

**BMP Suite for Reducing Thermal and TSS Impacts of Urban Runoff on  
Kinnickinnic River**

BMP Measure	Description	Benefit		Application Comments
		TSS	Thermal	
<b>Category 1- Larger-scale BMP's suitable for end-of-pipe application. Application at relatively small number of locations can have large beneficial impact, expected to give bigger "bang-for-the-buck"</b>				
<i><b>Rock Crib/Cooling Trench</b></i>	Buried rock-filled trench that uses ambient soil temp to cool runoff	Yes	Yes	<ul style="list-style-type: none"> <li>• Can be installed as buried linear feature having minimal interference with above ground passive uses</li> <li>• Tech analysis suggests 6-7 degree C reduction in runoff temperature for trench designed to hold water for 35 minutes or more</li> <li>• 140 foot long 10" x10" trench (.35 void ratio) needed to contain .2" of runoff from imp area from 12-acre downtown watershed</li> <li>• Desirable to have runoff pre-treatment if flow is concentrated already</li> <li>• Several installed and being monitored in Dane Co WI</li> </ul>
<i><b>Thermal swales</b></i>	Vegetated surface swale with outlet control at downstream end	Yes	Yes	<ul style="list-style-type: none"> <li>• Allows cooling of runoff through evaporation and reduction in runoff volume through infiltration</li> <li>• Outflow rate control essential to reduce rate of runoff delivery to stream</li> <li>• Dane Co. WI literature suggests swales 300'-500' in length, 3' deep, with 8" outlet for 100 acre HDR drainage is desirable</li> <li>• Need dedicated surface area to accommodate,</li> <li>• Might enhance effect with shading as long as swale stability is not compromised</li> <li>• Desirable to have runoff pre-treatment if flow is concentrated already</li> </ul>
<i><b>Infiltration Trench</b></i>	Granular filled trench constructed in permeable soil	Yes	Yes	<ul style="list-style-type: none"> <li>• Designed to reduce runoff volume through water loss to soil</li> <li>• Can be installed as buried linear feature having minimal interference with above ground passive uses</li> <li>• Need to field check soil suitability</li> </ul>

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				<ul style="list-style-type: none"> <li>with borings, especially in urban environment</li> <li>Recommendations for separations from building foundations to avoid seepage issues</li> <li>Pre-treatment necessary if flow is concentrated (vs. sheet drainage)</li> </ul>
<b><i>Shaded Detention basin</i></b>	Small shaded surface ponding area where runoff is detained prior to discharge	Yes	Yes	<ul style="list-style-type: none"> <li>Best application appears to be use of existing depressions bordered by mature vegetation that shades all or most of area</li> <li>Main issue is how to get runoff in and out of depression area</li> </ul>
<b><i>Manufactured BMP (swirl concentrators, etc.)</i></b>	Units installed below grade to catch and treat stormwater to remove trash, oil and grease, and TSS	Yes	No	<ul style="list-style-type: none"> <li>Best application for RF may be as pre-treatment for runoff going to another BMP for thermal control</li> <li>30-40% TSS reduction expected with proper design and maintenance (3-4 times yearly)</li> <li>Access to vactor truck needed to do maintenance</li> </ul>
<b>Category 2 – Smaller scale BMP's which if done at a large number of sites can have a significant cumulative impact. Often most suitable for incorporation as part of re-development or utility re-construction activities</b>				
<b><i>Bioretention (such as rainwater garden)</i></b>	Shallow, landscaped surface depression designed to catch and infiltrate/filter runoff	Yes	Yes	<ul style="list-style-type: none"> <li>Best use is to catch and treat sheet drainage from small areas (&lt;1 acre)</li> <li>One application is if land owner is interested in creating visual amenity that acts as “natural” infrastructure</li> <li>Good application would be to construct in center medians of roads and along edges of parking lots to catch and treat sheet drainage (e.g. Menard’s retail store in Eau Claire, H.B. Fuller Co and Wayzata downtown area in TCMA, etc.)</li> </ul>
<b><i>Porous pavement</i></b>	Use of specially constructed pavement that transmits water through it to underlying soil	?	Yes	<ul style="list-style-type: none"> <li>Benefits are associated with runoff volume reduction</li> <li>City of Minneapolis has porous pavement pilot project installation that is being monitored</li> </ul>

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<i>Replacement of blacktop</i>	Blacktop would be replaced with lighter, more heat reflective material such as concrete	No	?	<ul style="list-style-type: none"> <li>Quantification of benefit during critical period vs. cost would be helpful.</li> </ul>
<i>Street-scaping</i>	Use of trees, porticos, etc. to shade impervious areas such as streets, parking lots, and sidewalks	No	Yes	<ul style="list-style-type: none"> <li>This could be incorporated into downtown re-development projects</li> </ul>
<i>Conversion of overflow parking lot hard surface</i>	Use of concrete cells or flexible plastic grids to replace pavement	Yes	Yes	<ul style="list-style-type: none"> <li>Suggested use is for overflow parking lot areas, not high traffic areas</li> </ul>
<i>Green roofs</i>	Veneers of living vegetation installed on top of buildings	N/A	Yes	<ul style="list-style-type: none"> <li>Mimic hydrologic processes associated with open space</li> <li>Reduces runoff volume from roofs through ET, cools runoff that does occur</li> <li>Common practice in Europe</li> <li>Green roof recently installed on Dakota County park shelter in MN near end of 2003 growing season</li> </ul>
<i>Roof-top runoff redirection</i>	Re-direction of downspouts carrying rooftop runoff to pervious areas	N/A	Yes	<ul style="list-style-type: none"> <li>Re-direction would be to pervious area to encourage more infiltration</li> </ul>
<i>Rain barrels</i>	Located to catch and temporarily hold roof-top runoff	No	Yes	<ul style="list-style-type: none"> <li>Mainly for temporary detention of rooftop runoff</li> <li>Suggested use as source of water for planters/ gardens, etc.</li> </ul>
<i>No-mow buffers</i>	Allowing grass to grow to mature height	Yes	Yes	<ul style="list-style-type: none"> <li>Un-maintained buffer areas/strips with native vegetation facilitate infiltration/filtration of runoff</li> <li>Suggested especially for areas close to River and adjacent to parking lots (i.e. the lot north of Division Street and west of Main Street)</li> <li>Sets good example for residents</li> </ul>

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<b>Category 3 – Enhancements to maintenance and education programs</b>				
<i>High efficiency street sweeping</i>	Use of high efficiency sweeper to supplement or replace mechanical sweeping	Yes	No	<ul style="list-style-type: none"> <li>• Grain sizes picked up are smaller than those typically removed by manufactured BMP's</li> <li>• Highest priority areas would be high impervious areas draining directly to the river</li> </ul>
<i>Storm drain stencils</i>	Messages painted near catch basins draining to priority resources	Yes	No	<ul style="list-style-type: none"> <li>• Tool to educate public on direct connection of storm drainage system with River</li> <li>• Increase awareness of public on issue of protection of River</li> </ul>