64 Frogs and Toads
California Department of Fish and Wildlife

**ARROYO TOAD**
*Bufo californicus* Camp 1915

**Status Summary**
*Bufo californicus* is a Priority 1 Species of Special Concern, receiving a Total Score/Total Possible of 93% (102/110). During the previous evaluation, it was also considered a Species of Special Concern (Jennings and Hayes 1994a), and it has been listed as federally Endangered since 1995.

**Identification**
*Bufo californicus* is a small to medium-sized (4.6–8.6 cm SVL), light-gray to tannish-brown toad that often has some greenish or olive and dark-brown mottling on the back and sides (Camp 1915, Stebbins 2003). The underside is buff or dirty white and usually unmarked (Stebbins 2003). A light middorsal stripe is rarely present (Jennings and Hayes 1994a, Stebbins 2003). Weak cranial crests are often present and the paratoids are oval-shaped and widely separated (Stebbins 2003). The advertisement call of this species is a musical trill that lasts 3–10 s. The pitch of the call rises quickly and is held constant for the remainder of the call, which ends abruptly (Stebbins 2003, Elliott et al. 2009). Like most toads, the tadpoles are small and black early in life. However, several weeks post-hatching they develop a cryptic tan coloration that closely

**Arroyo Toad: Risk Factors**

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<th>Ranking Criteria (Maximum Score)</th>
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<td>i. Range size (10)</td>
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<td>ii. Distribution trend (25)</td>
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<td>iii. Population concentration/ migration (10)</td>
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<td>iv. Endemism (10)</td>
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<td>viii. Projected impacts (10)</td>
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**Total Score** 102
**Total Possible** 110
**Total Score/Total Possible** 0.93
matches the substrate (Sweet 1992, Hancock 2009).

Metamorphosed individuals of this species may be confused with the western toad (B. boreas), which is the only sympatrically occurring toad. B. boreas has a prominent white or cream dorsal stripe and lacks cranial crests (Stebbins 2003). Young tadpoles that still retain the black coloration are difficult to distinguish from B. boreas, but older tadpoles are readily distinguishable.

**Taxonomic Relationships**

Until recently, *Bufo californicus* was considered a subspecies of the Arizona toad (*B. microscaphus*) (Price and Sullivan 1988), although recommendations to recognize it as a full species date back to Myers (1930). Frost and Hillis (1990) recognized this species as distinctive based on the general observation that few allopatrically distributed polytypic species represent single genetically cohesive units, as is implied by retaining *B. californicus* as a subspecies under *B. microscaphus*. Later analyses of allozyme data confirm that *B. californicus* is a distinct lineage, providing support for its recognition as a full species (Geragus 1998). Additional analyses of advertisement calls indicated a substantial amount of variation within the species complex, although the results were equivocal with respect to species status (Geragus et al. 1997). Lovich (2009a) analyzed data from two mitochondrial genes and found additional evidence that *B. californicus* is a distinct species. This work also identified clades within *B. californicus* that roughly correspond to parts of the range north and south of the Los Angeles Basin, respectively.

Frost et al. (2006a) recommended placing this species and many other North American bufonids in the genus *Anaxyrus*, although this proposal and the analyses that support it are controversial (Crother 2009, Frost et al. 2009a, Pauly et al. 2009). We choose not to follow this recommendation at the present time, pending further analyses, and to maintain taxonomic stability.
the inactive season. Sweet (1993) documented that toads experience ~55% per year mortality mostly during the winter, though other estimates suggest even higher mortality (D. Holland and N. Sisk, unpublished data, reported in Sweet and Sullivan 2005). Eggs and young larvae are apparently unpalatable to most predators, although garter snakes and nonnative fishes prey upon older tadpoles (Sweet 1993). Juvenile toads that have not yet adopted the nocturnal activity pattern characteristic of adults also experience high predation pressure (Hancock 2009). Adult toads experience intense predation from introduced bullfrogs in areas where that species occurs (Miller et al. 2012, R. Fisher pers., comm.). In the absence of bullfrogs, adult toads experience much lower predation intensity (Sweet 1993, Hancock 2009).

Habitat Requirements

Along with its close relative Bufo microscaphus, B. californicus may have the most specialized habitat requirements of any North American anuran (Stebbins 2003). This species requires shallow, slow-moving stream and riparian habitat. In some areas they may occupy first-order streams, although most populations inhabit second- to sixth-order streams that have extensive braided channels and sediment deposits of sand, gravel, or pebbles that are occasionally reworked by flooding (Sweet and Sullivan 2005). These toads will use either permanent or seasonal streams, although seasonal streams must flow for a minimum 4–5 months for successful reproduction and recruitment (Sweet and Sullivan 2005). At inland sites, radiotelemetry studies indicate that this species rarely moves beyond the immediate upland margin of streams, although in coastal sites arroyo toads appear to occasionally use and disperse across hotter and drier upland sites (Sweet 1992, Sweet 1993, Griffin and Case 2001, Hancock 2009, Mitrovich et al. 2011). Mitrovich et al. (2011) found that radio-tracked toads actively selected channel and terrace stream habitats, and largely avoided surrounding scrub, grassland, and forest. On average, males were found in closer proximity to flowing sections of stream than females, possibly to maximize reproductive opportunity (Mitrovich et al. 2011). Bufo californicus is known to occasionally use and breed in human-made habitats, such as artificial stream terraces and ponds (Price and Sullivan 1988, Mahrdt et al. 2002). It is unknown whether the species can persist in these habitats.

Distribution (Past and Present)

Bufo californicus historically occurred in coastal drainages from the San Antonio River, Monterey County, California, southward through the Transverse and Peninsular Ranges to the vicinity of Arroyo San Simón in Baja California Norte, Mexico (Price and Sullivan 1988, Gergus et al. 1997, Grismer 2002, Lovich 2009a). Almost all populations occur along the coast or on the coastal slopes of the southern California mountains. Six localities were previously recognized from the desert slopes of Los Angeles, Riverside, San Bernardino, and San Diego Counties, California (Patten and Myers 1992, Jennings and Hayes 1994a). Desert slope populations are known to occur at Little Rock Creek, Los Angeles County, and the Mojave River, San Bernardino County. Populations at Whitewater River, Riverside County, Borrego Springs (listed as San Felipe Creek in Jennings and Hayes 1994a), Vallecito Creek, and Pinto Canyon, San Diego County, are probably in error and are the result of misidentifications (Ervin et al. 2013). The known elevational range extends from near sea level to approximately 1000 m (Stebbins 2003; S. Sweet, pers. comm.).

The present distribution of B. californicus is considerably smaller than it once was. Jennings and Hayes (1994a) estimated that this species had disappeared from 76% of its former range in California, although more recent estimates place this loss at 65% (Sweet and Sullivan 2005).

Trends in Abundance

In addition to the extirpations discussed above, extensive declines in abundance have been
documented in most *Bufo californicus* populations that do survive. Extensive collections from the 1930s, largely stemming from the work of L.M. Klauber, suggest that this species was formerly present at much higher densities (S. Sweet, pers. obs., reported in Sweet and Sullivan 2005).

**Nature and Degree of Threat**
A recent 5-year review of the status of *Bufo californicus* thoroughly discusses the ongoing threats to this taxon (USFWS 2009). We follow the findings of that document and recommend that readers consult it for additional detail.

The greatest threat facing this taxon is loss and degradation of habitat that stems from modifications to hydrology from reservoir construction, roads, flood control, development, recreational activity, and mining (USFWS 2009). In addition, declines are occurring even in areas that are not subject to development and direct habitat degradation from human activities (Hancock 2009). These additional declines stem largely from introduced predators (primarily bullfrogs and green sunfish) and introduced plants, which degrade habitat and/or decrease survivorship of toads (Sweet 1992, Hancock 2009, USFWS 2009, Miller et al. 2012). Off-highway vehicle use has also caused both habitat degradation and direct mortality in this species (Ervin et al. 2006).

**Status Determination**
Major declines in both distribution and abundance, coupled with several ongoing threats, combine to warrant a Priority 1 Species of Special Concern status for *Bufo californicus*.

**Management Recommendations**
Management efforts for *Bufo californicus* should mirror those outlined by the USFWS recovery plan and 5-year review for this taxon (USFWS 1999, USFWS 2009). The recent 5-year review suggests that management efforts to date have been effective, and the outlook for this species has improved somewhat since it was initially listed (USFWS 2009). The most important management strategy is to preserve existing stream habitat that supports this species and to restore additional habitat that can support self-sustaining populations. Restoration efforts should include dam removal to allow streams to meander and rebuild sand and gravel bars, and removal of exotic plants and vertebrate predators.

**Monitoring, Research, and Survey Needs**
Monitoring, research, and survey needs are covered in depth in the USFWS recovery plan for this taxon and the recent 5-year review. We refer the reader to these documents for additional detail (USFWS 1999, USFWS 2009). Monitoring efforts should focus on recovering populations, particularly those in newly restored habitat. It is particularly important to continue monitoring through drought and El Niño cycles given that this is a short-lived species and several years of consistent drought could be extremely damaging to recovering populations.

In addition, research aimed at characterizing variation in this species’ life history in different parts of its range should be undertaken, as these differences might have an impact on future management efforts. For example, the two desert slope populations may differ substantially in several aspects of life history relative to the coastal slope populations. Additional research into the prevalence and potential impacts of *Bd* fungus on this species is also particularly important. Finally, molecular analyses of population size and connectivity might be particularly valuable in this taxon.