

**Project Title:** Water Requirements of Landscape Shrubs and Turfgrass

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**Significance to Industry:**

The State of Colorado is beginning to feel the pressures of population growth. The demand for responsible water management is becoming extremely important. To date there is no quantifiable information with regard to the water use of plants commonly used in Colorado's landscapes. The green industry must use empirical data and guess work to guide their irrigation practices, landscape design and water management policies. This project mirrors a study on annuals conducted by Colorado State University which resulted in useful data and proof that annuals could survive and remain attractive using only 50% ET.

The Green Industry of Colorado has worked hard to develop Best Management Practices (BMP's) for all segments of the Green Industry. The BMP's are and continue to be a work in progress. Research data from this project will help define and give credence to water management BMP's.

**Research Methodology:**

The 2005 season of this three-year project was used to establish the plants and measurements were taken in 2006 and 2007 growing seasons.

The measurements used in this project serve two main purposes. The first is to determine the plants water use. The second is to document the physiological effects of the plants going into stress. The crop coefficient system will be used to express plant water use.

Crop coefficients are used throughout the world to estimate what a plants water use or evapotranspiration will be. This coefficient system is most common in the agricultural practices. However, over the past two decades a variety of factors including increasing average temperatures and more frequent drought in the United States have brought about an increased application of crop coefficients to landscape plants.

Crop coefficients are based on a reference evapotranspiration ( $ET_o$ ). This reference evapotranspiration ( $ET_o$ ) is the amount of water a cool season grass evapotranspires in a day, typically Kentucky Bluegrass or full cover Alfalfa are used. This information is commonly available on the web.

This project has two main study areas. The first is the lysimeter study area. Here there are four replications of eight shrub species and two grass species. A weighing lysimeter will be used to measure plant water loss. The Penman-Monteith equation is used to calculate the plant water loss or evapotranspiration ( $ET_c$ ). The data collected here will be a base upon which crop coefficient values and ranges can be assigned in industry Best Management Practices (BMPs).

In addition to the weighing lysimeter, selected plants will have their vital signs documented throughout the growing season (vital signs meaning leaf pressure, stomatal conductance, transpiration, leaf temperature and solar light intensity). The leaf pressure is measured with a pressure bomb. The stomatal conductance, transpiration rate, leaf

temperature and solar light intensity are measured with a perometer. These instruments will be able to document the physiological processes of a plant going into stress. The data collected will be analyzed for both diurnal and seasonal variance.

The second area is the drought tolerance study area. This study area contains four sections with five replications of each shrub and turf grass species. Within each section all shrubs and grass species will receive the same amount of water. The amount of water given to each section is a percentage of reference evapotranspiration ( $ET_o$ ). The percentages of reference evapotranspiration ( $ET_o$ ) are 0%, 25%, 50% and 100%.

Soil moisture sensors have been installed in each section. The Diviner 2000 soil moisture sensors measure the amount of water in the soil at 10 cm intervals down to 70 cm. With these soil moisture sensors we hope to get a description of the wetting front of irrigation events. With calibration, we will be able to use the sensors to accurately track the movement of water within each irrigation section. Using the soil moisture sensors, we will fine-tune the irrigation schedule to determine the appropriate frequency of irrigation events for shrub species.

The grass species soil moisture will not be determined using the Diviner 2000. TDR probes will be used to document the soil moisture within the grass plot areas.

The shrubs and grass will be monitored throughout the growing season to note changes in appearance. These changes will be recorded both through visual documentation and selected growth data measurements.

Work continues at the CSU Plant Environmental Research Center (PERC). Tests are being conducted to improve the project's methods. The baseline data sets are being analyzed. The soil moisture sensors are being calibrated and tested.

### **Other Sources of Funds:**

Various GreenCO organizations have cooperated on this research project. Foundations include: GreenCO, American Society of Landscape Architects Colorado Chapter and Colorado Nursery and Education Foundation. State wide organizations contributing to the research include: Colorado Nursery and Greenhouse Association, Colorado Water Conservation Board, Garden Centers of Colorado, Associated Landscape Contractors of Colorado, Rocky Mountain Sod Growers Association and the Colorado Water Wise Council. Numerous individual nurseries throughout Colorado and the United States also have made initial contributions.

Several of the foundations and associations have pledged additional monetary support for the 2008 growing season of the research project. The monetary support for the research will need to come from numerous foundations, organizations, association and individual companies if we wish to continue this research in 2008.

### **Request for Grant Money:**

Half-time Graduate Research Assistantship for twelve months (stipend and tuition)	\$18,500.00
Plant material (hopefully will be in-kind donation)	\$ 2,200.00
<b>Total cost for first year</b>	<b>\$20,700.00</b>
<b>Total cost for second year</b>	<b><u>\$20,000.00</u></b>
<b>Total cost for two years</b>	<b>\$40,700.00</b>

**Use of Grant Money:**

We are requesting \$5,000 for the 2008 growing season. The funds will contribute to the ongoing plant water requirement research at Colorado State University. At the Think Tank meeting held in early November, the group suggested continuing the study but using more high water demanding shrubs and take data during the establishment year (minutes of meeting attached).