NEVADA DEPARTMENT OF WILDLIFE
NATIVE FISH AND AMPHIBIANS
FIELD TRIP REPORT

DATE(S):	22 and 29 July 2015
LOCATION(S):	Shoshone Ponds, White Pine County, NV
PURPOSE(S):	To assess the population of Pahrump poolfish
PERSONNEL:	Aaron Ambos (SNWA), Mark Beckstrand (NDOW), Chris Burg (NDOW), Jenny Grill (Volunteer), Kevin Guadalupe (NDOW), Nancy Herms (BLM)
PREPARED BY:	Kevin Guadalupe

INTRODUCTION

In 1972, the Bureau of Land Management's Ely District Office (BLM-Ely) constructed a series of warmwater ponds (i.e., Shoshone Ponds) in eastern Nevada with the intent of providing habitat for endangered species. On 13 August 1976, 50 Pahrump Poolfish *Empetrichthys latos latos* were transplanted from Manse Ranch into Shoshone Ponds' North Pond, making it one of three extant locations for the entire species, and the only location outside of Clark County (Figure 1). Poolfish were subsequently moved between ponds and associated surrounding surface water locations intentionally and occasionally during high water events (Withers 1985). Relict Dace *Relictus solitarius* was introduced to Shoshone Ponds' South Pond in December 1977. Relict Dace were purposefully removed and transferred to Steptoe Wildlife Management Area from South Pond as part of Shoshone Ponds' Stock Pond poolfish salvage efforts on 10 July, 2014. Approximately 50 poolfish from Stock Pond were introduced into North Pond, and approximately 200 Stock Pond poolfish were introduced into South Pond. During 2015 Shoshone Ponds surveys, Pahrump Poolfish existed in Stock Pond, North Pond, Middle Pond, South Pond, and Well #2 (Scotty's Meadow flowing well). Relict Dace persist in low numbers in South Pond. Annual surveys monitor relative abundance and age structure of Pahrump Poolfish at this refuge.

METHODS

On 22 July, 15 standard mesh Gee Minnow traps (0.64 cm mesh, 2.5 cm openings) and one exotic trap (0.32 cm mesh, 2.5 cm openings) were baited and set around the perimeter of Stock Pond at 0930 hours (Figure 1). Five standard traps and one exotic trap were set around the perimeter of each of the three ponds (i.e., South, Middle, and North ponds) in the Shoshone Ponds enclosure at 0800 hours. The traps were allowed to fish three hours before they were pulled. Eight standard mesh Gee Minnow traps were set in Well #2 flowing well every 10 m starting from just below the well head to 40 m downstream at 0940 hours, and allowed to fish three hours. All captured fish were measured, and fish greater than 30 mm were marked with an oblique clip to the caudal fin before release.

On 29 July, 16 standard baited traps were set in Stock Pond at 0900 hours. Six standard traps with bait were set along the perimeter of South, Middle, and North ponds at 0930 hours. Traps were allowed to fish approximately three hours before they were pulled.

Population estimates were calculated using Peterson's estimator: *MC*/*R*. Where *M* = number of individuals marked, *C* = number of individuals captured, and *R* = number of individuals recaptured. Approximate 95% confidence intervals were determined using a table appropriate to the Poisson distribution, after the method described in Ricker (1975).

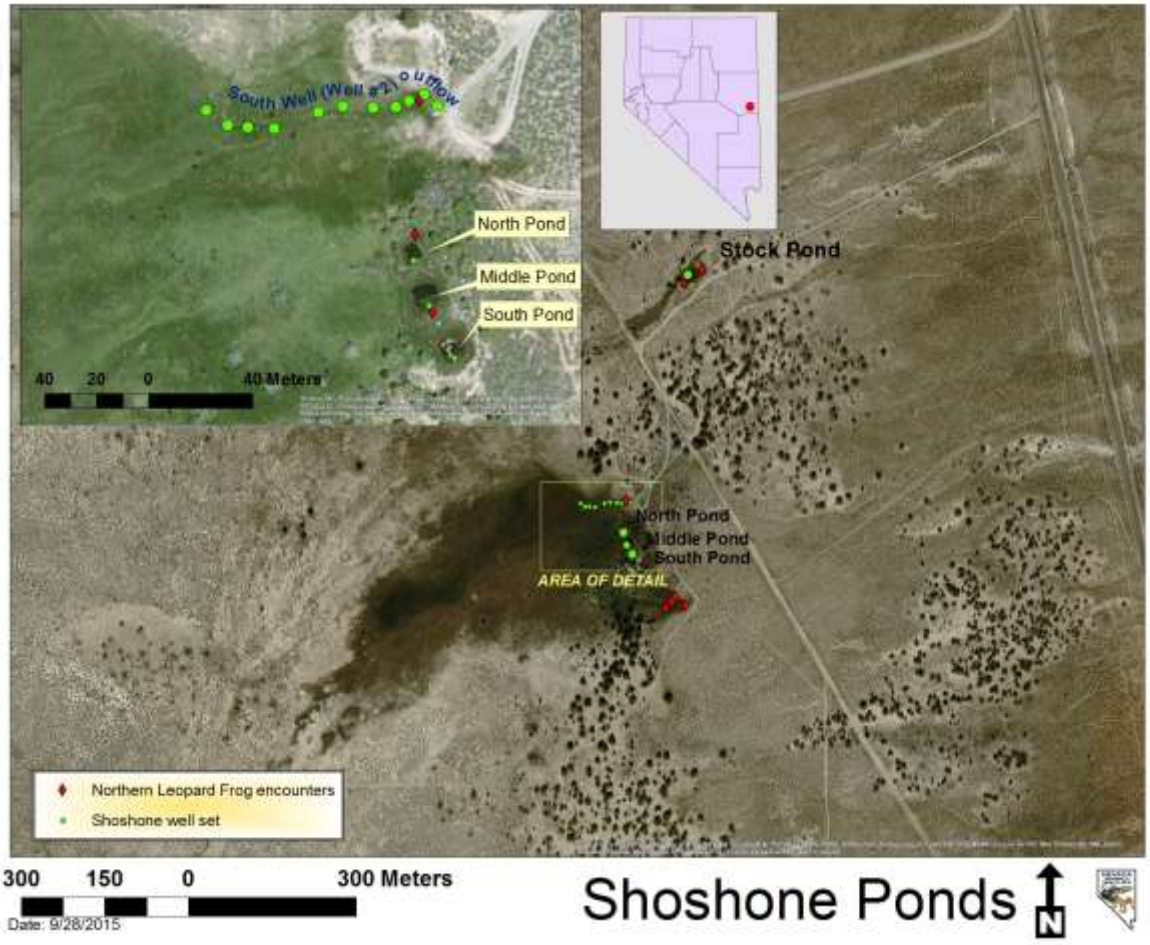

FIGURE 1. Pahrump Poolfish survey locations at Shoshone Ponds, White Pine County, Nevada, 2015.

RESULTS

On 22 July, 1,316 poolfish were captured (CPUE = 27.42) and marked in Stock Pond, 232 poolfish were captured and marked in Middle Pond (CPUE = 12.89), 90 poolfish were captured (CPUE = 5.00) and marked in South Pond, and 35 were captured (CPUE = 1.46) and marked in Well #2 Outflow (previously referred to as South Well). No Pahrump Poolfish were captured in North Pond, but a larval poolfish was encountered.

On 29 July, 890 poolfish were captured (CPUE = 18.54) in Stock Pond with 264 recaptures. There were 42 poolfish captured in Middle Pond (CPUE = 2.33) with 26 recaptures, and 80 poolfish captured (CPUE = 4.40) in South Pond with 49 recaptures. The population estimate was 4,437 (range = 3,932 – 5,005, *P* = 0.95) for Stock Pond, 375 (range = 256 - 573, *P* = 0.95) in

Middle Pond, 147 (range = 111 - 199, P = 0.95) in South Pond, and 72 (range = 29 - 180, P = 0.95) estimated in Well #2 Outflow (Table 2 and Figures 3,4,5,6,and 7).

Poolfish total length in Stock Pond ranged from 22 to 52 mm with an average of 38.26 mm (Figure 10). Poolfish ranged from 23 to 60 mm, averaging 35.56 mm in Middle Pond (Figure 9). Poolfish in South Pond ranged from 23 to 57 mm, averaging 45.17 mm (Figure 12). Pahrump Poolfish measured in Well #2 ranged from 22 mm to 50 mm, averaging 33.23 mm (Figure 12).

There were 25 Relict Dace removed from South Pond and transplanted to Steptoe Wildlife Management Area, averaging 60.55 mm (range = 55 - 70 mm; n = 9).

TABLE 1. Capture data and abundance statistics for Pahrump Poolfish at Shoshone Ponds, White Pine County, July 2015.

Location	Marked (*M*)	Captured (*C*)	Recaptured (*R*)	CPUE *M*	CPUE *C*	Estimate (95% C.I.)
Stock Pond	1,316	890	264	27.42	18.54	3,932<**4,437**<5,005
North Pond	0	0	0	0	0	0
Middle Pond	232	42	26	12.89	2.33	256<**375**<573
South Pond	90	80	49	5.00	4.40	111<**147**<199
Well #2	35	7	3	1.46	0.29	29<**72**<180

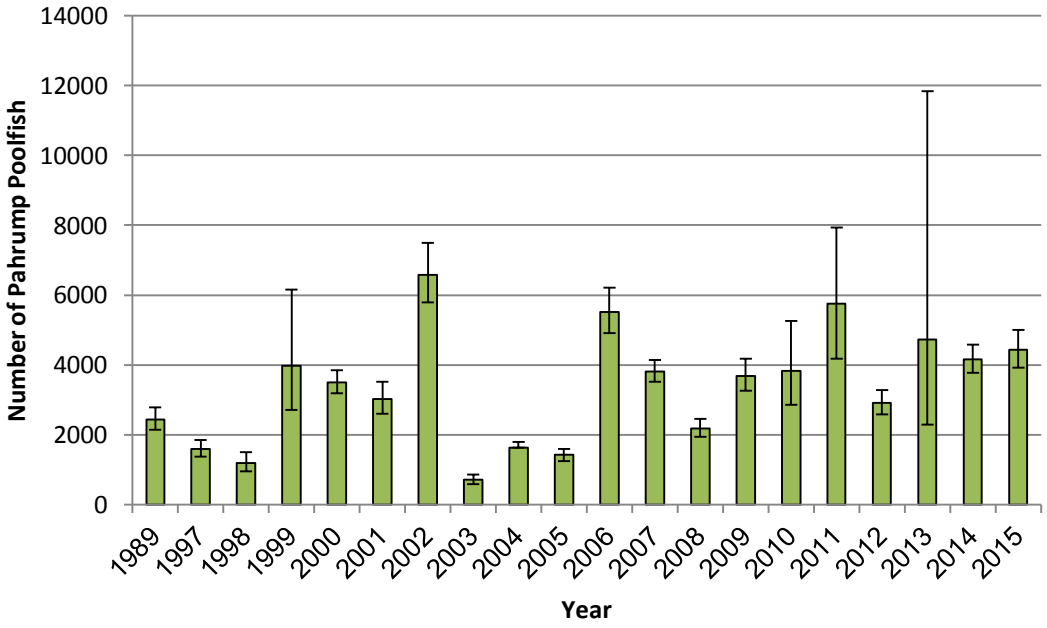

FIGURE 3. Population estimates for Pahrump Poolfish in Stock Pond, Shoshone Ponds, 1989 to 2015. Error bars represent 95% confidence intervals. In 2013 only seven recaptures were encountered, creating wide variance in estimation.

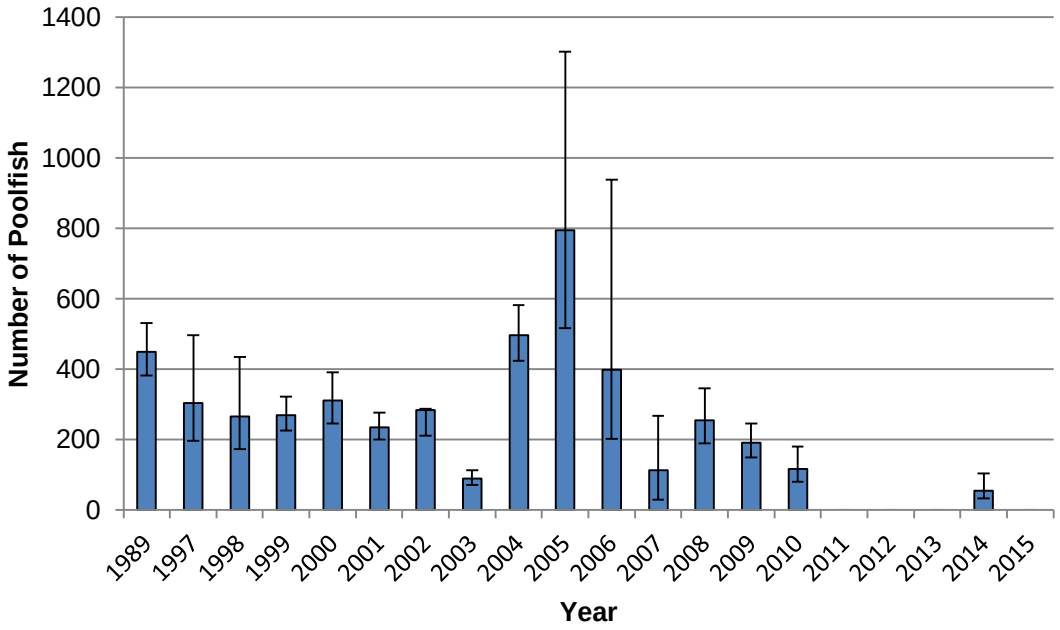

FIGURE 4. Pahrump Poolfish population estimates for North Pond, 1989 to 2015. Pahrump Poolfish were not captured in North Pond in 2011 through 2013. Approximately 50 poolfish were introduced form Stock Pond on July 10, 2014. Adult Poolfish were not captured or encountered during 2015 surveys; however, a single larval poolfish was encountered in North Pond.

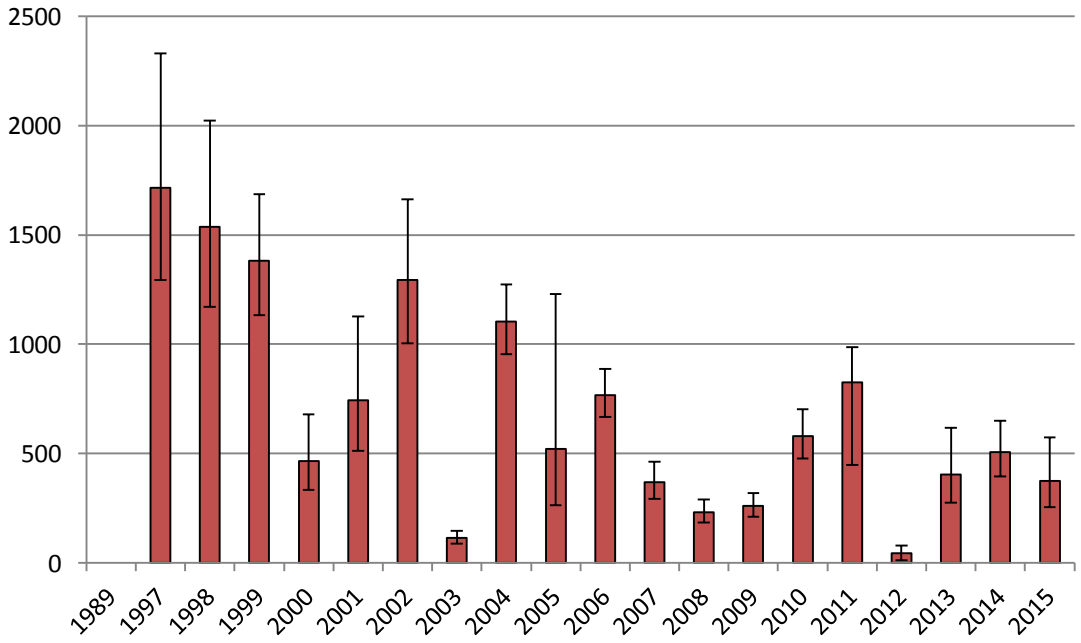

FIGURE 5. Population estimates of Pahrump poolfish for Middle Pond at Shoshone Ponds, 1989 to 2015.

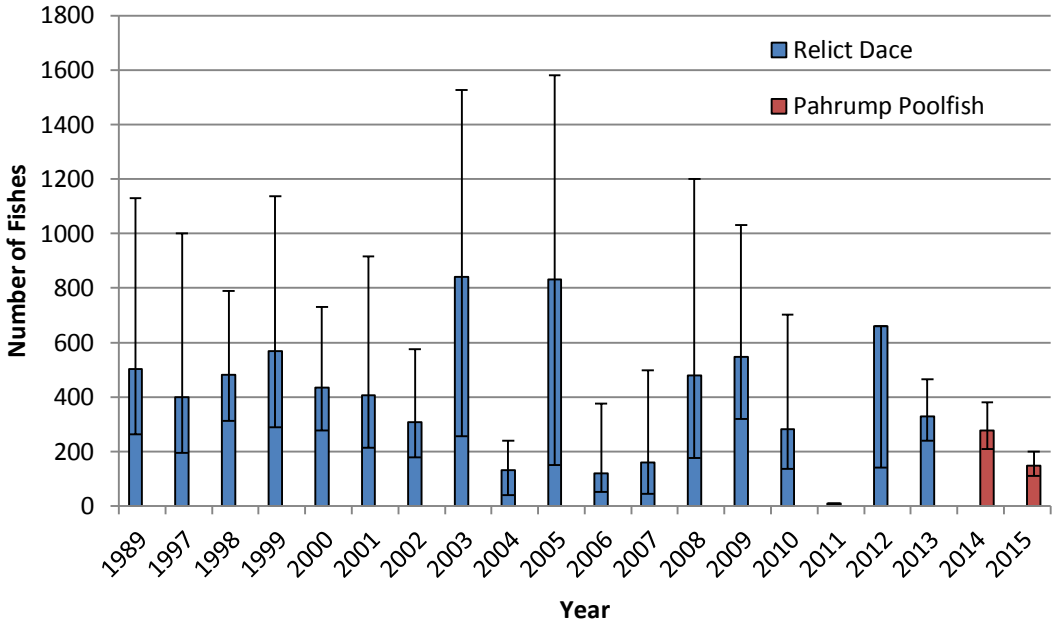

FIGURE 6. Population estimates for Relict Dace and Pahrump Poolfish at the South Pond, Shoshone Ponds 1989 - 2015. Relict Dace population estimates displayed large error due to low recapture rates. There were 25 Relict Dace relocated from South Pond to Steptoe WMA during 2015 surveys.

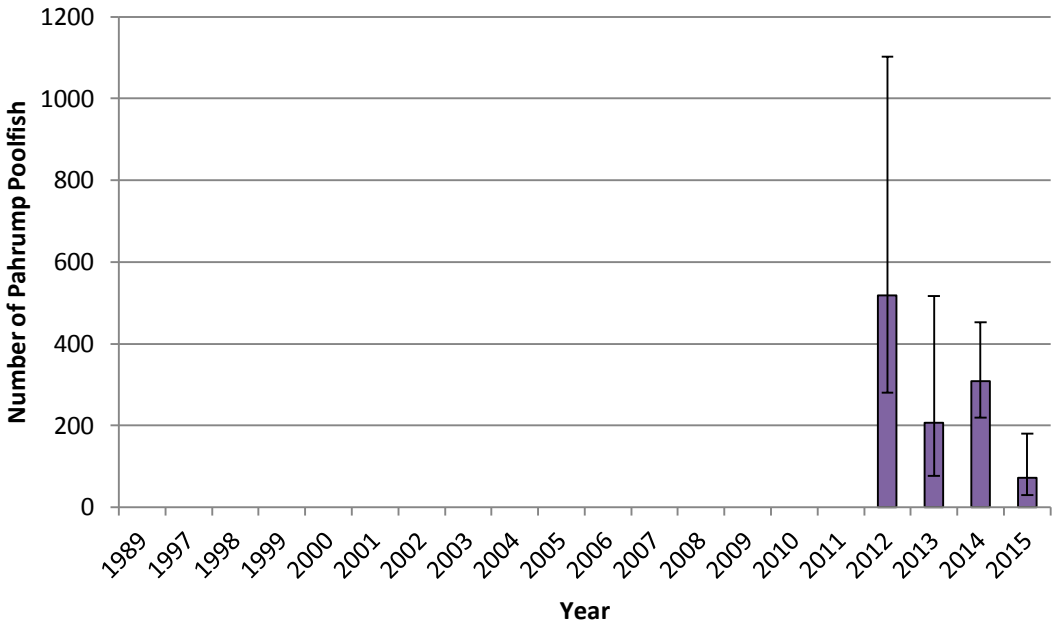

FIGURE 7. Population estimate for Pahrump Poolfish in Well #2. Population estimates in 2012 and 2013 were poolfish ≥ 30 mm. Estimates in 2014 and 2015 display fish ≥ 20 mm.

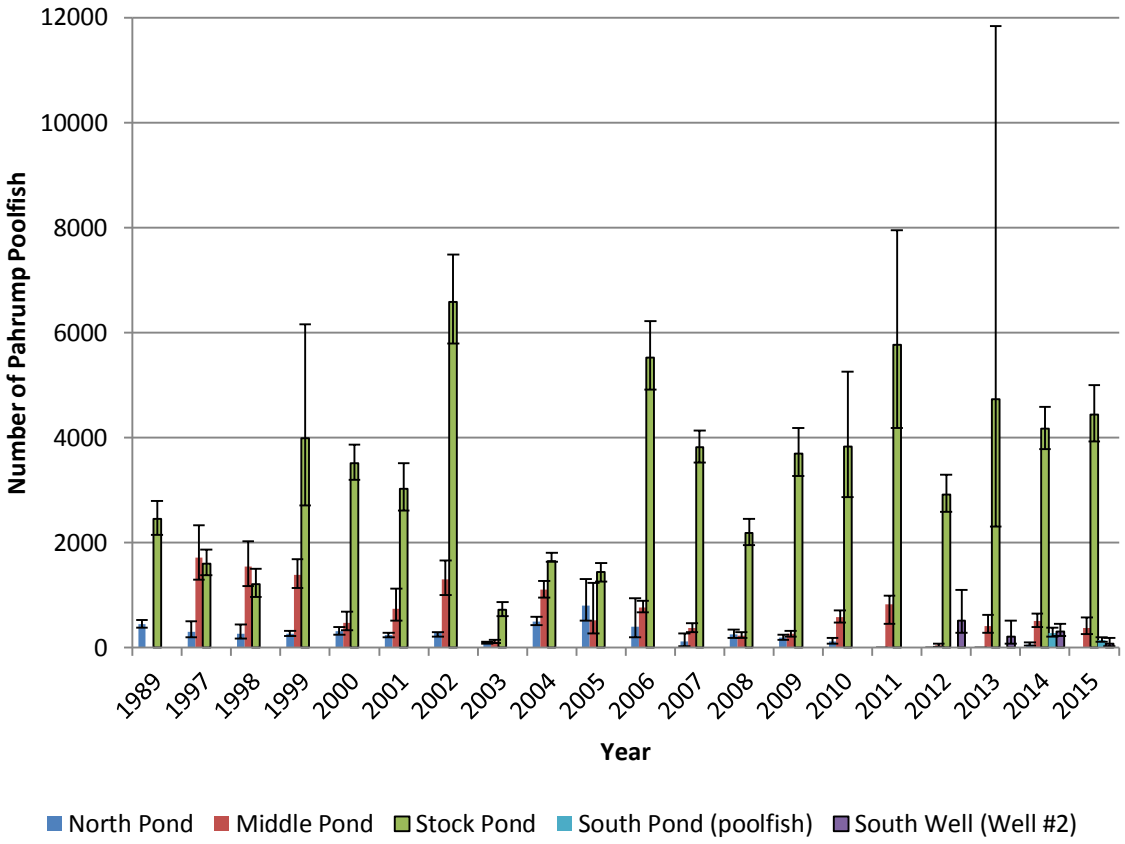

FIGURE 7. Population estimates for Pahrump Poolfish, Shoshone Ponds, 1989 to 2015.

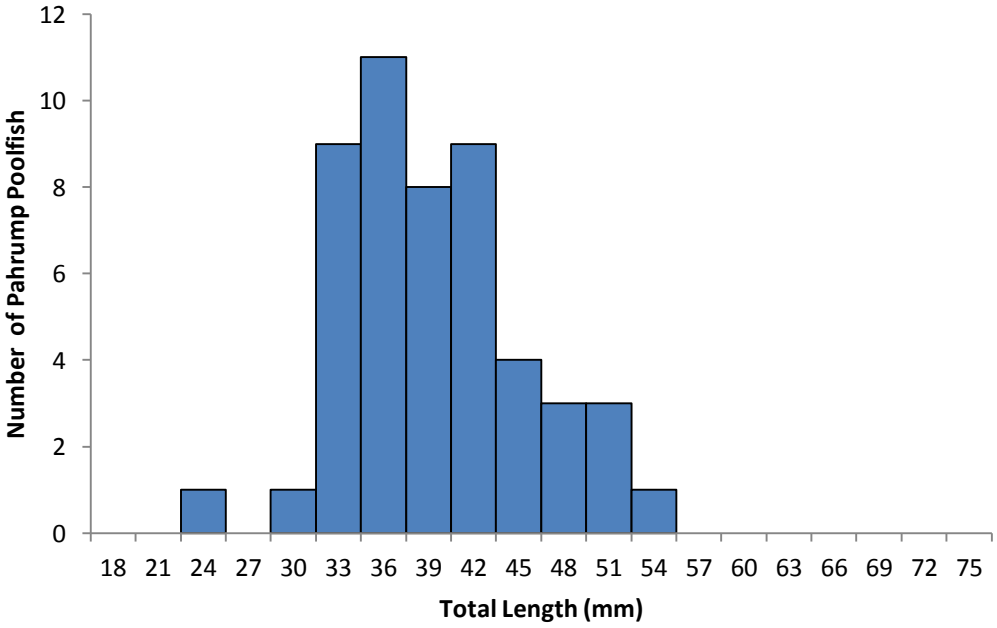

FIGURE 10. Length frequency distribution of Pahrump Poolfish captured during mark-recapture surveys from Stock Pond, 22 July, 2015. Poolfish averaged 38.26 mm (SD = 6.07 mm; range = 22 – 52 mm; *n* = 50).

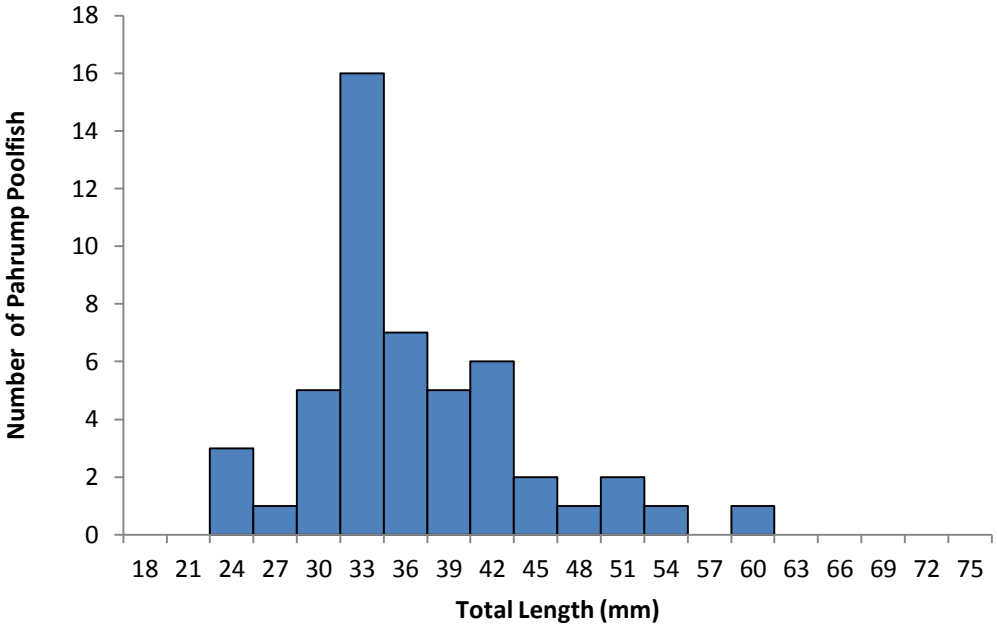

FIGURE 11. Length frequency distribution of Pahrump poolfish captured from Middle Pond, 22 July, 2015. Poolfish averaged 35.56 mm (SD = 7.42 mm; range = 23 – 60 mm; *n* = 50).

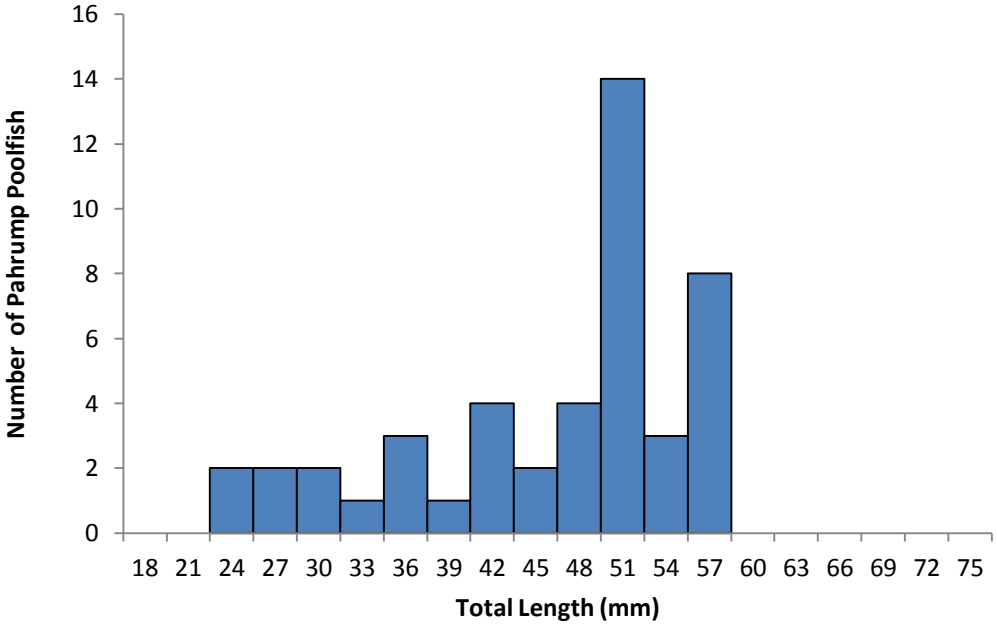

FIGURE 9. Length frequency distribution of Pahrump Poolfish captured during mark-recapture surveys from South Pond, 22 July, 2015. Pahrump Poolfish averaged 45.17 mm (SD = 9.61 mm; range = 23 – 57 mm; *n* = 46).

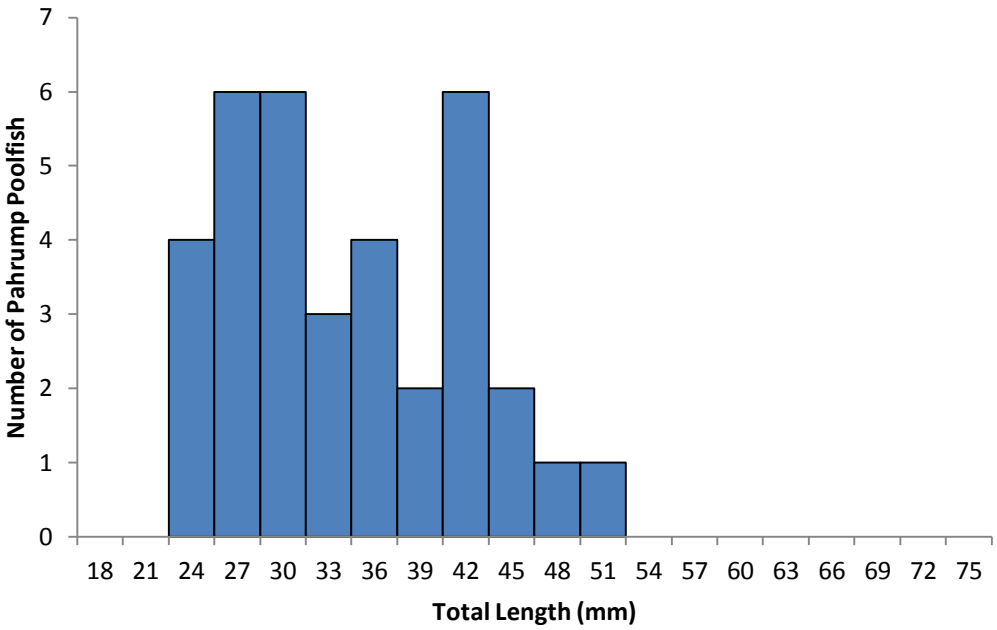

FIGURE 12. Length frequency distribution of Pahrump poolfish captured during mark-recapture surveys from Well #2 Outflow, 22 July, 2015. Poolfish averaged 33.23 (SD = 7.60 mm; range = 22 – 50 mm; *n* = 35).

DISCUSSION

Pahrump Poolfish population estimates increased slightly in Stock Pond and decreased in North Pond, Middle Pond, South Pond, and Well #2 compared to 2014 estimates. Adult poolfish were not captured in North Pond on either sampling occasion in 2015. However, a single larval poolfish was observed in North Pond. Emergent and riparian vegetation has again encroached around the perimeter of North and Middle ponds since vegetation maintenance activities in 2012, reducing available surface water. Water levels remain at capacity and were observed above levels when poolfish were extirpated from North Pond in 2011. North Pond had an abundance of submerged vegetation *Chara* sp. Dissolved oxygen measurements were not attainable at time of surveys due to field equipment malfunctions. Temperature data loggers were recovered and sent to Shawn Goodchild at North Dakota State University for analysis. Temperature loggers previously recorded pond temperature every hour for a year in Middle Pond and nearly two years in North Pond (Figure 13). From August 2012 to August 2013 Middle Pond's mean annual (18.83°C) water temperature was 3.80°C degrees warmer than North Pond (mean =15.02°C), and also demonstrated less variability and warmer minimum temperatures(mean minimum water temperatures: Middle Pond = 10.78°C, North Pond = 6.02°C). Middle Pond's deeper and larger surface area could create a buffer to seasonal variability better than the shallower and smaller diameter North Pond. These ponds are fed from the same well (Figure 14 and 15). Before spring failure, the endemic habitat for Pahrump Poolfish at Manse Spring had a near constant 24°C temperature (range 23.3°C – 25.0°C) and dissolved oxygen remained measurable at near saturation at about 8 - 9 ppm, ranging from a maximum 13 ppm (21 November 1964) to a minimum of 7.1 ppm (23 January 1968) (Deacon and Williams 2010). North Pond was measured at dissolved oxygen levels ≤ 1.00 in morning hours during diel oxygen monitoring on 8 August 2012 (Cattell 2012). Habitat enlargement and stabilization is recommended to increase and stabilize poolfish numbers within the fenced enclosure at Shoshone Ponds.

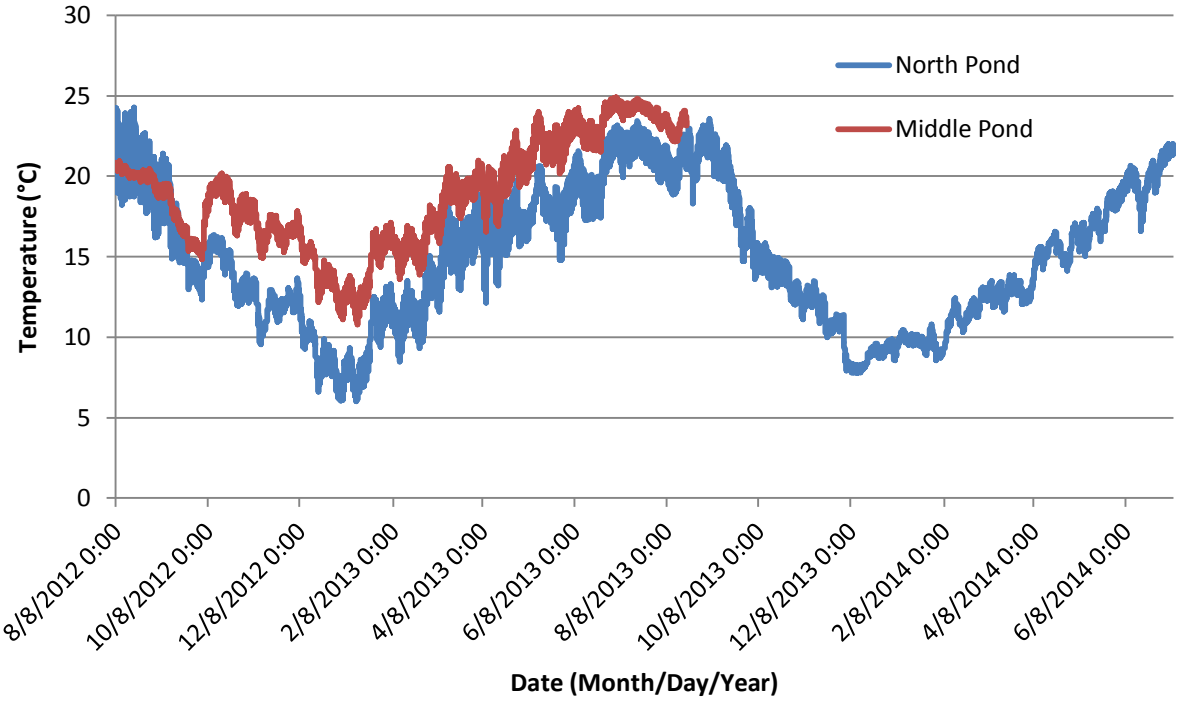

FIGURE 13. Temperature profile data (red line) for Middle Pond measured every hour from 8 August 2012 through 21 August, 2013 at Shoshone Ponds, White Pine County, Nevada. Temperature in Middle Pond averaged 18.82 °C (SD = 3.46°C; range = 10.76°C – 24.90°C; *n* = 9,073). Temperature profile data for North Pond (blue line) measured every hour from 8 August 2012 to 9 July 2014 at Shoshone Ponds, White Pine County, Nevada. Temperature in North Pond averaged 15.02°C (SD = 4.32°C; range = 6.02°C – 24.30°C; *n* = 16,810). Preliminary (unpublished) temperature data provided courtesy of Shawn Goodchild, North Dakota State University.

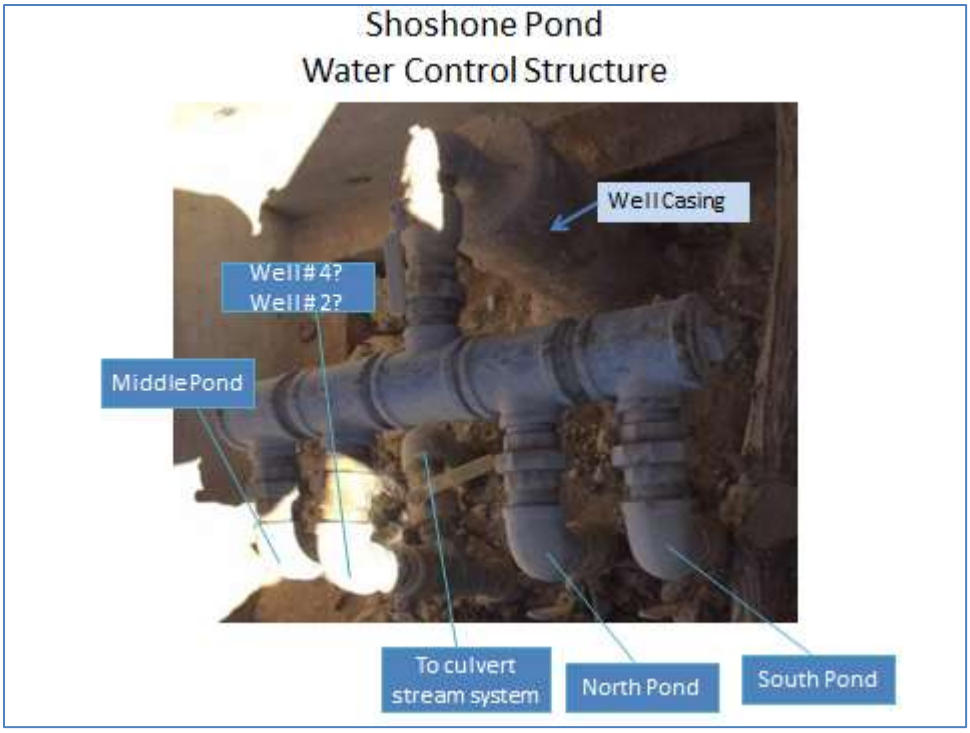

FIGURE 14. Shoshone Ponds piping picture displaying path of water from well casing. Photograph was taken on 22 July 2015, courtesy of Kevin Guadalupe.

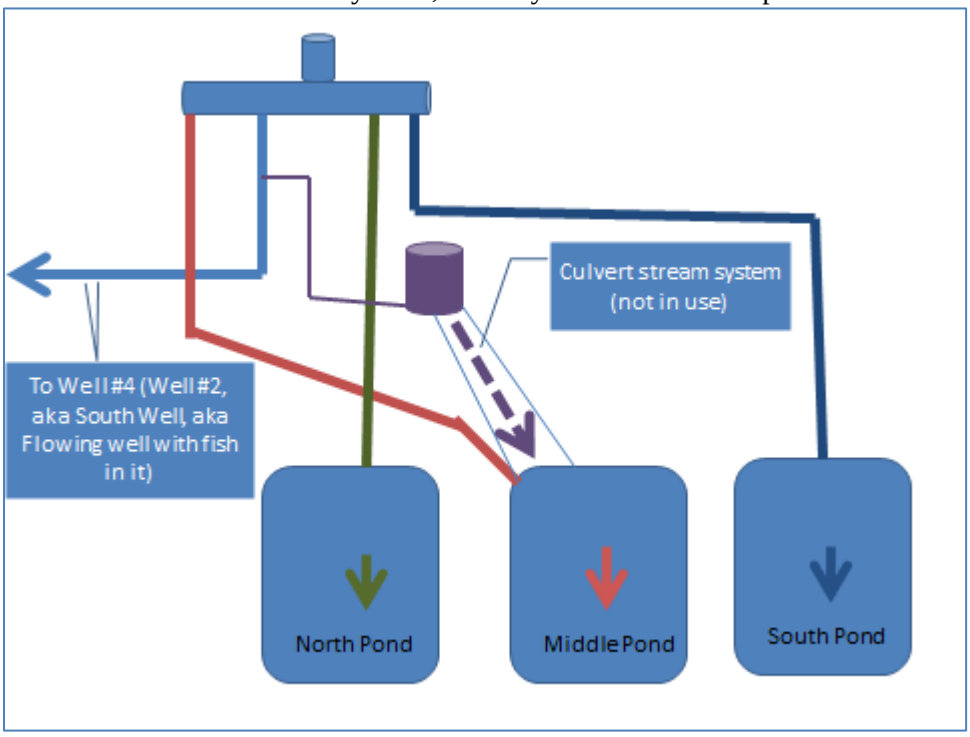

FIGURE 15. Recreated schematic from hand drawn map of well refurbishing work completed in 2011 at Shoshone Ponds, White Pine County, Nevada.

Vegetation maintenance was conducted on Middle and North ponds following survey activities on 29 July, 2015 (Figure 16). Vegetation was cleared from the staff gauge and southern

perimeter of North Pond. A 3 m long x 0.50-0.75 m wide swath of vegetation was cleared between Middle and North ponds, increasing a shallow flowing stream connecting Middle Pond water flowing into North Pond. This should create temporary increases of dissolved oxygen circulation into North Pond to stabilize water quality. An Onset U26 dissolved oxygen meter was deployed in the center of North Pond approximately 16 cm from surface, attached to a buoy. The oxygen data logger was set to measure dissolved oxygen and temperature every hour for up to six months before sensor cap expiration. This device will be retrieved and reported in January 2016.

FIGURE 16. (Top Left) North Pond pre-vegetation maintenance on 29 July, 2015 at Shoshone Ponds, White Pine County, Nevada. (Top Right) Post-vegetation clearing at North Pond. (Bottom Left) Middle Pond pre-vegetation maintenance. (Bottom Right) Post-vegetation clearing at Middle Pond. Photographs courtesy of Kevin Guadalupe.

In 2014 the BLM-Ely submitted Southern Nevada Public Lands Management Act funding proposal to address habitat maintenance needs to stabilize poolfish habitat. The Pahrump Poolfish Recovery Implementation Team is awaiting the decision (Round 15, Priority #6 as of 3 June, 2015) to move forward with long-term restoration goals.

Stock Pond remains the largest and most stable population of poolfish at Shoshone Ponds. Stock Pond levels have been observed as lowering during times of irrigation in Spring Valley. It is unknown if nearby irrigation, degrading artesian wells, continued drought, and/or combination of factors contributed to decrease flows to Stock Pond. In 2013 the BLM installed and continues to

maintain temporary solar powered pump that has stabilized water levels at Stock Pond. Fencing surrounding the pond prevents impacts cattle had on the structural integrity of the pond and direct consumption.

The United States Geological Survey (USGS) attempted to video log the well feeding Stock Pond on 12 May. A spoon was discovered approximately 135 ft down. Efforts are ongoing to retrieve the spoon and log the entirety of the reported 283 ft. The USGS also reported observing heavy calcium carbonate deposit that could have an impact on flow, recommending well scrubbing and flushing to improve flow.

A staff gauge was installed on 19 August 2015 at Stock Pond by NDOW personnel to assist in monitoring annual pond level fluctuations. Decreased water flow can have detrimental effects to survival and fitness of poolfish in Stock Pond through increased temperature variability, greater fluctuations in diel oxygen, and lesser overall available habitat. Installing an inline flow logger in the artesian well pipe at Stock Pond can track seasonal fluctuations of flow.

Plans to enlarge the enclosure, and/or connect Middle and North ponds are moving forward and should be completed within the next few years. This work would create additional habitat for the poolfish and further secure the habitat into the future. Additional population sites in Clark County are currently under investigation. Yearly maintenance should be conducted at this site to prevent riparian vegetation from filling in habitat, maintaining the ponds 1970s' available surface area. Population surveys will continue in August 2016.

Eleven Northern Leopard Frogs *Lithobates pipiens* were encountered during surveys and submitted to the NDOW occurrence database. Four of these were encountered at the Fish and Game Well just south of Shoshone Ponds (Figure 1).

LITERATURE CITED

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Deacon, J. E., and J. E. Williams. 2010. Retrospective Evaluation of the Effects of Human Disturbance and Goldfish Introduction on Endangered Pahrump Poolfish. Western North American Naturalist 70(4), © 2010, pp. 425–436

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