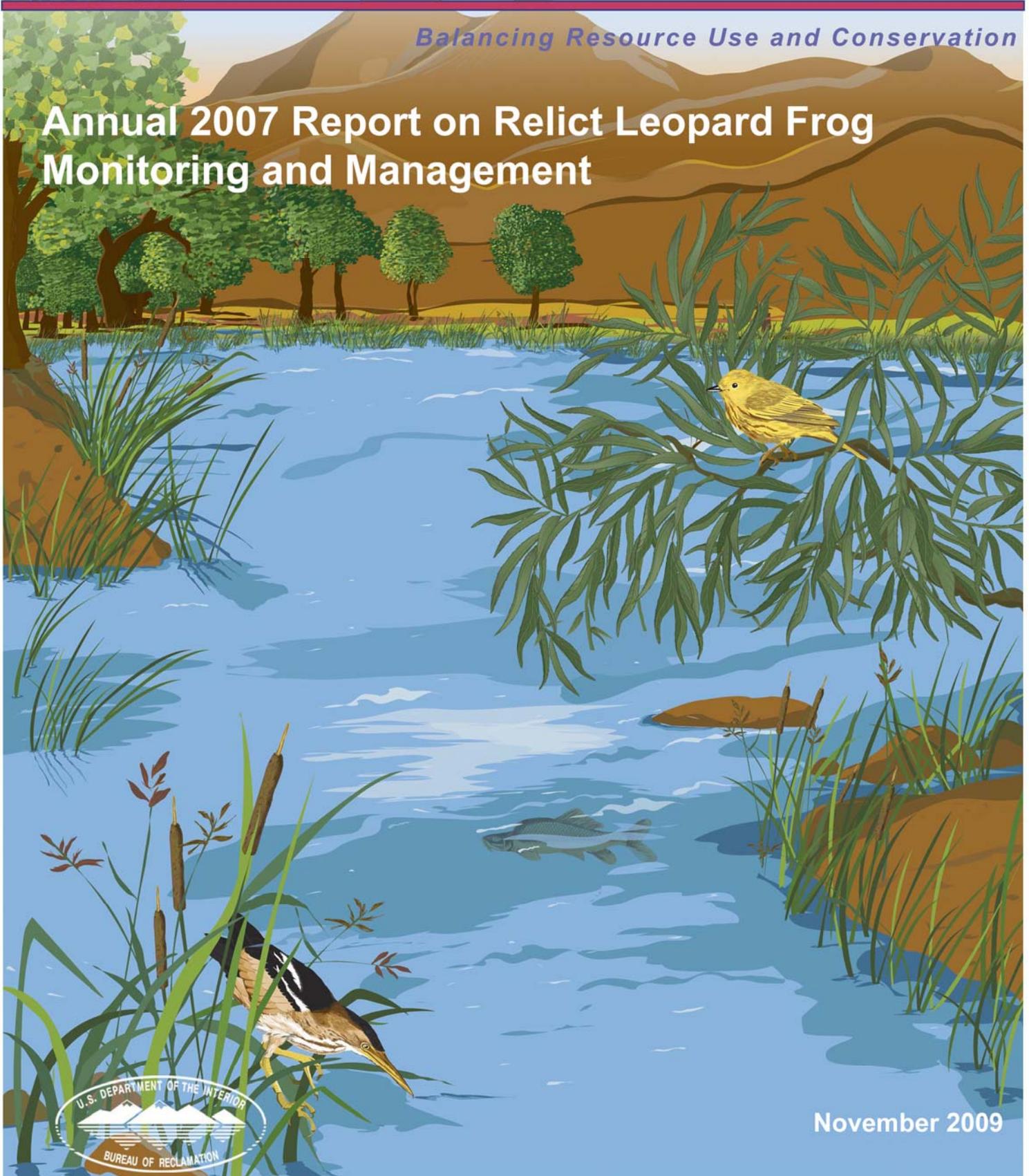




# Lower Colorado River Multi-Species Conservation Program

*Balancing Resource Use and Conservation*

## Annual 2007 Report on Relict Leopard Frog Monitoring and Management



November 2009

# Lower Colorado River Multi-Species Conservation Program Steering Committee Members

## **Federal Participant Group**

Bureau of Reclamation  
U.S. Fish and Wildlife Service  
National Park Service  
Bureau of Land Management  
Bureau of Indian Affairs  
Western Area Power Administration

## **Arizona Participant Group**

Arizona Department of Water Resources  
Arizona Electric Power Cooperative, Inc.  
Arizona Game and Fish Department  
Arizona Power Authority  
Central Arizona Water Conservation District  
Cibola Valley Irrigation and Drainage District  
City of Bullhead City  
City of Lake Havasu City  
City of Mesa  
City of Somerton  
City of Yuma  
Electrical District No. 3, Pinal County, Arizona  
Golden Shores Water Conservation District  
Mohave County Water Authority  
Mohave Valley Irrigation and Drainage District  
Mohave Water Conservation District  
North Gila Valley Irrigation and Drainage District  
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Salt River Project Agricultural Improvement and Power District  
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Wellton-Mohawk Irrigation and Drainage District  
Yuma County Water Users' Association  
Yuma Irrigation District  
Yuma Mesa Irrigation and Drainage District

## **Other Interested Parties Participant Group**

QuadState County Government Coalition  
Desert Wildlife Unlimited

## **California Participant Group**

California Department of Fish and Game  
City of Needles  
Coachella Valley Water District  
Colorado River Board of California  
Bard Water District  
Imperial Irrigation District  
Los Angeles Department of Water and Power  
Palo Verde Irrigation District  
San Diego County Water Authority  
Southern California Edison Company  
Southern California Public Power Authority  
The Metropolitan Water District of Southern California

## **Nevada Participant Group**

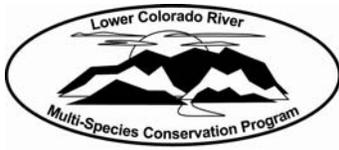
Colorado River Commission of Nevada  
Nevada Department of Wildlife  
Southern Nevada Water Authority  
Colorado River Commission Power Users  
Basic Water Company

## **Native American Participant Group**

Hualapai Tribe  
Colorado River Indian Tribes  
The Cocopah Indian Tribe

## **Conservation Participant Group**

Ducks Unlimited  
Lower Colorado River RC&D Area, Inc.



# Lower Colorado River Multi-Species Conservation Program

## Annual 2007 Report on Relict Leopard Frog Monitoring and Management

*Prepared by Dana Drake and Jef Jaeger, University of Nevada, Las Vegas*

Lower Colorado River  
Multi-Species Conservation Program  
Bureau of Reclamation  
Lower Colorado Region  
Boulder City, Nevada  
<http://www.lcrmscp.gov>

November 2009

## SUMMARY

- Nocturnal and diurnal visual encounter surveys were completed (annual survey requirements)
- PIT tag surveys for population estimation were initiated at Upper Blue Point Spring and Rogers Spring
- No frogs have been seen at Rogers Spring and few frogs have been seen at Blue Point Spring
- A total of 1,365 tadpoles and 592 post-metamorphic frogs were released at translocation sites
- Relict Leopard Frogs were discovered in a side canyon of the previously inaccessible Black Canyon Spring (near Salt Cedar Spring)
- Lower Grapevine Spring, NV (a translocation site) dried completely during summer
- Thirteen springs in Gold Butte and one in Black Canyon were visited to assess potential as translocation sites
- Photo points were established and photos were taken at sites at least twice during 2007
- EPMT crew reduced tamarisk at Black Canyon sites
- Habitat modification experiments were initiated to improve conditions at Upper Blue Point Spring and Rogers Spring, as part of a UNLV research project funded by MSHCP
- LMNP fire crews implemented a burn plan in association with the UNLV project at four selected sites along lower Rogers Spring

## MONITORING OF NATURAL SITES

During 2007, diurnal and nocturnal visual encounter surveys (VES) were conducted at all natural Relict Leopard Frog sites, including one previously inaccessible site, and all experimental sites but Sugarloaf Spring (14 sites, 135 surveys total). The main findings of interest were that we observed signs of reproduction (eggs and tadpoles) at all of the natural *Rana onca* sites in the Black Canyon, which had been severely impacted by floods and associated debris flows in October 2006. Several sites have already yielded a new cohort of metamorphs, including Bighorn Sheep Spring, Salt Cedar Spring, and the previously inaccessible Black Canyon Spring. Habitat conditions at Bighorn Sheep Spring have not recovered from the flood event and counts at this site continue to be low. A newly discovered side channel in the Black Canyon Spring drainage also harbors *R. onca*.

No *R. onca* have been observed this year at Rogers Springs, while two frogs were observed at Lower Blue Point Spring during several surveys. Mark-recapture estimates of the populations of *R. onca* at upper Blue Point Spring are in the low teens. All surveys for *R. onca* were conducted by at least one trained biologist with experience in amphibian surveys.

Data from surveys at natural sites are summarized for 2007 in Tables 1-3. Below is a summary of annual observations and findings at each of these sites.

### Black Canyon Sites

Bighorn Sheep Spring, NV: Nine diurnal and two nocturnal VES were conducted at this site. All life stages of *R. onca* were observed over the course of these surveys. On 1/17/07 over 500 tadpoles were observed; many of these tadpoles overwintered. Metamorphs were observed on 3/22/07. We were pleasantly surprised to find a *R. onca* egg mass at one of the remaining pools at this site in September. Herbacious vegetation at this site is trying to make a comeback after the scouring from the October 2006 storms; however, few pools currently exist in the system, and stretches of the system remain under gravel with no or little surface flow. The largest count at this site was 63 frogs. Photos were taken at photo points on 7/31/07 and 11/09/07. All of the life stages of *Bufo punctatus* (red-spotted toad), except egg masses, were also observed at this site this year.

The National Park Service Exotic Plant Management Team (EPMT) was in the canyon on 2/06/07 removing tamarisk, and pools and other frog-sensitive areas were marked for the crew members to avoid while removing vegetation and applying herbicide.

A total of seven egg masses were brought from this site to the laboratory at Lake Mead National Recreation Area (NRA) in Boulder City for translocation efforts. One *R. onca* egg mass was brought back on 2/06/07. This mass had 551 eggs (egg masses were counted by keeping the mass in a hatchery basket in the lab during development and then counting hatchlings once they emerged and then adding the number of dead eggs and embryos still in the mass). Two egg masses were brought into the lab on 2/20/07 (184 and 457 eggs, respectively) and four egg masses were brought into the lab from this site on 3/09/07 (348, 269, 383, and 409 eggs each).

Boy Scout Spring, NV: Four diurnal and two nocturnal VES were conducted at this site. All life stages of *R. onca* but juveniles were observed during these surveys. The survey on 01/20/07 was conducted as part of Amphibian Population Task Force field trip. Adult and juvenile *B. punctatus* were also observed at this site this year. Steady rains on 2/19/07 caused several of the pools in the canyon to fill in and made the already tiny pool where the eggs were laid and tadpoles were found even smaller. This site, however, appears to have weathered the flooding well and counts remain similar to surveys in previous years (Tables 1 and 2). Photo points were taken on 2/20/07 and 11/14/07.

Dawn's Canyon, NV: Four diurnal and two nocturnal VES were conducted at this site, and adults, larvae, and eggs were observed. On 2/20/07 large blowouts in the canyon walls were observed in the lower third of the canyon, likely a result of steady rains on 2/19/07. Two adult *B. punctatus* were also seen at this site in the spring. Photos were taken at photo points on 2/20/07 and 11/14/07.

Salt Cedar Spring, NV: Eight diurnal and two nocturnal VES were conducted at this site. All life stages, including one hatched egg mass observed on 3/9/07, were observed during these surveys. Tadpoles were observed at varying developmental stages; it appears that several of them overwintered. Metamorphs from the overwintering *R. onca* tadpoles were observed on 3/9/07 and 3/22/07. Crayfish remained very abundant in the stream and pool at the base of the survey area near the confluence with the Colorado River, but have not moved up over a dry stretch and earthen dam into upper portions of the stream. Adult *B. punctatus* were observed in all but 2 surveys at this site this year. The vegetation is beginning to come back, in the form of cattails and tamarisk, with a small amount of herbaceous vegetation. In general, habitat along this stream continues to appear favorable for *R. onca*. Photos were taken at photo points on 2/16/07, 7/31/07, and 11/9/07. While the EPMT crew was in the canyon doing tamarisk removal on 2/6/07, a new path was cut through the vegetation around the lower crayfish pool to ease access and improve survey conditions.

Black Canyon Spring (formerly referred to as Salt Cedar Canyon, NV): Seven diurnal and two nocturnal VES were conducted at this site. No frogs, tadpoles, or egg masses were seen until the 2/16/07 survey. Frogs and tadpoles of *R. onca* have been seen in a small side pool off the main channel and one egg mass has been seen. *Bufo punctatus* have been present on most surveys at this site. On 2/06/07, the EPMT crew removed and applied herbicide to tamarisk along the main drainage. Tamarisk is making a very strong comeback, with thousands of seedlings sprouted and some already a couple of feet tall, especially at the lower end of the canyon. This area is supposedly on the annual rotation of the EPMT. A new "hot tub" pool has been constructed by park visitors at the upper end of the survey area. Photos were taken at photo points on 2/16/07, 7/31/07, and 11/9/07.

Black Canyon Spring Side Canyon, NV: This coldwater site is a newly discovered area off of the main Black Canyon Spring drainage and consists of a side canyon that opens into what was formerly referred to as Salt Cedar Canyon. Although part of the main Black Canyon Spring system, we report

on surveys of this area separately at this time to facilitate our understanding of the system. Seven diurnal and two nocturnal VES were conducted at this site this year. Several large, slow pools that looked like good frog habitat were observed. No frogs were seen or heard until 3/9/07, although the EPMT crew reported hearing frogs calling during the second week of February while they were controlling tamarisk in this canyon. Adults, juveniles, tadpoles, and eggs have been observed here during the surveys. Herbaceous vegetation has grown in densely, especially in the upper stretch of the survey area. *Bufo punctatus* were seen at this site in May. Photos were taken at photo points on 7/31/07 and 11/9/07.

**Table 1.** Summary of *Rana onca* observed at natural sites in the Black Canyon during nocturnal visual encounter surveys conducted in 2007. Temperatures (degrees C) are ambient air temperature during surveys (Temp<sup>A</sup>) and water temperature (Temp<sup>W</sup>) generally taken at sites where eggs (E), tadpoles (L), or adult (A) or juvenile (J) frogs were seen.

Site	Date	Temp <sup>A</sup>	Temp <sup>W</sup>	A	J	L	E
Bighorn Sheep Spring	4/19/2007	19.4	10	63	0	300+	0
	10/30/2007	25.5	17	44	7	2	0
Boy Scout Canyon Spring	5/8/2007	26.2	15	13	0	0	0
	10/30/2007	25.3	17	20	0	0	1
Dawn's Canyon Spring	5/8/2007	25.7	17	3	0	0	0
	10/15/2007	26	17	1	0	7	0
Salt Cedar Canyon Spring	5/2/2007	26.5	18	21	15	2	0
	10/17/2007	24.8	21	22	2	0	0
Black Canyon Spring	5/2/2007	28	18	16	1	0	0
	10/17/2007	23.4	28	5	0	0	0
Black Canyon Spring Side	5/2/2007	27.8	15	21	1	0	0
	10/17/2007	23	16	14	9	0	0

**Table 2.** Summary of *Rana onca* observed at natural sites in the Black Canyon during diurnal visual encounter surveys conducted in 2007. Temperatures (degrees C) are ambient air temperature during surveys (Temp<sup>A</sup>) and water temperature (Temp<sup>W</sup>) generally taken at sites where eggs (E), tadpoles (L), or adult (A) or juvenile (J) frogs were seen.

Site	Date	Temp <sup>A</sup>	Temp <sup>W</sup>	A	J	L	E
Bighorn Sheep Spring	1/17/2007	12.6	15-18	3	0	500+	0
	2/6/2007	15.6	16	3	0	300+	6
	2/16/2007	19.7	19	5	0	300+	2
	2/20/2007	17.8	19	3	0	300+	4
	3/9/2007	29.9	23	6	1	200+	5
	3/22/2007	27.0	24	10	1	300+	1
	7/31/2007	34.2	24	5	2	1	0
	9/27/2007	32	19	2	0	300+	1
11/09/2007	26.3	12	1	0	9	0	
Boy Scout Canyon Spring	1/12/2007	8.8	15	4	0	0	0
	1/20/2007	12.1	18	4	0	0	1
	2/20/2007	16.2	18	4	0	1	1
	11/14/2007	17	24.1	4	0	0	0
Dawn's Canyon Spring	1/12/2007	8.2	15	1	0	0	0
	2/20/2007	14.2	18	2	0	0	0
	3/22/2007	22.2	20	2	0	0	1
	11/14/2007	24.3	15	0	0	0	0
Salt Cedar Canyon Spring	1/17/2007	12.6	18-25	3	0	56	0
	2/6/2007	22.6	25	5	0	60+	0
	2/16/2007	13.6	18.5-23	1	0	51	0
	3/9/2007	27.6	27	2	6	300+	0
	3/22/2007	27	24	2	3	300+	0
	7/31/2007	29.8	27	5	3	0	0
	9/27/2007	28.9	26	7	0	0	0
	11/9/2007	26.1	24	5	0	0	0
Black Canyon Spring	1/17/2007	14.1	24	0	0	0	0
	2/6/2007	21.9	8	0	0	0	0
	2/16/2007	12.7	11-13.5	3	0	0	0
	3/9/2007	25.7	13.5	3	0	12	1
	3/22/2007	23	17	1	0	25	0
	7/31/2007	32	31	1	0	0	0
	11/9/2007	26.2	29	0	0	0	0
Black Canyon Spring Side	2/16/2007	12.7	11	0	0	0	0
	3/9/2007	25.7	13.5	3	0	0	0
	3/22/2007	23	17	3	0	0	3
	7/31/2007	32.4	23.5	4	3	48	0
	9/27/2007	26.9	18	3	8	0	0
11/9/2007	24.1	14	2	5	0	0	

## Northshore Spring Complex

Blue Point Spring, NV: Fourteen diurnal and 24 nocturnal VES were conducted on the upper spring stretch (upper Blue Point Spring), and three diurnal and five nocturnal VES were conducted on the lower spring stretch (lower Blue Point Spring). No frogs were observed during the diurnal surveys at either the upper or lower stretches of the stream until November, while frogs were observed in the spring and fall at upper Blue Point Spring and in the fall at lower Blue Point. The number of frogs observed at this site remains low (Tables 3). Weekly diurnal surveys at upper Blue Point began in October in search of egg masses. Photos were taken at photo points at upper Blue Point on 2/3/07 and 10/6/07, and at lower Blue Point on 2/5/07 and 11/12/07.

As part of a research project, experimental vegetation modifications were conducted by UNLV personnel with field crew assistance from the Nevada Conservation Corps (NCC) along the upper stretch of the spring in early February and again in mid-November 2007. Experimental sections of lower Blue Point were also cut in November (details of these cuts will be reported as part of the separated UNLV project). Additionally, as part of the habitat experiments, a fish-free channel was created near Northshore Road at upper Blue Point Spring in early spring and has been maintained through the year. An additional shallow pool was constructed near the historical dam further upstream in mid-summer; this latter pool was considered a failure because fish were able to colonize, although the site appears to be good adult habitat.

Mark-recapture efforts at this site have also been conducted with the assistance of Matt Graham, a doctoral candidate at UNLV, as part of the habitat manipulation experiments; these data will also be reported elsewhere, but in general the estimated number of adult frogs along this system appears to be in the low teens, far lower than estimates reported in the 1990s (survey data from this effort are included in Table 3).

A turtle with carapace diameter of approximately 8 inches was observed at this site on 4/5/07; this was probably a newly released pet. Although positive identification was not made, it was determined to probably be a slider and definitely not a soft-shelled turtle. We were unable to capture it.

Rogers Spring, NV: Two diurnal and five nocturnal VES were conducted this year at this site. No *R. onca* were observed during these surveys. There were almost no sites along this system, outside those included in habitat experiments discussed below, that can be considered good quality habitat for these frogs. One *Bufo woodhousii* (Woodhouse's toad) was heard calling and one *B. punctatus* was observed on 4/6/07, and one *B. woodhousii* was heard calling on 4/9/07. Photos were taken at photo points on 11/19/07.

Habitat modifications at lower Rogers Spring were also conducted at this site in November as part of the UNLV research efforts. Several 10-m stretches of sawgrass (*Cladium*) were mechanically cut and organized to border sections of spring reaches as part of an experimental burn plan aimed at improving habitat conditions for *R. onca*. The burn plan was initiated on 12/13/07, with Lake Mead NRA fire crews and members of the Lake Mead NRA vegetation crew, and UNLV collaborators present. Four sections (each about 30-40 m in leaner length) of sawgrass-dominated riparian area near the Telephone Pole Road were burned (specifics on the burns along with vegetation response monitoring will be reported as part of the UNLV study).

**Table 3.** Summary of *Rana onca* observed at Blue Point Spring and Rogers Spring during visual encounter surveys conducted in 2007. Surveys include those conducted as a mark-recapture study to estimate population sizes. Temperatures (degrees C) are ambient air temperature during surveys (Temp<sup>A</sup>) and water temperature (Temp<sup>W</sup>) generally taken at sites where eggs (E), tadpoles (L), or adult (A) or juvenile (J) frogs were seen.

Site	Time	Date	Temp <sup>A</sup>	Temp <sup>W</sup>	A	J	L	E
Upper Blue Point Spring	Diurnal	2/3/2007	3.6	24.5	0	0	0	0
	Diurnal	2/5/2007	18.9	23	0	0	0	0
	Diurnal	2/15/2007	19.8	23	0	0	0	0
	Diurnal	2/22/2007	24.2	29	0	0	0	0
	Diurnal	10/16/2007	27.7	18	0	0	0	0
	Diurnal	10/22/2007	22.2	22	0	0	0	0
	Diurnal	10/29/2007	19.5	22	0	0	0	0
	Diurnal	11/5/2007	24.2	22	2	0	0	0
	Diurnal	11/12/2007	23.5	22	0	0	0	0
	Diurnal	11/19/2007	25.6	22	2	0	0	0
	Diurnal	11/26/2007	21.7	20	2	0	0	0
	Diurnal	12/06/2007	15.5	23	0	0	0	0
	Diurnal	12/14/2007	10.6	18	0	0	0	0
	Diurnal	12/28/2007	12	-	0	0	0	0
	Nocturnal	3/21/2007	19.9	28	2	0	0	0
	Nocturnal	4/5/2007	29.9	29	2	0	0	0
	Nocturnal	4/9/2007	23.2	27	3	0	0	0
	Nocturnal	4/17/2007	24.5	14	2	0	0	0
	Nocturnal	5/6/2007	22.5	21	3	0	0	0
	Nocturnal	5/17/2007	29.3	-	4	0	0	0
	Nocturnal	5/23/2007	-	-	4	0	0	0
	Nocturnal	5/30/2007	31	-	5	0	0	0
	Nocturnal	6/7/2007	24	-	5	0	0	0
	Nocturnal	6/15/2007	33.7	-	4	0	0	0
	Nocturnal	6/20/2007	32.2	-	6	0	0	0
	Nocturnal	6/28/2007	31.5	-	6	0	0	0
	Nocturnal	7/12/2007	34.8	-	0	0	0	0
	Nocturnal	7/19/2007	36.6	-	0	0	0	0
	Nocturnal	7/25/2007	30.6	-	3	0	0	0
	Nocturnal	8/2/2007	32.2	-	1	0	0	0
	Nocturnal	8/11/2007	36.1	-	1	0	0	0
	Nocturnal	8/28/2007	30.8	24	0	0	0	0
	Nocturnal	9/12/2007	31.7	-	2	0	0	0
	Nocturnal	10/10/2007	19.2	18	6	0	0	0
	Nocturnal	10/17/2007	20.7	-	6	0	0	0
	Nocturnal	10/24/2007	20.8	-	3	0	0	0
	Nocturnal	11/2/2007	21.7	-	5	0	0	0
	Nocturnal	11/17/2007	15.4	-	4	0	0	0

**Table 3.** continued

Lower Blue Point Spring	Diurnal	2/5/2007	18.9	27	0	0	0	0
	Diurnal	2/15/2007	19.8	27	0	0	0	0
	Diurnal	11/27/2007	17	19	2	0	0	0
	Nocturnal	5/13/2007	24.2	19	0	0	0	0
	Nocturnal	5/17/2007	31.6	-	0	0	0	0
	Nocturnal	5/22/2007	17.4	19.5	0	0	0	0
	Nocturnal	8/28/2007	30.1	20	0	0	0	0
	Nocturnal	10/10/2007	24.6	15	2	0	0	0
Rogers Spring	Diurnal	2/15/2007	21.2	19	0	0	0	0
	Diurnal	11/19/2007	25.7	12	0	0	0	0
	Nocturnal	4/6/2007	18.1	24	0	0	0	0
	Nocturnal	4/9/2007	23.4	22	0	0	0	0
	Nocturnal	5/6/2007	20.7	13	0	0	0	0
	Nocturnal	10/11/2007	21	15	0	0	0	0
	Nocturnal	11/8/2007	19.9	9	0	0	0	0

### MONITORING OF EXPERIMENTAL TRANSLOCATION SITES

Surveys of experimental sites were conducted in the same fashion as at the natural sites. Surveys during the spring were conducted prior to any translocation conducted for the year. A total of 31 VES surveys (diurnal and nocturnal) were conducted at the six sites. No surveys were conducted at Sugarloaf Spring, as it had dried during 2006. Surveys of Lower Grapevine Spring revealed that the site had dried over the summer. Adults and tadpoles were seen at all sites this year, and egg masses were seen at all but Tassi Spring and Lower Grapevine Spring. Data from surveys at experimental sites are summarized in Tables 4-5. Below is a summary of observations and findings at each of these sites for 2007.

Goldstrike Canyon, NV: Five diurnal and two nocturnal VES were conducted at this site. No amphibians were seen until 2/20/07. We have observed all but the juvenile stage of development at this site during 2007. Adult and juvenile *B. punctatus* have been observed on surveys this year since 2/20/07. Photos were taken at photo points on 2/20/07 and 11/14/07.

Grapevine Spring (Meadview), AZ: Four diurnal and two nocturnal VES were conducted at this site. There were still ice patches in the lower third of the survey stretch in January. All but the egg masses of *R. onca* have been observed at this site, although something resembling a hatched *R. onca* egg mass was observed on 4/13/07. One juvenile *Hyla arenicolor* (canyon treefrog), several *H. arenicolor* eggs and thousands of unidentified recently hatched tadpoles were also observed on 4/13/07. Three adult *Bufo punctatus* were seen on the nocturnal survey on 4/23/07. Photos were taken at photo points on 1/25/07 and 11/11/07.

Lower Grapevine Spring, NV: Two diurnal and two nocturnal VES were conducted at this site. The spring nocturnal survey revealed adult and larval *R. onca* (presumably the larvae overwintered from their late summer introduction), but the site was dry when visited for another nocturnal survey in October and no frogs were observed. At this time, we are recommending that this site no longer be considered for translocations but further surveys will be conducted to determine whether frogs survive

the dry period. The EPMT crew was at the site on 1/29/07 for tamarisk control. Photo points were taken on 1/29/07 and 11/6/07.

Pupfish Refuge Spring, NV: Three diurnal and two nocturnal VES were conducted at this site. All life stages of *R. onca* have been observed during 2007. Major road reconstruction occurred at this site during the early part of the year, including excavation of the ditch alongside the road that once provided adult and breeding habitat for frogs seen on previous surveys. Because of hazards associated with road construction, site visits were restricted by the construction company and BOR until after road completion in late February. In March, a paved road had replaced the dirt road that goes under the bridge to the launch. The culvert under the road just below the pupfish refuge was redirected and large grates were installed there and down where the large pool in the roadside drainage ditch at the bottom of the hill used to be. A steep-sided ditch has been dug on the side of the road. These conditions do not appear to provide the same quality of habitat as previously, especially because of the loss of the large roadside ditch pond where egg masses and tadpoles were previously observed. On 11/28/07, an NCC crew was coordinated to open up the habitat in the stretch of stream below the new road and ponding in that area was improved. Photos were taken at photo points on 3/2/07 and 11/7/07.

Red Rock Spring, NV: Three diurnal and two nocturnal VES were conducted at this site. Several stretches of the stream still had thick layers of ice on top during the January survey. All but the juvenile stage of development of *R. onca* were observed on the second visit. One adult, over 300 larvae, and two new sets of egg strands of *B. woodhousii/microscaphus* were observed during the March survey. An adult toad was captured that exhibited *B. woodhousii* characteristics. Cows were present and abundant at the site during the surveys. New egg masses and tadpoles of *R. onca* were observed during the October survey. Photos were taken at photo points on 1/23/07 and 11/7/07.

Sugarloaf Spring, AZ: This site was not surveyed during this period and has been discontinued as a translocation site because of drying as previously noted.

Tassi Spring, AZ: Two diurnal and two nocturnal VES were conducted at this site. Two juvenile *R. onca* we observed in the water tank in front of the homestead, and tadpoles were observed in the tank late in the year. *Rana onca* were heard calling from that tank in November of this year. This site only received its first juvenile frogs in August 2006, and adult *R. onca* have been seen consistently since then. *Bufo woodhousii*, *B. punctatus*, and *H. arenicolor* were observed and were calling in the lower outflow of the stream below the fence in April 2007. Photos were taken at photo points on 1/23/07 and 11/7/07.

**Table 4.** Summary of *Rana onca* observed at experimental sites during diurnal visual encounter surveys conducted during 2007. Temperatures (degrees C) are ambient air temperature during surveys (Temp<sup>A</sup>) and water temperature (Temp<sup>W</sup>) generally taken at sites where eggs (E), tadpoles (L), or adult (A) or juvenile (J) frogs were seen.

Site	Date	Temp <sup>A</sup>	Temp <sup>W</sup>	A	J	L	E
Goldstrike Canyon	1/12/2007	7.5	30	0	0	0	0
	1/21/2007	12	26	0	0	0	0
	2/20/2007	12.6	18	1	0	26	0
	3/4/2007	18.4	20	1	0	300+	2
	11/14/2007	25.1	20	0	0	0	0
Grapevine Spring, AZ	1/25/2007	20.7	8	0	0	0	0
	3/6/2007	22	11	6	1	0	0
	4/13/2007	18.3	17	2	3	2	12
	11/11/2007	22.6	9	6	2	0	0
Lower Grapevine Spring, NV	1/29/2007	17	8	0	0	0	0
	4/5/2007	24.9	19	0	0	0	0
Pupfish Refuge	1/3/2007	18.6	25	8	0	8	3
	3/2/2007	17.2	24	5	1	35	2
	7/28/2007	27.1	26	1	0	0	0
Red Rock Spring	1/23/2007	20.5	9.5	0	0	0	0
	3/28/2007	16	18	0	0	300+	3
	11/7/2007	23.7	9	4	0	0	0
Tassi Spring	1/23/2007	21.4	15.5	0	2	0	0
	11/7/2007	25.7	16	16	0	23	0

**Table 5.** Summary of *Rana onca* observed at experimental sites during nocturnal visual encounter surveys conducted during 2007. Temperatures (degrees C) are ambient air temperature during surveys (Temp<sup>A</sup>) and water temperature (Temp<sup>W</sup>) generally taken at sites where eggs (E), tadpoles (L), or adult (A) or juvenile (J) frogs were seen. \*Note that Lower Grapevine Spring was dry when visited in October for survey.

Site	Date	Temp <sup>A</sup>	Temp <sup>W</sup>	A	J	L	E
Goldstrike Canyon	4/19/2007	22.6	25	8	1	7	0
	10/15/2007	26.2	23	10	0	0	0
Grapevine Spring, AZ	4/24/2007	18.5	13	11	2	50	0
	10/14/2007	23.8	11	32	2	11	0
Lower Grapevine Spring, NV	4/22/2007	20.3	12	4	0	100+	0
	10/31/2007*	25.3	-	0	0	0	0
Pupfish Refuge	5/4/2007	22.6	15	18	0	10	0
	10/4/2007	29	23	23	0	0	0
Red Rock Spring	5/16/2007	28.4	17	22	0	0	0
	10/2/2007	18.9	15	21	0	125	1
Tassi Spring	4/25/2007	21.3	15	4	0	0	0
	10/2/2007	20.2	19	18	0	5	0

## HEAD-STARTING AND TRANSLOCATIONS

A total of seven egg masses from Bighorn Sheep Spring were brought whole into the laboratory as part of the translocation program. Bringing whole masses into the lab enabled us to count numbers of eggs per egg mass and given poor conditions of pools at the source spring (Bighorn Sheep Spring), we felt this approach was better than leaving large numbers of tadpoles within inadequate habitat at that site. From the egg masses, 520 tadpoles were taken to the Willow Beach Fish Hatchery on 2/19/07 and 575 tadpoles on 3/7/07 for a total of 1,095 tadpoles being reared at Willow Beach. A total of 2,206 tadpoles were hatched from eggs for rearing at the National Park Service facility in Boulder City.

Releases began on 4/19/07 and were completed by 5/16/07. A total of 1,365 tadpoles and 592 frogs were released to augment six established translocation sites (Table 6). Although efforts are underway, no new translocation sites were permitted this year.

**Table 6.** Tadpole and post-metamorphic frog release data for the Relict Leopard Frog translocation program during 2007.

Date	Translocation Site	Tadpoles Released (n)	Frogs Released (n)	Total
4/19/07	Goldstrike Canyon	250	0	250
4/25/07	Grapevine, AZ	820	0	820
4/22/07	Lower Grapevine Spr, NV	295	250	545
4/25/07	Tassi Spring	0	226	226
5/5/07	Pupfish Spring	0	38	38
5/16/07	Red Rock Spring	0	78	78

### Egg Mass Oviposition Site Study

In addition to management actions, research has been initiated to better understand oviposition site selection. Data collection focuses on the areas in which *R. onca* oviposit, and includes pool or pond size in which the egg masses are laid, canopy cover, substrate, vegetation, as well as the material to which the egg masses are attached and general size of the egg mass. Currently, data collected on 40 egg masses from eight sites are being analyzed.

### Translocation Site Reconnaissance

On 3/27-28/07, Marc Maynard of the BLM guided UNLV personnel to several springs in the Gold Butte area to consider as possible translocation sites for *R. onca*. None of the sites were considered ideal, but several had some potential for successful translocations and will be brought to the attention of the Relict Leopard Frog Conservation Team for consideration. On 7/8-9/07, revisits were made to Red Bluff Spring, Cataract Spring, Bear Paw Poppy Springs, and Quail Spring to assess the sites for water availability. All but Red Bluff Spring seemed to have as much water at the sites as when first visited in the spring. Sites visited and observations are summarized in Appendix 1. In terms of habitat, Quail Spring is the most promising of the sites visited, and Mr. Maynard has initiated compliance activity towards future translocation.

On recommendation from Joe Hutcheson, GIS, NPS, Mike Burrell (NDOW) and Dana Drake surveyed Nevada Falls, approximately 200 m upstream of Bighorn Sheep Spring, on 9/27/07. There were a few small pools in a narrow rock canyon, with long stretches of dry area between the pools. The site appears to get repeatedly scoured during rains. There was little vegetation or other habitat for *R. onca*. About 50 newly metamorphosed *B. punctatus* were present during the survey.

## **OTHER ACTIVITIES**

### **Habitat Improvement Study**

A UNLV project titled, Habitat Manipulations for Relict Leopard Frogs (*Rana onca*), headed by Jef Jaeger and funded by the MSHCP (project number 2005-UNLV-597-P) was initiated on 1/16/07 at Blue Point Spring and Rogers Spring. Actions include vegetation cutting to improve adult habitat and construction of fish-free breeding pools. Survey activities associated with this project that overlap with *R. onca* monitoring surveys are reported above. Quarterly reporting is being provided by UNLV to Clark County and is available for public access; other summary reporting will be provided to the County and made available to the RLFCT. These reports are being compiled for the NPS as part of the documentation of *R. onca* management.

**Appendix 1.** Observations and comments on springs within the Gold Butte Area that were evaluated for translocations in March 2007. Asterisks indicate that sites need to be revisited in summer to evaluate water persistence.

Sites	Date	Easting	Northing	Elev. (ft)	Fish	Crayfish	Potential	Comments
Cataract Spring	3/27/07	741063	4012537	2052	no	no	moderate*	Unsure of H2O persistence (currently ~ 1 gal/sec). Few cattails, abundant tamarisk, few pools
Quail Spring	3/27/07	744720	4016973	2604	no	no	high	Single small pool, cattle use, dense aquatic vegetation, could hold a few frogs; pool needs to be dug out
Grapevine Spring	3/27/07	754669	4014004	4326	no	no	low	Unsure of H2O persistence, limited flow, patchy pools, some deeper, base usually has 3-4 m deep pond but dry at this visit. Elevation concern.
Falls Spring	3/27/07	752540	4014690	4115	no	no	low	Drains high elevation area. Abundant flow, little pooling. Probably dries down to just the spring on topo map. Some cattails, pools in the area. Jeep trail follows and in stream bed. Elevation concern.
Summit Spring	3/27/07	758991	4016942	3817	no	no	low	Very small stream, heavy vegetation, not much pooling.
Connoly Spring	3/27/07	760134	4014521	3363	no	no	low	No water in spring, just one 5 m diameter tank with 0.6 m deep water.
Red Bluff Spring	3/28/07	746144	4038626	1611	no	no	moderate*	Open shallow stream with several pools greater than 25 cm deep, with cattails. Water feeding from several springs. Jeep trail heavily used through watered areas with high frog squash factor.
Lower Red Bluff Spring	3/28/07	745477	4038487	1540	no	no	low	One large pool (0.5 m deep); stream mostly within ORV and flash flood narrow drainage. Frogs from Red Bluff would likely end up here.
Bear Paw Poppy Spring	3/28/07	744080	4036108	1499	no	no	low	NW side of Lime Ridge Wilderness, not marked on maps, near NPS and BLM border. Multiple drainages, dense <i>Typha</i> and tamarisk.
next to Bear Paw Poppy Spring	3/28/07	744044	4035919	1501	no	no	moderate*	NW side of Lime Ridge Wilderness, not marked on maps, near NPS and BLM border. Nutrient rich water, burro, cattle use. <i>Typha</i> abundant. Less than 100 m of habitat. Vegetation management necessary before/after release.
near Red Rock Spring site	3/28/07	749410	4039084	1800	no	no	low	Approx 0.5 m from existing translocation site. Water variable and spotty; intermittent flow which may or may not persist throughout the year..
Overflow near Juanita Spring	3/28/07	745199	4058156	2040	no	no	low	Very difficult terrain to navigate, H2O soaked in with dense vegetation, steep, high velocity, no apparent pools, not likely candidate for translocation site.
Cottonwood pool near Juanita Spring	3/28/07				yes	yes	low	Pool ~ 8 m wide. Abundant cattails and crayfish. Fairly shallow, cow use. Stream flows about 5 m then goes underground. Mosquitofish present.