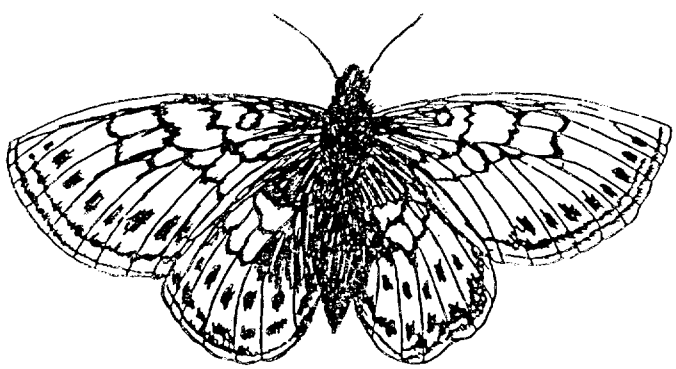
UNCOMPAHGRE FRITILLARY

BUTTERFLY



RECOVERY PLAN

UNCOMPAHGRE FRITILLARY BUTTERFLY

RECOVERY PLAN

Prepared by the Uncompahgre Butterfly Recovery Team

Bill Wallis, Leader
Forest Service
Region 2
Gunnison, Colorado

Hugh Britten
University Nevada-Reno
Reno, Nevada

Joe Capodice
Bureau of Land Management
Montrose District
Gunnison, Colorado

Janet Coles
Colorado Natural Areas Program
Denver, Colorado

Tom Holland
Forest Service
Region 2
Delta, Colorado

Terry Ireland
Fish and Wildlife Service
Region 6
Grand Junction, Colorado

Paul A. Opler
Fish and Wildlife Service
Region 8
Fort Collins, Colorado

For
Region 6
Fish and Wildlife Service
Denver, Colorado

Approved: Ralph O. Morgenweck
Regional Director, Region 6, Fish and Wildlife Service

Date: March 17, 1994

DISCLAIMER

Recovery plans delineate reasonable actions that are believed to be required to recover and/or protect listed species. Plans are published by the Fish and Wildlife Service, and are sometimes prepared with the assistance of recovery teams, contractors, State agencies, and others. Objectives will 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 approval of any individuals or agencies involved in the plan formulation other than the Fish and Wildlife Service. They represent the official position of the 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. Cost and time estimates outlined in the Implementation Schedule are only estimates, and also are subject to modification.

Literature Citations should read as follows:

Fish and Wildlife Service. 1994. Uncompahgre Fritillary Butterfly Recovery Plan. Denver, Colorado. 20 pp.

Additional copies may be purchased from:

The Fish and Wildlife Reference Service
5430 Grosvenor Lane, Suite 110
Bethesda, Maryland 20814

(301) 429-6403
or
1-800-582-3421

The fee for the Plan varies depending on the number of pages in the Plan.

EXECUTIVE SUMMARY

Current Species Status: The Uncompahgre fritillary butterfly was listed as endangered on June 24, 1991 (56 F.R. 28712). The butterfly has been verified at only two areas in the San Juan Mountains in Colorado. There is anecdotal evidence of other colonies in the San Juans and southern Sawatch ranges in Colorado. Documented populations were estimated at 1,400 individuals in 1992 and 3,284 in 1993. Both odd- and even-year broods at the type locality on Mt. Uncompahgre apparently have rebounded from their previous decline, but trends are difficult to determine due to insufficient information. The even-year brood at Redcloud Peak appears stable with 400-500 adults in each of the last 3 even-years. The odd-year brood at Redcloud Peak also apparently rebounded with approximately 1,000 individuals in 1991 and 1,384 in 1993.

Habitat Requirements and Limiting Factors: The butterfly exists above treeline in patches of its larval host plant, snow willow. The butterfly is most often found on north and east facing slopes, which provide a moist, cool, microclimate. The greatest known controllable threat is butterfly collecting. Climatological patterns, disease, parasitism, predation, and trampling of larvae by humans and livestock might pose additional threats.

Recovery Objective: The primary objective is to prevent the species extinction and protect existing butterfly colonies for the foreseeable future. The secondary objective is to downlist and delist the species.

Recovery Criteria: Preliminary criteria for downlisting and delisting the species have been identified; however, these criteria may change as more information is available. Downlisting may be considered if threats are removed and if adequate quality habitat exists to maintain stable colonies of butterflies for 10 consecutive years at Mt. Uncompahgre and Redcloud Peak. Delisting may be considered after stable colonies of butterflies exist for 10 consecutive years at a minimum of 10 sites.

Actions Needed: Major actions needed for achieving recovery of the Uncompahgre fritillary butterfly are:

1. Enforce restrictions on Uncompahgre butterfly collection.
2. Search for new colonies.
3. Monitor population status of existing and newly found colonies.
4. Obtain data on habitat requirements and life history.
5. Monitor climatological trends at known colony sites.
6. Determine threats besides collecting.
7. Determine propagation techniques.
8. Reintroduce and transplant butterflies.

Total Estimated Cost of Recovery: Unknown.
Date of Recovery: Unknown.

TABLE OF CONTENTS

PART I--INTRODUCTION

Description

The Uncompahgre fritillary butterfly (Boloria acrocnema) was discovered on July 30, 1978, and was subsequently described as a new species by Gall and Sperling (1980). It was listed as endangered on June 24, 1991 (56 F.R. 28712). The Uncompahgre fritillary butterfly (butterfly) is in the Order Lepidoptera and Family Nymphalidae. The butterfly is small, with a 2-3 centimeter (1 in.) wingspan. Males have rusty brown wings criss-crossed with black bars; females' wings are somewhat lighter (Gall 1983). Underneath, the forewing is light ocher and the hindwing has a bold, white jagged bar dividing the crimson brown inner half from the purple-grey scaling on the outer wing surface. The body has a rusty brown thorax and a brownish black abdomen (Gall and Sperling 1980).

Distribution

The Uncompahgre fritillary butterfly has the smallest total range of any North American butterfly species. Its habitat is limited to two verified areas (inhabited by three colonies) and possibly an additional two small colonies in the San Juan Mountains and southern Sawatch Range in Gunnison, Hinsdale, and Chaffee counties in southwestern Colorado. The type locality is on Mt. Uncompahgre in the Big Blue Wilderness, Hinsdale County, Colorado, and occurs on land managed by the Forest Service (FS). A second colony also occurs on Mt. Uncompahgre near the type locality. The only other known colony is the Redcloud Peak population discovered in 1982 on land managed by the Bureau of Land Management (BLM).

Despite numerous attempts to locate other colonies, no other major colonies have been verified. In 1988, three individuals were seen at one new location on BLM lands, and three individuals were seen at another new location on FS lands. These two sites must be investigated to determine if they represent possible new colonies. There is a report of four colonies in the San Juan Mountains and southern Sawatch Range, but these unverified sites, if extant, have been kept secret by their discoverer. Because the butterfly is found in remote, generally inaccessible areas, it is possible that the species may occur in other mountain ranges in Colorado, but there have been no other reports of the butterfly.

During 1987 and 1988, field surveys were carried out by Dr. Peter Brussard and students under a contract funded by FS, BLM, and Fish and Wildlife Service (FWS) (Brussard and Britten 1989). Though they visited over 50 sites that appeared to satisfy the butterfly's habitat requirements, they found only the few individuals at the two new sites previously mentioned.

Habitat and Life History

All colonies known to FWS are associated with patches of snow willow (Salix nivalis) above 3,810 meters (12,500 ft.); the snow willow provides larval food and cover. The species has been found only on northeast-facing slopes, which

are the coolest and wettest microhabitat available in the San Juans (Scott 1982, Brussard and Britten 1989). The females usually lay their eggs on snow willow (Seidl 1992), which is the larval food plant, or in litter within snow willow patches. Adults take nectar from a range of flowering alpine plants (Seidl 1993a).

Scott (1982) and Brussard and Britten (1989) believe that the species has a biennial life history, which means that it requires 2 years to complete its life cycle. Eggs laid in 1990 (even-year brood) would be caterpillars in 1991 and mature into adults in 1992. Similarly, eggs laid in 1991 (odd-year brood) would become adults in 1993. The odd- and even-year broods may function as essentially separate populations. Results from genetic studies, however, indicate that there is gene flow between odd- and even-year broods (Brussard and Britten 1989), indicating that the odd- and even-year broods may not be entirely separated. Based on her observations, Seidl (1994, pers. comm.) believes that, at times, larvae hatched early in summer can develop into adults the following year instead of taking an additional year.

Brussard and Britten (1989) used electrophoretic techniques to examine population genetic variability. The study revealed that the butterfly is only about one-third as heterozygous as populations of B. improba from northwestern Canada. This low genetic variability may indicate less environmental adaptability, i.e., a reduced ability to adapt to a changing environment. In fact, its range of habitat usage is less than that of B. improba populations in Wyoming and British Columbia.

Population Status

At the type locality at Mt. Uncompahgre, the 1978 colony (even-year brood) was estimated by Larry Gall to be 800 individuals (Interagency Agreement 1984); the 1988 colony was estimated to be 208 individuals (Brussard and Britten 1989). Brussard and Britten (1989) found no butterflies at Mt. Uncompahgre in 1987, although small numbers were found at an auxiliary site about 2.5 km from the type locality. In 1989, no population surveys were conducted at any site. Seidl (1991a) found no butterflies at the type locality in 1990 or 1991 but four were found in 1991 at the auxiliary site (Seidl 1991b). In 1992 the even-year brood rebounded to approximately 704 (close to 1978 levels) at the type locality and 292 at the auxiliary site (Seidl 1993a). The odd-year population at the auxiliary site increased dramatically in 1993 to an estimated 1,612 individuals. Because of these large numbers, the auxiliary site is now considered to constitute a second colony on Mt. Uncompahgre. The population at the type locality also increased in 1993 to 288 individuals (Seidl 1993b). Further monitoring of the even- and odd-year broods at both colonies at Mt. Uncompahgre is needed to determine if this rebound continues or if additional declines occur.

At Redcloud Peak, the 1982 colony was estimated to be between 1,000 and 1,500 individuals (Interagency Agreement 1984); the 1988 estimate was 492 individuals (Brussard and Britten 1989), and the 1990 estimate (Seidl 1990) was 412. The even-year brood remained about the same in 1992 with 408 individuals (Seidl 1993a). In 1991 the Redcloud Peak population was estimated at 996 and increased to 1384 in 1993 (Seidl 1993b). The status of the

odd-year colony at Redcloud Peak appears to be increasing, but is difficult to assess due to a lack of historical data on estimated size. Continued monitoring is needed to determine the status of both the odd- and even-year broods at Redcloud Peak.

Reasons for Listing

The butterfly was listed as endangered in 1991 due to the declines observed during the 1980's. While there has recently been increased numbers in the even- and odd-year classes at the two sites, the status of the species is still difficult to determine because of gaps in survey information. Further, there is no indication as to whether this rebound will persist or whether additional declines will occur. The cause of the species apparent decline in the 1980's is also unknown, but may be related to threats described below.

As one of the few North American butterfly species discovered in the last half century, it is attractive to collectors. Its sedentary nature, weak flying ability, and tendency to fly low to the ground make it easy to collect. Overcollection is considered the greatest human-caused threat to the species. The apparent population increases in even- and odd-year broods may be in response to cessation of collecting pressure. Other actual or potential threats to the species include adverse climatic changes, small population size, and low genetic variability. There is a minor potential threat from trampling of larvae by humans and livestock.

Conservation Measures

Listing the butterfly as endangered has given it protection under section 9 of the Endangered Species Act (Act). Section 9 prohibits the importation, exportation, take, possession, sale, or transportation of the butterfly. Take is defined under section 2 of the Act as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. Violation of the provisions of the Act can result in criminal penalties of up to $100,000 and 1 year in prison for an individual or $200,000 for a corporation, and up to $25,000 in civil penalties.

Section 7(a)(1) 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 and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR 402. Section 7(a)(2) requires Federal Agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed 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 FWS.

In 1984, FS and BLM signed an interagency agreement for the conservation of the butterfly. The interagency agreement facilitated funding for butterfly research and surveys for the butterfly and its habitat. Yearly reports of potential habitat and butterfly sightings or population estimates were recorded and filed with FS and BLM (Joe Capodice, BLM, and Bill Wallis FS,

pers. comm. 1992). After the species was listed, FWS joined FS and BLM in an interagency agreement to further conserve the butterfly. Guidelines for conducting butterfly surveys were developed by FWS, BLM, and FS in 1993 to facilitate compliance with section 7 of the Act and to aid in recording characteristics of potential habitat and butterfly colony sites.

A variety of research on the species biology was conducted by Hugh Britten in 1987 and 1988 and by Amy Seidl in 1990, 1991, 1992, and 1993. Both researchers also spent time searching and mapping potential colony sites. This research has provided most of the current information available on the butterfly's biology and distribution.

Habitat protection measures at the colony sites have been established by FS and BLM. Historically, herds of sheep were driven over both mountains where the butterflies occur, but BLM and FS no longer allow grazing at the colony sites. There was a report of sheep being driven over the Mt. Uncompahgre site in 1992 despite the closure. The FS will need to continue to work with ranchers to ensure their sheep are not driven through the Mt. Uncompahgre area. A hiking trail passes near the Redcloud Peak colony, but routing changes were made to the trail to reduce the likelihood that hikers will deviate from the trail and cross through the butterfly site. The FS has prohibited the collection of butterflies on Mt. Uncompahgre since 1984. The BLM recently announced the prohibition of butterfly collecting at Redcloud Peak starting on July 1, 1993 (58 F.R. 26151). The BLM designated Redcloud Peak as an Area of Critical Environmental Concern in February 1993. The Colorado Natural Areas Program has registered, but not yet designated, Mt. Uncompahgre as a State Natural Area. This means that the site has been identified as one deserving special attention, but a management agreement (for a Natural Area) has not been completed. The Redcloud Peak site also is under consideration for State Natural Area designation. Similar habitat protection measures may be needed on any newly found colony sites.

Other than prohibiting collection and preventing damage to the snow willow habitat, it appears that very little management of the butterfly population or its habitat is needed. However, should significant population declines be determined or other problems with reproduction or survival be identified, other management measures, possibly including propagation and reintroduction, may be necessary. Reintroduction and propagation also may be needed to increase the numbers of colonies in suitable habitats to facilitate recovery and possible delisting of the species.

PART II--RECOVERY

Objective

The primary objective is to prevent the species extinction and protect existing butterfly colonies for the foreseeable future. Once this is accomplished, the secondary objective is to downlist and delist the species.

Downlisting and Delisting Criteria

If additional colonies are found, if the known population number naturally increases, or if propagation coupled with augmentation or reintroduction is successful in increasing their numbers, the butterfly may be considered for downlisting or delisting. Because of the species restricted distribution, it is uncertain whether the species can be delisted. Preliminary downlisting and delisting criteria are identified as follows (these criteria may change as additional information becomes available in the future):

Downlisting may be considered if threats are removed and if adequate quality habitat exists to maintain stable colonies of butterflies for 10 consecutive years at both Mt. Uncompahgre and Redcloud Peak. Delisting may be considered after stable colonies of butterflies exist for 10 consecutive years at a minimum of 10 sites. The numbers that will need to be maintained in order to define the colonies (and entire population) as stable cannot presently be determined.

Step-down Outline

1. Conduct law enforcement efforts to prohibit collecting the butterfly.
2. Search for additional colonies.
    - 2.1. Coordinate search locations.
    - 2.2. Coordinate efforts to locate and train searchers.
    - 2.3. Search for colonies.
3. Conduct biological research.
    - 3.1. Monitor known colony population levels.
    - 3.2. Determine oviposition sites.
    - 3.3. Determine life history of larvae.
    - 3.4. Conduct habitat monitoring and research.
        - 3.4.1. Record snowfall, rainfall, and temperature levels at Mt. Uncompahgre and Redcloud.
        - 3.4.2. Determine soil moisture and temperature levels.

3.4.3. Determine new-found colony elevation, slope, and aspects.

3.4.4. Monitor plant phenology.

3.4.4.1. Monitor morphological phenology of snow willow.

3.4.4.2. Monitor morphological phenology of major adult nectar sources.

4. Determine if other threats exist besides collecting.

4.1. Determine if disease, parasitism, or predation is a threat.

4.2. Determine if sheep or livestock grazing is a threat.

4.3. Determine if recreational activity is a threat.

5. Determine laboratory propagation techniques if natural reproduction does not occur.

5.1. Conduct propagation experiments on related species.

5.2. Propagate the Uncompahgre fritillary butterfly.

6. Reintroduce and transplant butterflies.

6.1. Reintroduce butterflies.

6.2. Transplant to suitable sites.

7. Conduct recovery team activities.

8. Conduct BLM, FS, and FWS contracting with researchers.

9. Erect educational signs.

Narrative

1. Conduct law enforcement efforts to prohibit collecting the butterfly.

Section 9 of the Endangered Species Act prohibits "take" of listed species. Take is defined as "harm, harass, kill," etc. Collecting of the butterfly is a violation of section 9. Patrol of known butterfly colonies by law enforcement agents from FWS, FS, and BLM is needed during the butterfly's flight season to enforce prohibitions against butterfly collecting. Researchers should report collecting or habitat destruction activity to law enforcement agents.

2. Search for additional colonies.

Major butterfly colonies are known to occur at only two locations. Previous surveys have turned up only a few individuals at two additional locations. Continued searches in suitable habitat areas are needed to verify the presence or absence of additional colonies and evaluate the need for reintroduction of additional colonies.

2.1. Determine search locations.

Create a mapping system to guide annual searches of potential butterfly habitat and help locate new butterfly colonies. The maps will show habitat that has been searched, and an accompanying narrative will explain the history of those sites that have been searched. The maps may be stored on BLM's geographic information system and should be combined with digital elevation models. Work plans to guide search efforts should be prepared annually.

2.2. Coordinate efforts to locate and train searchers.

Depending on cost efficiency, searchers may be voluntary or may be hired. A coordinator will be needed to organize and train searchers in proper search protocol. The coordinator also will prepare necessary documents to provide payments or per diem to searchers, and possibly provide housing and/or transportation.

2.3. Search for colonies.

Normally teams of two people will search potential habitat areas identified by the coordinator. The search will last for the duration of the flight season of approximately 6 weeks starting in late June. Possible finds will be reported to the coordinator, who will visit the site for confirmation. It is expected to take 10 years to fully search possible habitat areas.

3. Conduct biological research.

Additional research is needed to facilitate successful laboratory propagation, to expand knowledge of appropriate reintroduction sites and timing of reintroduction, to increase knowledge of the butterfly's

requirements in utilizing its host plant, and to monitor population levels.

3.1. Monitor known colony population levels.

The Pollard transect method will continue to be used to obtain a population estimate of known colonies (Pollard 1977). This method does not require handling the butterflies, and causes the least impact to them. Brussard and Britten's (1989) derivation of the formula used to calculate population estimates in Gall's (1984) article will be used to calculate estimates of the butterfly population. Monitoring population levels will allow managers to identify population trends and to evaluate when conditions are such that propagation and augmentation of the population may be needed.

3.2. Determine oviposition sites.

This task was completed in 1993. The butterflies lay their eggs on snow willow or litter within snow willow patches. The snow willow patches occur on north to northeast facing slopes. No microsite habitat characteristics were taken around the immediate oviposition.

3.3. Determine life history of larvae.

Information on life history and habitat requirements of the larvae is needed to determine factors limiting larval survival. Recording larval food sources, overwintering sites, and preferred summer habitat is important to understand factors limiting larval survival and to facilitate reintroduction attempts. The leaf pattern left by foraging larvae should be recorded to help locate larvae in the future. Observation of the larvae will be attempted first in the field. If field observation proves difficult, then laboratory observation will be conducted.

3.4. Conduct habitat monitoring and research.

Brussard and Britten (1989) noted that the decline in the butterfly may be attributable to unusually warm and dry weather in the San Juan Mountains in recent years. Therefore, onsite weather monitoring, coupled with population monitoring, is recommended as a means of testing correlations between weather patterns and population estimates.

3.4.1. Record snowfall, rainfall, and temperature levels at Mt. Uncompahgre and Redcloud.

Manual measurement of snow depth each spring at certain locations in or near colonies is needed to provide an index of snow pack and snowmelt in relation to butterfly emergence. Snow pack and related soil moisture may affect the density and timing of emergence of the butterfly. If

emergence after snowmelt is similar from year to year, proper timing of surveys may more easily be planned in future years. A measuring stick should be inserted in at least three places in the snow at the same point on the same days in June of each year. Pictures taken the same day each spring from a consistent photo point also may be beneficial to record extent of snowpack.

An automatic monitoring device should be placed at both Mt. Uncompahgre and Redcloud for recording rainfall and temperature. Snow and rainfall levels from SNOTEL weather devices close to colony sites also can be monitored to help determine precipitation levels. Timing of snowmelt and amount of snow and rainfall is an integral part of phenology data.

The air temperature could be measured using a simple thermometer if automatic recording devices are not available. Readings should take place at the same time each morning and afternoon.

3.4.2. Determine soil moisture and temperature levels.

Soil moisture might be a factor affecting plant growth, chemical toxicity in plants, and larval survival. Larval mortality may be a direct result of dehydration or an indirect result of lack of food sources, plant toxicity, or excessive moisture causing plant molds or an increase in pathogens. Parasites and predators may increase or decrease in response to soil moisture levels. A soil probe that accurately records moisture and temperature would facilitate these measurements. A soil thermometer also may be used if the soil probe does not record temperature.

3.4.3. Determine elevation, slope, and aspect of newly discovered colonies.

As new colonies are discovered, information on elevation, slope, and aspect of the colony site should be recorded to increase knowledge of topographical variation acceptable to the butterflies. Climatological measurements proposed to be recorded at Mt. Uncompahgre and Redcloud Peak under task 3.4.1. should be taken if further information is needed when new colonies are found.

3.4.4. Monitor plant phenology.

Morphological and physiological phenology of larval food plant and adult nectar sources will be monitored throughout the flight season and correlated with the butterfly's life history, behavior, and survival.

3.4.4.1. Monitor morphological phenology of snow willow.

Monitoring efforts at colony sites also should include tracking of the following stages in snow willow phenology: (1) bud break; (2) flowering; (3) leaves completely unfurled; (4) change to fall color; (5) senescence/leaf drop. This task is considered completed in 1993. No correlations to emergence of adult butterflies could be determined.

3.4.4.2. Monitor morphological phenology of major adult nectar sources.

The availability of nectar may vary by species throughout the flight season. Monitoring will track the phenology of plants that are important nectar sources. Data gathered through 1992 indicates that the butterfly is a general nectarer and, therefore, conservation of a particular species of plant used for nectaring is not necessary. Phenological study of the nectar sources may provide correlation on timing of butterfly emergence, which will help determine when butterfly emergence may occur in a potential area. Phenology plots have been studied the last 4 years; 1993 may be the last year nectar source phenology is conducted. Researchers will continue to study data gathered to try and determine if nectar source emergence and butterfly emergence are synchronous.

4. Determine if other threats exist in addition to collecting.

Collecting has been identified as the greatest threat to this species. Other activities such as recreation and livestock grazing are potential threats, but either are of lesser impact or the degree of impact has not been determined. There also may be some threat to the species from predation, parasitism, or disease; however, these threats also have not been determined.

4.1. Determine if disease, parasitism, or predation is a threat.

If during future research it is found that disease, parasitism, or predation may be contributing to the butterfly's decline, methods for decreasing the threat will be sought.

4.2. Determine if sheep or livestock grazing is a threat.

The FS and BLM have eliminated grazing at the major colonies because grazing was a suspected threat. If new colonies are found in areas with livestock grazing, studies will be conducted to

determine what effect grazing has on the butterfly. Studies may use exclosures to determine if the butterfly and snow willow are more prevalent inside or outside the exclosures, and how elimination of grazing within the exclosures affects changes in snow willow and butterfly density.

4.3. Determine if recreation is a threat.

Observations of hikers, picnickers, and horseback riders should be recorded. If these activities appear to be damaging habitat, it may be necessary to limit access to butterfly areas.

5. Determine laboratory propagation techniques if natural reproduction does not occur.

Efforts to ensure or increase natural reproduction through removal or reduction of factors inhibiting natural reproduction should be emphasized over laboratory propagation. It is hoped that through proper management natural reproduction will occur at a sufficient level (a) to maintain and increase colony numbers and (b) to allow removal of some adults or larvae to facilitate reestablishment of other colonies in suitable habitat. If natural reproduction is not sufficient to accomplish this, only then will laboratory propagation be considered.

5.1. Conduct propagation experiments on related species.

Both Boloria titania and B. improba can be used as surrogate species to determine propagation techniques. Initial propagation experiments can be based on techniques described in the literature. If these initial attempts are unsuccessful, experimentation with techniques may be necessary. Substrate that eggs are laid on, light, temperature, and moisture may need to be considered to successfully propagate the butterfly. Similarly, host plant cultivation techniques may need to be researched if it is determined that plant nutrients or toxic chemicals may be a problem with survival of larvae.

5.2. Propagate the Uncompahgre fritillary butterfly.

Propagation should take place only if laboratory attempts with related species prove successful. Propagation with the butterfly can take place using parents from large, stable, colonies. If the total estimated butterfly population declines precipitously, propagation attempts should be initiated as soon as possible.

6. Reintroduce and transplant butterflies.

Reintroduction and transplantation of butterflies to suitable habitat may be considered as a means to increase the number of butterfly colonies, thereby increasing protection of the species from extinction and progressing toward species recovery and eventual delisting.

6.1. Reintroduce butterflies.

If a colony or brood is extirpated and the habitat appears suitable, it may be appropriate to reintroduce the butterfly. This should be done only if transportation and propagation techniques prove successful. Butterflies should be reintroduced in the larval or adult stages. An increased monitoring effort should ensue after reintroduction, and Pollard transects should be reestablished if butterfly populations are persistent enough to provide accurate trend results.

6.2. Transplant to suitable sites.

If populations are stable at major colony sites, attempts to introduce butterflies to other suitable sites may be warranted. This action could help colonize unoccupied suitable habitat and limit risk of losing the species to catastrophic events at the major colonies. This should be done only if searchers fail to discover other colonies. Suitable sites need to be field checked, mapped, and monitored for continuing suitability of habitat conditions prior to reintroduction attempts, and for success of the colony after the reintroduction effort.

7. Conduct recovery team activities.

The recovery team should maintain communication to facilitate management of the butterfly and determine future research needs. The recovery plan may need to be updated or revised pending research findings. Yearly meetings should be arranged to discuss research findings and possibly update or revise the recovery plan.

8. Conduct BLM, FS, and FWS contracting with researchers.

The BLM and FS had an interagency agreement for a number of years that funded contracts for research activities on the butterfly. The FWS entered into an interagency agreement with BLM and FS in 1992 to increase funding and facilitate further research. Contracts will continue to be processed by BLM and FS. Contracts lasting more than 1 year would facilitate research technique and data consistency by employing the same researcher over a longer period. Permits from FWS will need to be processed every year to conduct field research.

9. Erect educational signs.

Signs announcing a prohibition on collection of the butterfly and instructing people to stay on trails may be erected; however, they should be general enough to prevent informing people of the exact location of the butterflies.

Literature Cited

Brussard, P.F., and H. Britten. 1989. The status of the Uncompahgre fritillary (Boloria acrocnema). Final report prepared for the Forest Service, Bureau of Land Management, and Fish and Wildlife Service. Montana State University. Bozeman. 47 pp. plus tables and figures.

Gall, L.F. 1983. Uncompahgre fritillary butterfly. Pages 477-479 in The IUCN invertebrate red data book. S.M. Wells, R.M. Pyle, N.M. Collins, eds. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland. 632 pp.

Gall, L.F. 1984. Population structure and recommendations for conservation of the narrowly endemic alpine butterfly, Boloria acrocnema (Lepidoptera: Nymphalidae). Biol. Conserv. 28:1-28.

Gall, L.F., and F.A.H. Sperling. 1980. A new high altitude species of Boloria from southwestern Colorado (Nymphalidae), with a discussion of phenetics and hierarchical decisions. Jour. Lepid. Soc. 34:230-252.

Interagency Agreement. 1984. Interagency agreement and species management perspective for Mt. Uncompahgre fritillary butterfly (Boloria acrocnema). Forest Service and Bureau of Land Management. Gunnison, Colorado. 52 pp.

Pollard, E. 1977. A method for assessing changes in the abundance of butterflies. Biol. Coserv. 12:115-134.

Scott, J.A. 1982. The life history and ecology of an alpine relict, Boloria improba acrocnema (Lepidoptera: Nymphalidae), illustrating a new mathematical population census method. Papilio 2:1-12.

Seidl, A. 1990. Final report on the Uncompahgre fritillary, Boloria acrocnema. Unpublished report prepared for the Bureau of Land Management, in Fish and Wildlife Service files, Denver, Colorado. 7 pp.

Seidl, A. 1991a. Addendum to final report on the Uncompahgre fritillary, Boloria acrocnema. Letter and addendum prepared for the Bureau of Land Management, in Fish and Wildlife Service files, Denver, Colorado. 4 pp.

Seidl, A. 1991b. Final report on the preliminary biological studies and continued monitoring of the Uncompahgre fritillary butterfly. Unpublished report prepared for the Forest Service, in Fish and Wildlife Service files, Denver, Colorado. 21 pp.

Seidl, A. 1993a. Final report on the Uncompahgre fritillary butterfly. Unpublished report prepared for the Forest Service, in Fish and Wildlife Service files, Denver, Colorado. 48 pp.

Seidl, A. 1993b. Preliminary report on the Uncompahgre fritillary butterfly. Unpublished report prepared for the Forest Service, in Fish and Wildlife Service files, Denver, Colorado. 4 pp.

PART III--IMPLEMENTATION SCHEDULE

The Implementation Schedule outlines actions and estimates costs for the recovery plan. It is a guide for meeting the recovery objectives and tasks discussed in Part II of this plan. This schedule indicates the priority of tasks, task duration, parties responsible for carrying out the tasks, and cost estimates for the first 3 years of recovery activities. Accomplishment of the tasks should help in recovery of the Uncompahgre fritillary butterfly.

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 species population or habitat quality, or some other significant negative impact short of extinction.

Priority 3: All other actions necessary to meet the recovery objectives.

Abbreviations Used in Implementation Schedule

BLM	Bureau of Land Management
CDNR	Colorado Department of Natural Resources
ES	Ecological Services
FS	Forest Service
LE	Law Enforcement
OIT	Office of Information Transfer
UNR	University of Nevada at Reno

Other Definitions

Continuous: Task that starts after approval of the Uncompahgre Fritillary Butterfly Recovery Plan, but that might continue every year up until 5 years after recovery.

Ongoing: Task that has occurred previous to approval of the Recovery Plan and might continue up to 5 years after recovery of the butterfly.

Part III--Implementation Schedule
Uncompahgre Fritillary Butterfly

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURATION (YRS)	RESPONSIBLE PARTY FWS			COST ESTIMATES (000'S)			COMMENT
				REG.	PROG.	OTHER	FY1994	FY1995	FY1996	
1	1.	Enforce prohibition on collecting	ongoing	6	LE	 BLM FS	5 5 5	5 5 5	5 5 5	
1	2.1.	Determine search locations	10			BLM FS	1 1	1 1	1 1	
1	2.2.	Organize searchers	10			BLM FS	0.5 0.5	0.5 0.5	0.5 0.5	
1	2.3.	Search for colonies	10			BLM FS	3 3	3 3	3 3	
1	3.1.	Monitor population levels	ongoing	6	ES	 BLM FS	1 2 2	1 2 2	1 2 2	
2	5.1.	Propagate related species	3	6	ES		5	5	5	
2	5.2.	Propagate butterfly	cont.	6	ES					Priority 1 if reintroduction necessary. (ca. $5000/yr)
2	3.2.	Determine oviposition sites	completed	6	ES	 BLM FS				Completed in 1993. Ovipositon snow willow and surrounding litter.

Implementation Schedule (continued)

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURATION (YRS)	RESPONSIBLE PARTY FWS			COST ESTIMATES (000'S)			COMMENT
				REG.	PROG.	OTHER	FY1994	FY1995	FY1996	
2	3.3.	Determine larval life history	2	6	ES	 BLM FS	1 1 1			Partially completed. Most larvae are probably biennial but potential exists for 1 year development.
2	3.4.1.	Record snow, rain, and air temp. levels	ongoing	6	ES	 BLM FS	3 3 3	0.5 0.5 0.5	0.5 0.5 0.5	
2	3.4.2.	Determine soil moist. and temp.	ongoing	6	ES	 BLM FS	1 1 1	0.5 0.5 0.5	0.5 0.5 0.5	
2	3.4.3.	Determine elev., slope, aspect, of new colony sites	cont.	6	ES	 BLM FS				Contingent on finding new colonies. (ca. $1000/agency/yr)
2	3.4.4.1.	Monitor morphologic phenology of snow willow	completed	6	ES	 BLM FS				Completed 1993. No apparent correlation.
2	3.4.4.2.	Monitor phenology of nectar sources	ongoing	6	ES	 BLM FS	0.5 0.5 0.5			Partially completed 1993. Correlation not yet determined but may exist.
2	7.	Conduct recovery team activities	ongoing	6 8	ES OIT	 BLM FS CDNR UNR	2 1 1 1 1 1	2 1 1 1 1 1	2 1 1 1 1 1	

Implementation Schedule (continued)

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION (YRS)	RESPONSIBLE PARTY FWS			COST ESTIMATES (000'S)			COMMENT
				REG.	PROG.	OTHER	FY1994	FY1995	FY1996	
2	8.	Contract administration	ongoing	6	ES	 BLM FS	1 1 1	1 1 1	1 1 1	
3	4.1.	Determine disease, parasitism, predation threats	ongoing	6	ES	 BLM FS	0.25 0.25 0.25	0.25 0.25 0.25	0.25 0.25 0.25	
3	4.2.	Determine livestock threats	cont.	6	ES	 BLM FS				Contingent on finding new colonies with livestock grazing.
3	4.3.	Determine recreation threats	ongoing	6	ES	 BLM FS	0.25 0.25 0.25	0.25 0.25 0.25	0.25 0.25 0.25	
3	6.1.	Reintroduce butterflies	10	6	ES	 BLM FS				Contingent on Redcloud colony size, finding new colonies. (ca. $1000/agency/yr)
3	6.2.	Transplant to other suitable sites	10	6	ES	 BLM FS				"..."
3	9.	Erect signs	1			FS BLM	 1			Forest Service completed 1993.

PART IV--SUMMARY OF PUBLIC COMMENTS FOR THE UNCOMPAHGRE FRITILLARY BUTTERFLY DRAFT RECOVERY PLAN AND RESPONSES TO THE COMMENTS

This recovery plan was made available to the public for comment as required by the 1988 amendments to the Endangered Species Act of 1973. The public comment period was announced in the Federal Register (58 F.R. 13795) on March 15, 1993, and closed on May 14, 1993. Over 170 press releases were sent to the print media located in Colorado.

During the public comment period 10 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 Fish and Wildlife Service have been sent to that agency as required by the 1988 amendments to the Act. A few comments were addressed in the text and were editorial changes or clarification of proposed actions. The following responses are directed at comments that were not addressed within the text of the Recovery Plan.

One commenter recommended that domestic livestock grazing be excluded from all known colonies. Another commenter said grazing should be recognized as a potential problem. The Fish and Wildlife Service, FS, and BLM recognize grazing as a potential problem, and FS and BLM have excluded grazing in the two known colony sites. As mentioned in the recovery plan, grazing impacts will be studied if new colony sites are discovered that have grazing in or adjacent to the butterfly colonies.

One commenter recommended that the Pollard transect count continue to be used to derive population indices. The Recovery Team does plan to continue using the Pollard technique. The same commenter also suggested that buffer zones be placed around colony sites. The Fish and Wildlife Service feels that "no collection" areas around known colonies already have sufficient buffer zones but will encourage buffer zone placement around any new colonies.

One commenter suggested that the low genetic variability may provide the butterfly with better adaptability to its environment because its genomes have been finely tuned to the environmental conditions, not less adaptability as the recovery plan suggested. That may be true; however, this comment is theoretical, as is the statement in the recovery plan, and neither can be currently proven.

Another commenter said that low genetic variability may mean that more butterflies are needed to provide a "stable" colony, and he suggested that a population model be used to determine minimum viable population levels. Some preliminary literature review and discussions with population and invertebrate experts by the Service have led to the conclusion that estimating population levels needed for the butterfly's survival is very difficult, and may not be necessary to achieve recovery of the species. However, the need for an analysis of population viability should be reexamined in the future. The same commenter also asked what a "stable" colony is, and what exactly is needed to initiate delisting. The commenter was concerned that if these population criteria were not quantitatively well-defined, the issue of delisting criteria would be open for political debate in the future. The Recovery Team has discussed these issues at length, but has not been able to come up with definite answers. However,

the Recovery Team will continue to try to estimate what constitutes a stable colony and a population level necessary for continued survival of the butterfly. The Recovery Team came up with its best estimate of what is needed for downlisting and delisting criteria. Downlisting and delisting criteria may be revised as more information becomes available to the scientific community and Recovery Team.

One commenter said that reintroduction should be used only as a last resort to recover the species. Another commenter said that the odd-year Mt. Uncompahgre colony is the only colony that needs recovering, and reintroduction from Redcloud to Mt. Uncompahgre should be done in 1993. The Service agrees with the first commenter, and plans to use reintroduction as a last resort for recovery of the species. Population trends for the odd-year colonies will be ascertainable after the 1993 field season, and the Revovery Team will determine if reintroduction is necessary after 1993. The Recovery Team has allocated $1,000/year/Federal Agency if reintroduction is necessary.

One commenter was concerned that allocation of monies to law enforcement (LE) would take money away from more pressing biological needs. The $5,000 allocated to each LE branch of the Federal Agencies is simply a cost/time estimate of LE effort. This cost will be part of the LE officers' normal salary, and would not be a cost beyond their normal salary that would take money away from important biological research.
Two commenters suggested that potential colonization sites be determined based on wind direction that would blow adult butterflies from the known colony sites to new locations. Wind may be one means of dispersal and the Recovery Team will consider this when conducting surveys for new colonies. One of the commenters also suggested that other means of dispersal be explored. Dispersal factors would be interesting to know, and may help with recovery efforts. The Recovery Team will consider literature review and research on dispersal methods, and may incorporate this activity into the Recovery Plan in the future.

One commenter mentioned that locating butterfly colonies also could be achieved by comparing known colony elevations, slopes, and aspect to other areas with the same features. The Recovery Team is aware of this fact and plans to use this methodology as a way to prioritize search areas. The same commenter suggested that we need to record emergence dates of the adult butterflies to determine when is the best time to search for the butterflies. The Service has been keeping track of emergence dates and will use this information to schedule searches.

One commenter suggested that soil pH be recorded. The Recovery Team does not feel that this is an important factor based on past studies in the region. However, we will continue to consider soil and precipitation pH studies in the future.

One commenter suggested that educational signs would draw people to the butterfly colonies, and this would harm the butterfly and/or its habitat. The Recovery Team is aware of this and will consider sign context and placement as it affects recovery of the butterfly.