | 6                 | ES    | BLM, NPS               |               |       |       | To be determined.               |
| 3        | 4.3  | Land management designations for <u>S. suffrutescens</u> .                 | 2 years       | 6                 | ES    | BLM, BIA, DOE, UIT     |               |       |       | To be determined.               |
| 3        | 5    | Propagate each species.  | ongoing       | 6                 | ES    | BLM, NPS, CPC, UT      | 6,000         | 1,000 | 1,000 |                                 |

| Priority | Task | Task Description   | Task Duration | Responsible Party |       |                             | Cost Estimate |       |       | Comments   |
|----------|------|--|---------------|-------------------|-------|-----------------------------|---------------|-------|-------|--|
|          |      |  |               | FWS               | Other | Region Program              | FY-01         | FY-02 | FY-03 |  |
| 3        | 6    | Establish new populations/stands.  | 10 years      | 6                 | ES    | BLM, NPS, CPC, UT           |               |       |       | If possible and feasible, cost to be determined. |
| 3        | 7    | Develop Informational and educational programs for <u>S. argillacea</u> , <u>S. barnebyi</u> and <u>S. suffrutescens</u> . | ongoing       | 6                 | ES    | BLM, BIA, NPS, DOE, UIT, UT | 6,000         | 1,000 | 1,000 |  |

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This recovery plan was made available to the public for comments as required by the 1988 amendments to the Endangered Species Act (Act) of 1973. The public comment period was announced in the Federal Register (58 F.R. 49522) on September 23, 1993, and closed on November 22, 1993. Press releases were sent to about 80 newspapers in Utah.

During the public comment period, four comment letters were received. The comments provided in these letters have been considered and incorporated as appropriate. Comments addressing recovery tasks that are the responsibility of an agency other than the U.S. Fish and Wildlife Service have been sent to that agency as required by the 1988 amendments to the Act.