U.S. Fish & Wildlife Service

Recovery Plan for the Carson Wandering Skipper

(Pseudocopaeodes eunus obscurus)

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Recovery Plan

for the

Carson Wandering Skipper

(Pseudocopaeodes eunus obscurus)

June 2007

CalifornialNevada Operations Office
U.S. Fish and Wildlife Service
Sacramento, California

Approved: _____
Manager, California/Nevada Operations Office
U.S. Fish and Wildlife Service

Date: 6/14/2007

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LITERATURE CITATION SHOULD READ AS FOLLOWS:

U.S. Fish and Wildlife Service. 2006. Recovery plan for the Carson wandering skipper (*Pseudocopaeodes eunus obscurus*). U.S. Fish and Wildlife Service, Sacramento, California. viii + 94 pages.

An electronic version of this recovery plan is available at http://www.r1.fws.gov/ecoservices/endangered/recovery/plans.html and http://endangered.fws.gov/recovery/index.html.

Acknowledgments

This recovery plan was prepared by Marcy Haworth, Fish and Wildlife Biologist with the U.S. Fish and Wildlife Service, with input from species experts and stakeholders. We gratefully acknowledge the commitment and efforts of the following individuals in the recovery of the Carson wandering skipper. Without their assistance and participation during recovery team meetings, this document would not have been possible.

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We would also like to thank the following individuals for their assistance in the development or preparation of this document:

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Executive Summary

Current Species Status: The Carson wandering skipper (*Pseudocopaeodes eunus obscurus*) is a small butterfly in the subfamily Hesperiinae (grass skippers). The subspecies was federally listed as endangered on November 29, 2001. At the time of listing, only two extant populations were known, one in Washoe County, Nevada, and one in Lassen County, California. A third known population of the subspecies, from Carson City, Nevada, is considered extirpated as of 1998. In 2004, one additional population was located south of Carson City in Douglas County, Nevada, along the Carson River. In 2005, a second population in Washoe County, Nevada, was confirmed. Currently, there are four extant populations of the Carson wandering skipper. The long-term persistence of the newly discovered populations in Douglas County and Washoe County must be determined.

Habitat Requirements and Limiting Factors: Carson wandering skipper habitat is characterized as lowland grassland habitats on alkaline substrates. Occupied areas are located in a small region east of the Sierra Nevada in northwestern Nevada and northeastern California, and are characterized by an elevation of less than 1,524 meters (5,000 feet), the presence of *Distichlis spicata* (saltgrass) (Hickman 1993) and nectar sources in open areas near springs or water, and possible association with geothermal activity.

Threats to the subspecies include habitat destruction, degradation, and fragmentation due to urban and residential development, wetland habitat modification, agricultural practices, gas and geothermal development, and nonnative plant invasion. Other threats include collecting, excessive livestock trampling/grazing, water exportation projects, road construction, recreation, pesticide drift, and inadequate regulatory mechanisms. This subspecies is also vulnerable to chance environmental or demographic events, to which small populations are particularly vulnerable. The combination of only four known populations, small range, and restricted habitat makes the subspecies highly susceptible to extinction or extirpation from a significant portion of its range due to random events such as fire, drought, disease, or other occurrences (Shaffer 1981, 1987; Groom *et al.* 2006).

Recovery Priority: The Carson wandering skipper has a recovery priority number of 3C. This ranking, determined in accordance with the Recovery Priority Criteria published in the Federal Register (U.S. Fish and Wildlife Service 1983), is based on a high degree of threat, high potential for recovery, and taxonomic classification as a subspecies. Conflict with construction or development actions (urban, residential, and agricultural) may occur.

Recovery Goal: To recover the Carson wandering skipper to the point where it can be delisted.

Recovery Criteria: Downlisting of the Carson wandering skipper to threatened status can be considered when the following criteria are met:

1) For the Lassen County, California, population/metapopulation **and** one of the three known Nevada populations or a comparable newly discovered population, management has been established in perpetuity to effectively address threats to the species and ensure persistence of the populations. The population in Nevada must have been occupied for 6 years out of the most recent 10-year sequence with no downward trend in abundance. In California, suitable habitat patches equivalent to 50 percent or more of the currently known suitable habitat patches must be managed to effectively address threats, and each of these habitat patches must have been occupied for 6 years out of the most recent 10-year sequence with no downward trend in abundance across the population/metapopulation.

2) Adaptive management plans have been developed and implemented with adequate long-term funding, either individually or comprehensively, for the two populations in downlisting criterion #1. These plans must address appropriate management for the Carson wandering skipper with regards to habitat and land uses that may affect habitat quality, including but not limited to development (urban, residential, water, gas and geothermal), livestock grazing, recreation, invasive plant control, pesticide use, and public education.

Delisting of the Carson wandering skipper can be considered when the following conditions are met:

1) For the Lassen County, California, population/metapopulation **and** two of the three known Nevada populations or comparable newly discovered populations, management has been established in perpetuity to effectively address threats to the species and ensure persistence of the populations. Each population in Nevada must have been occupied for 6 years out of the most recent 10-year sequence after downlisting criteria are met, with no downward trend in abundance. In California, suitable habitat patches equivalent to 75 percent or more of the currently known suitable habitat patches must be managed to effectively address threats, and each of these habitat patches must have been occupied for 6 years out of the most recent 10-year sequence after downlisting criteria are met, with no downward trend in abundance across the population/metapopulation. Appropriate landscape connectivity must exist among patches (*i.e.*, land use between most sites is considered open space and not urban or suburban) in order to facilitate potential movement of the Carson wandering skipper among patches.

2) Adaptive management plans have been developed and implemented with adequate long-term funding, either individually or comprehensively, for the three populations in delisting criterion #1. These plans must address appropriate management for the Carson wandering skipper with regard to habitat and land uses that may affect habitat quality, including but not limited to development

(urban, residential, water, gas, and geothermal), livestock grazing, recreation, invasive plant control, pesticide use, and public education.

3) In addition to the populations in delisting criterion #1, for at least one additional Carson wandering skipper population or metapopulation, including a known population or any that may be discovered or established within Carson wandering skipper historical range, management has been established in perpetuity to effectively address threats to the species and ensure persistence of the population, unless we conclude (through intensive, comprehensive surveying) that additional populations or metapopulations do not exist and it would not be ecologically feasible to establish/reestablish one or more of them within Carson wandering skipper historical range.

4) *Lepidium latifolium* invasion into known and presumed suitable habitat for the Carson wandering skipper has been eliminated or reduced and managed to levels that do not pose a threat to the persistence of the Carson wandering skipper.

5) A long-term conservation plan and conservation agreements have been developed to guide management throughout the range of the Carson wandering skipper after it has been delisted.

6) A monitoring plan to cover a minimum of 5 years post-delisting of the Carson wandering skipper has been developed and is ready to be implemented to ensure the ongoing recovery of the species and the continuing effectiveness of management actions.

The criteria for downlisting and delisting of the Carson wandering skipper may change as more information becomes available.

Recovery Actions: Major actions needed for achieving recovery of the Carson wandering skipper are:

1. Manage existing populations and important habitat on public and private lands to minimize threats.

2. Establish a research program to determine the ecological requirements and life history of the Carson wandering skipper, and develop a program to survey for additional populations and monitor existing populations and habitats for trends and threats.

3. Develop and implement an outreach program to keep local communities informed of the Carson wandering skipper's status and means to carry out recovery actions.

4. Evaluate progress of recovery, effectiveness of management and recovery actions, and revise management plans and recovery criteria as necessary.

Total Estimated Cost of Recovery (in $1,000s): Details are found in the Implementation Schedule.

YEAR	ACTION 1	ACTION 2	ACTION 3	ACTION 4
2007	10	248.2	4	
2008	430	215	10	
2009	635	266.5	5	
2010	608	233.3		
2011	610	276.5		6
2012	600	125		
2013	600	125	5	
2014	5	35	5	
2015	13	25		
2016		25		5
2017	5	35		
2018		75		
2019		75	5	
2020	13	35	5	
2021		25		5
2022		25		
2023		25	5	
2024		25	5	
2025	8	25		
2026		25		5
TOTAL	3,537	1,944.5	49	21

The total estimated cost of recovering the Carson wandering skipper is $5,551,500 over the next 20 years, plus additional costs that cannot be estimated at this time.

Date of Recovery: If surveying and habitat management efforts to eliminate threats are successful in allowing actions to be implemented as recommended and recovery criteria are met, downlisting could be considered in 2017. Delisting could be considered in 2027, if actions are implemented as recommended and recovery criteria are met.

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I. Background

A. STATUS OF THE SPECIES

The Carson wandering skipper (*Pseudocopaeodes eunus obscurus*) is a small butterfly in the subfamily Hesperiinae (grass skippers). The **subspecies*** is federally listed as **endangered**. The Carson wandering skipper was given short-term protection under the Endangered Species Act of 1973, as amended, on November 29, 2001, when we published an emergency rule (U.S. Fish and Wildlife Service 2001a) to list the subspecies as endangered. The emergency rule provided Federal protection to the Carson wandering skipper for 240 days, during which time we initiated the normal listing process for ensuring its long-term protection. A proposed rule to list the Carson wandering skipper was published in the Federal Register concurrently with the emergency listing (U.S. Fish and Wildlife Service 2001b). On August 7, 2002, we published a final rule listing the Carson wandering skipper as an endangered species (U.S. Fish and Wildlife Service 2002). **Critical habitat** has not been designated for this subspecies.

At the time of listing, only two **extant populations** were known, one in Washoe County in northwestern Nevada and one in Lassen County in northeastern California. A third known population of the subspecies, from Carson City, Nevada, is considered **extirpated** as of 1998. Currently, there are four extant populations (Figure 1). In 2004, one additional population was discovered and two single sightings of individual Carson wandering skippers occurred in Nevada. The new population was found south of Carson City in Douglas County along the Carson River. One of the single sightings occurred approximately 16 kilometers (10 miles) south of the previously known population in Washoe County. The second single sighting occurred south of Flanigan, Washoe County. In 2005, habitat for one of the single sightings was impacted due to development; a **habitat conservation plan** was prepared for mitigation of these impacts and a section 10 (a)(1)(a) incidental take permit was issued by the Service in 2005. An additional population located on another private landowner's property adjacent to this habitat was confirmed in 2005. The long-term persistence of the newly

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* A glossary is provided in Appendix B of this plan. Words written in **bold type** within the text are defined in the glossary.

Figure 1. General locations of extant and extirpated populations of the Carson wandering skipper.

discovered populations in Douglas County and Washoe County must be determined.

B. SPECIES DESCRIPTION AND TAXONOMY

The genus *Pseudocopaeodes* in the family Hesperiidae (skippers) and subfamily Hesperiinae (grass skippers) contains only one **species**, the alkali skipper or wandering skipper (*Pseudocopaeodes eunus*). The species *Pseudocopaeodes eunus* consists of five subspecies: the nominate subspecies *Pseudocopaeodes eunus eunus*, the alkali skipper or eunus skipper; *P. e. obscurus*, the Carson wandering skipper; *P. e. alinea*, the Ash Meadows alkali skipper; *P. e. flavus*, the Nevada alkali skipperling or yellow alkali skipper; and an undescribed fifth subspecies found in 1998 (Brussard *et al.* 1999). Common names of subspecies reflect usage by New Mexico Department of Game and Fish (2000), The International Lepidoptera Survey (2004), and Nevada Natural Heritage Program (2004). *Pseudocopaeodes eunus obscurus*, the Carson wandering skipper, is locally distributed in grassland habitats on alkaline substrates in eastern California and western Nevada. *Pseudocopaeodes eunus alinea* is found in eastern desert areas of southern California and in southern Nevada; *P. e. eunus* is located in western desert areas of southern California; and *P. e. flavus* is found in western and central Nevada and the east slope of the Sierra Nevada in California. The undescribed fifth subspecies is found in Mono County, California (Brussard *et al.* 1999). Only the Carson wandering skipper, *P. e. obscurus*, is listed under the Endangered Species Act.

The Carson wandering skipper was first described by Austin and Emmel (1998). The **dorsal** ground color is dull, somewhat brownish orange. The **costal** area of the **forewing** is smudged with black. The **hind wing** is dusted rather heavily with black especially along the anal margin. The black terminal line on both wings is broad. **Veins** are blackened, and fringes of both wings are broadly dark gray **proximally** and whitish **distally**. The **ventral** surface is dull yellowish-orange and paler distally on the forewing and all of the hind wing. The forewing **apex** is grayish. Vein tips of the forewing are heavily blackened, and the veins of the hind wing are broadly outlined with dark gray, nearly filling **cells anterior** to M1 (medial vein 1) and **posterior** to CuA2 (anterior cubitus vein 2). The female's dorsal surface is similar to that of the male, as described above, but with

heavier dusting on the **discal** area of the hind wing. The ventral surface is like that of the male. Males tend to average 13.1 millimeters (0.52 inches) in size, ranging from 12.0 to 13.9 millimeters (0.47 to 0.55 inches) (size is forewing length from base to apex). Females average 14.7 millimeters (0.58 inches) in size, and range from 13.4 to 15.6 millimeters (0.53 to 0.61 inches).

The Carson wandering skipper can be distinguished from the other subspecies of *Pseudocopaeodes eunus* by a combination of several characteristics. The Carson wandering skipper is browner and less intensely orange on its dorsal surface, with thicker black coloring along the veins, outer margin, and on both **basal** surfaces; and it is duller, overall, with an expanse of bright yellow and orange ground color, especially on the ventral surface, interrupted by broadly darkened veins. Infrequently, specimens from populations of other *Pseudocopaeodes eunus* subspecies approach the less heavily marked extremes of the Carson wandering skipper. However, they do not give the impression of an insect with a dark ventral hind wing, and they lack the dark apex on the ventral forewing (Austin and Emmel 1998). **Larvae** (caterpillars) of the subfamily Hesperiinae are usually green or tan caterpillars with dark heads and black collars (Scott 1986).

C. POPULATION TRENDS AND DISTRIBUTION

The Carson wandering skipper currently occupies areas located in a small region east of the Sierra Nevada in northwestern Nevada and northeastern California, at elevations of less than 1,524 meters (5,000 feet). Historically, known population locations included the **type locality** found near the Carson Hot Springs in Carson City (formerly Ormsby County), Nevada, and one other site in Lassen County, California. When described in Austin and Emmel (1998), specimens from two additional sites, Dechambeau Hot Springs at Mono Lake (misspelled in publication as “Dechambean”) and Hot Springs, Mono County, California, were assigned, with uncertainty due to their small numbers, to the Carson wandering skipper subspecies. Based on 1998 surveys (Brussard *et al.* 1999), these Mono County specimens would be more appropriately assigned to the currently undescribed subspecies (G. Austin, Nevada State Museum and Historical Society, pers. comm. 2001).

No information is available on historical population numbers of the Carson wandering skipper. It is possible that a fairly large population of the subspecies occurred from the Carson Hot Springs site to the Carson River. Outflow from the springs likely supported a water table high enough to support *Distichlis spicata* (L.) Greene (saltgrass) (Hickman 1993), its larval food plant, and a variety of **nectar** sources. Urban development, water diversions, and wetland manipulations have eliminated most of the habitat in this area (Brussard 2000).

Likewise, it is possible that more appropriate habitat once existed for the Carson wandering skipper between the existing populations in Lassen County, California, and Washoe County, Nevada (P. Brussard, University of Nevada, Reno, pers. comm. 2001). Over time, habitat between these populations has become unsuitable and fragmented due to natural drying and human activities, and the populations may have become isolated from one another. The population locations are approximately 120 kilometers (75 miles) apart. While the dispersal capability of the Carson wandering skipper is unknown, it is unlikely that any current genetic exchange occurs between these populations because skippers, in general, seldom fly far (Scott 1986). Further surveys are needed to determine if the single Carson wandering skipper sighting that occurred near Flanigan, Washoe County, in 2004 indicates a population/**metapopulation** in the area. The subspecies likely represents a remnant of a more widely distributed complex of populations in the western Lahontan basin (Brussard *et al.* 1999).

Currently, there are four extant populations of the Carson wandering skipper. Two of these populations were newly discovered by surveys conducted in 1998 throughout potential, suitable habitat in Nevada and California. Presence of the Carson wandering skipper is most easily determined by observing adults feeding on a nectar source and as such is reported as a **nectar site** location. The distribution of the Carson wandering skipper population that may occur in the vicinity of that nectar site must be determined. One nectar site was located in Warm Springs Valley, Washoe County, Nevada, and two nectar sites were located in Honey Lake Valley, Lassen County, California. The sites in Lassen County could be a rediscovery of the area where skippers were collected in the 1970s; however, the collection record is too vague to be certain (P. Brussard, pers. comm., 2001). The two nectar sites in Honey Lake Valley were located about

8 kilometers (5 miles) from one another. Other populations were not found in 2000 and 2001, despite additional, more limited attempts (P. Brussard, pers. comm. 2000; R. Niell, University of Nevada-Reno, pers. comm. 2002).

Surveys in 2002 and 2003 located four other nectar sites; two of them were in close proximity to the two previously known nectar sites in Honey Lake Valley, California (R. Niell *in litt.* 2003, Earth Tech, Inc. 2003). In 2004, several additional nectar sites were found in Honey Lake Valley, California (Honey Lake Conservation Team 2005; Sanford 2004). Depending on the distances among these numerous nectar sites, the Carson wandering skipper in Honey Lake Valley may consist of one large population rather than a metapopulation. Further research is needed to determine the population structure in Honey Lake Valley, California.

One new population was found in Nevada along the Carson River in Douglas County in 2004 (D. Murphy, University of Nevada, Reno, pers. comm. 2004). Two single sightings of Carson wandering skipper individuals were made in Washoe County in 2004, one in Spanish Springs Valley and the other near Flanigan (D. Murphy, pers. comm. 2004; Sanford 2004). In 2005, habitat for the single sighting in Spanish Springs was impacted due to residential and commercial development. A population located on another private landowner's property adjacent to this habitat was confirmed in 2005.

To the best of our knowledge, only four populations of the Carson wandering skipper are extant, one in Lassen County, California, two in Washoe County, and one in Douglas County, Nevada. The single Carson wandering skipper sighting near Flanigan, Washoe County, observed in 2004 may or may not indicate a local population/metapopulation is present. Further research is needed in this area.

1. Nevada

a) Carson City Site. The Carson wandering skipper was first collected in 1965 at a location north of U.S. Highway 50, Carson City (formerly Ormsby County), Nevada. Habitat at this site has been greatly modified over time, and most of it was destroyed by construction of a shopping center (Brussard *et al.* 1999). Several years later, an extension of the population was discovered north of

the original location (Brussard *et al.* 1999). In the 1990s, additional urban development further reduced the remaining habitat, and the site is now completely surrounded by development.

The Carson City site was surveyed for the Carson wandering skipper by the University of Nevada, Reno from 1997 to 2001 (Table 1). Only five individuals (four males and one female) were observed during surveys in June 1997. One possible sighting of a Carson wandering skipper occurred at a project site in 1998 (Brussard *et al*. 1999). No individuals were observed at this site in 1999, 2000, or in 2001 (P. Brussard, pers. comm., 2000; R. Niell, pers. comm., 2001). In 2002, surveys were again conducted with no individuals observed (M. Haworth, U.S. Fish and Wildlife Service, pers. obs. 2002). This population is now considered extirpated.

Habitat changes resulting from drainage manipulations for residential and commercial development are likely responsible for this probable extirpation of the Carson City population (Brussard *et al*. 1999). Furthermore, construction of a freeway bypass in its entirety will impact approximately 2 hectares (6 acres) of previously occupied habitat and about 8 hectares (20 acres) of the potential habitat remaining at both areas north and south of U.S. Highway 50 (P. Frost *in litt*. 1998). Construction activities began in 2002-2003, and the section of the bypass located north of U. S. Highway 50 opened in spring 2006 (M. Haworth, pers. obs. 2004, 2006).

b) Douglas County (Carson River) Site. This nectar site, found and searched in 2004 (Table 1), occurs on Bureau of Land Management administered lands in Douglas County, Nevada. The site is about 4 hectares (10 acres) in size. Additional habitat likely extends onto adjacent Nevada State lands and City of Incline Village lands. The entire habitat on the three properties combined is estimated at about 57 hectares (140 acres). Approximately nine Carson wandering skippers were observed but none were seen feeding on nectar (R. Niell *in litt*. 2004). The long-term persistence of this population must be determined. This site was searched in 2005 but no Carson wandering skippers were observed (M. Haworth, U.S. Fish and Wildlife Service, and C. Funari, Bureau of Land Management, pers. obs. 2005).

Table 1. Occupied Carson wandering skipper nectar sites in Nevada, and dates of monitoring efforts since 1997.

Site Name	1997	1998	1999	2000	2001	2002	2003	2004	2005
Carson City	X	O	O	O	O	O			
Douglas County (Carson River)								X	O
Washoe County Site #1: Warm Springs Valley (BLM)		X			X	X	X	X	X
Washoe County Site #1: Warm Springs Valley (Private)		X							X
Washoe County Site # 2a: Spanish Springs								X	
Washoe County Site # 2b: Spanish Springs									X
Washoe County Site #3: Flanigan								X	

X site searched and subspecies present
O site searched and subspecies not present

c) Washoe County Site #1 (Warm Springs Valley). This site occurs on Bureau of Land Management and adjacent private lands (Table 1). The nectar site is estimated to include about 10 to 12 hectares (25 to 30 acres), with approximately half of the site occurring on Bureau of Land Management lands and half on private lands (Brussard *et al.* 1999). Because management activities differ between the public and private ownerships at this site, we report it as two nectar sites (Bureau of Land Management (BLM) and Private). A few Carson wandering skippers were seen approximately 1.6 kilometers (1.0 mile) northeast of this site. This suggests the Carson wandering skipper may occur in small numbers elsewhere in the valley (Brussard *et al.* 1999). Surveys were not conducted in 1999 or 2000 at these nectar sites. In 2001, searches of this area were made to confirm the Carson wandering skipper's presence. Five individuals were found at the nectar site on Bureau of Land Management lands; private lands were not searched (V. Rivers, Truckee Meadows Community College, pers. comm. 2001). In 2002 and 2003, searches of the Bureau of Land Management nectar site were made to confirm the Carson wandering skipper's presence, and 3 and approximately 15 individuals, respectively, were observed in 1 day in both years (M. Haworth, U.S. Fish and Wildlife Service, and W. Devaurs, Bureau of Land Management, pers. obs. 2002, 2003). In 2004, one and three Carson

wandering skippers were observed during 2 days of searching the Bureau of Land Management nectar site (M. Haworth and C. Funari, pers. obs. 2004).

In 2005, both the Bureau of Land Management parcel and the private lands were searched, and Carson wandering skippers were observed on both properties. One and nine individuals were observed on the Bureau of Land Management parcel during 2 days of searching, and eight individuals were observed on the private lands during 1 day (M. Haworth and C. Funari, pers. obs. 2005). In August 2005, approximately 32 hectares (80 acres) of the private property was acquired by the Bureau of Land Management through Southern Nevada Public Lands Management Lands Act funding.

d) Washoe County Site #2 (single sighting – Spanish Springs a and b). Part of this nectar site (Spanish Springs a) was found in 2004 (Table 1). This site is located on private lands in Spanish Springs Valley. One male Carson wandering skipper was observed feeding on nectar (D. Murphy *in litt.* 2004). Suitable habitat is estimated at approximately 16 hectares (40 acres). Additional Carson wandering skipper habitat may occur on adjacent private property.

In 2005, 39 acres (16 hectares) of habitat in the vicinity of this single sighting was impacted due to residential and commercial development. A habitat conservation plan was prepared (Lionel Sawyer & Collins 2005) and a section 10 (a)(1)(a) incidental take permit was issued by the Service. Mitigation for the affected habitat involves the off-site acquisition of replacement habitat that is of equal or better quality than the affected acreage. The applicant is responsible for acquiring at least 39 acres (16 hectares) of replacement habitat.

A newly discovered population (Spanish Springs b) located on another private landowner's property adjacent to the above-mentioned habitat was confirmed in 2005. Based on the location of the single sighting in 2004, permission to search the adjacent property was requested and granted. Four Carson wandering skipper individuals (three males and one female) were observed during 4 days of searching (M. Haworth and C. Funari, pers. obs. 2005). The long-term persistence of this population must be determined.

e) Washoe County Site #3 (single sighting – Flanigan). A single male Carson wandering skipper was observed in 2004 (Table 1) along the southeastern

boundary of an alkali flat south of Flanigan (Sanford 2004). This area was not surveyed in 2005 (M. Sanford *in litt*. 2005).

2. California

The Carson wandering skipper population/metapopulation in Honey Lake Valley in Lassen County, California, appears to be larger than all three populations in Nevada in terms of both numbers and amount of habitat, as suggested by the following information. Numerous nectar sites were located around Honey Lake during the period from 1998 to 2005. While it is not yet clear whether the Carson wandering skippers found around Honey Lake form a single population or a metapopulation, distances between the nearest nectar sites may be within the dispersal range of adults. As additional information is collected, the population structure in Honey Lake Valley should become evident.

Two nectar sites found in 1998 in Lassen County, California, occurred on public lands managed by the California Department of Fish and Game (CDFG, Site #1) and private lands (Site #2) (Table 2). In 1998, two individuals were observed on the public lands, while several individuals were observed at a nectar site less than 2 hectares (5 acres) in size on the private lands. These nectar sites are located approximately 8 kilometers (5 miles) from each other (Brussard *et al.* 1999).

Surveys were not conducted at these sites in 1999. Surveys were conducted in 2000, and while several individuals were seen on the private-property nectar site, none were seen on the public lands (P. Brussard, pers. comm., 2000). In 2001, searches were conducted to confirm the Carson wandering skipper's presence. A few Carson wandering skippers (three and four individuals found on separate days) were observed on the private-property nectar site, but none were observed on the public lands nectar site (V. Rivers, pers. comm. 2001). In 2002, no individuals were observed on the private-property nectar site (M. Haworth, pers. obs. 2002; R. Niell *in litt*. 2003). In 2002, two individuals were seen on the California Department of Fish and Game public lands (S. Black *in litt*. 2002; M. Vaughn *in litt*. 2002; R. Niell *in litt*. 2003).

During surveys conducted in the Honey Lake Valley in 2002 and 2003 for specific proposed projects, four more nectar sites were found (Table 2). In 2002,

Table 2. Occupied Carson wandering skipper nectar sites in Lassen County, California, and dates of monitoring efforts since 1997.

Site Name	1997	1998	1999	2000	2001	2002	2003	2004	2005
CDFG (#1)		X		O	O	X		X	
Private (#2)		X		X	X	O			
Wendel Area (#3)						X		X	
Mapes Rd (#4)						X			
The Island (#5)							X	X	
Cross Depot Access (#6)							X	X	X
North Shore – Honey Lake Ranch (#7-8)								X	X
North Shore – Dakin Unit (#9-10)								X	X
East Shore – Wendel Hot Springs (#11-14)								X	X
East Shore – Amedee Hot Springs (#15-17)								X	X
Northern Shore Island (#18-22)								X	X
Western Shore Island (#23)								X	O
Southern Shore Island (#24-25)									X

X Site searched and subspecies present
O Site searched and subspecies not present

a new nectar site (Site #3) was found near the Wendel Hot Springs area. On 4 different days, 1 to 20 individuals were seen feeding on nectar. Also in 2002, three individuals were seen on Mapes Road (Site #4), approximately 3 miles west of the private property site (Site #2) (P. Epanchin, U.S. Fish and Wildlife Service, *in litt*. 2002). In 2003, Carson wandering skippers were observed on two parcels of land, The Island (Site #5) and Cross Depot Access (Site #6), that have been transferred to the Honey Lake Conservation Team for future deeding to the California State Lands Commission. The number of Carson wandering skippers observed nectaring ranged from 1 to 33 over 3 survey days at these 2 sites (Earth Tech Inc. 2003). In 2004, Sanford (2004) observed three Carson wandering skippers in the general area of the Cross Depot Access site (Site #6).

In June 2004, employees of Michael Baker, Jr., Inc., inventoried land around the Honey Lake shoreline within the lake's boundary (meander) line. Forty areas were identified, based on habitat data collected (nectar sources, areas of *Distichlis* cover, elevation, soil alkalinity, nearby water sources, etc.), as potential habitat to be surveyed for Carson wandering skipper presence during the spring/summer flight season. As a result of this effort, 22 nectar sites for the Carson wandering skipper were found in Honey Lake Valley, California (Honey Lake Conservation Team 2005). Most of the surveys occurred on former military lands immediately around the lake currently held by the Honey Lake Conservation Team. Other, more upland, areas were surveyed with permission from the landowners.

Due to the number of new occupied nectar sites (17) found in 2004, for reporting purposes we group them into 6 general areas around Honey Lake: North Shore (Honey Lake Ranch), North Shore (Dakin Unit), East Shore (Wendel Hot Springs), East Shore (Amedee Hot Springs), Northern Shore Island, and Western Shore Island. The remaining individual nectar sites found in 2004 were located very near to nectar sites found previously in 2002 and 2003 (as indicated in Table 2), and 2004 information will be included under those previous locations to avoid double-counting nectar sites. Thus, in 2004, between 7 and 37 Carson wandering skipper individuals were observed at these nectar sites found previously in 2002 and 2003.

The six general areas where new nectar sites were found around Honey Lake during 2004 are discussed below:

- North Shore (Honey Lake Ranch). This general area includes two new nectar sites (#7 and #8) where one Carson wandering skipper individual was observed at each site. Land ownership includes Honey Lake Conservation Team and private lands.

- North Shore (Dakin Unit). This general area includes 2 new nectar sites (#9 and #10) where 2 and 22 Carson wandering skipper individuals, respectively, were observed. Land ownership includes Honey Lake Conservation Team, private, Bureau of Land Management, and state lands.

- East Shore (Wendel Hot Springs). This general area includes 4 new nectar sites (Sites #11 to #14) where between 1 and 186 Carson wandering skipper individuals were observed. Land ownership includes Honey Lake Conservation Team, private, and Bureau of Land Management lands.

- East Shore (Amedee Hot Springs). This general area includes three new nectar sites (#15 to #17) where one Carson wandering skipper was observed at each site. Land ownership includes Honey Lake Conservation Team and state lands.

- Northern Shore Island. This general area includes 5 new nectar sites (#18 to #22) where 1 to 37 Carson wandering skippers were observed. Land ownership includes Honey Lake Conservation Team, private, and state lands.

- Western Shore Island. This general area includes one new nectar site (#23) where three Carson wandering skippers were observed. Land ownership includes Honey Lake Conservation Team, private, and state lands.

In 2005, Honey Lake Conservation Team (2006) surveyed 24 areas around Honey Lake. This reduction from 40 areas surveyed in 2004 is a result of eliminating areas on private lands and combining and adjusting the boundaries of the remaining areas. The areas surveyed in 2005 covered approximately the same areas along the northern, eastern, and southern shorelines of Honey Lake as those surveyed in 2004. Because of these changes, we are unable to compare the 17 individual sites identified in 2004 with sites identified in 2005; we can, however, compare the 6 general areas between these years for observations of Carson wandering skippers.

- North Shore (Honey Lake Ranch). Carson wandering skippers (24 and 43) were observed near the two nectar sites.

- North Shore (Dakin Unit). Twenty-four Carson wandering skippers were observed near each of the two sites in 2005.

- East Shore (Wendel Hot Springs). Carson wandering skippers were observed near the four sites in 2005, ranging from 8 to 499 individuals.

- East Shore (Amedee Hot Springs). Carson wandering skippers were observed near two of the three sites in 2005. One individual was seen on one site and three individuals on the second site.

- Northern Shore Island. All five sites supported Carson wandering skippers in 2005. Numbers of individuals ranged from 1 to 15.

- Western Shore Island. Carson wandering skippers were not seen in this general area in 2005.

- Southern Shore Island. In 2004, Carson wandering skippers were not observed in this general area. As a result, it was not identified as a new nectar site. In 2005, individuals were observed at two sites; one individual was seen at one site and two individuals at the second site.

D. LIFE HISTORY/ECOLOGY

Little is known about the life history and ecology of the Carson wandering skipper. During summer (June and July), females lay their cream-colored eggs on *Distichlis spicata*, the larval host plant for the species (Garth and Tilden 1986, Scott 1986). The Carson wandering skipper apparently requires *Distichlis spicata* with succulent, green leaves from March through June to complete its life cycle. *Distichlis spicata* is a common species in the *Atriplex-Sarcobatus* (saltbush-greasewood) vegetation communities of the intermountain west and is widely distributed in lowland areas of now dry **pluvial** lakes. Different kinds of *Distichlis* communities exist, ranging from near-monotypic communities in meadow areas to understories in shrub-dominated communities (Young *et al.* 1986). Some *Distichlis* communities have roots in contact with the groundwater table while others rely on soil moisture from precipitation.

Limited observations have been made of the early life stages of the Carson wandering skipper. However, the Carson wandering skipper's life cycle is likely similar to other species of the subfamily Hesperiinae. Larvae of the Hesperiinae

live in **silked-leaf nests**, and some species make their nests partially underground. **Pupae** generally rest in the nest, and larvae generally hibernate during winter (Scott 1986). The Honey Lake Conservation Team (2006) described Carson wandering skipper larvae as having a light green body with a distinctive black collar below the head. The head is a rusty brown orange color. Some larvae may be able to extend their period of **diapause** for more than one year depending on the individual and environmental conditions (P. Brussard, pers. comm., 2001). The pupae emerge as adult butterflies in late spring/early summer. The life span of an adult Carson wandering skipper is possibly 1 to 2 weeks but they may live longer where abundant nectar sources exist with minimal habitat disturbance (Sanford 2006).

Carson wandering skippers may differ from other *Pseudocopaeodes eunus* subspecies in producing only one **brood** per year during the June to mid-July **flight season** (Austin and Emmel 1998). The other subspecies may produce a second brood in late July to late September (Austin and Emmel 1998). During the 1998 surveys (Brussard *et al.* 1999), the formerly occupied Carson City site and the two occupied sites were visited in June and July and again in August and September to look for second broods; none were found.

E. HABITAT CHARACTERISTICS/ECOSYSTEM

Little is known about the specific habitat requirements of the Carson wandering skipper beyond the similarities recognized among known locations of this subspecies. Carson wandering skipper habitat is generally characterized as lowland grassland habitats on alkaline substrates. Based on observations of known, occupied sites, suitable habitat for the Carson wandering skipper in any given year has the following characteristics: elevation of less than 1,524 meters (5,000 feet), location east of the Sierra Nevada, and presence of green *Distichlis spicata* cover with a flowering nectar source during March through June. Other characteristics may include possible geothermal activity and open areas near springs or water (Brussard *et al.* 1999).

There are no data in the literature on the **micro-habitat** requirements of the Carson wandering skipper (Brussard *et al.* 1999). However, it is likely that suitable larval habitat is related to the depth of the water table. Many *Distichlis*

areas are inundated in the spring. During wet years, larval survival likely depends on *Distichlis* areas being above standing water. In dry years, however, survival is probably related to the timing of the host plant **senescence**. Therefore, **micro-topographic** variation is probably important for larval survival because it provides a greater variety of appropriate habitats throughout the landscape over time (Brussard *et al.* 1999). Because the few historical collections of the Carson wandering skipper have been near hot springs, it is possible this subspecies may require the higher water table or ground temperatures associated with these areas to provide the appropriate temperatures for successful larval development (Brussard *et al.* 1999). However, more recent nectar sites are not located particularly close to geothermal springs. Larval development may not rely on appropriate temperatures but rather on the presence of good quality *Distichlis spicata* cover provided by more permanent water sources.

Adult Carson wandering skippers require nectar for food. For a *Distichlis* area to provide appropriate habitat for the Carson wandering skipper, an appropriate nectar source must be present and in bloom during the spring/summer flight season. Few plants that can serve as nectar sources grow in the highly alkaline soils occupied by *Distichlis spicata*. Plant species known to be used by the Carson wandering skipper for nectar include *Thelypodium crispum* (thelypody), *Sisymbrium altissimum* (tumble mustard), *Pyrrocoma racemosus* (racemose golden-weed), *Cirsium arvense* (Canada thistle), *Cirsium vulgare* (bull thistle), *Lotus corniculatus* (bird's foot trefoil)[†], *Cleomella parviflora* (slender cleomella), *Cleomella plocasperma* (small-flowered cleomella), *Heliotropium curassavicum* (heliotrope), *Potentilla* sp. (cinquefoil), *Sesuvium verrucosum* (western sea purslane), and *Cressa truxillensis* (alkali weed) (Brussard *et al.* 1999; R. Niell *in litt*. 2003; D. Murphy *in litt*. 2004; Honey Lake Conservation Team 2005; Honey Lake Conservation Team 2006). If alkaline-tolerant plant species are not present but there is a fresh-water source to support alkaline-intolerant nectar sources adjacent to the larval host plant, the area may provide suitable habitat (Brussard *et al.* 1999). Nectar sources depend on various environmental conditions and are likely to be transitory. Thus, nectar sites used by the Carson wandering skipper may change from year to year. In general,

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[†] *Lotus* occurrences are referred to as *Lotus corniculatus* in this recovery plan, although identification to species is possibly ambiguous. According to The Jepson Manual (Hickman 1993:618-619), "[i]n Europe, diploid *L. tenuis* Willd. is segregated [from *L. corniculatus*]; it seems indistinguishable in California."

habitat for the Carson wandering skipper is indicated by overall *Distichlis* cover located near or encompassing patches of nectar plants.

1. Nevada

a) Carson City Site. This site (Table 3) no longer supports the Carson wandering skipper as a result of surrounding development and habitat changes likely caused by drainage manipulations to accommodate residential and commercial development. Most of the original habitat was destroyed by the construction of a shopping center. Subsequent urban development in the 1990s further reduced the remaining habitat to approximately 8 hectares (20 acres) (Brussard *et al.* 1999). While the site still supports *Distichlis spicata* and areas of the native mustard *Thelypodium crispum*, which served as the only nectar source at this site, the Carson wandering skipper has not been observed there since 1997. The elevation of this site is about 1,420 meters (4,660 feet). The Carson Hot Springs drainage currently meanders through this general area though portions of it have been modified as a result of development activities.

b) Douglas County (Carson River) Site. This site in Douglas County (Table 3) occurs on Bureau of Land Management administered lands, with additional habitat likely extending onto adjacent Nevada state lands and City of Incline Village lands. The potential nectar sources include *Lotus corniculatus* and the site is about 4 hectares (10 acres) in size. The entire habitat, including the nectar site, on the three properties is estimated at about 57 hectares (140 acres). The elevation is 1,420 meters (4,659 feet). *Distichlis spicata* occurs throughout the habitat and is interspersed with an overstory of *Artemisia* sp. (sagebrush), *Sarcobatus vermiculatus* (greasewood), and *Atriplex* sp. (saltbush). The density of *D. spicata* cover ranges from very sparse to fairly dense. There is an accumulation of salt on the soil surface. Hot springs are noted about 2 kilometers (1.5 miles) south of the site. The Carson River is located nearby, and the lands within the City of Incline Village support wetlands (R. Niell *in litt*. 2004).

The Bureau of Land Management portion of the site is dissected by a two-track unpaved road; a second dirt road occurs along two sides of the site. Evidence of recreational shooting was found on-site (R. Neill *in litt*. 2004), which could impact the site through habitat trampling.

Table 3. Currently and formerly occupied Carson wandering skipper sites in Nevada, with site characteristics.

Site Name	**Found East of Sierra Nevada**	**Elevation less than 5,000 feet**	**Salt Grass**	**Nectar**	**Micro-topographic Relief**	**Geo-thermal Spring within 1.5 miles**	**Non Geo-thermal Spring within 1.5 miles**	**Other Water Source within 1.5 miles**
Carson City	X	X	X	X	X	X		
Douglas County	X	X	X	X	X	X		X
Washoe County Site #1: Warm Springs Valley (BLM)	X	X	X	X	X	X		
Washoe County Site #1: Warm Springs Valley (Private)	X	X	X	X	X	X		
Washoe County Site #2a: Spanish Springs	X	X	X	X	X			
Washoe County Site #2b: Spanish Springs	X	X	X	X	X			
Washoe County Site #3: Flanigan	X	X	X	X	X	?	? X	X

X

c) Washoe County Site #1 (Warm Springs Valley). This site occurs on Bureau of Land Management administered lands and adjacent private lands, and is reported as two nectar sites (Table 3). Both nectar sites combined are estimated to be about 10 to 12 hectares (25 to 30 acres), with approximately half occurring on Bureau of Land Management lands and half on private lands (Brussard *et al*. 1999). The nectar source *Pyrrocoma racemosus* is abundant, as is *Distichlis spicata*. The nectar sites are located at 1,290 meters (4,233 feet) in elevation. Springs are located within about 1.6 kilometers (1.0 mile) of the nectar sites.

In 2005, 32 hectares (80 acres) of private property was acquired by the Bureau of Land Management through Southern Nevada Public Lands Management Lands Act funding (W. Devaurs *in litt*. 2005). This area includes the portion of the above-mentioned nectar site on private lands.

d) Washoe County Site #2 (single sighting – Spanish Springs a and b). This site is located on private lands in Spanish Springs Valley (Table 3). One male Carson wandering skipper was observed nectaring on *Cleomella plocasperma* (D. Murphy *in litt*. 2004). The nectar site where the Carson wandering skipper was seen was less than 2 hectares (5 acres) in size but this particular nectar source, along with other known nectar sources such as *Pyrrocoma racemosus*, *Lotus corniculatus*, and *Sisymbrium altissimum*, occurred in scattered areas over the property. The site is located at 1,359 meters (4,460 feet) in elevation. A large, open water body occurs nearby, approximately 0.4 kilometer (0.25 mile) away. Springs occur between 6 and 13 kilometers (4 and 8 miles) away. This site is threatened by ongoing residential development. In 2005, habitat in the vicinity of this single sighting was impacted due to residential and commercial development; a habitat conservation plan was prepared (Lionel Sawyer & Collins 2005) and a section 10 (a)(1)(a) incidental take permit was issued by the Service in 2005. This impacted area will be mitigated with acquisition of off-site replacement habitat.

In 2005, adjacent private lands (Spanish Springs b) were surveyed with permission and four Carson wandering skippers were seen. The nectar source *Cleomella plocasperma* occurs in patches scattered over approximately 16 to 20 hectares (40 to 50 acres). The site is located at approximately 1,359 meters (4,460 feet) in elevation. A large, open water body occurs on-site. Springs occur

between 6.4 and 12.9 kilometers (4 and 8 miles) away. *Lepidium latifolium* (tall whitetop or perennial pepperweed), a nonnative, perennial herbaceous plant, is invading these lands (M. Haworth and C. Funari, pers. obs. 2005). The Service is working with the current landowner on the possible establishment of a wetland/wildlife preserve for this site.

e) Washoe County Site #3 (single sighting – Flanigan). A single male Carson wandering skipper was sighted south of Flanigan along the southeastern boundary of a dry alkali flat at elevation 1,212 meters (3,975 feet) (Sanford 2004). The individual was observed on *Distichlis spicata*. The vegetation in the area was composed of *D. spicata* and *Sarcobatus vermiculatus*, with some *Artemisia* sp. Potential nectar sources were *Chrysothamnus* sp. (rabbitbrush) or *Medicago sativa* (alfalfa). The entire habitat encompasses 283 hectares (700 acres), with nectar sources covering about 0.4 hectares (1 acre). The nearest spring site was less than 1.6 kilometers (1 mile) away. Surveys are needed to determine if a population/metapopulation exists in this area.

2. California

Carson wandering skippers were observed at a total of approximately 25 sites/areas in the vicinity of Honey Lake from 1998 to 2005 (Table 4).

a) Lassen County Site #1. A general area with nectar sites found in 1998 occurred on public lands (one site) managed by the California Department of Fish and Game and on adjacent private lands (one site) (Brussard *et al.* 1999). Two females were observed on the public lands, one on *Lotus corniculatus*. *Distichlis spicata* is abundant in this area. The site is located at approximately 1,234 meters (4,050 feet) in elevation. Springs are known to be located within 2 kilometers (1.5 miles) of the site.

In 2002, Carson wandering skippers were again located on California Department of Fish and Game lands in this general area. One Carson wandering skipper was seen nectaring on *Cleomella parviflora* (R. Niell *in litt*. 2003). The *Distichlis* habitat in the immediate area is about 2 hectares (5 acres) in size. The site is at about 1,219 meters (4,000 feet) in elevation. Ditches provide a

Table 4. Currently or formerly occupied Carson wandering skipper sites in Lassen County, California, with site characteristics.

Site Name	**Found East of Sierra Nevada**	**Elevation less than 5,000 feet**	**Salt Grass**	**Nectar**	**Micro-topographic Relief**	**Geo thermal Spring within 1.5 miles**	**Non Geo-thermal Spring within 1.5 miles**	**Other Water Source within 1.5 miles**
CDFG (#1)	X	X	X	X	X	X		
Private (#2)	X	X	X	X	X	X		
Wendel Area (#3)	X	X	X	X	X	X		
Mapes Rd (#4)	X	X	X	X	X	?	?	?
The Island (#5)	X	X	X	X	X			X
Cross Depot Access (#6)	X	X	X	X	X			X
North Shore – Honey Lake Ranch (#7-8)	X	X	X	X	X			X
North Shore – Dakin Unit (#9-10)	X	X	X	X	X			X
East Shore – Wendel Hot Springs (#11-14)	X	X	X	X	X			X
East Shore – Amedee Hot Springs (#15-17)	X	X	X	X	X			
Northern Shore Island (#18-22)	X	X	X	X	X			
Western Shore Island (#23)	X	X	X	X	X			
Southern Shore Island (#24-25)	X	X	X	X	X			X

freshwater source on site. Another sighting on the California Department of Fish and Game lands was reported in 2002 (S. Black *in litt*. 2002, M. Vaughn *in litt*. 2002). A Carson wandering skipper also was seen on a levee separating ponds created for waterfowl. The site's elevation is about 1,219 meters (4,000 feet). In 2004, one Carson wandering skipper was observed on/near California Department of Fish and Game lands on *Heliotropium curassavicum* at approximately 1,222 meters (4,010 feet) in elevation (Honey Lake Conservation Team 2005). The nectar source *Sesuvium verrucosum* was also available on-site. Water sources occur within 2.4 kilometers (1.5 miles) of the sighting.

b) Lassen County Site #2. Another general area with nectar sites found in 1998 occurred on private lands with nectar plants covering less than 0.4 hectare (1 acre) in size. *Distichlis spicata* is abundant in this area, but the attraction appears to be the nectar source, *Lotus corniculatus*. Eight Carson wandering skippers were observed during one particular visit in 1998 (Brussard *et al.* 1999). This site is located at approximately 1,234 meters (4,050 feet) in elevation. Springs occur within 2.4 kilometers (1.5 miles) of the site.

c) Lassen County Site #3. This site, on the north side of Honey Lake (Wendel Area), is a nectar site consisting of several nectar sources (R. Niell *in litt*. 2003). Carson wandering skippers were seen nectaring on *Cleomella parviflora*, *Potentilla* sp., and *Lotus corniculatus*. As many as 15 to 20 individuals were seen on different days. The *Distichlis* habitat is about 4 hectares (10 acres) in size. The site is located at approximately 1,219 meters (4,002 feet) in elevation. Springs are located on-site. In 2004, seven Carson wandering skippers were observed on *Lotus corniculatus*, though *Cleomella parviflora* was also available, at elevation 1,228 meters (4,030 feet).

d) Lassen County Site #4. In 2002, three Carson wandering skippers were observed along Mapes Road on the north side of Honey Lake, nectaring on *Lotus corniculatus*. This area was near a culvert under the road, which created an artificial low, wet area (P. Epanchin *in litt*. 2002). Details on the size of the habitat or its elevation were not provided.

e) Lassen County Site #5. This site (The Island) was located in 2003 on the peninsula on the south side of Honey Lake. It includes various-sized nectar

patches up to 40 hectares (100 acres) consisting of *Heliotropium curassavicum* and *Sisymbrium altissimum* (Earth Tech Inc. 2003). The entire *Distichlis* habitat is about 81 hectares (200 acres) in size. Numerous Carson wandering skippers were seen nectaring on *H. curassavicum*. The site's elevation is 1,213 meters (3,980 feet). Freshwater sources are located approximately 13 kilometers (8 miles) away. Geothermal springs are located about 24 kilometers (15 miles) from the site. In 2004, 37 and 7 Carson wandering skippers were observed at elevations 1,219 meters (4,000 feet) and 1,216 meters (3,991 feet), respectively, in this area (Honey Lake Conservation Team 2005). Individuals were observed on *H. curassavicum* and *Sesuvium verrucosum*.

f) Lassen County Site #6. This site (Cross Depot Access), also found on the south side of Honey Lake in 2003, is located at about 1,211 meters (3,975 feet) in elevation. The *Distichlis* habitat is about 162 hectares (400 acres), and the nectar site is less than 0.2 hectare (0.5 acre). A few Carson wandering skippers were seen nectaring on *Heliotropium curassavicum*. Freshwater sources are located approximately 16 kilometers (10 miles) away. Geothermal springs are located more than 24 kilometers (15 miles) from the site (Earth Tech Inc. 2003).

In 2004, 7 and 14 Carson wandering skippers were found at elevations of 1,218.6 meters (3,998 feet) and 1,211.9 meters (3,976 feet), respectively. Individuals were observed on *Heliotropium curassavicum* though *Sesuvium verrucosum* was also available (Honey Lake Conservation Team 2005). Also in 2004, three Carson wandering skipper individuals were observed nectaring on *Heliotropium curassavicum* in this general area. *Sesuvium verrucosum* was also available (Sanford 2004).

g) Lassen County Sites #7-23 in 2004, #24-25 in 2005. As stated earlier, 17 new nectar sites were located around Honey Lake in 2004 and were grouped into 6 general areas for ease of reporting (Honey Lake Conservation Team 2005). Because the number and boundaries of surveyed areas changed in 2005, it is not possible to describe 2005 sites as discrete from 2004 sites. Therefore, Southern Shore Island is the only new site found in 2005 that is described below.

- North Shore (Honey Lake Ranch). Two nectar sites (Sites #7 and #8) were found at elevations of 1,210 meters and 1,213 meters (3,969 and 3,980 feet), respectively. Nectar sites were less than 2.0 hectares (5 acres) to 4.0 hectares (10 acres) in size. While Carson wandering skippers were observed nectaring on *Heliotropium curassavicum*, *Lotus corniculatus* and *Sisymbrium altissimum* were also available as nectar sources. The *Distichlis* habitat is between 8 and 12 hectares (20 and 30 acres) in size over both sites combined. Water sources are 0.8 to 1.6 kilometers (0.5 to 1 mile) away (Honey Lake Conservation Team 2005).

- North Shore (Dakin Unit). Two nectar sites (Sites #9 and #10) were found at elevations of 1,213 meters (3,980 feet) and 1,214 meters (3,984 feet), respectively, in this area and were less than 2 hectares (5 acres) in size. Carson wandering skippers were observed nectaring on *Heliotropium curassavicum*, but *Lotus corniculatus*, *Sisymbrium altissimum*, and *Sesuvium verrucosum* were also available as nectar sources. Nearby *Distichlis* habitat is between 16 and 101 hectares (40 and 250 acres) in size. Water sources are within 1.6 kilometers (1 mile) of these sites (Honey Lake Conservation Team 2005).

- East Shore (Wendel Hot Springs). Four nectar sites (Sites #11 to #14) were included in this general area and were found between 1,214 and 1,222 meters (3,982 and 4,008 feet) in elevation. Nectar sites were between 2 hectares (5 acres) and 16 hectares (40 acres) in size. Carson wandering skippers were observed nectaring on *Heliotropium curassavicum*, *Sesuvium verrucosum*, and *Lotus corniculatus*, although *Cleomella parviflora* was also available as a nectar source. The *Distichlis* habitat was between less than 2 and 97 hectares (5 and 240 acres) in size at these sites. Water sources were between 0.8 and 1.6 kilometers (0.5 and 1.5 miles) away (Honey Lake Conservation Team 2005).

- East Shore (Amedee Hot Springs). The three nectar sites (Sites #15 to #17) found in this general area were located between 1,212 and 1,216 meters (3,975 and 3,990 feet) in elevation. Nectar sites were between less than 2 hectares (5 acres) and 8 hectares (20 acres) in size. While Carson wandering skippers were observed nectaring on *Heliotropium*

curassavicum, *Sesuvium verrucosum* was also available as a nectar source. The *Distichlis* habitat was between 12 and 47 hectares (30 and 115 acres) in size. A water source was 0.3 kilometers (0.2 miles) away from one site but between 3 and 5 kilometers (2 and 3 miles) away from the other two sites (Honey Lake Conservation Team 2005).

- Northern Shore Island. The five nectar sites (#18 to #22) were found between 1,213 and 1,215 meters (3,979 and 3,986 feet) in elevation. Nectar sites were from less than 2 hectares to about 26 hectares (5 acres to 65 acres) in size. Carson wandering skippers were observed nectaring on *Heliotropium curassavicum* and *Sesuvium verrucosum*, although *Lotus corniculatus*, *Cleomella parviflora*, and *Sisymbrium altissimum* were also available as nectar sources. The *Distichlis* habitat was between 14 and 77 hectares (35 and 190 acres) in size. Water sources were between 3 and 8 kilometers (2 and 5 miles) away (Honey Lake Conservation Team 2005).

- Western Shore Island. This nectar site (#23) was found at an elevation of 1,219 meters (4,000 feet). The nectar site was less than 2 hectares (5 acres) in size. While Carson wandering skippers were observed nectaring on *Heliotropium curassavicum*, *Lotus corniculatus* was also available as a nectar source. The *Distichlis* habitat was about 16 hectares (40 acres) in size. Water sources were between 6.8 and 7.2 kilometers (4.2 and 4.5 miles) away.

- Southern Shore Island. In 2005, Carson wandering skippers were observed at two sites (#24 and #25). These nectar sites were found at an elevation of 1,217 meters (3,993 feet) and 1,210 meters (3,970 feet), respectively. The first nectar site of about 14 hectares (34 acres) consisted primarily of *Heliotropium curassavicum*, but *Sesuvium verrucosum*, *Lotus corniculatus*, and *Sisymbrium altissimum* were also present. The *Distichlis* habitat was about 28 hectares (68 acres) in size. Water sources were between about 5 and 16 kilometers (3 and 10 miles) away. The second nectar site was about 9 hectares (23 acres) in size, and both *H. curassavicum* and *S. verrucosum* covered most of the site; *Sisymbrium altissimum* was also present. The *Distichlis* habitat was about 21 hectares (52 acres) in size. Water sources were between 1.6 kilometers and about

16 kilometers (1 and 10 miles) away (Honey Lake Conservation Team 2005).

F. REASONS FOR LISTING/THREATS

Species are placed on the List of Endangered and Threatened Wildlife and Plants based on one or more of the five listing factors for Federal listing of a species in section 4(a)(1) of the Endangered Species Act. The five listing factors are (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) over-utilization for commercial, recreation, scientific, or educational purposes; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; and (5) other natural or manmade factors affecting its continued existence. On August 7, 2002, we published a final rule listing the Carson wandering skipper as an endangered species (U.S. Fish and Wildlife Service 2002).

Although the Carson wandering skipper is thought to have been historically rare, it is likely to have been more widespread in the past (Brussard *et al*. 1999). Only four populations are currently known to exist. At the time of listing the following threats were discussed: habitat destruction, degradation, and fragmentation due to urban and residential development; wetland habitat modification; agricultural practices (such as excessive livestock grazing and trampling); gas and geothermal development; and nonnative plant invasion. Other threats include collecting, water exportation projects, road construction, recreation, pesticide drift, lack of state regulatory mechanisms for the protection of insects, and naturally occurring events in conjunction with the small, isolated nature of the known populations.

1. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Adult Carson wandering skippers have not been observed at the Carson City, Nevada, site since 1997. The Carson wandering skipper has likely been extirpated from this site due to development and habitat changes resulting from drainage manipulations for residential and commercial development (Brussard *et*

al. 1999). Adjacent lands surrounding this site will continue to be developed for commercial and residential use.

The remaining unoccupied habitat at the Carson City site also will be fragmented or destroyed by construction of a freeway bypass and associated flood control facilities in their entirety by the Nevada Department of Transportation. The alignment will impact approximately 2 hectares (6 acres) of previously occupied habitat and about 8 hectares (20 acres) of the potential habitat remaining at both areas north and south of U.S. Highway 50 (P. Frost *in litt.* 1998). Construction activities began in 2002-2003, and the section of freeway corridor located north of U. S. Highway 50 opened in spring 2006 (M. Haworth, pers. obs. 2004, 2006).

Residential development is occurring in the vicinity of the Washoe County, Nevada, populations. Urban development is occurring in the vicinity of the Lassen County, California, population/metapopulation. Increases in domestic wells could reduce the water table in the area, resulting in changes to the *Distichlis* community in these valleys (Brussard *et al*. 1999). As these areas become more populated, fragmentation and degradation of the Carson wandering skipper's habitat is expected to increase due to development.

Inappropriately managed livestock grazing is a potential threat to the Carson wandering skipper through reduction of the availability of nectar sources and *Distichlis spicata* cover, trampling, ground compaction, and increased spread of weeds. Until 2001, grazing practices on Bureau of Land Management administered lands at the Washoe County Site #1 allowed for a November to March grazing season. While this season of use avoids adverse impacts to adult Carson wandering skipper nectar sources and *Distichlis spicata* larval host plants during spring and summer, high livestock densities can cause mortality to hibernating larvae through trampling during the winter. On adjacent private lands, cattle densities and timing are not regulated, and cattle have access to nectar sources during the Carson wandering skipper's spring/summer flight season. With acquisition of these private lands adjacent to Bureau of Land Management lands in 2005, cattle grazing will be suspended unless determined useful as a habitat management tool. Cattle also have access to various ownerships on some of the Lassen County sites; however, it is unknown at this

time what type of management is being implemented. As stated earlier, timing of use and densities of livestock can affect the availability of adult nectar sources and *Distichlis spicata* larval host plants, as well as larval survival.

Implementation of proposed large-scale water exportation projects could result in the lowering of the water table in Warm Springs (Nevada) or Honey Lake (California) Valleys. Reduced groundwater supply may cause the loss of a portion of the *Distichlis* community upon which the Carson wandering skipper population in these areas depends (Brussard *et al*. 1999).

As development increases near known sites, there may be a potential for increases in recreational activities, such as off-highway vehicle use. This use is likely to occur both on public and private lands as these areas become more developed (Brussard *et al*. 1999). Recreational use at the Carson City, Nevada, site may have contributed to the possible extirpation of that population through habitat destruction and fragmentation.

A proposed gas and geothermal development permit has been issued near the Lassen County, California, population. The Carson wandering skipper may be associated with geothermal areas (Brussard *et al*. 1999), and the resulting hydrologic and ground disturbances caused by exploratory drilling may affect the subspecies and its habitat.

At the Lassen County population, *Lepidium latifolium* is of concern. *Lepidium latifolium* is a perennial herbaceous plant native to Europe and Asia that grows in disturbed sites, wet areas, ditches, roadsides, and croplands. Spreading roots and numerous seeds make this plant very competitive relative to other native plants and difficult to control (Stoddard *et al.* 1996). *Lepidium latifolium* often occurs in dense patches that become near-monoculture sites (Young *et al.* 1995). Beginning in 2000, this nonnative species began to encroach on the nectar site on a private property in California, and has become established in patches of *Lotus corniculatus*, this site's nectar source. By 2002, a portion of this nectar site had been eliminated due to *Lepidium latifolium* invasion. In Lassen County, *Lepidium latifolium* has become widely established (Howard 2000). In Washoe County, Nevada, *Lepidium latifolium* has become established at the Spanish Springs #2b

site. A few individual plants have been noted at the Warm Springs Valley Site #1.

Pesticide use can be a potential threat to the Carson wandering skipper. Pesticides used to control pests could affect the Carson wandering skipper if used in close proximity or through pesticide drift (Brussard *et al*. 1999).

2. Over-Utilization for Commercial, Recreation, Scientific, or Educational Purposes

The known populations of Carson wandering skipper that remain could face strong pressure from collectors. Because some of the nectar sites occur near public roadsides, the subspecies is easily accessible, and the limited number and distribution of these populations make it vulnerable to collectors. To date, there are no known cases of collecting causing a population extirpation. However, collecting of the Carson wandering skipper at the Carson City, Nevada, site over several years may have contributed to the extirpation of that population. Between 1965 and 1989, at least 90 females and 86 males were collected during 7 different years by various collectors (Austin and Emmel 1998). During this time, this was the only site where the Carson wandering skipper was thought to occur.

3. Disease or Predation

Threats from predation, parasitism, or disease have not been determined. In 2005, a robber fly (*Efferia* sp.) was observed preying on an adult Carson wandering skipper (Honey Lake Conservation Team 2006). A minute pirate bug (*Cortus tristicolor*) and spiders were observed preying on Carson wandering skipper larvae (Yssel 2005 as cited in Honey Lake Conservation Team 2005). It is unknown whether predation is occurring at a level that may cause a concern.

4. The Inadequacy of Existing Regulatory Mechanisms

The Carson wandering skipper occurs on Federal, State, and private lands. The California Department of Fish and Game is unable to protect insects under its current regulations (California Fish and Game Code undated). Although the California Environmental Quality Act and California Endangered Species Act

may provide a measure of protection to this subspecies, these laws are not adequate to protect the Carson wandering skipper and ensure its long-term survival (see further discussion in section I.G [Conservation Measures]). The Nevada Division of Wildlife does not protect insects under its current regulations (Nevada Revised Statutes 1999).

5. Other Natural or Manmade Factors Affecting its Continued Existence

The apparent low numbers of the Carson wandering skipper make it vulnerable to risks associated with small, restricted populations (Shaffer 1981, 1987; Groom *et al*. 2006). Because the Carson wandering skipper occurs at only four known isolated locations and in fairly small numbers, this subspecies is susceptible to **extinction** as a result of naturally occurring **stochastic** environmental or demographic events. These events could include wildfire, disease or predation, and severe weather events such as flooding. Random demographic effects (such as skewed sex ratios) and loss of genetic variability also may result in individuals and populations being less able to cope with environmental change, and could cause the loss of one or more populations. In addition, the loss of habitat compromises the ability of the Carson wandering skipper to disperse. Populations remain isolated with no opportunity to migrate or recolonize if conditions become unfavorable.

G. CONSERVATION MEASURES

Conservation measures include scientific studies, laws that provide protection, and other activities that affect the conservation of the Carson wandering skipper.

1. Federal Protection

Section 6 of the Endangered Species Act provides for Cooperative Agreements between the Service and state wildlife agencies that have approved conservation management programs for listed species. To date, neither the California Department of Fish and Game nor the Nevada Department of Wildlife has applied for section 6 funds for conservation of the Carson wandering skipper.

Section 7(a) of the Endangered Species Act requires Federal agencies to evaluate their actions with respect to any species that is proposed to be listed or is listed as endangered or **threatened**, and with respect to its critical habitat, if any is proposed or designated. Federal agencies are required to confer with us informally on any action that is likely to jeopardize the continued existence of a proposed species, or result in destruction or adverse modification of proposed critical habitat. If a species is subsequently listed, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species, or to destroy or adversely modify its critical habitat. If a Federal agency action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with us. Section 7(a)(1) requires that these agencies use their authorities to further the conservation of listed species. Several informal and formal consultations have been conducted in Nevada and California since the Carson wandering skipper's listing. These have included construction of a Federal Correctional Institute, Department of Defense ordnance and explosive response actions, land transfers to Lassen County, Herlong, and the Honey Lake Conservation Team, Caltrans construction of a wetlands mitigation bank in California, several recreational events, and construction of water supply pipelines on Bureau of Land Management lands in Nevada (U.S. Fish and Wildlife Service files).

Section 9 of the Endangered Species Act makes it illegal for any person subject to the jurisdiction of the United States to take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or attempt any such conduct), import or export, transport in interstate or foreign commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Regulations further define harm to include significant habitat modification or degradation that results in the killing or injury of wildlife by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harassment consists of intentional or negligent actions that create the likelihood of injury to listed species to such an extent to significantly disrupt normal behavior patterns which include, but are not limited to breeding, feeding, or sheltering.

Section 10 of the Endangered Species Act provides for the issuance of two types of permits. These permits authorize actions that would otherwise be prohibited under section 9. Such permits are available for scientific purposes or to enhance the propagation or survival of the listed species [section 10(a)(1)(A)] and for incidental take in connection with otherwise lawful activities [section 10(a)(1)(B)]. To date, one section 10(a)(1)(A) permit request that included the Carson wandering skipper among several species of butterflies has been reviewed and a permit issued for harassment of the Carson wandering skipper for photographic purposes only (U.S. Fish and Wildlife Service files). In addition, one section 10(b)(1)(B) permit has been issued for incidental take associated with habitat impacts resulting from planned residential development activities in Nevada (Lionel Sawyer & Collins 2005). The habitat conservation plan prepared to minimize and mitigate the effects of incidental take includes provisions to acquire approximately 16 hectares (39 acres) of offsite replacement habitat.

Some protection is afforded the Carson wandering skipper on lands administered by the Bureau of Land Management at Washoe County Site #1 due to their commitment to assist in the conservation of this subspecies through a Cooperative Agreement. This Cooperative Agreement was signed by the Service, Nevada Department of Transportation, the Federal Highway Administration, and the Bureau of Land Management in October 1999. Since then, the Bureau of Land Management has designated 98 hectares (243 acres) of their lands at the Washoe County site as an Area of Critical Environmental Concern. This designation allows the Bureau of Land Management discretion in determining actions that can occur within this area (Bureau of Land Management 2001). In 2005, the Bureau of Land Management acquired 32 hectares (80 acres) of adjacent private lands which support habitat occupied by the Carson wandering skipper. This area will become part of Bureau of Land Management's Area of Critical Environmental Concern for the Carson wandering skipper, resulting in a total area of 130 hectares (323 acres).

2. State Protection

Although California State laws may provide a measure of protection to this subspecies, these laws are not adequate to protect the Carson wandering skipper and ensure its long-term survival. The California Environmental Quality

Act pertains to projects on non-Federal lands and requires that a project proponent publicly disclose the potential environmental impacts of proposed projects. Section 15065 of the California Environmental Quality Act Guidelines requires a "finding of significance" if a project has the potential to "reduce the number or restrict the range of a rare or endangered plant or animal," including those that are eligible for listing under the California Endangered Species Act. However, under the California Environmental Quality Act, where overriding social and economic considerations can be demonstrated, a project may go forward despite significant adverse impacts to a species.

A wetlands mitigation bank located adjacent to existing California Department of Fish and Game lands is being established near the Lassen County Site #1. This parcel of 121 hectares (300 acres) has been recently grazed and farmed. The bank is intended to create a minimum of 37 hectares (92 acres) of emergent wetlands at this site to mitigate for wetland losses in sagebrush scrub and juniper woodland habitats due to road construction in Lassen and Modoc Counties and in the eastern portion of Plumas County. This bank will be managed by the California Department of Fish and Game (California Department of Transportation and California Department of Fish and Game 1998). Long-term maintenance of the wetlands will follow the terms and conditions of the Honey Lake Wildlife Area Management Plan (Holmes and Novick 1993, California Department of Transportation 2002). The Honey Lake Wildlife Area Management Plan (Holmes and Novick 1993) is scheduled to be updated in the near future. This plan allows for providing suitable habitat and protecting threatened and endangered species, including the Carson wandering skipper.

3. Private Organizations

The Honey Lake Conservation Team is a consortium of two non-profit natural resource conservation organizations (The Trust for Public Lands and the Center for Urban Watershed Renewal) and two natural resource consulting firms (The Bioengineering Group, Inc., and Michael Baker Jr., Inc.). These organizations were selected by the Department of Defense to hold title of the Honey Lake property, which encompasses those sites within and immediately around the lake, for a period of five years (2003 to 2008) or until transferred to the State of California. The transfer of this property recently occurred in

November 2006. The Department of Defense has committed to providing funds of $8,650,000 until 2008 for management of the Honey Lake property. Of this sum, $1,000,000 will be spent for studying, understanding, promoting, and enhancing the Carson wandering skipper and its habitats. This will include the development of a Carson wandering skipper Conservation Strategy and a Honey Lake Management Plan for these lands (G. Burton *in litt*. 2003). The Honey Lake Conservation Team has worked with other parties as appropriate in managing these transferred lands in consideration of the Carson wandering skipper. The California State Lands Commission will continue this management.

H. RECOVERY STRATEGY

Due to the restricted range of this subspecies and its vulnerability, a priority for **recovery** is to manage and maintain the remaining populations and the habitats on which they occur; threats must be effectively counteracted to assure the persistence of populations. Threats to habitat may be addressed through such means as land acquisition from willing sellers, conservation agreements, management agreements, or by other means.

Very little is understood about the ecology, life history, or population structure of the Carson wandering skipper. A good understanding of these parameters is needed to protect fully the subspecies from extinction. Research is essential in making scientifically based conservation decisions. A research program that targets the life history and habitat requirements of the Carson wandering skipper is necessary to achieve its recovery. Additional research needs to be conducted to provide a better understanding of the subspecies' demographics and whether or not the Carson wandering skipper occurs as **local populations** at a **local scale** or as metapopulations at a **metapopulation scale** (Hanski and Gilpin 1991). Annual monitoring of the known populations with appropriate, consistent methods is essential to better understand normal population fluctuations, trends, and movement into or out of changing habitats. Monitoring should be applied during a sufficient period of time (a minimum of 20 years) to address the variability of environmental conditions that may be experienced by the Carson wandering skipper. Surveys are needed in potential habitats to determine the distribution of known populations or the presence of additional populations. As more information becomes available, areas that

support adequate amounts of suitable habitat will be evaluated as possible reintroduction sites. Delisting of the Carson wandering skipper could be based, in part, on the discovery or establishment of one or more additional populations or metapopulations located elsewhere within its range. However, we may determine that locating or establishing one or more additional populations or metapopulations elsewhere within its range is not feasible.

Viable populations or metapopulations must be perpetuated throughout the Carson wandering skipper's geographic range in California and Nevada. This can be accomplished by maintaining extant populations or metapopulations throughout its range, and improving and stabilizing those populations or metapopulations that are less secure such that they are large enough to be viable. Monitoring and **adaptive management** should **protect** areas against threats, maintain suitable habitat over time, and identify appropriate responses to any declines.

Because of the natural fluctuation of butterfly abundance due to various factors, using numbers of individuals as a recovery criterion is inappropriate. This also applies to identifying a required minimum population size. Due to the difficulties involved with associating numbers of populations or individuals within each population with recovery success for invertebrates, the amount of suitable habitat and its occupancy is recommended as a feasible means of expressing recovery criteria (D. Murphy, University of Nevada, Reno, and E. Fleischman, Stanford University, pers. comm. 2004). Some habitat/landscape characteristics known or suspected to be associated with Carson wandering skipper occupancy include green *Distichlis spicata* for larval feeding at the appropriate time of year, nectar sources for adult feeding at the appropriate time of year, and presence of springs or other water sources for larval host plant/nectar establishment. It is reasonable to presume that a site with these characteristics is suitable for Carson wandering skippers. The definitive measure of habitat suitability is occupation by and persistence of a species over time.

For the purposes of this plan, "known suitable habitat" equates with "occupancy" of the habitat by the Carson wandering skipper, as determined by survey results; "presumed suitable habitat" has Carson wandering skipper habitat characteristics, but occupancy has not been determined. It is important to clarify

known and presumed suitable **habitat patches** and opportunities for managing these areas for the benefit of the Carson wandering skipper. At this time it is not known how many presumed habitat patches exist or where they are located. The spatial extent of suitable habitat patches, distances between them, and the extent of suitable migration corridors are also not currently known.

Four categories of suitable habitat patches can be identified: (1) known suitable habitat (**occupied habitat**) that is currently managed or can be managed for the Carson wandering skipper; (2) known suitable habitat that is not currently managed or cannot be managed for the Carson wandering skipper; (3) presumed suitable habitat that is currently managed or can be managed for the benefit of the Carson wandering skipper; and (4) presumed suitable habitat that is not currently managed or cannot be managed for the Carson wandering skipper. Over time, consideration will be given to eliminating areas that appeared to be presumed suitable habitat, but are not, as determined by repeated searches and monitoring.

Within the four known populations/metapopulations in Nevada and California, known suitable habitat exists that is managed or can be managed for the benefit of the Carson wandering skipper. These include the Bureau of Land Management site and recently acquired private lands in Warm Springs Valley, Washoe County, Nevada (1 combined nectar site); the private lands site in Spanish Springs Valley, Washoe County, Nevada (1 nectar site); the California Department of Fish and Game site in Lassen County, California (1 nectar site); the Carson River site in Douglas County, Nevada (1 nectar site); and the Honey Lake Conservation Team/California State Lands Commission lands in Lassen County, California (19 nectar sites). Some currently known suitable habitat also exists that is not being managed or cannot be managed for the Carson wandering skipper at the Lassen County, California, Site #2 (Private, 1 nectar site), Site #3 (Wendel area, 1 nectar site), and Site #4 (Mapes Road, 1 nectar site).

The California population/metapopulation appears to be larger in size and to cover a greater land base than the Nevada populations. As such it will be necessary to ensure appropriate management of known suitable habitat patches for the Carson wandering skipper in perpetuity at the California site. In addition, the possible influence of varying Honey Lake water levels on population size must be determined for the population/metapopulation. Surveys conducted in 2004 and

2005 occurred primarily within the lake's boundary (meander) line and numerous nectar sites were located. During the 2004 survey, Honey Lake was dry. In 2005, conditions were wetter with some standing water in Honey Lake. No previously known sites were reported as under water in 2005. During wet years, it is possible that some nectar sites and *Distichlis* acreage used by the Carson wandering skipper will be inundated by rising lake levels. As a result, this population/metapopulation may experience fluctuations in the number of individuals based on the availability of nectar sites for adults and the amount of *Distichlis spicata* available for larvae. Dry years may offer an opportunity for population/metapopulation increases or expansion while wet years may cause declines or contraction. Long-term monitoring should help clarify the effects of lake water levels. Management of nectar sites in more upland areas around Honey Lake to eliminate threats may be essential to the long-term persistence of this subspecies in California.

Recovery of the Carson wandering skipper can be based, in part, on the number of known suitable habitat patches being managed for the species. Increasing the number of known suitable habitat patches managed for the Carson wandering skipper from the three other categories listed above would be beneficial, and appropriate management for a sufficient number of these known suitable habitat patches should be ensured in perpetuity for downlisting or delisting of the Carson wandering skipper to occur. The occupancy of these sites must be documented over time because they may not be used every year. Priority for appropriate management of these areas will be assigned to known or suspected nectar source patches.

The support and participation of stakeholders will be necessary for the recovery of the Carson wandering skipper in California and Nevada. The Carson wandering skipper has been found on public (Federal and State) and private lands. As indicated in section II.C (Recovery Narrative) below, many opportunities are available for stakeholders and other interested parties to become involved in the recovery of the Carson wandering skipper.

Monitoring of the Carson wandering skipper should incorporate methods and techniques that will be applicable and consistent with monitoring after the subspecies is delisted. A post-delisting monitoring plan that can be integrated

into ongoing surveys for recovery will be developed and implemented for a minimum period of 5 years after delisting to ensure recovery.

II. Recovery

A. RECOVERY OBJECTIVES AND CRITERIA

1. Recovery Objectives

The primary objective of this recovery plan is to prevent the extinction of the Carson wandering skipper and to ensure that existing populations or metapopulations are protected from threats for the foreseeable future, thereby perpetuating viable populations or metapopulations of the subspecies throughout its **range**. The secondary objective is to allow for reclassification and eventual recovery and delisting of this subspecies. This plan is intended to guide willing participants in achieving these objectives. Actions emphasized in this plan that will be needed to meet recovery objectives are described in the recovery criteria below. Recovery objectives for the Carson wandering skipper may be achieved if additional populations or metapopulations are found, if appropriate management to counteract threats is ensured in perpetuity for a large amount of the known suitable habitat, if the number of the known populations increases naturally or through propagation and augmentation, if reintroduction/introduction efforts are successful, and if threats are eliminated or reduced. While knowledge of the current status of the Carson wandering skipper and its range-wide distribution is limited, the following criteria for downlisting and delisting are based on the best available information. These criteria may be revised and further quantified as additional information from research and monitoring becomes available in the future.

2. Recovery Criteria

Recovery plans are not regulatory documents and are intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species, and criteria that may be used to determine when recovery is achieved. There are many paths to accomplishing recovery of a species, and recovery may be achieved without all criteria being fully met. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, the Service may judge that over all criteria, the

threats have been minimized sufficiently, and the species is robust enough to reclassify from endangered to threatened or perhaps delist. In other cases, recovery opportunities may have been recognized that were not known at the time the recovery plan was finalized. These opportunities may be used instead of methods identified in the recovery plan. Likewise, new information may change our understanding of the subspecies' biology. This new information may change our evaluation of appropriate recovery criteria in the future. Overall, recovery is a dynamic process requiring adaptive management, and judging the degree of recovery of a species is also an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan.

Downlisting or delisting is warranted when a listed species no longer meets the definition of endangered or threatened, respectively, under the Endangered Species Act. We set recovery criteria to serve as objective, measurable guidelines to assist us in determining when a species has recovered to the point that the protections afforded by the Endangered Species Act are no longer necessary. However, the actual change in listing status is not solely dependent upon achieving the recovery criteria set forth in a recovery plan; it requires a formal rulemaking process based upon an analysis of the same five factors considered in the listing of a species (see section I.F [Reasons for Listing/Threats]). The recovery criteria presented in this recovery plan thus represent our best assessment of the conditions that would most likely result in a determination that downlisting or delisting of the Carson wandering skipper is warranted as the outcome of a formal five factor analysis in a subsequent regulatory rulemaking.

<u>Downlisting</u> of the Carson wandering skipper to threatened status can be considered when the following criteria are met:

(1) For the Lassen County, California, population/metapopulation <u>and</u> one of the three known Nevada populations or a comparable newly discovered population, management has been established in perpetuity to effectively address threats to the species and ensure persistence of the populations. The population in Nevada must have been occupied for 6 years out of the most recent 10-year sequence with no downward trend in abundance. In California, suitable habitat patches equivalent to 50 percent or more of the currently known suitable habitat

patches must be managed to effectively address threats, and each of these habitat patches must have been occupied for 6 years out of the most recent 10-year sequence with no downward trend in abundance across the population/ metapopulation.

(2) Adaptive management plans have been developed and implemented with adequate long-term funding, either individually or comprehensively, for the two populations in downlisting criterion #1. These plans must address appropriate management for the Carson wandering skipper with regards to habitat and land uses that may affect habitat quality, including but not limited to development (urban, residential, water, gas and geothermal), livestock grazing, recreation, invasive plant control, pesticide use, and public education.

Delisting of the Carson wandering skipper can be considered when the following conditions are met:

(1) For the Lassen County, California, population/metapopulation and two of the three known Nevada populations or comparable newly discovered populations, management has been established in perpetuity to effectively address threats to the species and ensure persistence of the populations. Each population in Nevada must have been occupied for 6 years out of the most recent 10-year sequence after downlisting criteria are met, with no downward trend in abundance. In California, suitable habitat patches equivalent to 75 percent or more of the currently known suitable habitat patches must be managed to effectively address threats, and each of these habitat patches must have been occupied for 6 years out of the most recent 10-year sequence after downlisting criteria are met, with no downward trend in abundance across the population/ metapopulation. Appropriate landscape connectivity must exist among patches (*i.e.*, land use between most sites is considered open space and not urban or suburban) in order to potentially facilitate movement of the Carson wandering skipper among patches.

(2) Adaptive management plans have been developed and implemented with adequate long-term funding, either individually or comprehensively, for the three populations in delisting criterion #1. These plans must address appropriate management for the Carson wandering skipper with regard to habitat and land

uses that may affect habitat quality, including but not limited to development (urban, residential, water, gas, and geothermal), livestock grazing, recreation, invasive plant control, pesticide use, and public education.

(3) In addition to the populations in delisting criterion #1, for at least one additional Carson wandering skipper population or metapopulation, including a known population or any that may be discovered or established within Carson wandering skipper historical range, management has been established in perpetuity to effectively address threats to the species and ensure persistence of the population, unless we conclude (through intensive, comprehensive surveying) that additional populations or metapopulations do not exist and it would not be ecologically feasible to establish/reestablish one or more of them within Carson wandering skipper historical range.

(4) *Lepidium latifolium* invasion into known and presumed suitable habitat for the Carson wandering skipper has been eliminated or reduced and managed to levels that do not pose a threat to the persistence of the Carson wandering skipper.

(5) A long-term conservation plan and conservation agreements have been developed to guide management throughout the range of the Carson wandering skipper after it has been delisted.

(6) A monitoring plan to cover a minimum of 5 years post-delisting of the Carson wandering skipper has been developed and is ready to be implemented to ensure the ongoing conservation of the species and the continuing effectiveness of management actions.

Prior to implementation of any action in this plan, the lead Federal agency must comply with all applicable provisions of the National Environmental Policy Act and the Endangered Species Act. All necessary Federal, State, and local permits or authorizations must be obtained. These recovery criteria were designed to provide a basis for consideration of downlisting and delisting, but not for automatic downlisting or delisting. Before delisting occurs, we must determine that the five listing factors no longer are present or no longer continue to adversely affect the listed species. The final decision regarding delisting will

be made only after a thorough review of all relevant information and public participation in the review process.

B. STEP-DOWN OUTLINE FOR RECOVERY ACTIONS

1. Manage existing populations and essential habitat on public and private lands to minimize threats

    1.1 Identify and map known occupied sites, especially those of suspected **source populations**.
    1.2 Establish appropriate long-term management of known occupied sites, especially those of suspected source populations.
    1.3 Identify and map spring sites important to the Carson wandering skipper.
    1.4 Establish appropriate long-term management of important spring sites.
    1.5 Support mapping of *Lepidium latifolium* by Federal, State, local agencies, and other interested parties.
    1.6 Support control of *Lepidium latifolium* by Federal, State, local agencies, and other interested parties.
    1.7 Support monitoring of *Lepidium latifolium* by Federal, State, local agencies, and other interested parties.
    1.8 Work with interested landowners, University of California Cooperative Extension, and other interested parties to control *Lepidium latifolium* at occupied and potential sites.
    1.9 Work with interested landowners of occupied sites to develop livestock grazing management plans to enhance habitat conditions for the Carson wandering skipper.
    1.10 Coordinate with Federal, State, and local agencies to address issues of large-scale ground water pumping to ensure adverse impacts to the Carson wandering skipper do not occur.
    1.11 Work with non-Federal public and private interests (local landowners, agricultural interests, geothermal development interests, water developers, etc.) on a voluntary basis to develop and implement safe harbor agreements, conservation agreements, habitat conservation plans, or other programs (such as Partners for

Fish and Wildlife and Farm Bill conservation programs) to protect, restore, enhance, and manage existing populations and habitat, as well as potential habitat of the Carson wandering skipper.

1.12 Coordinate with State wildlife resource agencies (California Department of Fish and Game and Nevada Department of Wildlife) to provide Federal section 6 funds to be used by the states to carry out species recovery actions.

1.13 Coordinate with Bureau of Land Management to acquire additional habitat and water rights from a willing seller at the Washoe County, Nevada, Site #1 and develop a management plan.

1.14 Seek to acquire additional occupied or potential habitat from willing sellers, when possible, through fee acquisitions.

1.15 Conduct Endangered Species Act section 7 consultations with various Federal agencies (*e.g.*, Bureau of Land Management, Federal Highway Administration, Department of Defense, Department of Justice (Federal Bureau of Prisons), Army Corps of Engineers, Animal and Plant Health Inspection Service, and Natural Resource Conservation Service) or their designated agents as appropriate to protect Carson wandering skipper populations and enhance Carson wandering skipper habitat.

1.16 Coordinate with the Army Corps of Engineers to avoid, minimize, or compensate for impacts to *Distichlis* and wetland habitat in relation to section 404 of the Clean Water Act activities.

1.17 Coordinate with the California Department of Transportation and California Department of Fish and Game regarding implementation of the Honey Lake Mitigation Bank in consideration of the Carson wandering skipper.

1.18 Coordinate with the Honey Lake Conservation Team/California State Land Commission on the management of their lands adjacent to Honey Lake in consideration of the Carson wandering skipper.

2. Establish a research program to determine the ecological requirements and life history of the Carson wandering skipper, and develop a program to survey for additional populations and monitor existing populations and habitats for trends and threats.

2.1 Develop and implement a program to survey for additional populations (a survey protocol for proposed projects has been developed).

2.2 Develop and implement a monitoring program for known populations and habitat for trends and threats.

2.3 Better understand ecological (including specific habitat needs) and life history requirements of the Carson wandering skipper.

2.4 Determine population structure and dispersal distance of Carson wandering skippers in Honey Lake and Warm Springs Valleys and at the Douglas County site.

2.5 Determine the relationship between livestock grazing and the Carson wandering skipper and its habitat.

2.6 Develop a hydrologic model to better understand the relationship between surface and groundwater resources in Honey Lake and Warm Springs Valleys and at the Douglas County site.

2.7 Develop techniques for captive propagation with possible introduction/reintroduction to unoccupied, suitable sites.

2.8 Develop techniques for Carson wandering skipper habitat creation and enhancement.

3. Develop and implement an outreach program to keep local communities informed of the Carson wandering skipper's status and means to carry out recovery actions.

3.1 Create an internet web site to provide information on the subspecies and the recovery process.

3.2 Prepare general information materials for the public.

3.3 Use and develop kiosks at appropriate sites such as California Department of Fish and Game management areas, Honey Lake Conservation Team/California State Lands Commission lands, and California Department of Transportation Safety Roadside Rest Areas for educational material distribution.

3.4 Encourage Resource Conservation Districts and cooperative extension to provide technical assistance to landowners to further land management activities to assist in Carson wandering skipper recovery.

3.5 Foster community involvement and educational opportunities with schools, scouts, 4H, and other groups to assist in Carson wandering skipper recovery.

3.6 Identify landowners with suitable habitat willing to assist in the recovery of the Carson wandering skipper.

4. Evaluate progress of recovery and effectiveness of management and recovery actions; revise management plans and recovery criteria as necessary.

4.1 Revise the recovery plan as appropriate at 5-year intervals.

4.2 Hold periodic stakeholder meetings to encourage information sharing.

C. RECOVERY NARRATIVE OUTLINE FOR ACTIONS ADDRESSING THREATS

1. Manage existing populations and essential habitat on public and private lands to minimize threats. Only four populations of Carson wandering skipper are currently known to exist. Protection and management of these populations are essential to the subspecies' survival.

1.1 Identify and map known occupied sites, especially those of suspected source populations. Identify known, occupied sites of Carson wandering skipper habitat that occur on Federal, State, and private property, and obtain spatial coordinates of sites using GPS (global positioning systems). Access permission must be obtained to conduct surveys.

1.2 Establish appropriate long-term management of known occupied sites, especially those of suspected source populations. Known, occupied sites of Carson wandering skipper habitat occur on Federal, State, and private property. Because of the low number of known sites, ensuring appropriate management of these areas to minimize threats, through such means as acquisition from willing sellers, conservation agreements, management agreements, or

other means, is important to the survival of the subspecies. Those sites that are believed to provide habitat for source populations especially need protection. Access permission must be obtained to conduct surveys.

1.3 Identify and map spring sites important to the Carson wandering skipper. Because of the close association of Carson wandering skipper with *Distichlis spicata*, and the influence of springs on *D. spicata* quality and availability of nectar plants, identification of spring habitats is likely important to Carson wandering skipper survival and recovery. Spatial coordinates of spring sites can be obtained using GPS. Access permission must be obtained to conduct surveys.

1.4 Establish appropriate long-term management of important spring sites. Because of the close association of the Carson wandering skipper with *Distichlis spicata*, and the influence of springs on *D. spicata* quality and availability of nectar plants, spring habitats are likely important to Carson wandering skipper survival and recovery. Appropriate management of those areas within/near occupied Carson wandering skipper habitat must be ensured through acquisition from willing sellers, conservation agreements, management agreements, or other means. Access permission must be obtained to conduct surveys.

1.5 Support mapping of *Lepidium latifolium* by Federal, State, local agencies, and other interested parties. Aggressive plant species invasions, such as by *L. latifolium*, can be a threat to the Carson wandering skipper by replacing other plant species, particularly nectar plants, required by the Carson wandering skipper. The first line of defense in invasive species control is prevention; when that fails, early detection and a rapid response to new infestations, containment of larger infestations, and local eradications can control further infestation. This action would provide support (funds and personnel) to local entities such as the Lassen County Special Weed Action Team, University of California Cooperative

Extension, and other interested parties to map *L. latifolium* in and around areas known to be used by the Carson wandering skipper. Additional support may also be provided for the mapping of *L. latifolium* in areas where potential Carson wandering skipper habitat could be threatened by this invasive species. Refer to recovery actions 1.6, 1.7, and 1.8.

1.6 Support control of *Lepidium latifolium* by federal, state, local agencies, and other interested parties. This action would provide support (funds and personnel) to local entities such as the Lassen County Special Weed Action Team, University of California Cooperative Extension, and other interested parties to control *L. latifolium* in and around areas known to be used by Carson wandering skipper. Additional support may also be provided for the control of *L. latifolium* in areas where potential Carson wandering skipper habitat could be threatened by this invasive species. Refer to recovery actions 1.5, 1.7, and 1.8.

1.7 Support monitoring of *Lepidium latifolium* by Federal, State, local agencies, and other interested parties. This action would provide support (funds and personnel) to local entities such as the Lassen County Special Weed Action Team, University of California Cooperative Extension, and other interested parties to monitor *L. latifolium* in and around areas known to be used by Carson wandering skipper. Additional support may also be provided for the monitoring of *L. latifolium* in areas where potential Carson wandering skipper habitat could be threatened by this invasive species. Refer to recovery actions 1.5, 1.6, and 1.8.

1.8 Work with interested landowners, University of California Cooperative Extension, and other interested parties to control *Lepidium latifolium* at occupied and potential sites. Invasions of *L. latifolium* into areas containing *Distichlis spicata* and/or nectar plants have resulted in loss of occupied and potential habitats, and continued invasions are likely to result in greater losses of appropriate habitats and the conversion and degradation of lowland

grassland habitats. Opportunities exist for landowners to conduct habitat improvement projects, manage livestock grazing, control weeds, and engage in other actions to reduce the coverage of *L. latifolium* and to prevent it from invading new sites. Technical assistance and/or program funds to help interested landowners conduct those kinds of activities are available from the Service, the University of California Cooperative Extension, U.S. Department of Agriculture, and other agencies and organizations. Landowners who are concerned about the effects of *L. latifolium* on the Carson wandering skipper or on the land in general, and who wish to engage in projects to remove *L. latifolium*, are encouraged to contact their local agency or extension office to begin that effort. Likewise, agency and extension service staff are encouraged to outreach to landowners to inform them about land and habitat degradation from *L. latifolium* invasions and to provide technical assistance and funds toward control and elimination of *L. latifolium* from affected lands. Refer to recovery actions 1.5, 1.6, and 1.7.

1.9 <u>Work with interested landowners of occupied sites to develop livestock grazing management plans to enhance habitat conditions for the Carson wandering skipper</u>. Landowners of occupied sites should be informed about the Endangered Species Act and the associated legal requirements and assistance programs available. Educational material on the Carson wandering skipper should be distributed to landowners. Landowners should be notified of any financial assistance available to implement programs. The Service, the landowner, and other involved agencies should form working partnerships with the University of California Cooperative Extension (Livestock Farm Advisor) and Natural Resource Conservation Service (Range Specialist) to develop a mutually agreeable livestock grazing management plan to enhance habitat conditions for the Carson wandering skipper and at the same time continue to provide a viable livestock operation. Grazing guidelines must be developed to provide an economically sound business for the landowner of occupied sites. These management

plans would be developed in association with the research discussed in recovery action 2.5.

1.10 Coordinate with Federal, State, and local agencies to address issues of large-scale ground water pumping to ensure adverse impacts to the Carson wandering skipper do not occur. Groundwater extractions in sensitive habitat for the Carson wandering skipper may reduce or eliminate spring discharges supporting the vegetation that appears to provide necessary habitat elements. It is recommended that we work closely with Federal, State, and local water management and purveyor agencies in California and Nevada to evaluate the effects of groundwater level declines associated with municipal and agricultural groundwater extraction in Honey Lake and Warm Springs Valleys. Proposed evaluations include an inventory of existing wells and water rights, anticipated future groundwater development potential based upon water rights, assessment of geological and hydrological conditions, and development of numerical groundwater flow models to assess the surface effects of groundwater extraction. Monitoring of vegetation and the Carson wandering skipper should occur in association with commencement of pumping.

1.11 Work with non-Federal public and private interests (local landowners, agricultural interests, geothermal development interests, water developers, etc) on a voluntary basis to develop and implement safe harbor agreements, conservation agreements, habitat conservation plans, or other programs (such as Partners for Fish and Wildlife and Farm Bill conservation programs) to protect, restore, enhance, and manage existing populations and habitat as well as potential habitat of the Carson wandering skipper. Opportunities for Carson wandering skipper recovery on private and non-Federal public lands should be investigated on a willing/interested landowner basis on suitable lands. Existing water rights and infrastructure installation and maintenance issues will need to be considered. Landowners should be informed of the various opportunities available through safe harbor agreements and

habitat conservation plans. Funding sources include, but are not limited to, the Service's Partners for Fish and Wildlife program and Landowner Incentive Program; and the Natural Resource Conservation Service's Wildlife Habitat Improvement Project funds. Refer to recovery action 3.6.

1.12 Coordinate with State wildlife resource agencies (California Department of Fish and Game, California Parks and Recreation Department, and Nevada Department of Wildlife) to provide Federal section 6 funds to be used by the States to carry out species recovery actions. Opportunities for Carson wandering skipper recovery on State lands should be investigated. Land managers should be informed of the opportunities and funding sources available through Endangered Species Act section 6 grants.

1.13 Coordinate with Bureau of Land Management to acquire additional habitat and water rights from a willing seller at the Washoe County, Nevada, Site #1 and develop a management plan. In 2005, the Bureau of Land Management Carson City Field Office acquired 32 hectares (80 acres) of occupied habitat along with groundwater rights to sustain that habitat. This parcel is adjacent to and will become part of the Bureau of Land Management's Carson Wandering Skipper Area of Critical Environmental Concern. Southern Nevada Public Lands Management Act appropriations were used to finalize the transactions with willing sellers. A site-specific management plan to address habitat management needs and threats to the population or habitat will be developed. The plan will include goals, strategies, funding sources, and time line, and will incorporate an adaptive management strategy.

1.14 Seek to acquire additional occupied or potential habitat from willing sellers, when possible, through fee acquisitions. Occupied and potential habitats could be acquired from willing sellers throughout the Carson wandering skipper's range, with first preference to fee acquisitions. Where appropriate, conservation

agreements could be acquired from willing sellers to ensure habitat is managed to prevent threats from disturbance or development. Funding sources could include Southern Nevada Public Lands Management Act, Land and Water Conservation Fund, agency appropriations, donations or grants. Future management of acquired fee-title lands would be directed toward Carson wandering skipper conservation and restoration in accordance with the acquiring agency's or organization's mission.

1.15 Conduct Endangered Species Act section 7 consultations with various Federal agencies (*e.g.*, Bureau of Land Management, Federal Highway Administration, Department of Defense, Department of Justice (Federal Bureau of Prisons), Army Corps of Engineers, Animal and Plant Health Inspection Service, and Natural Resource Conservation Service) or their designated agents as appropriate to protect and enhance Carson wandering skipper populations and habitat. We will conduct section 7 consultations with various Federal agencies or their designated agents on projects affecting the Carson wandering skipper throughout its range to ensure these projects do not jeopardize its continued existence.

1.16 Coordinate with the Army Corps of Engineers to avoid, minimize, or compensate for impacts to *Distichlis* and wetland habitats in relation to section 404 of the Clean Water Act activities. We will coordinate with the U.S. Army Corps of Engineers when a permit is required to reduce proposed project impacts to wetland and *Distichlis* habitats through section 404 of the Clean Water Act. Where impacts to these habitats cannot be avoided, mitigation will be required.

1.17 Coordinate with the California Department of Transportation and California Department of Fish and Game regarding implementation of the Honey Lake Mitigation Bank in consideration of the Carson wandering skipper. A wetlands mitigation bank located adjacent to existing California Department

of Fish and Game lands is being established near the Lassen County Site #1 (see section I.G [Conservation Measures]). The bank is intended to create a minimum of 37 hectares (92 acres) of emergent wetlands at this site to mitigate for wetland losses in sagebrush scrub and juniper woodland habitats due to road construction in Lassen and Modoc Counties and in the eastern portion of Plumas County. This bank will be managed by the California Department of Fish and Game (California Department of Transportation and California Department of Fish and Game 1998). Long-term maintenance of the wetlands will follow the terms and conditions of the Honey Lake Wildlife Area Management Plan (Holmes and Novick 1993, California Department of Transportation 2002). Opportunities to pursue Carson wandering skipper recovery at the bank site should be explored.

1.18 Coordinate with the Honey Lake Conservation Team/California State Lands Commission on the management of their lands adjacent to Honey Lake in consideration of the Carson wandering skipper. The Honey Lake Conservation Team is a consortium of two non-profit natural resource conservation organizations (The Trust for Public Lands and the Center for Urban Watershed Renewal) that will receive the Honey Lake property from the Department of Defense (see section I.G [Conservation Measures]). The Honey Lake Conservation Team will hold title to the lands until transferred to the State of California. The Department of Defense has committed to providing the Honey Lake Conservation Team with $8,650,000 for management of the property. Of this sum, $1,000,000 will be spent for studying, understanding, promoting, and enhancing the Carson wandering skipper and its habitats. This will include the development of a Carson wandering skipper Conservation Strategy and a Honey Lake Management Plan for these lands.

2. Establish a research program to determine the ecological requirements and life history of the Carson wandering skipper, and develop a program to

survey for additional populations and monitor existing populations and habitats for trends and threats. The current understanding of the biology and ecology of the Carson wandering skipper is limited. A better understanding of habitat requirements, behavior, and population dynamics is necessary to support appropriate recovery recommendations. Research is needed to determine the best techniques for propagation and/or introduction/reintroduction into suitable habitats if selected as a conservation strategy. This strategy should be used only as a last resort and not in place of protecting existing populations.

2.1 Develop and implement a program to survey for additional populations. Although *Distichlis* areas in northwestern Nevada and northeastern California have been surveyed to varying degrees since 1999, there is still a possibility that additional populations may exist. Areas in Lassen County, California, and Washoe and Douglas Counties, Nevada, identified as having soils that support *Distichlis spicata* should be mapped and then searched during the flight season. Additional populations also may be found if more access to private land becomes available (access permission must be obtained).

Survey guidelines to determine presence or absence became available prior to the 2002 Carson wandering skipper flight season. The survey guidelines may be obtained from either the Nevada Fish and Wildlife Office in Reno, Nevada, or from the Sacramento Fish and Wildlife Office in Sacramento, California. Survey guidelines should be obtained annually because the methods are subject to change as additional information is gathered over time.

2.2 Develop and implement a monitoring program for known populations and habitat for trends and threats. Annual monitoring of Carson wandering skipper populations is needed to track their status and progress towards recovery. Parameters for population and habitat trends must be selected, methods and techniques determined, and a plan developed and implemented. Population trends in invertebrates are very difficult to determine, since normal

annual variation in numbers may span two to three orders of magnitude. It is highly unlikely that standard capture-mark-release-recapture techniques can be used successfully to obtain quantitative estimates of Carson wandering skipper population sizes. Individuals are difficult to capture and too small to handle without damaging them. Furthermore, their relative rarity and unknown dispersal tendencies make the likelihood of obtaining enough recaptures for meaningful estimates remote at best. Brussard *et al.* (1999) attempted to obtain estimates of relative population numbers using the Pollard (1977) walking transect technique. However, the variance in transect counts was so large that the attempt did not provide statistically useful information.

The application of qualitative descriptors is probably the most reliable method of monitoring Carson wandering skipper populations. The following descriptors were used by Brussard *et al.* (1999): *abundant* (usually observed in large numbers), *common* (usually observed but not in large numbers), *fairly common* (usually observed but in small numbers or not always observed), *uncommon* (occasionally observed) and *rare* (a single sighting). We have developed survey guidelines for the Carson wandering skipper (U.S. Fish and Wildlife Service 2006) that provide the following categories to indicate the number of individuals seen: low (1-10 individual seen per day); medium (11-30 individuals seen per day); and high (31-100 or more individuals seen per day). When possible, recording of actual numbers when observations are less than 10 is preferable. Inter-annual trends in these descriptors/ranges, along with maps showing occupied and unoccupied localities, should give reasonable insight into population trends in the Carson wandering skipper. Properly established photo points and verbal descriptions should provide adequate documentation of habitat trends. Reporting requirements of various environmental laws should provide information on land-use changes that might adversely impact the Carson wandering skipper.

Data will be gathered according to methods outlined in the monitoring program. Monitoring methods should be applied consistently during a sufficient period of time (minimum of 20 years). This period of time is needed to include the variability of environmental conditions experienced by the Carson wandering skipper. Any new threats to the Carson wandering skipper also should be identified. Copies of monitoring reports should be provided to the Service so review and assessment of the status of populations and habitat can be made. This information will be maintained in a database developed by the Nevada Fish and Wildlife Office in Reno, Nevada.

2.3 Better understand ecological (including specific habitat needs) and life history requirements of the Carson wandering skipper. For example, raising individuals from egg to adult in the laboratory is important to determine: (1) whether the larvae spin webs, (2) how many larvae can co-exist and ultimately develop on a single *Distichlis spicata* plant, and (3) if the species can re-enter diapause under adverse conditions. Once this information is known, careful field studies may produce more information on larval ecology.

It is also important to better understand larval habitat. For example, monitoring adult female ovipositing within the *Distachlis spicata* habitat will assist in determining which habitat patches the larvae and pupae will occupy. Suitable larval habitat may be determined by soil moisture levels, *Distachlis spicata* phenology, flooding, or other microhabitat factors. It will be important to effectively manage *Distachlis spicata* habitat for larval survival and growth. See recovery actions 2.2 and 2.4.

2.4 Determine population structure and dispersal distance of Carson wandering skippers at Honey Lake and Warm Springs Valleys and at the Douglas County sites. Understanding the structure of Carson wandering skipper populations is necessary for recovery. Populations could be independent demographic and genetic units with little or no dispersal among them (island model); the

populations could have independent dynamics but sufficient dispersal among them to recolonize after extinction events (metapopulation model), or movement among habitat patches may be extensive enough that dynamics are essentially correlated (single population model). Each of these population structures would require a different management approach. Because it is probably infeasible to determine dispersal distances with any precision and to make accurate estimates of population size in the Carson wandering skipper (see recovery action 2.2), an incidence-function approach following presence/absence at nectar sites over time is probably the most appropriate method for determining population structure. All nectar sites where the Carson wandering skipper has been found must be mapped accurately; these sites should be visited every year to determine the presence or absence of individuals. Over time, these data will allow estimation of annual colonization and extinction rates. These rate probabilities, plus the spatial arrangement of habitat patches and the distances among them, would provide insight into whether or not patch dynamics are synchronous or asynchronous, and whether or not asynchronous dynamics are correlated with distance.

Information on both daily and long-distance movements would be useful for determining population structure, habitat requirements and connectivity, and restoration opportunities. This information will be extremely difficult to obtain. Because of the difficulties with using capture-mark-release-recapture studies on the Carson wandering skipper (see recovery action 2.2), this approach is infeasible. One possibility is to monitor a surrogate, such as one of the other subspecies of *Pseudocopaeodes eunus*, to estimate dispersal distances. Another possibility is to place concentrations of nectar sources at increasing distances from known areas of adult concentration and monitor their use to determine movements.

2.5 <u>Determine the relationship between livestock grazing and the Carson wandering skipper and its habitat</u>. Livestock grazing is a major agricultural activity in Carson wandering skipper habitat

areas. Currently there is no information on what level of grazing and type of grazing management enhances or degrades habitats for the Carson wandering skipper. Differences in animal stocking rates (number and type of livestock per acre) and management (grazing early season, late season, year-long, high intensity/short duration, etc.) may improve, degrade, or have no significant effect on the quality of habitats for the Carson wandering skipper. Research on different grazing regimes, likely assisted by exclosure/seasonality manipulations, should occur on a smaller scale prior to any applications to larger-scale areas. The Service should work with universities, agricultural extension offices, government agencies, Farm Bureaus, non-governmental organizations, Cattlemen's Associations, and others to support research on the types of grazing management that are most beneficial or detrimental to the Carson wandering skipper (through the use of a surrogate). Livestock operators can use this information to determine what type and level of grazing can improve their lands for the Carson wandering skipper and which practices are least likely to result in conflicts between the Carson wandering skipper and livestock grazing. This research would be applied to the development of grazing management plans as encouraged in recovery action 1.9.

2.6 Develop a hydrologic model to better understand the relationship between surface and groundwater resources in Honey Lake and Warm Springs Valleys and at the Douglas County site. Habitat requirements of the Carson wandering skipper include the presence of *Distichlis spicata*, which usually grows in areas where the water table is near the surface. Since it is likely that suitable Carson wandering skipper habitat is related to water table depth, a numerical groundwater model should be constructed to evaluate the interactions between surface and groundwater. Activities include an inventory of current groundwater extraction wells and pumping records, mapping spring locations, placement of monitoring wells for measurement of water level fluctuations, conducting aquifer tests to ascertain the effects of groundwater

extraction on spring discharge, and collection of water quality data to attempt to correlate the presence of geothermal water with Carson wandering skipper habitat. These data can be incorporated into a numerical model used to evaluate the effects of groundwater fluctuations on spring discharge and shallow water tables.

2.7 Develop techniques for captive propagation with possible introduction/reintroduction to unoccupied, suitable sites. While many butterfly species have been raised in captivity, rearing them on a scale large enough for a successful introduction/reintroduction program is difficult and expensive. Inducing individuals to mate is often a limiting factor to continuous rearing. Hand pairing is often used, but the technique is tedious, impractical for rearing large numbers of individuals, and probably results in unwanted artificial selection. Successful introduction/reintroduction of the Carson wandering skipper is also highly problematic because we know so little about its ecological requirements. Success with recovery action 2.3 could facilitate the development of these techniques, but captive propagation and introduction/reintroduction as a conservation strategy should be used only as a last resort to prevent extinction of the subspecies.

2.8 Develop techniques for Carson wandering skipper habitat creation and enhancement. Because it is highly likely that the Carson wandering skipper requires *Distichlis spicata* with succulent, green leaves from March through June to complete its life cycle, adding enough water to *D. spicata* areas to keep the plants green should enhance larval habitat considerably. This could be done on a small scale with shallow wells and low-flow solar or wind-powered pumps. A predictable supply of water also would facilitate the availability of suitable nectar sources for adult Carson wandering skippers. The plants and the butterflies will very likely establish on enhanced sites on their own. Nectar sources also should be planted if appropriate.

3. Develop and implement an outreach program to keep local communities informed of the Carson wandering skipper's status and means to carry out recovery actions. Increasing public awareness of the Carson wandering skipper will assist efforts to protect and recover this subspecies.

3.1 Create an internet web site to provide information on the subspecies and the recovery process. A website will be created by Service to provide information on the Carson wandering skipper and the recovery process.

3.2 Prepare general information materials for the public. Regional and local information on Carson wandering skipper protection and recovery should be prepared and distributed to interested parties. These materials should include brochures and fact sheets that describe the status of the listed subspecies, its value and role in the environment, the importance of its habitats, and the efforts being undertaken for its recovery. Information related to recreational activities and possible impacts to the Carson wandering skipper and its habitat should be included. Public outreach also should include warnings to lepidopterists and other insect collectors that taking of specimens without proper authorization is a violation of the Endangered Species Act, which provides both criminal and civil penalties. Outreach materials should be distributed to affected landowners, schools, and other community facilities. Outreach methods also should involve working with the media, displaying exhibits at community centers, preparing school lesson plans, etc.

3.3 Use and develop kiosks at appropriate sites such as California Department of Fish and Game management areas, Honey Lake Conservation Team/California State Lands Commission lands, and California Department of Transportation Safety Roadside Rest Areas for educational material distribution. Education and outreach activities can be important tools in the recovery of threatened or endangered species, especially for little-known invertebrate species such as the Carson wandering skipper.

Educational programs encourage conservation and proper management. Brochures and other outreach materials should be made available to the public at local California Department of Fish and Game management areas and California Department of Transportation Safety Roadside Rest Areas kiosks. These materials should include a discussion of the importance of the subspecies to the region (*i.e.*, federally listed, restricted range, unique to the area) and how the public can assist in its recovery.

3.4 Encourage Resource Conservation Districts and cooperative extension to provide technical assistance to landowners to further land management activities to assist in Carson wandering skipper recovery. There are a variety of threats to the Carson wandering skipper that are linked to various activities on both public and private lands. Several agencies can provide land management and/or pest management recommendations to assist private landowners in the reduction of these threats and the recovery of the Carson wandering skipper. These include the Honey Lake Valley Resources Conservation District, the Natural Resources Conservation Service, University of California Cooperative Extension, University of Nevada Reno Cooperative Extension Service, and the Lassen County Agricultural Commissioner.

3.5 Foster community involvement and educational opportunities with schools, scouts, 4H, and other groups to assist in Carson wandering skipper recovery. An important component in the recovery of a species is community involvement. Schools, parents and teachers, youth groups, and other volunteer organizations are involved throughout California and Nevada in projects to restore fish and wildlife habitats on private lands and elsewhere. These activities have the dual purpose of educating the public about habitats and the species that use them while restoring and improving lands for fish and wildlife, including threatened and endangered species. In some cases schools have “adopted” a threatened or endangered species as a mascot, worked to learn about the species, and have taken a personal stake in its survival. As a result, fears

surrounding the species and its associated regulatory restrictions are lessened, the species gains habitat and public support, and prospects for recovery are enhanced. Federal, State, and local agencies, and other interested parties, are urged to reach out to a variety of schools and volunteer organizations to assist them in developing educational programs about the Carson wandering skipper and its life history and habitat needs, and to encourage schools and volunteer organizations to become involved in activities that foster its long-term survival.

3.6 Identify landowners with suitable habitat willing to assist in the recovery of the Carson wandering skipper. Landowners having suitable Carson wandering skipper habitat should be contacted to inquire about their interest in participating in the recovery of the Carson wandering skipper. Their assistance is important in the success of Carson wandering skipper recovery. Agencies will work with participants on a voluntary basis to provide technical assistance and inform participants of funding opportunities available. It is important to let private landowners make their own decisions and determine the level of participation they are willing to undertake. Also refer to recovery actions 1.11., 3.2, and 3.4.

4. Evaluate progress of recovery and effectiveness of management and recovery actions; revise management plans and recovery criteria as necessary.

4.1 Revise the recovery plan as appropriate at 5-year intervals. This plan should be updated or revised, as appropriate, at 5-year intervals to reflect current conditions and to incorporate new research findings.

4.2 Hold periodic stakeholder meetings to encourage information sharing. It is important to share information regarding research, habitat management techniques, monitoring, and success of adaptive management efforts. Recovery partners and other interested parties should be involved. Meetings should be held

when sufficient information has been gathered, possibly every 3 to 5 years.

III. Implementation Schedule

The Implementation Schedule that follows lists the actions and estimated costs for the recovery program for the Carson wandering skipper. It is a guide for meeting the recovery goals outlined in this plan. Parties with authority, responsibility, or expressed interest to implement a specific recovery action are identified in the Implementation Schedule. When more than one party has been identified the proposed lead party may be indicated by an asterisk (*). The listing of a party in the Implementation Schedule does not require, nor imply a requirement, that the identified party has agreed to implement the actions(s) or to secure funding for implementing the action(s). However, parties willing to participate may benefit by being able to show in their own budgets that their funding request is for a recovery action identified in an approved recovery plan and is therefore considered a necessary action for the overall coordinated effort to recover the Carson wandering skipper. Also, section 7(a)(1) of the Endangered Species Act directs all federal agencies to utilize their authorities in furtherance of the purposes of the Endangered Species Act by carrying out programs for the conservation of threatened and endangered species.

A. Key to Recovery Action Priority Numbers

Action priorities are set according to the following standards:

Priority 1: Those actions that must be taken to prevent extinction or to prevent the species from declining irreversibly;

Priority 2: Those actions that must be taken to prevent a significant decline in species populations/habitat quality or some other significant negative impact short of extinction; and

Priority 3: All other actions necessary to provide for full recovery of the species.

B. Codes used in the Implementation Schedule

Continual:	Action will be implemented on a periodic basis once begun.
Ongoing:	Action is currently being implemented and will continue until no longer necessary for recovery.
TBD:	To be determined
*	Primary responsible party: a party likely to take the lead, or have an especially large role in implementing a recovery action.

C. Key to Acronyms in Implementation Schedule

ACIN	Academic Institutions
APHIS	Animal and Plant Health Inspection Service
BLM	Bureau of Land Management
Caltrans	California Department of Transportation
COE	Army Corps of Engineers
CDFG	California Department of Fish and Game
CSLC	California Division of State Lands Commission
FWS	Fish and Wildlife Service
HLCT	Honey Lake Conservation Team
NDOT	Nevada Department of Transportation
NRCS	Natural Resources Conservation Service
SWAT	Lassen County Special Weed Action Team
UCCE	University of California Cooperative Extension
UNR	University of Nevada Reno
USDA	U.S. Department of Agriculture
WCDWR	Washoe County Department of Water Resources

Implementation Schedule for the Carson Wandering Skipper Draft Recovery Plan											
Recovery Action Priority	**Recovery Action Number**	**Recovery Action Description**	**Recovery Action Duration (years)**	**Responsible Parties**	**Cost Estimate (in $1,000 units)**						**Comments**
					Total Costs	**FY 07**	**FY 08**	**FY 09**	**FY 10**	**FY 11**	
1	1.1	Identify and map known occupied sites, especially those of suspected source populations	2	FWS CDFG UNR BLM HLCT	2 2 2 2 2	1 1 1 1 1	1	1 1 1 1			
1	1.2	Establish appropriate long-term management of occupied sites, especially those of suspected source populations	TBD	FWS CDFG BLM Landowners	TBD						
1	1.3	Identify and map spring sites important to the Carson wandering skipper	2	FWS CDFG UNR BLM HLCT	2 2 2 2 2	1 1 1 1 1	1	1 1 1 1			
1	1.4	Establish appropriate long-term management of important spring sites	TBD	FWS CDFG BLM Landowners	TBD						
1	1.8	Work with interested landowners, UCCE, and other interested parties to control *Lepidium latifolium* at occupied and potential sites	Ongoing	SWAT UCCE NRCS Landowners	--						Cost within existing budgets

Implementation Schedule for the Carson Wandering Skipper Draft Recovery Plan											
Recovery Action Priority	**Recovery Action Number**	**Recovery Action Description**	**Recovery Action Duration (years)**	**Responsible Parties**	**Cost Estimate (in $1,000 units)**						**Comments**
					Total Costs	**FY 07**	**FY 08**	**FY 09**	**FY 10**	**FY 11**	
1	1.11	Work with non-Federal interests to develop and implement Safe Harbor agreements, conservation agreements, habitat conservation plans, or other programs to protect, restore, enhance, and manage existing Carson wandering skipper populations and habitat as well as potential habitat	5	FWS* Landowners	25	5			5		
1	1.13	Coordinate with BLM to acquire additional habitat and water rights from a willing seller at the Washoe County, Nevada, Site #1 and develop a management plan	1	BLM	400		400				This property and 25 acre-feet of water rights were acquired by BLM in 2005
1	2.1	Develop and implement a program to survey for additional populations	3	FWS* UNR/ACIN BLM CDFG	25 25 25 25	8.3 8.3 8.3 8.3		8.3 8.3 8.3 8.3		8.3 8.3 8.3 8.3	

Implementation Schedule for the Carson Wandering Skipper Draft Recovery Plan											
Recovery Action Priority	**Recovery Action Number**	**Recovery Action Description**	**Recovery Action Duration (years)**	**Responsible Parties**	**Cost Estimate (in $1,000 units)**						**Comments**
					Total Costs	**FY 07**	**FY 08**	**FY 09**	**FY 10**	**FY 11**	
1	2.2	Develop and implement a monitoring program for known populations and habitat for trends and threats	20	FWS* UNR/ACIN BLM CDFG HLCT	100 100 100 100 100	5 5 5 5 5	5 5 5 5 5	5 5 5 5 5	5 5 5 5 5	5 5 5 5 5	
1	2.3	Better understand ecological (including specific habitat needs) and life history requirements of the Carson wandering skipper	2	FWS* UNR/ACIN BLM CDFG HLCT/CSLC	150	75	75				
1	2.4	Determine population structure and dispersal distance of Carson wandering skipper in Honey Lake and Warm Springs Valleys and at the Douglas County site	3	FWS* UNR/ACIN BLM CDFG HLCT/CSLC	250			83.3	83.3	83.3	
1	3.6	Identify landowners with suitable habitat willing to assist in the recovery of Carson wandering skipper	1	FWS* BLM NRCS	1 1 1	1	1 1				
2	1.5	Support mapping of *Lepidium latifolium* by Federal, State, local agencies, and other interested parties	2	SWAT* UCCE NRCS HLCT	12.5 12.5 12.5 12.5		6.25 6.25 6.25 6.25	6.25 6.25 6.25 6.25			

Implementation Schedule for the Carson Wandering Skipper Draft Recovery Plan											
Recovery Action Priority	**Recovery Action Number**	**Recovery Action Description**	**Recovery Action Duration (years)**	**Responsible Parties**	**Cost Estimate (in $1,000 units)**						**Comments**
					Total Costs	**FY 07**	**FY 08**	**FY 09**	**FY 10**	**FY 11**	
2	1.6	Support control of *Lepidium latifolium* by Federal, State local agencies, and other interested parties	Ongoing	SWAT UCCE NRCS Landowners	750 750 750 750			150 150 150 150	150 150 150 150	150 150 150 150	
2	1.7	Support monitoring of *Lepidium latifolium* by federal, state, local agencies, and other interested parties	Continual	SWAT UCCE NRCS HLCT	8 8 8 8				2 2 2 2		
2	1.12	Coordinate with State wildlife resource agencies to provide Federal section 6 funds to be used by the states to carry out species recovery actions	Continual	FWS* CDFG NDOW	TBD						
2	1.14	Seek to acquire additional occupied or potential habitat from willing sellers, when possible, through fee acquisitions	Continual	TBD	TBD						
2	1.15	Conduct Endangered Species Act section 7 consultations to protect and enhance Carson wandering skipper populations and habitat	Ongoing	FWS* BLM, FHWA, DOD, DOJ, COE, NRCS, APHIS	--						Costs within existing budgets

Implementation Schedule for the Carson Wandering Skipper Draft Recovery Plan											
Recovery Action Priority	**Recovery Action Number**	**Recovery Action Description**	**Recovery Action Duration (years)**	**Responsible Parties**	**Cost Estimate (in $1,000 units)**						**Comments**
					Total Costs	**FY 07**	**FY 08**	**FY 09**	**FY 10**	**FY 11**	
2	2.5	Determine the relationship between livestock grazing and the Carson wandering skipper and its habitat	3	UCCE NRCS ACIN Ag Agencies	7.5 7.5 7.5 7.5			2.5 2.5 2.5 2.5	2.5 2.5 2.5 2.5	2.5 2.5 2.5 2.5	
2	3.4	Encourage Resource Conservation Districts and cooperative extension to provide technical assistance to landowners to further land management activities to assist in Carson wandering skipper recovery	Continual	Federal/State Agencies	--						Costs within existing budgets
3	1.9	Work with interested landowners of occupied sites to develop livestock grazing management plans to enhance habitat conditions for the Carson wandering skipper	2	FWS UCCE NRCS BLM Ag Agencies Landowners	10						

Implementation Schedule for the Carson Wandering Skipper Draft Recovery Plan											
Recovery Action Priority	**Recovery Action Number**	**Recovery Action Description**	**Recovery Action Duration (years)**	**Responsible Parties**	**Cost Estimate (in $1,000 units)**						**Comments**
					Total Costs	**FY 07**	**FY 08**	**FY 09**	**FY 10**	**FY 11**	
3	1.10	Coordinate with federal, state, and local agencies to address issues of large-scale ground water pumping to ensure adverse impacts to the Carson wandering skipper do not occur	Ongoing	WCDWR	--						Costs within existing budgets
3	1.16	Coordinate with the COE to avoid, minimize, or compensate for impacts to *Distichlis* and wetland habitat in relation to section 404 of the Clean Water Act activities	Ongoing	COE* FWS	--						Costs within existing budgets
3	1.17	Coordinate with Caltrans and CDFG regarding implementation of the Honey Lake Mitigation Bank in consideration of the Carson wandering skipper	Ongoing	FWS CDFG* Caltrans	--						Costs within existing budgets

Implementation Schedule for the Carson Wandering Skipper Draft Recovery Plan											
Recovery Action Priority	**Recovery Action Number**	**Recovery Action Description**	**Recovery Action Duration (years)**	**Responsible Parties**	**Cost Estimate (in $1,000 units)**						**Comments**
					Total Costs	**FY 07**	**FY 08**	**FY 09**	**FY 10**	**FY 11**	
3	1.18	Coordinate with the Honey Lake Conservation Team/California State Land Commission on the management of their lands adjacent to Honey Lake in consideration of the Carson wandering skipper	5	FWS* BLM CDFG	--						Costs within existing budgets
3	2.6	Develop a hydrologic model to better understand the relationship between surface and groundwater resources in Honey Lake and Warm Springs Valleys and at the Douglas County site	7	WCDWR	700	100	100	100	100	100	
3	2.7	Develop techniques for captive propagation with possible introduction/ reintroduction to unoccupied, suitable sites	2	FWS* UNR/ACIN	100						Costs for technique development. Need for augmentation to be assessed; partners not identified at this time

Implementation Schedule for the Carson Wandering Skipper Draft Recovery Plan											
Recovery Action Priority	**Recovery Action Number**	**Recovery Action Description**	**Recovery Action Duration (years)**	**Responsible Parties**	**Cost Estimate (in $1,000 units)**						**Comments**
					Total Costs	**FY 07**	**FY 08**	**FY 09**	**FY 10**	**FY 11**	
3	2.8	Develop techniques for Carson wandering skipper habitat creation and enhancement.	4	FWS BLM UNR NRCS CDFG	8 8 8 8 8					2 2 2 2 2	
3	3.1	Create an internet web site to provide information on the subspecies and the recovery process	1	FWS	1	1					
3	3.2	Prepare general information materials for the public	1	FWS	3	3					
3	3.3	Use and develop kiosks at appropriate sites for educational material distribution	1	Caltrans CDFG HSLT CSLC	2	2					
3	3.5	Foster community involvement and educational opportunities with schools, scouts, 4H, and other groups to assist in Carson wandering skipper recovery	Continual	FWS* BLM NRCS UCCE CDFG	8 8 8 8 8	1	1 1 1 1	1 1 1 1 1			
3	4.1	Revise the recovery plan as appropriate at 5-year intervals	Periodic	FWS	20					5	

Implementation Schedule for the Carson Wandering Skipper Draft Recovery Plan											
Recovery Action Priority	**Recovery Action Number**	**Recovery Action Description**	**Recovery Action Duration (years)**	**Responsible Parties**	**Cost Estimate (in $1,000 units)**						**Comments**
					Total Costs	**FY 07**	**FY 08**	**FY 09**	**FY 10**	**FY 11**	
3	4.2	Hold periodic stakeholder meetings to encourage information sharing	Continual	FWS	1					1	
Total estimated cost of recovery over 20 years: $5,551,500											

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Appendix A. Summary of Threats and Recommended Recovery Actions

Listing Factor	Threat	Recovery Criteria	Recovery Action Numbers
A	Development (urban, residential, road)	A(1,2) B(1,2,3,5,6)	1.1; 1.2; 1.3; 1.4; 1.11; 1.13; 1.14; 1.15; 2.8; 3.1; 3.2; 3.5; 3.6; 4.1; 4.2
A	Wetland loss	A(1,2) B(1,2,3,5,6)	1.2; 1.4; 1.10; 1.11; 1.12; 1.13; 1.14; 1.16; 1.17; 1.17; 2.8; 3.1; 3.2; 3.3; 3.4; 3.5; 3.6; 4.1; 4.2
A	Agricultural practices	A(1,2) B(1,2,3,5,6)	1.2; 1.4; 1.5; 1.6; 1.7; 1.8; 1.9; 1.10; 1.11; 1.12; 1.16; 2.5; 2.8; 3.1; 3.2; 3.4; 3.5; 3.6; 4.1
A	Gas and geothermal development	A(1,2) B(1,2,3,5,6)	1.1; 1.2; 1.11; 1.14; 1.15; 2.3; 2.8; 3.1; 3.2; 3.4; 3.5; 3.6; 4.1; 4.2
A	Nonnative plant invasion	B(4,5,6)	1.5; 1.6; 1.7; 1.8; 1.9; 1.11; 1.12; 1.15; 1.16; 1.17; 1.18; 2.8; 3.1; 3.2; 3.3; 3.4; 3.5; 3.6; 4.1; 4.2
A	Water exportation	A(1,2) B(1,2,3,5,6)	1.3; 1.4; 1.8; 1.9; 1.10; 1.11; 1.12; 1.15; 1.16; 1.17; 2.6; 3.1; 3.2; 3.3; 3.4; 3.5; 3.6; 4.1; 4.2
B	Collection	A(1,2) B(1,2,3,5,6)	1.2; 3.1; 3.2; 3.3; 3.5; 4.2
B	Recreation	A(1,2) B(1,2,3,5,6)	1.2; 1.4; 1.11; 1.12; 1.13; 1.14; 1.15; 1.16; 1.17; 1.18; 3.1; 3.2; 3.3; 3.4; 3.5; 4.1; 4.2
C	Disease, predation	N/A	N/A
D	Inadequate regulatory mechanisms	N/A	Beyond scope of recovery plan; would require legislation changes
E	Use of pesticides/insecticides	A(1,2) B(1,2,3,5,6)	1.6; 1.8; 1.11; 1.12; 1.13; 1.17; 1.18; 3.1; 3.2; 3.3; 3.4; 3.5; 3.6; 4.1; 4.2
E	Stochastic events, small population size	A(1,2) B(1,2,3)	1.2; 1.4; 1.9; 1.10; 1.11; 1.12; 1.13; 1.14; 1.16; 1.17; 1.18; 2.1; 2..2; 2.3; 2.4; 2.5; 2.7; 2.8; 3.4; 3.5; 3.6

Listing Factors:

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

B. Overutilization for Commercial, Recreational, Scientific, Educational Purposes

C. Disease or Predation (no known diseases; predation not known to be a threat at this time)

D. The Inadequacy of Existing Regulatory Mechanisms

E. Other Natural or Manmade Factors Affecting Its Continued Existence

Recovery Criteria

A. Downlisting criteria

(1) For the Lassen County, California, population/metapopulation and one of the three known Nevada populations or a comparable newly discovered population, management has been established in perpetuity to effectively address threats to the species and ensure persistence of the populations. The population in Nevada must have been occupied for 6 years out of the most recent 10-year sequence with no downward trend in abundance. In California, suitable habitat patches equivalent to 50 percent or more of the currently known suitable habitat patches must be managed to effectively address threats, and each of these habitat patches must have been occupied for 6 years out of the most recent 10-year sequence with no downward trend in abundance across the population/metapopulation.

(2) Adaptive management plans have been developed and implemented with adequate long-term funding, either individually or comprehensively, for the two populations in downlisting criterion #1. These plans must address appropriate management for the Carson wandering skipper with regards to habitat and land uses that may affect habitat quality, including but not limited to development (urban, residential, water, gas and geothermal), livestock grazing, recreation, invasive plant control, pesticide use, and public education.

B. Delisting criteria

(1) For the Lassen County, California, population/metapopulation and two of the three known Nevada populations or comparable newly discovered populations, management has been established in perpetuity to effectively address threats to the species and ensure persistence of the populations. Each population in Nevada must have been occupied for 6 years out of the most recent 10-year sequence after downlisting criteria are met, with no downward trend in abundance. In California, suitable habitat patches equivalent to 75 percent or more of the currently known suitable habitat patches must be managed to effectively address threats, and each of these habitat patches must have been occupied for 6 years out of the most recent 10-year sequence after downlisting criteria are met, with no downward trend in abundance across the population/metapopulation. Appropriate landscape connectivity must exist among patches (*i.e.*, land use between most sites is considered open space and not urban or suburban) in order to facilitate potential movement of the Carson wandering skipper among patches.

(2) Adaptive management plans have been developed and implemented with adequate long-term funding, either individually or comprehensively, for the three populations in delisting criterion #1. These plans must address appropriate management for the Carson wandering skipper with regard to habitat and land uses that may affect habitat quality, including but not limited to development (urban, residential, water, gas, and geothermal), livestock grazing, recreation, invasive plant control, pesticide use, and public education.

(3) In addition to the populations in delisting criterion #1, for at least one additional Carson wandering skipper population or metapopulation, including a known population or any that may be discovered or established within Carson wandering skipper historical range, management has been established in perpetuity to effectively address threats to the species and ensure persistence of the population, unless we conclude (through intensive, comprehensive surveying) that additional populations or metapopulations do not exist and it would not be ecologically feasible to establish/reestablish one or more of them within Carson wandering skipper historical range.

(4) *Lepidium latifolium* invasion into known and presumed suitable habitat for the Carson wandering skipper has been eliminated or reduced and managed to levels that do not pose a threat to the persistence of the Carson wandering skipper.

(5) A long-term conservation plan and conservation agreements have been developed to guide management throughout the range of the Carson wandering skipper after it has been delisted.

(6) A monitoring plan to cover a minimum of 5 years post-delisting of the Carson wandering skipper has been developed and is ready to be implemented to ensure the ongoing conservation of the species and the continuing effectiveness of management actions.

Appendix B. Glossary of Terms Used in the Recovery Plan

adaptive management a type of natural resource management in which decisions are made as part of an ongoing science-based process. Adaptive management involves testing, monitoring, and evaluating applied strategies, and incorporating new knowledge into management approaches that are based on scientific findings and the needs of society. Results are used to modify management policy, strategies, and practices.

anterior near or toward the head

apex on the wing near its tip

basal on the wing near its base

broods generations per year

cell any area between wing veins in an insect; each cell is designated by the vein in front of it

costal side of the wing toward the body

critical habitat the specific areas within the geographical area currently occupied by a species, at the time of listing, on which are found physical and biological features essential to the conservation of the species and that may require special management considerations or protections; and specific areas outside of the geographic area occupied by a species at the time of listing upon determination by the Secretary of the Department of Interior that such areas are essential for the conservation of the species

diapause	a natural state of suspended development at any life stage
discal	an area in the center of a butterfly wing
distal	away from the point of attachment
dorsal	the upper surface
endangered	a species which is in danger of extinction throughout all or a significant portion of its range
extant	in existence
extinction	complete disappearance or death of a species throughout its entire range
extirpated	the disappearance of a species from a portion of its range
flight season	period of time during which a single generation of adults appear
forewing	the front wing of a butterfly
habitat conservation plan	a plan developed for land management to meet Federal requirements for obtaining an incidental take permit pursuant to section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended
habitat patch	a discrete geographic area containing habitat/landscape characteristics associated with Carson wandering skipper occupancy, such as green *Distichlis spicata*, nectar sources, and springs or other water sources. At this time it is not known how many presumed suitable habitat patches exist or where they are located. The spatial extent of suitable habitat patches, distances between

them, and the extent of suitable migration corridors are also not currently known.

hind wing the rear wing of a butterfly

larva (plural larvae) the immature and wingless form (caterpillar) that hatches from the egg of a holometabolous insect (an insect that develops by metamorphosis from larva to adult). The larva will eventually transform into a pupa before reaching adulthood.

local population set of individuals which all interact with each other with a high probability

local scale the scale at which individuals move and interact with each other in the course of their routine feeding and breeding activities

metapopulation set of local populations which interact via individuals moving among populations

metapopulation scale the scale at which individuals infrequently move from one place (populations) to another, typically across habitat types which are not suitable for their feeding and breeding activities, and often with substantial risk of failing to locate another suitable habitat patch in which to settle

micro-habitat a small specialized habitat

micro-topographic pertaining to slight irregularities of a land surface

nectar sugar secretion of a plant. Nectar attracts insects and birds which pollinate the flowers on the plant.

nectar sites	areas where the adult Carson wandering skipper has been observed feeding on flowering plants. Carson wandering skippers are most readily observed when nectaring on plants during their flight season. These areas vary in size and offer a food resource but may or may not provide the other necessary life history requirements of the Carson wandering skipper.
occupied habitat	areas utilized for breeding, feeding, and shelter, and adjoining dispersal corridors
pluvial	formed by the action of rainfall
population	a group of individuals in a locality that interbreed when mature
posterior	away from the head
protect	to guard against loss; *i.e.*, effectively counteract threats to assure the persistence of a population. Carson wandering skipper habitat may be protected through such means as land acquisition from willing sellers, conservation agreements, management agreements, or by other means.
proximal	next to the point of attachment
pupa (plural pupae)	stage between larva and adult
range	geographic area occupied by a species or subspecies
recovery	improvement in the status of a listed species to the point where listing is no longer appropriate under the criteria established in the Endangered Species Act
senescence	aging

silked-leaf nest	larvae of the Hesperiidae family can silk together a leaf tube where most larvae live and pupate. The pupa may rest in a Y-shaped silk girdle inside this leaf nest.
source populations	populations in high-quality habitat where birth rates exceed death rates and surplus individuals disperse to other areas as migrants
species	as defined by the Endangered Species Act, a species includes any subspecies of fish or wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife which interbreeds when mature
subspecies	a group of interbreeding natural populations differing taxonomically and by gene pool characteristics, often isolated geographically from other such groups within a biological species
stochastic	random or chance variables
threatened	a species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range
type locality	the locality where the specimen from which a species was named was collected
vein	any of the riblike structures that form the framework of an insect's wing
ventral	the bottom surface

Appendix C. Summary of Comments on the Draft Recovery Plan

On March 2, 2006, the Service released the Draft Recovery Plan for the Carson Wandering Skipper for a 90-day public comment period that ended on May 31, 2006, for Federal agencies, state and local governments, and members of the public (71 FR 10703). In addition, we solicited comments on the recovery plan from three independent peer reviewers.

Comments were received from all three peer reviewers. These comments, where appropriate, have been incorporated into the text of the recovery plan. In addition, we offer the following discussion in the interest of providing a fuller explanation and response to certain specific comments. We received no comments from the public.

1. **Comment**: One peer reviewer suggested a post-delisting period of 10 years rather than 5 years. **Response**: This length of time was not changed in the recovery plan. A post-delisting monitoring period of not less than 5 years, as required by section 4(g) of the Endangered Species Act, is a reasonable period of time to continue to monitor a species after delisting to ensure ongoing recovery and continued effectiveness of management actions. Additionally, this period is stated in the recovery plan as a "minimum" period of 5 years.

2. **Comment**: One peer reviewer thought the inclusion of an abundance criterion seemed inconsistent with the rest of the draft recovery plan as habitat suitability and occupancy seemed to be selected as the major indicators of Carson wandering skipper status. **Response**: It is correct that habitat suitability and occupancy are a part of the recovery criteria for downlisting and delisting of the Carson wandering skipper. In the Recovery Strategy section of the plan, we indicate the need for a better understanding of normal population fluctuations, trends, and movements into or out of changing habitats. While using actual numbers of individuals as a recovery criterion is inappropriate because of the natural fluctuation of butterfly abundance due to various factors, including population trend information can be informative. The criteria for downlisting and delisting include both of these criteria as well as additional ones.

3. **Comment**: One peer reviewer questioned whether Recovery Action Number 3.6 (identify landowners with suitable habitat) in the Implementation Schedule should be an ongoing action instead of a 1-year action. **Response**: The intention is to make an initial concerted effort to contact landowners with suitable habitat to inquire about their interest in participating in the Carson wandering skipper's recovery. We recognize that as more information is obtained about the Carson wandering skipper and its habitat, there is a potential for additional habitat to be located over time. Additional landowner contacts may be necessary at a later time.