A COMPILATION OF OBSERVATIONS OF ALAMEDA WHIPSNAKES OUTSIDE OF TYPICAL HABITAT

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Abstract: The Alameda whipsnake (*Masticophis lateralis euryxanthus*) is a threatened subspecies for which recovery to non-threatened status is a goal. Information on the whipsnake's natural history is currently limited and efforts are underway to identify habitat requirements that may contribute to the recovery of this snake. From publicly available data and our own observations, we determined that the Alameda whipsnake has been observed in a very wide range of habitat types, which is contrary to that currently documented. We believe that this information can be used to assist recovery of this subspecies. Increased knowledge of more varied habitat use by Alameda whipsnakes may increase the possibility of the preservation of available adjacent habitats and facilitate connectivity between patches of core habitat.

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The California whipsnake (*Masticophis lateralis*) is a colubrid snake known to utilize a wide range of habitat types including open desert, oak woodland, pine forest, chaparral, and associated open landscapes (Ortenburger 1928, Stebbins 2003). This species is represented by 2 subspecies: the chaparral whipsnake (*M. l. lateralis*) and the Alameda whipsnake (*M. l. euryxanthus*) (Stebbins 2003). The ranges of these subspecies are contiguous in southern Alameda County, northern Santa Clara County, and western San Joaquin County, California (Jennings 1983). The chaparral whipsnake has been reported to use woodlands, grasslands, scrublands, and riparian habitats (Ortenburger 1928; J. A. Alvarez, personal observation); the Alameda whipsnake has commonly been reported to have a more specific association with chaparral and scrub plant communities (Swaim and McGinnis 1992, Swaim 1994, U.S. Fish and Wildlife Service 1997, U.S. Fish and Wildlife Service 2002), although the U.S. Fish and Wildlife Service (USFWS) acknowledges that because trapping efforts were focused within chaparral and scrub plant communities, habitat information for this subspecies has biases (U.S. Fish and Wildlife Service 2000).

The holotype specimen of the Alameda whipsnake was collected in annual grassland/oak (*Quercus* spp.) woodland near Berkeley, California (A. Mossman, Humboldt State University, personal communication. Work conducted by Hammerson (1978, 1979) with the Alameda whipsnake included specimens captured in oak woodland in western Alameda County, California (G. Hammerson, The Nature Conservancy, personal communication). McGinnis and Swaim (1993. Life history and current distribution of the Alameda whipsnake [*Masticophis lateralis euryxanthus*]. California Department of Fish and Game, Sacramento, California, USA) reported that 1 male Alameda whipsnake, which was tracked using radiotelemetry, was recorded in pure stands of annual grassland 9% of the time. The above observations indicate that the Alameda whipsnake may utilize a wider range of habitat types than currently reported.

In 1971, the California Department of Fish and Game listed the Alameda whipsnake as threatened; it was listed as threatened by USFWS in 1997. Although these listings highlighted the need to better understand the

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natural history of the Alameda whipsnake to facilitate its recovery, the whipsnake has been studied relatively little since it was initially described by Riemer (1954). Only 3 researchers have recently focused on this subspecies as a subject of intense study (Hammerson 1978, 1979; McGinnis and Swaim 1993; Swaim 1994).

We reviewed publicly available observational records (n = 129) of free-ranging Alameda whipsnakes and possible intercross specimens in Alameda and Contra Costa Counties. Our analysis included pure Alameda whipsnakes and any intercross specimens (between *M. l. euryxanthus* and *M. l. lateralis*) that occurred within the area delineated as the "zone of intergradation" by Jennings (1983). Because no conclusive data exist on the genetic differentiation between the subspecies within the zone of intergradation, we elected to include specimens within the northern portion of that intergradation zone. In addition, USFWS proposed that any listed species or subspecies and possible intercross specimens would be managed as though all were listed species or subspecies (U.S. Fish and Wildlife Service 1996). Therefore, this methodology closely follows the guidelines proposed by USFWS. Herein, we refer to Alameda whipsnakes and the intercross specimens as Alameda whipsnakes.

We studied observational records and specimens from museums and universities, reports from the California Natural Diversity Data Base (CNDDB) (California Department of Fish and Game. 2003. Commercial version—November 3, 2003. Wildlife Habitat Data Analysis Branch, Sacramento, California, USA), publicly accessible consulting reports from survey efforts, personal communications from knowledgeable individuals, and all published accounts, and analyzed our own observations. In 2005, the senior author verified museum specimens as *M. l. euryxanthus* or *M. l. euryxanthus* intercrosses. Habitat conditions associated with museum specimens were verified through field visits to the site of collection, as well as through review of current and historical aerial photos. We considered an Alameda whipsnake to be in "typical habitat" (i.e., chaparral/scrub plant communities) if the animal observed was ≤100 m from a patch of chaparral/scrub that was >40 m in diameter. Animals estimated to be >100 m from chaparral/scrub plant communities that was >40 m in diameter were considered to be in "atypical habitat".

We acknowledge the shortcomings of using these data in our analysis, including misidentification of snakes by the observer from CNDDB records, inaccurate or imprecise location information, and the inherent sampling biases of random sightings. We successfully contacted many of the reported observers to verify their observations or discuss habitat conditions. Records were excluded if habitat conditions were not verifiable by field visits, aerial photography, or personal communication. We also recognize that significant changes to habitat may have occurred since the observation. We excluded observations where post-observation changes in habitat condition were evident. For example, we included the data point if the observation was in oak woodland, which was older than the observation. We excluded the observation if it occurred in an area that showed change based on historical and current aerial photos and site visits. In addition, road-killed animals were considered to utilize the habitat adjacent to the road (e.g., annual grasslands). For these, the distance was measured from the road edge to the nearest patch of typical habitat. We also included observations that had a reported distance error and subtracted that error from our estimates. In the case of road-killed animals, we added the distance error to the location in both directions along the road. In all cases, we measured the distance to the nearest patch of habitat regardless of direction, slope, habitat type, etc. In spite of the shortcomings of available data, we believe that this methodology illustrates a trend in habitat use that has not yet been reported.

For 10 observations, habitat conditions were ambiguous or were obscured by human development; we did not include these observations in this analysis. Alameda whipsnakes found in chaparral/scrub vegetation types accounted for 82 of 129 records reviewed. We determined that 37 observations of Alameda whipsnake were associated with oak woodland, riparian, annual grassland, and other plant communities (Table 1). Estimated distances

Table 1. Thirty-seven records of observations of free-ranging Alameda whipsnakes and the dominant habitat type within which the snake was found in California. Habitat types defined as AG = annual grassland, MEF = mixed evergreen forest, OS = oak savanna, OW = oak woodland, RI = riparian.

Date	Habitat[a]	General location	County[b]	Distance (m) to scrub[c]	Source[d]
1976	OW	Marsh Creek Road	CC	100	Museum specimen - MVZ128223
2004[e]	RI	Round Valley Regional Park	CC	100	S. Bobzien, personal communication
2003	AG	Lime Ridge, Walnut Creek	CC	100	D. Jansen, personal communication
2003	AG	Lime Ridge, Walnut Creek	CC	100	D. Jansen, personal communication
2003	AG	Lime Ridge, Walnut Creek	CC	100	D. Jansen, personal communication
2004[e]	AG	Lawrence Livermore Lab.	AL	100	J. Woollett, personal communication
1990	OW	South of Los Vaqueros Res.	CC	100	McGinnis[f] 1990
1994	AG	Tilden Regional Park	AL	150	Swaim 1994
1998	OW	Northwest of Los Vaqueros Res.	CC	200	J. Alvarez, personal observation
1978	OS	Mines Road	AL	200	Museum specimen - MVZ164944
1975	RI	Sunol Regional Park	AL	250	Museum specimen - CAS191951
1973	AG	Corral Hollow Road	AL	250	Museum specimen - MVZ116504
2003	AG	Telsa Road	AL	350	M. van Hattem, personal communication
1981	RI	Morgan Territory Regional Park	CC	400	CNDDB record #19
2004[e]	AG	Lawrence Livermore Lab.	AL	400	J. Woollett, personal communication
1985	OW	Tesla Road	AL	400	Museum specimen - MVZ229945
1995	OW	Tesla Road	AL	400	Museum specimen - MVZ230734
2004[e]	AG	Lawrence Livermore Lab.	AL	450	J. Woollett, personal communication
1996	OW	Orinda Village	CC	500	Museum specimen - CAS201051
1999	OW	West of Los Vaqueros Res.	CC	500	J. Alvarez, personal observation
2002	OW	Del Valle Reservoir	AL	600	A. Murphy, personal observation
1999	RI	Tassajara Creek, Danville	CC	600	CNDDB record #49
2000	AG	Finley Road	AL	650	Swaim[g] 2000
1970	RI	Niles Canyon, Fremont	AL	750	Museum specimen - CAS191955
1972	OW	Sunol Regional Wilderness	AL	800	Museum specimen - CAS191952
1986	OW	Mitchell Canyon Road	CC	800	Museum specimen - MVZ215647
1974	OW	Arroyo Mocho/Mines Rd	AL	950	Museum specimen - MVZ128906

2003	MEF	Tilden Regional Park	AL	1000	Museum specimen - CAS227730
2004[e]	RI	Round Valley Regional Park	CC	1000	S. Bobzien, personal communication
1998	OW	South of Los Vaqueros Res.	CC	1100	J. Alvarez, personal observation
1960	AG	Tesla Road	AL	1100	Museum specimen - MVZ70518
1996	AG	Tesla Road	AL	1700	Museum specimen - MVZ230736
1981	AG	Morgan Territory Road	CC	1850	Museum specimen - MVZ193330
2002	AG	West of Pleasant Hill	CC	2000	A. Murphy, personal observation
1948	AG	Hamilton Gultch, Berkeley	AL	2650	Museum specimen - MVZ50390
1983	AG	North of Los Vaqueros Res.	CC	7050	CDFG *in* McGinnis 1990
1999	AG	Northeast of Los Vaqueros Res.	CC	7350	J. Alvarez, personal observation
			mean	1041	
			SD	1580	

[a] Nearest dominant habitat to the location of reported observation.
[b] County: AL = Alameda; CC = Contra Costa.
[c] Distance estimated in meters (± 50 m) to the nearest chaparral/scrub habitat patch ≥40 m in diameter.
[d] Individuals noted as an observation source are personal communications with the senior author. MVZ = Museum of Vertebrate Zoology, Berkeley, California; CAS = California Academy of Sciences, San Francisco; CNDDB = California Natural Diversity Data Base, Sacramento.
[e] No specific date given during personal communication that occurred during date shown.
[f] S. M. McGinnis. 1990. Survey for the Alameda whipsnake (*Masticophis lateralis euryxanthus*) on the north-facing slope of the Kellogg Creek Watershed west of Vasco Road, Contra Costa County, California. Manteca, California, USA.
[g] K. E. Swaim. 2000. Alameda whipsnake habitat assessment, Carnegie State Recreation Area and Alameda/Tesla properties, Alameda and San Joaquin Counties, California. Livermore, California, USA.

from chaparral/scrub plant communities to the presumed observation location ranged from 100 to >7,300 m ($\bar{x}$ = 1041 m; SD = 1,580 m) (Table 1). These observations indicated that the Alameda whipsnake was utilizing annual grassland (n = 17), oak woodland (n = 12), and other habitats adjacent, but not restricted to, chaparral and scrub. McGinnis and Swaim (1993) reported that Alameda whipsnakes occasionally utilized annual grasslands with widely scattered shrubs. Swaim (1994) suggested that Alameda whipsnakes might use annual grasslands seasonally for seeking mates. Recently, S. M. McGinnis (McGinnis Consulting, personal communication) suggested that this subspecies may range widely through 2 or more habitat types, but it does not appear to establish a self-sustaining population without available quality coastal scrub or chaparral habitat. It is reasonable to attribute some observations of Alameda whipsnake in atypical habitat to dispersal and also to the seasonal movements of individuals; however, 29% of the reported observations that we analyzed were found outside of what has heretofore been considered typical habitat for the subspecies. Recently, Alameda whipsnakes have been reported to utilize a greater number of slope aspects than was previously reported (Alvarez 2006). These observations, when considered *en toto*, contribute to our understanding of the habitats utilized by the Alameda whipsnake. Habitat associations for this subspecies should include those that co-occur in the general chaparral/scrub habitat mosaic. Careful consideration should be made for land management issues in areas where the Alameda whipsnake is known to occur. In particular, land managers and consultants should consider intact annual grassland, oak woodland, and riparian habitats, as well as non-natural and disturbed open habitats associated with chaparral/scrub

plant communities as potential habitat in areas already occupied by Alameda whipsnakes.

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