California Legless Lizard

Anniella pulchra

Photo of a Bakersfield locality California Legless Lizard © Gary Nafis- used with permission.

USDA Forest Service: Sensitive Species

California Department of Fish and Game: California Species of Special Concern

NatureServe Global Conservation Status Rank: G3G4 T2T3 QS2- Vulnerable

Written by: C. Yasuda May 2012

Reviewed by: P. Krueger November 2012

Species account

The California Legless Lizard (*Anniella pulchra*) is found in the coastal ranges from Antioch (Contra Costa County), California south to Baja California, Mexico (Jennings and Hayes 1994; Morey 2000). Where habitat is suitable, this species is also found in the San Joaquin Valley, southern California mountains, foothills of the Sierra Nevada mountains and the Mojave desert (Fig. 1). This species has been documented from sea level to near 1800m (6000ft) (Morey 2000). Formerly the dark animals found near Monterey, California were considered to be a separate subspecies but recent genetic studies found that they are paraphyletic with the more common light colored lizards (Pearse and Pogson 2000). Additional studies on the genetics of this species are ongoing and although there are several distinct lineages no subspecies are currently recognized for this species (Parham and Papenfuss 2009).

Within Region 5 the species has been documented on the Angeles, Cleveland, Los Padres, San Bernardino and Sequoia National Forests.

No baseline surveys have been conducted to determine population levels on National Forest System lands. Due to the secretive, fossorial nature of this lizard it is often undetectable by standard herpetofaunal survey techniques. Successful population estimates requires labor intensive surveys which require significant habitat disturbance. Standard survey techniques such as those which utilize cover boards missed a substantial amount of the known population and surveys utilizing these techniques may underestimate or fail to document a population of California legless lizards (Kuhnz et al. 2005).

Habitat Status

California legless lizards inhabit a range of habitats including coastal dune, valley-foothill, chaparral and coastal scrub (Morey 2000). Populations are most dense along the coast indicating that sandy habitats are preferred (Klauber 1932). The predominant factors which define the habitat for this species and prevent range expansion are the moisture content of soil, ground temperature, soil structure, and vegetation. Legless lizards are not found in areas which have high clay soils (Miller 1944). Although they prefer loose soil, they can be found in areas of dense soil and among rocks as long as these areas have sufficient leaf litter for burrowing (Klauber 1932). Both the oak-annual grass association and lupine-stable dune association are

preferred by this species as they allow for the build-up of leaf litter to burrow through (Kuhnz et al. 2005; Miller 1944). Animals are rarely encountered in the open, and are typically found under cover objects or in the course of soil excavation (Klauber 1932). Cover objects include stones, burlap sacks, boards, leaf litter and other debris (Klauber 1932; Miller 1944; Kuhnz et al. 2005). California legless lizards are typically found between one and three inches under cover, however they are documented to be as deep as a foot below the surface of the substrate (Miller 1944).

California legless lizards primarily consume insect larvae and adult beetles. They will also consume other small invertebrates such as small insects and spiders. Wild lizards have been observed eating large (more than 1.25 inches in length) insect larvae and two species of small ground dwelling beetles (Helops and Platyderma). In laboratory settings larvae of grain beetles (*Tenebrio molitor*) and termites (*Zootermoptsis sp.*) are readily eaten (Miller 1944). Foraging occurs at the base of vegetation either on the surface, in leaf litter or in sandy soil (Stebbins 2003).

Legless lizards are documented to passively drink water straight from moist soils (Fusari 1985). It is unlikely that legless lizards regularly encounter standing water as animals placed in water were unable to swim, attempted to burrow in the water and drowned. Moisture is also important to shedding in this species as animals kept only in dry sand retained shed resulting in reduced foraging success and occasionally death (Miller 1944). Rainfall in some areas where California legless lizards have been collected has been as low as three inches annually (Klauber 1932).

California legless lizards can tolerate a wide range of temperatures. The upper thermal limit is 40C, above which animals quickly perish. Animals do not appear to have a specific lower limit as animals were able to survive temperatures of 4C overnight, however it is likely that a realistic lower activity limit is 13C (Miller 1944). Although these lizards can tolerate a wide variety of temperatures, they appear to avoid temperatures below 20C and above 28C in laboratory settings (Bury and Balgooyen 1976).

California legless lizards in southern California are primarily seen and collected in February, but have been collected in July and August. Activity is primarily fossorial, and these animals rarely travel above ground (Klauber 1932). As these animals can achieve extremely high

densities (3,582 animals/0.228 m^2) it is likely that they do not exhibit territoriality and have small home ranges (Kuhnz et al. 2005). Emigration rates are low for this species but individual animals actively create new burrow systems in the laboratory (Miller 1944).

California legless lizards are live bearing with litter size ranging from one to four offspring (Miller 1944). In one population the average litter size was 1.3 offspring with a maximum of two offspring per female (Goldberg and Miller 1985). Ovulation occurs in May, June or July with insemination occurring before, during and after ovulation (Miller 1944). Although the exact breeding time is unknown, it likely begins in early spring and continues into July. In a laboratory setting offspring are born in mid to late October with a gestation period of approximately four months (Goldberg and Miller 1985) Presumably sexual maturity is attained when the animals are two to three years old (Miller 1944). Females likely do not reproduce annually, however the exact cycle is not known (Goldberg and Miller 1985).

Threats/Management Concerns:

Outside of National Forest System lands the primary threat to the California legless lizard is habitat loss due to habitat development. As this species is secretive, not all of its populations are documented, and many populations will likely disappear before being discovered. Parham and Papenfuss (2009) found that of three populations sampled in the Bakersfield region, two were extirpated by the conclusion of their study. California legless lizards are significantly impacted by bulldozing and plowing which alters and compacts the soil structure rendering it unusable to this species. Additional impacts are caused by livestock grazing, off-highway vehicle use, erosion, and the introduction of invasive habitat altering plants (Jennings and Hayes 1994). Predation is likely a major factor in survival of this species as most animals are found to have regenerated tails indicating previous predation attempts. Although these animals can autotomize their tail, they are still preyed upon by numerous other animals including: house cats (*Felis domesticus*), white-footed mice (*Peromyscus maniculatus*), loggerhead shrikes (*Lanius ludovicianus*), and common kingsnakes (*Lampropeltis getula*). Other predators which likely consume California legless lizards include domestic dogs (*Canis domesticus*), Norway rats (*Rattus norvegicus*), California ground squirrels (*Spermophilis beecheyi*), meadow mice (*Microtus californicus*), pocket gophers (*Thomomys bottae*), moles (*Scapanus latimanus*), crows (*Corvus brachyrhychos*), alligator lizards (*Elgaria cooeruleus* and *E. multicarinatus*), gopher

snakes (*Pituophis catenifer*) and racers (*Coluber sp.*) (Miller 1944). Wildfire likely impacts this species, albeit not directly, due to the impacts caused by bulldozers used in firefighting efforts and the loss of leaf litter.

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Species Name (both Common and Scientific): *Thamnophis hammondii* (Two-striped garter snake)			
Criteria	Rank	Rationale	Literature Citations
1 Distribution within R5	B	*Thamnophis hammondii* occurs in all R5 National forests in Southern California from the southern extent of the Cleveland National Forest to through the San Bernardino and Angeles National forests, and to the Monterey district of the Los Padres National Forest. *Thamnophis hammondii* is a semi-aquatic snake frequently found in and around water in all types of riparian areas with permanent or intermittent freshwater streams and pools (Grismer, 2002; Stebbins, 2003). Dominant vegetation includes willow, brushland, oak woodland, and coniferous forest from sea level to 2,450m (Stebbins, 2003). Confidence in Rank call: High	Grismer, 2002; Stebbins, 2003

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Criteria	Rank	Rationale	Literature Citations
2 Distribution outside R5	B	Historically *Thamnophis hammondii* had a relatively continuous distribution in the watersheds of the Coast and Transverse ranges from Monterey south to northern Baja Mexico but urbanization, in particular concrete channelization for flood control, has affected populations in Los Angeles, Orange, San Bernardino, and San Diego counties (Jennings and Hayes, 1994). Recent visual observation records in the Los Angeles basin and San Diego County (NAFHA, 2011) lend some evidence that some of these populations may persist despite being listed as extinct by Jennings and Hayes (1994) but further investigation is needed. Scattered populations are also known in Baja California from the US border well south into Baja California del Sur where *T. hammondii* is common in suitable habitat (Grismer, 2002; Herpnet, 2010; Stebbins, 2003) A population of *Thamnophis hammondii* identified as a unique subspecies, *T. h. catalinae*, is also known from Santa Catalina Island off the coast of southern California (Schoeder, 1994; Backlin et al, 2004; Stebbins, 2003). This population is listed as extirpated by Jennings and Hayes (1994). Sampling for reptiles and amphibians on Santa Catalina Island by Backlin and others (2004) did not reveal *T. hammondii* but the locations and methods employed were poorly suited to record this species (Backlin et al., 2004). Introduced American bullfrogs (*Lithobates catesbeiana*) are thought to have had a sizeable impact on the populations of Santa Catalina Island and elsewhere (Backlin et al., 2004) as they are known to eat *T. hammondii* at all life stages. Confidence in Rank call: High	Grismer, 2002; Herpnet, 2010; Stebbins, 2003; Backlin et al., 2004, Jennings and Hayes, 1994

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Criteria	Rank	Rationale	Literature Citations
3 Dispersal Capability	B	The biology of *Thamnophis hammondii* has not received much attention. Most studies of western North American*Thamnophis* have focused on *T. sirtalis* and *T. elegans* (Rossman et al., 1996, Fontenot, 2002). Jennings and Hayes (1994) cite a report that found *T. hammondii* home ranges varied from $80m^2$ to $1500m^2$ in the summer and from $50m^2$ to $9,000m^2$ in the winter (Rathbun et al., 1993) however their ability to colonize habitat is unknown. In the summer active months *T. hammondii* are found foraging in the stream channel but in the winter (October-January) they are found away from streams, up to 100 to 180m away (Fontenot, 2002; Rathbun et al., 1993), in or near their near hibernacula in coastal sage scrub or grassland habitat adjacent to riparian areas (Jennings and Hayes, 1994). *Thamnophis hammondii* are active January-November and may be crepuscular or nocturnal during hot weather (Rossman et al., 1996) but are frequently observed during the day (Sweet, pers. comm.). *T. hammondii* are not known to make long mating pilgrimages as is found in *T. sirtalis* but study of spatial ecology and reproductive behavior is lacking for *T. hammondii*. Spatial ecology of a similarly aquatic garter snake, *Thamnophis atratus*, has been studied (Welsh et al., 2010). Recaptured males (20% recapture rate) were found to have traveled an average of nearly 40 meters and females (25% recapture rate) only 9.5m from juvenile to adult life stages. Confidence in Rank call: Moderate	Fontenot, 2002; Jennings and Hayes, 1994; Rathbun et al., 1993; Rossman et al., 1996; Welsh et al., 2010

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Criteria	Rank	Rationale	Literature Citations
4 Abundance in R5	B	Many populations have been lost on National National forests in R5 on the Angeles and San Bernardino National forests, probably due to concrete channelization of the lower reaches of some streams for flood control purposes (Jennings and Hayes, 1994). Urbanization has caused the majority of loss in *Thamnophis hammondii* abundance (Jennings and Hayes, 1994). Threats to abundance in R5 would be stream channel modification for flood control purposes (Jennings and Hayes, 1994) and the introduction of non-native predators, namely American bullfrogs (*LIthobates catesbeiana*). Because of the large losses in abundance both in and outside of R5 the importance of remaining populations on National Forest Service Land is magnified for *T. hammondii*. Biologists on the Cleveland National Forest have some concern about *T. hammondii* abundance (Evelyn, 2011). *Thamnophis hammondii* and *Pituophis catenifer* are the most frequently encountered snakes in the Los Padres National Forest (Sweet pers. comm.). However, the apparent abundance of these snakes shows a strong negative association with intensity of recreational use in any particular drainage – near access points and campgrounds *T. hammondii* are seldom seen, but reach moderate densities between 0.5 and 1 stream mile distant. It is not clear what *T. hammondii* eat in streams with low fish densities, during times of year when tadpoles are absent. In these situations both early and late in the year (February-March, and August-October) many individual T. *hammondii* are extremely thin (Sweet pers. obs.) Confidence in Rank call: Moderate	Evelyn, 2011; Jennings and Hayes, 1994

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Criteria	Rank	Rationale	Literature Citations
5 Population Trend in R5	A	Research on the population status of *Thamnophis hammondii* is needed. Populations on the Los Padres National Forest have generally declined in larger streams, especially those with significant recreational use, between the early 1980s and the present (Sweet, pers. obs.). Populations in smaller streams and on larger streams well away from access points appear to be stable over the same interval. Several pressures have likely contributed to decreases in *Thamnophis hammondii* populations throughout its range these include, predation from non-native American bullfrogs (*Lithobates catesbeiana*), fish, and feral pigs (Sus scrufus); loss of prey food base (*Rana draytonii, R. boylii, R. muscosa*); incidental take from off-road vehicle use; and recreational fisherman who kill *T. hammondii* because they mistakenly believe that garter snakes consume large numbers of trout (*Oncorynchus*) (Jennings and Hayes, 1994). *Thamnophis hammondii* prey on the abundant, fecund, and urban tolerant (Riley et al., 2005) Pacific tree frog (*Pseudacris regilla*) (Stebbins, 2003) so population recovery may be possible if habitat is made suitable for *T. hammondii*. Confidence in Rank call: Moderate	Jennings and Hayes, 1994; Riley et al., 2005; Stebbins, 2003
6 Habitat Trend in R5	A	Loss of habitat due to concrete channelization of streams is likely the cause of the population losses for *Thamnophis hammondii* noted in Jennings and Hayes (1994) in the Angeles and San Bernardino National forests. Increased off-road vehicle use in R5 can also contribute to the degradation of habitat (Jennings and Hayes, 1994). Southern California streams experience cycles of flood-stripping and regeneration of riparian corridor vegetation. *Thamnophis hammondii* seem to survive about equally well in barren post-flood conditions and maturing corridor vegetation (Sweet, pers. obs.) Confidence in Rank call: Moderate	Jennings and Hayes, 1994

Species Name (both Common and Scientific): *Thamnophis hammondii* (Two-striped garter snake)			
Criteria	Rank	Rationale	Literature Citations
7 Habitat Vulnerability or Modification	A	Stream alteration through concrete channelization seems to have had a severe negative impact on *Thamnophis hammondii* in southern California. This includes populations lost from the Angeles and San Bernardino National forests (Jennings and Hayes, 1994). The impacts on *Thamnophis hammondii* from cattle grazing and off-road vehicle use should be assessed as they have a potentially negative impact on the species (Jennings and Hayes, 1994). Water recreation in riparian areas degrades habitats by introducing exotic species, increasing water turbidity, introducing pathogens, and lowering water quality (Lueng et al., 2000). These recreation-related impacts can have a large effect at the site of the recreation activity by reducing the health and fitness of wildlife (Leung et al., 2000). Snakes are especially likely to be killed on sight. The majority of R5 where *T. hammondii* occurs was given a Fire Threat rating of Very High or Extreme by CDF (2004). Impacts from fire would likely be both direct and indirect. Direct impacts would be fire-related mortality, and loss of habitat necessary for thermal regulation and brumation (Rossman et al., 1996). Indirect impacts of fire include the loss of prey species on which *T. hammondii* relies, mainly fish and amphibians (Stebbins, 2003; Rossman, 1996) which includes adult and larval amphibians as well as fish. Confidence in Rank call: High	CDF,2004; Jennings and Hayes, 1994; Rossman, 1996

Species Name (both Common and Scientific): *Thamnophis hammondii* (Two-striped garter snake)

Criteria	Rank	Rationale	Literature Citations
8 Life History and Demographics	B	*Thamnophis hammondii* breed in spring and give birth to 4-36 live young born in summer (Stebbins, 2003). *Thamnophis hammondii* are thought to reach sexual maturity in 2-3 years (Jennings and Hayes, 1994). Sex ratios were found to be not significantly different from 1:1 during surveys on La Brea Creek in southern California (Fontenot, 2002). *Thamnophis hammondii* prey on aquatic vertebrates, their eggs and their larvae (Stebbins, 2003). Stomach contents recorded by Fontenot included *Ensatina eschscholtzii*; metamorphosed and larval *Pseudacris regilla*; larval *P. cadaverina*; metamorphosed *Rana draytonii*; metamorphosed *Anaxyrus boreas*; *Gaterosteus aculeatus*, *Hesperoleucus symmetricus*; and fish eggs (Fontenot, 2002). Raptors, shrikes, herons, and raccoons are native predators and American bullfrogs, largemouth bass, and feral pigs are non-native predators (Jennings and Hayes, 1994). More research into the life history and demographics *of Thamnophis hammondii* is needed. Confidence in Rank call: Moderate	Stebbins, 2003

Initial Evaluator(s): Sam Sweet and Chris Evelyn

Date: 10/13/2011

Review Team:
Catherine Yasuda: California species of special concern; Patti Krueger, continue on SS list due to risk of habitat and limited distribution; 6/12/2012

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APPENDIX A: REGION 5 SENSITIVE SPECIES EVALUATION FORM

Species Name (both Common and Scientific): California Spotted Owl (*Strix occidentalis occidentalis*)

Criteria	Rank	Rationale	Literature Citations
1 Distribution within R5	B	The California Spotted Owl is a resident subspecies of Spotted Owl that breeds locally in old-growth coniferous and mixed pine-oak forest regions at 0-2,500 m elevation in the Sierra Nevada and southern California[1-6], and probably western Nevada[7]. The Northern Spotted Owl (*S. o. caurina*) also breeds in USFS Region 5 in the Cascade Mts. and northwestern California south along the coast to Marin County[1,3,5]. California Spotted Owls are found on all 13 Region 5 National Forests in southern California and the Sierra Range (Lassen NF to Sequoia NF). The eBird database[8] contains 241 records for 328 individual California Spotted Owls on Region 5 National Forests between 1970 and 2011. Forests with the most records include Angeles NF (124 records/173 individuals), Sequoia NF (20/30), Tahoe NF (20/25), Los Padres NF (23/27), Cleveland NF (15/21), and San Bernardino NF (13/13). The fewest records come from the Lake Tahoe Basin MU (1/1) and Lassen NF, where no records are in the eBird database but where the species is nevertheless known to occur[6,9,10]. The CNDDB database[11] includes no records of this species. The Natural Resource Information System (NRIS) database[12] contains the following number of California Spotted Owl observations on each Region 5 NF (NFs with zero records are not listed): Angeles NF (255), Cleveland NF (299), Eldorado NF (8384), Lake Tahoe Basin MU (605), Lassen NF (9338), Los Padres NF (387), Modoc NF (21), Plumas NF (7279), San Bernardino NF (2300), Sequoia NF (2107), Sierra NF (3367), Stanislaus NF (2248), and Tahoe NF (4012). Many of these observations of course represent multiple observations of the same birds. The CDFG Biogeographic Information and Observation System (BIOS)[13] contains the following number of Spotted Owl territory locations (although records go back to 1972 and many territories are probably no longer active: Angeles NF (65), Cleveland NF (20), Eldorado NF (218), Inyo NF (5), Lake Tahoe Basin MU (14), Lassen NF (155), Los Padres NF (113), Plumas NF (308), San Bernardino NF (152), Sequoia NF (81), Sierra NF (228), Stanislaus NF (239), and Tahoe NF (203). Confidence in Rank is **High** based on abundance of data on this well-studied subspecies.	1. Grinnell and Miller 1944 2. Garrett and Dunn 1981 3. Gutiérrez 1994 4. Small 1994 5. Gutiérrez et al. 1995 6. Davis and Gould 2008 7. Floyd et al. 2007 8. eBird 2011 9. Blakesley et al. 2001 10. USFS 2007 11. CDFG 2010 12. USDA FS Region 5 2011 13. Gould 2010

Species Name (both Common and Scientific): California Spotted Owl (*Strix occidentalis occidentalis*)			
Criteria	Rank	Rationale	Literature Citations
2 Distribution outside R5	A	The California Spotted Owl is restricted almost entirely to USFS Region 5, with only a very small and possibly extirpated population breeding in mountains of extreme northern Baja California[1,2]. Confidence in Rank is **High** based on abundance of data on this well-studied subspecies.	1. Gutiérrez et al. 1995 2. AOU 1998
3 Dispersal Capability	A	The California Spotted Owl is generally considered a resident subspecies[1,2], although some post-breeding dispersal and seasonal-altitudinal movement has been documented[1,3]. Confidence in Rank is **High** based on abundance of data on this well-studied subspecies.	1. Gutiérrez et al. 1995 2. AOU 1998 3. Bond et al. 2010
4 Abundance in R5	B	California Spotted Owls are considered locally uncommon[1-5]. In detailed surveys a minimum of 3,050 California Spotted Owls were detected between 1970 and 1992 including 1,008 pairs and 436 single birds in the Sierra Nevada and 598 individuals from other populations[6,7]. Crude density estimates have ranged from 0.12–0.21 owls/km sq in the Sierra Nevada to 0.088–0.396 owls/km sq in s. California[7]. Insufficient Breeding Bird Survey data[8] are available to estimate population size in California or Nevada based on Partners in Flight estimating models[9]. The eBird database[10] (see Section 1) indicates fairly common abundance but there is likely observational bias concerning this species due to its being highly sought after by birders. Confidence in Rank is **High** based on abundance of data on this well-studied subspecies.	1. Garrett and Dunn 1981 2. Small 1994 3. Fix and Bezener 2000 4. Floyd et al. 2007 5. Steel et al. 2011 6. Gutiérrez 1994 7. Gutiérrez et al. 1995 8. Sauer et al. 2008 9. PIF 2007 10. eBird 2011
5 Population Trend in R5	D	Trends in California Spotted Owl populations are ambiguous due to difficulty in obtaining precise annual population estimates[1-3]. There is insufficient data from USFS Region 5 to estimate trends with Breeding Bird Survey[4] data, and Christmas Bird Count[5] data indicate no trends in California populations (including both Northern and California Spotted Owls). There are indications of possibly stable populations in local areas of the Sierra Nevada Range[6,7] and of declines in some isolated populations of southern California[1,8]. Confidence in Rank is **Low** based on ambiguity of published analytical results.	1. Gutiérrez 1994 2. Gutiérrez et al. 1995 3. Davis and Gould 2008 4. Sauer et al. 2008 5. Sauer et al. 1996 6. Franklin et al. 2004 7. Blakesley et al. 2010 8. Gutiérrez and Prichard 1990

Species Name (both Common and Scientific): California Spotted Owl (*Strix occidentalis occidentalis*)			
Criteria	Rank	Rationale	Literature Citations
6 Habitat Trend in R5	B	Throughout northern California, old-growth coniferous and mixed pine-oak habitats in which California Spotted Owls breed have been affected by various anthropogenic factors (see Section 7)[1,2]. It is difficult to predict how effects of global climate change[3] will affect California Spotted Owl populations, but Spotted Owls have been found to be unusually susceptible to heat stress, which could suggest that increasing temperatures might exceed physiological tolerances in some areas[4]. Another way climate change may affect the species is through changing fire regimes, though recent research suggests Spotted Owls can continue to thrive, at least in the short-term, in post-fire landscapes[5,6]. Confidence in Rank is **Medium** due to only moderate efforts at addressing habitat trends specific to California Spotted Owls in Region 5 National Forests.	1. CalPIF 2002 2. Bunn et al. 2007 3. Franco et al. 2006 4. Weathers et al. 2001 5. Bond et al. 2009 6. Roberts et al. 2011
7 Habitat Vulnerability or Modification	A	Old-growth, coniferous and mixed pine-oak utilized by California Spotted Owls in California and Nevada have been severely affected by direct loss and fragmentation of habitat from intensive logging, altered fire regimes, and exurban development, especially in the Sierran foothills and in southern California[1-7]. Fire suppression during the first part of the 20th century probably has had both positive and negative effects on California Spotted Owls[8], but historical timber-harvesting practices, especially clear-cutting, has had well-documented negative impacts on this species. A possible indirect result of anthropogenic habitat alteration on Northern Spotted Owls has been range extension of Barred Owls (*S. varia*) into California, which aggressively compete with and have excluded Spotted Owls from certain locations, though Barred Owls have not yet become established within the range of California Spotted Owls[9]. Management actions benefiting California Spotted Owls include retaining large tracts of undisturbed old-growth forests, attempting to limit effects of exurban development, and, consideration of active Barred Owl removal if Barred Owls begin to establish themselves within the range of California Spotted Owl, [6-10]. Confidence in Rank is **Medium** due to lack of studies addressing habitat trends specific to California Spotted Owls in Region 5 National Forests.	1. Franzreb and Ohmart 1978 2. Gutiérrez et al. 1995 3. Siegel and DeSante 1999 4. CalPIF 2002. 5. Bunn et al. 2007 6. Davis and Gould 2008 7. Steel et al. 2011 8. Bond et al. 2009 9. Livezey 2010 10. USFS 2007

Species Name (both Common and Scientific): California Spotted Owl (*Strix occidentalis occidentalis*)			
Criteria	Rank	Rationale	Literature Citations
8 Life History and Demographics	B	California Spotted Owls are strongly associated with areas of mature and old forest with thick canopy that contains many dense, old, live and dead trees and fallen logs[1-3], where increased occupancy, survival, and nesting success have been documented in the Sierra Nevada[4]. In the central Sierra Nevada, forests with medium and large trees and >70% canopy cover were positively associated with survival and occupancy rates while amounts of hardwood forest, brush-sapling, or pole coniferous forest was negatively associated with these parameters[5]. Primary food resources are small mammals, especially woodrats and flying squirrels[1]. Age of first breeding of Spotted Owls can be 1 yr but is usually 2-4 yrs, breeding is frequently skipped when cyclic prey resources are down (40-50% skipping by established pairs recorded), clutch size is usually 2 eggs (range 1-3), 50% of pairs in the Sierra Nevada have fledged at least one young and reproductive success has been measured at 0.80 young fledged per nest, and juvenile survival is thought to be low but adult survival relatively high[1,7-9].No major effects of parasites and diseases on population parameters have been recorded[1]. California Spotted Owls have a life-history strategy similar to larger raptors with a relatively low annual reproductive rate and a relatively long lifespan[9]. Confidence in Rank is **High** due to substantial demographic data on natural history and population parameters of this well-studied species.	1. Gutiérrez et al. 1995 2. Bond et al. 2004 3. Steel 2011 4. Blakesley et al. 2001 5. Seamans and Gutiérrez 2007 6. Bond et al. 2009 7. Lahaye et al. 1994 8. Blakesley et al. 2005 9. Steel et al. 2011
Initial Evaluator(s): Peter Pyle, Rodney Siegel, Danielle Kaschube, and Ron Taylor Review Team: Patti Krueger; continue as Sensitive Species; potential decline and possible negative management actions without SS protection; 6/12/2012			Date: March 15, 2012

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