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Note: This is the last in a series of three articles about “Landscaping for the Watershed”. This series takes a fresh look at the watershed to reveal ways to turn urban runoff into a resource, rather than a pollution source or flooding hazard. For more information, you can visit the web site of County Landscape & Design at www.owendell.com.

The answer is to take a fresh look at the watershed and to recognize that every square foot of land upstream - whether under natural or manmade cover - is a functional (or dysfunctional) part of that watershed. Communities and individual landowners must take responsibility for their contribution to the problem. Each home, commercial or public building, parking lot and road must be redesigned to reduce or eliminate runoff, to filter pollutants and to be a constructive rather than a damaging element in the larger system to which it contributes.

PERCENT LANDSCAPED AREA

1. ADEQUATE LANDSCAPED AREA: Review and if necessary modify existing requirements for adequate landscaped area on municipal properties to provide absorption of stormwater and [groundwater recharge](#), as well as healthy root environment for trees and other landscape plantings.

ROOFS

1. ECOROOF: Install water-absorbent living [ecoroofs](#) on public buildings. (Germany, Belgium, elsewhere. Tax credits in NYC, Seattle, Chicago, Portland, elsewhere)
<http://www.barrettroofs.com>, http://www.enn.com/enn-news-archive/2000/12/12312000/rooftops_40979.asp, <http://www.greengridroofs.com>

PAVING

1. ALTERNATIVES TO [IMPERMEABLE PAVING](#): Where paving is required, mandate the use of permeable materials and systems.
<http://www.greenbuilder.com/sourcebook/PerviousMaterials.html> (Florida Concrete & Products Association Inc., 3030 Dade Ave., Orlando, Fla. 32804, 800-342-0080, <http://www.fcpa.org>) (Cool Communities, Rome, GA. http://www.coolcommunities.org/cool_pavements.htm)
2. PERMEABLE STREETS: Repave streets with [pervious concrete](#) or other permeable materials. (Florida & deep south, Great Britain, elsewhere)
<http://www.greenbuilder.com/sourcebook/PerviousMaterials.html> (Florida Concrete & Products Association Inc., 3030 Dade Ave., Orlando, Fla. 32804, 800-342-0080, <http://www.fcpa.org>) (Cool Communities, Rome, GA. http://www.coolcommunities.org/cool_pavements.htm)
3. PERMEABLE SIDEWALKS: Use [pervious concrete](#) or other permeable material for construction and reconstruction of sidewalks.
<http://www.greenbuilder.com/sourcebook/PerviousMaterials.html> (Florida Concrete & Products Association Inc., 3030 Dade Ave., Orlando, Fla. 32804, 800-342-0080, <http://www.fcpa.org>) (Cool Communities, Rome, GA. http://www.coolcommunities.org/cool_pavements.htm)
4. NATURAL SIDEWALKS: Where practical, use natural materials like [decomposed granite](#) or [soil paving](#) for sidewalks. The city of Paris, France successfully uses loose and pervious materials extensively in public rights of way. Many communities in the United States and all over the world have no problem with safe, pervious, natural public paths. If [decomposed granite](#) paths are good enough for Alice Keck Park Memorial Gardens, then why aren't they good enough for other pedestrian uses?

5. SIDEWALK REDUCTION PROGRAM: Evaluate the necessity for sidewalks, remove existing sidewalks where practical, and minimizing the construction of new sidewalks. Install sidewalks on one side of the street only.

6. ROOT-FRIENDLY PAVING: Trees offer many advantages to residents and the environment. Sidewalks, roads, foundations and other urban infrastructure are detrimental to the root systems and overall health of trees and other plants. Santa Barbara is a Tree City USA, but like all cities it damages its urban forest through unwise paving techniques. Develop a plan for improved methods of caring for tree root zones, including engineered or [structural soils](#) beneath city sidewalks and streets, "continuous trench" and "root path trench" methods of rootzone enhancement, and pervious paving techniques.

7. NON-TOXIC SEAL COATING: Develop and mandate the use of pavement maintenance materials that do not leach toxic waste.

PARKING LOTS

1. PERMEABLE PAVING: Mandate [permeable paving](#) in all parking lots ([Pervious concrete](#), turf block, gravel, [decomposed granite](#), etc.). (<http://www.greenbuilder.com/sourcebook/PerviousMaterials.html>) (Florida Concrete & Products Association Inc., 3030 Dade Ave., Orlando, Fla. 32804, 800-342-0080, <http://www.fcpa.org>) (Cool Communities, Rome, GA. http://www.coolcommunities.org/cool_pavements.htm) (<http://www.sacbee.com/content/news/neighbors/northeast/story/1335503p-1405103c.html>)

2. INTERNAL DRAINAGE: Grade paved surfaces to drain to central [percolation beds](#) or planter islands that are also designed as [bioswales](#).

3. SUBSURFACE [STORMWATER STORAGE CHAMBERS](#): Use the area beneath paved parking lots to temporarily store storm [runoff](#) by developing [subsurface filter beds](#) and other water-holding & filtration structures.

(T.R.E.E.S. Project: <http://www.treepeople.org/trees>)

4. [PONDING ZONES](#): Direct [runoff](#) from paved areas to on-site ponding or recharge areas.

5. PARKING STALL SIZE REDUCTION: Reduce overall parking lot size by downsizing individual stalls.

6. PARKING LOT SWEEPING: Sweep all paved parking lots, at a minimum in fall prior to the start of rainy season.

7. NON-TOXIC SEAL COATING: Develop and mandate the use of pavement maintenance materials that do not leach toxic waste.

CURBS & GUTTERS

1. "DRAGONTOOTH" OR [CUT CURBING](#) TO ALLOW WATER MOVEMENT INTO SOIL: Where curbing is necessary, install pervious or gapped curbing to permit water to run off pavement into adjacent vegetated [swales](#) where it can be absorbed into the soil.

2. ELIMINATION OF CURBS & GUTTERS: Unless geological, hydrological or other considerations prevent it, remove existing curbs and gutters and replace them with natural vegetated [bioswales](#) which will delay [runoff](#) into creeks and absorb and filter stormwater before it reaches waterways.

STORMWATER SYSTEMS

1. STORMDRAIN FILTRATION: Provide filtration systems on storm drain inlets.

2. PONDING ZONES AT INLETS: Where feasible, raise [stormdrain inlets](#) to create [ponding zones](#) for [groundwater recharge](#) and filtration.

3. [RETENTION GRADING](#): Where geologically and hydrologically appropriate, include [bermed](#) ponding areas and [swales](#) to hold water on site.

[WATER HARVESTING](#) & GROUNDWATER RECHARGE

1. NEIGHBORHOOD PERCOLATION ZONES: Create and maintain areas of open, vegetated land in

low-lying neighborhoods to serve as [percolation](#) zones to capture storm [runoff](#) and allow it to enter the ground water table. These could also serve as community parks and gathering places.

2. GRAYWATER SYSTEMS: Develop [graywater](#) systems in public buildings and schools. Make these available as an educational resource for the community to learn how to develop graywater systems on private property.

(<http://www.rmi.org/sitepages/pid287.php> , <http://oasisdesign.net/index.htm>)

3. CISTERNS & RAINWATER CATCHMENT SYSTEMS: Install [cisterns](#), [waterwalls](#) and other rainwater catchment and storage systems on municipal properties. These can be used in two ways: 1.) to slow the entry of storm water into waterways, mimicking natural systems that are not possible to restore in urban areas, and 2.) provide pure water for irrigation and even for potable use. Use these systems as public examples of successful approaches to rainwater catchment.

(http://dmoz.org/Science/Environment/Water_Resources/Rainwater_Harvesting)

(<http://www.edgewaterenviro.com/rainwater.htm>) (<http://www.rmi.org/sitepages/pid287.php>)

4. DRY STREAMBEDS: Install natural [dry streambeds](#) in [runoff](#) areas. Where appropriate, include [percolation chambers](#) to direct storm water into the ground.

BIOFILTRATION

1. BIOSWALES: Develop vegetated [bioswales](#) in public parks and other public properties, as well as on the edges of public streets and roadways. These can serve multiple functions: slow stormwater [runoff](#) into waterways, filter pollution, reduce the need for street sweeping, save the cost of expensive [pave-and-pipe](#) infrastructure in new developments, maintain or restore a pleasant rural atmosphere in neighborhoods, sequester carbon, produce oxygen, recharge [groundwater](#), provide habitat for native plants and wildlife, act as small local mini-green spaces.

STREET SWEEPING

1. ROUTINE STREET SWEEPING PROGRAM: Regular street sweeping to eliminate pollution sources such as oils and lubricants, tire rubber, brake lining dust, animal feces and rubbish. At minimum, sweep all streets in fall prior to rainy season. Give highest priority to streets with curbs, gutters and stormdrains that feed untreated stormwater into creeks or ocean; lower priority to rural streets with adequate infiltration zones adjacent to paved roadways.

IRRIGATION WATER MANAGEMENT

1. WATER MANAGEMENT IN PARKS & PUBLIC PROPERTIES: In addition to existing water management programs and practices, take watershed issues into account in all water management decisions, training and equipment upgrades. Consider [runoff](#), [percolation](#), ground water recharge, etc.

FERTILIZER USE REDUCTION

1. FERTILIZER APPLICATION MANAGEMENT: Develop and follow stringent guidelines for fertilizer application on all public properties.

2. TRAINING PROGRAMS: Train public grounds maintenance employees and companies contracting with public agencies for maintenance services in proper fertilizer use.

3. MUNICIPAL COMPOSTING AND DISTRIBUTION SYSTEM: Develop and implement a municipal [greenwaste](#) composting system. Distribute compost in place of fertilizer on public properties.

4. USE OF ORGANIC FERTILIZERS: Encourage the use of organic fertilizers over chemical fertilizers. Organics are more resistant to leaching and are also better for plants, and the [soil foodweb](#).

5. LEAF LITTER RETENTION: Encourage the practice of allowing leaf litter to remain in place where appropriate. Removal of leaf litter disrupts the nutrient loop and makes it necessary to import lost nutrients in the form of fertilizers. It also exposes the soil to drying and erosion, leading to excess silt flows.

6. LOW NUTRIENT-REQUIRING PLANT SPECIES: Encourage the use of plants that require little or no supplemental fertilization.

PESTICIDE USE REDUCTION

1. REDUCTION/ELIMINATION OF MUNICIPAL PESTICIDE USE: Reduce or eliminate use of pesticides on all public properties.
2. PESTICIDE BAN FOR ORNAMENTALS: Follow the lead of Halifax, Nova Scotia in banning the use of pesticides for ornamental plants.
3. PEST-SUSCEPTIBLE PLANT REDUCTION: Remove species that are known to be especially susceptible to pest and disease infestations and replace them with durable, low-maintenance species.

ORGANIC MULCHES

1. MULCHING PROGRAM: [Mulch](#) all open ground and planter beds in public parks and other properties. Maintain a minimum 3 inch thick cover of mulch at all times. Mulch improves water absorption, reduces [runoff](#), improves the [soil foodweb](#), prevents surface erosion, reduces water loss by evaporation, improves the root environment for plants and improves the appearance of planting beds.
2. PUBLIC EDUCATION: Educate the public about the advantages of [mulch](#), including improvement of the ability of soil to absorb water.

HOMELESS SHELTERS & TOILETS

1. HOMELESS SHELTERS: Provide year-round shelter for homeless residents in order to eliminate homeless encampments along creeks and elsewhere.
2. PUBLIC TOILETS: Improve the availability of public toilet facilities.

ANIMAL WASTE CONTROL

1. PUBLIC EDUCATION: Publicize the impact of animal wastes on the watershed through flyers, direct mailings to pet and domestic animal owners, workshops for animal welfare groups and programs in schools.
2. REGULATIONS: Strengthen and/or enforce regulations requiring pet owners to take responsibility for waste.
3. STREET SWEEPING: See above.
4. CLEANUP MATERIALS AND FACILITIES: Provide mutt mitts and other facilities at all appropriate public sites.

CLEAN VEHICLES

1. VEHICLE REDESIGN: Encourage the development of sealed engine compartments to reduce leakage of oil and other fluids.
2. NON-TOXIC WEARING SURFACES: Encourage the development of non-toxic tires, brake linings and other wearing surfaces that deposit abraded materials into the environment.

CREEKSIDE RECREATION

1. PROVIDE RECREATIONAL OPPORTUNITIES ALONG URBAN CREEKS: Do as San Luis Obispo has done and create attractive, usable public spaces along lower Mission Creek.