

**A SURVEY OF THE
HERPETOFAUNA OF
BRUNEAU RESOURCE AREA,
BOISE DISTRICT,
WITH FOCUS ON THE
SPOTTED FROG,
RANA PRETIOSA**



by
James C. Munger
Lisa Heberger
Dia Logan
Wade Peterson
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Summary: Little is known about the distribution and abundance of reptiles and amphibians in the deserts of the Intermountain West. In particular, the status of the spotted frog, Rana pretiosa, (presently federally classified as C2) is poorly known. We conducted censuses of the amphibians at potential breeding sites in the portion of the Bruneau Resource Area at the southern end of the Owyhee Mountains and collected data on potentially important habitat variables. We found adult spotted frogs at 41 sites and their larvae at 3 sites out of 204 characterized. Adult spotted frogs tended to be found at oxbows, pools, or ponds, at sites with sandy substrate, at sites with lower sagebrush cover, and at sites with hideaways present. Sites with spotted frogs had significantly less evidence of grazing than did sites without spotted frogs. Larvae of the other common species of amphibian, the Pacific treefrog (Pseudacris regilla), were found at 37 sites, and adults at 11 sites. Two other amphibian species and ten reptile species were found as well.

INTRODUCTION.

The Boise district plans to prepare a Resource Management Plan for the Bruneau Resource Area in the mid-1990's. To allow construction of an RMP that is sensitive to the wildlife of an area, it is important to know the occurrence and status of species present in the area. At the present time, however, little is known of the occurrence in the resource area of members of two classes of vertebrates, amphibians and reptiles.

Of particular concern are the amphibians. A number of researchers have argued that amphibian populations worldwide are undergoing a decline (e.g. Freda and Dunson 1986, Weygoldt 1989, Wake and Morowitz 1990 and Wyman 1990). The hypothesized reasons for decline include: (i) global phenomena, either increased ultraviolet radiation (due to partial loss of the protective ozone layer) or climate change. (ii) pollution, in the form of pesticides or acid rain, the effects of which may be exacerbated by the relatively permeable skin of amphibians, (iii) loss of breeding habitat due to human impacts, or the fragmentation of habitat, leading to local extinctions without recolonization, and (iv) the introduction of exotic species, both fishes and amphibians, which prey upon larval forms.

Of the species of amphibian that occur in the Bruneau Resource Area, the spotted frog (Rana pretiosa) is the only species recognized by the federal government as being potentially in trouble. Presently, the species has a federal status of C2, meaning that listing is possibly appropriate, but that more information is needed before proper consideration can be given. The U.S. Forest Service Region 4 lists

the species as "sensitive". The Bureau of Land Management does not list the species. Idaho Fish and Game list it as G5S5, meaning that it is widespread and abundant, both throughout its range and within Idaho.

The spotted frog has a distribution that covers much of western North America, from southern Alaska to central Nevada, and historically from the Pacific coast to Wyoming. It has been extirpated from west of the Cascades due to predation from introduced bullfrogs. It usually occurs in mountainous areas near slow-flowing streams and rivers, lakes, springs, and marshes. It is highly aquatic, typically occurring near cool permanent quiet water. In the more arid portions of its range, it exists as isolated populations, inhabiting higher elevation ranges. One such isolated population occurs in the Owyhee Mountains of southwestern Idaho. Because the Endangered Species Act requires protection of populations as well as species, it is important to determine the status of the Owyhee Mountains population.

The objectives of this project are (1) To provide information on the abundance and distribution of populations of spotted frogs in the southern portion of the Bruneau Resource Area, both from censuses and from museum records, (2) To provide an indication of the habitat variables important to spotted frogs, (3) to provide information on the distribution and habitat requirements of other species (amphibians and reptiles) incidentally captured in the same area, and (4) to indicate the reliability of using National Wetland Inventory maps to predict the presence of spotted frogs and other amphibians.

METHODS

DATABASE

Museum records from the Idaho State University Database were not accessed for this report; information from those records will be compiled and reported in the report from 1994's field season.

SURVEY FOR REPTILES AND AMPHIBIANS

Survey for Amphibians. During the period of 18 May to 9 July 1993, we visited a number of sites in the area of the Mud Flat Guard Station. Essentially, we visited as many sites as possible during this period, basing our decisions on which site to visit on accessibility and nearness to our base at the Guard Station. Once chosen, a given body of water (mostly streams and ponds) was surveyed by walking as much of its length or circumference as possible. At these water bodies, we searched for amphibians by carefully examining all shallow and bank areas, watching for sudden movement, turning rocks and vegetation, and dipnetted for larvae and eggs in promising areas. When adult amphibians were found, their location and species were noted. When larval amphibians were found, their number was estimated and a minimum of 5 were taken as a sample for later identification (identification in the field is difficult).

Habitat Characterization: At most sites where amphibian adults or larvae were found, we conducted a site characterization. In practice, in those areas where relatively few amphibians were captured, each capture site was characterized. In areas where adults were abundant, we characterized a subsample of capture sites. We also characterized arbitrarily chosen sites roughly every 400 meters of stream length; these sites were later compared to capture sites.

For each water body (e.g. stream), we measured three variables: conductivity (MC-1 meter, MarkIV, Lab-Line Instruments), and hardness and alkalinity, determined from Hach kits on water samples. Capture sites and random sites were characterized as follows: (i) We measured water characteristics: pH with a handheld meter; water temperature with a mercury thermometer; depth and width of the body of water; characterization as run, riffle, pool, oxbow, or pond. (ii) Substrate described by estimating the percent coverage underwater of mud, sand, gravel, and rock. (iii) Streamside vegetation was described by

visual inspection) a score of 0 to 3 for each of sagebrush, grass, forb, willow, cottonwood, reed, and bare. (iv) Aquatic vegetation was described by assigning a score of 0 to 3 for each of algae, emergent vegetation, and submerged vegetation. (v) We scored whether there was a hiding place present, and whether that hideaway consisted of branches, vegetation, rocks, or an overhang. (vi) We extracted from National Wetland Inventory maps the system, the class, and the regime. (vii) We described the location to the nearest 1/64 section. (viii) We classified the weather as sunny, partly cloudy, cloudy, and rainy; and measured the air temperature with a mercury thermometer, (ix) We scored grazing as 0 (none) to 3 (heavy) based on a quick visual inspection.

Statistical Analysis: Statistical analyses were used to provide an initial exploratory analysis aimed at indicating which habitat variables appear to be more or less associated with the presence of spotted frogs. Because tree frogs, Pseudacris regilla, were quite abundant throughout the site, we performed similar analyses on this species. The two other amphibian species encountered, Woodhouse's toad (Bufo woodhousei) and the western toad (Bufo boreas) were only encountered a total of 3 times, not enough to warrant analysis. Analyses consisted (i) contingency table analysis (SAS PROC FREQ) for categorical habitat variables vs. presence or absence of each species, and (ii) multivariate analysis of variance (MANOVA; SAS PROC GLM) to determine if the means of non-categorical (including ranked) habitat variables (e.g. water depth) differed between sites where a species was present and sites where it was not present. Note that sites where a species was not present included (i) random sites and (ii) sites where a different species was found. Analyses of conductivity, hardness, and temperature were conducted using separate ANOVA's because a substantial number of values for these variables are missing, and these missing values would have compromised the power of the MANOVA.

Miscellaneous Sightings. While conducting amphibian surveys or while walking or driving to sites, we occasionally encountered reptiles. The locations of these sightings were recorded.

Sample Collection and Deposition: An adult of each species or amphibian and reptile was collected, fixed in formalin, and preserved in ethanol for deposition in Boise State University's Vertebrate Museum. Additional specimens were preserved if they were taken from greater than 10 miles from the sites of other specimens of the same species.

RESULTS

We characterized a total of 204 sites. Of these, 103 were random sites, 41 were at Rana pretiosa adult sites, 3 were at R. pretiosa larval sites, 12 were at Pseudacris regilla adult sites, 37 were at P. regilla larval sites, 1 was at a Bufo woodhousei adult site, 1 at a Bufo boreas adult site, and 1 at a Bufo (species not identified) larval site. Twelve of the random sites were dry, and are excluded from the analysis presented here. Examination of the output indicates very little effect of this exclusion on the trends presented below.

Spotted frogs were observed in the following drainages: Rock Creek, Camas Creek, Deep Creek, Camel Creek, Hurryback Creek, Stoneman Creek, Pole Creek, Slack Creek, and in two ponds and one reservoir. Another possible sighting was made at Dry Creek. Sites at which spotted frogs and the other two amphibian species were observed are marked on the accompanying QUADRANGLE MAPS. The SITE NOTES give a description of the sites. APPENDIXES I AND II give the complete data set for all variables measured at the 204 sites.

SPOTTED FROGS

National Wetland Inventory Classification. Spotted frog larvae were found at only three sites, and these sites tended to be the type at which adults were most common. All larvae were found in palustrine systems; adults were found significantly more than expected in palustrine systems, but they also occurred

in riverine systems. Larvae were either in emergent or shrubscrub class, and adults were found significantly more than expected in the shrubscrub class with fewer than expected in emergent class. Larvae were all in seasonally flooded regime, and adults were found significantly more than expected in seasonally flooded but also in permanently flooded and temporarily flooded (Table 1).

Water body characteristics. Adult spotted frogs were found substantially more than expected in calm water: oxbows and pools. They did occur, albeit at lower than expected frequencies, in all water types, including runs and ripples. Larvae were found in slow water: one site each was found in pond, pool, and oxbow. No differences between frog sites and non-frog sites were found with regards depth or width of the water body (Table 1). No differences in water chemistry characteristics were found. However, water temperatures at sites at which spotted frog larvae were found were significantly warmer than at random sites (Table 4).

Substrate and vegetation. Sites with adult spotted frogs had marginally significantly more sand and less gravel than did sites without adults, but adults were found in a wide variety of substrate types. In contrast, all three larval sites had 100% mud as a substrate. Sites with adult spotted frogs had significantly less sagebrush cover and marginally less forb cover than did sites without adults. No patterns were obvious with regards larvae. Aquatic vegetation did not differ between sites with frogs and sites without frogs. Sites with hideaways had a higher probability of having frogs than did sites without hideaways; all sites with larvae present had hideaways present (Tables 1, 2, and 3).

Grazing. Sites with adult spotted frogs had a significantly lower rating for evidence of grazing (average rating 0.769 on a scale of 3) than did sites without adults (average rating 1.262). Larvae were found in a sites with ratings of 0, 1, and 2. The average rating for sites without spotted frog larvae was 1.162 (Tables 2 and 3, Figure 1).

TREEFROGS

Treefrog adults were found at only 11 sites, giving relatively little power for answering questions regarding their location. Larvae, however, were found at 37 sites.

National Wetland Inventory Classification. Treefrog adults and larvae were found in both palustrine and riverine systems, with no real pattern. Adults were found throughout the various classes, but larvae were found significantly more than expected in emergent and unconsolidated bottom classes, and less in the shrubscrub class. Both adults and larvae were found in a wide variety of regimes in approximately expected frequencies (Table 1).

Water body characteristics. Treefrog adults were never found in oxbows, but were found significantly more than expected near pools, runs, and ponds. Larvae, on the other hand, were found significantly more in oxbows, ponds, and pools than expected. Interestingly, they were recorded to occur in runs as well, although at lower than expected frequencies (Table 1). No water chemistry variables were significant. However, sites with treefrog larvae had warmer water temperatures than did random sites (Table 4).

Substrate and vegetation. Treefrog adults exhibited no significant trends with regards substrate or vegetation. Sites where larvae were found were significantly wider, and with significantly more mud and less gravel substrate than were sites without larvae. In addition, sites with larvae had significantly more reed cover, marginally more forb cover, and significantly more emergent vegetation, submerged vegetation, and algae than did sites without treefrog larvae (Tables 1, 2, and 3).

Grazing. No significant difference existed between sites with adults or larvae and sites without adults or larvae (Tables 2 and 3).

MISCELLANEOUS SIGHTINGS

During our field work, we encountered individuals of 5 lizard species: Sideblotched lizard (*Uta stansburiana*), Western whiptail lizard (*Cnemidophorus tigris*), sagebrush lizard (*Sceloporus graciosus*), short-horned lizard (*Phrynosoma douglassi*), and western fence lizard (*Sceloporus occidentalis*). We also encountered 5 snake species: Western rattlesnake (*Crotalus viridus*), western terrestrial garter snake (*Thamnophis elegans*), striped whipsnake (*Masticophis taeniatus*), racer (*Coluber constrictor*), and gopher snake (*Pituophis catenifer*)

DISCUSSION

HABITAT REQUIREMENTS OF SPOTTED FROGS.

Although we found no set of parameters that clearly define the habitat requirements of spotted frogs, we did find that adult spotted frogs tended to be found in situations with slow water, and were especially prevalent in the oxbows of streams. These sites were typically in sandy areas, with relatively little vegetation, and with some sort of hideaway. Several adults were typically found together in ponds and oxbows; those encountered on stream banks were typically found singly.

Given the large number of sites at which adult frogs were found, it is surprising how few breeding sites were found. It is unclear whether they were breeding at sites undiscovered by us, whether they had failed to breed for some environmental reason (e.g. cool temperatures), or whether they had attempted to breed but had failed because of egg death due to some environmental factor. Two things can be said about breeding sites (besides their rarity): all three sites were found in slow water situations, and all three had a mud substrate. In addition, the water temperature was quite warm at larval sites. It is our hope that during the summer of 1994 we will be able to find and describe more breeding sites.

NATIONAL WETLAND INVENTORY MAPS AS PREDICTORS OF AMPHIBIAN PRESENCE.

We found several significant associations of the presence of frogs with one or more NWI variables. On the one hand, this gives some indication that NWI maps could be used to identify areas that are more likely to harbor amphibians: according to our analysis, higher than expected numbers of sites with palustrine regime, shrubscrub class, and seasonally flooded regime held adult spotted frogs. On the other hand, however, such generalizations ignore the possibility that other areas might be important for larvae. In addition, it should be noted that these trends cannot be used to predict the presence of frogs. For example, frogs were found with more than expected frequency at sites with C (seasonally flooded) regime. However, only 33 of 134 C-regime sites sampled had adult spotted frogs.

DIFFERENCES BETWEEN SPOTTED FROGS AND TREEFROGS

The most striking difference between these species is the relative proportions of sites with larvae to sites with adults. Three of 44 sites with spotted frogs held larvae. Thirty-seven of 49 sites with treefrogs held larvae. We can speculate as to 3 possible reasons for this: (i) Treefrogs appear to be much more opportunistic in their choice of breeding sites. They were found in a wide variety of habitat types, although sites with larvae did tend to have more aquatic vegetation and mud substrate than did sites without larvae. (ii) Adult treefrogs are undoubtedly more difficult to find, since they are quite terrestrial and may be hiding in nearby rocks or vegetation. Spotted frogs, in contrast, were often seen in water, where they could easily be detected and captured. (iii) Spotted frog eggs may be more susceptible to environmental damage than are treefrog eggs as evidenced by a recent study by Blaustein et al. (1994) that found that eggs of another *Rana* species are more susceptible to UV radiation than are treefrog eggs.

EFFECTS OF GRAZING

This study found that sites with adult spotted frogs had ratings for grazing pressure that were significantly lower than sites without adult spotted frogs. This trend was noted by workers in the field. This result does provide preliminary evidence that grazing may degrade the habitat in a way that makes it less favorable for spotted frogs. Before such a conclusion is made, however, further confirmatory data should be gathered and other possible explanations, such as that cattle may not have had access to areas where spotted frogs are most common, should be ruled out.

STATUS OF THE SPOTTED FROG

Our general impression is that although the spotted frog can be common in some areas, these areas are fairly limited, apparently to certain permanent water bodies. The other species of amphibian common to the area was much more wide spread, occupying temporary as well as permanent water bodies. As mentioned above, the rarity of breeding sites for spotted frogs is troubling. More study is needed to determine whether these sites are indeed rare, and if so, to determine the causes of this rarity.

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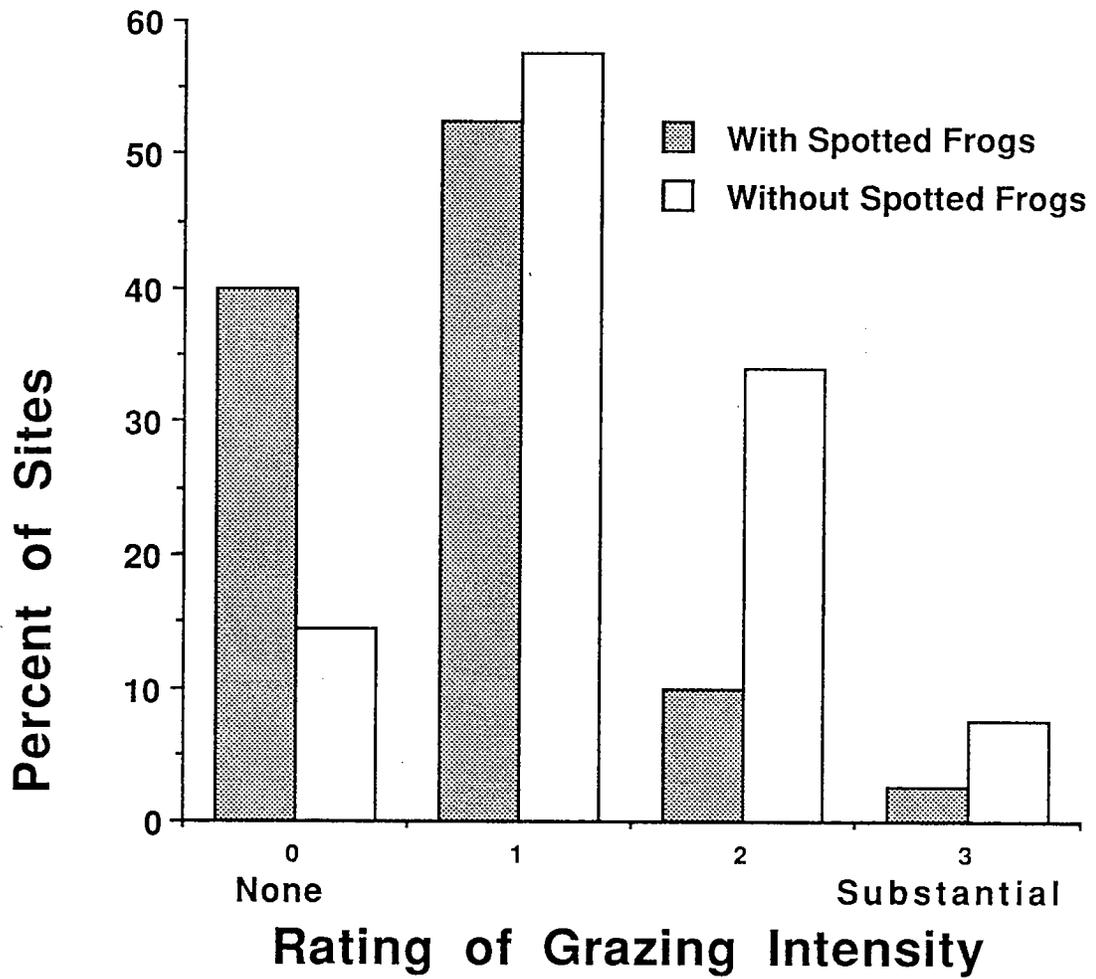


Figure 1. Relative grazing intensity at 40 sites at which spotted frog larvae and/or adults were found and at 132 sites at which neither spotted frog adults nor spotted frog larvae were found.