Carson Wandering Skipper
(Pseudocopaeodes eunus obscurus)

5-Year Review:
Summary and Evaluation

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U.S. Fish and Wildlife Service
Nevada Fish and Wildlife Office
Reno, Nevada

August 27, 2012

5-YEAR REVIEW

Carson wandering skipper *(Pseudocopaeodes eunus obscurus)*

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Subspecies Overview:

As summarized from the recovery plan for this subspecies (Service 2007), the Carson wandering skipper (*Pseudocopaeodes eunus obscurus*, CWS) is a small butterfly in the subfamily Hesperiinae (grass skippers). 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. These areas are characterized by having an elevation of less than 1,524 meters (m) (5,000 feet (ft)), presence of *Distichlis spicata* (L.) Greene (saltgrass) (Hickman 1993), nectar sources in open areas near springs or other water sources, and a possible association with geothermal activity.

At the time of listing in 2001, two extant populations were known, one in Washoe County, Nevada, and one in Lassen County, California. A third known population, from Carson City, Carson City County, Nevada, is considered extirpated as of 1998. In 2004, one additional population was located south of Carson City, along the Carson River in Douglas County, Nevada. In 2005, a second population in Washoe County was confirmed. Therefore, there are four extant populations of the CWS.

Methodology Used to Complete This Review:

This review was prepared by the Nevada Fish and Wildlife Office (NFWO), following the Region 8 guidance issued in March 2008. We used information from the recovery plan and surveys conducted by experts who have been monitoring various localities of this subspecies. The

recovery plan and information available in our files were our primary sources of information used to update the subspecies' status and threats. We received one correspondence from the public (State of California, Department of Justice) in response to our Federal Register notice initiating this 5-year review. This 5-year review contains updated information on the subspecies' biology and threats, and an assessment of that information compared to that known at the time of listing. We focus on current threats to the subspecies that are attributable to the Act's five listing factors. The review synthesizes all this information to evaluate the listing status of the subspecies and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

Contact Information:

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Cooperating Field Office: David Kelly, Sacramento Fish and Wildlife Office, (916) 414-6492.

Federal Register (FR) Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register on March 5, 2008 (73 FR 11945, Service 2008). We received one response to the Federal Register notice regarding this subspecies.

Listing History:

Emergency Listing
FR Notice: 66 FR 59537
Date of Emergency Rule: November 29, 2001
Entity Listed: Carson wandering skipper (*Pseudocopaeodes eunus obscures*), an insect subspecies
Classification: Endangered

Final Listing
FR Notice: 67 FR 51116
Date of Final Listing Rule: August 7, 2002
Entity Listed: Carson wandering skipper (*Pseudocopaeodes eunus obscures*), an insect subspecies
Classification: Endangered

Review History: There have been no 12-month status reviews, 5-year reviews, or other relevant documents that contain a five-factor analysis and conclusion previously completed for this subspecies.

Subspecies' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for the CWS is *3C* according to the Service's 2011 Recovery Data Call for the NFWO, based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). This number indicates that the taxon is a subspecies that faces a high degree of threat and has a high potential for recovery. The "C" indicates conflict with construction or other development projects or other forms of economic activity.

Recovery Plan

> **Name of Plan:** Recovery Plan for the Carson Wandering Skipper (*Pseudocopaeodes eunus obscurus*)
> **Date Issued:** June 14, 2007

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Act defines "species" as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as DPSs to species of vertebrate fish or wildlife. Because the subspecies under review is an invertebrate, the DPS policy is not applicable, and the application of the DPS policy to the subspecies' listing is not addressed further in this review.

Information on the Subspecies and its Status

Subspecies Biology and Life History

Little is known about the life history and ecology of the CWS. During summer (June and July), females lay their cream-colored eggs on *Distichlis spicata*, the larval host plant (Garth and Tilden 1986, Scott 1986). The CWS apparently requires *D. spicata* with succulent, green leaves from March through June to complete its life cycle.

Limited observations have been made of the early life stages of the CWS. However, the CWS's life cycle is likely similar to other species and subspecies of the subfamily Hesperiinae. Larvae (caterpillars) of the Hesperiinae live in silked-leaf nests, and some species make their nests partially underground; larvae generally hibernate during winter (Scott 1986). Carson wandering skipper larvae have a light green body with a distinctive black collar below the head (Honey Lake Conservation Team (HLCT) 2006); the head is a rusty brown orange color. Some larvae may be able to extend their period of diapause (a natural state of suspended development at any life stage) for more than one season depending on the individual and environmental conditions (P. Brussard, University of Nevada Reno (UNR), pers. comm. 2001). Generally, pupae rest in the larval nest (Scott 1986). After several instar stages, the pupae emerge as adults in May or June (Sanford 2006a). The life span of an adult CWS is possibly 1-2 weeks, but they may live longer where abundant nectar sources exist with minimal habitat disturbance (Sanford 2006a).

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 from late July to late September (Austin and Emmel 1998). During 1998 CWS surveys (Brussard *et al.* 1999), the formerly occupied Carson City site and the two occupied sites (Washoe County, Nevada; Lassen County, California) were visited in June and July and again in August and September to look for second broods; none were found.

Spatial Distribution

The subspecies occupies areas located in a region east of the Sierra Nevada in northwestern Nevada and northeastern California at elevations of less than 1,524 m (5,000 ft). The subspecies' distribution likely represents a remnant of a more widely distributed complex of populations in the western Lahontan Basin (Brussard *et al.* 1999). The CWS was first collected in Carson City in 1965 north of U.S. Highway 50 in Carson City (Ormsby) County, Nevada; several years later, a northern extension of this population was discovered (Brussard *et al.* 1999). The Carson Hot Springs drainage meanders through this general area. The site supports *Distichlis spicata* and areas of *Thelypodium crispum* (native mustard), the only known nectar source present. Habitat at this site has been greatly modified since 1965, primarily due to drainage manipulations for residential and commercial development (Brussard *et al.* 1999). In the 1990's, available habitat was reduced to approximately 8 hectares (ha) (20 acres (ac)) (Brussard *et al.* 1999) and completely surrounded by development. Highway construction completed in 2006 impacted an estimated 2 ha (6 ac) of CWS habitat remaining within the site (P. Frost, Nevada Department of Transportation, *in litt.* 1998; M. Haworth, Service, pers. obs. 2006). This site is now considered unoccupied and the CWS population extirpated (see Abundance below).

It is possible that the distribution of CWS associated with this site once extended from the Carson Hot Springs to the Carson River. Outflow from the springs likely maintained a water table high enough to support *Distichlis spicata* and a variety of nectar sources. However, urban development, water diversions, and wetland manipulations have also eliminated most of the suitable habitat in this larger area (Brussard 2000).

A 1970's CWS collection record exists for Lassen County, California, but the location details are described as vague (Brussard *et al.* 1999; Brussard, pers. comm. 2001). Specimens historically collected from two additional sites, Dechambeau Hot Springs at Mono Lake and Hot Springs, Mono County, California, were also originally assigned to the CWS subspecies, but with uncertainty due to the small numbers of specimens (Austin and Emmel 1998). Based on 1998 surveys (Brussard *et al.* 1999), these Mono County specimens would be more appropriately assigned to a currently undescribed skipper subspecies (G. Austin, Nevada State Museum and Historical Society, pers. comm. 2001). Therefore, these two Mono County sites are not discussed further in this 5-year review for CWS.

At the time of listing, only two extant populations were known, one in Washoe County, Nevada, and one in Lassen County, California. These populations were discovered in 1998 during surveys throughout potential suitable habitat in Nevada and California (Brussard *et al*. 1999). 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 Honey Lake Valley sites are

located about 8 kilometers (km) (5 miles (mi)) apart and could be in the area where skippers were collected in Lassen County during the 1970's (Brussard, pers. comm. 2001).

It is possible that additional CWS nectar sites once existed within the 120 km (75 mi) between the populations in Lassen and Washoe Counties (Brussard, pers. comm. 2001). Habitat between these populations has become increasingly unsuitable and fragmented due to natural drying and human activity, and they may now be isolated from one another. Other populations, outside of the area between these Lassen and Washoe County populations, were not found in 2000 or 2001, despite additional limited surveys (Brussard, pers. comm. 2000; R. Niell, UNR, pers. comm. 2002).

Currently, there are four extant populations of CWS, two in Washoe County and one in Douglas County, Nevada; and one in Lassen County, California (Figure 1). The two new populations in Nevada were discovered during 2004. The CWS population in Honey Lake Valley in Lassen County is larger than the three populations in Nevada combined in terms of spatial distribution and amount of habitat. The known spatial distribution and available habitat of the Lassen County population has been greatly expanded based primarily on surveys of Honey Lake shoreline areas during 2004-2008. During 2004, 23 nectar sites were found (HLCT 2005). In 2005, CWS were observed at 18 sites, including 2 new sites in the Southern Shore Island area. In 2006, 2007, and 2008, CWS were observed at 20 (HLCT 2007), 22 (HLCT 2009), and 21 sites (HLCT 2010), respectively. These new (2004-2008) occupied nectar sites are grouped into six general areas around Honey Lake: Cross Depot Access, North Shore, East Shore, Northern Shore Island, Western Shore Island, and Southern Shore Island (HLCT 2006). Distances between the nearest nectar sites may be within the dispersal range of adult CWS. A complete description of all four extant Nevada and California populations and their associated nectar sites is provided in the recovery plan (Service 2007). However, brief summaries of nectar sites associated with the four populations are provided below and in Tables 1 and 2.

Nevada

Washoe County Populations

Washoe County Site #1 - Warm Springs Valley. This site is located about 37 km (23 mi) north of Reno. This site was discovered in 1998 and included a combination of Bureau of Land Management (BLM) and private lands, split almost evenly in area (Brussard *et al.* 1999). In 2005, 32 ha (80 ac) of the private property with the nectar site were acquired by the BLM through Southern Nevada Public Land Management Act (Public Law 105-263) funding (W. Devaurs, BLM, *in litt*. 2005). Because land management activities differed between the public and formerly private parcels, we distinguish between the two halves of Site #1 (BLM and Private) when appropriate. The nectar source *Pyrrocoma racemosus* (racemose golden-weed) is abundant throughout the site, as is *Distichlis spicata*. A small drainage way meanders through the site. Springs are located within about 1.6 km (1 mi) of the nectar areas (Service 2007).

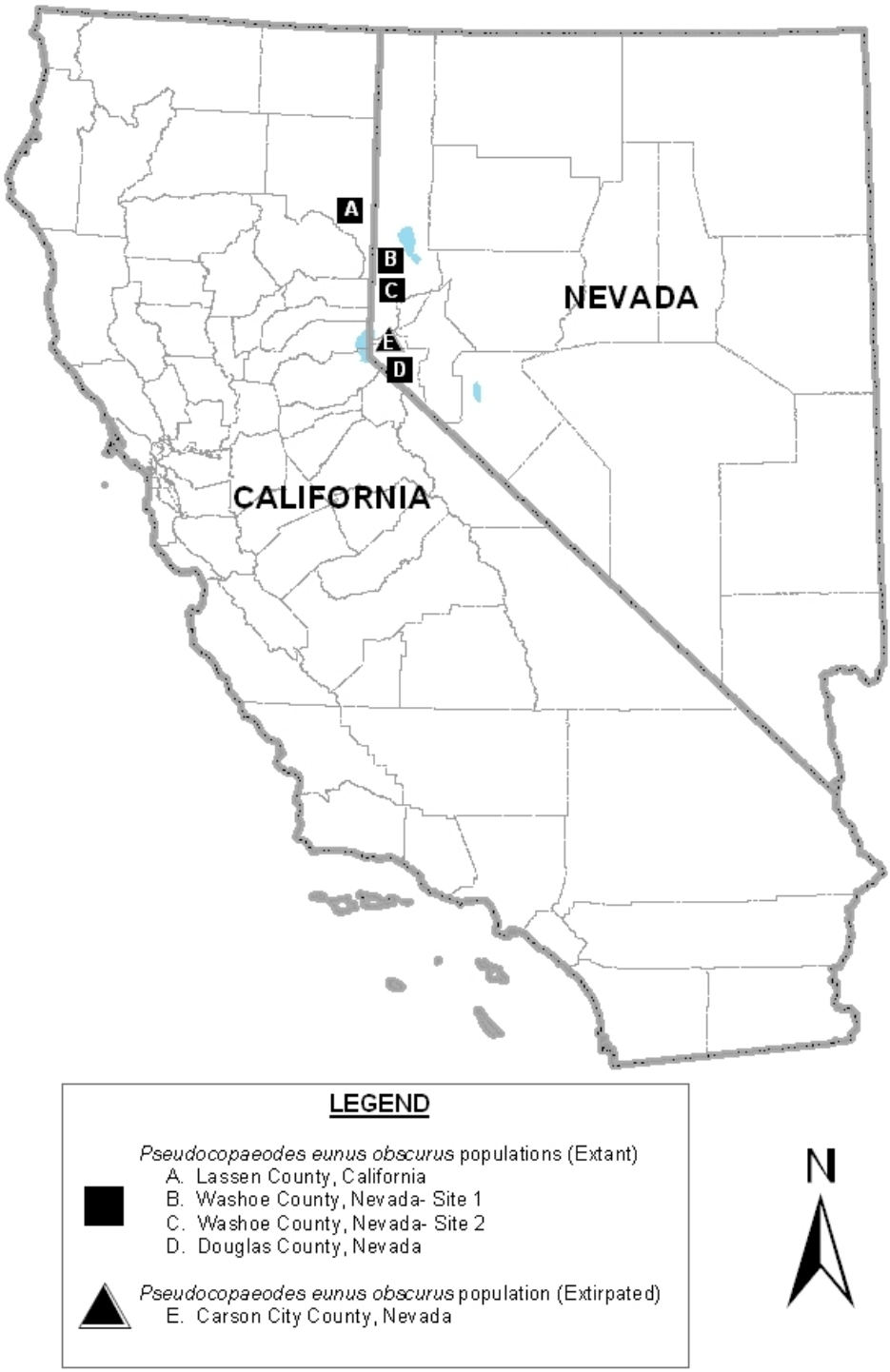

Figure 1. General locations of extant and extirpated populations of the Carson wandering skipper.

Washoe County Sites #2A and #2B - Spanish Springs Valley. This area in Spanish Springs Valley is approximately 16 km (10 mi) south of the site found in adjacent Warm Springs Valley and is located about 5 km (3 mi) north of the Reno/Sparks area. This area was former ranch land that is being converted to areas of commercial and urban development. Washoe County Sites #2A and #2B are located adjacent to one another. The North Truckee Drain (a ditch that returns former irrigation flows and now urban runoff back to the Truckee River located to the south) runs through portions of both properties. A small dam at the southern end of Washoe County Site #2B provides some flood control capabilities for the Spanish Springs area, which could result in some flooding of this site. Manmade wetlands with vegetation and associated water management control structures (formerly constructed for waterfowl hunting) provide wetland habitat on Washoe County Site #2B. Springs occur approximately 6 and 13 km (4 and 8 mi) away from #2A and #2B (Service 2007).

Spanish Springs Valley Site #2A was found in 2004 when a single male CWS was observed nectaring on *Cleomella plocasperma* (small-flowered cleomella) (D. Murphy, UNR, *in litt*. 2004; Murphy, pers. comm. 2004). This nectar source and others such as *Pyrrocoma racemosus, Lotus corniculatus* (bird's foot trefoil)[1], and *Sisymbrium altissimum* (tumble mustard) occur in scattered areas over the 16-ha (40-ac) private property.

In 2005, adjacent undeveloped private land (Spanish Springs Valley #2B) was surveyed and CWS were present (Haworth *et al*., unpubl. data 2005). *Cleomella plocasperma* also occurs in patches on this 81-ha (200-ac) property.

Table 1. Occupied Carson wandering skipper (CWS) nectar sites for populations in Nevada.

CWS Population	Nectar Site	Current Land Ownership	Overall Site Size (ha/ac)	Nectar Site Size (ha/ac)	Elevation (m/ft)
Washoe County	Warm Springs Valley (#1)	Federal	130/321	12/30	1,290/4,233
	Spanish Springs Valley (#2A)	Private	16/40	2/5	1,359/4,459
	Spanish Springs Valley (#2B)	Private	81/200	20/49	1,359/4,459
	Flanigan (#3)	Private	283/699	0.4/0.99	1,212/3,977
Douglas County	Carson River	Federal/City/ State	51/125 (for 3 areas)	unknown	1,420/4,659

Washoe County Site #3 - Flanigan. This site occurs in the eastern portion of Honey Lake Valley which occurs along the border of California and Nevada in Lassen and Washoe Counties, respectively. Honey Lake Valley lies to the northwest of adjacent Warm Springs Valley. In 2004, a single male CWS was observed on *Distichlis spicata* along the southeastern boundary of a dry alkali flat (East Alkali Flat) located south of Flanigan, Nevada (Sanford 2004).

[1] *Lotus* occurrences are referred to as *L. corniculatus* in this 5-year review, although identification to species is possibly ambiguous. According to The Jepson Manual (Hickman 1993: 618-619), "In Eur, diploid *L. tenuis* Willd. is segregated [from *L. corniculatus*]; it seems indistinguishable in CA."

The other vegetation in the area was composed of *Sarcobatus vermiculatus* (greasewood), with some *Artemisia* sp. (sagebrush), and potential nectar sources included *Sisymbrium altissimum* and *Medicago sativa* (alfalfa) (Sanford 2004). In 2006, East Alkali Flat held water and other potential nectar sources noted were *Cryptantha* sp. (cryptantha) and *Suaeda* sp. (seepweed) (Sanford 2006b).

Douglas County Population

Carson River Site. In 2004, a CWS population was found along the Carson River on BLM land (Murphy, *in litt*. 2004; Niell, *in litt.* 2004). This site, located in Carson Valley, is about 3.2 km (2 mi) south of Carson City. Additional suitable habitat was thought to exist on adjacent City of Incline Village land and Northern Nevada Correctional Center land. This possible suitable habitat was confirmed to be occupied in 2011 (Sanford 2011). Nectar sources used by CWS at this site include *Lotus corniculatus* and *Crepis runcinata* (fiddleleaf hawksbeard) (Sanford 2011). *Distichlis spicata* occurs throughout the habitat and is interspersed with an overstory of *Artemisia* sp., *Sarcobatus vermiculatus,* and *Atriplex* sp. (saltbush). There is an accumulation of salt on the soil surface in the area. The City of Incline Village land supports wetlands (Niell, *in litt*. 2004). Hot springs are located about 2 km (1.5 mi) south of the site (Service 2007). Suitable habitat within these three properties totals approximately 51 ha (125 ac) (Sanford 2011). Located to the west and adjacent to this area is another property that could provide additional suitable habitat (Sanford 2011), but it has not been surveyed to date.

California

Lassen County Populations

Honey Lake, located about 56 km (35 mi) southeast of Susanville, California, is approximately 25,090 ha (62,000 ac) in size (HLCT 2005). It is a shallow (4.6 m (15 ft deep)), ephemeral lake with a peninsula extending into the lake from the southern end which is commonly referred to as "The Island" (HLCT 2005). Honey Lake is supplied by the Susan River from the north, small streams located primarily to the north, intermittent Long Valley Creek from the south, and a few thermal springs (Wendel Hot Springs, an unnamed spring north of Wendel Hot Springs, Amedee Hot Springs) to the north and northeast of the lake (HLCT 2005). During years of low precipitation, Honey Lake can dry completely (HLCT 2005).

Lassen County Site #1 - California Department of Fish and Game (CDFG). Carson wandering skippers have been observed on or near CDFG land along the north side of Honey Lake in different areas during three different years. In 1998, CWS were observed on *Lotus corniculatus* in an area with abundant *Distichlis spicata* (Brussard *et al.* 1999).
In 2002, a CWS was observed near the 1998 area nectaring on *Cleomella parviflora* (Niell, *in litt*. 2003). Another 2002 sighting occurred on a levee between waterfowl ponds (S. Hoffman Black, The Xerces Society, *in litt*. 2002; M. Vaughn, The Xerces Society, *in litt*. 2002). In 2004, a CWS was observed on or near the CDFG land using *Heliotropium curassavicum* (heliotrope) (HLCT 2005); the nectar source *Sesuvium verrucosum* (western sea purslane) was also present.

Lassen County Site #2 - Private. This area on private land along the north side of the lake was found in 1998 when eight CWS were seen (Brussard *et al.* 1999). *Distichlis spicata* is abundant, and the nectar source *Lotus corniculatus* is present.

Lassen County Site #3 - Wendel Area. In 2002, a nectar site was found near the Wendel Hot Springs. Carson wandering skippers were seen nectaring on *Cleomella parviflora, Potentilla* sp. (cinquefoil), and *Lotus corniculatus* (Niell, *in litt*. 2003).

Lassen County Site #4 - Mapes Road. In 2002, CWS were observed nectaring on *Lotus corniculatus* along Mapes Road on the north side of Honey Lake approximately 5 km (3 mi) west of Lassen County Site #2-Private (P. Epanchin, Service, *in litt*. 2002).

Lassen County Site #5 - Cross Depot Access. This area with two nectar sites (The Island and Cross Depot Access) on the south side of Honey Lake had CWS nectaring on *Heliotropium curassavicum* in 2003 (Earth Tech, Inc. 2003). Others have also found CWS in the general area of the Cross Depot Access site, and *Sesuvium verrucosum* is also available as a nectar source (Sanford 2004, HLCT 2005).

Lassen County Site #6 - North Shore. This area includes four nectar sites. Land ownership includes California State Lands Commission (CSLC) and private lands. Carson wandering skippers were observed nectaring on *Heliotropium curassavicum,* but *Lotus corniculatus, Sisymbrium altissimum, Sesuvium verrucosum, and Cleomella parviflora* were also available (HLCT 2005).

Lassen County Site #7 - East Shore. This area includes six nectar sites. Land ownership includes CSLC, private, and BLM lands. Carson wandering skippers were observed nectaring on *Heliotropium curassavicum, Sesuvium verrucosum,* and *Lotus corniculatus*, although *Cleomella parviflora* was also available (HLCT 2005).

Lassen County Site #8 - Northern Shore Island. This area includes four nectar sites. Land ownership includes CSLC lands. Carson wandering skippers were observed nectaring on *Heliotropium curassavicum* and *Sesuvium verrucosum*, although *Lotus corniculatus, Cleomella parviflora,* and *Sisymbrium altissimum* were also available (HLCT 2005).

Lassen County Site #9 - Western Shore Island. In 2003, this area with three nectar sites on the western side of the peninsula was found to support CWS (Earth Tech, Inc. 2003). Land ownership includes CSLC lands. Various-sized nectar patches of *Heliotropium curassavicum, Sisymbrium altissimum,* and *Sesuvium verrucosum* are present (Earth Tech, Inc. 2003; HLCT 2005), but CWS have only been observed nectaring on *H. curassavicum* (HLCT 2005).

Lassen County Site #10 - Southern Shore Island. This area includes five nectar sites with *Heliotropium curassavicum, Sesuvium verrucosum, Lotus corniculatus,* and *Sisymbrium altissimum* (HLCT 2005).

Table 2. Occupied Carson wandering skipper nectar sites for the Lassen County population in California.

Nectar Site	Current Land Ownership	Overall Site Size (ha/ac)	Number of Nectar Sites	Nectar Site Size (ha/ac)	Elevation (m/ft)
CDFG (#1)	State	Not reported	1	2/5	1,219–1,234/ 4,000–4,049
Private (#2)	Private	Not reported	1	0.4/.99	1,234/4,049
Wendel Area (#3)	Private	4/10	1	Not reported	1,219/4,000
Mapes Road (#4)	Private	Not reported	1	Not reported	Not reported
Cross Depot Access (#5)	State	155/383	2	4.2/10	1,212–1,212.5/ 3,977–3,978
North Shore (#6)	State/Private/ Federal	235/581	4	13/32	1,216–1,217/ 3,990–3,993
East Shore (#7)	State/Private	386/954	6	19/47	1,208–1,217/ 3,964–3,993
Northern Shore Island (#8)	State	219/541	4	24/59	1,211–1,217/ 3,973–3,993
Western Shore Island (#9)	State	106/262	3	7.3/18	1,208–1,213/ 3,964–3,980
Southern Shore Island (#10)	State	232/573	5	41.3/102	1,210–1,273/ 3,970–4,177

Abundance

Between 1965 and 1989, at least 90 female and 86 male CWS were collected over 7 years from the historical Carson City population (Austin and Emmel 1998). From 1997 to 2001, only five individuals (four males and one female) were observed there, all in June 1997 (Brussard *et al*. 1999, Brussard, pers. comm. 2000; Niell, pers. comm. 2001). During 2002 surveys, no individuals were observed (Haworth *et al*., unpubl. data 2002). This population is now considered extirpated.

Little information regarding abundance was known for the two extant populations at the time of listing. In 1998, Brussard *et al*. (1999) collected 24 individuals from the Southern Washoe County population at Washoe County Site #1-Warm Springs Valley and 25 individuals from the Lassen County population at Lassen County Site #2-Private.

The interim survey guidelines for the CWS (Service 2009) encourage surveyors to report numbers by category (*i.e.*, low, 1-10 individuals observed per day; medium, 11-30 individuals observed per day; or high, 31-100 individuals observed per day) or actual numbers observed. Some earlier surveys were conducted solely to determine CWS presence or absence at a site. Reported numbers are mostly from limited survey periods, meaning visits occurred variably and periodically once CWSs were observed at a site. These data are not sufficient to estimate population sizes at the various sites, but do provide limited information related to possible population trends. See Tables 3 and 4 for numbers reported for CWS observations in Nevada and California, respectively, between 1997 and 2011.

Nevada

Douglas County Carson River Site

The Douglas County population located along the Carson River was discovered in 2004. Total numbers of individuals seen in 2004 (Niell, *in litt*. 2004) and 2009 (M. Sanford, consultant, *in litt.* 2009) were low (Table 3) despite the presence of additional nearby apparently suitable habitat to support this isolated population. In 2011, complete surveys were conducted on all three parcels administered or owned by the BLM, Northern Nevada Correctional Center, and City of Incline Village for the first time; a total of 60 individuals were seen (Sanford 2011). This recent survey effort confirmed that more suitable habitat was available for the CWS in the area and the numbers seen were greater, suggesting a more secure site with a more robust population than was previously known.

Washoe County Site #1 - Warm Springs Valley

This site was first discovered in 1998 (Brussard *et al.* 1999). It included a combination of BLM and private lands initially, but in 2005, 32 ha (80 ac) of private property was acquired by the BLM. While this site has been surveyed repeatedly over a number of years and CWS are consistently observed, all survey efforts are more appropriately described as presence/absence surveys rather than complete surveys except for those in 2011. The number of CWS seen from 1998 to 2010 remained low (Table 3). However, in 2011, complete surveys were conducted, and a total of 137 individuals were observed over the survey period (Haworth *et al*., unpubl. data 2011) (Table 3). These numbers indicate a more robust population than previously thought.

Washoe County Sites #2A and #2B - Spanish Springs Valley

This area located in Spanish Springs Valley was found in 2004 when a single individual was observed on Spanish Springs Valley Site #2A (Murphy, *in litt*. 2004). As discussed below under Factor A, this area was impacted by residential and commercial development. The area has not been surveyed since as suitable habitat no longer exists. Spanish Springs Valley Site #2B was confirmed as occupied in 2005 when 4 individuals (1 female, 3 males) were seen during survey efforts (Haworth *et al*., unpubl. data 2005). Between 2006 and 2010, this area has either not been surveyed or incomplete surveys have been conducted, and CWSs have not been observed (Table 3). A complete survey occurred in 2011, but no CWSs were observed (Haworth, unpubl. data 2011). Due to the residential and commercial development activities that have occurred surrounding this former ranch land over the years and the low numbers seen in 2005, the CWS may have become extirpated from this site. The Service has committed to conduct consecutive complete surveys from 2011 to 2015 to determine whether the CWS continues to exist at this site.

Washoe County Site #3 - Flanigan

The Flanigan site was discovered in 2004 when a single male CWS was observed along the southeastern boundary of a dry alkali flat south of Flanigan (Sanford 2004). Surveys were not conducted in 2005, but from 2006 to 2009 complete surveys were conducted, and CWS have not

been observed at this site since 2004 (Sanford 2006b, 2007a, 2008, 2009). This location may not support a population, and the CWS observed may have been a dispersing individual.

California

Lassen County Populations

The CWS was observed beginning in 1998 in two areas along the north side of Honey Lake (Brussard *et al*. 1999) (Table 4). Four additional sites were noted in 2002-2003 (Epanchin, *in litt*. 2002; Earth Tech, Inc. 2003). Carson wandering skipper numbers were low to medium for various dates visited during these years (Table 4). In June 2004, more comprehensive surveys were conducted around the Honey Lake shoreline and 22 nectar sites were found with a total of 480 CWSs being observed (HLCT 2005).

In 2005, the HLCT (2006) surveyed 24 areas around Honey Lake. The areas surveyed in 2005 covered approximately the same areas along the northern, eastern, and southern shorelines of Honey Lake but were not identical to those surveyed in 2004. Because of these changes, we are unable to compare the individual sites identified in 2004 with individual sites identified in 2005; we can, however, compare the general areas between these years for observations of CWSs (Table 4). Carson wandering skippers were observed at 18 of the 24 sites for a total of 777 CWSs (HLCT 2006). The HLCT (2007, 2009) surveyed these 24 areas around Honey Lake and observed CWSs at 20 of the 24 sites for a total of 617 CWSs in 2006, and CWSs were observed at 22 of the 24 sites for a total of 1,059 CWSs in 2007. In 2008, CWSs were observed at 21 of the 24 sites for a total of 861 CWSs (HLCT 2010). In 2011, abbreviated surveys were conducted (only 11 of the 24 sites surveyed) around the lake and 205 CWSs were found at 8 of these sites (Yssel Environmental Services 2011). Based on these surveys conducted between 2004 and 2011, the CWS population around Honey Lake appears to be relatively stable with regards to both occupied locations and overall numbers.

Table 3. Carson wandering skipper abundance in Nevada during 1997-2011 surveys; prepared for 5-year review, 2012. Multiple counts (x/x/x) indicate numbers seen on different days during surveys (complete or incomplete).

Nectar Site Name	1997	'98	'99	2000	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11
Carson City Population															
Carson City	5[a]	0[a]	*[b]	*[b]	*[c]	*[d]	---	---	---	---	---	---	---	---	---
Douglas County Population															
Carson River								9[e]	*[f]	---	*[g]	---	4[h]	---	7/20/31/2[i]
Washoe County Populations															
#1-Warm Springs Valley (BLM)		Few[a]	---	---	5[j]	3[k]	15[l]	1/3[m]	1/9[n]	*[o]	10[p]	6[q]	5[r]/10-20 for BLM and Private[s]	4[t]	6/44/9/3[u]
#1-Warm Springs Valley (Private)		Few[a]	---	---	---	---	---	---	8[n]	*[o]	1/1[p]	4[q]	2[r]	---	14/43/13/5[u]
#2A-Spanish Springs Valley								1[v]	---	---	---	---	---	---	---
#2B-Spanish Springs Valley									1/2/1[w]	---	---	*[x]	*[y]	*[z]	0[aa]
#3-Flanigan								1[bb]	---	0[cc]	0[dd]	0[ee]	0[ff]	---	---

--- area not surveyed * none seen during incomplete surveys

[a] Brussard *et al.* 1999; [b] P. Brussard, UNR, pers. comm. 2000; [c] R. Niell, UNR, pers. comm. 2001; [d] Haworth *et al*., unpubl. data 2002; [e] Niell, *in litt*. 2004; [f] M. Haworth, Service, and C. Funari, BLM, unpubl. data 2005a; [g] Haworth, unpubl. data 2007a; [h] M. Sanford, consultant *in litt.* 2009; [i] Sanford 2011; [j] V. Rivers, Truckee Meadows Community College, pers. comm. 2001a; [k] Haworth *et al*., unpubl. data 2002; [l] Haworth and W. Devaurs, BLM, unpubl. data 2003; [m] Haworth and Funari, unpubl. data 2004; [n] Haworth and Funari, unpubl. data 2005b; [o] Haworth, unpubl. data 2006; [p] Haworth, unpubl. data 2007b; [q] Haworth, unpubl. data 2008; [r] Haworth, unpubl. data 2009; [s] J. Levy, consultant, *in litt.* 2009; [t] Haworth and P. Ziegler, BLM, unpubl. data 2010; [u] Haworth *et al*., unpubl. data 2011; [v] D. Murphy, UNR, *in litt.* 2004; [w] Haworth *et al*., unpubl. data 2005; [x] Haworth and S. Crowley, Kiley Ranch Communities, unpubl. data 2008; [y] Haworth *et al*., unpubl. data 2009; [z] Haworth and J. Harter, Service, unpubl. data 2010; [aa] Haworth, unpubl. data 2011; [bb] Sanford 2004; [cc] Sanford 2006b; [dd] Sanford 2007a; [ee] Sanford 2008; [ff] Sanford 2009.

Table 4. Carson wandering skipper abundance for the Lassen County population in California during 1998-2011 surveys; prepared for 5-year review, 2012. Multiple counts (x/x/x) indicate numbers seen on different days during surveys (complete or incomplete).

Nectar Site Name	1998	99	2000	01	02	03	04	05	06	07	08	09	10	11
#1-CDFG	2[a]	---	*[b]	*[c]	1[de]/2[f]	---	1[l]	---	---	---	---	---	---	---
#2-Private	8[a]	---	several[b]	3/4[c]	0[gh]	---	---	---	---	---	---	---	---	---
#3-Wendel Area					14/1/20/ 2[h]	---	---	---	---	---	---	---	---	---
#4-Mapes Road					3[i]	---	---	---	---	---	---	---	---	---
#5-Cross Depot Access						2/1[j]	3/21[+kl]	5[+m]	10[+n]	29[+o]	6[+p]	---	---	0[q]
#6-North Shore							27[+l]	115[+m]	61[+n]	32[+o]	89[+p]	---	---	20[q]
#7-East Shore							343[+l]	611[+m]	437[+n]	634[+o]	537[+p]	---	---	170[+q]
#8-Northern Shore Island							79[+l]	39[+m]	53[+n]	152[+o]	44[+p]	---	---	11[+q]
#9-Western Shore Island						5/33[j]	10[+l]	4[+m]	11[+n]	92[+o]	126[+p]	---	---	4[q]
#10-Southern Shore Island								3[+m]	45[+n]	120[+o]	59[+p]	---	---	---

--- area not surveyed

* none seen during incomplete surveys

[+] represents total number for the season from one or more locations included within this named site

[a] Brussard *et al.* 1999; [b] P. Brussard, UNR, pers. comm. 2000; [c] V. Rivers, Truckee Meadows Community College, pers. comm. 2001b; [d] S. Hoffman Black, The Xerces Society, *in litt.* 2002; [e] M. Vaughn, The Xerces Society, *in litt*. 2002; [f] R. Niell, UNR, *in litt*. 2003; [g] M. Haworth, Service, and P. Epanchin, Service, unpubl. data 2002; [h] Niell, *in litt*. 2003; [i] Epanchin, *in litt*. 2002; [j] Earth Tech, Inc. 2003; [k] Sanford 2004; [l] HLCT 2005; [m] HLCT 2006; [n] HLCT 2007; [o] HLCT 2009; [p] HLCT 2010; [q] Yssel Environmental Services 2011.

Habitat or Ecosystem

Little is known about the specific habitat requirements of the CWS 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 CWS has the following characteristics: elevation of less than 1,524 m (5,000 ft), location east of the Sierra Nevada, and presence of green *Distichlis spicata* cover with a flowering nectar source available during May through July (flight season) near springs or other water sources. *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 *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. There may also be a habitat association with geothermal activity (Brussard *et al.* 1999). We have estimated a total of about 560 ha (1,385 ac) of known occupied habitat (salt grass, nectar, other) within Nevada and about 1,340 ha (3,300 ac) of known occupied habitat (salt grass, nectar, other) within California.

There are no data in the literature on the micro-habitat requirements of the CWS (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* heights being above standing water. In dry years, survival is probably related to the timing of host plant senescence. Therefore, micro-topographic variation may be important for larval survival because it provides a greater variety of appropriate habitats throughout the landscape over time (Brussard *et al.* 1999). The few historical collections of CWS have been near hot springs, so 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 recently identified nectar sites are not located close to geothermal springs. Therefore, larval development may not rely on temperature as much as the presence of good quality *Distichlis spicata* cover commonly provided by more permanent water sources.

Few plants that can serve as nectar sources grow in the highly alkaline soils occupied by *Distichlis spicata*. Species known to be used by the CWS for nectar include *Thelypodium crispum*, *Sisymbrium altissimum*, *Pyrrocoma racemosus*, *Cirsium arvense* (Canada thistle), *Cirsium vulgare* (bull thistle), *Lotus corniculatus*, *Cleomella parviflora* (slender cleomella), *Cleomella plocasperma*, *Heliotropium curassavicum*, *Potentilla* sp., *Sesuvium verrucosum*, *Cressa truxillensis* (alkali weed), *Astragalus douglasii* (Douglas' milkvetch), *Malvella leprosa* (alkali mallow), and *Crepis runcinata* (Brussard *et al.* 1999; Niell, *in litt*. 2003; Murphy, pers. comm. 2004; HLCT 2005, 2006, 2009; Sanford 2011). 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, an area may still provide suitable CWS habitat (Brussard *et al.* 1999). Nectar sources depend on various transitory environmental conditions and thus, nectar sites used by a CWS population may change from year to year.

Changes in Taxonomic Classification or Nomenclature

No taxonomic changes have been made for the CWS.

Subspecies-specific Research and/or Grant-supported Activities

Carson Wandering Skipper Survey and Habitat Mapping Project (Project # 2010-0512-002).

Beginning in 2011, the National Fish and Wildlife Foundation, San Francisco, California, funded a 2-year study to survey for the CWS and to map suitable habitat at the Douglas County site in Nevada. Surveying and mapping efforts occurred on lands administered by the BLM, City of Incline Village, and Northern Nevada Correctional Center. In 2011, it was confirmed that these lands support CWS (Sanford 2011). Survey efforts will continue in 2012. This effort is being conducted by Dr. Monte Sanford, consultant, 3404 Skyline View Drive, Reno, Nevada 89509 (775-826-1541; monte.sanford@gmail.com).

Five-Factor Analysis

The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Nevada

Washoe County Populations

Washoe County Site #1 - Warm Springs Valley (BLM and Private). At the time of listing, threats at Site #1-Warm Springs Valley included excessive livestock grazing and trampling, residential development, potential increased recreational use, a proposed water exportation project, and potential pesticide spray drift.

Management practices on the BLM land included a November-March grazing season. The identified threat was high livestock densities potentially causing larval CWS mortality due to trampling of larvae hibernating in *Distichlis spicata* during the winter. On the adjacent private land, cattle densities, use areas, and season of use were not regulated. The threats in this area included livestock trampling of *Distichlis spicata* and nectar sources, as well as potential direct mortality of CWS eggs, pupae, or feeding larvae. In 2001, the BLM eliminated livestock grazing on the public land portion of this site based on an assessment that showed livestock use had adversely impacted the springs; constructed a fence to exclude trespass cattle from the adjacent private land; and designated 98 ha (243 ac) as an Area of Critical Environmental Concern (ACEC), which allows the BLM discretion in determining actions that can occur (BLM 2001). In 2005, the BLM acquired 32 ha (80 ac) of adjacent occupied habitat along with groundwater rights from the private landowner and added this parcel to the ACEC. Cattle

grazing has been suspended within the ACEC unless determined to be useful as a habitat management tool.

At the time of listing, residential development was occurring in the area surrounding Site #1-Warm Springs Valley. Homes in this rural area commonly use groundwater wells for domestic water. Increases in domestic well pumping could impact the water table, resulting in changes to the *Distichlis* community in the valley. Fragmentation and degradation of the CWS's habitat at the site was expected to increase through development activities.

Development in the surrounding area continues to be a threat. A 12,000-home development project is proposed in neighboring Winnemucca and Upper Dry Valleys. The primary associated threats are an increase in domestic wells and groundwater importation or exportation projects that could impact the water table in Warm Springs Valley. With the recent decrease in residential and commercial development in northern Nevada, the immediacy of this development threat is currently reduced.

Although recreational activities, such as off-road vehicle (ORV) use, were identified as threats at the time of listing, the fencing around the ACEC has eliminated the threat from ORV recreation in the known CWS habitat. Though the land is now all public, there appears to be little other recreational use of the entire site. With potential increases in development in the surrounding area, however, the concern for some associated recreational use of the site remains.

At the time of listing, the Nevada State Engineer's Office had approved change-in-use applications (from agricultural to municipal and industrial) for a private landowner to export surface and groundwater (up to 3,577,097 cubic meters per year (m^3y) (2,900 acre-feet per year (afy)) from Warm Springs Valley (Stantec Consulting, Inc. 2000; H. Ricci, Nevada Department of Conservation and Natural Resources, *in litt*. 2001). Implementation of this project could lower the water table in Warm Springs Valley and result in adverse changes to the *Distichlis* community. In addition, facility construction could result in direct impacts to CWS and their habitat. To date, this water exportation project has not been constructed.

In 2006, informal section 7 consultation with the BLM was completed on the Intermountain Water Supply Project (Service 2006a). This project would convey up to 3,083,705 m^3y (2,500 afy) to Stead and Lemmon Valley, located 8-24 km (5-15 mi) north of Reno. Monitoring of the groundwater withdrawal will ensure potential indirect impacts to the CWS population in Warm Springs Valley are detected (BLM 2005, Service 2006a). If groundwater monitoring in Bedell Flat indicates a project-related drawdown in Warm Springs Valley, the applicant will implement contingency measures that will include varying the production of groundwater between the existing production wells, geographically redistributing groundwater, or reducing or suspending groundwater extraction from one or more wells; associated effectiveness monitoring would also occur. To date, this water exportation project has not been constructed.

At the time of listing, a potential threat was pesticide spray drift from alfalfa fields located adjacent to the occupied nectar site which could eliminate a large part of the CWS population (Brussard 2000). Pesticides are used to control alfalfa pests such as aphids, cutworms,

grasshoppers, and mites (Carpenter *et al*. 1998). To date, this potential threat has not been monitored and remains undocumented.

Since listing, a new threat has materialized at this site from nonnative *Lepidium latifolium*. *Lepidium latifolium* is a perennial plant native to Europe and Asia which grows in disturbed sites, wet areas, ditches, roadsides, and cropland. Spreading roots and numerous seeds make this invasive plant difficult to control (Stoddard *et al.* 1996). *Lepidium latifolium* often occurs in dense patches that become near-monocultures (Young *et al.* 1995). *Distichlis spicata* and nectar plant communities could be impacted if the species spreads. The amount of infestation is currently small (less than 0.4 ha (1 ac)).

The following sites in Nevada were found after listing.

Washoe County Sites #2A and #2B - Spanish Springs Valley. Spanish Springs Valley Site #2A was found in 2004 when a single CWS was observed (Murphy, *in litt*. 2004). In 2005, 16 ha (39 ac) of habitat in the vicinity was impacted due to residential and commercial development. A habitat conservation plan was prepared (Lionel Sawyer & Collins 2005) and a section 10(a)(1)(B) incidental take permit was issued in 2005 under the Act. Mitigation included the off-site acquisition of replacement habitat (16 ha, 39 ac) of equal or better quality than the habitat lost. The applicant secured this replacement habitat in 2008 at Honey Lake, and the Lassen Land and Trails Trust is the Grantee of the associated conservation easement deed. In 2010, a single CWS was observed on the replacement property (L. Larsen, Lassen Land and Trails Trust, *in litt*. 2010).

The likely extension of the Spanish Springs Valley Site #2A population to the south was confirmed on another private landowner's adjacent property in 2005 (Spanish Springs Valley #2B). The long-term persistence of this newly discovered population has yet to be determined. The Kiley Ranch Preservancy Foundation has established a wildlife and wetland preserve on 87 ha (215 ac) of this property. The Service is involved in the development of a management plan for the site. The preserve is an example of conserving wildlife values within an urban setting for the benefit of existing natural resources and the public. The management of the preserve will incorporate the needs of the CWS. *Lepidium latifolium* has become established at the Spanish Springs Valley Site #2B, and plans are being developed to address the threat. Both sites are surrounded by commercial and residential development. A fire ignited by lightening occurred in June 2007 on Spanish Springs Valley Site #2A; while a small area of *Distichlis spicata* is known to have burned, actual impacts to this CWS population remain unknown.

Washoe County Site #3 (Flanigan). This site was found in 2004 when a single male was sighted along the southeastern boundary of an alkali flat near Flanigan (Sanford 2004). Implementation of the large scale water exportation project could result in lowering of the water table in Honey Lake Valley and may impact the *Distichlis spicata* community. As discussed below for the Lassen County population, a section 7 consultation was completed for this project (Service 2006b) and an adaptive management plan was finalized in 2007 (Sanford 2007b). This water exportation project has been constructed, but it is not operational due to the ongoing local decline in residential development.

Douglas County Population

Carson River Site. This site found in 2004 occurs on BLM-administered lands (Niell, *in litt*. 2004). The site also includes additional habitat which extends onto adjacent Northern Nevada Correctional Center lands and City of Incline Village General Improvement District Wetland Enhancement Facility lands (Sanford 2011). The BLM portion of the site is dissected by a two-track road; a second dirt road occurs along two sides of the site. Evidence of recreational shooting was found on-site (Neill, *in litt*. 2004) which could impact the site through human habitat trampling or fire ignition. In 2005, the BLM proposed modification to the western boundary of an allotment to exclude grazing in the area where the CWS habitat had been found. The Service (2005) completed an informal consultation on the action. *Lepidium latifolium* is found on both Northern Nevada Correctional Center lands and City of Incline Village General Improvement District Wetland Enhancement Facility lands (Sanford 2011).

California

Lassen County Population

Lassen County Sites #1 (CDFG) and #2 (Private). At the time of listing, threats at the two known Lassen County sites (#1 CDFG and #2 Private) included *Lepidium latifolium* invasion, a proposed natural gas and geothermal energy development projects, urban development, potential excessive livestock grazing and trampling, and a proposed water development project.

Public and private lands in the Honey Lake area are severely infested with *Lepidium latifolium* (Howard 2000). *Lepidium latifolium* was first noted in 2000 on Lassen County Site #2 (Private) (Rivers, pers. comm. 2001b). *Lepidium latifolium* continues to be a concern at Honey Lake and to the best of our knowledge, *L. latifolium* control has not occurred at either of the two original Lassen County sites.

At the time of listing, a permit for a proposed natural gas and geothermal development had been extended by the Lassen County Planning Commission (Lassen County Department of Community Development 2002). The permit allowed exploratory drilling of hydrocarbon wells and a geothermal water test well near the occupied sites. Carson wandering skippers may be associated with geothermal areas (Brussard *et al*. 1999), and the hydrologic and ground disturbances caused by exploratory drilling may affect the subspecies and its habitat. The Service (2002a) provided technical assistance for this project, but we have no information on its current status. Since 2002, CWS habitat has been found at locations away from geothermal areas. However, future development of geothermal areas at Honey Lake could still have direct and indirect impacts to CWS and their habitat in areas north and northeast of the lake.

At the time of listing, construction of a Federal Correctional Institution was proposed near Her long, California, at the southern end of Honey Lake, and its associated water supply needs and wastewater treatment facility could impact CWS habitat in the basin directly or indirectly through groundwater table lowering. In 2002, we completed informal consultation with the U.S.

Department of Justice related to the construction of the Federal Correctional Institution and concluded that the project would not adversely affect the CWS or its habitat (Service 2002b).

Further development around Honey Lake located near Susanville, California, is likely in the future as the majority of the shoreline (above the high watermark) is in private ownership. There are some areas of State lands to the north, south, and southeast of the lake with some Federal military lands along the east and southeast shorelines. Increases in domestic wells and groundwater pumping could reduce the water table in the area, resulting in changes to the *Distichlis* community in the valley. As these areas become more populated, fragmentation and degradation of the CWS's habitat is expected to increase. As development increases near known sites, there is also potential for increased recreational activities, such as ORV use, on both public and private lands.

Cattle had access to both known Lassen County sites (#1 CDFG and #2 Private) at the time of listing; however, it was unknown what grazing management was being implemented. Research into the impacts of grazing on CWS has not been conducted. However, inappropriately managed livestock grazing is a potential threat to the CWS through reduction of the availability of nectar sources and *Distichlis spicata* cover, trampling, ground compaction, and increased spread of weeds. Season 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. It remains unknown what grazing management is being implemented at these sites.

At the time of listing, there was a proposal to export water from Honey Lake Valley to the North Valleys (Lemmon and Spanish Springs Valleys, Washoe County, Nevada). Implementation of a large scale water exportation project could lower the water table in Honey Lake Valley. Reduced groundwater supply may cause adverse changes to the *Distichlis* community (Brussard *et al*. 1999). At that time, plans were to export 9,867,854.8 m^3y (8,000 afy) of groundwater annually from Honey Lake Valley to the North Valleys (D. Pattalock, Vidler Water Company, pers. comm. 2002). Due to anticipation of adverse impacts to CWS habitat, formal section 7 consultation with the BLM was completed in 2006 (Service 2006b). To avoid indirect impacts to CWS in the vicinity of Fish Springs Ranch/East Alkali Flat (Washoe County Site #3-Flanigan) from groundwater pumping, several contingency measures and monitoring were included in the project. In 2007, an adaptive management plan for the project was finalized (Sanford 2007b). This project has since been constructed but is not operational due to the ongoing local decline in residential development.

The following sites in Lassen County were found after listing.

Lassen County Sites #3 (Wendel Area) and #4 (Mapes Road). These two sites were located since listing. The Wendel Area is located near the Wendel Hot Springs and any future development of geothermal areas at Honey Lake, as discussed above, could have direct and indirect impacts to CWS and their habitat in areas north and northeast of the lake. We are unaware of potential threats to CWS at the Mapes Road site.

Lassen County Sites #5 (Cross Depot Access), #6 (North Shore), #7 (East Shore), #8 (Northern Shore Island), #9 (Western Shore Island), and #10 (Southern Shore Island). Since listing, numerous additional nectar sites have been found around Honey Lake (HLCT 2005, 2006, 2007, 2009, 2010). This occurred as a result of the Sierra Army Depot (through the U.S. Department of Defense) transferring 23,323 ha (57,632 ac) to the HLCT (Service 2003), which included occupied and potential CWS habitat below Honey Lake's high water mark in 2003. The HLCT held title to the land until transfer to the CSLC was completed in 2006. The U.S. Department of Defense provided $8,650,000 for management of the property through 2008. Of this sum, $1,000,000 was to be spent on studying, understanding, promoting, and enhancing the CWS and its habitats which resulted in more comprehensive survey efforts. This also included the development of a Carson Wandering Skipper Conservation Strategy for the transferred land which is not yet completed. The HLCT worked with other parties in managing the land in consideration of the CWS; the CSLC continues this conservation-oriented management. Threats to these general areas include invasion by *Lepidium latifolium* and *Bromus tectorum* (cheatgrass), livestock grazing (cattle, horses, and sheep), proposed development, and recreational (ORV) use (HLCT 2010).

As of 2008, 66 percent of the 24 survey sites supported *Lepidium latifolium* (HLCT 2010). Since listing, 8.4 ha (20.7 ac) of *L. latifolium* were mapped (in 2005) around the lake within and near occupied CWS sites (HLCT 2006). The Honey Lake Valley Resource Conservation District and the Lassen County Special Weed Action Team in conjunction with HLCT developed a Tall Whitetop Treatment Plan to control *L. latifolium* in CWS areas (HLCT and Lassen County Special Weed Action Team 2007). After 1 year of treatment, a visit in 2009 indicated 90 percent control of *L. latifolium* in the Amedee Hot Springs treatment area (East Shore) (HLCT 2010). Coordination has also occurred with the Service. Failure to control this invasive species could result in the loss of various nectar sites. Depending on the methods used (herbicide or mechanical treatments) and timing, control efforts could also directly impact the CWS population and its habitat at various sites.

In 2006, *Bromus tectorum* (cheatgrass) was identified as a possible new threat to CWS habitat around Honey Lake; it was found at 56 percent of the 24 occupied sites (HLCT 2007). In 2007 and 2008, *Bromus tectorum* was present at 58 percent of the 24 sites (HLCT 2009, 2010). This invasive species can create a fire hazard within the areas it colonizes and may otherwise impact nectar sites (HLCT 2007).

Fire may be a new threat to the CWS and its habitat. A brush fire broke out on The Island in early June 2007 (HLCT 2009); however, no occupied CWS habitat was known to be impacted. Smoke from fires may influence flight patterns and nectaring behavior if CWS perceive smoke similarly to cloudy days when they appear to be less active (HLCT 2009).

In 2005, horses were identified as a possible new threat to CWS due to the effects of grazing (HLCT 2006). Cattle or horses were reported on 33 percent of the 24 CWS sites in 2005 (HLCT 2006), while in 2007 and 2008 they were reported on 71 percent of the 24 CWS sites (HLCT 2009, 2010). We are aware of at least one private landowner who grazes cattle seasonally and the animals are off the occupied area (an East Shore site) during the CWS flight season. This seasonal management appears to be compatible with CWS needs. However, the area around

Honey Lake is open range (California Code Section 17123(c)) and there are few fences. As a result, many livestock graze freely and have access to almost all of the lake bed (HLCT 2009). In 2008, domestic sheep wandered off BLM land and were seen near occupied CWS sites in the North Shore and East Shore general areas (HLCT 2010). The sheep were seen grazing *Heliotropium curassavicum* one of CWS known nectar sources and *Distichlis spicata* (HLCT 2010). As mentioned above for cattle, potential threats of domestic sheep grazing to CWS is the reduction of nectar sources and *Distichlis spicata* cover, trampling, ground compaction, and increased spread of weeds. As domestic sheep are not covered under local open grazing laws, and should be tended by a herder at all times, it appears that this incident was unintentional (HLCT 2010).

In 2005, two proposed land development actions were begun (HLCT 2010). One project is proposed for "The Island" (Northern Shore Island, Western Shore Island, Southern Shore Island areas) and the other is proposed near Herlong (East Shore, Cross Depot areas). Neither project is moving forward at this time (HLCT 2010).

A number of Honey Lake residents have and continue to use ORVs adjacent to and on the Honey Lake lakebed as conditions allow (HLCT 2010). Currently, this type of activity appears to be relatively light, but as the local communities that surround the lake increase, this could become more of a threat to CWS individuals and their habitat.

In summary, the loss and modification of *Distichlis spicata* and nectar source habitats continues to be the primary threat to the CWS in Nevada and California. In areas where habitat is protected by some means the potential for indirect adverse impacts to occur due to water table declines and resultant effects to *Distichlis spicata* and nectar sources remains a concern. Land acquisitions and transfers have helped protect some habitat; however, development of surrounding lands could still impact these lands via recreation or fragmentation. These impacts may potentially prevent dispersal of CWSs between nectar source areas. Habitat that has been protected may be subjected to changes in hydrological condition and has been subjected to invasion by nonnative plants, as well as other conditions (*i.e.*, inappropriate grazing levels) that result in the habitat being less suitable for CWS. Out of the four known extant CWS populations, 75 percent are located on mostly public lands (Federal, State, city), and 25 percent occur on private lands.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

At the time of listing, overutilization through collection was a concern. Rare butterflies and moths are highly prized by collectors, and an international trade exists for insect specimens, in both live and decorative markets, as well as a specialist trade that supplies hobbyists, collectors, and researchers (Morris *et al.* 1991, Williams 1996). The specialist trade differs from both the live and decorative markets in that it concentrates on rare and threatened species (U.S. Department of Justice 1993).

There are no studies on the impact of the removal of individuals from natural populations for this subspecies, but it is possible that the CWS has been adversely affected. At the Carson City site,

CWS individuals were collected for personal butterfly collections from the late 1960's until the early 1990's (Austin and Emmel 1998, Brussard *et al.* 1999). From 1965 to 1989, at least 86 males and 90 females were collected during 7 different years by various collectors (Austin and Emmel 1998). During that period, this was the only known population of CWS. The CWS is now considered extirpated from the site. While habitat degradation and loss have also occurred at this site, collecting may have contributed to extirpation.

At the time of listing, there was concern that the two known sites with CWS in California (Lassen County Sites #1-CDFG and #2-Private) could face strong pressure from collectors. Since the nectar sites occurred along public roadsides, they were easily accessible. The limited number and distribution of these small populations made them vulnerable to even limited collection.

Currently, no collecting of CWS is known to be occurring. Section 10 collection permits have not been applied for or issued by the Service. This threat has likely been reduced as a result of the listing.

FACTOR C: Disease or Predation

Threat from disease was not known to be a factor in the final listing rule (Service 2002c). Currently, disease does not appear to be a threat.

At the time of listing, we indicated predation by other species such as birds or insects, on eggs, larvae, pupae, or adults was likely, but it was unknown how predation might be affecting the CWS's viability. Since the listing, a robber fly (*Efferia* sp.) was observed preying on an adult CWS (HLCT 2006), and a minute pirate bug (*Cortus tristicolor*) and spiders were observed preying on CWS larvae (Yssel 2005, as cited in HLCT 2005). It remains unknown whether predation is occurring at a level that may cause concern, and at this time, we do not have information to suggest that predation is a threat.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

The CWS and its habitat occur on public (Federal, State, city) and private lands in Nevada and California. Existing regulatory mechanisms appear to be adequate at this time. There are several State and Federal laws and regulations that are pertinent to federally-listed species, each of which may contribute in varying degrees to the conservation of federally-listed and non-listed species. Existing regulatory mechanisms that may provide some protection for the CWS are: (1) Federal laws and regulations including the Clean Water Act, the Federal Land Policy and Management Act, the Act, and the Lacey Act; and (2) State laws, including the California Environmental Quality Act (CEQA), the California Endangered Species Act, and the Lake and Streambed Alteration Program.

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

At the time of listing, the CWS was considered at risk to chance environmental or demographic events, to which small populations are particularly vulnerable. The combination then of only

two populations, small numbers (Tables 3 and 4), small range, and restricted habitat left the subspecies susceptible to extinction or extirpation from portions of its range due to random events such as fire, drought, disease, or other occurrences (Shaffer 1981, 1987; Meffe and Carroll 1994). Additionally, random demographic effects (*e.g.*, skewed sex ratios) and loss of genetic variability could result in individuals and populations being less able to cope with environmental change and could cause the loss of one or both of the populations. Loss of habitat compromised the ability of the CWS to disperse. Populations were isolated with no opportunity to migrate or recolonize if conditions became unfavorable.

Since the listing, the CWS continues to be threatened by apparent low numbers (Tables 3 and 4) making it vulnerable to risks associated with small, restricted populations (Shaffer 1981, 1987; Groom *et al*. 2006). Though additional nectar sites and populations have been found since listing, the number of known populations remains small (four). The suite of new and old nectar sites around Honey Lake may serve as a metapopulation to reduce the risk of local extirpation. However, the spatial extent of suitable habitat around Honey Lake is limited and is influenced by lake level fluctuations. Areas where CWSs have been found in more upland habitats, that may offer some protection from fluctuating lake levels, are limited. Overall, the four populations remain isolated with little to no opportunity to migrate or recolonize if conditions became unfavorable.

Climate Change

Climate change is a new threat that was not identified at the time of listing. A comment was received during the Service's comment period for the Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Reviews of 58 Species in California and Nevada; Availability of Completed 5-Year Reviews in California, Nevada and Southern Oregon (Service 2008) regarding climate change and possible impacts to the CWS based on impacts to other butterflies (E. Brown, Jr., California Department of Justice, *in litt.* 2008). More specifically, a concern was raised regarding potential declines in water supplies from drought or water diversions (Brown, Jr., *in litt.* 2008), which could impact this subspecies as it is dependent on moisture or a high water table.

Our analyses under the ESA include consideration of ongoing and projected changes in climate. The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). "Climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (*e.g.*, temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (*e.g.*, habitat fragmentation) (IPCC 2007). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

While there are concerns related to potential climate change effects, impacts to the CWS under predicted future climate change are unclear. A trend of warming in the mountains of western North America is expected to decrease snowpack, hasten spring runoff, and reduce summer stream flows, and increased summer heat may increase the frequency and intensity of wildfires (Intergovernmental Panel on Climate Change (IPCC) 2007). While it is reasonable to assume that the subspecies may be affected, we lack sufficient certainty in knowing how and how soon climate change will affect it, the extent of average temperature increases, or potential changes to the level of threat posed by drought or wildfire regime changes. The most recent literature on climate change includes predictions of hydrological changes, higher temperatures, and expansion of drought areas, resulting in a northward and upward elevation shift in range for many species (IPCC 2007).

Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field *et al*. 1999, Cayan *et al*. 2005, IPCC 2007). Predictions of climatic conditions for smaller sub-regions such as California or Nevada remain uncertain. It is unknown at this time if climate change in California or Nevada will result in a warmer trend with localized drying, higher precipitation events, or other effects. We have no knowledge of more detailed climate change information specifically for this subspecies. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to the CWS at this time.

III. RECOVERY CRITERIA

The Recovery Plan for the Carson Wandering Skipper (*Pseudocopaeodes eunus obscurus*) was approved in June 2007 (Service 2007). Recovery plans provide guidance to the Service, States, other partners, and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species, and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, overall, the threats have been minimized sufficiently, and the species is robust enough, to downlist or delist the species. In other cases, new recovery approaches and opportunities unknown at the time the recovery plan was finalized may be more appropriate ways to achieve recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery is a dynamic process requiring adaptive management, and assessing a species' degree of recovery is likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of subspecies' status in this 5-year review on progress that has been made toward recovery since the subspecies was listed by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated.

Recovery Objective: Recommend measures needed to improve and secure the subspecies' status so that it may be removed from the Federal list of endangered and threatened species.

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 subspecies 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.

This recovery criterion has been partially met. Most of the known occupied CWS nectar sites around Honey Lake are now under the management of CSLC. Two of the three populations in Nevada occur partially on BLM lands. The third known population in Nevada occurs on private lands, but a wetland/wildlife preserve has been established which provides some protection especially from urban development. The needs of the CWS are being considered on all of these lands, however, effective management actions must be established in perpetuity to address threats and ensure persistence of the populations. This has not occurred, and threats to all populations still remain. In addition, the known occupied habitats are primarily nectar sites and the entire area that may be necessary to fulfill all CWS life requirements may not be secured within the nectar sites alone.

Rigorous population estimates and trend analyses are needed but are not currently available for any of the known population sites in Nevada or California. Survey efforts conducted to date are more appropriately considered as presence/absence surveys or limited observation surveys. These surveys have occurred periodically over time and at various sites. This type of information is not sufficient to determine abundance trends. Consistent survey data must be collected at all sites for at least a 10-year period to determine population trends.

This recovery criterion addresses listing factors A, D, and E. Factor A is addressed by requiring that many suitable habitat sites be secured and threats be addressed to ensure persistence of populations. Factor D is addressed primarily under current Federal protections available under the Act, thereby also reducing threats through management actions. Factor E is addressed by requiring that many sites be secured to reduce the vulnerabilities of small, restricted populations in addition to the possible occurrence of isolating mechanisms.

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

This recovery criterion has not been met. Adaptive management plans have not been developed for any of the populations in Nevada or California.

This criterion addresses listing factors A, D, and E. Factor A is addressed by requiring adaptive management plans be in place that guide the reduction or elimination of the various threats to the CWS. Factor D is addressed primarily under current Federal protections available under the Act by reducing various threats through management actions. Factor E is addressed by requiring management plans that will guide activities at numerous sites to reduce the vulnerabilities of small, restricted populations and possible isolating mechanisms.

Recovery Criteria: 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 subspecies 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 CWS among patches.

Please see response to downlisting criterion #1. While this recovery criterion has been partially achieved, as needed and discussed above, additional suitable sites need to be secured with appropriate management established as well as stable or increasing populations being achieved prior to delisting. This criterion addresses listing factors A, D, and E.

(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 CWS 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.

This recovery criterion has not been met. Adaptive management plans have not been developed for any of the populations in Nevada or California required for delisting. Please see response to downlisting criterion #2. This criterion addresses listing factors A, D, and E.

(3) In addition to the populations in delisting criterion #1, for at least one additional CWS population or metapopulation, including a known population or any that may be discovered or established within CWS historical range, management has been established in perpetuity to effectively address threats to the subspecies 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 CWS historical range.

This recovery criterion has not been met. We have not located an additional population nor have we determined that additional populations or metapopulations do not exist and that it would not be ecologically feasible to establish or reestablish one or more of them within CWS's historical range. Because of the lack of good historical knowledge for this subspecies' distribution, it is important to continue to look for additional populations to aid in its recovery.

This criterion addresses factors A and E. Factor A is addressed by securing an additional population and addressing potential threats to it. Factor E is addressed by attempting to secure as many sites as possible to reduce vulnerabilities to small, restricted populations, including possible effects of population isolation.

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

This recovery criterion is being partially met. Efforts have begun and are continuing related to mapping areas with *Lepidium latifolium* encroachment at Nevada and California sites. Control of *Lepidium latifolium* has occurred at specific sites in California (HLCT and Lassen County Special Weed Action Team 2007) with some success noted at these sites (HLCT 2010). Further work is necessary at numerous sites to eliminate or substantially reduce this threat for the CWS throughout its current range.

This criterion addresses factor A. Reducing or eliminating the threat from nonnative invasive plant species would improve habitat conditions for the CWS in both Nevada and California.

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

This recovery criterion has not been met. A long-term conservation plan and conservation agreements are needed but have not been developed to guide management throughout the range of the CWS after it has been delisted. This subspecies has not been delisted.

This criterion addresses listing factors A and E. Factor A is addressed by managing secured habitat sites over the long-term that have significantly reduced or eliminated the various threats to the CWS and by maintaining high habitat quality for the CWS through future management actions. Factor E is addressed by requiring that the numerous sites have been and will continue to be managed such that vulnerabilities to small, restricted populations along with possible effects of population isolation are reduced.

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

This recovery criterion has not been met. A monitoring plan to cover a minimum of 5 years post-delisting of the CWS has not been developed but will be needed at the appropriate time.

This criterion addresses listing factors A, D, and E. Factor A is addressed by determining whether management of suitable habitat sites to reduce or eliminate various threats has been and continues to be successful. Factor D is addressed by determining whether State or Federal protections, other than the Act, are successfully maintaining high quality habitat for the CWS at secured sites through appropriate management actions. Factor E is addressed by determining whether secured, managed sites have successfully improved and are maintaining population numbers and distribution.

IV. SYNTHESIS

At the time of listing in 2001, only two CWS populations were known, one in Washoe County, Nevada, and one in Lassen County, California. In 2004, a population was located in Douglas County, Nevada. An additional population in Washoe County was confirmed in 2005. Many additional occupied sites have been found around Honey Lake associated with the Lassen County population. The long-term persistence of the two newly-discovered populations in Douglas and Washoe Counties has yet to be determined. At this time, the Douglas County site appears more promising as a persistent population while the Spanish Springs Valley Site #2B in Washoe County appears less promising as a long-term population; both are vulnerable due to small geographic area and population size. While known CWS populations and distribution have increased since listing, all of these populations remain at risk. Current threats to these populations are primarily due to development, nonnative plant invasion, livestock grazing, recreational activities (*e.g.*, ORV use), and small and restricted population vulnerabilities. The status of this subspecies remains endangered due to the small number of populations, apparent low numbers of individuals, and continued threats. Therefore, we believe the CWS still meets the definition of endangered, and we recommend no status change at this time.

V. RESULTS

Recommended Listing Action:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (indicate reason for delisting according to 50 CFR 424.11):
    ____ *Extinction*
    ____ *Recovery*
    ____ *Original data for classification in error*
__x_ No Change

New Recovery Priority Number and Brief Rationale: We do not recommend a change of the recovery priority number.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

We recommend the following recovery actions be initiated or completed over the next 5 years:

1. Map, control, and monitor *Lepidium latifolium* in CWS habitat. Aggressive plant species invasions, such as by *L. latifolium*, can threaten CWS by out-competing other species, particularly nectar plants. This effort 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, control, and monitor *L. latifolium* in and around areas used by the CWS in Nevada and California. Additional support could be provided for mapping, controlling, and monitoring of *L. latifolium* in areas where potential CWS habitat could be threatened by this invasive species.

2. Develop and implement a management plan for the Washoe County Site #1-Warm Springs Valley and the Carson River Site. In 2005, the BLM's Carson City Field Office acquired 32 ha (80 ac) of occupied habitat along with groundwater rights to sustain that habitat immediately adjacent to their Carson Wandering Skipper ACEC. This acquired parcel has since become part of the ACEC. A site-specific management plan to address habitat management needs (e.g., grazing as a management tool, potential research activities) and threats (e.g., surrounding development including groundwater use and recreation, *Lepidium latifolium* control) to the CWS population should be developed and implemented. The plan should include goals and strategies, identify potential funding sources, present an implementation timeline, and incorporate an adaptive management strategy. This plan could be broader and comprise a larger area than the ACEC at the Washoe County Site #1-Warm Springs Valley and include management objectives for the BLM portion of the Carson River site for the Douglas County population. This would involve addressing habitat management needs (e.g., potential research activities) and threat mitigation (e.g., recreation, *Lepidium latifolium* control) for this second population in the plan as well.

3. Develop and implement a monitoring program for known populations and habitats to track trends and threats. Consistent annual monitoring of CWS populations is needed to track their status and progress towards recovery. Criteria for evaluating population and habitat trends must be selected, monitoring methods and techniques determined, and a monitoring plan developed and implemented.

Monitoring methods should be applied consistently during a sufficient period of time (minimum 20 years) to include the normal variability of environmental conditions experienced by the CWS. Any new threats to the CWS also should be identified. Improved monitoring of the Carson River site in Douglas County and Washoe County Site #2B-Spanish Springs Valley for long-term population and habitat trends is crucial to determining if there are three extant populations in Nevada. Monitoring data would be used by the Service to review and assess the status of populations and habitats. An associated database for the subspecies would be developed by the Service's Nevada Fish and Wildlife Office.

4. Implement research to determine the complete ecological requirements and life history of the Carson wandering skipper. A better understanding of CWS habitat requirements, behavior, and population dynamics is necessary to support effective recovery recommendations. It is especially important to better understand larval habitat. Monitoring adult females ovipositing within *Distachlis spicata* habitat will assist in determining which habitat patches the larvae and pupae occupy.

Determining the population structure of the CWS 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. Information on both daily and long-distance dispersal movements would be useful for determining population structure, habitat requirements and connectivity, and restoration opportunities. Capture-mark-release-recapture studies on the CWS are infeasible. One alternative is to monitor a surrogate, such as another subspecies of *Pseudocopaeodes eunus*, to estimate dispersal distances. Another option is to place concentrations of nectar sources at increasing distances from known areas of adult concentration and monitor their use to determine movements.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

Carson wandering skipper (*Pseudocopaeodes eunus obscurus*)

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

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

Review Conducted By: Marcy Haworth

Date Submitted to Region 8: August 27, 2012

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve Edward D. Koch Date 8/27/12