

AMPHIBIAN SURVEYS IN THE GREATER YELLOWSTONE ECOSYSTEM, 2001

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INTRODUCTION

During mid-summer of 2001, I spent three weeks as a volunteer surveying for amphibians in and adjacent to Yellowstone National Park (YNP). David Corkran was the scout, data recorder, site photographer, and occasional surveyor. Tory and Meredith Taylor were amphibian surveyors and horsepackers for the final week of our work. Our efforts were part of a project to characterize amphibian species distribution and abundance within the Greater Yellowstone Ecosystem (GYE), by surveys to identify breeding sites. Principal investigators are Debra Patla and Dr. Charles Peterson at Idaho State University. The project is part of the U. S. Department of Interior's Amphibian Research and Monitoring Initiative (ARMI). Generous grants from the Sierra Club Foundation and the Northwest Ecological Research Institute (NERI), and partial reimbursement of expenses from the ARMI budget, helped defray most of our direct costs for the project, particularly the outfitter fees for the horsepack trip. This report summarizes all of our work, but focuses on the final week of surveys for which the two grants were received.

STUDY AREAS

Several 7th level watershed units of YNP had been randomly selected in 2000. For 2001, we agreed to survey for amphibians in 3 of the units. These were: Unit # 302 – Buffalo Meadows in the Firehole River of the Madison River drainage, Unit # 167 – Duck/Maple Creek in the Madison River drainage, and Unit # 494 – Upper Chipmunk Creek on the Two Ocean Plateau in the Yellowstone River drainage. In addition, we surveyed other wetlands near Unit # 494 and in the Teton Wilderness Area on the Bridger-Teton National Forest. Figure 1 shows the general locations of all of the survey areas. Figures 2 through 4 are the annotated topographic map sections for the survey areas on the Two Ocean Plateau.

METHODS

Within each of the selected watershed units, we were requested to visit potential amphibian breeding habitat, as identified by the National Wetland Inventory (NWI). For each of the watershed units we were given a map and list of the NWI wetlands, with notations on which sites not to visit if we did not have sufficient time. Other recognized constraints included access feasibility, safety, and avoiding disturbance to wildlife.

Our protocol for each of the units involved three steps. First, we transcribed the watershed unit boundary and the outlines of all wetlands identified on the NWI map onto the 7.5 minute topographic maps of the area. Second, we studied the topographic maps and all available trail maps, guidebooks, and the YNP Backcountry Trip Planner to determine campsite locations, trail access and distances, and to evaluate the feasibility of cross-country travel routes to reach all of the wetlands. With this information we planned our pack trips and day hikes, secured backcountry permits, and advised appropriate backcountry rangers of our plans. Third, we worked through the watershed unit, visiting one or more wetlands on each day, and completing surveys where potential amphibian breeding habitat was found.

At each potential breeding site visited, a basic amphibian survey (Thoms et al. 1997) was completed. For distinct ponds, surveyors walked around the entire perimeter and a zigzag course through wide shallow water zones, scooping with a net every five or six steps. For wet meadows, we walked a zigzag course through the area, searching for water pockets where changes in the vegetation were noticed, and surveying these as we did ponds. For streams running through wet meadows, we walked along one side, brushing a net through the vegetation on the opposite side, and surveying stream pools in the same way we did ponds. For each wetland surveyed, the numbers of larvae, metamorphs, juveniles and adults of each species of amphibian were recorded, along with survey start and end times, weather, habitat data, water temperature, pH and conductivity, and UTM coordinates taken with a GPS unit. A map of each wetland was sketched, and any wetland not shown on the NWI map was plotted on the topographic map of the unit. Photographs were taken of each site, and of the species and life stages found in the watershed unit. Observations of other wildlife, particularly reptiles, were also recorded.

Precautions were taken to reduce the possibility of transferring amphibian diseases or weed seeds. Before travelling to YNP, all amphibian gear had been scrubbed and sterilized with 10% chlorine. Between trips into different watersheds, all gear was scrubbed and all sides dried in direct sunlight for several hours. After exposure to dead frogs found in one location, several items were sterilized with boiling water and direct sunlight.

RESULTS

In 2001, we worked on the project for part or all of 25 days between July 9 and August 6, completing surveys of amphibian habitat on 13 days, and spending part or all of the other days backpacking, horsepacking, coordinating with the principal investigator or Park Service Rangers, and transferring data from field notes to data sheets. Backpacking, horsepacking, and cross-country day hiking from backcountry campsites gave us access to wetlands in the three selected units. Several wetlands outside of the selected watersheds were reached by trail and cross-country hiking on the last 3 days of our work. Extensive blowdown of trees that had been killed in the 1988 Yellowstone fires frequently presented obstacle courses that slowed our cross-country progress, and occasionally prevented our reaching all sites planned for a particular day.

Unit #302 – Buffalo Meadows

To complete the survey work begun in 2000 in the Buffalo Meadows unit we took a 4-day backpack trip similar to the one last year, working out of the same campsite adjacent to the unit. On each day we reached different parts of the unit by either continuing north on the trail and then following a compass course (derived from the topographic map) to each wetland, or hiking cross-country following elk trails parallel to the east side of the creek draining Buffalo Meadows (which we called “Buffalo Fork”). The first 2 days we worked in the southeast portion of the unit, visiting small wetlands that had not been visited in 2000. The 3rd day we spent in the main Buffalo Meadows, re-surveying several ponds and surveying others only briefly visited in 2000. The last morning we re-surveyed one pond in the Little Firehole Meadows part of the unit. Our surveys occurred on the same dates as last year (July 10-12, 2000 and July 11-14, 2001). There had been even less precipitation in winter and spring, and many sections of the meadow that were very wet sedge areas last year were dry or only slightly moist. However, all of the ponds we re-surveyed were at the same water level or only slightly lower, except for one which was dry. As in 2000, three species of amphibians were found in the unit during the surveys: tiger salamander (*Ambystoma tigrinum*), boreal chorus frog (*Pseudacris maculata*), and Columbia spotted frog (*Rana luteiventris*). Larval stages confirming breeding were found at several sites for each species. The highest priority species (because of their reported declining populations), western toad (*Bufo boreas*) and northern leopard frog (*Rana pipiens*), were not found in the unit, nor were any reptiles seen. Other wildlife noted included Barrow’s goldeneye (*Bucephala islandica*), sora (*Porzana carolina*), sandhill crane (*Grus canadensis*), muskrat (*Ondatra zibethicus*), elk (*Cervus elaphus*), and moose (*Alces alces*).

Unit #167 – Duck/Maple Creek

A 5-day backpack trip gave us access to the north fork of Duck Creek, a tributary of Maple Creek. Because the nearest campsites are 5 km from the edge of the unit, special permission was obtained from the YNP Backcountry Office to find a place to make camp near the head of the west fork of Winter Creek, about 1 km off of the Mt. Holmes Trail and $\frac{3}{4}$ km from the north edge of the unit. From the undesignated campsite, we found a good cross-country route over the low divide from Winter Creek into the Duck/Maple Creek unit. The 2nd afternoon was spent scouting with binoculars from the divide and surveying one site. Two long days were spent following topographic features, elk trails, and compass bearings to reach the other wetlands and complete the surveys. Four amphibian species were found in the unit: tiger salamander, western toad, boreal chorus frog, and Columbia spotted frog. Chorus frogs, including larvae and

metamorphs, were found at several sites. Tiger salamanders and spotted frogs were each found at one site, with only adults being observed. A juvenile western toad was found at one site, and 12 larvae were found at a different site but it did not appear that others had already metamorphosed and left the water. No leopard frogs or reptiles were found in the unit. Other wildlife seen in and near the unit during this trip and a recreational return trip included Barrow's goldeneye, sora, eastern kingbird (*Tyrannus tyrannus*), black rosy finch (*Leucosticte atrata*) near the 10,336 foot summit of Mt. Holmes, pine grosbeak (*Pinicola enucleator*), tracks of several wolves (*Canis lupus*), a sow and 2 cub grizzly bears (*Ursus arctos*), and a great many elk.

Unit #494 – Upper Chipmunk Creek

A 7-day horsepack trip gave us access to the upper end of the main branch of Chipmunk Creek (Figure 2) from the south, through the Teton Wilderness Area. The YNP Backcountry Office had given us special permission to stay 4 nights at a designated campsite about 2 km from the western edge of the unit (and more than 40 km from the trailhead). On the 2nd afternoon we followed a compass course to survey sites in the west-central part of the unit. On the 3rd day we followed topographic features and elk trails to reach the extreme east end of the unit. From a cliff top vantage point along the way, we were able to view a number of the sites with binoculars. From the east end we surveyed sites, working back west through the unit. On the 4th day we followed topographic features and a compass course to reach the northwest part of the unit, where we completed the surveys.

The major part of the Two Ocean Plateau is an extensive, high elevation area of huge rolling meadows interspersed with patches and stringers of forest. Whitebark and lodgepole pine dominate the drier forest sites, while Engelmann spruce and subalpine fir are the dominant species on the north slopes and the more moist fringes of wetlands. The headwaters of Chipmunk Creek are in this mosaic of meadows and forest patches at the north edge of the plateau proper (the entire drainage is within the region named the Two Ocean Plateau). However, most of the drainage slopes north toward Yellowstone Lake, and large sections are extensive stands of large diameter lodgepole pine that were burned in the 1988 Yellowstone fires. These areas now have numerous large logs with many side branches, which make cross-country travel arduous and slow. We were fortunate to find elk trails along the cliff top through the south portion of the unit on the 3rd day. The topographic map was generally accurate with perennial streams and wetlands. It did seem that the NWI map for this unit had been drawn with different standards for wetlands than those of other units we have worked on. Several sites (particularly #12 and 14) were large areas of upland forest or upland meadow with scattered trees. These did include small benches of wet meadow or patches of seasonally moist forest, which we would have expected to be mapped as separate small sites. One site (#5, which was a portion of a very extensive NWI wetland) was a burned forested hillside, with no wetland vegetation seen from either the top or the bottom.

We were requested to visit at least 16 of the more than 20 sites shown on the NWI map. We completed surveys, or made brief visits and found no potential amphibian breeding habitat, at 14 sites. Three other sites were scanned with binoculars from the cliff top near the south edge of the unit. We looked straight down onto #8, but only viewed #19 and #20 from 1½ and 2 km respectively. We may also have seen #13 from this viewpoint, and we did walk through it but apparently thought it was another dry part of #12, which we mistakenly thought extended north

of the creek at that point (had there been any potential breeding habitat we would have seen it). An unmapped pond (#101) was found between sites #6 and #7, but it was dry at the time of the survey.

Only 2 species of amphibians were found in the unit: boreal chorus frog and Columbia spotted frog. No larvae or metamorphs were seen, but we did find several juvenile spotted frogs that were probably yearlings. No reptiles were seen in the unit. Other wildlife noted in the unit included blue grouse (*Dendragapus obscurus*), spotted sandpiper (*Actitis macularia*), American dipper (*Cinclus mexicanus*), tracks of wolf and grizzly bear, and the ubiquitous elk.

Other sites on the Two Ocean Plateau

During the trip to survey the Upper Chipmunk Creek Unit we were also able to visit sites in several other drainages. On the 2nd afternoon we traversed 2 wetlands in the south fork of Chipmunk Creek, and re-visited one of these on the 4th afternoon. We took a long cross-country hike on the 5th day, spending most of the time on the Two Ocean Plateau proper along the Continental Divide, surveying sites at the heads of the south fork of Chipmunk Creek, Crooked Creek, and Plateau Creek (Figure 3).

In the lower part of the south fork of Chipmunk Creek, we found Columbia spotted frog adults at both sites visited. Neither site was fully surveyed. Meredith Taylor found 2 dead adult spotted frogs at Site B, and 2 more when she re-visited the site 2 days later. Three of these frogs were collected and will be necropsied for evidence of disease. Two other live adult spotted frogs seen on the first visit appeared to be healthy. At the head of this drainage on the Plateau, boreal chorus frog adults were found at 3 of the 4 ponds visited (the other was dry at the time), and 2 of the ponds had larvae and metamorphs, confirming breeding by this species at those sites.

At the head of Crooked Creek on the Plateau, we visited 7 ponds, of which 3 were dry at the time. Two of the ponds had boreal chorus frog recent metamorphs. One of these also had an adult and several larvae. We did not find any amphibians at the other 2 ponds.

Three ponds were visited at the head of Plateau Creek on the Plateau. Several other segments of the dry channel connecting the ponds probably formed pools in a wet year, but were not looked at except from a distance. We found no amphibians in the 2 larger ponds, but found a large number of boreal chorus frog larvae and metamorphs in a small pond that was drying rapidly at the time of our survey.

Other wildlife noted on the Two Ocean Plateau were Swainson's and red-tailed hawks (*Buteo swainsoni* and *B. jamaicensis*), spotted sandpipers, tracks of grizzly bear, and elk.

Sites in the Teton Wilderness Area

At the start of the horsepack trip to the Two Ocean Plateau, our route through the Teton Wilderness Area followed Pacific Creek and Gravel Creek, passing close by several ponds and other wetlands. On our return at the end of the week, we were able to survey briefly several sites adjacent to the trail in the Gravel Creek drainage (Figure 4). The first evening of the return we surveyed one large wetland near the campsite. On the last morning of the trip we stopped at 4 other sites for quick surveys.

The Gravel Creek drainage is characterized by deep and unstable volcanic ash soils that regularly slump, creating bizarre angles in the drainage pattern and numerous benches that develop into wetlands. In fact the trail had been re-routed in 2000 to avoid a huge new slide, and went past 2 wetlands that otherwise would not have been accessible. Much of this area also burned during the 1988 Yellowstone fires, and is now a mosaic of open lodgepole forest, burned stands, and extensive meadow slopes.

Three species of amphibians were found during our brief surveys. Columbia spotted frogs were found at every site surveyed. These included mostly adults, but metamorphs were also found at 2 sites. Boreal chorus frogs were found at 2 sites, including both adults and metamorphs. A western toad was found at one site. It was an immature or small adult, and could have traveled overland for some distance from its natal site, so we did not confirm a toad breeding site. No reptiles were found on the trip. Several bird species were noted, including green-winged teal (*Anas crecca*), Barrow's goldeneye, sora, sandhill crane, pine grosbeak, tracks of wolf and grizzly bear, muskrat, and, of course, elk.

DISCUSSION

The 2001 winter and spring were exceptionally dry, and amphibian breeding sites that are shallow may never have received enough water to be available this year. However, periodic summer rains maintained some ponds that probably otherwise would have dried up, stranding developing larvae.

The Buffalo Meadows unit (#302) again was found to be very productive of all 3 of the commonly occurring amphibian species, but again produced no reptile observations. Many ponds were at or near the same water level as last year, which may indicate seeps or springs that maintain them. Large numbers of adult spotted frogs were seen at certain ponds in the main meadow, including 90 at one pond, perhaps spatially restricted by drying of streams or other parts of the meadow. Survey results from our return to the unit suggest that many amphibians traditionally breed in the ponds that are permanent or that last long enough for larvae to reach metamorphosis, rather than using ponds that may be warmer or more productive of food but that are ephemeral. It would be interesting to see if the same ponds are selected in a wet year that were used in the 2 dry years. There remain several wetlands that have not been visited, scattered in the north and west edges of the unit, but including one on the east edge that we did not have time to reach. These are all very small and were probably dry at the time of the survey, however they could possibly provide amphibian breeding habitat in a wet year. This unit probably has been adequately covered now.

The Duck/Maple Creek unit (#167) was somewhat enigmatic. While 4 amphibian species were found, breeding was confirmed for only 2, and only the chorus frog was widespread. Tiger salamanders were found at a single pond but in good numbers, while spotted frogs were limited to 2 adults at one pond. There was no evidence of breeding by either species, although habitat appeared to be appropriate for either or both at 4 or 5 sites. Perhaps the apparent lack of perennial streams and paucity of springs limit the summer or overwintering habitat requirements for these species, or the distances overland may be too great for dispersal into the watershed from other occupied areas. Western toads were found breeding at one pond, but only 12 larvae were found, and there was no evidence that others had already metamorphosed and left the

immediate area. Since a single toad female can lay 10,000 eggs, the probability that most of the year's production of toad eggs or larvae had died remains a subject of concern. I expected to find western terrestrial garter snakes (*Thamnophis elegans*) in some of the meadows, and am puzzled as to why we did not. Although we completed about all that was requested, we may well have missed some breeding habitat by not visiting the other sites, particularly #1, 10, and 14. To reach these sites would have necessitated at least another day, or a second trip into the area (a possibility for a future year).

The Upper Chipmunk Creek unit (#494) was not at all productive for amphibians; indeed we did not find a single breeding site. There was suitable breeding habitat in a number of sites, but it was restricted to small pockets that were dry at the time of the surveys, except for the 2 large ponds at the east end of the unit (#15 and 16). Possible reasons for these 2 ponds not having larvae of any amphibian species are that they are in the pass where they are quite exposed to the wind which may impede the growth of emergent vegetation (possibly by blowing ice around the pond margins as it is breaking up in the spring), or they may be in areas of heavy snowdrift which melts late. We looked at least briefly at all of the sites requested. We should have made a greater effort to reach #20, because it is shown as a wetland on the topographic map and may have included a pond (although it was dry at the time of the surveys). That would have been a likely source of the juvenile spotted frogs seen at #12, although the small lake (not surveyed) in the south fork of Chipmunk Creek may be the main breeding site for that species in the region. Having 4 surveyors at Upper Chipmunk Creek made it possible to cover some large sites efficiently in the 2½ days we spent on the unit, leaving us time to explore more of the region. This unit probably has been adequately covered.

The unusually dry winter and spring, and the late dates of our final week of surveys, could have prevented our finding amphibian larvae or even metamorphs remaining at breeding sites, even at 9,500 feet on the Two Ocean Plateau. Despite these potential problems we were able to document breeding sites of one amphibian species on the Plateau, and breeding sites of 2 species and the presence of a 3rd in the Teton Wilderness Area. The Plateau south of the Chipmunk Creek unit was very productive of the single species, chorus frog. It is very likely that the Two Ocean Plateau is too high in elevation for reptiles to be present. Perhaps we should have concentrated our extra time in one of the 3 watersheds visited, and of course we barely scratched the surface of the enormous Teton Wilderness Area. It would be very interesting to explore this magnificent region further.

Reports similar to this one, along with data sheets, maps, and photographs, were sent to the Bridger-Teton NF and to Debra Patla for inclusion in her report to YNP. I will write at least one article for a magazine and will present our data to the Society for Northwestern Vertebrate Biology next spring.

Acknowledgements: Dave Corkran's skillful route-finding and compass acumen were the key to our successful surveys, and his persistence with recording data and photographing sites were also exceptional. Tory and Meredith Taylor were both extremely observant, patient at negotiating difficult blowdown, and dedicated participants in long days of surveys, not to mention excellent horsepackers. Debra Patla's planning and coordination were invaluable in making the most efficient use of our time and efforts, and I am very grateful to her for obtaining

maps for us and arranging for reimbursement of many of our expenses. I also appreciated the interest and support of the National Park Service, particularly Anita Varley, Backcountry Office Supervisor, who made helpful suggestions on our route into Duck/Maple Creek, and who permitted us great latitude in finding an appropriate undesignated campsite. The Sierra Club Foundation's very generous grant and NERI's continuing and enthusiastic support made possible our unforgettable trip to the Teton Wilderness Area and the Two Ocean Plateau of Yellowstone National Park.

LITERATURE CITED

Thoms, C., C. C. Corkran, and D. H. Olson. 1997. Basic amphibian survey for inventory and monitoring in lentic habitats. *In*: D. H. Olson, W. P. Leonard, and R. B. Bury, editors. *Sampling Amphibians in Lentic Habitats: Methods and Approaches for the Pacific Northwest*. Olympia, WA: Society for Northwestern Vertebrate Biology, Northwest Fauna #4. pp 35-46.

PROJECT BUDGET AND EXPENDITURES

	Budget	Expenditures
Horse packers for 7 days	4,200	4,500
Mileage (2,000 miles @ \$.30/mi.)	600	(2,531 mi.) 759
Maps (4 USGS topo. maps)	21	(7 maps) 38
Film (4 rolls + developing)	54	65
Copying, postage, long distance phone calls	20	20
Survey & camping supplies (bear repellent)	<u>30</u>	<u>80</u>
Totals	\$4,925	\$5,462

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Figure 1. Yellowstone National Park, Grand Teton National Park, and Teton Wilderness Area, showing general locations of areas surveyed in 2001.

Figure 2. Survey Unit # 494, Upper Chipmunk Creek.

Figure 3. Sites surveyed in other watersheds
on the Two Ocean Plateau.

Figure 4. Sites surveyed in the Teton Wilderness Area.

Figure 5. a.) Horsepacking (and hiking) to the Two Ocean Plateau.

Figure 5. b.) Chipmunk Creek watershed and Table Mtn.

Figure 6. a.) Surveying wetland bench along Upper Chipmunk Creek.

Figure 6. b.) Columbia spotted frog.

Figure 7. a.) Boreal chorus frog.

Figure 7. b.) Western toad.