ABSTRACT

The study of water-saving technology is critically important due to urban population growth, drought, and decreasing potable water supplies in Texas and throughout many parts of the world. Because current water supplies are not expected to meet water demand in the coming decades, this could have serious impacts on families, industrial growth, and economic stability. At the same time, water is wasted every year by inefficient or improper landscape irrigation practices. After thorough research on products available on the market today, it was found that none exist with the function of managing lawn/landscape irrigation based on detection of runoff. Thus, designing a device which could mitigate landscape runoff could potentially 1) offer greater landscape irrigation efficiency and water conservation, 2) improve water quality of streams and lakes, and 3) contribute to efforts aimed at addressing the future water crisis.

This research investigated a Landscape Irrigation Runoff Mitigation System (LIRMS) for minimizing irrigation water losses from residential or commercial landscapes. Four types of irrigation runoff sensors were designed and manufactured. A central control module for receiving signals from sensors and controlling several irrigation valves at the same time was also designed. Afterwards, the prototypes were installed in the field and hardwired with the central control module along with two control plots with no runoff sensors installed. The different prototypes were evaluated based on their performance characteristics including the ability of each to work reliably over an extended period of time and to effectively reduce runoff.
A website was designed so that irrigation data could be accessed online. Also, a wireless communication module and an autonomous energy system were designed and tested to allow the wireless communication between the irrigation runoff sensor and the control unit as well as to reduce energy consumption.

The Landscape Irrigation Runoff Mitigation System (LIRMS) equipped with the cubic float prototype/conductivity prototype showed the highest potential for water conservation, leading to a runoff reduction rate of 40% - 50%. Further studies should focus on advancing the wireless communication module and conducting more tests under different irrigation strategies for refining the system to reduce even greater amounts of runoff.

A provisional patent for the system has been filed with the U.S. Patent and Trademark office [1].