

Vulnerability of amphibians to climate change: implications for rangeland management

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KEY WORDS: amphibians, climate, grasslands, water

Introduction: Many amphibian populations have declined drastically in recent years due to a large number of factors including the emerging threat of climate change (Wake 2007). Rangelands provide important habitat for amphibians. In addition to natural wetlands, stock tanks and other artificial water catchments provide habitat for many amphibian species (Euliss et al. 2004).

Material & Methods: We used the species vulnerability climate change assessment tool created by Rocky Mountain Research Station (v.1.0) to assess vulnerability of amphibian species that occur in the Middle Rio Grande region of central New Mexico, USA to projected climate change. This tool generates scores for individual species based on traits predicted to be related to either vulnerability (positive scores), resilience (negative scores) or neutral/ unknown (score = 0). Scores are calculated for four groups of related traits or factors and overall. Climate projections and relevant species information were taken from published literature and online databases as part of the scoring process.

Results & Discussion: Most amphibian species in the Middle Rio Grande, New Mexico were vulnerable to declines with climate change, but not all amphibian species were expected to be equally vulnerable nor were the same factors important. Western chorus frogs were identified as the most vulnerable while American bullfrogs were predicted to benefit from projected climate change (Table 1).

species	common name	habitat	physiology	phenology	interactions	overall
<i>Pseudacris triseriata</i>	western chorus frog	3	2.1	2.1	1	9.1
<i>Rana pipiens</i>	northern leopard frog	3.5	0.7	-2.1	4	8.3
<i>Ambystoma mavortium</i>	barred tiger salamander	3	1.4	2.1	1	8.3
<i>Bufo woodhousii</i>	Woodhouse's toad	3	0.7	-3.8	1	4.4
<i>Scaphiopus couchii</i>	Couch's spadefoot	-0.7	0.7	2.1	1	1.9
<i>Spea bombifrons</i>	plains spadefoot	-1.2	0.7	2.1	0	0.3
<i>Bufo cognatus</i>	Great Plains toad	-1.2	0	2.1	0	-0.4
<i>Spea multiplicata</i>	New Mexico spadefoot	-0.7	-1.4	2.1	1	-0.5
<i>Rana catesbeiana</i>	American bullfrog	1.4	-1.4	-5	0	-2

Table 1. Factor and overall scores for New Mexico amphibian species indicating predicted vulnerability to climate change from most to least vulnerable overall.

Timing and quantity of precipitation as related to life history requirements was a common source of vulnerability. Other traits, such as aestivation or prolonged breeding periods, were associated with resilience. The resilience of the American bullfrog is of interest as it is known to negatively impact many native amphibians and has been implicated in the spread chytridiomycosis, a disease that can result in high mortality for species like the leopard frog (Bradley et al. 2002).

Conclusions: Management of rangeland water sources will become increasingly critical in regions projected to become drier, not just for sustaining grazing, but also for sustaining amphibian populations. Rangeland research and management planning need to consider the future of water and interactions with wildlife populations.

References:

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