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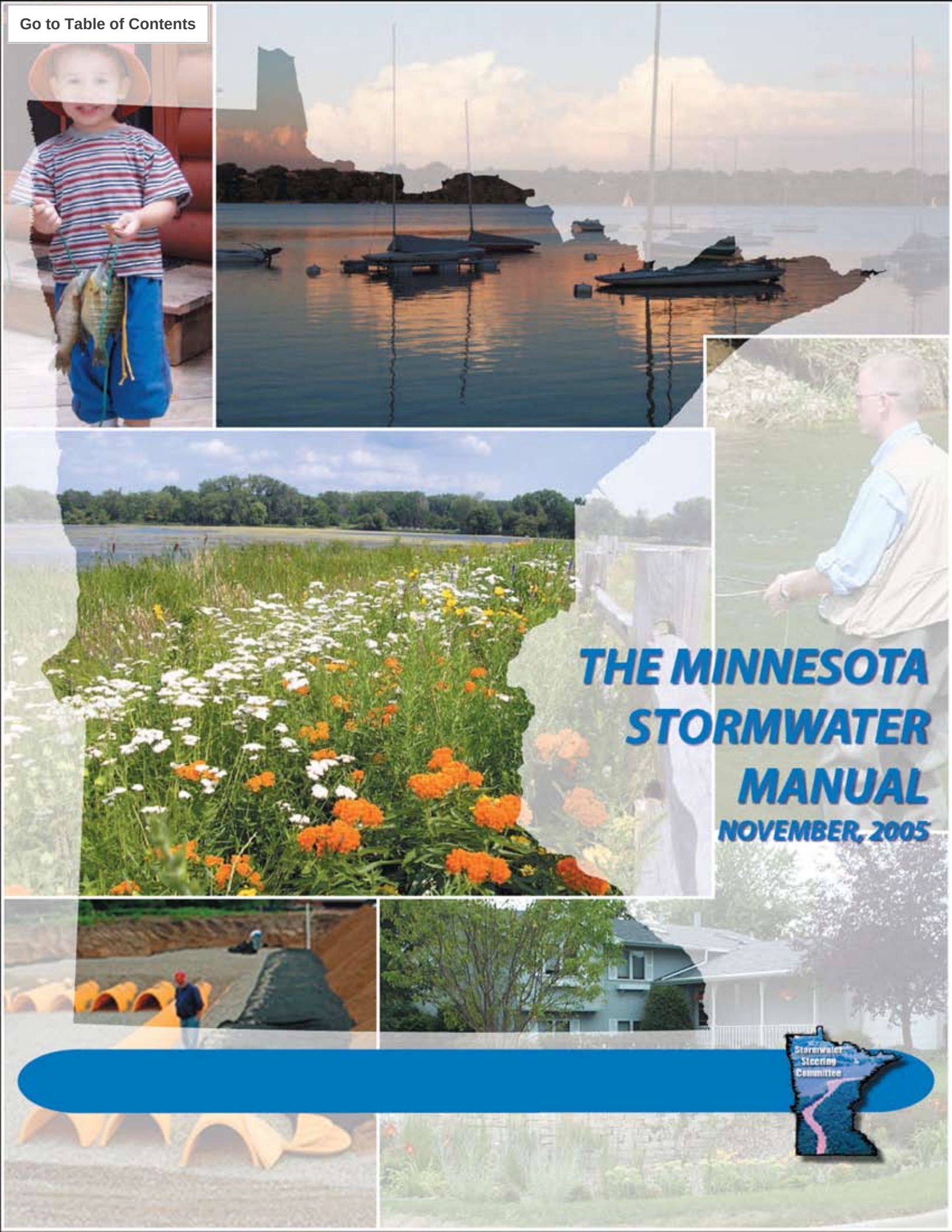

THE MINNESOTA STORMWATER MANUAL

NOVEMBER, 2005

Stormwater Steering Committee

E. Landscaping

Many of the previous practices could also be included in a general category that stresses the importance of stable landscapes with native vegetation. In many respects, this is LID/BSD with an added emphasis on structuring the land surface to handle moving water from impervious surfaces. Routing water to low-lying (sump) areas where it can soak in, placing planter boxes or grated inlets for watering trees, and contouring slopes to reduce runoff velocity are all variations on the landscaping theme.

Tying low impact drainage features together via corridors or designed natural treatment trains can further enhance overall site volume reduction by creating a string of reduction possibilities.

Table 3.1 Volume Reduction Practices

Process	BMP*	Comments	Location in Manual
Storage	Rain barrel/cistern	Small-scale runoff collectors keep water around for later re-use or slow release	Chapter 12, Runoff Volume Minimization
	Rooftop (green roof)	Storage on a roof prevents water from leaving the site; combining with vegetation (engineered green roof) makes it even better	Chapter 12, Runoff Volume Minimization
	Wetland/pond storage	Combination of standing water surface and vegetative root exposure yields dramatic volume reductions	Chapter 12, Pond and Wetland BMP sections
Conveyance	Vegetated swale	Provides water a chance to soak into the ground and be filtered as it flows	Chapter 12, Bioretention BMPs
	Filter strips/buffers	Variation on vegetated swale with side slope protection	Chapter 12, Temporary Construction Erosion Control and Bioretention BMP sections
Landscaping	Low impact development/better site design	Includes such things as scattered bioretention, shared pavement; native or prairie plantings	Chapter 4
	Bioretention (rain gardens)	Exposes runoff water to plant roots for uptake; can be underdrained and still effective	Chapter 12, Bioretention BMPs

*Note that some BMPs occur in more than one reduction practice

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Chapter 12-1

Pollution Prevention Fact Sheets

This chapter contains residential, municipal, industrial and commercial pollution-prevention fact sheets

Residential Practices

Residential pollution prevention practices are household and neighborhood activities that prevent or reduce the contamination of stormwater.

Key Considerations

Residential pollution prevention practices prevent or reduce stormwater contamination from residential sources such as yards, driveways, sidewalks, and household products.

These practices are often simple, low cost behavioral changes that improve subwatershed water quality by minimizing the introduction of pollutants including sediment, nutrients, metals, bacteria, trash, oil, and toxins.

Each of these practices are highly suitable and effective in cold climates. Table 12.PREV.1 indicates the pollutants controlled by various residential pollution prevention practices while Table 12.PREV.2 describes some of the methods used for each of these practices. See Photo Credits and References for further information.

Eagle Valley - Woodbury, MN

Table 12.PREV.1 Residential Practices Pollutant Controls (Source: modified from the Center for Watershed Protection

Practice	Stormwater Pollutants Controlled						
	Sediment	Nutrients	Metals	Bacteria	Trash	Oil	Toxins
Fertilizer and Pesticide Management	○	●	○	○	○	○	●
Litter and Animal Waste Control	○	●	○	●	●	○	○
Yard Waste Management	◑	●	○	◔	◔	○	○
Household Hazardous Waste Control	○	◔	●	○	○	●	●
Alternative Product Use	○	○	○	○	○	○	●
Better Car and Equipment Washing	◑	●	◑	○	○	◑	◑
Better Sidewalk and Driveway Cleaning	●	◑	◑	○	◑	◑	◔
Better Sidewalk and Driveway Deicing	◑	◔	◔	○	○	○	◑
Proper Pool Discharge	○	○	○	○	○	○	●
Septic Tank Maintenance	◔	●	○	●	○	○	◔
Exposed Soil Repair	●	◑	◔	◔	○	○	○
Native Landscaping	●	●	◔	◔	◔	○	○
Healthy Lawns	●	◑	◔	◔	○	○	○

Legend	
○ = Uncontrolled	◑ = Moderately Controlled
◔ = Slightly Controlled	● = Significantly Controlled

Pollution Prevention

Table 12.PREV.2 Residential Pollution Prevention Methods

Practice		Method
	Fertilizer and Pesticide Management	Reduce or eliminate the need for fertilizer and pesticides by practicing natural lawn care, planting native vegetation, and limiting chemical use; follow Minnesota Statutes Chapter 18C and federal regulatory requirements on fertilizer and pesticide storage and application if used.
	Litter and Animal Waste Control	Properly dispose of pet waste and litter in a timely manner and according to local ordinance requirements.
	Yard Waste Management	Prevent yard waste from entering storm sewer systems and water bodies by either composting or using curbside pickup services and avoiding accumulation of yard waste on impervious surfaces; keep grass clippings and leaves out of the street.
	Household Hazardous Waste (HHW) Control	Ensure that hazardous waste, including paints, stains, solvents, cleaning products, used motor oil, antifreeze, and pesticides, are disposed of properly by participating in a County household hazardous waste collection program; properly store hazardous waste items.
	Alternative Product Use	Use less harmful products including alternative cleaning solutions, pesticides, fertilizers, automotive and paint products to reduce the amount of toxic substances released into sewer systems.
	Better Car and Equipment Washing	Wash cars less often and on grassy areas using phosphorus-free detergents and non-toxic cleaning products or use commercial car washes to prevent dirty wash water from flowing to storm sewer systems and water bodies.
	Better Sidewalk and Driveway Cleaning	Sweep sidewalks and driveways and dispose of sweepings in the trash instead of using hoses or leaf blowers to clean surfaces.
	Better Sidewalk and Driveway Deicing	Reduce or eliminate the need for deicing products by manually clearing sidewalks and driveways prior to deicer use; use environmentally-friendly deicing products when possible, apply sparingly and store properly if used.
	Proper Pool Discharge	Check local ordinances for pool water discharge requirements; pool water should be discharged to sanitary sewer systems or held for a week or more without addition of chlorine prior to spreading over pervious areas to prevent stormwater contamination.
	Exposed Soil Repair	Use native vegetation or grass to cover and stabilize exposed soil on lawns to prevent sediment wash off.
	Native Landscaping	Reduce turf areas by planting native species to reduce and filter pollutant-laden runoff and prevent the spread of invasive, non-native plant species into the storm sewer system.
	Healthy Lawns	Maintain thick grass planted in organic-rich soil to a height of at least 3 inches to prevent soil erosion, filter stormwater contaminants, and absorb airborne pollutants; limit or eliminate chemical use and water and repair lawn as needed

Note: See page 7 for photo credits

Pervious Pavement

Pervious pavements reduce the amount of runoff by allowing water to pass through surfaces that would otherwise be impervious. Water can either infiltrate into the ground, if soil permeability rates allow, or be conveyed to other BMPs or a storm water system by an under-drain.

Design Criteria

- Pervious pavement is typically used in low traffic areas including overflow parking areas, emergency vehicle lanes, and pedestrian areas.
- In-situ soils should have field-verified minimum permeability rates greater than 0.3 in./hr. Contributing runoff from offsite should be limited to a 3:1 ratio of impervious area to pervious pavement area.
- The selected systems load bearing surface should be suited to maximum intended loads.
- Design storms should be infiltrated within 48 hours.

Grasspave® at Bradshaw Celebration of Life Center - Stillwater, MN

Benefits

- Good for highly impervious areas – particularly parking lots.
- Reduces need for other storm water BMPs by reducing runoff.
- Construction costs of some systems are less than traditional paving.
- Soil-enhanced turf systems resist compaction, increase infiltration, and provide soils for healthier vegetation.

Limitations

- Construction costs of some systems are more expensive than traditional paving
- Use depends on infiltration rates of underlying soils.
- Maintenance costs are higher than conventional paving.
- Not recommended for high traffic areas because of durability concerns.

Description

Pervious pavements can be subdivided into three general categories: 1) Porous Pavements – porous surfaces that infiltrate water across the entire surface (i.e. porous asphalt and porous concrete pavements); 2) Permeable Pavers – impermeable modular blocks or grids separated by spaces or joints that water drains through (i.e. block pavers, plastic grids, etc.); 3) Amended Soils - Fiber or artificial media added to soil to maintain soil structure and prevent compaction. There are many different types of modular porous pavers available from different manufacturers.

Pervious pavement systems reduce runoff from impervious surfaces by allowing stormwater to pass through the load bearing surface and infill that are selected based upon the intended application and required infiltration rate. Runoff is stored in the stone aggregate base course/ storage layer, if present, and allowed to infiltrate into the surrounding soil (functioning like an infiltration basin), or collected by an under-drain system and discharged to the storm sewer system or directly to receiving waters (functioning like a surface sand filter).

Regular maintenance of pervious pavements is necessary to ensure long-term effectiveness. Annual or semi-annual sweeping or vacuuming of surface debris (litter, sediment, etc.) is STRONGLY RECOMMENDED for pavement or pavers. If clogging occurs, the filtration media below the surface may need to be replaced. Manufacturers should be consulted for specific maintenance requirements.

Currently, the MPCA will allow site designers to reduce the water quality volume sizing when using pervious pavement, up to a maximum of ½ acre of new impervious surface. The MPCA will not allow pervious pavements as a replacement for water quality treatment BMPs, such as infiltration or filtration practices.

Runoff Volume Minimization

Rainwater Harvesting

Rain water harvesting is the practice of collecting rain water from impermeable surfaces, such as rooftops, and storing for future use. There are a number of systems used for the collection, storage and distribution of rain water including rain barrels, cisterns, evaporative control systems, and irrigation.

Design Criteria

- The system should be watertight, have a smooth interior surface, be located on level and stable ground, have a tight-fitting lid, good screens on the inlet and outlet and have an emergency overflow device.
- To prevent the breeding of mosquitoes, empty the water in less than 5 days or place a fine screen over all openings.
- Material can withstand the pressure of water over long periods of time.
- Disconnect and drain rain barrels and cisterns in the winter to prevent freezing and deformation of the rain water harvesting system.

Residential rain barrel - Stillwater, MN

MANAGEMENT SUITABILITY

High*	Water Quality (V_{wq})
Med.	Channel Protection (V_{cp})
Low	Overbank Flood Protection (V_{p10})
Low	Extreme Flood Protection (V_{p100})
High*	Recharge Volume (V_{re})

POLLUTION REMOVAL

100%*	Total Suspended Solids
100%*	Nutrients - Total Phosphorus/ Total Nitrogen
100%*	Metals - Cadmium, Copper, Lead, and Zinc
100%*	Pathogens - Coliform, Streptococci, E. Coli
100%*	Toxins - Hydrocarbons, Pesticides

MECHANISMS

X*	Infiltration
X*	Screening/ Filtration
X	Temperature Control
X	Settling
X	Evaporation
X*	Transpiration
X*	Soil Adsorption
X*	Biological/ Micro. Uptake

SITE FACTORS

Rooftop	Drainage Area
NA	Max. Slope
NA	Min. Depth to Bedrock
NA	Min. Depth to Water Table
NA	SCS Soil Type *can be used in C&D soil types with modifications (e.g. underdrains)
Poor	Freeze/ Thaw Suitability
Suitable	Potential Hotspot Runoff

**Assuming water is drained to a vegetated pervious area. Does not apply to volume of runoff that bypasses the system*