

**NORTHERN LEOPARD FROG INVENTORY SURVEYS
2006 REPORT**



**BOULDER OPEN SPACE AND MOUNTAIN PARKS
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NORTHERN LEOPARD FROG INVENTORY SURVEY– 2006

Despite widespread geographic distribution in North America, the northern leopard frog (*Rana pipiens*; hereafter leopard frog) is now a sensitive, threatened, or endangered species in every western state and Canadian Province. Here in Colorado, leopard frogs are now a Special Concern species (Colorado Division of Wildlife 2006).

Specific dates of population declines in Colorado aren't known, but leopard frogs appear to have declined at most sites throughout the west between the 1950s – 1980s. Primary putative factors in the decline of leopard frogs and other native ranids (true frogs) include disease, habitat fragmentation and loss, artificial hydrologic manipulation, aquatic pollutants, American bullfrogs (*Rana catesbaeina*), and non-native fish. Scientists believe that several of these factors are acting in concert in most western aquatic systems. However, habitat alteration/loss and non-native vertebrates (fish and frogs) are considered to have had the most effect in western North America. In addition, recent research has revealed that Chytrids (*Batrachochytrium dendrobatidis*) fungal infections are significantly reducing amphibian populations on a global scale.

Leopard frogs are native to Boulder. However, continued human development, bullfrogs, fish, and infectious disease threaten leopard frogs here as well. As Boulder continues to grow, wetlands are increasingly fragmented by roads and traffic. In addition, chemical pollutants from cars, lawns, and other sources degrade wetland water quality. Non-native “sport” fish are present in many water bodies around Boulder, and sport fish eat native amphibians including leopard frogs. Finally, bullfrogs — another non-native predator— have been successfully introduced into the Boulder area, and they are believed to be expanding their range locally. All of these factors are affecting OSMP wetlands and associated amphibians.

In 2006, the Resource Conservation Section of OSMP began an inventory of leopard frog distributions in City of Boulder OSMP wetlands. Our goal was to document the current distribution of leopard frogs and bullfrogs in randomly-selected wetland areas, and in areas last surveyed for leopard frogs in 1996.

Survey Methods

Wetland sites enrolled in this survey included all OSMP sites where Livo (1997) observed leopard frogs and 25 sites that were randomly selected using Arc/GIS OSMP wetland data layers. All surveyors were trained in visual encounter survey techniques and in frog ID techniques during early August, and surveys began immediately afterwards. Volunteer surveyors were each assigned one wetland site, and were asked to survey it four times during August – September. During surveys, surveyors walked slowly around pond and stream margins, visually searching for frogs. Areas of appropriate vegetation (low emergent, floating algal mats, etc.) were paid more attention

than areas of poor-quality (e.g. sand, cobble substrates) cover. During each visit, numbers and locations of all frogs were tallied by species on data sheets which were returned to OSMP. Surveyors disinfected all boots, shoes, nets, etc., with a bleach solution (off site) following each survey.



The McClung survey team with an adult female bullfrog in August, 2006. (L. Sitongia photo)

Survey Results

During 2006, 33 volunteers conducted surveys for leopard frogs and bullfrogs at 24 wetland areas distributed across OSMP property. We began surveying on August 2, and completed surveys on October 1. During this period, volunteers logged 122 survey-hours of effort, and observed a total of 81 leopard frogs and 547 bullfrogs. OSMP Resource Conservation staff surveyed an additional 8 wetlands, observing 91 leopard frogs and 555 bull frogs in 25 hours of effort. In total, we surveyed 32 wetlands (Figs. 1 & 2; Appendix), and observed 172 leopard frogs and 1,102 bull frogs.

We conducted surveys in four wetland types: we surveyed at 18 different ponds, five perennial (permanent) streams, five intermittent streams, and four irrigation ditches, and expended 72, 28, 32, and 15 hours of survey effort in each type, respectively (Fig. 3).

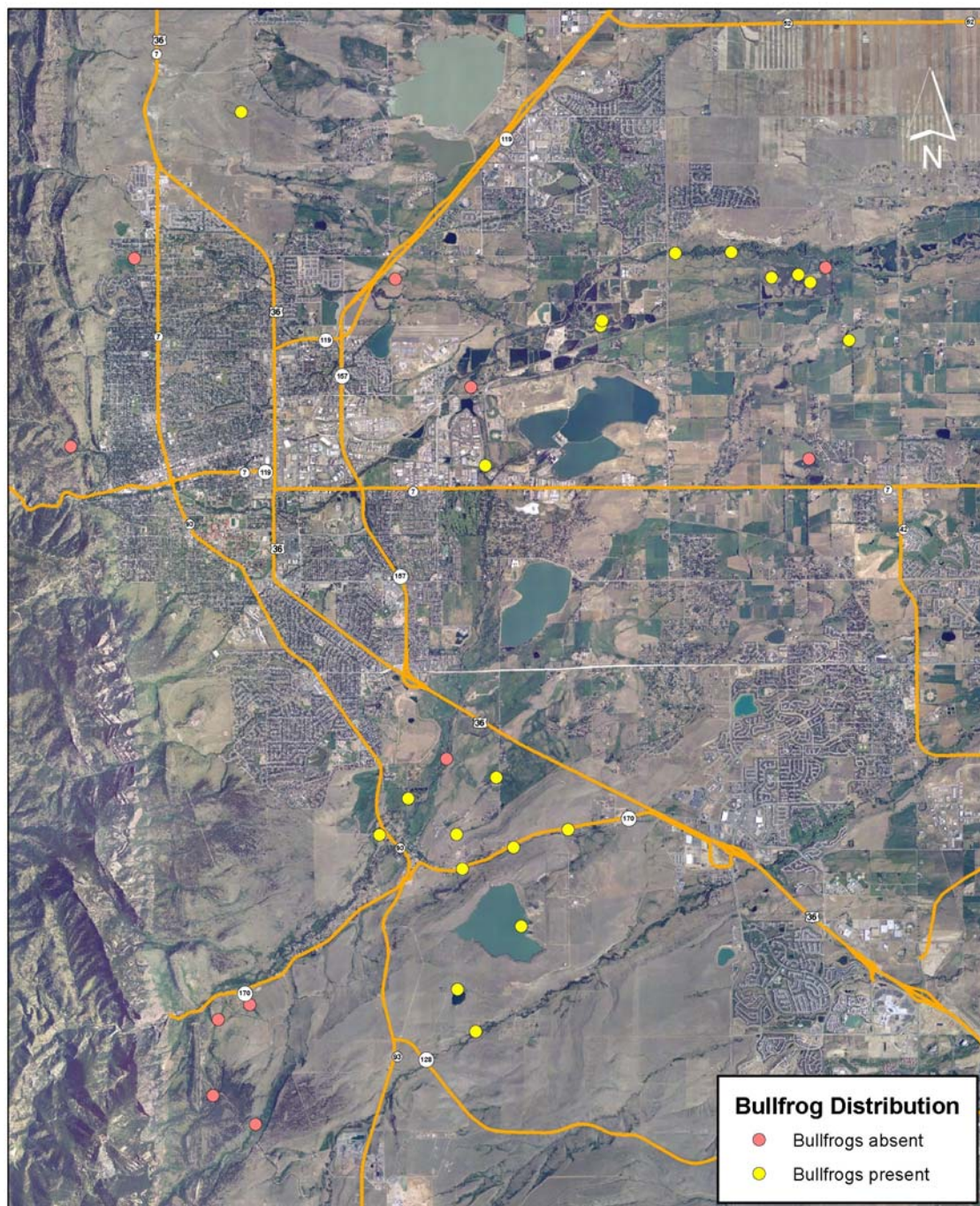


Figure 2. Boulder Open Space and Mountain Parks wetland sites that were surveyed for frogs (all dots), and sites where bullfrogs were observed (yellow dots) during 2006.

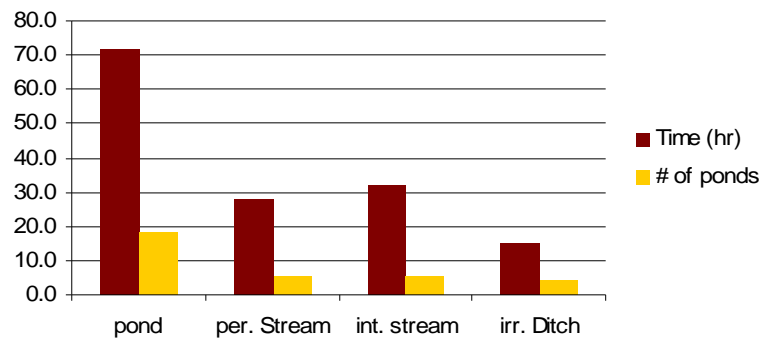


Figure 3. Hours of survey effort and number of sites surveyed in each of the four wetland types.

The percentage of occupied sites provides a measure of amphibian distributions that can be used to compare trends over years. Percent site-occupancy was similar for leopard frogs and bullfrogs, and these two species co-occurred at 34% of all sites. Leopard frogs occupied 53% of all surveyed sites, including 50% of all ponds, 60% of perennial streams, 60% of intermittent streams, and 75% of irrigation ditches. Bullfrogs were present at 56% of all surveyed sites, including 69% of ponds, 60% of perennial streams, 20% of intermittent streams, and 75% of the irrigation ditches surveyed.

Abundance of each species also provides a valuable measure of distributions over space and is comparable over years. The numbers of leopard frogs and bullfrogs seen (observed abundance) differed to a large degree. The highest numbers of leopard frogs were observed at Teller Lake South (at Teller Farm), Davidson Ditch along Cherryvale Road, and Dunn 2, which is south of Eldorado Springs Road.

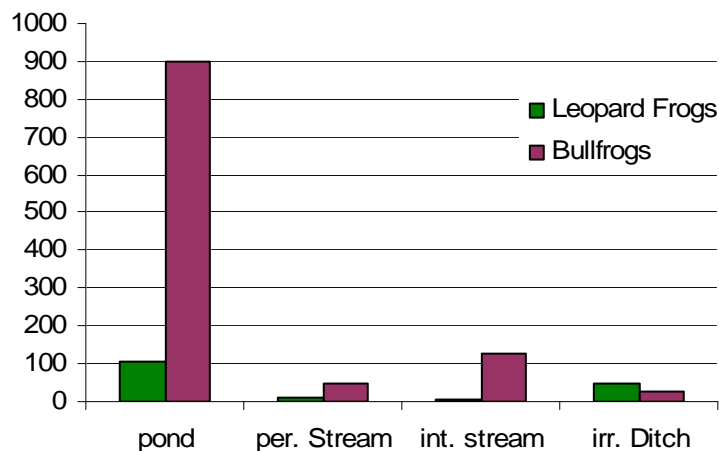


Figure 4. Total number of northern leopard frogs and bullfrogs seen in each of the four surveyed wetland types.

Highest numbers of bullfrogs occurred at Eggleston Reservoir no. 4, Marshall Lake, and at Fancher. When individual sites were pooled, both leopard frogs and bullfrogs were most abundant at ponds. However, bullfrogs outnumbered leopard frogs in three of the four wetland types, with observed bullfrog-to-leopard frog ratios of approximately 9:1 in ponds, 18:1 in intermittent streams, and 4:1 in perennial streams (Fig. 4). Leopard frogs outnumbered bullfrogs 2:1 in irrigation ditches.

Adjusted abundance data-

To more meaningfully compare frog abundance among wetland types, it was necessary to adjust the number of frogs observed in each wetland type by the amount of time spent surveying in each wetland type. This was necessary because we spent more time looking in some areas than in others (Fig. 3). This adjustment (# frogs seen / # hours spent searching) resulted in an estimate called catch-per-unit time of survey effort, or cpu.

Based on cpu estimates, relative abundance of leopard frogs during late summer was highest in irrigation ditches, then in ponds, and was lowest in both stream types (Fig. 5)

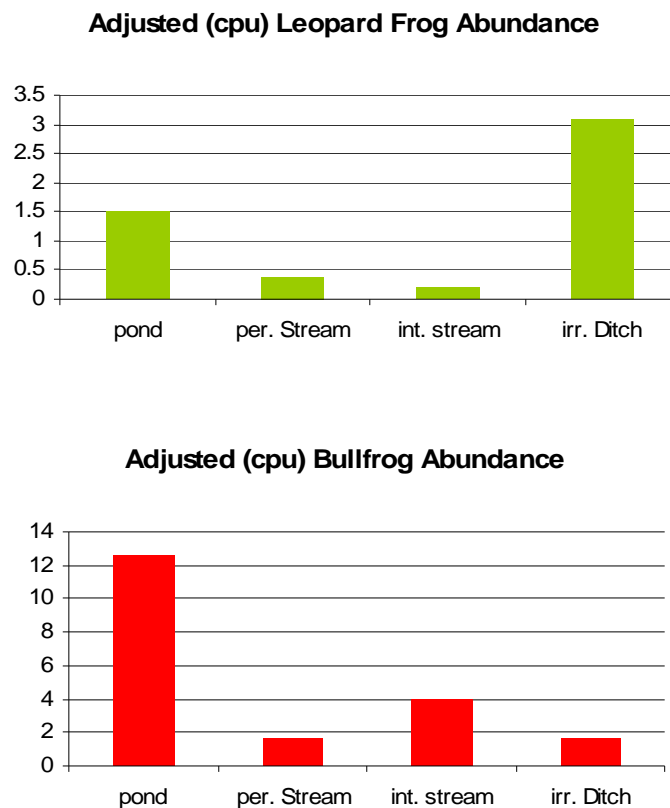


Figure 5. Number of frogs seen per hour of survey effort in each of the four wetland types.

It is important to note that leopard frogs were observed in low relative numbers in all wetland types; even in irrigation ditches leopard frogs were observed at a rate of about 3 frogs per hour of searching. Conversely, bullfrog relative abundance was highest in ponds, where over 12 bullfrogs were observed per hour of search effort (Fig. 5).

Summary

- 1) Leopard frogs and bullfrogs each occurred at approximately 50% of the sites surveyed; bullfrogs were more abundant than leopard frogs in three of four wetland types.
- 2) We observed leopard frogs at five (56%) of nine sites where Livo (1997) observed them. While this suggests a marked decline, it is important to note that our level of survey effort was not sufficient to *confirm* absence from a site with confidence. We will emphasize monitoring these sites in 2007 to see if this trend holds once again.
- 3) Both the number and distribution of bullfrogs appear to have increased in the 10 years between 1996 – 2006.
- 4) Bullfrogs are now widely distributed across Boulder, and occur in high numbers at some sites. Bullfrogs were observed in Boulder Creek, South Boulder Creek, and Coal Creek, the three main stream systems crossing OSMP lands.
- 5) Leopard frogs are still distributed widely across Boulder, with areas of concentration occurring at wetlands bordering Boulder Creek and South Boulder Creek.

Future Work

Comparisons with 1996 data

In addition to examining the current distribution of leopard frogs and bullfrogs at OSMP wetlands, we plan to compare current distribution information with information from 1996, the last year that rigorous amphibian surveys were conducted. We are currently in the process of entering 1996 distribution data for leopard frogs and bullfrogs into our GIS database. Once this is completed, we will compare data from both time periods, and will include this information in next years' annual summary. Please email me (GermaineS@bouldercolorado.gov) if you are interested in receiving a copy of this report once it has been prepared.

Meanwhile, we plan to conduct leopard frog surveys again in 2007, using the same methods as in 2006. In 2007, we will conduct surveys between mid June and late August, because this will increase our ability to identify breeding wetlands based on our observations. Please keep the OSMP frog survey effort in mind when making your volunteer plans for next year.

Also, we plan to begin a spring amphibian breeding chorus survey in 2007 as well, and will be distributing information on this in the very near future. Please contact Steve or Lisa (DieraufL@bouldercolorado.gov) if you are interested in doing spring breeding chorus surveys.



Acknowledgements

Thanks to the following people for making our first year of volunteer-based frog inventories a success; Lisa Dierauf, for her tremendous effort in coordinating volunteers for frog surveys; Jennifer Sherry, for her help with survey site selection; Mo Valenta, for her help in generating map figures for this report; and to the following individuals for their help conducting surveys: Jen Archuleta, N. Benson, Amy Birtwistle, Tim Bickmore, Eliza Bicknell, Megan Bowes, AD Chesley, Donna Collier, Todd Deiningner, Jessie Dulberger, Eric Fairlee, Michelle Gosz, Christine Guzy, Janet Hanley, Buffy Hastings, Damaris Hoyl-Methner, Devin Huston, Ben Lenth, Linda Mahoney, Steve and Charlie McClung, Erin Myers, Barbara Nelson, Jo O'brian, Colleen O'Connell, Anita Rae, M. Reeves, Rose Reynolds, Billy Schweiger, Leonard Sitongia, Deb Stabler, Terry Stuart, Heather Swanson, and Ralph Vickery.



(adult female leopard frog; S. Germaine photo)

Literature Referenced in this report

Adams, M. J. 1999. Correlated factors in amphibian decline: exotic species and habitat change in western Washington. *Journal of Wildlife Management* 63:1162-1171.

_____, 2000. Pond permanence and the effects of exotic vertebrates on anurans. *Ecological Applications* 10:559-568.

Colorado Division of Wildlife. 2006. Wildlife species of concern > amphibians:
<http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/Amphibians/>

Corn, P. S. 1994. What we know and what we don't know about amphibian declines in the west. Pp 59 – 67 *in* W. Covington and L. DeBano, technical coordinators. Sustainable ecological systems: implementing an ecological approach to land management. U.S. Forest Service Gen. Tech. Report RM-247.

Hayes, M. P. and M. R. Jennings. 1986. Decline of ranid frogs in western North America: are bullfrogs (*Rana catesbeiana*) responsible? *J. Herpetology*. 20:490-509.

Hecnar, S. J. and R. T. M'Closkey. 1997. The effects of predatory fish on amphibian species richness and distribution. *Biological Conservation* 79:123-131.

Kendall, K. 2002. Survey protocol for the northern leopard frog. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 43. Edmonton.

Livo, L. 1997. City of Boulder 1996 amphibian and reptile survey. Final report to City of Boulder Open Space and Mountain Parks. Boulder, CO.

Richter, B. D., D. P. Braun, M. A. Mendelson, and L. L. Master. 1997. Threats to imperiled freshwater fauna. *Conservation Biology* 11:1081-1093.

Appendix. Site name, wetland type, numbers of leopard frogs and bullfrogs observed, and relative numbers of leopard frogs and bullfrogs at 32 wetland sites surveyed by OSMP volunteers and staff, 2006.

Site Name	Wetland Type ^a	Leopard Frogs ^b	Bullfrogs ^b	Leopard Frog2 ^c	Bullfrog2 ^c
Big Bluestem Trailhead pond	Pond	2	108	1.32	71.21
Boulder Creek @ 75th	Stream1	0	1	0.00	0.12
Boulder Creek @ Arapahoe	Stream1	5	44	2.38	20.95
Butte Mill	Stream1	0	0	0.00	0.00
Coal Creek	Stream2	0 (3 ^e)	0 (2 ^e)	0.00	0.00
Davidson Ditch @ Cherryvale	Irr. Ditch	31	2	38.75	2.50
Davidson Ditch @ Marshall	Irr. Ditch	3	17	0.85	4.81
Dunn2	Pond	17	0	51.00	0.00
Eggleston Reservoir #4	Pond	0	346	0.00	94.36
ERTL east	Pond	9	0	1.62	0.00
ERTL west	Pond	0	1	0.00	0.16
ERTL1	Pond	2	53	1.29	34.19
ERTL2	Pond	1	5	0.88	4.41
Fancher Ponds	Pond	13	137	0.91	9.63
Goodhue Ditch	Irr. Ditch	12	6	1.39	0.69
Lindsay Pond	Pond	0	0	0.00	0.00
Marshall Lake	Pond	0	156	0.00	93.60
McKenzie	Irr. Ditch	0	0	0.00	0.00
Mesa Reservoir	Pond	0	18	0.00	7.35
Moore	Stream2	1	0	0.33	0.00
S. Boulder Creek	Stream1	2	0	0.32	0.00
Sawhill #7	Pond	0	27	0.00	10.80
Sawhill #6	Pond	1	4	0.16	0.66
Slake	Stream2	4	128	0.49	15.74
Spring Brook	Stream2	2	0	0.26	0.00
Sunshine Canyon	Stream2	0	0	0.00	0.00
Teller Lk north ^d	Pond	0	47	0.00	2.90
Teller Lk South	Pond	12	0	12.00	0.00
Teller Lk South B	Pond	51	0	29.14	0.00
Windhover Ranch	Stream1	4	2	0.55	0.27
Wonderland Lake	Pond	0	0	0.00	0.00

^a Stream1 = permanent stream; stream2 = intermittent stream; irr ditch = irrigation ditch.

^b Number of leopard frogs and bullfrogs observed during all surveys per site.

^c Number of leopard frogs and bullfrogs, adjusted to estimate number seen per hour of survey effort.

^d Two teams were accidentally assigned this site.

^e Incidental observations by S. Germaine during July and August 2006.

Teller Lake South and Teller Lake South B are depicted with only one symbol in Figs. 1 and 2.