Endangered Amphibian Research within Grazed Grasslands

Joseph DiDonato

Joseph DiDonato presented an overview of research since 1996 pertaining to amphibian populations in pond habitats. Although researchers gathered data on all amphibian species at all life stages and all macro-invertebrates at each pond surveyed, the results presented were focused on pond habitat for two endangered species: red-legged frogs and tiger salamanders. The presentation further focused on the inter-relationship of grazing as a habitat management tool for maintaining vegetation at appropriate levels in ponds and the surrounding uplands as part of species management in the East Bay Regional Park District. The East Bay Regional Park District is a patchwork of regional parks comprising close to 100,000 acres in Alameda and Contra Costa Counties. Most species of concern occur east of the very densely populated highway 80 corridor in Eastern and Southern Alameda and Eastern Contra Costa Counties; this was also the location of the study sites. Adjacent private lands also contain similar populations of these species of special concern.

Researchers wanted to entertain the management of habitat for red-legged frogs and tiger salamanders in conjunction with cattle grazing. They aimed to shed light on the management of these ponds for a variety of species, but have decided to use the two aforementioned species as an example to illustrate how utilizing livestock grazing and its effects on ponds where these species breed and spend a significant amount of time is productive. The effects of grazing also enhance the habitat for other species, most notably the California ground squirrel, which tends to be a keystone species in Valley Grassland environments; they serve to provide habitat development underground and as a prey species above ground. Many species in the District are known to utilize these burrows as refuge sites, in this case most notably amphibians. It is important to understand that in the case of California tiger salamanders especially, ponds only play a role in part of their life cycle. Adult California tiger salamanders enter ponds after the first heavy rains in winter usually from about November through January. Tiger salamanders may enter ponds very infrequently; in fact they may only enter once in five years and take up to seven years to begin breeding. Joe further emphasized that although these ponds certainly play a critical role for tiger salamanders to complete the reproductive phase of their lifecycle, they spend the majority of their time in the surrounding uplands. During their time in the uplands it has been verified by spotlight surveys that tiger salamanders are in and out of ground squirrel burrows and under debris in the uplands. Joe also cited research done by Dr. H. Bradley Schafer (UC Davis) on the life history of this species. Researchers have concluded that pond and upland habitat, as well as cattle, are important to the maintenance of these communities and will continue to integrate cattle management with these species to meet the needs of all.

Pond data was collected utilizing dip-nets, seines, and other tools during the surveys. Out of a total of 275 ponds in the district 179 were surveyed in 1996, 210 in 2000, and 186 in 2004, not all of the ponds were full in any one year for a variety of reasons. Researches evaluated pond vegetation in and around ponds; for this presentation percent submerged and percent emerged

vegetation were focused on, and were categorized as zero percent, less than 15 percent, or more than 15 percent. The majority of the ponds evaluated were exposed to livestock grazing, very few are enclosed because managers have realized the value of the habitat goes down and species of concern utilize the habitat less frequently when grazing is removed.

In the case of the California tiger salamander if they are present in the pond then they are definitely breeding. The number of ponds with breeding was compared to the number of ponds available for breeding in a given survey year to yield values for the percent of available ponds with tiger salamanders breeding. The number of ponds available varies annually, however results for 1996, 2000, and 2004 illustrate that approximately fifty percent of ponds within the range and with necessary requirements for tiger salamanders were occupied by them.

In the case of red-legged frogs, if a pond is occupied by them it does not necessarily mean they will breed that year. The number of ponds occupied by red-legged frogs was compared with the number of ponds with breeding to yield a value for percent of ponds with breeding. From 73 to 89 percent of ponds with frogs also had breeding in 1996, 2000, and 2004. Red-legged frogs were more consistently present at individual ponds from year to year than tiger salamanders.

Researchers examined the vegetation structure in ponds as a result of livestock grazing, and found that for California tiger salamanders to successfully breed they must have significantly reduced vegetative structure. Furthermore, they found that these ponds can support red-legged frogs and a variety of other species as well. Researchers also noted that the density of ground squirrel burrows was also higher around grazed ponds with less vegetative structure, and as noted earlier these burrows are critical refuge sites for tiger salamanders and a variety of species in the uplands. Results demonstrate that the relative frequency of California tiger salamander occurrence is negatively correlated with the percent emergent vegetation in the ponds. The majority of salamanders occurred in ponds containing very little emergent vegetation. In the case of red-legged frogs, the relative frequency of their occurrence was also demonstrated to be negatively correlated with the percent emergent vegetation contained in the pond. The fact that 47 percent of detections were in ponds with five percent or less emergent vegetation demonstrates that not a lot of vegetation is required to sustain breeding populations of red-legged frogs. Joe acknowledged that these results may have been somewhat skewed due to reduced detection rates associated with increased vegetation density; these rates are likely variable with different amounts of vegetation.

One possible reason given for the above trend is that these amphibians may avoid ponds with lots of vegetation because they are more susceptible to predacious aquatic hexapods that presumably feed on their larvae. Researchers found that although California tiger salamanders do coexist with hexapods, there is a significant negative correlation between populations of predacious insects and the occurrence of tiger salamanders in the ponds. This trend is probably a result of the fact that these insects require vegetation to breed and to utilize as perches to prey from. Additionally, Joe mentioned that introduced fish and bullfrogs also cause severe problems for amphibians in local ponds.

In conclusion, livestock grazing is an effective tool for maintaining open grasslands and oak savannah communities. There appears to be a strong association between these grazed communities, burrowing rodents, and the presence of tiger salamanders. Furthermore, compaction and reduction of vegetation by livestock has been documented to increase the ponding duration of vernal pools and seasonal ponds. The creation of stockponds has created highly suitable reproductive habitat for tiger salamanders. On District lands tiger salamanders breed exclusively in seasonal and perennial stockponds. The district supports over 500 adult red-legged frogs, and the vast majority of water bodies that support red-legged frogs also provide water for livestock. These stockponds provide highly suitable habitat that has augmented the red-legged frog population in the East Bay. In summary, red-legged frogs are certainly compatible with range management utilizing livestock as a tool. Amphibians evolved with disturbances associated with large herbivores and such animals continue to play an important role in these ecosystems. Furthermore, the USFWS recent ESA 4d rule exempts routine grazing practices as part of the endangered species act. It was also stressed that private lands highly complement public lands in long-term species management.