USGS
science for a changing world

Western Ecological Research Center http://www.werc.usgs.gov

Nonnative Grass Invasions and Fire in the Sonoran Desert

Fires appear to have been infrequent historically in the saguaro-palo verde plant communities that characterize the Sonoran Desert's Arizona Upland. Both saguaro cacti and palo verde trees suffer great losses when exposed to fire, their thin outer layers failing to provide protection from excessive fire temperatures.

Two nonnative grass invaders increase the hazard of fires during the parched arid foresummer of June and July. Winter precipitation promotes the growth of annual red brome *(Bromus madritensis),* whose persistent dry stems can add to fuel loads for 2–3 years after the seeds have dropped. Warmer summer rains promote perennial buffelgrass *(Pennisetum ciliare),* which has spread even to the remote backcountry.

The results of these fires can be devastating and cause lasting changes to desert communities. U.S. Geological Survey researchers have collaborated with the National Park Service and Bureau of Land Management in fire studies. They have determined that there are increased risks to the survival of saguaros and tortoises by exposure to fires fueled by nonnative grasses.

The researchers found that 11 percent of a sample of tortoises were killed by the 1994 Mother's Day fire at Saguaro National Park in Tucson, Arizona. More than 20 percent of a sample population of saguaros died within five years following the fire. Losses such as these are considered to be catastrophic among long-lived species. In fact, the fires that follow invasions by nonnative grasses have the ability to change the structure of the deserts. Even less-intense fires are causing long-lasting changes in the composition and diversity of plant communities.

Fire-killed desert tortoise. Photo: L. DeFalco.

Research is still needed on:

- Fire behavior
- Fuels management
- Seed bank ecology
- Invasive plant control
- Effects of habitat change on native plant and animal communities

Researchers are only beginning to understand the changes in Southwestern deserts that result from these plant invasions and fires. The problems of nonnative plant invasions, increased fire frequency, and restoration are interrelated and require an integrated research program to gain valuable information for managers.

For more information, contact:

Dr. Todd C. Esque
USGS Western Ecological Research Center
Las Vegas Field Station
160 N. Stephanie
Henderson, NV 89074
Phone: 702.564.4506
Email: todd_esque@usgs.gov

Dr. Cecil R. Schwalbe
USGS Southwest Biological Science Center
Sonoran Desert Research Station
125 Biological Sciences East
University of Arizona
Tucson, AZ 58721
Phone: 520.621.5508
Email: cecil_schwalbe@usgs.gov