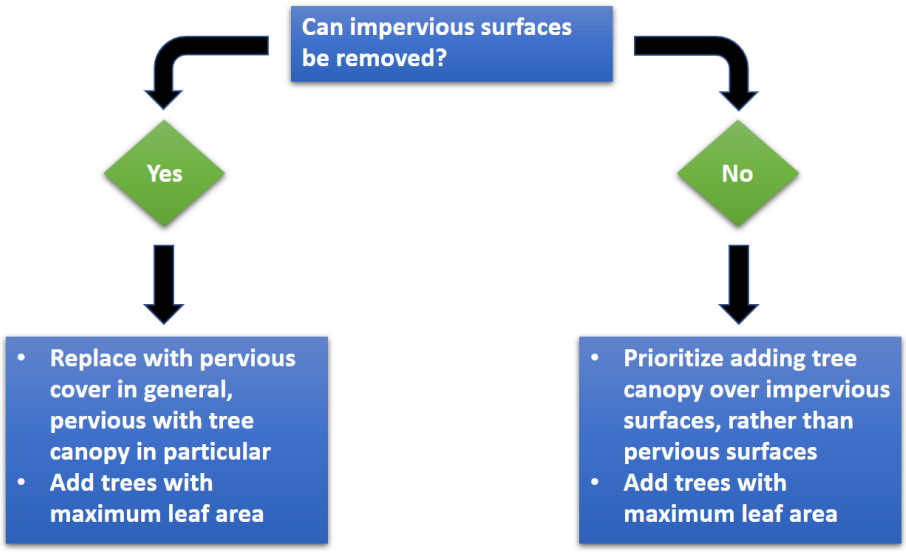
Recommendations for Improving Watershed-Scale Water Quality & Quantity

Based on results from the Great Lakes Restoration Initiative (GLRI) project
Urban Forest Enhancements of Ecosystem Services
Using the i-Tree Suite of urban forestry management software

July 2021

Decision-trees below highlight the approaches which modeling efforts found as most effective in forest planning for watershed health. On-the-ground examples applying these approaches are shared as actionable paths forward.

If your goal is primarily reducing stormwater runoff:



Runoff is largely driven by weather patterns and Directly Connected Impervious Area (DCIA). DCIA is the impervious area where rainfall runs only over impervious surfaces, from where it first lands to where it enters a water body.

We found the largest reduction in runoff is from reduced DCIA. Whether or not DCIA can be reduced, urban trees can slow and reduce runoff while enabling infiltration and many valuable co-benefits.

The *Great Lakes Green Streets Guidebook* (SEMCOG 2013) is a GLRI-funded resource compiling examples of road projects using green infrastructure (GI).

In Onondaga County, NY, the Save the Rain program replaced DCIA with pervious pavers in parking lanes, planted street trees, and installed bioinfiltration trenches.

Replacing DCIA with pavers and bioretention basins significantly impacts runoff, while trees enhance those stormwater benefits and simultaneously clean the air, moderate temperatures, improve wellness, support biodiversity, and more.


Source: Onondaga County Save the Rain


Source: City of Ann Arbor, Michigan

The City of Ann Arbor, MI, upgraded a local road to permeable pavement, increasing infiltration for the basin draining into the area. Reducing DCIA will significantly reduce runoff. Trees complement that effect.

Even if the road stayed impervious, it is lined with street trees surrounded by permeable tiles. This enables infiltration of runoff from nearby DCIA and tree benefits including interception.

Southeast Michigan Council of Governments (SEMCOG). 2013. Great Lakes Green Streets Guidebook. Detroit, MI.

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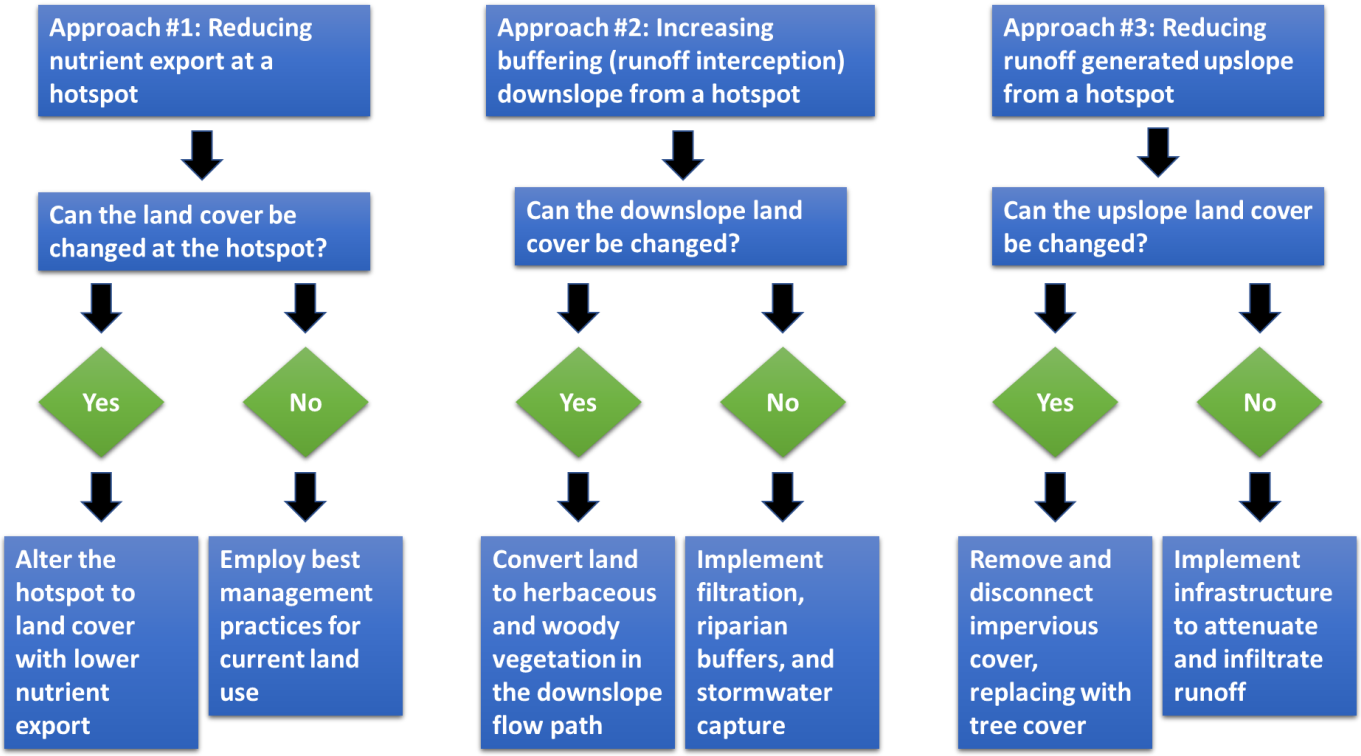
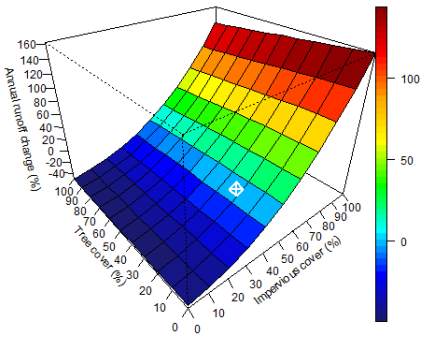
If your goal is primarily reducing nutrient loading to surface water:



Our i-Tree Buffer analysis in 30 Great Lakes watersheds produced maps of hotspot locations most in need of interventions. Multifunctional tree plantings in and around hotspots can help accomplish all three of the above approaches.

GLRI contributes to USDA National Agroforestry Center (NAC) grants and programs, supporting on-the-ground activities to address nutrient loading hotspots while providing many other benefits of trees and diversified agriculture. The NAC offers replicable examples and specific guidelines in resources such as *Conservation Buffers* (Bentrup 2008).

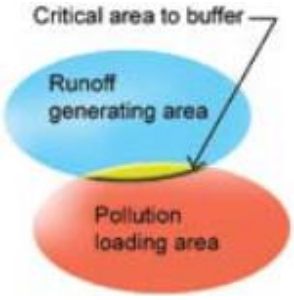


3D graph of percent change in surface runoff for combinations of tree and impervious cover, near Milwaukee, WI.

In urban areas, space for buffering is limited and runoff reduction is the aim.

In rural areas, buffers are a key best practice for water quality.

Conservation Buffers agrees with our findings about priority locations: areas with high nutrient export and high runoff inflow are the most in need of buffering.



Bentrup, G. 2008. Conservation buffers: design guidelines for buffers, corridors, and greenways. Gen. Tech. Rep. SRS-109. Asheville, NC: Department of Agriculture, Forest Service, Southern Research Station.

Wondering what to plant and where to plant it?

Visit the project at https://www.itreetools.org/support/resources-overview/project-profiles/glri-forest-planning for:

- Tree species recommendations for optimizing runoff reduction
- Maps of potential plantable space within each watershed
- Maps of nutrient hotspot and priority buffering locations
- More detailed watershed-specific recommendations

Suggested Citation: Coville, R.C. & Kruegler, J. (2021). Recommendations for Improving Watershed-Scale Water Quality & Quantity [fact sheet]. Great Lakes Restoration Initiative, Urban Forest Enhancements of Ecosystem Services.

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