

# Fact Sheet #4: Control Stormwater Runoff with Trees

## Points to remember

RAINFALL INTERCEPTION is influenced by:

- ☛ Intensity and duration of the rainfall event
- ☛ Tree species—deciduous, broadleaf evergreen, or conifer
- ☛ Tree architecture—size, number of leaves, and arrangement of leaves and branches
- ☛ Weather—temperature, relative humidity, net solar radiation, and wind speed

TREES STORE MORE WATER during a 1-inch rainfall event that lasts two days versus one that lasts only two hours. Therefore:

- ☛ As compared to flood events, small storms are responsible for most of the annual pollutant loading of receiving waters
- ☛ Trees are most effective in intercepting rainfall during small events
- ☛ Urban forests are likely to produce more benefits through water quality protection than flood control.

ONE OF OUR STUDIES FOUND that a typical medium-sized tree can intercept as much as 2380 gallons of rainfall per year.

BROADLEAF EVERGREENS AND CONIFERS intercept more rainfall than deciduous species where winter rainfall patterns prevail.



Renderings by Alan A. Loomis, <http://www.deliriousla.net>

Redesign streets where trees work in combination with grass and porous pavers to retain water on site.

TREES WORK IN COMBINATION with other stormwater controls to produce a comprehensive solution to rainfall interception, runoff and landscape water use:

- ☛ Backyard cisterns capture roof runoff, and provide supplemental irrigation
- ☛ Swales hold overflow
- ☛ Bermed lawn-area retention basins facilitate infiltration
- ☛ Grates/drywells capture driveway runoff

STRATEGIES TO ENHANCE the urban forest and improve the control of stormwater runoff:

- ☛ Plant more trees in appropriate places
- ☛ Improve the maintenance of existing trees
- ☛ Plant species with a higher rate of growth where appropriate

- ☛ Plant species with architectural features that maximize interception
- ☛ Match trees (deciduous, evergreen) to rainfall patterns
- ☛ Plant trees in groves where possible
- ☛ Plant low water-use species
- ☛ Plant broadleaf evergreens where appropriate and avoid south-facing windows
- ☛ Use native plants, which, once established, can easily withstand summer dry seasons and reduce the need for supplemental irrigation.

In Oakland, California, the continuous tree canopy is estimated to intercept 4 inches of rain over one acre in a typical year— about 108,000 gallons.

NOTE: In looking for solutions to stormwater runoff it is important to consider an integrated approach that uses other water conservation, water retention, flood management, and pollution control strategies. Community solutions include but are not limited to: porous pavement, vegetated swales and filter strips, recharge areas under parking lots, holding tanks and cisterns under playfields, surface area holding ponds, turf grass filters, and riparian retention and treatment areas. For more information on these solutions see the TreePeople website at <http://www.treepeople.org/trees/charrette.htm>, and their book, *Second Nature: Adapting Los Angeles' Landscape for Sustainable Living*, edited by Patrick Condon and Stacy Moriarity.

# References: Control Stormwater Runoff with Trees

For more information, refer to the following publications:

Chang, G.; J. Parrish; and C. Souer. 1990. The first flush of runoff and its effect on control structure design. Environmental Resource Management Division. Department of Environmental and Conservation Services. City of Austin, Austin, TX. 36 pp.

Claytor, R. A.; and T. R. Schueler. 1996. Design of stormwater filtering systems. The Center for Watershed Protection, Silver Spring, MD.

McPherson, E. G. 1998. Structure and sustainability of Sacramento's urban forest. J. Arbor. 24(4): 174-190.

McPherson, E. G., et. al. 2000. Tree guidelines for coastal Southern California communities. Local Government Commission, Sacramento, CA. 97p.

McPherson, E. G., et. al. 1999. Benefit-cost analysis of Modesto's municipal urban forest. J. Arbor. 25(5): 235-248.

Xiao, Q. F., et. al. 2000. Winter rainfall interception by two mature open-grown trees in Davis, California. Hydrol. Process. 14: 763-784.

Xiao, Q. F., et. al. 2000. A new approach to modeling tree rainfall interception. J. of Geophysical Research. 105(D23): 29, 173-29, 188.

Xiao, Q. F., et. al. 1998. Rainfall interception by Sacramento's urban forest. J. Arbor. 24(4): 235-244.



*Incorporate stormwater treatment into street design by adding trees and swales. From Green Neighborhoods, a publication of NeighborhoodLAB, <http://neighborhood.uoregon.edu/>.*

## Trees protect water and soil resources.

A healthy urban forest can reduce the amount of runoff and pollutant loading in receiving waters in four primary ways:

- 1) Through evapotranspiration, trees draw moisture from the soil ground surface, thereby increasing soil water storage potential.
- 2) Leaves, branch surfaces, and trunk bark intercept and store rainfall, thereby reducing runoff volumes and delaying the onset of peak flows.
- 3) Root growth and decomposition increase the capacity and rate of soil infiltration by rainfall and reduce overland flow.
- 4) Tree canopies reduce soil erosion by diminishing the impact of raindrops on barren surfaces.

## Urban forests can dispose of waste water

Urban forests can provide other hydrologic benefits. For example, irrigated tree plantations or nurseries can be a safe and productive means of wastewater treatment and disposal. Reused wastewater can recharge aquifers, reduce stormwater treatment loads, and create income through sales of nursery or wood products. Recycling urban wastewater into green-space areas can be an economical means of treatment and disposal, while at the same time providing other environmental benefits.

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