Uncompahgre Fritillary Butterfly
(Clossiana improba acrocnema)
5-Year Review:
Summary and Evaluation

Photo Credit: Creed Clayton, U.S. Fish and Wildlife Service, 2007

U.S. Fish and Wildlife Service
Western Slope Office, Colorado Ecological Services
Grand Junction, Colorado

September 28, 2018

5-YEAR REVIEW
Uncompahgre Fritillary Butterfly (*Clossiana improba acrocnema*)

EXECUTIVE SUMMARY

In 2010 we recommended that the Uncompahgre fritillary butterfly (UFB) be downlisted to threatened per the UFB downlisting criterion (see section 2.2.3 below). The recommendation was a result of average to high abundance of the UFB on two colonies, Mt. Uncompahgre and Redcloud Peak, for over 10 years with no apparent threats to these two colonies. However, due to other elevated priorities, a downlisting rule was not written. Since 2010, climate change has appeared as a discernible, impactful, threat such that the downlisting criterion is no longer being met. Effects of climate change have been observed through increases in statewide temperatures and earlier date of snowmelt and is the likely cause of multi-year suppression or extirpation of some colonies or sub-colonies of the UFB. Further predicted changes in climate in the next 32 to 72 years will likely result in increased adverse changes to UFB habitat and population abundance. Delisting criterion calling for 10 stable colonies for 10 consecutive years is also no longer being met. At most, considering population abundance at quantitatively monitored colonies and presence/absence at qualitatively monitored colonies, there are only 8 colonies that are considered stable. Consequently, based on the best available scientific and commercial data, our current recommendation is for the classification of the UFB to remain as endangered.

Also, we recently became aware of taxonomic work that took place in the last several years. Based on this work, and discussion with respected lepidopterist and author of the UFB final listing rule, Dr. Paul Opler, it was determined that the scientific name of the UFB should change from *Boloria acrocnema* to *Clossiana improba acrocnema*. Designation as a subspecies along with changes to the level of threat and recovery potential changes the Recovery Priority Number. Due to observed and predicted climate change effects we recommend increasing the level of threat from low to moderate and, in light of likely continued climate change effects, we recommend changing recovery potential to low. These rankings along with the new taxonomic classification as a subspecies alter the Recovery Priority Number from a 14 to a 12.

1. GENERAL INFORMATION

1.1 Purpose of 5-Year Reviews

The U.S. Fish and Wildlife Service (Service) is required by Section 4(c)(2) of the Endangered Species Act of 1973, as amended, (ESA) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since the time it was listed or since the most recent 5-year review. Based on the outcome of the 5-year review, we recommend whether the species should: 1) be removed from the list of endangered and threatened species; 2) be changed in status from endangered to threatened; 3) be changed in status from threatened to endangered; or 4) remain unchanged in its current status. Our original decision to list a species as endangered or threatened is based on the five threat factors described in Section 4(a)(1) of the ESA. These same five factors are considered in any subsequent

reclassification or delisting decisions. In the 5-year review, we consider the best available scientific and commercial data on the species, and we review new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process that includes public review and comment.

1.2 Reviewers

Lead Regional Office: Mountain-Prairie Regional Office
Kathy Konishi, Fish and Wildlife Biologist, (303) 236-4224
Kate Norman, Chief, Decision Support Branch, (303) 236-4214

Lead Field Office: Western Slope Office, Colorado Ecological Services
Ann Timberman, Western Slope Supervisor, (970) 628-7181
Terry Ireland, Fish and Wildlife Biologist, (970) 628-7188

1.3 Methodology Used to Complete the Review

The 5-year review was conducted by Terry Ireland, the lead U.S. Fish and Wildlife Service (Service) biologist for the Uncompahgre fritillary butterfly (UFB). On May 27, 2016, we published an announcement initiating the 5-year review process and seeking new information on the UFB (U.S Fish and Wildlife Service 81 FR 33698). There were no new comments or new information submitted during the public review period. We relied on the 2017 field report (Alexander and Keck 2018) for the 2017 field season and previous field seasons' quantitative and qualitative population monitoring information. We also relied on other recent research and additional literature gathered since the 2010 5-year Review for this current review. Population recruitment, abundance, and density were not calculated yet for the 2018 field season at quantitatively monitored colonies at the time of this review so qualitative information at all colonies was incorporated via personal communication from Kevin Alexander for 2018 monitoring information. Alexander and Keck (2018) summarizes quantitative population data from 2003-2017 using a formula developed previously (Alexander and Keck 2007).

1.4 Background

1.4.1 FR Notice Citation Announcing Initiation of This Review

81 FR 33698, May 27, 2016

1.4.2 Listing History

FR notice: 56 FR 28712
Date Listed: June 24, 1991
Entity listed: Species
Classification: Endangered

1.4.3 Review History

1994 Recovery Plan (U.S. Fish and Wildlife Service 1994). Used threats and information in the 1991 listing for development of the Recovery Plan.

2010 5-Year Review (U.S. Fish and Wildlife Service 2010). The 2010 5-year Review recommended down-listing but due to higher priorities a down-listing package was not prepared and the species has remained endangered.

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

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

*The system for determining Recovery Priority Number was established in a September 21, 1983 Federal Register notice (U.S. Fish and Wildlife Service 48 FR 43098).

As established by the 2010 5-Year Review, the Recovery Priority Number for the UFB at the start of this review is a 14. This number indicated that: (1) populations faced a low degree of threat; (2) recovery potential was high; and (3) the UFB was listed at the species level.

1.4.5 Recovery Plan

Name of plan: Uncompahgre Fritillary Butterfly Recovery Plan
Date approved: March 17, 1994

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment Policy

The Distinct Population Segment (DPS) Policy is not applicable to UFB because the ESA precludes listing DPSs of non-vertebrate animals (and plants). For more information, see our 1996 DPS policy (U.S. Fish and Wildlife Service and National Marine Fisheries Service 61 FR 4722).

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

_X_ **Yes**
____ **No**

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?

___ **Yes**
_X_ **No.** We may wish to change the recovery criteria based on new information regarding genetics, population status, and climate change concerns. See Section 4 for more information on this option.

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

_X_ **Yes**
___ **No**

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

Downlisting Criterion: "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."

Mt. Uncompahgre and Redcloud Peak were the only two colonies known at the time of listing and recovery planning. Shortly after completion of the Recovery Plan, an additional colony was discovered. Eight other

colonies were discovered in subsequent years. To take improvement of the species population status into account, the Recovery Plan stated that "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."

Population monitoring transects are installed at Mt. Uncompahgre, Redcloud Peak, and Colony C. A population trend report was developed for monitoring data collected through the 2006 field season to help determine if populations could be considered "stable" as stated in recovery criterion (Alexander and Keck 2007). Population monitoring has also been conducted each year since and is summarized through the 2017 field season (Alexander and Keck 2018). Recruitment (i.e. abundance) at both the Redcloud Peak sub-colonies and two of the three sub-colonies at Mt. Uncompahgre were about average in 2017 in comparison to prior years. However, the Mt. Uncompahgre middle sub-colony was low compared to the prior years (Alexander and Keck 2018). Although the butterfly's numbers can vary year to year and some colonies or sub-colonies that are absent one or two years have been extant the following years, population sizes are or appear to be remaining low at some colonies or sub-colonies and extirpation appears to have occurred at one colony (Alexander and Keck 2018; Alexander, Western State Colorado University (WSCU), pers. comm. 2018). UFB's were not observed at one other qualitatively monitored colony in 2018 (Alexander, WSCU, pers. comm. 2018), though additional monitoring must be done to determine if that colony is extirpated.

In terms of threats, factors listed in the final listing rule (U.S. Fish and Wildlife Service 56 FR 28712) and the Recovery Plan include trampling of the UFB and its habitat by humans and livestock, collecting, lack of regulatory mechanisms, adverse climatic changes, small population size, and low genetic variability. Some off-trail hiking continues to occur through Redcloud Peak and Mt. Uncompahgre colonies and researchers walk transects for population counts as well as searches but population impacts have not been detected from human trampling and all other direct habitat threats appear to be ameliorated. Adequate regulatory mechanisms exist at Redcloud Peak and Mt. Uncompahgre.

Based solely on population abundance through 2017, climate change has not yet affected the quantitatively monitored colonies on Redcloud Peak or Mt. Uncompahgre. However, previously predicted changes (Intergovernmental Panel on Climate Change (IPCC) 2007; Ray et al. 2008) in temperature and other weather patterns have been observed globally, statewide, and regionally and it is predicted from numerous models that climate will change even more by mid-century and the end of

the century (Lukas et al. 2014; IPCC 2014). As a result, climate change could begin affecting Redcloud Peak and Mt. Uncompahgre. In fact, very warm and dry conditions in southwestern Colorado in 2018 were noticeable on UFB colonies on the two mountains. With changes in climate being observed regionally and further predicted climate change it is determined that not all threats have been removed. Consequently, the UFB is not warranted for downlisting. For a more detailed assessment of threats see section 2.3.2 below.

Delisting Criterion: "Delisting may be considered after stable colonies of butterflies exist for 10 consecutive years at a minimum of 10 sites."

Three of the colonies have been quantitatively monitored for population status for more than ten years. Recruitment at Mt. Uncompahgre and Redcloud Peak colonies appear to be about average in 2017, and both increased slightly in the last two years (Alexander and Keck 2018). The trend appears stable at these two colonies compared to annual recruitment since 2003 (though the middle sub-colony at Mt. Uncompahgre appears to have a decreasing trend) (Alexander and Keck 2018). However, Colony C has had very low or no recruitment in the last 3-4 years, through 2017, and has a decreasing trend (Alexander and Keck 2018). Furthermore, two colonies where only qualitative presence is assessed had no butterflies detected in 2017. One of these (called Colony D for this review) has definitively had no butterflies in four of the last six years including none in the last two years through the 2018 field season and is likely extirpated (Alexander and Keck 2018; Alexander, WSCU, pers. comm. 2018).

Based on information since the 2010 5-Year Review, and including 2018 qualitative observations only, there are only two of the three quantitatively monitored colonies that appear stable or increasing (through 2017), and at most only six of the eight qualitatively monitored populations were detected in 2018. Therefore, at most, only eight stable populations are considered to exist and the delisting criterion is not being met. Refer to Section 2.3.1 below for further biological information section, 2.3.2 for further threat assessment information, and section 4.0 for future recommended actions.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 Abundance, population trends (e.g., increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Up to eleven colonies are known to have existed. Three colonies are quantitatively monitored with line

transects, and the remaining eight have only been qualitatively monitored for presence. Unfortunately, one of the qualitatively observed colonies (Colony D) has been definitively absent four out of the last six years and possibly absent a fifth year (through 2018) with presence last recorded in 2016 (Alexander and Keck 2018; Alexander, WSCU, pers. comm. 2018). It is therefore likely that this colony is extirpated. Furthermore, in 2018 another colony (Colony E), was not present but has been consistently present since 2011 (and definitively or likely present all years from 1995 to 2009). Additionally, a qualitatively monitored sub-colony of Redcloud Peak was absent in both 2017 and 2018 (Alexander, WSCU, pers. comm. 2018) and a qualitatively monitored sub-colony of Mt. Uncompahgre was potentially missing in 2017 and definitively missing in 2018 (Alexander, WSCU, pers. comm. 2018).

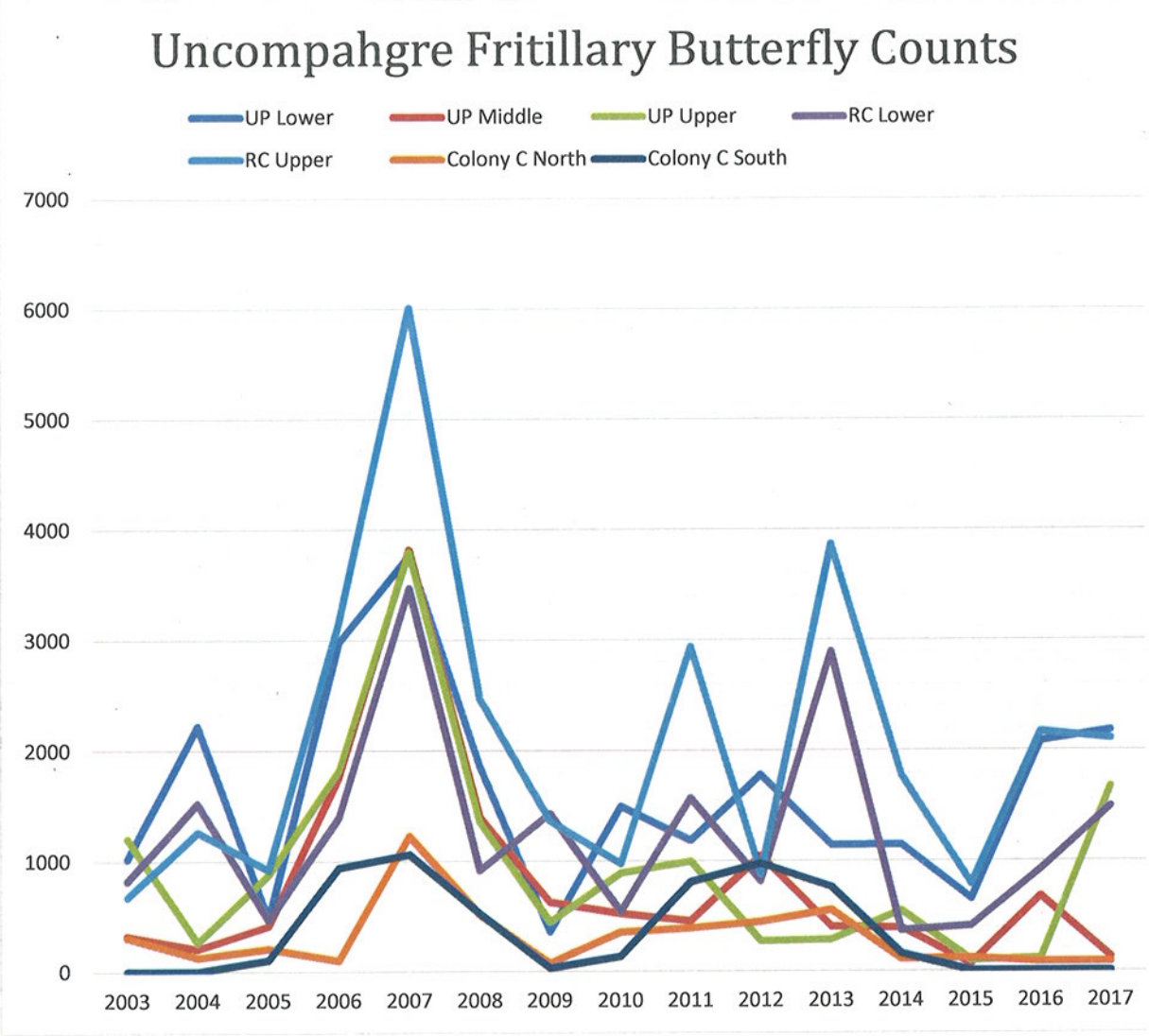
The two originally known sites, Redcloud Peak and Mt. Uncompahgre, have been monitored intensively since 1992. Redcloud Peak is the only known colony on U.S. Bureau of Land Management (BLM) land. Due to changes in transect methodology and missing data in earlier years, data for these two sites are the most reliable since 2003. Calculations formulated in a 2007 trend analysis have been used since then to calculate annual population numbers (Alexander and Keck 2007; Alexander and Keck 2018).

Three sub-colonies at Mt. Uncompahgre and two sub-colonies at Redcloud Peak are quantitatively monitored. Colony C also consists of two sub-colonies that are quantitatively monitored. In 2007, the total estimated population of the three colonies was approximately 23,100. However, most cumulative estimates have been between 3,500 and 9,900 since 2003. For 2017 the estimate could be considered average, at about 7,600. However, annual monitoring reveals that Colony C sub-colonies declined sharply or were absent starting in 2014 and continuing through the 2017 field season (Alexander and Keck 2018). Estimates have not been calculated yet for 2018, but Colony C will be very low again (Alexander, WSCU, pers. comm. 2018). There were two UFB's counted on a transect at Colony C South in 2018 where they were absent for three years (Alexander, WSCU, pers. comm. 2018). It is possible that Colony C South was naturally augmented from Colony C North since it is only about ½ mile away. Table 1 and Figure 1 illustrate population estimates for each of the quantitatively monitored sub-colonies as far back as 2003 when consistent and usable data is available.

Table 1. Uncompaghre fritillary butterfly population recruitment estimates sub-colonies at Mt. Uncompahgre, Redcloud Peak, and Colony C (Alexander and Keck 2018).

Year	UP Lower	UP Middle	UP Upper	RC Lower	RC Upper	Colony C North	Colony C South
2003	1018	322	1203	818	671	306	No count
2004	2222	205	260	1524	1263	125	0
2005	470	412	873	465	916	209	105
2006	2976	1754	1813	1394	3152	99	940
2007	3764	3818	3797	3469	6007	1227	1060
2008	1856	1401	1352	915	2470	516	524
2009	357	627	444	1430	1362	72	26
2010	1492	522	887	538	971	354	133
2011	1183	454	990	1567	2936	388	808
2012	1778	1047	267	816	879	445	975
2013	1140	402	281	2894	3863	554	762
2014	1144	392	544	366	1771	107	157
2015	651	64	93	408	787	117	0
2016	2082	675	112	921	2166	81	0
2017	2176	127	1668	1490	2102	81	0

Figure 1. Graph of Uncompahgre fritillary butterfly population recruitment estimates of sub-colonies at Mt. Uncompahgre, Redcloud Peak, and Colony C.



The UFB primarily has a biennial life-cycle. However, as evidenced by genetic homogeneity between broods at the Redcloud Peak site, some caterpillars may take two summers to mature rather than three (Britten and Brussard 1992; Seidl 1996; Monroe et al. 2016). Slowly developing caterpillars may take up to four years to mature. For example, if a UFB egg is laid in 2018, the individual would typically spend all of 2019 as a caterpillar, metamorphose into a butterfly and reproduce to complete the normal biennial life-cycle in 2020. Quickly developing caterpillars could hatch from an egg in 2018, and then metamorphose into an

adult and reproduce in 2019. However, an extension to a third year is possible such that a UFB egg laid in 2018 would develop and remain a caterpillar for all of 2019 and 2020 then metamorphose into an adult and reproduce in 2021. Very dry or very wet weather is suspected to be a factor in population changes and may influence the length of time to maturity.

2.3.1.2 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.): Britten and Brussard (1992) compared the UFB at Redcloud Peak with other butterflies in the *B. improba* group in the Rocky Mountains north to the Yukon Territory. The UFB was found to be distinct from other closely related species. It was also found that UFB's within the Redcloud Peak colony were genetically homogeneous between the two years they were collected in that locality (Britten and Brussard 1992).

In a later analysis, genetic samples were collected in 2008 and 2009 at each of the eleven colonies to determine gene flow between colonies and effective population size (Monroe et al. 2016). However, only Mt. Uncompahgre, Redcloud Peak, and Colony C had enough material to be adequately evaluated. Results indicate that the three colonies exist as a metapopulation suggesting low-level migration between the colonies. Gene flow between the even- and odd-year broods was reaffirmed through inter-colonial genetic homogeneity supporting occasional differences in developmental maturity. However, the effective population size was low relative to other rare insects and may be cause for concern about persistence of the UFB (Monroe et al. 2016). Monroe et al. (2016) also stated that the butterfly has persisted because of two types of rescue: temporal, via differing development times between brood years, and traditional, through occasional immigration. As such it appears crucial that all three colonies remain extant to provide gene flow and occasional population rescue of a faltering colony (Monroe et al. 2016).

Additional genetic samples were collected at the other extant colonies in 2017 with the intent to further explore gene flow (Alexander and Keck 2018). Two whole-body UFB's were also submitted for genomic sequencing that should help identify additional genetic markers and increase the robustness of additional gene flow analyses (Hugh Britten, University of South Dakota, pers. comm. 2018).

2.3.1.3 Taxonomic classification or changes in nomenclature: The UFB belongs to the Family Nymphalidae, Subfamily

Heliconiinnae, and Tribe Argynnini. However, the taxonomic history of the UFB is complicated. The UFB was discovered and described as a full species by Gall and Sperling (1980) based on phenotypic appearance. Not all people agreed with its species status or even genus. A 1981 butterfly catalogue assigned most *Boloria* species to genus *Clossiana* including *improba* but did not mention *acrocnema* as either a separate species or subspecies of *improba*, likely due to the recent naming of the species (Miller and Brown 1981). Miller and Brown (1981) pointed out complexity in this group of butterflies, noting that the species *improba* has also variously been placed in genera *Argynnis*, *Brenthis*, and *Boloria* in the past. It was also described as a subspecies of *Boloria improba* (*B. i. acrocnema*) in The Butterflies of North America – A Natural History and Field Guide (Scott 1986). However, genetic data from Britten and Brussard (1992) suggested genetic differentiation from species in the *B. improba* group further north, specifically its closest neighbor approximately 330 air miles to the north in Wyoming, *B. i. harryi*, supporting Gall and Sperling's (1980) classification as a full species.

More recently, Simonsen (2005) looked at the genitalia of many butterflies related to the UFB and placed the UFB with others in the family under the genus *Boloria* but subgenus *Clossiana.* He did not specifically address the UFB in that article, stating that he had no specimens of the UFB to examine and mentioned in passing that Britten and Brussard (1992) had done some work on the *B. improba/acrocnema* complex. Tuzov and Bozano (2006) examined numerous Palearctic species around the world and, as Miller and Brown (1981) did, reassigned many species in the genus *Boloria* to the genus *Clossiana.* Furthermore, Tuzov and Bozano (2006) assigned the Uncompahgre butterfly as *Clossiana improba acrocnema.*

Another taxonomic study analyzed *B. acrocnema* and its closest geographical relative *B. improba harryi* from Wyoming using morphologic and molecular analyses (Simonsen et al. 2010). The authors suggested that *B. acrocnema* should also be placed as a subspecies under *B. improba* but (again) suggested it be placed under subgenera *Clossiana* using the nomenclature *B. (C.) improba acrocnema.* Simonsen et al. (2010) also suggest *B. i. harryi* have the same rank and be considered *B. (C.) improba harryi.* Simonsen et al. (2010) admitted though that they had few specimens for molecular analyses and that the *improba/acrocnema* complex forms a closely related and homogenous group.

Despite substantial geographic separation from *B. (C.) i. harryi* as pointed out in Britten and Brussard (1992), the more recent work referenced has changed the taxonomic structure of the UFB and its relatives. Consequently, the Service has decided that the nomenclature of the UFB should follow the more recent classifications. The two most recent classifications are Tuzov and Bozano (2006) and Simonsen et al. (2010). Renowned lepidopterist and author of the Final Rule listing the UFB, Dr. Paul Opler (Colorado State University, pers. comm. 2018), recommends Tuzov and Bozano (2006) for nomenclature based on its broader consideration of related butterflies in Europe. Their assignment of genus also circles back to the older assignment in the genus *Clossiana* in the Miller and Brown (1981) catalogue. Based on these more recent taxonomic assignments and Dr. Opler's recommendation the Service will accept changing the UFB's scientific name to *Clossiana improba acrocnema.*

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

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range: The Final Rule largely dismisses threats under this Factor from mining, grazing, hiking, and trampling. However, the Recovery Plan includes research into the effects of grazing on the UFB as a recovery task, due to information obtained after the Final Rule regarding sheep grazing at Mt. Uncompahgre. There were also concerns that sheep may graze at newly discovered colonies. Sheep are the most common domesticated animal that grazes in UFB habitat. Instances of cattle or horse grazing are rare.

Trampling of the UFB could occur as a result of sheep grazing and the removal of some nectar sources has been observed in UFB localities from sheep grazing (Alexander, WSCU, pers. comm. 2008). In recognition of these potential impacts from grazing, the U.S. Forest Service (USFS) avoids sheep grazing within UFB colonies or allows only trailing through the colonies and suitable habitat, but not bedding or long-term grazing. The only colony with sheep trailing on a reoccurring (but inconsistent) basis has been Mt. Uncompahgre, though no sheep have grazed there for a few years (Alexander, WSCU, pers. comm. 2018). Sheep grazing used to occur on Redcloud Peak, but has been unavailable to grazing for many years (U.S. Bureau of Land Management 1993).

Due to no evidence that colony abundance was being affected by sheep trailing, despite removal of some nectar sources at Mt. Uncompahgre, we determined in a December 16, 2008, informal section 7 consultation with USFS that occasional sheep trailing may affect, but is not likely to adversely affect the UFB colony (U.S. Fish and Wildlife Service 2008).

Any future USFS or BLM actions associated with sheep grazing in UFB habitat will require section 7 consultation with the Service.

Some hiking impacts continue to occur at Redcloud Peak and Mt. Uncompahgre (Alexander and Keck 2018). Trail erosion, widening, and braiding on Mt. Uncompahgre has been repaired, and trails on both mountains were moved several years ago to minimize hiking through the colonies, but portions of the trails skirt the edges of both colonies. Descending hikers have crossed the colonies, especially at Redcloud Peak (Alexander and Keck 2018). No population impacts have been noted from cross-colony hiking but recreational hiking is increasing, and it remains a potential impact. Since the UFB was listed and the Recovery Plan was written there have been no other activities that have resulted in destruction, modification, or curtailment of the UFB's habitat at known colony sites.

In conclusion, since listing, the only on-the-ground activities that have impacted known UFB colonies are minor habitat modification from hiking and sheep grazing at Mt. Uncompahgre and Redcloud Peak. However, we do not believe that sheep grazing has been, or will be, a threat to the UFB with the measures in place to avoid or minimize impacts. Consequently, it does not appear that the present or threatened destruction, modification, or curtailment of its habitat or range is currently threatening the UFB or affecting recovery.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes: Butterfly collecting was the primary reason stated in the Final Rule for listing the UFB under the ESA. There were only two known locations and small numbers of UFBs documented prior to the listing in 1991. UFB collection took place a few years prior to listing when the USFS had a Special Order Closure (U.S. Forest Service 1984) to butterfly collecting around Mt. Uncompahgre. The person responsible for the collecting was found in violation of the USFS closure and illegal collecting of other butterflies under the ESA and other laws (U.S. Department of Justice 1993). No illegal UFB collecting is known to have occurred since listing of the UFB.

The possibility of collectors or biologists impacting the UFB was mentioned in the Final Rule listing the UFB. To date, as then, no habitat impacts, even on permanent population monitoring transects, have been noted and no trampling has ever been documented by researchers. Some incidental taking occurred during genetic sample collection in 2008, but the take was 0.5 percent or less of monitored populations. No incidental take occurred during 2009 genetic sampling. More recent genetic sampling occurred in 2017 with no mortality (Alexander and Keck 2018).

In conclusion, overutilization for commercial, recreational, scientific, or educational purposes has not occurred since listing or finalization of the Recovery Plan to the extent that it has affected recovery. However, in the absence of the butterfly having protection by listed status, collection by hobbyists, researchers, educators, or by those seeking commercial gain could once again become a threat. This issue requires long-term management, as outlined in Section 4.0 below, before ESA protections could be considered for removal.

2.3.2.3 Disease or predation: The Final Rule stated that there are no known diseases to the UFB and predation by birds has rarely been observed (Wilcove 1980). There has been no evidence in the intervening years to the contrary. Consequently, neither disease nor predation appears to be a threat to the UFB, and is not affecting recovery.

2.4.2.4 Inadequacy of existing regulatory mechanisms: The Final Rule stated that collecting and grazing protections afforded to the UFB by the USFS and by the BLM were commendable, but because of their discretionary nature could be withdrawn or lapse in effectiveness. Consequently, listing provides a greater level of protection.

In 1993, the BLM issued the Gunnison Resource Area Resource Management Plan (RMP) which provided a directive on the protection of the Redcloud Peak UFB colony (BLM 1993). The RMP established an Area of Critical Environmental Concern (ACEC) around Redcloud Peak. Management direction under the ACEC included: collection only through Service and BLM authorization; grazing exclusion in the Silver Creek basin; restriction of motor vehicles to designated routes (although no routes exist in the ACEC); and avoidance of placement of rights-of-way in the ACEC. The ACEC did allow Federal oil, gas, and geothermal leasing, but with a controlled surface use stipulation and avoidance of mineral material disposal. No oil, gas, or geothermal development has occurred to date, and given the ruggedness of the location, it is unlikely to occur.

As mentioned previously, the USFS closed all butterfly collecting around Mt. Uncompahgre (U.S. Forest Service 1984) prior to listing and have consulted on actions that could impact the UFB. Other areas that contain UFBs do not have butterfly collecting closures that would protect the species in the absence of listing under the ESA. Before we are able to find that adequate regulatory mechanisms exist that would protect the species upon delisting, the USFS and BLM will need to place additional closures around sites or agree to regulate collecting through special use permit issuance.

While the UFB is still listed, activities on USFS or BLM lands require section 7 consultation and preparation of a National Environmental Policy Act (NEPA) document, both of which can stipulate measures to avoid and

minimize impacts to the UFB. After delisting, activities on USFS or BLM lands will continue to require preparation of a NEPA document. The NEPA is a disclosure statute only and does not require minimization of impacts to sensitive species such as the UFB. Any measures to avoid and minimize impacts to the UFB would be voluntary unless placed in an RMP. The BLM ACEC designation could be removed through revision of the RMP. Therefore, we have determined that a management plan signed by the USFS and BLM that addresses grazing, collecting, recreation and other on-the-ground threats will be necessary in order to remove the threat of inadequate regulatory mechanisms.

In conclusion, the current regulatory mechanisms that exist are not adequate to protect the UFB were the species to be delisted. We find that a management and monitoring plan that provides protection to the species and its habitat will be necessary in order to delist the species.

2.3.2.5 Other natural or manmade factors affecting its continued existence: The Final Rule and UFB Recovery Plan state that adverse climate changes could become a potential threat to the UFB as well as small population size, and limited genetic variability. Since the Final Rule and Recovery Plan were written, there has been increasing information on climate change. Summarized information and excerpts from long-term global, State, and regional climate observations and predictions are included below. Information on the worldwide loss of glaciers, loss of ice sheets and sea ice, melting of permafrost, sea level rise, and ocean acidity are only briefly mentioned in this document, though they likely have indirect impacts to the UFB by influencing changes in precipitation patterns including snowpack and possibly regional temperatures.

Climate Change - Global Level

According to the Intergovernmental Panel on Climate Change (IPCC 2007) Fourth Assessment Report "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level." Average Northern Hemisphere temperatures during the second half of the 20th century were very likely higher than during any other 50-year period in the last 500 years and likely the highest in at least the past 1,300 years (IPCC 2007). It is very likely that over the past 50 years cold days, cold nights, and frosts have become less frequent over most land areas, and hot days and hot nights have become more frequent (IPCC 2007). It is likely that heat waves have become more frequent over most land areas, and the frequency of heavy precipitation events has increased over most areas (IPCC 2007).

The Fourth Assessment Report also predict that changes in the global climate system during the 21st century are very likely to be larger than those observed during the 20th century (IPCC 2007). For the next two decades, a warming of about 0.4°F (all measurements converted to English system) per decade is projected (IPCC 2007). Afterward, temperature projections increasingly depend on specific emission scenarios. Emission scenarios are presented as Representative Concentration Pathways or RCP's of 2.6, 4.5, 6.0, and 8.5, which are consistent with the full range of scenarios in the literature. (For more definition of RCP's refer to IPCC (2007), IPCC (2014) or other sources). The IPCC (2007) predicted global average surface warming during the 21st century between 2.0 and 11.5°F, depending on the emissions scenario.

Since the IPCC Fourth Assessment Report was published, a Fifth Assessment report has been prepared (IPCC 2014). The latest report contains updates on global conditions. The report stated that each of the last three decades has been successively warmer than any preceding decade since 1850. The period from 1983 to 2012 was likely the warmest 30-year period of the last 1400 years in the Northern Hemisphere (medium confidence). Using multiple datasets, the globally averaged combined land and ocean surface temperature data as calculated by a linear trend show warming (1.5 °F) over the period 1880 to 2012. Also, Northern Hemisphere spring snow cover has continued to decrease in extent (high confidence).

Past emissions to the atmosphere of gases as a result of human activity (anthropogenic emissions), as well as future anthropogenic emissions and natural climate variability, will drive future climate. The predicted average global temperature change for the period 2016–2035 relative to 1986–2005 is similar for the four RCPs and will *likely* be in the range 0.5 to 1.3°F (*medium confidence*). The predicted average global temperature change assumes that there will be no major volcanic eruptions or changes in some natural sources (e.g., CH4 and N2O), or unexpected changes in total solar irradiance. By the mid-21st century, the magnitude of the projected climate change will depend on the choice of emissions scenario by humans.

"Relative to 1850–1900, global surface temperature change for the end of the 21st century (2081–2100) is projected to *likely* exceed 2.7°F for RCP4.5, RCP6.0, and RCP8.5 (*high confidence*). Warming is *likely* to exceed 3.6°F for RCP6.0 and RCP8.5 (*high confidence*), *more likely than not* to exceed 3.6°F for RCP4.5 (*medium confidence*), but *unlikely* to exceed 3.6°F for RCP2.6 (*medium confidence*)."

Compared to 1986-2005, the increase of global mean surface temperature by the end of the 21st century (2081–2100) is *likely* to be 0.5°F to 3.1°F under RCP2.6, 2°F to 4.7°F under RCP4.5, 2.5°F to 5.6°F under RCP6.0 and 4.7°F to 8.6°F under RCP8.5. The Arctic region will continue to warm more rapidly than other parts of the planet.

It is *virtually certain* that there will be more frequent hot temperature extremes and fewer cold temperature extremes over most land areas on daily and seasonal timescales. It is *very likely* that heat waves will occur with a higher frequency and longer duration but occasional cold winter extremes will also continue to occur (IPCC 2014).

Climate Change - State (Colorado) Level

Ray et al. (2008) produced a climate change report for Colorado which was subsequently updated (Lukas et al. 2014). Summers were projected to warm more than winters in the Ray et al. report (2008). Projections suggested that by mid-century, typical summer monthly temperatures will be as warm, or warmer, than the hottest ten percent of summers that occurred in last half of the 20th century (Ray et al. 2008).

Model projections for precipitation are less reliable than model projections for temperature (Ray et al. 2008), especially in mountainous terrain such as the range of UFB. Increasing temperature and soil moisture changes may shift mountain habitats toward higher elevation (Ray et al. 2008).

Lukas et al. (2014) reported that average temperatures in Colorado increased 2°F in the last thirty years (consistent with the global average). No long-term trends in average annual precipitation have been detected but snowpack has mostly been below average since 2000. Snowmelt has been one to four weeks earlier in the last thirty years in Colorado due to lower snow-water equivalency since 2000, a warming trend in spring temperatures, and enhanced solar absorption from dust on snow. Precipitation monitoring has detected no long-term trend in Colorado even considering the relatively dry period since 2000 (Lukas et al. 2014).

The southern part of Colorado (where the UFB occurs) is more at risk of less precipitation in the future (Lukas et al. 2014). Temperatures are expected to rise 2.5°F to 5°F by 2050 relative to a 1971–2000 baseline under a medium-low emissions scenario and rise 3.5°F to 6.5°F in a high emissions scenario. Precipitation is expected to increase in the winter in Colorado. However, most projections of Colorado's spring snowpack (April 1 snow-water equivalency) show declines for the mid-21st century due to the projected warming. Heat waves and droughts (and wildfires) are expected to increase in frequency and severity in Colorado by 2050 due to the projected warming (Lukas et al. 2014). Since the UFB is an

alpine species, wildfires are not expected to impact the UFB, but heat waves and drought could affect them.

Climate Change - Regional Level and Correlative Studies

Climate and abiotic studies in the general region of the UFB and on UFB colonies have taken place. In one experimental study at Rocky Mountain Biological Lab (RMBL) near Gothic, Colorado, (approximately 9,600 feet) results showed that removal of snow to mimic earlier observed and predicted snowmelt dates had a deleterious effect on nectar sources through direct impact by frost (Gezon et al. 2016). Adding to that, another study of butterfly (*Speyeria mormonia*) demographics at RMBL supported that earlier snowmelt led to less abundance of nectar sources which reduced the food available to *S. mormonia* and had a linear relationship to decline in fecundity (reproduction) of the butterfly (Boggs and Inouye 2012).

A third study at RMBL, which has continued for 28 years, has monitored changes in plant composition using heat lamps to mimic predicted temperature changes (Panetta et al. 2018). The widespread mountain flower *Androsace septentrionalis* was found to have disappeared or nearly disappeared (91 percent average decline) in heated areas. The decline had a direct correlation to earlier snowmelt which caused a decline in the plant's seedbank. Unfortunately, control areas (no heat lamps) with the warmest and earliest-melting microenvironments, as of 2016, matched the coolest and latest-melting heated areas in regards to shifts in plant community, indicating current ambient temperatures are now affecting the environment similar to the plots with heat lamps (Panetta et al. 2018).

As recognized in Panetta et al. (2018), not only has *A. septentrionalis* declined but earlier studies in the heat lamp plots show a community shift in vegetation from non-woody forbs to woody vegetation, particularly *Artemisia tridentata* (Wyoming sagebrush). After only four years the heat lamps produced a shift to woody vegetation (Harte and Shaw 1995). Continued study of the heat lamp experiment confirmed this vegetation shift, showed that soil carbon was being reduced and released into the atmosphere and that a change in the floral community of at least montane ecosystems is expected over this century (DeValpine and Harte 2001; Perfors et al. 2003; Harte et al. 2015).

A correlative study in the Canadian Rocky Mountains over a twenty-year time frame showed that a Holarctic alpine butterfly (Parnassius smintheus) is affected by extreme minimum and maximum temperatures in November affecting egg overwintering (Roland and Matter 2016). The study also showed that snowfall can ameliorate the effects of temperature (Roland and Matter 2016). The alpine UFB does not have eggs that overwinter but

larvae overwinter (Seidl 1996) and could be affected by extreme temperature and snowpack fluctuations.

Isotopic data collected during the summer of 2017 at UFB colonies on Mt. Uncompahgre and Redcloud Peak suggest that the majority of soil water originates from snowmelt, with increasing contributions from rainfall later in the season (Gianniny 2018). Soil moisture, streamflow, and rainfall data were also collected during the summer of 2018, an extreme drought year. Data over these two years describe a complex and variable hydrologic system. Basal moisture levels originate from snowmelt but change in response to subsequent rainfall events. As the climate warms, the San Juan Mountains are expected to see decreased snowfall and earlier snowmelt. These changes will drastically alter the hydrology of high mountainous areas (Gianniny 2018). Additional water flow and soil moisture data has been taken but the analysis is not complete (Alexander, WSCU, pers. comm. 2018).

Because the UFB is restricted to a range of 12,100 to 13,500 feet (Ellingson 2003), climate change could restrict the UFB's habitat to a zone so narrow that the species would be unable to survive. Britten and Brussard (1992) believe that the UFB is a "glacial relict," or a species that was more widespread during or shortly after the last glacial period, but with temperature increase since the last glacial period the range has been restricted to isolated mountaintops. Naturally, this would lead one to believe that increasing temperatures would further compress the UFB's range.

To summarize, the average global temperature has increased as predicted and is expected to increase in the future (IPCC 2007, 2014). Colorado average temperatures have met or exceeded global averages and are also expected to increase in the future. Snowpack has generally decreased in the Northern Hemisphere (IPCC 2014) and has generally been below average in Colorado since 2000, but no long-term precipitation trends have been detected (Lukas et al. 2014). Winter precipitation is expected to generally increase in Colorado but more of it may come in the form of rain and the southern half of the state is predicted to get less precipitation, so both snowpack and precipitation amount in the San Juan Mountains in the future is unknown. Within Colorado, short-term temperature predictions by Ray et al. (2008) have been borne out and the average temperature increase has met or even exceeded the global average in the last 30 years (Lukas 2014). Earlier snowmelt of 1-4 weeks has been observed due to this warming (Lukas et al. 2014). Regional or correlative studies have also shown that snow is melting earlier and will melt earlier with warmer temperatures and may affect the timing of flowering, availability of water and related abundance of nectar sources. The decrease in nectar sources could affect UFB productivity, as shown with a study on *S. mormonia*

(Boggs and Inouye 2012) but results may not be directly related to the UFB due to different life patterns.

Direct measurements on UFB colonies for temperature, water availability, and plant phenology are limited. The exception being Gianniny's (2018) isotopic water analysis showing that most of the soil water (that supports nectar sources) is from snowmelt. If the snowmelt continues to get earlier, the UFB emergence may not be able to meet earlier nectar source phenology. Additionally, at the UFB's high altitudes, spring frosts may reduce the abundance of nectar sources if flowers emerge early in spring. The UFB does show some plasticity regarding the timing of emergence to snowmelt. However, with future predicted climate change the UFB may not be able to adjust enough physiologically or developmentally to adapt to continually earlier snowmelt or widely varying climate (IPCC 2014; Van Dyck et al. 2015).

Evidence to date has not detected climate effects to the UFB's at Mt. Uncompahgre or Redcloud Peak. Additionally, all qualitatively monitored colonies but one have had at least one year where there were no UFB's detected but then they reappeared (Alexander and Keck 2018). Despite this promising information, very low numbers of butterflies at Colony C since 2014, likely extirpation of Colony D, lack of presence at Colony E in 2018, and lack of presence at two other qualitatively monitored sub-colonies in 2018 suggest that climate is starting to affect the UFB. It is unknown if 2018's hot and dry climate will continue but that is one predicted scenario with more swings in weather with abundant snowpack in one or more years followed by subsequent meager snow is also a potential scenario (IPCC 2014; Lukas et al. 2014).

Small Population Size

Small population numbers at individual colonies could affect the UFB. However, the UFB can bounce back from low numbers as evidenced by population fluctuations of up to ten times between low to high counts at the three quantitatively monitored colonies (Alexander and Keck 2018). In 2015 the quantitatively monitored colonies and their sub-colonies all experienced low numbers but Mt. Uncompahgre and Redcloud Peak rebounded to average numbers in 2017 (Alexander and Keck 2018). However, Colony C declined substantially in 2014 and has not recovered to average numbers. Colony C South did have two adult butterflies detected in 2018 on a monitoring transect after three years of no butterflies (Alexander, WSCU, pers. comm. 2018). This may have been due to recolonization from Colony C North since it is only about ½ mile away. Despite this recolonization, it would not be surprising to lose Colony C entirely due to adverse environmental conditions or other natural causes of this now demographically small colony. Colony D has had few or no

butterflies detected in the last six years and it is likely that small population size potentially coupled with climate change has caused extirpation of this colony.

Genetic Variability

Low genetic variability could possibly cause problems but has not been detected to have caused problems as of yet. Genetic analysis from samples collected in 2008 and 2009 at the three quantitatively monitored colonies show that they are relatively heterozygous among the sites (0.41 to 0.46 heterozygosity) and between even and odd years (Monroe et al. 2016). Heterozygosity among the colonies is surprising considering the distance between the colonies and suggests at least a low level of migration between the sites suggesting they are acting as a metapopulation (Monroe et al. 2016). Assuming that low-level migration is happening, how they find the other seemingly isolated colonies is still a mystery. Heterozygosity between even and odd-year broods supports Britten and Brussard's (1992) findings and indicates genetic mixing between years is still occurring. Further genetic analysis of samples collected at other colonies should be able to tell us if the other sites are as heterozygous and whether they are acting as metapopulations or are isolated.

In conclusion, climate change is suspected to have caused low numbers or absences of UFB's, but more direct climate research and its related effects to UFB habitat are needed. It is possible the altitude at which the UFB colonies occur will ameliorate some predicted change in temperature and precipitation, but current demographic suppression for multiple years at Colony C and absence at Colony D, E, and sub-colonies suggest climate change is starting to affect UFB abundance. The hot and dry summer of 2018 was observable on UFB colonies but influences to UFB abundance likely won't be known for two years given the mostly biennial life-cycle and will only be detectable if snowpack and climate are relatively normal the next couple years for comparison. The UFB only has up to eleven known colony sites, and so cumulatively the UFB's range is not extensive. If some colonies remain absent due to climate or other reasons they may not be able to augment or recolonize sites, leading to further declines. Genetic variability appears adequate at the three quantitatively monitored sites, but new genetic analysis is needed for the other colonies. In short, changes in climate have been observed, are predicted to become warmer and potentially dryer or have more pronounced swings and, coupled with small population size at individual colonies and overall, could affect recovery of the UFB.

2.4 Synthesis

Since listing and the completion of the Recovery Plan, the number of confirmed UFB colonies increased from two to eleven. Total population estimates for the three quantitatively monitored colonies climbed to as high as about 23,000 in 2007 but returned in 2008 to a more typical level for the 2003 to 2017 period. As such, the status of the UFB was looking promising during the writing of the 2010 5-year Review. The low numbers of Colony C since 2014 is of concern but played virtually no role in the average 2017 figure since abundance at Mt. Uncompahgre and Redcloud Peak made up the bulk of the numbers. At the time of the 2010 5-year Review, the other eight qualitatively monitored populations persisted despite four of the colonies apparently having no UFBs during one or two surveys in different years since 2001. However, Colony D is now likely extirpated. Absence of UFB at Colony E is of concern due its consistent presence since 2011 (and from 1995 to 2009), and two qualitatively monitored sub-colonies of Redcloud Peak and Mt. Uncompahgre are of concern since they've possibly been absent for two years and were definitively absent in 2018.

Most threats have been addressed. The primary threat of collecting appears to have been forestalled by the maintenance of UFB collecting closures around the two well-known colonies, regular researcher presence, occasional law enforcement visits, and prohibition of collection by the ESA. However, these protections must be extended into the future by regulatory mechanisms before we can ascertain that factor D has been sufficiently addressed.

The only observable current impacts are caused by relatively minor habitat degradation from hiking trails on the edge of colonies at Mt. Uncompahgre and Redcloud Peak. With conservation measures in place at Mt. Uncompahgre and Redcloud Peak and no impact to population abundance from limited habitat modification noted, domestic sheep grazing is not currently considered to be threat to the species.

Climate change has not been directly tied to declines in abundance at Colony C or absence at Colony D, E, or two qualitatively monitored sub-colonies of Mt. Uncompahgre or Redcloud Peak. However, observed earlier snowmelt dates in Colorado, generally less snowpack since 2000, results of regional research showing changes in flora from warmer conditions, changes to reproduction in another species of butterfly from less nectar sources, and predictions of warmer, drier, or more frequent swings in temperature and precipitation suggest that climate may currently be impacting the UFB and, furthermore, climate predictions do not bode well for the UFB or its habitat.

Some climate research directly related to the UFB has occurred (Alexander, WSCU, pers. comm. 2018; Gianniny 2018) but more needs to be conducted (see Recommendations for Future Actions below). The small population size of some colonies could be a concern, especially when coupled with climate change. Genetic research results for at least the three quantitatively monitored colonies suggest low genetic variability is not an issue. If

Colony C becomes extirpated in the next couple years it will likely be due to climate change effects or other natural events rather than low genetic variability. Isolation and genetic variability of the other eight colonies are uncertain but, given funding, analysis of samples collected from those colonies should reveal levels of isolation or connection.

During the time of the 2010 5-year Review, adequate quality habitat existed for over ten years at Mt. Uncompahgre and Redcloud Peak producing what appeared to be stable population numbers. Immediate on-the-ground threats ceased or had been moderated (collecting, recreational impacts, and grazing). These conditions led us to recommend downlisting for the UFB, but due to higher priorities, a downlisting rule was never pursued. Though habitat conditions and abundance at these two colonies still generally appear stable the threat of effects of climate change to the UFB appears more certain. Additionally, some of the other colonies have declined in abundance or have likely become extirpated since 2010. Observations of climate change have occurred, recent research has shown how and possibly why some colonies of the UFB have been affected, and predictions for further climate change continue. As such, the Service determines that the UFB should remain listed as endangered.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X_ No change is needed

3.2 New Recovery Priority Number: Change to 12.

Brief Rationale: The UFB was ranked a 14 in the 2010 5-year Review. Informal consultation on trail placement, ski area activities, private land access, and grazing have taken place, but none have resulted in development or economic conflict. No formal consultations have occurred for any project since the UFB was listed, an indication that no projects have been proposed which would have resulted in taking of the species. Despite few activities directly affecting habitat or the UFB we only have two of the three quantitatively monitored colonies that appear stable and only six of eight qualitatively monitored colonies that appear persistent. With only eight colonies appearing stable this does not meet the minimum delisting goal of ten stable colonies for ten years.

Immediate threats to the species stated in the listing rule and Recovery Plan have been ameliorated or have not surfaced as more than minor threats. However, until a management plan has been finalized that would result in the continued protection of the species, we find that the threat of inadequate regulatory mechanisms has not been sufficiently removed. Furthermore, changes to the climate have been observed, effects of climate change proven on other butterfly

species and habitat, and there are further predicted changes to climate. Consequently, recovery no longer looks as obtainable for the UFB as it once did. The threat to the UFB remains moderate because we do not have absolute proof of long-term climate effects to the UFB even though there is no other explanation for decline or disappearance of some colonies or sub-colonies. The recovery potential in light of likely climate change effects is therefore low. There also appears to be scientific agreement that the UFB taxonomy has changed since the last 5-year Review, and the UFB should now be classified as a subspecies. These ranking factors place the UFB recovery priority at 12.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Continue to monitor population abundance and presence.

- Continue to research climate change impacts to the UFB and its habitat and continue to gather other literature relevant to climate change impacts to the UFB.

- Support means to reverse climate change within our influence.

- Discuss whether quantitative monitoring should rotate amongst colonies that have not received quantitative monitoring to date (but retain consistent monitoring at Colony C due to precarious status).

- Conduct further genetic analyses and literature review to determine the level of genetic variability at the eight currently qualitatively monitored sites and determine if gene flow between colonies is, or will, pose a threat to the UFB.

- Develop a genetics management and monitoring plan if genetic problems are determined to exist.

- Revise recovery criteria and recovery actions if necessary to address the current status and threats to the UFB as more information on climate change impacts is available and as more genetic information is available.

- Determine if the definition of "stable" needs to be clarified in the recovery criteria, especially for colonies that only have had qualitative monitoring.

- In the long-term, retain the USFS and BLM butterfly collecting closures around Mt. Uncompahgre and Redcloud Peak and develop a post-delisting management plan to ensure on-the-ground threats remain low at all colonies. Through the management plan, state that collecting closures will be placed around all colonies or that permits for collecting will not allow more than one UFB to be annually collected on colonies in coordination with the Service.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW
of the Uncompahgre fritillary butterfly
(Clossiana improba acrocnema)

Current Classification: Endangered range-wide

Recommendation resulting from the 5-Year Review:

___ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ No change needed

Review Conducted By: Terry Ireland, Western Slope Office, Colorado Ecological Services

FIELD OFFICE APPROVAL:

Western Slope Supervisor, Colorado Ecological Services, Fish and Wildlife Service

Approve Ann Tuda
Western Slope Supervisor, Colorado Ecological Services

Date 9/28/18