ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AAABH01170
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Rana pipiens*
COMMON NAME: Northern Leopard Frog
SYNONYMS: *Lithobates pipiens* complex
FAMILY: Ranidae

AUTHOR, PLACE OF PUBLICATION: Schreber 1782. Naturfursher, Halle 18:182.

TYPE LOCALITY: White Plains, New York (Schmidt 1953 *in* Degenhart).

TYPE SPECIMEN: Neotype UMMZ 71365, Fall Creek, Etna, Tompkins County, New York

TAXONOMIC UNIQUENESS: Frost et al. (2006) recognized *Lithobates* (Anura: Raniae) for all species of North American "*Rana*" not placed in *Rana sensu stricto*. Although Crother (2008) accepted this change, others expressed a reluctance to accept this taxonomy (Hillis 2007, Wiens et al. 2009). Hillis and Wilcox (2005) provided a phylogenetic taxonomy that retained the species now under *Lithobates* within *Rana*. The nomenclature of North American ranids continued to be debated (Dubois 2007, Pauly et al. 2009, Frost et al. 2009) without resolution. Fouquette and Dubois (2014) suggested *Lithobates* be considered a subgenus of *Rana*, and Yuan et al (2016) suggested returning *Lithobates* to *Rana*. Crother (2017) suggested the best course of action was to hold this taxonomic change in abeyance and retained the use of *Lithobates*, as does Frost (2021). Holycross et al. (2022a, 2022b) and Arizona Game and Fish Department (2022) follow Yuan et al. (2016), using *Rana*, so HDMS uses *Rana* for the genus.

Large genus including Old and New World Species. *Rana pipiens* complex separated, contains nearly 20 species within North America, 6 species within Arizona (5 native and 1 introduced). Much published information on "*Rana pipiens*" actually pertains to other species that have been described or recognized since the early 1970s.

Hoffman and Blouin (2004) used mtDNA data to develop a hypothesis regarding the evolutionary history and phylogeography of *Rana pipiens*, indicating that *R. pipiens* is split into populations containing discrete eastern or western haplotypes, with the Mississippi River and Great Lakes region dividing the geographic ranges. O'Donnell and Mock (2012) reported on genetic evidence for an eastern and a western lineage (corresponding closely to the old *Rana pipiens pipiens* and *Rana pipiens brachycephala* ranges), but with a broad zone of introgressions between the two areas, and discussed the taxonomic and conservation implications (Frost 2021).

DESCRIPTION: Green to brownish, with well-defined, pale-bordered, oval or round dark spots on back, white to cream below. White stripe on upper jaw. Well-defined, pale dorsolateral folds that are continuous and not angled inward. "Voice is "low 'motorboat' or snore like sound interspersed with grunting and chuckling, lasting about 1-5 seconds. Choruses are a medley of moaning, grunting, and chuckling that suggests the sounds made by rubbing a well-inflated rubber balloon. Paired vocal sacs expand over the forelimbs" (Stebbins 1985). There is usually one spot on the head anterior to the eyes. Few or no tubercules on the dorsal and lateral body surface. Mean SVL in males is 68.3 mm (2.7 in) and in females 74.2 mm (2.92 in). The eardrum is without a light center. During breeding season, the males have a swollen, darkened thumb base and loose skin between the jaw and the shoulder. Males are usually smaller in size. The tadpole has coarse indistinct mottling on the tail. The distal half of the tail tends to darken approaching metamorphosis.

Color variations include the Burnsi variant, which may be found in either brown or green and does not have any dorsal spots. It has spots or bars on the limbs and may have black stippling on the back and sides. The second variant Kandiyohi, is brown with dashes of white and brown or black. The spots on the back and legs are still discernable, as well as the dorsolateral fold.

AIDS TO IDENTIFICATION: *R. pipiens* has a complete supralabial stripe, complete dorsolateral folds uninterrupted and undeflected in the sacral region. Adult *R. pipiens* may have green pigment in the groin region, and males possess vestigial oviducts. The posterior surfaces of the thighs in *R. chiricahuensis* have numerous small papilla, each surrounded by cream colored skin. Adult *R. chiricahuensis* have a mottled venter, and males along the southern Arizona border have vestigial oviducts. *R. berlandieri* is native to New Mexico and has been successfully introduced in recent years to southwestern Arizona in the Lower Colorado River near Yuma and the Gila and Salt Rivers as far east as Phoenix. Males unlike *R. yavapaiensis*, possess prominent vestigial oviducts (Platz 1988). Brown specimens of the Northern leopard frog differ from pickerel frogs by having round spots scattered randomly about the back, and a greenish wash on the thighs. *Rana catesbeiana* lacks dorsolateral folds and has a plain unicolored dorsum. *Hyla regilla* has toe pads. *Rana boylii* lacks dorsolateral folds and has pale triangle on snout. *Rana mucosa* lacks dorsolateral folds and has yellow on the underside of the legs, smoother skin and dark tipped toes. *Rana aurora* has less distinct dorsolateral folds, spotted with a less uniform pattern, a less pointed snout and red or yellow under the hind legs (Platz 1988).

ILLUSTRATIONS: Color drawing (Stebbins 1985: plate 15)
Color photo (Degenhart 1996: plate 25)
Color photos of green and brown burnsi phases (LeClere 2023)

TOTAL RANGE: Great Basin Region from northern Arizona, western Nevada and Washington to southern Canada; east to southeast Canada and New Jersey; now absent from much of the western area of its historical total range (USDI, FWS 2011).

RANGE WITHIN ARIZONA: Historically, the species has been found in lakes, tanks, springs, creeks, and rivers across the Colorado Plateau in northeast Arizona, primarily in Coconino, Navajo, and Apache Counties; currently, Northern leopard frogs are largely restricted to man-made waters (earthen tanks constructed for livestock and wildlife) on the Coconino National Forest (USDI, FWS 2009b). This may be the only remaining functional major population in Arizona, although a few small and isolated populations persist elsewhere in its Arizona range (USDI, FWS 2009b).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Found in a variety of habitats, most cold-adapted of all leopard frogs. May forage far from water, when frightened seeks water in a zigzag pattern of jumps. Like most frogs, leopard frogs are sluggish animals, often staying immobile for long periods of time. Sometimes the males call while underwater. They produce a low-pitched snore often followed by a chuckling noise, or a deep *urr, urr, urr*. They have internal vocal sacs, so their throats do not appear to move when they call. When they move far from a body of water they may absorb dew to keep moist. *Rana pipiens* hibernates in deep water. Juvenile leopard frogs often cluster together. Northern leopard frogs are one of the more terrestrial of the ranid frogs and use a considerable amount of upland habitat around breeding ponds throughout the adult life stage (Smith & Keinath 2007).

REPRODUCTION: Breeds mid-March to early June. In most areas, sexually mature in 2 years. The males, which are usually smaller in size, use their specialized thumbs to clasp females during mating. Mating occurs in the water while the female swims with the male attached to her back. By releasing her eggs, females stimulate milt ejaculation by the male and the eggs are fertilized. A single female may lay 3,000 to 5,000 eggs in one round mass that measures 3-6 in (7.5-15 cm) across. Tadpoles hatch in about a week and metamorphose in about three months, though hatching time and time to metamorphosis varies geographically and altitudinally (Smith & Keinath 2007). Aquatic larvae have been found to over winter in some areas (TNC 1988). Estrogenic exposure during vulnerable stages of development can impact metamorphosis, causing developmental delays of up to two weeks for tadpoles and effects on the reproductive organs lasting into early adulthood, an increasingly common issue across Northern leopard frog habitat (Hogan et al. 2008; Lambert et al. 2015).

FOOD HABITS: Tadpoles are considered generalist herbivores that primarily eat floating green and blue-green algae, plant tissue, organic debris, and possibly small invertebrates (TNC 1988; Smith & Keinath 2007). Northern leopard frogs then become carnivorous at metamorphosis (Merrell 1977 *in* Smith & Keinath 2007), and are opportunistic insectivores that will eat primarily small invertebrates, including smaller Northern leopard frogs (Smith & Keinath 2007).

HABITAT: A variety of habitats are needed to meet the requirements of all life stages, including grassland, brush land, woodland, and forest ranging high into mountains, usually in

permanent waters with rooted aquatic vegetation; the species also frequents ponds, canals, marshes, springs, and streams. Beaver ponds and human-constructed habitats such as earthen stock tanks and borrow pits also play a significant role in many populations (USDI, FWS 2009b). Sub adult Northern leopard frogs will typically migrate to feeding sites along the borders of larger, more permanent bodies of water while recently-metamorphosed frogs will move across land, primarily to locate new breeding areas (USDI, FWS 2009b).

ELEVATION: 0 - 11,000 ft (0 - 3,353 m) Stebbins 1985. Based on records from the Heritage Data Management System, elevation in Arizona ranges from 2,640 - 9,155 ft (805 - 2,790 m) (AZGFD, unpublished data accessed 2002).

PLANT COMMUNITY: Grassland, brush land, woodland, and forest land.

POPULATION TRENDS: The Northern leopard frog is now considered uncommon in a large portion of its range in the western United States, and declines of the species have been documented in most western states; local extinctions and disappearances are reported throughout its historical range (USDI, FWS 2009b).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:
None (as *Lithobates* [=*Rana*] *pipiens*) (USDI, FWS 2011)
[UR (as *Lithobates* [=*Rana*] *pipiens*) (USDI, FWS 2009a)]
[PTN (Center for Native Ecosystems et al. 2006)]

STATE STATUS:
1 (AZGFD, AWCS 2022)
[1A (AGFD SWAP 2012)]
[WSC (AGFD, WSCA 1996 in prep)]
[Candidate (AGFD, TNW 1988)]

OTHER STATUS:
Bureau of Land Management Sensitive (as *Lithobates pipiens*) (USDI, BLM AZ 2010, 2017)
[Bureau of Land Management Sensitive (USDI, BLM AZ 2008)]
Forest Service Sensitive (as *Lithobates pipiens*) (USDA, FS Region 3 2013)
[Forest Service Sensitive USDA, FS Region 3 2007, 1999, 1988]
Group 2 (NNDFW, NESL 2000, 2005, 2008)
[Group 4 (NNDFW, NESL 1994)]
LC (IUCN, IUCN SSC Amphibian Specialist Group 2022)

MANAGEMENT FACTORS: Two of the main threats to this species are habitat destruction and pollution. Overutilization is also considered a potential threat, as they are collected for biological supply houses and fishermen use them for bait. Threats from habitat loss, disease, non-native species, pollution and climate change have cumulatively resulted in population declines across historical range (USDI, FWS 2015). Predaceous fish (introduced by various government agencies and by the general public) and establishment of nonnative populations of bullfrogs have displaced several native frog species populations including the Northern leopard frog (Smith & Keinath 2007). Studies indicate that exposure to pesticides can cause both stimulatory and suppressive immune changes in adult Northern leopard frogs and is doing so in wild populations due to land use change and water contamination (Gilbertson et al. 2003). Exposure to estrogen as a result of pollution has also been found to affect metamorphosis and sex ratios in impacted populations (Hogan et al. 2008).

PROTECTIVE MEASURES TAKEN: Closed season, Arizona Game and Fish Department. In 2006, eight environmental organizations submitted a petition to the U.S. Fish and Wildlife Service (USFWS) to list the western population of the Northern leopard frog in Wisconsin and the states west of the Mississippi River (Center for Native Ecosystems et al 2006); in 2009, the U.S. Fish and Wildlife Service opened a status review of the species and hosted several information solicitation periods based on petition findings that provided substantial evidence that the western U.S. population is genetically distinct from the eastern Northern leopard frog (USDI, FWS 2009a). It was determined in 2011 that Endangered Species Act protection for the Northern Leopard Frog was not warranted (USDI, FWS 2011).

SUGGESTED PROJECTS: Distribution, habitat, population, and life history studies. Taxonomic studies, particularly genetic studies of the western U.S. population and of the convergence zone of the eastern and western haplotypes in Wisconsin and Ontario, Canada (USDI, FWS 2009b). Petition findings have also included requests for information on "what may constitute physical or biological features essential to the conservation of the species, where these features are currently found, whether any of these features may require special management considerations or protection, and whether there are areas outside the geographical area occupied by the species that are essential to the conservation of the species" (USDI, FWS, 2009b).

LAND MANAGEMENT/OWNERSHIP: BIA – Fort Apache Reservation and Navajo Nation; NPS – Canyon de Chelly national monument, Glen Canyon National Recreation Area, Grand Canyon National Park; USFS – Apache-Sitgreaves, Coconino and Kaibab National Forests; AZGFD – Lamar Haines Memorial Wildlife Area; Private.

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ADDITIONAL INFORMATION:

Northern leopard frog coexists, occasionally hybridizing, with Plains leopard frog in southeastern Colorado. Also hybridizes with Chiricahua leopard frog (*Lithobates chiricahuensis*) in areas of central Arizona and western New Mexico where their ranges overlap (Stebbins 1985).

Leopard frogs are often used for dissection in biology classes. Unfortunately, a well meaning teacher and lab aides may release unneeded animals, perhaps believing it is kinder than outright killing. However, frogs kept in close quarters such as shipping crates and overcrowded aquaria may get a disease called "red-leg" caused by an *Aeromonas* bacteria. Releasing sick frogs infect otherwise healthy local populations and may cause sudden population collapses. During the 1970's in the Chicago Region, Leopard Frogs suffered a severe decline but appear to be rebounding where suitable habitat is still available.

The Northern leopard frog is the state amphibian of Minnesota and Vermont.

Revised: 1993-08-23 (SSS)
1995-03-22 (MJS)
2002-12-06 (AMS)
2021-07-07 (CRB)
2023-04-12 (MBL)