

Western Ecological Research Center

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Contact:

Dr. William I. Boarman

Phone:

858-637-6880

Email:

william_boarman@usgs.gov

San Diego Field Station, USGS Western Ecological Research Center, 5745 Kearny Villa Road, Suite M, San Diego, CA 92123

Spatial Distribution of Risk of Desert Tortoise Predation by Common Ravens

In the western Mojave Desert, common ravens have increased in numbers by 1,500 percent over the last several decades, subsidized by human developments in the region. Large numbers of non-breeding common ravens live in and around human communities, while breeding ravens are more evenly distributed across the landscape. A recent publication in *Ecology* explains how USGS scientist Dr. William I. Boarman and Dr. William B. Kristan, an adjunct professor at California State University, San Marcos, used tortoise models to test this hypothesis.

The scientists left small, styrofoam tortoise models, which resembled juvenile tortoises about 2 inches long, at 100 sampling points in the Western Mojave Desert on and around Edwards Air Force Base. Raven attacks left distinctive punctures in the top or long cuts around the sides of 29 of these bait tortoises. After four days, the tortoise models were retrieved and assigned scores by whether they had raven bill impressions. A computer model for risk of raven predation on desert tortoises was developed based on these data and on surveys of raven abundance at the sampling points.

The researchers' findings suggested that areas of elevated predation risk occurred under two different circumstances. First, predation risk was close to 100 percent near large groups of ravens that were distant from successful nests, usually near roads and landfills. These raven groups exert a higher predation pressure than if the same area was occupied by a territorial pair of ravens, because they are densely concentrated and do not spend time and energy defending resources. Second, predation risk reached between 44 and 59 percent near successful nests that had relatively small numbers of ravens in the vicinity. In this case, the breeding ravens do not have

Management Implications:

- Desert tortoises face predation pressure from both large groups of ravens and breeding pairs; consequently, decreasing the regional raven population may be the only way to alleviate impacts on declining tortoise populations.
- Areas that concentrate large number of ravens, such as landfills, may exert a disproportionate amount of raven predation on nearby tortoise populations. Such areas should be managed to reduce their use by ravens.
- Because increased raven reproductive success increases the risk of tortoise predation, features such as roads, which promote raven reproduction by providing road-killed animals as food subsidy, may also be risk factors for tortoises. Unlike towns and landfills, roads are distributed throughout both developed and undeveloped desert.

to spend a lot of their time defending their territory, allowing them to become more effective predators. An alternative explanation is that there is an increased demand for prey near successful nests, and to meet the demand, adult ravens must either spend a greater proportion of their time hunting or perhaps choose an available prey item that they might otherwise not target. Where large numbers of intruders occurred near successful nests, a rare circumstance, predation risk was 0 percent, possibly indicating that increased effort devoted to territorial defense reduced the time devoted to hunting prey by the territorial birds.

Kristan, W. B., III, and W. I. Boarman. 2003. Spatial distribution of risk of desert tortoise (Gopherus agassizii) predation by common ravens (Corvus corax). Ecology 84(9):2432-2443.