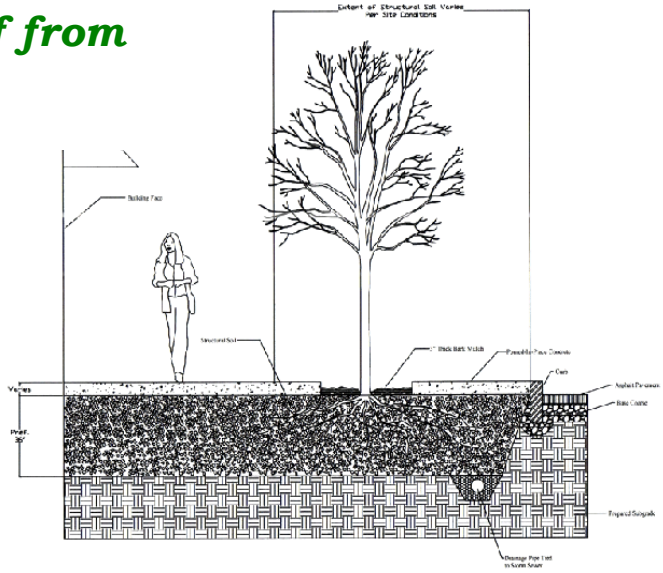
Green Streets
Storm water management system for paved areas

A unique structural soils system will be designed to retain all runoff from a 25-year storm event.



The Initiative
Developing green infrastructure technologies that protect water quality by reducing contaminants in urban runoff is gaining interest among regulators, developers, and consultants. Our research, at the USDA Forest Service, Pacific Southwest Research Station's Center for Urban Forest Research, currently involves quantifying the benefits tree crowns have on runoff reduction. With this project we can build on that existing knowledge by studying how the use of structural soils can enhance the role that trees play in on-site storm water management.

Study Objectives
We are developing and evaluating a storm water management system that directs water to a reservoir of structural soil under pavement. Structural soils are engineered to support vigorous tree growth and reduce root and hardscape conflicts, as well as be load-bearing. Trees are an integral part of the system by first intercepting rainfall to reduce runoff rates, and then removing water from the reservoir with their root systems. Using these engineered soils as runoff treatment and storage sites is a new idea.

Key to our system is its ability to be used in ordinary situations with no additional land area required. All developers and municipalities should be delighted to have a beautiful, compact, shaded parking lot with plenty of parking spaces but no runoff—or a shady broad avenue with arching trees and little or no runoff. These ideals seem impossibly distant from most development today, which provides little space for trees. We are working to increase space for trees by integrating them into the engineered storm water management system in ways that minimize conflicts and make efficient use of valuable land.

Phased Approach
Phase 1— Prototype Development: We are evaluating the physical and biological characteristics of different systems using two readily available structural soils, Cornell University Soil and Carolina Stalite. We also developed a new engineered soil (Davis Soil), using local materials. We are concluding greenhouse and laboratory tests to determine water storage capacity, water movement, structural stability when saturated, and ability of trees to remove water from a structural soil reservoir. We collected polluted runoff from parking lots and streets to test each system's ability to remove pollutants. The composition of the runoff was analyzed before and after passing through filtration cells filled with each type of structural soil.

Phase 2—Demonstration: Selected systems are being installed in several locations for testing. During this phase we are measuring runoff flowing into and out of the systems under a variety of rainfall events to evaluate their field performance and to calibrate the runoff/storage relationships that we developed in Phase 1.

As part of a national study funded through the National Urban and Community Forestry Advisory Council, similar systems are being installed in two locations with differing climates: Blacksburg, VA and Ithaca, NY.

Our ultimate goal is to develop a workable green street technology and foster its implementation.

What is Success
Success will mean increased benefits from urban trees for those responsible for managing storm water, trees, streets, and utilities. Consequently, we will target our findings for an array of constituencies, especially municipalities, engineers, landscape architects, planners and public works professionals. By demonstrating innovative ways to integrate trees into the infrastructure of cities, we are facilitating the development of greener cities .

USDA Forest Service, Pacific Southwest Research Station
Center for Urban Forest Research
www.fs.fed.us/psw/programs/cufr

June 2006