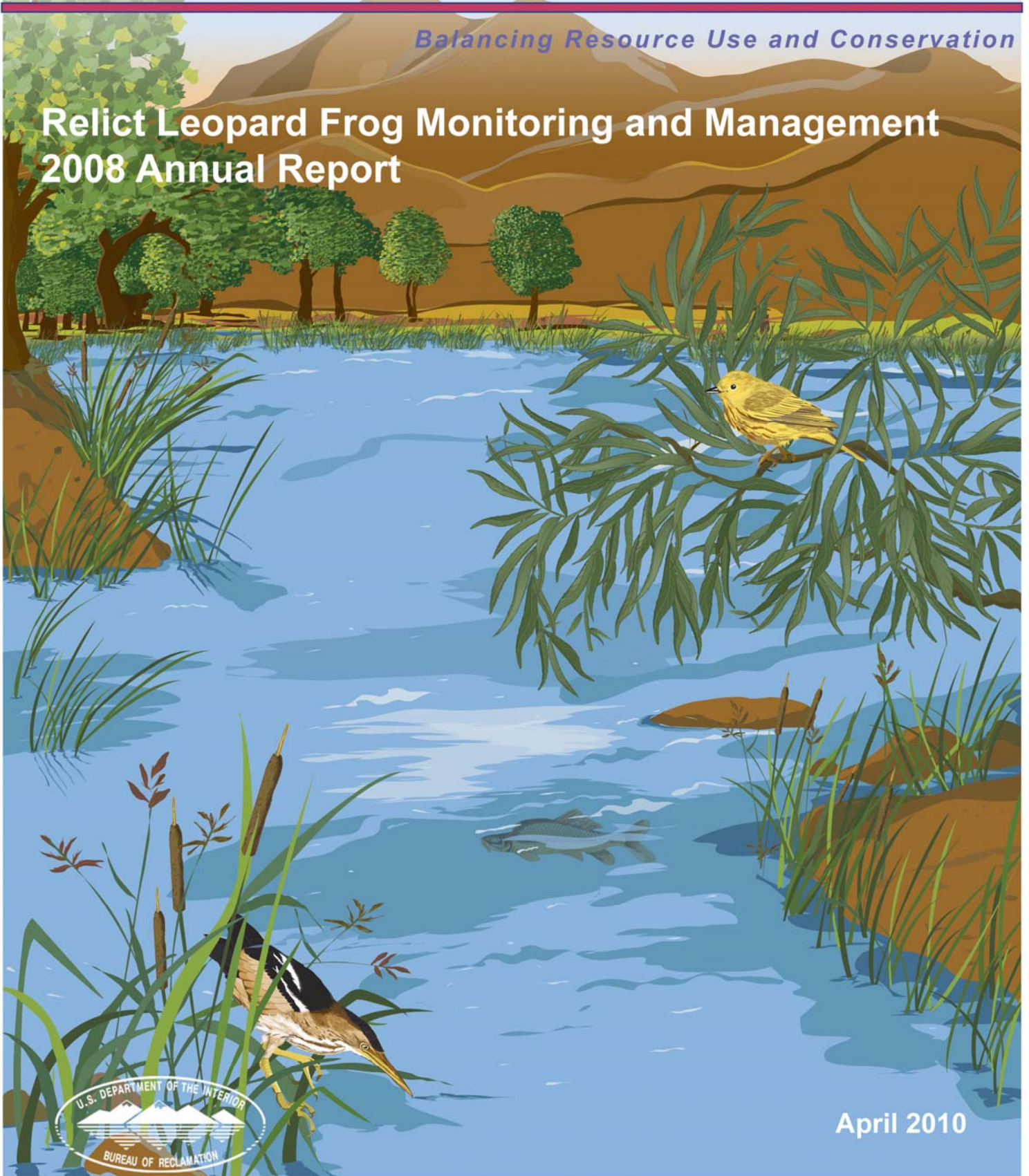




Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Relict Leopard Frog Monitoring and Management 2008 Annual Report



April 2010

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

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Arizona Department of Water Resources
Arizona Electric Power Cooperative, Inc.
Arizona Game and Fish Department
Arizona Power Authority
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QuadState County Government Coalition
Desert Wildlife Unlimited

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San Diego County Water Authority
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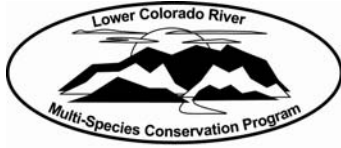
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Lower Colorado River Multi-Species Conservation Program

Relict Leopard Frog Monitoring and Management 2008 Annual Report

Prepared by

*Dana Drake, Public Lands Institute, University of Nevada, Las Vegas
Jef Jaeger, Public Lands Institute, 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>

April 2010

SUMMARY

- Diurnal visual encounter surveys were conducted; egg masses were seen at 10 of 13 sites
- Weekly egg mass surveys were conducted at upper Blue Point Spring through the end of June 2008
- Nocturnal visual encounter surveys were conducted at all 13 sites
- PIT-tag surveys for population estimation are underway at upper Blue Point Spring; low numbers are expected in spring of 2009
- Rains in early January further diminished the limited stream habitat at Bighorn Sheep Spring; egg masses for translocation this season were taken from other sites
- Temporary habitat restoration was conducted in September at Bighorn Sheep Spring, several ponds were created using sandbags; Relict Leopard Frogs (*Rana onca*) and tadpoles were observed in ponds during subsequent fall surveys
- A total of 1,370 tadpoles were hatched in the laboratory from partial egg masses collected from Salt Cedar and Boy Scout Springs for translocation
- A total of 150 tadpoles and 389 post-metamorphic frogs were released at translocation sites
- Modification of the head starting facility at Hilltop is mostly completed; tadpoles and frogs were reared there this spring
- Three egg masses were brought in from lower Blue Point Spring for head starting; 379 frogs were released at Blue Point and Rogers springs this summer
- In an effort to assess Bd (*Batrachochytrium dendrobatidis*, amphibian chytrid fungus), scrape samples were collected from amphibians at 12 sites during fall nocturnal surveys
- Quail Spring habitat modification was conducted for translocation in coordination with BLM; 138 frogs were released at the site in April 2008, and five were seen in November 2008
- Union Pass, Perkins Pond, Stewart Ranch, and the Springs Preserve were visited to assess suitability of these sites for future translocations
- National Park Service Exotic Plant Management Team (EPMT) crew reduced tamarisk and planted willow at Black Canyon Spring sites this spring and NPS volunteers removed tamarisk this fall
- Vocalizations of *Rana onca* were recorded at Grapevine Spring, AZ, as part of the Western Soundscape Archive project this spring

SITE SURVEYS

During 2008, diurnal visual encounter surveys (VES) were conducted at all natural *Rana onca* sites, and all experimental sites (13 sites, 95 surveys total) with the exceptions of Sugarloaf and Lower Grapevine springs in Nevada (removed from experimental list because of previous drying of streams). Weekly diurnal VES have been conducted at upper Blue Point Spring since January–June 2008 (21 surveys), and after the discovery of an egg mass at lower Blue Point Spring on March 15, have included the upper 200–300 meters of lower Blue Point Spring. To improve our understanding of breeding phenology at warm and cold water sites, efforts have been made to visit four cold water and four warm water sites twice monthly since September 2008.

One of the main activities of interest this spring was the collection of the three egg masses encountered at Blue Point Spring for head starting, and the release of a subsequent 379 frogs to Blue Point and Rogers springs. One finding was that despite even greater reduction of the already extremely limited habitat at Bighorn Sheep Spring caused by rains in January, both egg masses ($n = 4$) and tadpoles were observed in the remaining snippets of stream.

In general, egg masses and tadpoles have been observed at 10 sites. No egg masses or tadpoles have been seen yet this year at Rogers Spring, Black Canyon Spring, or Red Rock Spring, but *R. onca* have

been heard calling at Red Rock Spring. All surveys for *R. onca* were conducted by at least one trained biologist with experience in amphibian surveys. Survey data are summarized below and tabulated in Tables 1-5.

MONITORING OF NATURAL SITES

Black Canyon Sites

Bighorn Sheep Spring, NV

Eleven diurnal and two nocturnal VES were conducted this year (Tables 1 and 2). All life stages of *R. onca* were observed over the course of these surveys. No overwintering tadpoles were observed, and single-digit counts have become typical for adults and egg masses at this site. We were relieved to find an *R. onca* egg mass in a small, shallow section of stream in February, and Ross Haley and Joe Barnes found three additional egg masses, hatchlings, and some tadpoles, as well as three adults during a diurnal visit in March. Herbaceous vegetation at this site is trying to make a comeback after the scouring from the storms in October 2006 and subsequent filling in of the system from winter rains in 2007–2008. No major pools existed in the system this year until a temporary restoration effort that resulted in the construction of six dammed pools in September; most of the stream remains under gravel with little surface flow. New tadpoles and adults of *R. onca* have been seen in these new pools this fall. The USGS installed a flume in this system in October to monitor water flow. *Bufo punctatus* (red-spotted toad) have been seen in this spring. No egg masses were collected from this site for translocation efforts this season. As part of an assessment for Bd in *R. onca*, swabs were collected from two adult *R. onca* and two adult *B. punctatus* during fall surveys.

Boy Scout Spring, NV

Two diurnal and two nocturnal VES were conducted this year (Tables 1 and 2). All life stages of *R. onca* were observed during these surveys. Two fresh egg masses were found in a small side pool during the spring surveys; as part of the translocation program, part of one of the egg masses was brought in for rearing. *Bufo punctatus* have been seen in this spring. Bd swabs were collected from 10 adult *R. onca* and 4 adult *B. punctatus* during the fall.

Dawn's Canyon, NV

One diurnal and two nocturnal VES were conducted at this relatively small site this year (Tables 1 and 2). Adults and larvae were observed during the surveys at this site. Marc Maynard (BOR) reported an egg mass and two adult *R. onca* at this site on April 5, 2008. *Bufo punctatus* were also encountered at this site. Bd swabs were collected from one adult *R. onca* during the fall.

Salt Cedar Spring, NV

Eight diurnal and two nocturnal VES were conducted at this site this year (Tables 1 and 2). All life stages were observed during these surveys. Tadpoles were observed at varying developmental stages; it appears that several of these tadpoles overwintered. Metamorphs from the overwintering tadpoles were observed on February 27, 2008. Three partial egg masses were collected on January 23 and another on February 4, 2008 for rearing as part of the translocation program.

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 an earthen dam and dry section of channel into upper portions of the stream. No other amphibians were seen in this spring this year. Bd swabs were collected from two adult *R. onca* during the fall.

Black Canyon Spring, NV

Seven diurnal and two nocturnal VES were conducted at this site (Tables 1 and 2). No frogs, tadpoles, or egg masses were seen until the February 27, 2008 survey, although the EPMT crew said they saw

one adult *R. onca* the previous week. Adults of *R. onca* have been seen in a small side pool off the main channel, which continues to be a favored location for these frogs. *Bufo punctatus* were also encountered at this site. The EPMT crew was at this site the week of February 20, 2008 to manually remove tamarisk. They also planted willow cuttings in the main channel. NPS-led volunteers removed tamarisk from the main channel of the Black Canyon Spring site on October 21, 2008. One Bd sample was collected from *B. punctatus* at this site.

Black Canyon Spring Side Canyon, NV

This cold water site is off of the main Black Canyon Spring drainage and is our only cold water natural site. Eight diurnal and two nocturnal VES were conducted at this site this year (Tables 1 and 2). Several large, slow pools that looked like good frog habitat were observed. No frogs were seen or heard until February 27, 2008, and all life stages were observed. Herbaceous vegetation and tamarisk have grown in densely this year, especially in the upper stretch of the survey area. *Bufo punctatus* have been seen at this site. Bd swabs were collected from four adult *R. onca* and one *B. punctatus* during the fall.

Table 1. Summary of *Rana onca* observed at natural sites in the Black Canyon during diurnal visual encounter surveys conducted in 2008. Temperatures (°C) are ambient air temperature during surveys (Temp^A) and water temperature (Temp^W), generally taken at sites where eggs (E), tadpoles (L), or adult (A) or juvenile (J) frogs were seen.

Site	Date	Temp ^A	Temp ^W	A	J	L	E
Bighorn Sheep Spring	1/23/2008	15.1	10	1	0	0	0
	2/4/2008	11.6	14	0	0	0	0
	2/27/2008	18.6	13.5	1	0	0	1
	3/21/2008	-	-	3	0	300+	3
	5/1/2008	16.7	16	0	0	0	2
	7/29/2008	29.8	25	2	1	0	0
	9/16/2008	35	24	1	0	0	0
	10/2/2008	32.2	21	0	0	0	0
	10/27/2008	24.1	18	0	0	0	0
	11/24/2008	21.1	17	2	1	43	0
	12/5/2008	16.9	12	0	0	53	0
	Boy Scout Canyon Spring	2/4/2008	13	13	3	0	15
10/18/2008		20.6	16	9	0	0	0
Dawn's Canyon Spring	2/27/2008	19.2	13	0	0	1	0
Salt Cedar Canyon Spring	1/23/2008	16.2	15	0	0	300+	3
	2/4/2008	14.3	16	3	0	107	1
	2/27/2008	25.2	20	7	1	107	0
	9/16/2008	37	27	12	10	0	0
	10/2/2008	29.9	23.5	7	8	0	0
	10/27/2008	23	21	6	2	0	0
	11/24/2008	22.1	19	4	2	57	0
Black Canyon Spring	1/23/2008	17.1	25	0	0	0	0
	2/4/2008	14.8	25	0	0	0	0
	2/27/2008	22.7	27	1	0	0	0
	9/16/2008	31	31.2	0	0	0	0
	10/27/2008	24.3	28	0	0	0	0
	11/24/2008	21.6	27	0	0	0	0
	12/5/2008	17.5	21	0	0	0	0
Black Canyon Spring Side	1/23/2008	16.2	5	1	1	0	0
	2/4/2008	11.5	8	0	0	0	0
	2/27/2008	21.9	11	3	0	0	0
	5/1/2008	19.4	11	2	0	0	1
	9/16/2008	29.5	18	4	0	0	0
	10/27/2008	22.5	15	3	0	0	0
	11/24/2008	19.2	15	3	0	1	0
	12/5/2008	17.5	13	2	0	0	0

Table 2. Summary of *Rana onca* observed at natural sites in the Black Canyon during nocturnal visual encounter surveys conducted so far this year. Temperatures (°C) are ambient air temperature during surveys (Temp^A) and water temperature (Temp^W), generally taken at sites where eggs (E), tadpoles (L), or adult (A) or juvenile (J) frogs were seen.

Site	Date	Temp ^A	Temp ^W	A	J	L	E
Bighorn Sheep Spring	4/28/2008	26.3	15	36	0	0	2
	11/13/2008	21.1	15	4	0	37	0
Boy Scout Canyon Spring	4/28/2008	27.5	20	16	0	31	0
	11/13/2008	21	15	18	1	0	0
Dawn's Canyon Spring	3/18/2008	18.7	13	2	0	6	0
	11/13/2008	20.8	15	3	1	1	0
Salt Cedar Canyon Spring	4/22/2008	21.6	23	30	3	123	0
	11/4/2008	21	20	15	4	1	0
Black Canyon Spring	4/22/2008	27.8	28	0	0	0	0
	11/4/2008	20.3	27	1	0	0	0
Black Canyon Spring Side	4/22/2008	26.4	15	7	3	0	0
	11/4/2008	17.2	14	6	1	0	0

Northshore Spring Complex

Blue Point Spring, NV

Twenty-one diurnal and six nocturnal VES (these numbers do not include most of the mark-recapture surveys conducted in fall) were conducted at upper Blue Point Spring, and 20 diurnal and 2 nocturnal VES have been conducted at lower Blue Point Spring (Table 3). Surveys at Blue Point Spring were conducted combined with a separate research project being conducted by UNLV that is evaluating habitat modifications that have been done at this site. At upper Blue Point Spring, weekly diurnal egg mass surveys were conducted from January through the end of June. Three egg masses were observed at the upper end of lower Blue Point Spring and brought back to the NPS facility in Boulder City for head starting in an effort to bolster this population. These egg masses were not found during the official surveys but were observed during habitat work. All of these egg masses were found at the current point of stream emergence at lower Blue Point Spring. Since the discovery of the first egg mass, the upper 200–300 m of lower Blue Point Spring were included in the weekly diurnal egg mass surveys. One hundred and fifty-five frogs were released at upper Blue Point Spring, and 159 at lower Blue Point Spring between May and July 2008. Adults of *R. onca* were observed at upper and lower Blue Point Spring during nocturnal surveys. The number of frogs observed at these sites prior to the releases remained low (Table 3). We captured and removed a red-eared slider from the 120-m pond at upper Blue Point Spring in early January 2008. Bd swabs were collected from three adult *R. onca*: one at upper Blue Point Spring and two at lower Blue Point Spring during fall surveys.

As indicated above, efforts reported here were coordinated with the separate experimental habitat modification study conducted by UNLV personnel. Mark-recapture efforts during the spring indicated that adults at upper Blue Point Spring numbered only in the single digits. Two new fish-free ponds/channels were constructed at Blue Point Spring this year. One of the ponds was situated in a previously dry channel a few meters downstream of the fish-free pools constructed in early 2007. This new channel was flooded on February 2, 2008, and provides approximately 17 m of fish-free habitat (about 1.5 m wide and 0.5 m deep). The second pond at lower Blue Point Spring was flooded on March 15, 2008. This system also takes advantage of a formerly dry channel, which forms a series of smaller ponds. Overall, this channel established greater than 50 m of fish-free aquatic habitat (about 2 m wide by 0.5 m deep). Quarterly reports on these efforts were submitted by the UNLV

research team to Clark County, and are available at:
http://www.accessclarkcounty.com/air_quality/DCPActiveProjects/DCPActiveProjects.htm.

Rogers Spring, NV

One diurnal and three nocturnal VES have been conducted at this site this year (Table 3). No *R. onca* were observed during the surveys. The last time a frog was seen at this site during surveys was fall 2006. The majority of favorable habitat for frogs at this site were the areas mechanically cut or burned last year as part of the separate experimental habitat modification study, although the modified habitat was nearly regenerated to pre-treatment characteristics by the fall survey. Currently, the best existing habitat for the frogs is in a large pool just upstream of the telephone maintenance road, adjacent to treated areas. Sixty-four frogs reared from the three egg masses oviposited at lower Blue Point Spring were released in the modified habitats at Rogers Spring this summer. None were observed during the fall survey.

Table 3. Summary of *Rana onca* observed at Blue Point and Rogers springs during visual encounter surveys conducted in 2008. Temperatures (°C) are ambient air temperature during surveys (Temp^A) and water temperature (Temp^W), generally taken at sites where eggs (E), tadpoles (L), or adult (A) or juvenile (J) frogs were seen. Observations of “immature” frogs at upper Blue Point recorded on data sheets were counted as adult frogs in this table. Data from Upper Blue Point Spring does not include most of the mark-recapture surveys conducted this fall. An asterisk indicates a survey that included the upper 200–300 m of Lower Blue Point Spring.

Spring Site	Time	Date	Temp ^A	Temp ^W	A	J	L	E
Upper Blue Point	Diurnal	1/4/2008	16.5	18	0	0	0	0
	Diurnal	1/13/2008	16.2	20	0	0	0	0
	Diurnal	1/21/2008	14.5	20	0	0	0	0
	Diurnal	1/28/2008	11.8	20	0	0	0	0
	Diurnal	2/5/2008	9.9	20	0	0	0	0
	Diurnal	2/12/2008	22.4	20	0	0	0	0
	Diurnal	2/18/2008	18.7	21	0	0	0	0
	Diurnal	2/26/2008	19.6	21	0	0	0	0
	Diurnal	3/3/2008	19	21	0	0	0	0
	Diurnal	3/9/2008	18.5	22	0	0	0	0
	Diurnal	3/17/2008	16.2	21	0	0	0	0
	Diurnal	4/1/2008	18.1	22	0	0	0	0
	Diurnal	4/7/2008	21.6	22	0	0	0	0
	Diurnal	4/14/2008	25.2	24	0	0	0	0
	Diurnal	4/24/2008	26.6	23	0	0	0	0
	Diurnal	4/29/2008	35.4	23	0	0	0	0
	Diurnal	5/5/2008	21.1	21	0	0	0	0
	Diurnal	5/14/2008	25.5	21	0	0	0	0
	Diurnal	6/2/2008	31	22	0	0	0	0
	Diurnal	6/11/2008	26	23	0	0	0	0
	Diurnal	6/26/2008	32.6	24	0	0	0	0
	Nocturnal	3/4/2008	15.3	-	2	0	0	0
	Nocturnal	3/13/2008	22.7	-	1	0	0	0
	Nocturnal	3/20/2008	20.8	-	2	0	0	0
	Nocturnal	3/23/2008	17.3	18	3	0	0	0
	Nocturnal	4/4/2008	19.8	-	4	0	0	0
	Nocturnal	11/11/2008	15.5	23	19	0	0	0

Table 3 continued.

Spring Site	Time	Date	Temp ^A	Temp ^W	A	J	L	E
Lower Blue Point	Diurnal	2/26/2008	18.3	17	0	0	0	0
	Diurnal*	3/17/2008	16.4	20	0	0	0	0
	Diurnal*	4/1/2008	22	0	0	0	0	0
	Diurnal*	4/7/2008	21.6	20	1	0	0	0
	Diurnal*	4/14/2008	28.7	18	1	0	0	0
	Diurnal*	4/24/2008	26.1	21	1	0	0	0
	Diurnal*	4/29/2008	34.2	20	0	0	0	0
	Diurnal*	5/5/2008	22.6	20	1	0	0	0
	Diurnal*	5/14/2008	29.8	21	1	0	0	1
	Diurnal*	5/29/2008	28.5	18	1	0	0	0
	Diurnal*	6/11/2008	26.4	22	0	1	0	0
	Diurnal*	6/19/2008	27.1	22	0	3*	0	0
	Diurnal*	6/26/2008	34.2	24	2	6*	0	0
	Diurnal*	7/30/2008	32.5	26	2	3*	0	0
	Diurnal*	9/17/2008	28.8	19	1	2	0	0
	Diurnal*	10/6/2008	20.7	21	0	0	0	0
	Diurnal*	10/15/2008	28	18	1	0	0	0
	Diurnal*	11/19/2008	26.4	16	1	0	0	0
	Diurnal*	12/4/2008	16.2	17	0	0	0	0
	Rogers Spring	Diurnal	2/26/2008	21.1	15	0	0	0
Nocturnal		4/10/2008	18	20	0	0	0	0
Nocturnal		5/5/2008	21.7	19	0	0	0	0
Nocturnal		11/12/2008	21	16	0	0	0	0
Nocturnal		3/23/2008	16	18	3	0	0	0
Nocturnal		11/11/2008	15.5	16	3	0	0	0
Nocturnal		11/11/2008	15.5	16	3	0	0	0

MONITORING OF EXPERIMENTAL TRANSLOCATION SITES

Goldstrike Canyon, NV

Three diurnal and two nocturnal VES were conducted at this site (Tables 4 and 5), and adults, larvae, and eggs of *R. onca* were observed this season. *Bufo punctatus* have been seen in this spring. Fifty tadpoles were released at this site as part of the translocation program this spring. Bd swabs were collected from nine adult *R. onca* during the fall.

Grapevine Spring (Meadview), AZ

Nine diurnal and two nocturnal VES were conducted at this site (Tables 4 and 5). Ten fresh egg masses of *R. onca* were encountered March 20, 2008, and *R. onca* and *Hyla arenicolor* (canyon tree frog) were heard calling that day and evening. Overwintered tadpoles of *R. onca* were encountered during the survey. A diurnal survey two weeks later (April 4) revealed two additional egg masses of *R. onca*, and the egg masses first observed on March 20 were hatching. Thousands of eggs and hatchlings of *H. arenicolor* were seen as well. One hundred tadpoles were released here as part of the

translocation program. Dawn Fletcher (PLI, UNLV) and her assistant reported seeing 70 frogs and many large tadpoles of *R. onca* at the site on June 30, 2008. Bd swabs were collected from 10 adult and 1 juvenile *R. onca* during the fall.

Jeff Rice from Western Soundscape Archive came out on the March 20 nocturnal survey to record *R. onca* vocalizations. He recorded individuals as well as choruses of *R. onca* and assorted vocalizations. Jeff will make his recordings available to the RLFCT, and clips can be heard at www.westernsoundscape.org.

Lower Grapevine Spring, NV

One survey was conducted at this site since it was visited for a nocturnal survey in October 2007 and found to be dry; no frogs were observed. It was recommended that this site no longer be considered for translocations, but further surveys will be conducted as time allows to determine whether frogs survived the dry period. The diurnal survey on September 7, 2008 found the site to be predominately dry once again, with the exception of two small shallow pools remaining in deeper plunge pools, presumably from recent rains. One juvenile *Bufo punctatus* was seen in each pool. No *R. onca* were observed.

Pupfish Refuge Spring, NV

Eight diurnal and two nocturnal VES were conducted at this site (Tables 4 and 5), and all life stages of *R. onca* have been observed at this site. A metal pipeline was installed above ground along the roadside ditch in January to carry water up to the construction site at the overpass, but was removed in late spring. The ditch habitat does not appear to provide the same quality of habitat as before, primarily due to loss of pools for tadpole development. Several adults and egg masses have been seen in the ditch during subsequent surveys. Egg masses and tadpoles have been seen in pool habitat constructed last winter. *Bufo punctatus* have been seen and heard at this site. Seventy-six frogs were released at the site in the spring; this was the last translocation for this site. Pupfish were seen in the stream below the pupfish refuge in July 2008, but have not been seen this fall. Bd swabs were collected from 10 adult *R. onca* during fall surveys.

Quail Spring, NV

Habitat improvement and modification was conducted for translocation in coordination with BLM; 138 frogs were released at the site April 24, 2008. A diurnal survey was conducted at the site on November 7, 2008. Five frogs were seen at the site, and the habitat appeared comparable to the condition it was in when the frogs were released during the spring.

Red Rock Spring, NV

Eight diurnal and two nocturnal VES were conducted at this site (Tables 4 and 5). Only adults have been seen and heard at this site so far this year. *Bufo punctatus* and *B. woodhousii/microscaphus* (Woodhouse's/Arizona toad) were also heard. *Bufo punctatus* eggs and hatchlings were seen, but no other egg masses (or strands) were observed. Cows were present and abundant at the site during the surveys. One hundred post-metamorphic frogs were released at this site on April 2, 2008. Bd swabs were collected from seven adult *R. onca*, one *B. woodhousii/microscaphus*, and one *B. punctatus* during the fall.

Sugarloaf Spring, AZ

This site was not surveyed during this period and has been discontinued as a translocation site as previously noted.

Tassi Spring

Seven diurnal and two nocturnal VES were conducted at this site (Tables 4 and 5). Adults of *R. onca* were heard calling from the upper spring and seven egg masses were observed, as well as hatchlings

and late-stage tadpoles. Tadpoles of *R. onca* overwintered in both the upper spring and the tank in front of the homestead. *Bufo woodhousii*, *B. punctatus*, and *H. arenicolor* were observed and were calling in the lower outflow of the stream below the fence in March 2008. Thousands of *B. punctatus* and *H. arenicolor* eggs and tadpoles were present below the fence in April 2008, but strands of *B. woodhousii* eggs were not observed. Seventy-five post-metamorphic frogs were released in the upper spring on April 2, 2008. Bd swabs were collected from four *B. woodhousii* during fall surveys.

Table 4. Summary of *Rana onca* observed at experimental sites during diurnal visual encounter surveys conducted in 2008. Temperatures (°C) are ambient air temperature during surveys (Temp^A) and water temperature (Temp^W), 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 by October 2007.

Site	Date	Temp ^A	Temp ^W	A	J	L	E	
Goldstrike Canyon	2/18/2008	13.8	18	0	0	300+	1	
	4/28/2008	29.4	21	1	0	70	3	
	5/1/2008	19.5	20	1	0	300+	4	
Grapevine Spring, AZ	2/21/2008	17.3	5	15	0	0	0	
	4/5/2008	21.6	8	5	0	7	12	
	5/1/2008	16	15	21	5	300+	1	
	9/6/2008	21	14	25	3	0	0	
	9/23/2008	24.1	13	13	3	0	0	
	10/17/2008	20.2	8.5	6	3	0	0	
	10/28/2008	19.2	8	3	1	0	0	
	11/20/2008	16.4	8	2	0	0	0	
	12/2/2008	16.2	7	2	0	0	0	
	Pupfish Refuge	1/5/2008	18.1	20	2	0	300+	0
2/1/2008		17.2	23	3	0	300+	4	
4/25/2008		26.5	22	4	0	207	3	
5/3/2008		23.7	21	8	0	300+	0	
7/18/2008		34.1	24	6	1	300+	0	
9/17/2008		24.4	24	12	0	0	0	
10/2/2008		29.1	24	6	0	2	0	
10/21/08		24.1	23	5	0	0	0	
Red Rock Spring		2/15/2008	15	2!	0	0	0	0
		4/2/2008	24.8	12	3	0	0	0
	9/10/2008	32	15	7	0	0	0	
	9/24/2008	27.2	10	4	0	0	0	
	10/15/2008	18.5	5	1	0	0	0	
	11/18/2008	20.4	4	1	0	0	0	
	12/4/2008	20.1	7	0	0	0	0	
	12/13/2008	18	3	0	0	0	0	
	Tassi Spring	2/15/2008	18	17	11	0	20	1
		4/2/2008	28.2	15	12	0	105	7!
9/10/2008		33.1	18	4	1	0	0	
9/24/2008		31.1	11	4	0	0	0	
10/15/2008		24.5	16	8	0	0	0	
12/4/2008		16.5	14	3	0	0	0	
12/13/2008		18	14	5	0	0	0	

Table 5. Summary of *Rana onca* observed at experimental sites during nocturnal visual encounter surveys conducted in 2008. Temperatures (°C) are ambient air temperature during surveys (Temp^A) and water temperature (Temp^W), 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 in October survey.

Site	Date	Temp ^A	Temp ^W	A	J	L	E
Goldstrike Canyon	3/18/2008	21.4	18	22	0	5	0
	11/14/2008	24.7	14	12	0	0	0
Grapevine Spring, AZ	3/20/2008	19.8	5	29	1	16	10
	11/8/2008	23.3	8	38	4	37	0
Pupfish Refuge	3/13/2008	24.8	24	41	0	300+	0
	10/27/2008	27.4	23	46	2	0	0
Red Rock Spring	3/25/2008	21.1	9	13	0	0	0
	10/29/2008	17	9	10	0	0	0
Tassi Spring	3/25/2008	23.5	15	15	0	25	0
	10/29/2008	16.2	18	11	0	0	0

HEAD STARTING AND TRANSLOCATIONS

Given the lack of pools and surface water at Bighorn Sheep Spring, as well as the uncertainty of the status of this population, we collected eggs from other natural Black Canyon populations for translocation this season. A total of four partial egg masses from Salt Cedar Spring and one from Boy Scout Canyon were brought into the laboratory for rearing as part of the translocation program. After hatching, approximately 1100 tadpoles (approximately one to two weeks old) were taken to the Willow Beach Fish Hatchery in February 2008. Unfortunately, a mechanical breakdown in the barrier system in the tadpole raceway at Willow Beach in March resulted in a loss of an estimated 400 tadpoles. Some of the frogs and tadpoles reared at Willow Beach this season apparently had a calcium deficiency (diagnosis provided by ZooPath), but nothing similar appeared in the frogs and tadpoles reared in the NPS hilltop facility. Two 300-gallon fiberglass raceways have been added to the National Park Service's rearing facility in Boulder City, expanding the capacity for head starting *R. onca* at that location.

Releases of tadpoles and frogs at translocation sites began on April 2, 2008. A total of 150 tadpoles and 389 frogs were released to augment the current translocation sites (Table 6), including the release of frogs to one new translocation site, Quail Spring, in April 2008.

Table 6. Tadpole and post-metamorphic frog release data for Relict Leopard Frog translocation as of July 2008.

<i>Date</i>	<i>Translocation Site</i>	<i>Tadpoles Released (n)</i>	<i>Frogs Released (n)</i>	Total
4/28/2008	Goldstrike Canyon	50	0	50
4/4/2008	Grapevine, AZ	100	0	100
4/25/2008	Pupfish Spring	0	70	-
5/3/2008	Pupfish Spring	0	6	76
4/24/2008	Quail Spring	0	138	138
4/2/2008	Red Rock Spring	0	100	100
4/2/2008	Tassi Spring	0	75	75
Total		150	389	539

Three egg masses were collected from lower Blue Point Spring this year and brought into the National Park Service facility for head starting. Frogs were toe clipped according to release location (Rogers (right front third toe), lower Blue Point (left front third toe), and upper Blue Point (left front second toe) prior to release. Toes were kept for potential genetic study.

Table 7. Post-metamorphic Relict Leopard Frogs released at North shore locations. Eggs were collected at lower Blue Point in March, April, and May 2008.

<i>Date</i>	<i>Site</i>	<i>Frogs Released (n)</i>	Total
6/5/2008	Upper Blue Point	74	
6/11/2008	Upper Blue Point	14	
6/19/2008	Upper Blue Point	5	
6/25/2008	Upper Blue Point	16	
7/15/2008	Upper Blue Point	46	155
5/29/2008	Lower Blue Point	135	
6/11/2008	Lower Blue Point	7	
7/22/2008	Lower Blue Point	12	
7/30/2008	Lower Blue Point	5	159
5/21/2008	Rogers	47	
6/11/2008	Rogers	7	
7/22/2008	Rogers	10	64
Total			378

Translocation Site Reconnaissance

Representatives from BLM and AZGFD have surveyed springs in the Black Mountains, AZ, for potential sites to be reviewed for translocation. A field visit to the most promising site, Union Pass Spring, was conducted on January 17, 2008, and compliance activity for this site is currently underway by BLM personnel.

Ray Saumure from the Las Vegas Springs Preserve was invited to the Relict Leopard Frog Conservation Team (RLFCT) meeting in December 2007 to discuss the potential of establishing a refuge population of Relict Leopard Frogs at the Las Vegas Springs Preserve. A field visit to the site was made by members of the RLFCT on January 25, 2008.

Representatives from BLM and NDOW have surveyed areas near Moapa for potential sites for *R. onca* translocations. A diurnal field visit was conducted to two of these sites, Stewart Ranch and Perkins Pond, by representatives from BLM and UNLV on March 5, 2008. A nocturnal field survey was conducted at these sites on May 20. The aquatic habitat at Stewart Ranch was greatly reduced compared to the initial visit, and many overwintered bullfrog tadpoles were seen in larger pools downstream. The site was deemed less than desirable for Relict Leopard Frog translocation. Perkins Pond was a bit more promising, with abundant aquatic habitat still available. Bullfrogs (*R. catesbeiana*) and Pacific Treefrogs (*Pseudacris regilla*) were heard and *P. regilla* tadpoles were seen here.

Representatives from SNWA suggested two locations as possible translocation sites for the Relict Leopard Frog. The overflow at the Lake Mead water pump station facility was visited by representatives of the SNWA and UNLV personnel on May 22, and the Warm Springs Natural Area near Moapa on July 17, 2008. Further surveys will be needed at the Warm Springs Natural Area to determine the extent of Bullfrog distribution and ubiquity at the sites.