

## Rainwater Harvest Study Finds Roofing Material Affects Water Quality

*ScienceDaily (June 15, 2011)* — For the past few years, one of the most common questions facing the Texas Water Development Board (TWDB) hasn't been over contentious water rights or proposed water projects; it's been from homeowners wanting to know what type of roofing material is most suitable for collecting rainwater for indoor domestic use.

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"Rainwater harvesting is becoming fairly widespread, at least in Central Texas. There's interest born out of necessity because people are simply running out of water in rural areas or they're interested in conserving water supplies and it's good for the environment," said Dr. Sanjeev Kalaswad, the TWDB's rainwater harvesting coordinator.

But when it came to responding to residents' questions about which roof collection surfaces are best suited for rainwater harvesting, TWDB didn't have a good, science-based answer to give, Kalaswad said. That's when the Cockrell School of Engineering came in to help.

With funding from TWDB, Cockrell School faculty and students conducted an in-depth study -- recently published in the academic journal *Water Research* -examining the effects of conventional and alternative roofing materials on the quality of harvested rainwater. The study, led by civil, architectural and environmental engineering Assistant Professor Mary Jo Kirisits, showed that, of the five roofing materials tested, metal (specifically Galvalume®), concrete tile and cool roofs produce the highest harvested rainwater quality for indoor domestic use. The study also showed that rainwater from asphalt fiberglass shingle roofs and increasingly popular "green" roofs contain high levels of dissolved organic carbon (DOC). Although other potential pollutants can be significantly lower on green roofs (turbidity and aluminum), the high DOCs are significant where these roofs would be used for potable rainwater collection.

Water with DOC is not necessarily dangerous on its own, but Kirisits said when it's mixed with chlorine -- a common product used to disinfect water -- the two substances react to form byproducts that potentially cause cancer and other negative human health effects.

"Someone who already has a rainwater system is probably not going to change their roofing material based on this study, but this information is useful for anyone who's trying to make an informed decision about what material to use," Kirisits said.

Over the course of a year, Kirisits, her co-Principal Investigators Professor Kerry Kinney and Research Associate Professor Michael Barrett and their engineering students examined water collected from five roofing materials: asphalt fiberglass shingle, Galvalume®, concrete tile, cool and green roofs.

The test sites included both pilot-scale and full-scale residential roofs -- one of which was the roof on the home of Kirisits and her husband. The other roofs were located at or near the Lady Bird Johnson Wildflower Center, where her team had the expertise of the center's director of research and consulting, Dr. Mark Simmons, who helped them interpret some of their findings.

"We had a phenomenal graduate and undergraduate student team. I think the research topic captured their imagination because it's tangible; it's something they could do in their own home. They can talk to their parents about it and they get it," Kirisits said. "Our generation of students is sustainable and green-minded, so it was a great project for them to be involved in and lead."

Rainwater harvesting has been practiced in some form or another for centuries, but its popularity declined in the United States after the advent of large centralized water supply systems that provide cheap, reliable and abundant water.

The practice has experienced a rebirth in the United States in recent years, however, thanks largely to growing environmental concerns and dwindling water supplies in parts of the country.

The U.S. Environmental Protection Agency doesn't regulate the quality of residential rainwater collected through harvesting, but some local agencies and states, like Texas and Hawaii -- which are among the most proactive -- offer voluntary water quality guidelines.

While some roofing materials performed better than others in the study, Kirisits said rainwater harvested from each of the roofs would still have to be treated if the consumer wanted to meet EPA's drinking water standards or reuse guidelines.

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