International **Erosion Control** Association

For Immediate Release

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Technical Paper Describing Ability of Plant Roots to Strengthen Soil Earns Recognition for Excellence in Erosion Control

Steamboat Springs, CO. A report describing research on the engineering properties of plant roots for reinforcing soils has been honored with an international award for its contribution to the erosion control industry. The results of the study, which involves four riparian plant species, can be used to determine the stability of existing vegetated slopes and to design vegetated riverbanks, shorelines, highway embankments, landfill caps, contaminated sites, and other reclamation applications where the mechanical contribution of root reinforcement is important in predicting soil behavior.

The methods used to measure the contribution of plant roots to soil shear strength and the findings are presented in a technical paper titled, *Soil Strength Reinforcement by Plants*. It has received the 2006 Most Distinguished Technical Paper Award from the International Erosion Control Association. The award is given to one paper, prepared for the IECA annual conference, which contributes most significantly to advancing erosion control knowledge. It recognizes concise, clear technical writing that presents innovative solutions to erosion control problems.

The award was presented to the paper's author, Wendi Goldsmith, president of The Bioengineering Group Inc, Salem, Mass., during formal ceremonies at the annual IECA conference in Long Beach, California, Feb. 22, 2006.

The use of vegetation in soil bioengineering applications offers a more environmentally-friendly alternative to traditional engineered materials, such as concrete or steel, for providing structural reinforcement in stabilizing slopes. However, little quantitative research has been conducted to assess the impact of plant roots on soil strength. As a result, most designers tend to favor structural measures for reinforcing soil that lack the ecological benefits of vegetation.

"During my 15 years of practicing bioengineering design, I came to recognize that the absence of suitable data for input into common geotechnical stability formulas posed the most obvious obstacle to using plants effectively," Goldsmith says. "So I set about to adapt an approved ASTM testing methodology in order to generate those numbers."

The EPA office of Research and Development contributed funding towards this investigation.

In her research, Goldsmith measured the soil reinforcing effects of two herb species – tussock sedge and switch grass -- and two tree species – common cottonwood and black willow – which are typically used for site remediation and habitat restoration. She tested the shear strength of soil block samples permeated with roots of these four species and compared the results with shear strength tests of unvegetated soil blocks with similar soil types.

Goldsmith found that the root systems of switchgrass and black willow produce a five-fold increase in the shear strength of soils compared to fallow soils, with nearly as high an effect for the other two plant species. "Root elongation or slippage, rather than breakage, was the most common condition during failure for the grass and the sedge," Goldsmith explains. "This appears to explain how herb species can survive after a minor slope failure, which we have observed in numerous field conditions. The real beauty of these treatments is that they have the capacity to self-heal and regenerate, unlike inert materials. Plus, they provide habitat and water quality functions as well."

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The nature of the treatments, the testing procedure and analytical approaches used in this research are conservative. As a result, she notes, it's likely that the actual role of plants in strengthening soil is greater than documented in this research.

"I hope this study will support the work of a broad set of planners, designers and regulatory reviewers who are often faced with decisions regarding the selection and development of sites that could benefit from more rigorous evaluation of the soil strength contribution of plants," Goldsmith says. "Ideally, this and follow-up studies can help establish both the merit and a practical approach to incorporating vegetation for its physical function in land stabilization, including situations where it is currently routinely disregarded."

About IECA

The IECA, founded in 1972, is a non-profit professional organization with members in 46 countries around the world who are dedicated to minimizing accelerated soil erosion. This is the 15th year of the annual IECA Environmental Excellence Awards program.

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