

Cougars Encourage Lizards in Zion

Lizards and cougars are connected by food-web pathways. No, these big cats don't eat lizards, it's a little more complicated than that. "Trophic cascades" is a community ecology concept whereby a predator exerts a top-down influence on an ecosystem, affecting species diversity through a series of direct and indirect effects among organisms. In this light, Drs. Bill Ripple and Bob Beschta (Oregon State University) have investigated "predator-common" and "predator-rare" areas, including a study of wolves in Yellowstone National Park, Wyoming, and a study of cougars in Zion National Park, Utah. Both studies support the idea that these top predators have cascading effects on the biodiversity of the ecosystem: predator-common systems have much higher biodiversity. Why? Because the predators' presence tempers high levels of herbivory by elk and deer, and vegetation is retained along streams in particular. At Zion, lizards are part of the trickle-down effects (Ripple and Beschta 2006).

At Zion, Ripple and Beschta compared the biodiversity of a "Cougars-Rare" zone, where Mule Deer have become abundant, to the biodiversity of an otherwise similar "Cougars-Common" zone with fewer Mule Deer. They provide an interesting account of the history of Zion, with the heavy visitation by nature enthusiasts since the 1930s contributing to the displacement of cougars from Zion Canyon, the Cougars-Rare zone. Good records of deer populations since the 1930s also aided the study goals.

Lizard relative abundance (number per kilometer) and species richness (number of species) was higher in the Cougars-Common zone than in the Cougars-Rare zone. The number of lizard species in the Cougars-Common



Tree Lizards (*Urosaurus ornatus*) are found where cougars are common, in North Creek, but not in nearby Zion Canyon, where cougars are rare, as is riparian vegetation. Photo © LLC Jones.

zone doubled (see Table, below).

A similar pattern of higher relative abundance in the Cougars-Common zone was found for amphibians, butterflies, wildflowers, and aquatic plants. There were four butterfly subfamilies found in both zones, and six additional subfamilies found in the Cougars-Common zone: the butterfly diversity more than doubled with cougars present. An analysis of fish data showed an analogous pattern as well: more fish where cougars were common. Ripple and Beschta provided support for the key mechanism involved in this ecosystem transition being the Mule Deer herbivory on cottonwoods, in particular causing a drastic reduction in cottonwood recruitment. In the Cougars-Rare zone in Zion Canyon, high numbers of park visitors scared off cougars, deer flourished and diminished the gallery cottonwood forests, greater streambank erosion occurred, and cascading effects on other biota were striking. Important lessons from this work are that: 1) top predators can alter an

entire ecosystem; 2) an apparently benign signature of human influence can be related to drastic ecosystem changes; 3) some parts of US National Parks may be alarmingly degraded—they are not "pristine" areas; and 4) great strides in biodiversity conservation research are happening now. For lizards in Zion, cougars beget biodiversity!

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— Dede Olson

Species	Zion Canyon Cougars-Rare Zone	North Creek Cougars-Common Zone
Eastern Fence Lizard, <i>Sceloporus undulatus</i>	x	x
Sagebrush Lizard, <i>S. graciosus</i>	x	x
Plateau Whiptail, <i>Aspidoscelis velox</i>	x	x
Desert Spiny Lizard, <i>S. magister</i>		x
Common Side-blotched Lizard, <i>Uta stansburiana</i>		x
Tree Lizard, <i>Urosaurus ornatus</i>		x
Lizard density, no./km	~6 / km	~16 / km