

**Laguna Mountains Skipper**  
*(Pyrgus ruralis lagunae)*

**5-Year Review:  
Summary and Evaluation**



**U.S. Fish and Wildlife Service**

**Carlsbad Fish and Wildlife Office  
Carlsbad, California**

**September 2007**

## 5-YEAR REVIEW

**Species reviewed:** Laguna Mountains skipper (*Pyrgus ruralis lagunae*)

### TABLE OF CONTENTS

I.	General information.....	1
II.	Review analysis.....	2
III.	Results.....	14
IV.	Recommendations for further actions.....	14
V.	References.....	15

## 5-YEAR REVIEW

Laguna Mountains skipper (*Pyrgus ruralis lagunae*)

### I. GENERAL INFORMATION

**I.A. Methodology used to complete the review:** This review was compiled by staff of the Carlsbad Fish and Wildlife Office (CFWO). The review was completed using documents from office files as well as available literature on the Laguna Mountains skipper. No new information was received in response to the Federal Register notice announcing the initiation of this review.

### I.B. Reviewers

**Lead Region:** Diane Elam and Jenness McBride, California-Nevada Operations Office, 916-414-6464

**Lead Field Office:** Jim A. Bartel, Carlsbad Fish and Wildlife Office, 760-431-9440

### I.C. Background

**I.C.1. FR Notice citation announcing initiation of this review:** The notice announcing the initiation of this 5-year review and opening of the first comment period for 60 days was published on July 7, 2005 (70 FR 39327). A notice reopening the comment period for 60 days was published on November 3, 2005 (70 FR 66842).

**I.C.2. Species status:** In the 2005 Recovery Data Call for the Carlsbad Fish and Wildlife Office, the status of the subspecies was reported as “decreasing”.

**I.C.3. Recovery achieved:** This was reported as a value of “1” in the 2005 Recovery Data Call for the Carlsbad Fish and Wildlife Office. This indicated an estimate that 0 to 25 percent of the recovery objectives for this subspecies have been met.

#### I.C.4. Listing history

##### Original Listing

FR notice: 62 FR 2313-2322

Date listed: January 16, 1997

Entity listed (*species, subspecies, DPS*): Subspecies

Classification (*threatened or endangered*): Endangered

**I.C.5. Associated rulemakings:** Critical habitat designation proposed December 13, 2005 (70 FR 73699) in response to stipulated settlement agreement dated July 29, 2003 (per *CBD v. USFWS Civ. No. 03-0058-BTM*).

**I.C.6. Review History:** No prior reviews.

**I.C.7. Species' Recovery Priority Number at start of review:** The recovery Priority number is 3C according to the 2005 Recovery Data Call for the Carlsbad Fish and Wildlife Office. This number indicates that the taxon has a high threat and moderate to low recovery potential.

**I.C.8. Recovery Plan or Outline:** To date, no recovery plan has been finalized and approved for this taxon.

## **II. REVIEW ANALYSIS**

### **II.A. Application of the 1996 Distinct Population Segment (DPS) policy**

**II.A.1. Is the species under review listed as a DPS?** The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listings as distinct population segments (DPS) only to vertebrate species of fish and wildlife. Because the subspecies under review is an invertebrate, and the DPS policy is not applicable, the application of the DPS policy to the species listing is not addressed further in this review.

### **II.B. Recovery Criteria**

**II.B.1. Does the species have a final, approved recovery plan containing objective, measurable criteria?** No recovery plan has been finalized or approved; therefore recovery criteria are not applicable.

### **II.C. Updated Information and Current Species Status**

#### **II.C.1. Biology and Habitat**

**II.C.1.a. 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:**

The Laguna Mountains skipper is a small butterfly with a wingspan of about 3 centimeters (1.1 inches) found in montane meadow habitat of southern California Mountains. The Laguna Mountains skipper is restricted to the Laguna Mountains and Mount Palomar in San Diego County.

Population demography for the subspecies is unknown; life history parameters (emigration, immigration, annual productivity, mortality) are also currently unknown. No repeated, systematic population status studies of Laguna Mountains skipper localities (historic or recent) have been conducted. Despite surveys and anecdotal observations in historical skipper habitat during favorable collection periods, current sighting data are limited. Little is known regarding the subspecies' population status anywhere, including the five locations known at the time of listing. The site-specific identification of these five locations known at

the time of listing is vague, and we are unable to make direct comparisons between these locations and the few available data indicating current sighting information. The 2005 Recovery Data Call for the Carlsbad Fish and Wildlife Office indicated that the subspecies population is decreasing.

The subspecies has been associated with its primary host plant (*Horkelia clevelandii*) (62 FR 2314) and has also been observed laying eggs in at least three instances on *Potentilla glandulosa* (Pratt 2006). *Horkelia clevelandii* is a rare species within the range of the butterfly and has a restricted range in Laguna, Cuyamaca, and San Jacinto Mountains of southwestern California, and in northwestern Baja California, Mexico (Hickman 1993). Habitat destruction and degradation from overgrazing and trampling by cattle are considered to be the reasons for the decline of *H. clevelandii* (62 FR 2314); however, this plant has not been federally or state listed. Grazing by cattle in the Laguna Mountains and near Mount Palomar has been shown to cause direct mortality of larvae and eggs by trampling and consumption of *H. clevelandii* (62 FR 2314, Black and Vaughan 2005). Related changes in hydrology, invasion of exotic species, and forest encroachment caused by cattle grazing also affect the host plant. Cattle do not normally eat *H. clevelandii* or *P. glandulosa* while larvae are present due to seasonal timing; however, Pratt (2006) has recorded cattle eating *H. clevelandii* during drought conditions when other forage materials were scarce.

Survey attempts at all five locations known at the time of listing for Laguna Mountains skipper are few. Anecdotal observations and surveys have concentrated on Laguna Meadow and Palomar Mountain. Lack of recent (1999 to present day) sightings on Laguna Mountain at areas with former known sighting concentrations and with the highest density of *Horkelia clevelandii* and Laguna Mountains skipper suggest that the entire Laguna Mountain range may have become depopulated since the time of listing (Anderson, pers. comm. Dec. 2006). Individual Laguna Mountains skippers have not been detected on Laguna Mountain since 1999 (Pratt 2006), and any remaining populations may not be resilient enough to survive into the foreseeable future under current conditions. Laguna Mountain constituted over half of the Laguna Mountains skipper's former range (Figure 1). Loss of occupancy in this area may reflect a significant loss of genetic diversity for the skipper, and alter its long-term ability to adapt to changing environmental conditions and stochastic events. However, not all suitable habitat has been surveyed, and low populations are difficult to detect (Anderson, pers. comm. Dec. 2006). At this time, insufficient evidence exists to conclude that suitable habitat in the Laguna Mountains no longer supports an extant population, and presumption of complete extirpation would be premature at this time.

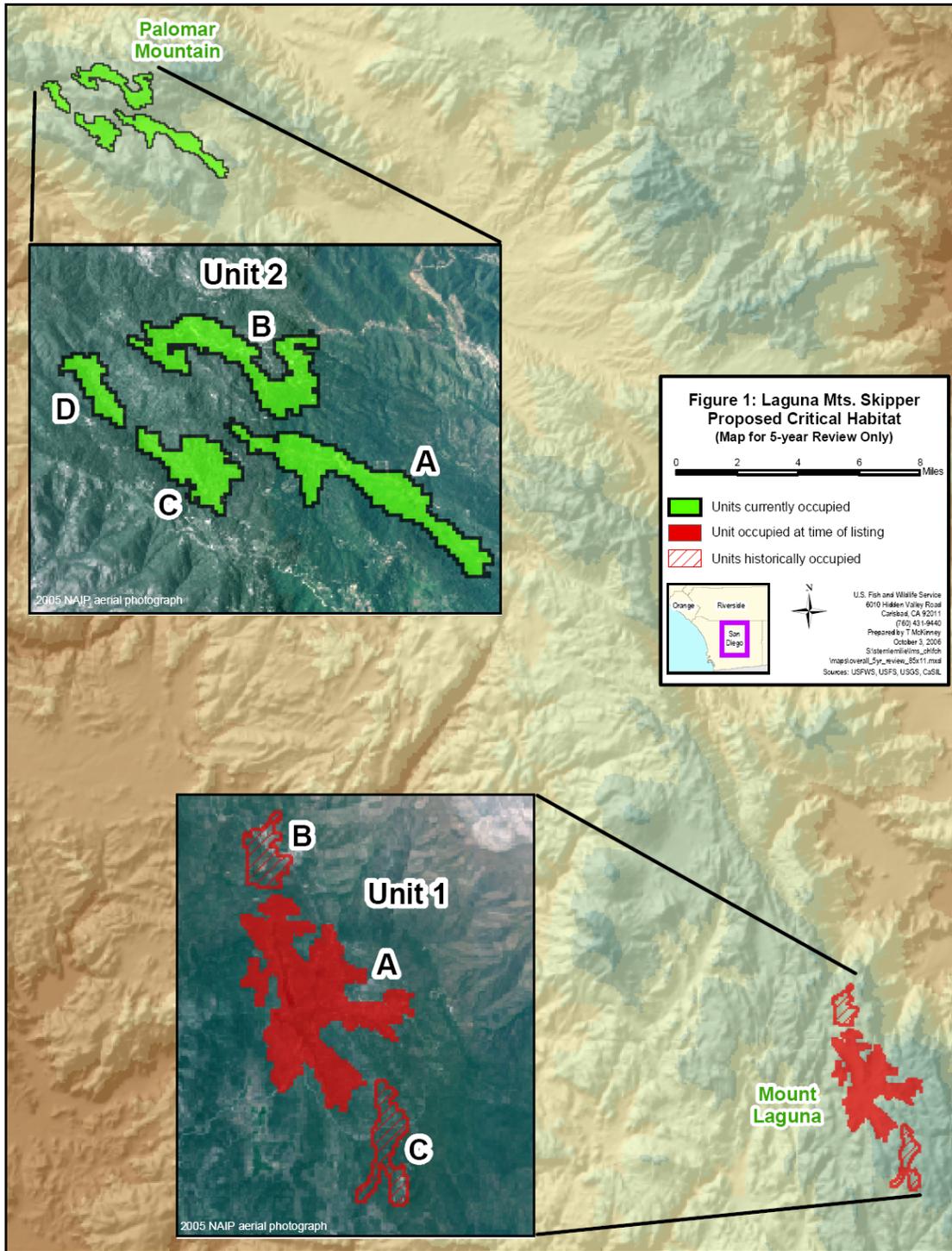


Figure 1. Approximate areas proposed as critical habitat for the Laguna Mountains skipper (70 FR 73699). All units were historically occupied.

Laguna Mountains skippers have been detected on Palomar Mountain as recently as 2006 (Pratt 2006, Walker 2006) during anecdotal observations and surveys. It is unlikely that individual butterflies are capable of dispersal between Laguna and Palomar Mountain, as approximately 45 miles (72 kilometers) of unsuitable

habitat exist between the two closest locations in each mountain range, and that distance is farther than the estimated dispersal distance of the genus *Pyrgus* (Mattoni 1998).

**II.C.1.b. Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):**

No information is available at this time for this monophyletic taxon.

**II.C.1.c. Taxonomic classification or changes in nomenclature:**

The Laguna Mountains skipper (*Pyrgus ruralis lagunae*) is one of two subspecies of the rural skipper (*Pyrgus ruralis*). The Laguna Mountains skipper was first described by Scott (1981), based on population isolation and color differentiation. Stanford and Opler (1996) described the rural skipper (*P. ruralis ruralis*) range as montane habitat from British Columbia/Alberta, Canada, south to the Sierra Nevada in California/Nevada, and other alpine habitat in Utah and northern Colorado. The genus *Pyrgus* has three other species in San Diego County, including the common checkered skipper (*P. communis*), small checkered skipper (*P. scriptura*), and western checkered skipper (*P. albescens*). There is no dissent amongst lepidopterists that we are aware of suggesting changes in taxonomic classification or changes in accepted nomenclature.

**II.C.1.d. Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g., corrections to the historical range, change in distribution of the species' within its historic range, etc.):**

Murphy (1990) reported at least six populations of the subspecies in the Laguna Mountains in the 1950s and 1960s; however, information at the time of listing only indicated one existing population in the Laguna Mountains. This final population in the Laguna Mountains has since become depopulated. The subspecies may no longer be present in the Laguna Mountains, which was the original type location for the subspecies, as it was last seen in 1999 (Pratt 1999). During a 10-year period (1994-2003), only four adult skippers have been found in the Laguna Mountains and only at the El Prado/Laguna campground. These sightings include a single individual in 1995 (Levy 1997), one adult in 1996 (Levy 1997), and two adults in 1999 (Pratt 1999). A single skipper larval shelter (no live larvae) was found in 1997 at the Meadow Kiosk (Pratt 1999). Recent survey efforts in suitable skipper habitat (Faulkner 2000a, 2000b, 2001, 2002, 2003, 2004; Osborne 2003, 2004) have yielded no sign of Laguna Mountains skipper in the Laguna Mountains. While additional surveys in potential habitat that is lesser quality than El Prado/Laguna and Meadow Kiosk may locate Laguna Mountains skipper, affirmative survey results are unlikely due to multi-year drought, high-density cattle grazing, and lack of maintenance of fences surrounding prime *Horkelia* plants at the El Prado/Laguna Mountain campground.

While the Service currently does not consider the subspecies extirpated in the Laguna Mountains, the subspecies population has declined throughout its entire range to a threshold where it may no longer be significant in providing ecosystem services within the ecosystem.

The subspecies has extremely limited distribution in meadow habitat near Mount Palomar. Historically, the Mount Palomar populations were small compared to Laguna Mountain populations. Prior to 1991, only five specimens were collected in the Palomar Mountains (Brown 1991). Today, this area apparently sustains the remnants of the subspecies' population and hence the largest known population of the subspecies. Recent sightings are few (Pratt 2006, Walker 2006); however, additional surveys in the Palomar Mountains have yielded several new limited occurrences on Federal, State, and private lands (e.g. Faulkner 2000b, Osborne 2003, Pratt 1999). Only one known occupied site (Mendenhall Valley) exists where multiple adult Laguna Mountains skippers can be reliably found in any given year. Though dated, Mattoni and Longcore (1998) extrapolated 1,470 individuals at the time in Mendenhall Valley. At no time have that many individuals been located during any survey. This number is an extrapolation of the number of larvae and individuals to estimate the potential population in the Mendenhall Valley. No further survey or additional empirical evidence supports this claim.

Past estimates are unsuited to evaluate the current status of the subspecies. No estimations or systematic surveys have been accomplished since Mattoni and Longcore (1998) in any portion of the subspecies' range; hence the impact of drought to the subspecies, impact of drought to the number of host plants available for selective grazing by cattle, impact of exotic plant species in montane habitat, impact to the Laguna Mountains skipper from cattle, and impact to habitat per continued grazing cannot be estimated.

The Laguna Mountains skipper has declined in presence and abundance throughout its range since the listing of the subspecies. Five locations were known to have Laguna Mountains skipper at the time of listing (62 FR 2313-2322). As indicated above in II.C.1.a., efforts to find Laguna Mountains skipper at each of these five locations have been limited to Levy (1997), Pratt (1999), Faulkner (2000a, 2000b, 2001, 2002, 2003, 2004), and Osborne (2003, 2004), and anecdotal observations on Palomar Mountains (Pratt 2006, Walker 2006). To date, only two of those five locations are known to have had sightings of skippers in the past two years, and only in the Palomar Mountains. The other locations known and indicated in the listing rule in the Laguna Mountains have not had Laguna Mountains skippers since the time of listing.

In 2006, Walker noted 19 individuals in French Valley in the Palomar Mountains (Walker 2006). These few individuals comprised the known population of the subspecies; no surveys have been accomplished in the Mendenhall Valley area

during recent years. No other empirical evidence exists to ascertain the current population of the subspecies.

Habitat fragmentation has occurred prior to and since the time of listing on private and within some public lands where the subspecies has been documented. U.S. Forest Service lands are bisected by roads, have had grazing pressures of what may be excessive animal unit months (AUM), and have increased human visitation (camping, hiking, sledding, etc.) on meadows where Laguna Mountains skippers have been, until recently, documented. This change in the level of fragmentation since listing has not been quantified.

**II.C.1.e. Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):**

Laguna Mountains skippers require *Horkelia clevelandii* to lay eggs on and for the caterpillars to eat and construct pupal shelters (Emmel and Emmel 1973; Scott 1981; Garth and Tilden 1986). The subspecies has also been documented on *Potentilla glandulosa* (Pratt 1999, Osborne 2004), which may be used as a host plant for population survival, in special circumstances (e.g., dry environmental conditions) where it occurs near *H. clevelandii*.

Host plant patches must be dense enough to support breeding (to provide multiple and diverse sites for depositing eggs), although the exact host plant patch size and density required for breeding is not known. A “patch” of host plants may consist of one to several clumps of *Horkelia clevelandii* or *Potentilla glandulosa* growing together, as well as numerous individual plants that are growing in close proximity. Adequate nectar, water, and mineral sources are also necessary for the subspecies’ survival.

Habitat within the Laguna and Palomar Mountains has become degraded due to cumulative effects of humans and human-related use (62 FR 2317). Habitat conditions at the five locations known at the time of listing have become degraded. Fences constructed to prevent cattle and humans from entering the remaining prime habitat at El Prado in the Laguna Meadows have fallen into disrepair, with cattle and humans frequenting the formerly protected meadow. Drought conditions, exotic species incursion, and human presence, augmented by cattle grazing, have synergistically degraded suitable habitat for the Laguna Mountains skipper (62 FR 2317, 70 FR 73699).

Cattle grazing, which may be helpful to the subspecies if managed properly, has directly and indirectly impacted Laguna Mountains skipper host plants and larvae through grazing and trampling caused by high or excessive AUMs (62 FR 2317). Low population density of the skipper and high density of cattle incrementally increase impacts through adverse grazing practices, although current densities are reduced on Forest Service lands relative to historic and private use (Anderson,

pers. comm. Dec. 2006). No grazing plan for cattle respective to the skipper on Forest Service managed lands has been developed.

Private land may currently host small populations of the Laguna Mountains skipper. Much of these private lands have gone unsurveyed, and conditions of these lands are currently unknown.

Much of the Laguna Mountains skipper habitat is under private or federal ownership. To date, 6,662 acres (2,696 hectares) of Laguna Mountains skipper habitat has been proposed as critical habitat for the subspecies (Figure 1) (70 FR 73699). This critical habitat designation comprises two units, Laguna Mountains and Palomar Mountains, respectively. These two units were subdivided into seven subunits, all of which were historically considered to be occupied. Four subunits on Palomar Mountain are known to be currently occupied.

#### **II.C.1.f. Other:**

At the time of listing, we indicated that naturally occurring events, such as weather extremes, fire, and/or drought, made the Laguna Mountains skipper vulnerable to extinction because of its extremely restricted range, localized distribution, and small population size (62 FR 2313, 62 FR 2320). Examples of weather extremes include more powerful winter storms, increase in thunderstorm (and dry lightning) activity, heavier rainfall and wind associated with storms, stronger Santa Ana winds, and intense heat spell temperatures (Field et al. 1999, NOAA 2007), all of which can have an effect on butterfly habitat, microclimate, and inter/intra ecological relationships of Lepidoptera eggs, larvae, and adults (Murphy and Weiss 1992, Parmesan 2006). Wildfire-related fire exclusion (the latter known, but not described at time of listing) and weather extremes can have additive, negative impacts on the Laguna Mountains skipper and skipper habitat (62 FR 2319). Further, analysis of the empirical constructs of small and declining population paradigms are necessary but currently not possible with the paucity of data and biological information available on the subspecies. See below II.C.2.e.

#### **II.C.2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)**

##### **III.C.2.a. Present or threatened destruction, modification or curtailment of its habitat or range:**

The listing rule inferred “*destruction and degradation from overgrazing and trampling of H. clevelandii by domestic cattle is considered to be the primary factor responsible for its decline*” (62 FR 2317). The listing rule indicated that three of the five locations of Laguna Mountains skipper were not subject to livestock grazing. The remaining two locations were subject to grazing; one on private lands and one on Forest Service managed habitat. Specific measured

habitat conditions at the time of listing were not recorded, and conditions to date are presently unknown.

Anecdotal observations of current habitat conditions for the Laguna Mountains skipper suggest that a majority of remaining suitable habitat has been and continues to be negatively impacted due to fragmentation, continued overgrazing, and human recreational presence. Wooden fences constructed to serve as enclosures on the Cleveland National Forest bordering the Laguna Meadow grazing allotment are currently in disrepair, leading to cattle and human use in protected habitat (Pagel, pers. comm. Sept. 2006). Remaining habitat on private land continues to experience high levels of cattle grazing (e.g., Upper French Valley) (70 FR 73699; Anderson, pers. comm. Dec. 2006). While the grazing levels had been reduced by the time of listing, impacts from grazing are likely to continue to have “*significant effect on the taxon due to the small numbers of Laguna Mountains skippers*” (62 FR 2317).

Human recreational presence near occupied meadows on public land continues to increase correlative to urban population increase (e.g., snow play and sledding activities at Meadow Kiosk, Laguna Mountain), and access by cattle and people to suitable habitat areas appears to have affected butterfly presence (e.g., Prado enclosure).

#### **II.C.2.b. Overutilization for commercial, recreational, scientific, or educational purposes:**

The Laguna Mountains skipper has been collected by lepidopterists for private and public museums. At the time of the listing, collecting pressure was indicated to be a threat to the subspecies (62 FR 2318). Collecting pressure on the subspecies following listing appears to have subsided; however, collection remains a viable threat of undetermined magnitude to the subspecies due to the value of Laguna Mountains skippers to butterfly collectors. There appears to have been no change since listing. This threat is speculative, as it has not been adequately studied with the subspecies or Lepidoptera in general.

Landowner vandalism was also inferred in the listing rule as a significant threat to the survival of the Laguna Mountains skipper (62 FR 2318). The effect of this speculative threat on the status of the subspecies has not been documented, and remains unknown for all five of the locations indicated in the listing rule.

#### **II.C.2.c. Disease or predation:**

This butterfly, like others, is undoubtedly consumed by predators, but there is no evidence that natural predation is a threat to the subspecies. At the time of listing to the present day, disease and natural predation are not known to be a factor affecting this subspecies. Parasitism has been identified as a threat to the subspecies; Laguna Mountain skipper eggs have been heavily parasitized by

*Trichogramma brevacapalum*, a parasitic wasp (Mattoni and Longcore 1998, Pratt 2000). Tachniid flies may also be a source of larval mortality (Osborne 2003).

Wild turkeys were suggested by the listing rule to be a threat to the Laguna Mountains skipper (62 FR 2318), however, to date no observations of turkeys eating butterflies or larvae have been documented. Incidental predation by cattle was also indicated in the listing rule as a significant threat to the subspecies. As noted by anecdotal observations, *Horkelia clevelandii* is moderately palatable to cattle (Levy 1994). Cattle may be eating Laguna Mountains skipper larvae via the consumption of the host plant; however, the gravity of this threat has not been quantified beyond Pratt's (2006) single observation during drought conditions when other forage material were scarce.

#### **II.C.2.d. Inadequacy of existing regulatory mechanisms:**

Currently, the Laguna Mountains skipper is listed under the Federal Endangered Species Act, recovery is promoted, and the subspecies is protected from take by Sections 4, 7, 9 and 10. This law is the primary mechanism for protecting the Laguna Mountains skipper. Multiple sections of the Act contain provisions that promote conservation of listed species. Since the time of listing, the Endangered Species Act consultation process has been used to analyze jeopardy regarding proposed Federal actions in the range of the federally listed Laguna Mountains skipper. Consultation between the Service and the Forest Service has led to surveys of Forest Service land, and in some cases fencing of suitable habitat.

The listing rule indicated that lack of effectiveness of other laws (California Environmental Quality Act [CEQA] and National Environmental Policy Act [NEPA, 42 U.S.C. 4321-4347]) contributed to the decline and subsequent listing of the subspecies through “*failure of CEQA, NEPA, and local laws and regulations to protect and provide for the conservation of [these] taxa*” (62 FR 2318). CEQA requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency. The Laguna Mountains skipper would be considered endangered under §15380 of CEQA because it is federally listed. Protection of listed species through CEQA is dependent upon the discretion of the lead agency involved.

The listing rule failed to analyze the National Forest Management Act (NFMA 1974, *et seq.* 16 U.S.C. 1600) used to maintain viable populations of Laguna Mountains skipper. Under the NFMA, the Cleveland National Forest in 2005 completed a Land and Resource Management Plan (LRMP) to provide for multiple use and sustained yield of the products and services obtained from National Forests, including wildlife. Within this plan, the Forest identified habitat management strategies and tactics to move listed species toward recovery and delisting and achieve desired area-specific goals.

The subspecies is not listed by the State of California, as insects are not afforded protection under state law. Insects are not protected from collection under California law. Therefore, the subspecies does not receive State purview on private land.

It is unlikely that avoidance measures would continue to be implemented if the Laguna Mountains skipper were not listed under the Federal Endangered Species Act. If the Laguna Mountains skipper were not listed, land use on private and public lands would likely be implemented without consideration of the subspecies' needs, resulting in accelerated losses of habitat and decreases in populations. To date, these Federal and State laws are still inadequate to protect the Laguna Mountains skipper, as shown by depopulation of the subspecies over half of its range since the time of listing.

**Summary of Factor D:** Other than the Endangered Species Act, existing laws and regulations only provide protection for the Laguna Mountains skipper in specific cases, such as where the subspecies and/or its habitat may be impacted. These protections are therefore applied sporadically throughout the range of the Laguna Mountains skipper, and are currently inadequate to comprehensively address the threats to the subspecies. These laws do not specifically address impacts from competing human recreational use and/or disturbance, grazing, and non-native vegetation, all of which remain primary threats to the Laguna Mountains skipper.

The Federal Endangered Species Act provides for conservation of the Laguna Mountains skipper and provides the mechanisms under which we can continue to work with the Forest Service, the State, local governments, and others to implement actions to stabilize the population and eventually recover the subspecies. We thus conclude that the regulatory mechanisms in the absence of listing are inadequate to address the threats to the Laguna Mountains skipper to such an extent that it is no longer in need of the protections of the Act.

#### **II.C.2.e. Other natural or manmade factors affecting its continued existence:**

The listing rule indicated that the restricted range, localized distribution, and small population size of the Laguna Mountains skipper “*make them vulnerable to the effects of habitat loss, degradation and fragmentation, especially with regard to naturally occurring events*” (62 FR 2318). Caughley (1994) and Groom et al. (2006) detail theoretical and empirical threats such as fragmentation, stochastic events, and climate change to endemic biological diversity involving small and declining populations. The fact that only several sightings and one large concentrated amalgamation of individuals of Laguna Mountains skipper remain makes the subspecies extremely vulnerable to such threats as catastrophic climatic events, inbreeding depression, collecting, cattle grazing, disease, wildfire, and parasitism. As indicated in the listing rule, “*the occurrence of even one of the following naturally occurring events could easily extirpate these populations*”

(FR 62 2319). The veracity of these threats has not diminished and has only increased since 1997.

### *Fire*

Fire was considered a severe threat to the Laguna Mountains skipper in the listing rule; i.e., the subspecies could not tolerate local extirpations due to fire. Fire may be a natural component for meadow regeneration and maintenance in Laguna Mountains skipper habitat, and the additional threat to the habitat from fire exclusion and the lack of other processes that formerly created suitable habitat make this subspecies even more vulnerable to extinction. Exotic plant species incursion have exacerbated fire danger to meadow plants necessary as host and nectar sources, and subsequently to the Laguna Mountain skipper.

Although the meadow habitat occupied by this subspecies is dependent upon some form of disturbance to set back succession (e.g., periodic fire and recent [within past ca. 100 years] grazing), intense fires at critical times during the life cycle of the Laguna Mountains skipper can eliminate colonies via killing larvae, adults, and host plants. Historically, this would not have been a problem since there were undoubtedly other adjacent populations that could recolonize depopulated sites. The threat of catastrophic wildfire is high on Palomar Mountain where the most robust known population occurs. Wildfire can cause effects over large areas of habitat (e.g., recent Paradise Fire in 2003). Adjacent forests have been affected by extended drought, severe insect infestation, fire exclusion, and now a high density of dead and dying trees with overgrown ladder fuels. Conflagrations with intense heat and increased flame lengths may pose the largest single stochastic risk to the few remaining small and declining concentrations of Laguna Mountains skipper in the Palomar Mountains.

### *Drought/Extreme weather*

Periodic droughts indicated as a threat to the Laguna Mountains skipper in the listing rule (62 FR 2319) have occurred since the time of listing (San Diego County Water Authority 2007). From 1996 to 2005 at the closest precipitation gauge (Lake Cuyamaca, San Diego County, CA), seven of 10 years had precipitation significantly below normal (San Diego County Water Authority 2007). This extended drought has additively affected meadow moisture regimes, tree mortality surrounding meadows, and vegetative conditions in and around meadows (Anderson, pers. comm. Dec. 2006). Exotic species incursion has been exacerbated by the loss of moisture-dependent plants. The quantitative effect of extreme weather conditions, such as drought, to the five Laguna Mountains skipper populations known at the time of listing is currently unknown. However, as an already small and declining population, climatological shifts and ensuing weather extremes, which may result in altered vegetative regimes and complete loss of suitable upper elevation habitat, could affect the recovery and existence of the Laguna Mountains skipper, because biological adaptation such as elevational

migration would not be possible for this extant mountain-top subspecies (Forister, pers. comm. Feb. 2007).

#### *Small and declining populations*

The listing rule suggested that habitat fragmentation can affect the genetic heterogeneity of small isolated populations (62 FR 2319). While only five localities of the subspecies were known at the time of listing, loss of any remaining peripheral populations and individuals that are a part of the Laguna Mountains skipper small and declining populations may expedite extirpation events for central/core populations (considered at present to be Mendenhall Valley in the Palomar Mountains). Small, declining, and peripheral (disjunct or connected) populations are more vulnerable to demographic, genetic, and environmental stochastic events and natural catastrophes. Genetic stochastic events can further influence population demography via inbreeding depression and genetic drift. Allee (1931) suggested small, single populations disappear when opportunities for reproduction dissipate because of reduced opportunity to find each other (Allee effect or depensation). Stephens et al. (1999) and Dennis (2002) suggest comparable definitions indicating that the Allee effect is a density-dependent event that is inversely related to population size. The Laguna Mountains skipper exhibits traits found in small and declining population paradigms that suggest immediate action to conserve the subspecies may still result in extinction, as the extinction threshold (vortex) for the subspecies may already have been reached via the aforementioned threats. No empirical information is available to determine the finite rate of population change ( $\lambda$ ) for the subspecies; however, by all accounts, the subspecies population has decreased since the time of listing even when locations of new sightings of scattered individuals are considered.

#### **II.D. Synthesis**

The last review of the conservation status of the Laguna Mountains skipper occurred during listing, in 1997. The lack of skippers detected since 1999 in approximately half of its former range in the Laguna Mountains indicates that a significant reduction in range may have already occurred or is likely to occur in the short-term, foreseeable future (Anderson, pers. comm. Dec. 2006). Habitat fragmentation and degradation continue to affect the remaining occurrences of Laguna Mountains skipper. Additional stressors of such as increased average temperature, adverse weather effects (storm intensity and timing), localized drought, increase in human recreation that affects fire frequency by increasing potential for fire-starts/spread in fire prone habitat, threat of collection, threat of range-wide conflagration by natural or anthropogenic causes, and Allee effect (depensation) continue to adversely affect the subspecies. These factors in addition to its extremely localized distribution and small population size makes the Laguna Mountains skipper highly vulnerable to extinction through a single cataclysmic event or synergistic factors of multiple threats.

The Laguna Mountains skipper may be the most endangered species in southern California during the next decade; without concentrated recovery efforts, its population may further progress on a path to extinction or may be unrecoverable. Therefore, we recommend no change in status.

### III. RESULTS

#### III.A. Recommended Classification:

- Downlist to Threatened**
- Uplist to Endangered**
- Delist** (*Indicate reasons for delisting per 50 CFR 424.11*):
  - Extinction*
  - Recovery*
  - Original data for classification in error*
- No change is needed**

#### III.B. New Recovery Priority Number: 3C

Recovery priority number 3C should not be revised.

### IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- 1) Gather baseline information regarding the species, host plant(s) and nectar sources. Regarding the species, gather data on the life history, growth, behavior, and patterns. Regarding the host plant, identify locations of *Horkelia* and *Potentilla*. Determine the nectar sources and locations. Determine any limiting factors.
- 2) Create affirmative relationships with private landowners to survey potential habitat and extant host plant distribution, provide land easements to protect extant and potential habitat, and develop incentives to encourage private land owner cooperation that could include host plant nurseries and plantings, captive breeding, and/or butterfly ranching.
- 3) Approve a final recovery plan.
- 4) Develop and implement a controlled propagation, reintroduction, and monitoring program to conserve the Laguna Mountains skipper from imminent extirpation and extinction consistent with Service policy (65 FR 56916-56922).
- 5) Work with the Forest Service to promote recovery of the subspecies on occupied and suitable Laguna Mountains skipper habitat, and to provide expert assistance implementing conservation recommendations outlined in Biological Opinions. Update the Biological Opinions with new data and information as they become available.

- 6) Research the effect of potential stressors on Laguna Mountain skipper including, but not limited to: 1) cattle grazing on Laguna Mountains skipper under varying Animal Unit Month treatments; 2) effects regarding groundwater and changing moisture regimes; 3) parasitism on eggs, larvae, and adults; and 4) climatological shifts.
- 7) Develop and refine a predictive model of Laguna Mountains skipper habitat.

## V. REFERENCES

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### **Personal Communications**

- Dr. Alison Anderson. Dec. 2006. U.S. Fish and Wildlife Service, Carlsbad, CA.
- Dr. Matt Forister. Feb. 2007. University of Nevada, Reno, NV.
- Dr. Joel E. Pagel. Sept. 2006. U.S. Fish and Wildlife Service, Carlsbad, CA.

**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of Laguna Mountains Skipper (*Pyrgus ruralis lagunae*)**

Current Classification Endangered  
Recommendation resulting from the 5-Year Review

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

Appropriate Listing/Reclassification Priority Number, if applicable N/A

Review Conducted By Staff, Carlsbad Fish and Wildlife Service Office

**FIELD OFFICE APPROVAL:**

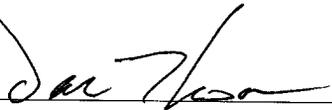
Lead Field Supervisor, Fish and Wildlife Service

Approve  Date July 31, 2007

**REGIONAL OFFICE APPROVAL:**

Acting

Lead Regional Director, Fish and Wildlife Service

Approve  Date 8/29/07