

**2025 Annual Summary of Activities
Relict Leopard Frogs at the Springs Preserve**

by

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The following report is the 2025 annual summary of activities under the 2017 Landowner Cooperative Agreement LCA-R01 between the Las Vegas Valley Water District (LVVWD) and Nevada Department of Wildlife (NDOW) for relict leopard frogs (*Rana onca*) at the 73-ha (180-acre) Springs Preserve in Clark County, Nevada, USA. This Agreement was granted pursuant to the 2015 Programmatic Candidate Conservation Agreement with Assurances (CCAA) between the U.S. Fish and Wildlife Service (USFWS) and NDOW.

EXECUTIVE SUMMARY

In 2025, the Springs Preserve relict leopard frog (*Rana onca*) urban rewilding project documented:

- We documented a **70% increase in adult frogs** captured in the NF ponds. We estimated that the adult population size was 57 adults, with a very narrow 95% Confidence Interval of 50–63 adult frogs. This estimate represents a **58% increase in the estimated size of the adult population** since 2024. This increase continues the previously documented pattern of **biennial increases-decreases in frog numbers**, most likely the result of short lifespans for most of the population.
- **Seven egg masses** in the North Fork Refugium Ponds (NF Ponds). This was a **56% decrease in egg masses** from the high of 16 in 2024. This was most likely the result of the 2:1 male-biased sex ratio (20M:10F) we documented in the NF Ponds in 2024.
- Not surprisingly, we trapped **33% fewer tadpoles** in the NF Ponds in July, which was expected because of the relatively lower number of egg masses in spring 2025.
- We documented a **43.5% decrease in the number of juveniles** captured during mark-recapture surveys in the NF Ponds. We estimated that the 2025 juvenile population was 134 individuals, with a 95% Confidence Interval of 80–188 frogs. Since 2022, juvenile numbers decrease when adult numbers increase, which may be due to cannibalism.
- We did not observe any egg masses in the Cienega; however, the observation of **three large tadpoles in the Cienega for the first time** confirms reproduction at that site, which lies within a floodwater detention basin.
- We observed **48 relict leopard frogs during a nocturnal survey of the Cienega** in August. We captured and marked 43 frogs (38 adults and 5 juveniles) in the Cienega during three mark-recapture surveys in August and September. **Only one marked frog was recaptured**, preventing us from estimating the population size, but which suggests a **very robust population size in the Cienega**.
- Our morphological comparison of adult female frogs in the Cienega and NF Ponds reveals **11 times as many adult females $\geq$ 80 mm in the Cienega than the NF Ponds**. The frog density in the NF Ponds was estimated to be approximately **one frog per m²** and adult size is likely constrained by available food resources. The **Cienega is as much as 40 times larger than the NF Ponds** and thus **adult female body size does not yet seem constrained by available resources**.
- To increase public awareness about relict leopard frogs, we provided **educational content** through an internal weekly newsletter, in-person teacher training, a podcast, posts on various social media platforms (i.e., Facebook, Instagram, LinkedIn, and YouTube), and content on the Springs Preserve website. Additionally, **1,963 Springs Preserve guests participated in a drop-in activity** specifically about the relict leopard frog.

INTRODUCTION

This annual report tiers off the 2008–2020 comprehensive report ([Saumure 2020](#)) that provides greater details concerning the history of the Springs Preserve site, the construction of the refugium ponds, translocation to establish the relict leopard frog population in the North Fork of the historic Las Vegas Creek, as well as the materials and methods used. Since 2020, annual reports summarize the current year's observations and data, with limited interpretation of our findings. With the establishment of a new population in the Meadows Flood Detention Basin (aka Cienega) in 2021, we also include a separate section for those observations and data in this report.

NORTH FORK REFUGIUM PONDS

In 2025, we observed the first relict leopard frog activity in the North Fork Refugium Ponds (NF Ponds) on February 19 and active frogs continued to be observed into early October.

Egg Mass Surveys

We documented seven relict leopard frog egg masses in 2025. We observed the first one on March 28. We observed four more the following day on March 29 ([right](#)); all five were deposited in the Upstream Pond. Colleagues from University of Nevada, Las Vegas (UNLV) led the official annual egg mass survey on April 1 and documented the same five egg masses. By April 13, newly hatched tadpoles were observed around all five. Once spring air temperatures increased, two additional egg masses were deposited in the Upstream Pond on May 27 and 29, for a total of seven documented egg masses in spring 2025. We did not document any egg masses in the fall.



Tadpole Survey

Every year, we incidentally capture relict leopard frog tadpoles during the annual Pahump poolfish mark-recapture surveys. In 2025, these surveys took place on July 30 and August 6.

- On July 30, we trapped 155 tadpoles, including 103 tadpoles in the Downstream Pond, 46 in the Upstream Pond, and 6 in the settling basin.
- On August 6, we trapped 193 tadpoles, including 122 tadpoles in the Downstream Pond, 64 in the Upstream Pond, and 7 in the settling basin.

The high count of 193 tadpoles in 2025 is approximately 33% less than in 2023 ($n = 300$) and 2024 ($n = 307$) but does not differ significantly from the 192 tadpoles captured in 2021. This recent decrease was likely the result of fewer egg masses in 2025, which in turn was the direct result of an adult frog sex ratio significantly skewed in favor of males (20M:10F) in fall 2024 ([Saumure 2024](#)).

On July 30, we assigned gross morphological development stages to each trapped tadpole: (1) no legs; (2) posterior limbs only; (3) anterior and posterior limbs present; and (4) newly metamorphosed froglets, air breathing with little to no tail remaining. The majority of the 2025 tadpole cohorts had either no posterior limbs or only posterior limbs present (**Fig. 1**). This morphological dichotomy may have resulted, at least in part, because five egg masses were

deposited in late March and another two egg masses were deposited two months later in late May, following a cold spell.

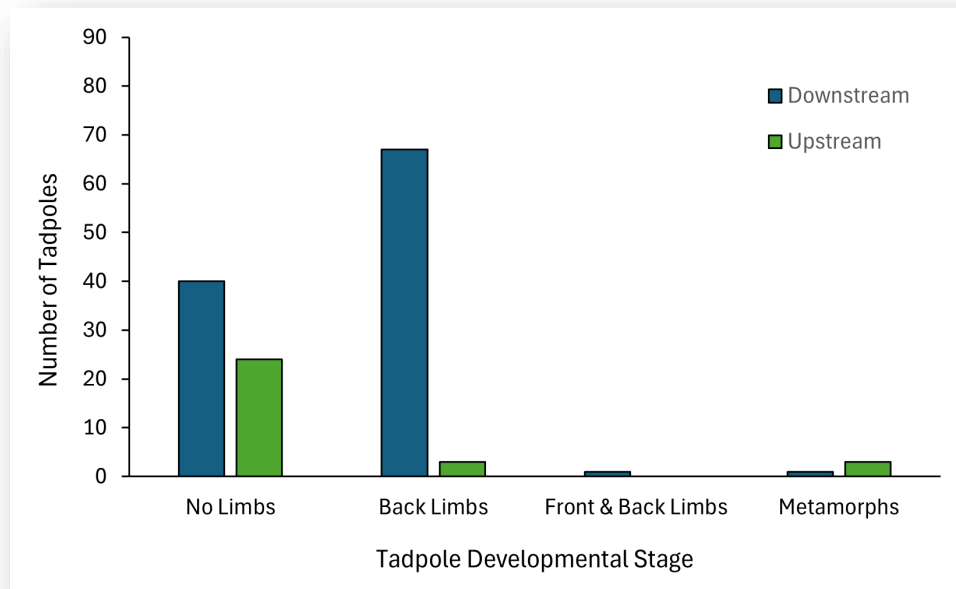


Fig. 1. Gross developmental stage of relict leopard frog (*Rana onca*) tadpoles trapped on 30 July 2025 in the Upstream and Downstream Ponds at the Springs Preserve, Las Vegas, Clark County, Nevada, USA.

We captured very few newly metamorphosed frogs (**Fig. 1**). As one might expect, air-breathing frogs are rarely captured in minnow traps set at the bottom of the ponds (**right**). Nonetheless, it does indicate that at least a few frogs had developed faster than most. One possibility is that the few metamorphosed individuals in July 2025 were from the 2024 cohort that overwintered as tadpoles.

Interestingly, there were significant differences in both the number of tadpoles and their relative stages of development between the Upstream and Downstream Ponds (**Fig. 1**). First, all egg masses were deposited in the Upstream Pond in 2025, even though twice as many tadpoles were captured in the Downstream Pond.



There are several theories, which are not necessarily mutually exclusive, as to why we captured more tadpoles in the Downstream Pond:

- Newly hatched, relatively weak tadpoles may have simply been passively drawn downstream by water currents, which deposited them in the terminal Downstream Pond.
- Although speculative, the species may instinctively seek to disperse downstream in Mojave Desert spring systems for any number of reasons, such as decreasing density and thus decreasing competition for available resources.
- More tadpoles were preyed upon by avian and/or invertebrate (e.g., dragonfly larvae) predators in the shallower Upstream Pond than the deeper Downstream Pond (i.e., habitat induced survivorship rates).

The differences in gross developmental stages between the ponds are perplexing. The two connected ponds, which share the same recirculated water, have seemingly opposite developmental rates. In the Upstream Pond, most of the tadpoles have not advanced to the point of developing posterior limbs, whereas in the Downstream Pond, significantly more tadpoles have advanced to the stage of having posterior limbs (**Fig. 1**). The most plausible scenario is that the dichotomy in developmental rates is the result of greater solar exposure in the Downstream Pond. Although tadpoles have been documented to bask in both ponds on aquatic vegetation near the surface (**right**), the Upstream Pond has more fleeting sunspots through the Fremont's cottonwood tree canopy. Conversely, most of the Downstream Pond receives sunshine for much of the day. There is also the possibility that development was faster in the shallower Upstream Pond, and the tadpoles had already metamorphosed.



Mark-recapture Survey

We captured 121 relict leopard frogs (51 adults and 70 juveniles) during the refugium pond surveys conducted on September 22 and 29, 2025 (**Table 1**).

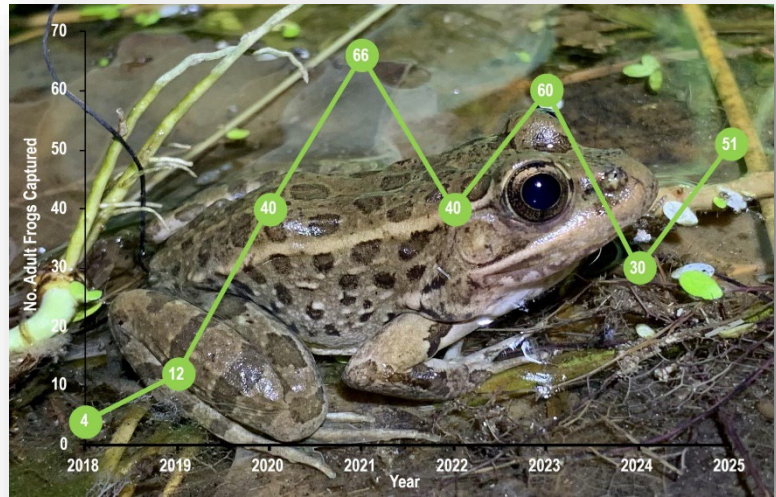
Capture Session.—We captured a total of 84 frogs, including 41 adults (22M:19F) and 43 juveniles, on September 22. Twenty-seven (65.8%) of the adults were recaptures from previous years. Of these 27 recaptured adults:

- Seventeen (41.4%) were recaptures from 2024 metamorphs/juveniles that were < 45 mm when first captured
- Six (14.6%) were PIT tagged as adults in 2024
- Four (9.7%) were PIT tagged as adults in 2023

Recapture Session.—We captured a total of 75 frogs, including 36 adults (23M:13F) and 39 juveniles, on September 29. Of these frogs, 26 adults (72%) were recaptures from the previous week's capture session (i.e., September 22, 2025). Of the 36 PIT tagged adults, three were first captured in 2023 and nine were first captured in 2024. Thus, 12 adults were recaptures from 2023 or 2024. Ten other PIT tagged frogs were toe-clipped as

juveniles in 2024. Thus, 22 of 36 frogs (61%) were first captured in a prior year. An interannual recapture rate of 61% in a frog is high for such a short-lived species.

Adults.—Increasing from 30 to 51 adult frogs captured during the 2024 and 2025 surveys represents a 70% improvement year over year. Using the modified Chapman population estimator, the 2025 adult population is estimated to be 57 adults, with a 95% Confidence Interval of 50–63 frogs (Chapman 1951; Dettloff 2023). This estimate represents a 58% increase in the estimated size of the adult population since 2024. This increase continues the previously documented pattern of biennial increases-decreases in frog numbers (**Table 1; below**), most likely the result of short lifespans for most of the frog population ([Saumure 2023](#)).



Although we documented a 2:1 male-biased sex ratio (20M:10F) in 2024, the sex ratio in 2025 was much closer to 1:1 (27M:24F).

Interestingly, there appeared to be an intersexual difference in recapture rates on September 29, 2025:

- Only 8 of the 19 females (42.1%) were recaptured frogs
- Conversely, 18 of the 22 males (81.8%) were recaptured frogs

This suggests that the females become ‘capture shy’ after a single capture event. This is an important and previously undocumented sampling bias.

Juveniles.—Decreasing from 124 to 70 juvenile (< 45 mm SVL) frogs captured during the 2024 and 2025 surveys represents a 43.5% decline year over year. Using the modified Chapman (1951) population estimator, the 2025 juvenile population is estimated to be 134 juveniles, with a 95% Confidence Interval of 80–188 frogs.

The number of post-metamorphic juveniles is a function of reproductive effort and tadpole survivorship. As previously mentioned, we documented a 2:1 male-biased sex ratio (20M:10F) in 2024. This led to substantially fewer egg masses in 2025, from a high of 16 in 2024 to a recent low of 7 in 2025, a 56% decrease. Consequently, tadpole numbers were relatively low in July 2025. Thus, the 43.5% decrease in juveniles we documented in September 2025 was not surprising. Since 2022, we have captured fewer juveniles in years with higher numbers of adults. We suspect this is because of the cannibalistic nature of the adults.

Interestingly, only 30.7% ($n = 12$) of the juveniles were recaptured during the second survey session on September 29. This recapture rate is consistent with the 32.5% documented in 2024. Although juveniles are relatively easy to capture initially, the relatively low recapture rates suggest that, like adult females, they adopt avoidance behaviors (i.e., become ‘capture shy’) after a single capture and subsequent processing, which includes toe-clipping.

Tadpoles.—Three large tadpoles, without posterior limbs, were captured incidentally and released after photographing (right) two of them on September 22. Three large tadpoles were captured incidentally on September 29, as well. Barring any mortality (e.g., predation, disease), these tadpoles will overwinter in the ponds.



Table 1. Summary of translocations, reproduction, and number of unique adult and juvenile relict leopard frogs (*Rana onca*) captured from 2018–2025 in the Springs Preserve refugium ponds (excludes Cienega population). These numbers exclude recaptures.

Year	Number of Surveys	Juvenile Frogs Released	Tadpoles Released	<i>In Situ</i> Tadpole Cohorts	Adults Captured	Juveniles Captured	Total Captured
2018	1	100	0	0	4	0	4
2019	2	111	101	1	12	178	190
2020	2	0 ^a	0 ^a	2–3	40	244	284
2021	2	24	91	9 ^b	66	161	227
2022	2	0	100	8 ^c	40	142	182
2023	2	0	101	10	60	21	81
2024	2	0	0	16 ^d	30	124	154
2025	2	0	0	7	51	70	121

^aNo releases due to access restrictions associated with the Covid-19 pandemic.

^b192 tadpoles were removed from the refugium ponds and translocated to the Springs Preserve Cienega.

^c212 tadpoles were removed from the refugium ponds and translocated to the Springs Preserve Cienega.

^dPresence of two tadpole size cohorts during surveys are indirect evidence of two fall egg masses.

Mortality

Several frog and tadpole mortalities were documented and reported to NDOW in 2025:

- On July 23, a frog and three tadpoles were found dead in the skimmer baskets. Proposed solution: Existing skimmer lids were deployed over the skimmers.
- On September 22, while attempting to catch a frog by hand during the annual mark-recapture survey, clasped a dead and decayed frog amidst a handful of algae.

CIENEGA

Egg Mass Surveys

The Cienega (aka “Meadows Detention Basin”) was surveyed by UNLV, SNWA, and the Springs Preserve for relict leopard frog egg masses on April 22, 2025. No egg masses were documented. Egg mass surveys have proven to be futile in the thick Cienega vegetation and will be discontinued. This section will be dropped from future reports.

Tadpole Translocation

No tadpoles were translocated in 2025. This section will be dropped from future reports until such time as additional tadpoles may be translocated for management purposes, such as to supplement population genetics.

Mark-recapture Survey

Mark-recapture surveys were completed in the Cienega on August 25, September 2, and September 15, 2025. Forty-eight frogs were observed during the capture session on August 25, 2025, which represents the minimum number of frogs present in the Cienega (**Table 2**). A total of 38 adults and 5 juveniles were captured during the three mark-recapture surveys.

Table 2. Summary of translocations, reproduction, and number of unique adult and juvenile relict leopard frogs (*Rana onca*) captured or observed from 2021–2025 in the Springs Preserve Cienega population. These numbers exclude recaptures.

Year	Number of Surveys	Tadpoles Translocated	<i>In Situ</i> Tadpole Cohorts	Frogs Observed	Adults Captured	Juveniles Captured	Total Captured
2021	1	192	-	1	-	-	-
2022	1	212	-	0	-	-	-
2023	1	0	-	23	-	-	-
2024	2	0	0	48	23	1	24
2025	3	0	1	48	38	5	43

Adults.—Of the 38 adult frogs that were captured in August–September 2025 (**Table 2**), there were 31 females and 7 males, an approximately 5:1 sex ratio in favor of females. Although a biased sex ratio can be concerning, it is less so when it favors females. Population size was not estimated for the Cienega due to an insufficient number of recaptures (i.e., only one). The low number of recaptures suggests the presence of a relatively large population of relict leopard frogs in the Cienega.

Juveniles.—The presence of five juvenile frogs is encouraging, as it represents a fivefold increase over 2024. With the confirmation of tadpoles (i.e., reproduction) in the Cienega, it can now be assumed that juveniles most likely represent recruitment in the Cienega. We cannot, however, rule out occasional rain-assisted dispersal from the NF Ponds.

Tadpoles.—Three tadpoles were observed in the Cienega in 2025.

Mortality

Two tadpole mortalities were documented in the Cienega and reported to NDOW in 2025:

- On June 17, two tadpoles with well-developed hind limbs in the Cienega were trapped and presumed to have died because they could not reach the pond surface where the water has more dissolved oxygen. Proposed solution: Any future tadpole trapping will employ traps modified to float at the surface.

MORPHOLOGY

We compared the length-mass relationship for all adult (SVL ≥ 45 mm) relict leopard frogs captured in 2024 and 2025 in both the Cienega ($n = 70$) and NF Ponds ($n = 67$) (**Fig. 3**). We did not include 2024 morphometric data if a frog was recaptured in 2025. Of note is that the larger Cienega pond system had 11 times ($n = 11$) more adult female frogs with a snout-vent length (SVL) of ≥ 80 mm than the NF Ponds ($n = 1$). The contrast between the sizes of the largest frogs between the two sites is notable (Fig 3.).

The most pronounced difference between the two sites is the amount of available wetland (i.e., aquatic and riparian) habitat. The NF Ponds are approximately 0.02 ha (0.05 acre), whereas the Cienega is as much as 40.5 times larger at approximately 0.81 ha (2 acres). Thus, relict leopard frog densities are likely higher in the substantially smaller NF Ponds. With an estimated 191 frogs (57 adults and 134 juveniles) inhabiting 0.02 ha in 2025, the frog density in the NF Ponds is 0.955 frogs/m². Thus, at a density of approx. one frog every square meter, we suspect that the population has expanded to, and in some years may have exceeded, carrying capacity. This would result in competition for available food resources and thus, generally smaller frogs overall. Conversely, the more recently established Cienega frog population inhabits a much larger wetland and is unlikely to have reached carrying capacity yet. Thus, food resources are likely relatively plentiful in the Cienega, and frogs can attain larger sizes due to the lack of intraspecific competition for food resources. This theory is supported by the fact that when the NF Ponds were first established in 2018, a few frogs grew to record sizes for the species between 2018–2020 ([Saumure 2022](#)).

What benefits might be conferred by frogs attaining larger sizes in newly colonized habitats? This question is addressed by looking at differences in maximum sizes of females between the two sites (**Fig. 4**). All but one of the largest frogs (≥ 80 mm) were in the Cienega. Larger body size means a larger gape size, increasing the potential size of prey items that can be consumed, including cannibalism (Toft 1980; McAlpine and Dilworth 1989; Measey et al. 2015). In addition, larger body size in female frogs is known to result in greater fecundity (Cummins 1986; Gibbons

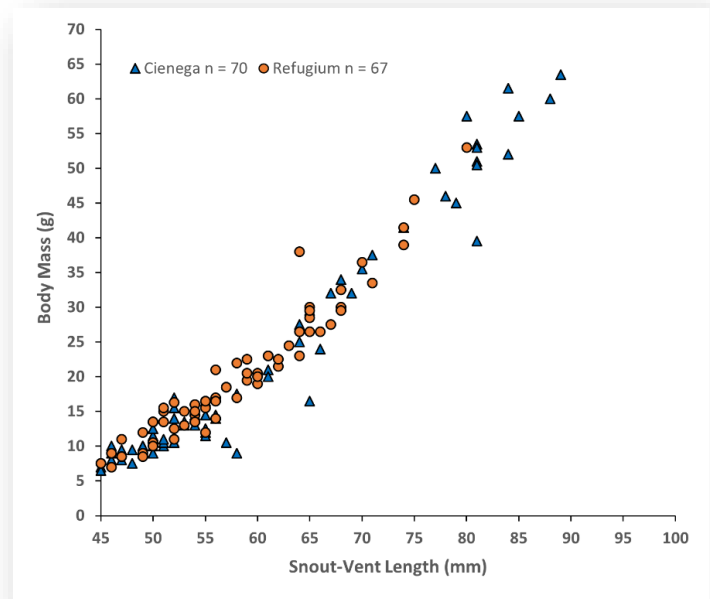


Fig. 3. Length-mass relationship for adult relict leopard frogs (*Rana onca*) captured in 2024 and 2025 in the Cienega and North Fork Refugium Ponds at the Springs Preserve, Las Vegas, Clark County, USA.

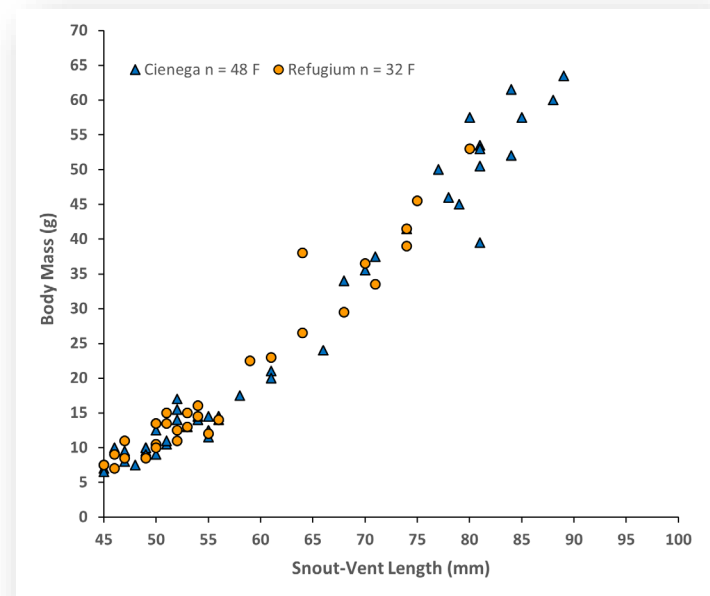


Fig. 4. Length-mass relationship for adult female relict leopard frogs (*Rana onca*) captured in 2024 and 2025 in the Cienega and North Fork Refugium Ponds at the Springs Preserve, Las Vegas, Clark County, USA.

and McCarthy 1986; Monroe et al. 2015). This is especially important for a short-lived species ([Saumure 2023](#)) that likely only reproduces 1–2 years after attaining maturity.

EDUCATION

Information about the relict leopard frog is shared on the Springs Preserve’s [website](#). The webpage includes drop-down menus with annual reports and scientific publications. Guests visiting the ponds can read interpretive panels about the history of the relict leopard frog and some of the threats the species faces.

The Springs Preserve Conservation Education Division has made it a goal to educate guests about the natural history of the frog and about the rewilding efforts that have been made to establish relict leopard frog populations at the Springs Preserve. Much of the educational programming is presented as a “drop-in” activity in our Origen Museum. This activity is a deep dive exploration of the species with a staff member, which includes:

- An explanation of what an endemic species is
- Why are frogs important environmental indicator species
- Why we brought the relict leopard frogs to the Springs Preserve
- What we are doing to restore and rewild our native habitats

In 2025, we had 1,963 drop-in interactions with guests specifically about the frogs. Other public education outreach efforts from the Springs Preserve were presented in internal SNWA newsletters and webpages (**Appendix I and II**) and online through social media platforms, as noted below. Note that many social media posts are provided in English and Spanish.

Title: Antiques Roadshow: Springs Preserve - Hour 2

Publication: PBS

Date: January 27, 2025

Hyperlink: <https://www.pbs.org/video/springs-preserve-hour-2-cuu1x4/>

Title: JENGA IN THE WILD: Rewilding endangered species supports historic ecosystem

Publication: Water Smart Podcast

Date: February 13, 2025

Hyperlink # 1: <https://www.youtube.com/watch?v=eewEFtzXqgo>

Hyperlink # 2: <https://www.facebook.com/thesnwa/videos/627644276552451>

Hyperlink # 3: <https://www.facebook.com/thesnwa/videos/1430278684804020>

Hyperlink # 4: [Appendix I](#)

Title: Ahhhh, look! The frogs are hugging!

Publication: Facebook

Date: April 12, 2025

Hyperlink: <https://www.facebook.com/share/p/1CjFVHr9nR/>

Title: Tadpole Triumph

Publication: Water Resources webpage

Date: June 24, 2025

Hyperlink: [Appendix II](#)

Title: Every family is a little wild. Join ours!

Publication: Facebook

Date: September 21, 2025

Hyperlink: <https://www.facebook.com/share/p/174buAgngb/>

Title: Little froglets everywhere!

Publication: Facebook & Instagram

Date: September 25, 2025

Hyperlink: <https://www.facebook.com/share/v/19W1Bb1c8s/>

Title: In Vegas, even some of the tadpoles are gamblers!

Publication: Facebook & Instagram

Date: November 2, 2025

Hyperlink: <https://www.facebook.com/reel/1137846188477812>

Title: Relict Leopard Frog Update

Publication: Facebook & Instagram

Date: November 16, 2025

Hyperlink: <https://www.facebook.com/photo?fbid=1256664869830901&set=a.639234304907297>

Title: World Wildlife Conservation Day

Publication: Facebook & Instagram

Date: December 4, 2025

Hyperlink: <https://www.facebook.com/share/r/17Ug8JzBh4/>

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ACKNOWLEDGMENTS

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Ambos, Audrey Bennett, Cindy Soriano, and Nayelit Ramirez. We thank SNWA Hydrologist Tyler Andreas for continuing to perform biweekly maintenance of the In-Situ water quality probe. We extend special thanks to the late Abigail Phillips for promoting the relict leopard frog through numerous innovative educational activities at the Springs Preserve. The photos included in this report were taken by Aaron Ambos, Renee Grayson, Katrina Smith, and Cindy Soriano. Lastly, thanks also to Debbie Van Dooremolen, Audrey Bennett, Cindy Soriano, Jean-Axel Urbieta Aguilar, Derek Babcock, and Katrina Smith for reviewing this report.

Appendix I



Rare species surviving and thriving

1 min read

A team of researchers has recreated habitat at the Springs Preserve to help protect the endangered Pahrump Poolfish and Relict Leopard Frog. Find out which species is cannibalistic, and which was nearly wiped out on the [Water Smarts Podcast](#), "JENGA IN THE WILD: Rewilding endangered species supports historic ecosystem."

When Las Vegas Valley artesian springs ran dry decades ago, several species disappeared from the landscape. Rewilding projects at the Springs Preserve have helped rebuild the native habitat and protect endangered species like the Pahrump Poolfish, Relict Leopard Frog and Desert Tortoise. [Tune in](#) and learn about the challenges of repopulating these fascinating species who call Springs Preserve home.

Visitors to the Springs Preserve can catch a glimpse of the Pahrump poolfish and relict leopard frogs by taking the trails to [Cottonwood Grove](#).



Appendix II

Tadpoles Triumph

A recent encounter with a tadpole in the Cienega (aka Meadows Detention Basin) at the Springs Preserve in June 2025 provided the first evidence of recruitment since tadpoles were first released in 2021 and 2022 in the hopes of establishing a new population. Subsequent trapping by staff revealed two tadpoles from the 2024 cohort that had overwintered and a third much smaller tadpole from 2025. This was a relief as surveys in 2024 and 2025 led by UNLV did not detect any egg masses in the thick riparian vegetation of the Cienega.

Surveys for frogs in August of 2023 and 2024 documented the presence of 23 and 48 frogs, respectively. The question remained, however...had these frogs just simply hopped over from the Refugium Ponds in the north fork of the Las Vegas Creek? As there's no way for aquatic tadpoles to swim from the Refugium Ponds to the Cienega, reproduction in the new population has been confirmed. This was exciting news to everyone involved with the conservation of this state-protected species as 2024 estimates by UNLV researchers suggest only about 1,800 frogs of this species remain.



Large 2024 relict leopard frog tadpole captured in Cienega in June 2025.