ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AAABB01010
Data Sensitivity: **No**

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Incilius alvarius* (Girard in Baird, 1859)

COMMON NAME: Sonoran Desert Toad

SYNONYMS: *Bufo alvarius* Girard, 1859
Ollotis alvaria (Girard, 1859)
Bufo alvarius Girard, 1859
Phrynoidis alvarius girard
Cranopsis alvaria girard

OTHER COMMON NAMES: Colorado River Toad

FAMILY: Bufonidae

AUTHOR, PLACE OF PUBLICATION: Girard in Baird, 1859

TYPE LOCALITY: Valley of Gila and Colorado

TYPE SPECIMEN: USNM 2572. Maj. G. H. Thomas. 1855 (Fouquette 1970)

TAXONOMIC UNIQUENESS: Within the genus *Incilius* there are 39 recognized species (ITIS 2025). Within the genus *Incilius* there are only 2 species found north of Mexico within North America (Nicholson 2025).

Incilius alvarius was previously placed in the genus *Bufo* (Crother 2000). Frost et al (2006) proposed splitting the genus *Bufo* into smaller monophyletic taxa to resolve long-recognized problems with paraphyly in the traditional treatment of *Buf*o, and placed the species in the genus *Ollotis*. This treatment was accepted by Crother (2008) and Collins and Taggart (2009). However, the oldest name for this taxon is *Incilius* Cope, 1863 (see Frost et al. 2009) which therefore takes precedence. This treatment was accepted by Crother (2012).

DESCRIPTION: The Sonoran Desert Toad is the largest toad native to the United States measuring up to 7.5 inches (191 mm) and sometimes even more (Holycross et al. 2022).

Sonoran Desert Toads are olive-green to brown and have lumps spread across their skin (Holycross et al. 2022). Juveniles can have small, orange-tipped tubercles on their back and are generally a lighter shade of green (Rorabaugh 2023). The Sonoran Desert Toad has conspicuous cranial crests and especially prominent parotoid glands with a large white tubercle below the glands (Holycross et al. 2022). The length of the parotoid glands equals the distance from their nostril to tympanum (Foquette 1970). They also have prominent glands on their hind legs with one set distal to the hips on the femur and another set proximal to the ankle. Individuals can weigh up to 1 kilogram when fully grown (Holycross et al. 2022).

AIDS TO IDENTIFICATION: The greatest aide to identifying this species is its size; it is the largest native toad to the United States with an adult measuring around 7.5 inches or larger. The large parotoid glands on its head, large glands on the legs, and large white wart at the angle of the jaw make it distinguishable from other large anura such as the American Bullfrog (*Rana catesbeiana*) (Murphy 2018, Holycross et al. 2022). Woodhouse's Toad (*Anaxyrus woodhousii*) has a pale median dorsal stripe (Stebbins 2003). Great Plains Toad (*A. cognatus*) has paired blotches on the dorsum. Arizona Toad (*A. microscaphus*) has oval-shaped parotoid glands and lacks enlarged warts on its hindlimbs (Stebbins 2003). Newly-metamorphosed Sonoran Desert Toads are similar to Red-spotted Toad (*A. punctatus*) but differ in being olive green instead of tan and having the white swelling or raised area at the corner of the mouth that is lacking in Red-spotted Toad (Murphy 2018).

ILLUSTRATIONS:

Color photo (Behler and King 1979)
Color photo (Stebbins 2003, Plate 14)
Color photo (Fouquet et al. 2013, p. 38)
Color photos (Murphy 2018)
Color photo (Holycross et al. 2022)
Color photo (Rorabaugh 2023)
https://live-reptilesofaz.pantheonsite.io/turtle-amphibs-subpages/h-i-alvarius/

TOTAL RANGE: The Sonoran Desert Toad has a range that begins in southwest New Mexico and extends across the southern half of Arizona into southeastern California. Their range also extends into northern Baja and goes south into Guirocoba, and Sonora Mexico (Murphy 2018). It is considered extirpated from the lower Colorado River area (Holycross et al. 2022, Murphy 2018) and has nearly been extirpated from California (NatureServe 2025).

RANGE WITHIN ARIZONA: The Sonoran desert toad inhabits mainly the southern half of the state with its range covering all of the southern counties and extending into the southern section of Yavapai county (Holycross et al. 2022, Rorabaugh 2023).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Sonoran Desert Toads are able to secrete powerful bufotoxins through their parotoid and legs glands which can be deadly if too much is ingested (Rorabaugh 2023). The poisons secreted include bufogenins, indolealkylamines, as well as a derivative of dimethyltryptamine (DMT) (Gutiérrez-González et al. 2016, Villa 2023). The toxin dimethyltryptamine is a strong hallucinogen and is being studied for its medicinal properties in treating addictions (Gutiérrez-González et al. 2016). The skin toxins may paralyze or kill dogs (Degenhardt et al. 1996).

Despite having such potent toxins, the Sonoran Desert Toad is still victim to being preyed upon by mammals in the Sonoran Desert. Predators of Sonoran Desert Toads include Racoons (*Procyon lotor*), skunks (*Mephitis* spp.), Gray Foxes (*Urocyon cineroargenteus*), Ringtails (*Bassariscus astutus*), Coatis (*Nasua narica*), and Bobcats (*Lynx rufus*) (Gutiérrez-González 2016). It has been observed that mammalian predators will flip the toad on its back and eat it through its stomach thus avoiding the dorsal glands which carry the toxins (Gutiérrez-González et al. 2016). Sonoran Desert Toads have been observed to display a defensive behavior when faced by a predator where they will lower their head and tilt their body forward to the predator exposing its glands and anatomical structures (Murphy 2018).

Sonoran Desert Toads are rarely observed during the breeding and monsoon season (Degenhardt 1996, Rorabaugh 2023). They spend much of their time underground in burrows (Degenhardt 1996). They tend to emerge up to a month before the monsoon starts but can also be found before or after that in areas that have permanent water sources (Rorabaugh 2023). When there is little precipitation or no water source they can be found in burrows or other underground shelters (Rorabaugh 2023).

Sonoran Desert Toads may remain in shelter in rodent burrows, rocky outcrops, or hollows under watering troughs for as long as 9 months during dry periods. Adults move overland to breeding sites prior to, or associated with, the onset of summer monsoon rains. The extent of these movements is not well known, but records of them moving >400 m in a single day are known (Fouquette et al. 2013).

REPRODUCTION: Reproduction for the Sonoran Desert Toad generally occurs during the monsoon season and happens at night after a period of significant rainfall (more than 1 inch (25.4 mm)) (Degenhardt et al 1996). In areas with a permanent water source the time of reproduction may differ. Sonoran Desert Toads generally breed in shallow waters created by the rainfall, as well as ponds, water catchments, or backwater systems (Rorabaugh 2023). Males will actively search for females or call for them from the selected water source. Calls are about one second and are weak, rough, and low pitched making a *whoooot* sound

(Degenhardt et al. 1996, Holycross et al. 2022). Sullivan and Malmos (1994) noted that calling males were significantly larger than those males only observed actively searching for females, and suggested that males may call more frequently when fewer conspecific males are present in a breeding aggregation. Females will lay up to 8,000 eggs in strings (Holycross et al. 2023).

FOOD HABITS: Sonoran Desert Toads are omnivores with their diet primarily consisting of invertebrates, including venomous centipedes, spiders, beetles, grasshoppers, wasps, millipedes, ants, termites, solpugids, snails, scorpions. They also eat small vertebrates such as mice, and lizards. It's thought that they will go out and hunt prey and eat anything they can fit in their mouth and overpower (Murphy 2018, Rorabaugh 2023).

HABITAT: Sonoran Desert Toads primarily occur in mesquite-creosote bush lowlands, but also can be found in rocky riparian zones with cottonwood and sycamore, arid grassland, stock ponds, and oak-walnut woodlands in mountain canyons (Degenhardt et al. 1996, Fouquette et al. 2013). It previously inhabited the Colorado River corridor but has been extirpated from that area (Arizona Game and Fish Department (AZGFD) 2022, Holycross et al. 2022).

ELEVATION: Anywhere with suitable habitat under 5,800 ft. (Rorabaugh 2023).

PLANT COMMUNITY: Arizona Upland Sonoran Desertscrub, Chihuahuan Desertscrub, Mohave Desertscrub, Semidesert Grassland, Plains and Great Basin Grassland, Madrean Evergreen Woodlands, Rocky Mountain Montane Forest and Meadow, Great Basin Conifer Woodlands, Petran Montane Conifer Woodlands (AZGFD 2022, Holycross et al. 2022).

POPULATION TRENDS: Presumed relatively stable within its natural range. Although Sonoran Desert Toads are abundant at many localities in Arizona, they appear to have declined in New Mexico and California (Fouquette et al. 2013).

SPECIES PROTECTION AND CONSERVATION

Status definitions: https://bit.ly/hdms-status-definitions
Heritage Network Conservation Status Rank definitions: https://bit.ly/hdms-rank-definitions

ENDANGERED SPECIES ACT STATUS:	None
STATE STATUS:	2 (AZGFD, AWCS 2022, 2024)
HERITAGE NETWORK STATUS:	G5
	S3S4

OTHER STATUS: LC (IUCN, IUCN SSC Amphibian Specialist Group 2019)

PREVIOUS STATUS
STATE STATUS: 1B (AZGFD, AWCS 2012)

MANAGEMENT FACTORS:

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Sonoran Desert Toad requires several years of robust population data to identify and understand threats (Villa 2023). Thorough surveys to evaluate the status of the Sonoran Desert Toad in the Foothills and Fortuna Wash in southwestern Arizona (Rorabaugh 2010).

LAND MANAGEMENT/OWNERSHIP:

BIA - Ak-Chin Indian and San Xavier Indian Reservations, Tohono O'odham Nation
BLM - Hassayampa, Kingman, Lake Havasu, Lower Sonoran, Safford, and Tucson Field Field Offices; Ironwood Forest and Sonoran Desert National Monuments; Las Cienega National Conservation Area
DOD - Luke-Williams Range
NPS - Organ Pipe Cactus National Monument, Saguaro National Park
Regional - Adobe Dam and White Tank Mountain Regional Parks; Cave Buttes Recreation Area; McDowell Mountain, Papago, Picture Rocks District, South Mountain, and Tucson Mountain Parks
State - Oracle State Park, State Trust Land
USFS - Coronado and Tonto National Forests
USFWS - Buenos Aires National, Cabeza Prieta, Leslie Canyon, and San Bernardino National Wildlife Refuges
Private

SOURCES OF FURTHER INFORMATION

LITERATURE CITATIONS:

Arizona Game and Fish Department. 2012. Arizona's State Wildlife Action Plan 2012–2022. Arizona Game and Fish Department, Phoenix, Arizona. 233 pages.
Arizona Game and Fish Department. 2022. Arizona Wildlife Conservation Strategy: 2022-2032. Arizona Game and Fish Department, Phoenix, Arizona. 378 pages.

Arizona Game and Fish Department. 2024. Arizona Wildlife Conservation Strategy: 2022-2032, AWCS minor revision September 2024. Arizona Game and Fish Department, Phoenix, Arizona. 381 pages.

Behler, John L. and F. Wayne King. 1979. The Audubon Society field guide to North American reptiles and amphibians. Alfred A. Knopf, New York, New York. 743 pages.

Collins, Joseph T., and Travis W. Taggart. 2009. Standard common and current scientific names for North American amphibians, turtles, reptiles, and crocodilians. Sixth edition. The Center for North American Herpetology, Lawrance, Kansas. iv + 44 pages.

Crother, Brian I., Jeff Boundy, Jonathan A. Campbell, Kevin de Queiroz, Darrel R. Frost, Richard Highton, John B. Iverson, Peter A. Meylan, Tod W. Reeder, Michael E. Seidel, Jack W. Sites, Jr., Travis W. Taggart, Stephen G. Tilley, and David B. Wake. 2000 [2001]. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. Fifth edition. Society for the Study of Amphibians and Reptiles, Herpetological Circular No. 29. 82 pages.

Crother, Brian I. (editor). 2008. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. Sixth edition. Society for the Study of Amphibians and Reptiles Herpetological Circular 37. 90 pages. Online with updates at: http://www.ssarherps.org/pages/comm_names/Index.php

Crother, Brian I. (editor). 2012. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. Sixth edition. Society for the Study of Amphibians and Reptiles Herpetological Circular 39. 92 pages.

Degenhardt, William G., Charles W. Painter, and Andrew H. Price. 1996. Amphibians and reptiles of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. 431 pages.

Fouquette, M. J., Jr. 1970. *Bufo alvarius*. Catalogue of American Amphibians and Reptiles. 93:1-4.

Fouquette, M. J. Jr, Charles W. Painter, and Priya Nanjappa. 2013. *Incilius alvarius* Girard, 1859, Sonoran Desert toad. Page 38 *in:* David M. Green, Linda A. Weir, Gary S. Casper, and Michael J. Lannoo. 2013. North American amphibians: distribution and diversity. University of California Press, Berkeley, California. 340 pages.

Frost, Darrel R., Taran Grant, Julián Faivovich, Raoul H. Bain, Alexander Haas, Célio F.B. Haddad, Rafael O. de Sá, Alan Channing, Mark Wilkinson, Stephen C. Donnellan, Christopher J. Raxworthy, Jonathan A. Campbell, Boris L. Blotto, Paul Moler, Robert C. Drewes, Ronald A. Nussbaum, John D. Lynch, David M. Green, and Ward C. Wheeler. 2006. The amphibian tree of life. Bulletin of the American Museum of Natural History. 297:1-370. http://dx.doi.org/10.5531/sd.sp.13

Frost, Darrel R., Joseph R. Mendelson, III, and Jennifer Pramuk. 2009. Further notes on the nomenclature of middle American toads (Bufonidae). Copeia 2009:418. https://www.jstor.org/stable/25512242

Gutiérrez-González, Carmina E., Miguel A. Gómez-Ramírez, Daniela Gutierrez-Garcia, Javier Valenziela, James C. Rorabaugh, and Asron D. Flesh. 2016. Interactions between Sonoran Desert Toads (*Incilius alvarius*) and mammalian predators at the Northern Jaguar Reserve, Sonora, Mexico. Sonoran Herpetologist 29(2):26-27. http://aaronflesch.com/sites/default/files/publications/interactions-between-sonoran-desert-toads-incilius-alvarius-and-mammalian-predators-at-the-northern-jaguar-reserve-sonora-mexico.pdf

Holycross, A.T., T. C. Brennan, and R. D. Babb. 2022. A field guide to amphibians and reptiles in Arizona, second edition. Arizona Game and Fish Department, Phoenix, Arizona. 165 pages.

Integrated Taxonomic Information System. 2025. The Integrated Taxonomic Information System (ITIS) on-line database. https://www.itis.gov, CC0, https://doi.org/10.5066/F7KH0KBK (Accessed 2025-04-09).

IUCN SSC Amphibian Specialist Group. 2022. *Incilius alvarius*. The IUCN Red List of Threatened Species 2022: e.T54567A53948448. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T54567A53948448.en

Murphy, John C. 2018. Arizona's amphibians & reptiles: a natural history and field guide. Book Services. 316 pages.

Nicholson, Kirsten E., editor. 2025. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. Ninth edition. Society for the Study of Amphibians and Reptiles. 87 pages.

NatureServe. 2025. NatureServe Explorer: An online encyclopedia of life [web application]. NatureServe, Arlington, Virginia, USA. Available: https://explorer.natureserve.org/. (Accessed 2025-04-09).

Rorabaugh, Jim. 2010. Conservation of amphibians and reptiles in northwestern Sonora and southwestern Arizona. Pages 181-204. *in:* William Halvorson, Cecil Schwabe, and Charles van Riper, III, editors. Southwestern Desert Resources. The University of Tucson Press, Tucson, Arizona. 360 pages.

Rorabaugh, Jim. 2023. Sonoran Desert Toad, *Incilius alvarius*. *in:* Online field guide to the reptiles and amphibians of Arizona, Arizona Game and Fish Department. https://live-reptilesofaz.pantheonsite.io/turtle-amphibs-subpages/h-i-alvarius/

Stebbins, Robert C. 2003. A field guide to western reptiles and amphibians. Third edition. Houghton Mifflin Company, Boston, Massachusetts. 533 pages.

Sullivan, Brian K. and Keith B. Malmos. 1994. Call variation in the Colorado River toad (*Bufo alvarius*): behavioral and phylogenetic implications. Herpetologica 50(2):146-156. https://www.jstor.org/stable/3893021

Villa, Robert A. 2023. Toad in the road: biocultural history and conservation challenges of the Sonoran Desert Toad. Journal of Psychedelic Studies 7(S1):68-79. https://doi.org/10.1556/2054.2023.00269

MAJOR KNOWLEDGEABLE INDIVIDUALS:

ADDITIONAL INFORMATION:

Revised: 2025-04-24 (CMP)

To the user of this abstract: you may use the entire abstract or any part of it. We do request, however, that if you make use of this abstract in plans, reports, publications, etc. that you credit the Arizona Game and Fish Department. Please use the following citation:

Arizona Game and Fish Department. 2025. *Incilius alvarius*, Sonoran Desert Toad. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona. 8 pages.