OHIO STREAM MANAGEMENT GUIDE

Eddy Rocks and the Importance of In-Stream Structure

Guide No. 20

Eddy rocks, as illustrated in Figure 1, are groupings of large rocks placed in a stream channel to improve the habitat structure. As the stream flows over the rocks, the diversion of the current scours holes in the channel bottom, this adds oxygen to the water and creates a more diverse habitat for fish.

Many streams in Ohio have been modified to increase their capacity to convey stormwater. This has most often been achieved by straightening the channel alignment and lowering the bed to increase channel slope and velocity. An increase in velocity and in the stream's capacity to transport additional sediment and suspended load can, over time, straighten the channel and reduce its roughness. Although these practices greatly improve the efficiency with which stormwater can be carried away, this kind of channel modification degrades the stream's natural value, destroys aquatic habitat and degrades water quality.

Reducing channel roughness removes much of the in-stream structure that provides habitat for fish and other aquatic life. Reinstalling some of this structure through biotechnical practices (methods that use vegetation and natural materials to restore channel roughness) provides hiding, spawning and feeding areas for fish. This also increases the substrate suitable for benthic (bottom dwelling) organisms to become established and support a healthier, more diverse aquatic ecosystem. Other biotechnical practices, such as establishing streamside vegetation to enhance in-stream structure, can vastly improve a stream's value as an aquatic habitat while maintaining much of its ability to convey runoff.

The purpose of this Ohio Stream Management Guide is to describe the generally suitable site conditions, design and installation of eddy rocks. The guidelines listed herein are a compilation of specifications from agencies in other states and from field experience here in Ohio.

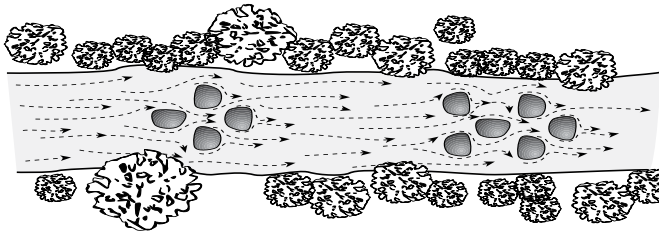

Figure 1. Eddy Rocks During Low Flow Conditions

DESIGN

Eddy rocks provide substrate for benthic organisms, aerate the water and create scour holes. The scour holes provide cover for fish and serve as mini-pools to preserve aquatic life during periods of low flow. Eddy rocks also dissipate high-energy flow and improve the appearance of channels.

The rocks as described herein, are best utilized in small streams or modified channels that have a uniform shape and little canopy cover. They are useful where erosive forces should be reduced, where habitat should be enhanced, and where the appearance of a channel could be restored to a more natural condition.

The placement of the Eddy Rocks is critical for optimal results. The objective is to place each rock so that high streamflows tumble over it, creating an eddy effect as shown in Figure 2. This current will cause the water to scour a hole downstream of the rock.

Selecting rocks of the appropriate size is critical so that they resist being moved by high streamflows. If the channel bottom is stable, a rock two feet in diameter (about 1,000 pounds) will resist movement in streamflow velocities up to 10 feet per second. A rock four feet in diameter will be stable in velocities up to about 13 feet per second. The maximum rock size in its largest dimension should not be greater than one-fifth the width of the channel. In small channels with a gradient of more than three percent, rocks may be up to one-third the channel width. If rocks of sufficient size are not available or accessible to the site, root wads may be substituted. Root wads, however, must be anchored securely to the streambed with cable fastened to a duck bill, or other suitable anchors. Refer to Guide 12, Evergreen Revetments, for a discussion of anchors and anchoring.

INSTALLATION PROCEDURE

1. Eddy rocks should be larger than 2 ft. in diameter except in small channels where they should be no more than

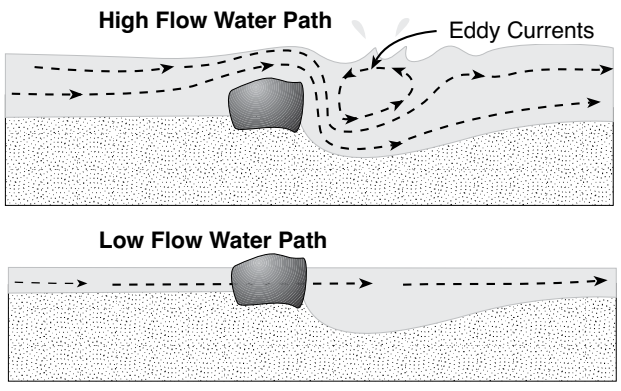

Figure 2. Effects of Flow Levels on Eddy Currents

one-third the width of the channel
2. Groups of three to seven rocks should be placed in a staggered pattern so current deflected around one rock then flows into another.
3. Eddy rocks should be placed in the center half of a channel in straight runs where they would be in swift current during high flow. However, they should not be placed in existing riffles.
4. Rocks should be placed with their longest dimension perpendicular to the flow, not angled to one bank or the other.
5. Rocks should be placed so they will project above the surface during low flows and be submerged during high flows. Also, they should be placed in an excavation so that they are at least one-third buried in the channel-bed.

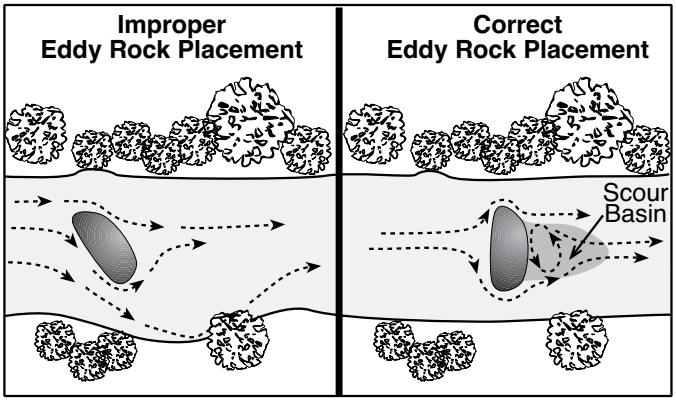

Figure 3. Effects of Eddy Rock Placement

MAINTENANCE

Inspect the eddy rocks after high water events during the first year and once a year thereafter. Displacement of a rock may require a deeper excavation into the streambed before placing it back into position. Look along the streambanks around the eddy rocks for any erosion that may be occurring. If it is determined that the rocks are redirecting the stream's energy into the adjacent bank, the rocks will need to be rearranged in order to avoid further streambank erosion.

As with any construction project in a stream, the Ohio Department of Natural Resources recommends you consult with the applicable local, state, and federal authorities listed in Guide 06, Permit Checklist for Stream Modification Projects, prior to construction. The extent of permit requirements will depend on the location and design of your project

The installation of eddy rocks is one of several biotechnical practices described in the series of Ohio Stream Management Guides available online at the Ohio Department of Natural Resources' website. These practices use vegetation or other natural materials to achieve stream management objectives. One of the chief advantages of biotechnical practices is that they help restore natural stream features such as in-stream habitat and streambank vegetation. Guide No. 10, Biotechnical Projects in Ohio, provides an overview of biotechnical practices, maps over 50 project sites, and lists contacts who can arrange site visits. No project should be undertaken without some understanding of the functions of stream energy and the source of the problem to be corrected. Guide No. 03, Stream Management and the Stream's Natural Processes, provides an overview of stream dynamics. Technical assistance about stream dynamics can also be obtained at your local Soil & Water Conservation District, which is listed under county government in local phone directories.

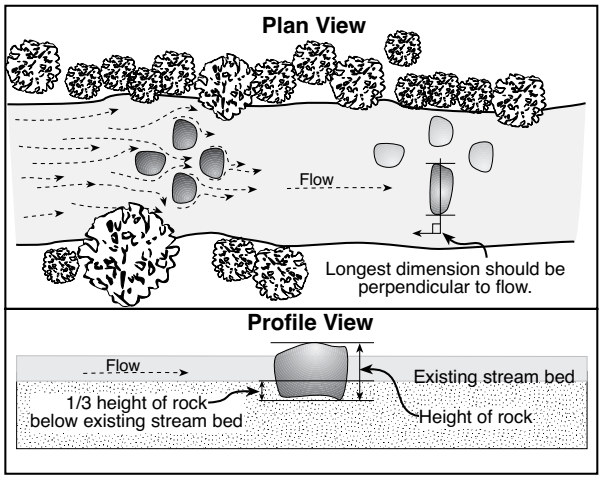

Figure 4. Placement Depth and Angle

REFERENCES

Mecklenburg, Dan, 1996, Rainwater and Land Development, Ohio's Standards for Storm Water Management, Land Development, and Urban Stream Protection, Second Edition, Ohio Department of Natural Resources, Division of Soil & Water Conservation in cooperation with the Natural Resources Conservation Service and the Ohio Environmental Protection Agency, Co-

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This guide is one of a series of guides covering a variety of watershed and stream management issues. For more information please see Guide 05 Index of Titles or call the ODNR Division of Soil and Water Resources at 614/265-6710. Single copies are available free of charge and may be reproduced. Please contact:

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The guides are also available on-line as web pages and PDF files at:
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