READY RESULTS
Next Steps to Put NCHRP Research into Practice

NCHRP NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

FOCUS ON: NCHRP Research Report 840

August 2017

New Tool Supports Watershed-Based Stormwater Management

Image courtesy of Minnesota DOT

Where road construction sites do not allow for use of stormwater treatment methods such as the vegetated swale shown here, a watershed-wide approach to stormwater runoff can be a cost-effective and environmentally beneficial alternative.

REAL-WORLD NEED

Most DOTs manage stormwater runoff from highway facilities on a project-by-project basis. Typically, this means using stormwater best management practices (BMPs), such as vegetated swales and retention ponds, near construction sites. But many locations, particularly in urban areas, have limited space in the right-of-way, which can make constructing stormwater facilities difficult and expensive. As a cost-effective alternative to traditional stormwater BMPs, agencies are increasingly interested in using a watershed approach, which takes into account the ecosystem of an entire area drained by a single waterway. By installing stormwater facilities not just on project sites but elsewhere in the watershed, DOTs can achieve the same and sometimes better environmental benefits for the same or lower costs. However, it is not always clear which BMPs to use—or where to place them within the watershed—to achieve the maximum benefit.

RESEARCH SOLUTION

NCHRP Project 25-37 developed a Microsoft Excel–based tool, the Watershed-Based Stormwater Mitigation Toolbox, to help transportation agencies compare and select stormwater BMPs. The Toolbox takes into account the overall impact on watershed health of both runoff facilities that are on specific project sites and those elsewhere within the watershed. Agencies can customize the tool to their environmental priorities and local conditions. The Toolbox also provides scientific support for a watershed-based approach that agencies can use as they work with regulators to make stormwater management decisions.

NEXT STEPS
Put It into Practice

EVALUATE

Communicate with state regulatory agencies to evaluate whether the watershed approach is a viable option in your state.

COLLABORATE

Many agencies within a state have an interest in water quality. Work with these other agencies to develop practices that align with each agency's mission, goals, and responsibilities.

REVIEW

To help determine watershed priorities, review existing planning documents from federal, state, and local entities.

NETWORK

Contact other states that have considered or implemented a watershed approach.

PARTNER

Apply for NCHRP implementation funding. See trb.org/nchrp.

About the Research

RESEARCH STRATEGY

Investigators began by identifying watershed data from national agencies that could be used to assess the baseline health of a watershed. Investigators then identified the performance measures most critical to watershed health and the relative effectiveness of various BMPs in maintaining or improving such measures. Using this information, researchers developed a methodology for evaluating and comparing BMPs. This methodology departs from a project-based approach, which generally focuses on specific pollutants. Instead, it analyzes ecosystem services, or the benefits and uses that a watershed provides to its community, such as providing a drinking water supply or a habitat for a commercial fishery. Investigators incorporated that methodology into the Watershed-Based Stormwater Mitigation Toolbox.

WHAT WE LEARNED

Four stormwater factors are critically important to watershed health: (1) total suspended solids; (2) nutrient content, which can encourage algae blooms that deplete oxygen for other aquatic species; (3) runoff volume; and (4) increased stream power, which can contribute to erosion and sediment transport. However, these factors don't affect all watersheds in the same way, and their relative importance varies with local conditions. The Toolbox allows users to prioritize the four performance measures by assigning specific weights to them. The tool then ranks stormwater BMPs based on how effective they are at improving the conditions that best support local priorities.

WHY IT MATTERS

The Toolbox provides a starting point for taking a holistic watershed approach to stormwater management and comparing on- and off-site treatment options. During the planning phase of transportation projects, agencies can use the Toolbox to help characterize watersheds and prioritize potential stormwater BMPs. Every state's regulatory environment is unique, and state regulators' ability to consider a watershed approach will vary. Consequently, the Toolbox can also provide agencies with valuable scientific support for taking a watershed approach to meet regulatory requirements.

Image courtesy of U.S. Fish and Wildlife Service

Downstream wetland restoration is an off-site BMP that can be used as part of a watershed-scale approach to mitigating pollution impacts from construction activities.

RESOURCES

Image courtesy of Washington State DOT (CC BY-NC-ND 2.0)

NCHRP PROJECT 25-37

FINAL PRODUCTS

NCHRP Research Report 840: A Watershed Approach to Mitigating Stormwater Impacts
trb.org/Main/Blurbs/175861.aspx

Watershed-Based Stormwater Mitigation Toolbox
trb.org/Main/Blurbs/175861.aspx

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ADDITIONAL RESOURCES

EnviroAtlas, U.S. Environmental Protection Agency
epa.gov/enviroatlas

Web Soil Survey, Natural Resources Conservation Service
websoilsurvey.sc.egov.usda.gov

National Centers for Environmental Information weather and climate data
ncdc.noaa.gov/data-access/quick-links

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