



### SAN JOAQUIN COACHWHIP

*Masticophis flagellum ruddocki* Brattstrom and Warren 1953

#### Status Summary

*Masticophis flagellum ruddocki* is a Priority 2 Species of Special Concern, receiving a Total Score/Total Possible of 53% (58/110). It was previously considered a Species of Special Concern (Jennings and Hayes 1994a).

#### Identification

*Masticophis flagellum* is a large (91–260 cm TL) slender colubrid snake with smooth scales and a large head and eyes (Stebbins 2003). The species is distributed across the southern portion of the United States from Florida to California, with western subspecies tending to be smaller than eastern animals. Brattstrom and Warren (1953) reported that their largest specimen of *M. f. ruddocki* was 170 cm TL. Coloration is highly variable within *M. flagellum*. The subspecies *M. f. ruddocki* has a tan, olive-brown, or yellowish-brown dorsal color and lacks the dark head and neckbands characteristic of other subspecies. The ventral coloration is light tan or yellow, with a pink or orange cast under the tail

(Jennings and Hayes 1994a, Stebbins 2003). The scales on the tail are often described as having a “braided” appearance (Stebbins 2003).

#### San Joaquin Coachwhip: Risk Factors

Ranking Metric (Maximum Score)	Score
i. Range size (10)	5
ii. Distribution trend (25)	20
iii. Population concentration/ migration (10)	0
iv. Endemism (10)	10
v. Ecological tolerance (10)	3
vi. Population trend (25)	10
vii. Vulnerability to climate change (10)	3
viii. Projected impacts (10)	7
Total Score	58
Total Possible	110
Total Score/Total Possible	0.53

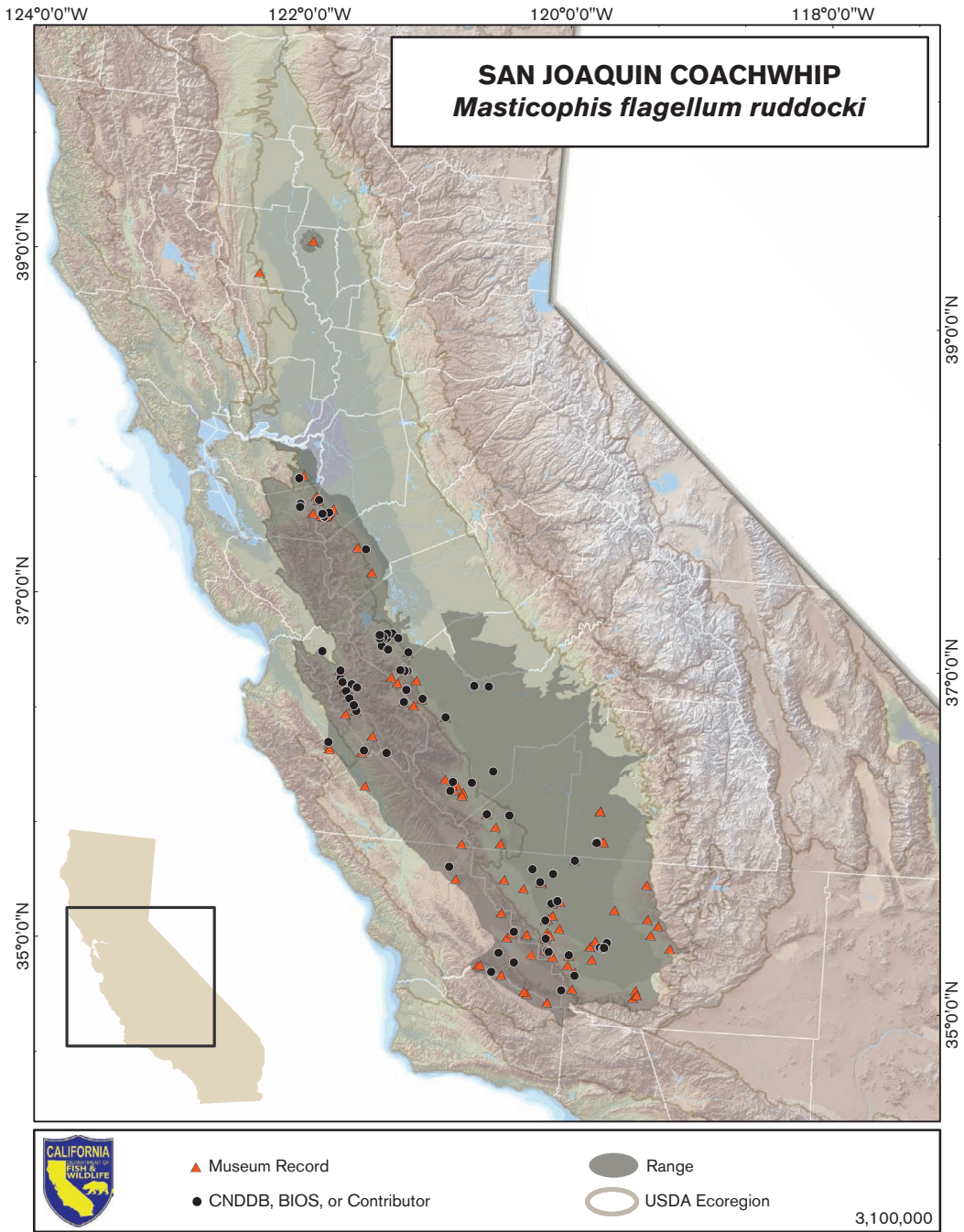


PHOTO ON PREVIOUS PAGE: San Joaquin coachwhip, Kern County, California. Courtesy of Jeff Lemm.

### Taxonomic Relationships

Brattstrom and Warren (1953) described *Masticophis flagellum ruddocki* as a subspecies based on morphological characters including dorsal coloration, the lack of dark neckbands, and a relatively low number of subcaudal scales. Analysis of mitochondrial DNA from California populations supported the uniqueness of *M. f. ruddocki*, corroborating the morphological data (Mitrovich 2006).

### Life History

Very little is known about the life history of *Masticophis flagellum ruddocki*. In general, *M. flagellum* is an extremely active diurnal snake that prefers warm temperatures (Brattstrom 1965, Hammerson 1977). Home ranges are suspected to be large, but no movement data are available for this subspecies (R. Hansen, pers. comm. in Jennings and Hayes 1994a). Preference for warm temperatures results in late-season emergence (April–May), and daily surface activity corresponds to the warmest parts of the day (Hammerson 1977). Data from red coachwhips (*M. f. piceus*) in the Mojave Desert found body temperatures as low as 13.9°C when inactive in burrows to a high of 40.8°C while actively moving (Secor 1995). Mating is thought to take place in May, with oviposition occurring in June or July (Jennings and Hayes 1994a). Adults may cease surface activity and retreat to mammal burrows as early as August (pers. obs. in Jennings and Hayes 1994a).

Like other members of the *M. flagellum* complex, the diet of *M. f. ruddocki* is presumably generalized on vertebrates, including large prey like antelope squirrels (*Ammospermophilus nelsoni*), blunt-nosed leopard lizards (*Gambelia sila*), and whiptails (*Aspidoscelis tigris*) (Montanucci 1965, Tollestrup 1979; S. Barry, pers. comm.; R. Hansen, pers. comm.; S. Sweet, pers. comm. in Jennings and Hayes 1994a).

### Habitat Requirements

*Masticophis flagellum ruddocki* occurs in open, dry areas with little or no tree cover (Morafka and Banta 1976). Valley grassland and saltbush

scrub habitats are used in the western San Joaquin Valley (Montanucci 1965, Banta and Morafka 1968, Tollestrup 1979, Sullivan 1981; pers. obs. in Jennings and Hayes 1994a). Spring road cruising surveys from 1972 to 1979 in eastern Alameda and western San Joaquin Counties found *M. f. ruddocki* in grassland and transitional habitat but not in mixed oak chaparral woodland (Sullivan 1981). *Masticophis flagellum ruddocki* will climb into bushes, apparently to scan for predators and prey or to seek cover (Cunningham 1955, Stebbins 2003). Mammal burrows are used for overwintering and possibly also for oviposition (Jennings and Hayes 1994a).

### Distribution (Past and Present)

*Masticophis flagellum ruddocki* is endemic to California, with a small range extending from Arbuckle, Colusa County, in the Sacramento Valley south to the Kern County portion of the San Joaquin Valley and west into the inner South Coast Ranges (Brattstrom and Warren 1953, Jennings and Hayes 1994a). A disjunct population occurs in the Sutter Buttes (Hayes and Cliff 1982).

Much of this subspecies' historic range has undergone dramatic land use changes from grassland to intensive agriculture in the Central Valley. *Masticophis flagellum ruddocki* is thought to be sensitive to disturbance and does not persist in cultivated areas (Ernst and Ernst 2003; S. Barry, pers. comm.). It has therefore suffered a severe range contraction in its Central Valley range.

### Trends in Abundance

Though neither historical nor current abundance estimates are available, we suspect that the conversion of historical habitat to row crop agriculture and urban development has resulted in lower abundances than in preagricultural times.

### Nature and Degree of Threat

Habitat loss and fragmentation due to agriculture and urbanization are the major threats to

*Masticophis flagellum ruddocki*. As with other diurnally active, highly mobile snakes, road mortality is probably a significant source of mortality, although its overall impact requires more study. The greatest potential threats from climate change are due to changes in fire regime. In the more coastal parts of the range, the area burned is expected to increase by up to 50% (Fried et al. 2004, Lenihan et al. 2008), and the probability of large (>200 ha) fires is predicted to increase (Westerling and Bryant 2008). Modest decreases in the probability of large wildfires are expected in the San Joaquin Valley. How *M. f. ruddocki* may respond to increased fire needs more study. Fire may have direct mortality effects on snakes and negative effects on prey populations but may also benefit *M. f. ruddocki* by increasing or maintaining the availability of open habitat. Under climate change projections, grassland habitat is expected to increase by up to 140% in the coastal part of the range, with little change in vegetation expected in the Central Valley (Lenihan et al. 2008, PRBO 2011). These vegetation shifts may result in additional potential habitat for *M. f. ruddocki*.

#### *Status Determination*

*Masticophis flagellum ruddocki* is a California endemic with a small range and is restricted to a heavily disturbed part of the state, resulting in a Priority 2 designation.

#### *Management Recommendations*

The lack of basic ecological information on this subspecies needs to be addressed before any meaningful management can be accomplished. At a minimum, remaining large habitat fragments and connectivity among fragments must be protected if the species is to persist.

#### *Monitoring, Research, and Survey Needs*

Although additional work on all aspects of its ecology, demography, and population genetic differentiation would be useful, information on reproductive biology, movement ecology, population sizes, and fragmentation is key priority for future work. Some large habitat fragments are currently protected from some kinds of human disturbance (e.g., the Carrizo Plain National Monument) and provide suitable areas to begin studying basic ecology and habitat requirements in this taxon.