

A DASH OF SALT

Researcher assesses salinity impacts on grasses, trees and shrubs

A Texas A&M researcher is assessing the impact of using moderately saline water for irrigating urban landscapes in West Texas and southern New Mexico.

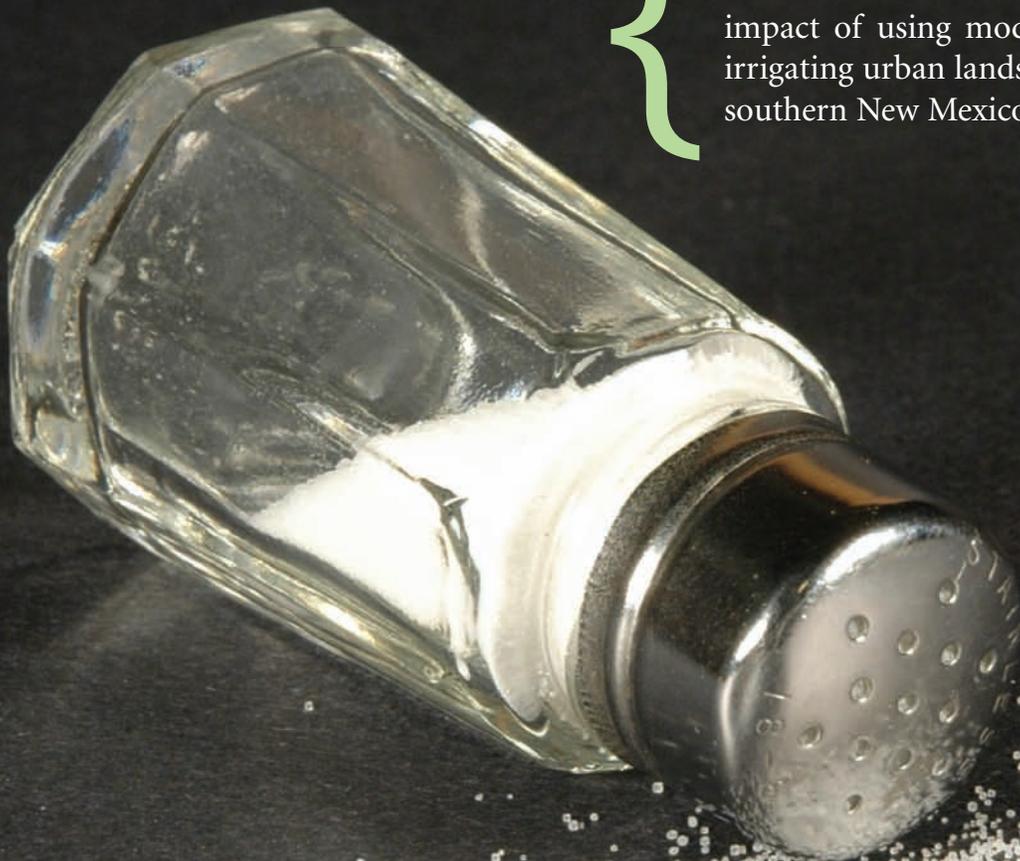




Fig. 1 – Foliar damage in Mulberry (*Morus alba*), pictured at left, and Arizona Cypress (*Cupressus arizonica*).



“The primary purpose of using moderately saline water for irrigation, including reclaimed water, is to conserve potable [drinkable] water,” said Dr. Seiichi Miyamoto, a professor and researcher with the Texas Agricultural Experiment Station at The Texas A&M University System Agricultural Research and Extension Center at El Paso. Miyamoto said he is evaluating salinity in water used for landscapes because he is seeing more landscapes damaged from too much salt in the water (containing dissolved salts near or in excess of 1,000 parts per million) used for irrigation. “We just do not have good guidelines to assess potential salinity hazards to landscape plants and soils,” he said.

Most reclaimed water in California, Arizona and New Mexico has salinity well below 1,000 ppm, but salinities of reclaimed waters in West Texas and some areas of southern New Mexico and central Arizona usually exceed 1,000 ppm, sometimes reaching 1,500 ppm or higher, Miyamoto said. Other areas, such as Midland-Odessa, may have even higher salinity levels.

The most common salt-induced problem appears as foliar damage when broadleaf trees or shrubs are sprinkler-irrigated, he said. Plant damage caused by sprinkler application of reclaimed water has been extensive and acute (fig. 1).

“We did not know plants are so sensitive to this form of salt damage,” Miyamoto said. “Many plants grow fine along the coast where seawater spray containing 35,000 ppm of salt hits foliage during high winds.

“We conducted an experiment where different types of landscape plants were sprinkled for 30 minutes every other day, a practice common at golf courses and city parks. We found that broadleaf deciduous trees are sensitive to this form of salt damage, while pines and junipers, which grow near the coast, are tolerant.”

Miyamoto said he believes that high-frequency irrigation used for maintaining landscapes is compounding this problem. Researchers also found salt crusts on leaf surfaces.

“It was a bit of a surprise when we saw salt crusts directly on the leaves, but it is not really surprising if you consider how the windshield of your car would look if it were sprinkled every other day for 180 days a year, with little or no rain,” he said. “You would not be able to see through it. We now have a guideline for assessing this type of salt damage for different species of plants.”

With this type of problem, Miyamoto said, “the key thing to remember is not to hit the plant leaves with sprinkler streams.”

In mature trees, this can be accomplished by converting sprinklers to low-trajectory or under-canopy types of sprinklers (fig. 2); however, this option may not work for shrubs and ground covers. The use of non-sprinkling irrigation systems, such as bubblers and drips may be needed. Infrequent deep irrigation does help, but not enough to correct the problem, he said.





Fig. 2 – Conversion to low trajectory sprinkler (a) and to bubblers (b) for reducing foliar damage.

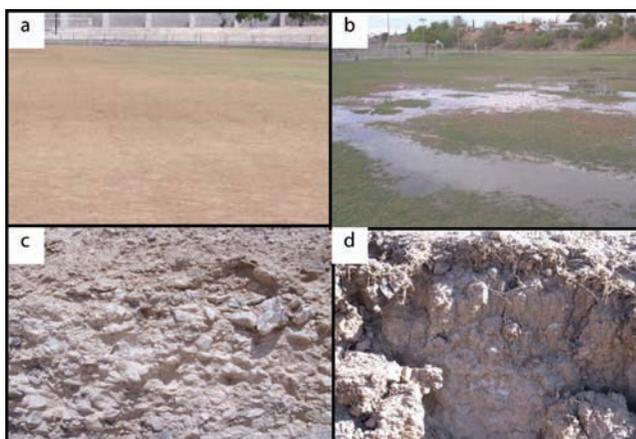


Fig. 3 – Examples of athletic fields affected by poor soils and salt accumulation. Clockwise: (a) upland soil, caliche, (b) bottomland soil, (d) a closeup of (b), and (c) a closeup of (a).

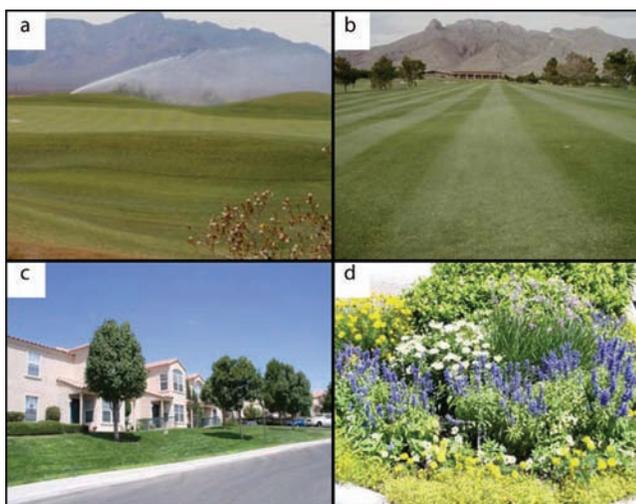


Fig. 4 – Successful use of reclaimed water for landscape irrigation: (a) golf course without trees, (b) upland soils with slope, (c) upscale apartments, and (d) flower beds with drip.

The second most frequent problem is soil salinization, or too much salt accumulation in the soil. This usually occurs in clayey (silty clay loam, clay loam and clay) bottomland and some upland soils that are poorly drained. Poor soil and irrigation management can also lead to soil salinization, even when inherent soil properties are suitable, he said.

Miyamoto said there is a definite need to develop guidelines for assessing soil suitability for irrigation with moderately saline water. To develop these guidelines, scientists are using athletic fields for their research. Poor turf growth caused by insufficient top soil, poor drainage and salt accumulation are just a few of the soil problems found in old and new athletic fields (fig.3).

Miyamoto’s research group at El Paso has developed a simple method of assessing soil salinization potential for recently formed, relatively uniform alluvial soils in the valley, referred to as Entisols. The research results show that soil salinity under the prevailing irrigation practices is influenced greatly by soil permeability. In Entisols, soil permeability is controlled to a large extent by soil texture and soil compaction. Therefore, soil salinization potential can be estimated from soil textural classes, field-use categories, and, of course, irrigation water salinity, Miyamoto said. According to these guidelines developed by Miyamoto and Chacon, soil salinization is likely in athletic fields (with extensive foot traffic) when the field consists of clayey soils and is irrigated with moderately saline water.

Miyamoto and his associates also developed publications in cooperation with El Paso Water Utilities on plant response to soil salinity. *Landscape plant lists for salt tolerance assessment* and *Photo Guide: Landscape plant response to salinity* covers more than 100 species of plants used for landscapes in the Southwest. Copies of these publications are available by contacting the Research and Extension Center at El Paso at (915) 859-9111.

Research is still not completed for upland areas where soils rich in calcium carbonate prevail. There are several cases where drainage problems appeared in stony sediments that make up foothills. These areas

are prime locations for urban growth, and athletic fields are constructed by placing topsoil over the stony sediment. According to Miyamoto, these stony sediments tend to seal and impair drainage. The cause is currently being investigated.

“These findings are somewhat of a concern to us,” Miyamoto said. “For one thing, public parks and school sports fields are built with engineering specifications covering soil stability and strength, but not for suitability for maintaining turf with water of moderate to elevated salinity.

“Knowing salt accumulation in certain types of soils, it seems that we may have to modify existing soil preparation guidelines in one of these clays,” he said.

At the same time, we should keep things in perspective, he said. When soil conditions are suitable and leaf damage is controlled, moderately saline water is excellent for turf irrigation, he said. There are many examples of successful uses on urban landscapes and golf courses (fig. 4). When the soil condition is not good, researchers said they need to find ways to amend it. This is also part of their ongoing research.

Miyamoto said the Rio Grande Basin Initiative, along with a matching fund from municipalities, have been instrumental for funding this type of applied research program. Without them, he said, “we would not have come this far.”

For additional information and a list of resources, please visit <http://twri.tamu.edu/news/2006-09-25-01/> or contact the Research and Extension Center at El Paso at (915) 859-9111. 

TWRI awards Mills Scholarships to graduate students

The Texas Water Resources Institute recently awarded Mills Scholarships to 13 Texas A&M University graduate students to pursue water-related research for the 2006-07 academic year.

TWRI's Mills Scholars Program, an endowed fund that supports research in water conservation and management, provided the \$1,500 scholarships to the students to use for education-related expenses. The scholarship program supports graduate students in diverse water research programs at Texas A&M University.

Students receiving the scholarships and their departments include: Kendra Johnson, Department of Biological and Agricultural Engineering; Vanessa Kelly, Jeremy Rice, Nick Russo III and Kati Stoddard, Water Management and Hydrologic Sciences; Trevor Knight, Department of Wildlife and Fisheries Sciences; Meredith Langille, Oke Nwaneshiudu and Sucheta Parkhi, Department of Civil Engineering; Anna Marie Nordfelt, Department of Geography; Lisa Prcin, Department of Rangeland Ecology and Management; Ronnie Schnell, Department of Soil and Crop Sciences; and Zach Vernon, Department of Forest Science.

Mills Cox, a former chairman of the Texas Water Development Board, endowed this scholarship program.

For more information on the Mill's Scholarship program or to learn more about the projects, contact the Texas Water Resources Institute at (979) 845-1851 or twri@tamu.edu.