Approaches to the Design of Biotechnical Streambank Stabilization

Volume II—A Field Assessment

Introduction

As part of a larger project to develop guidelines for the design of biotechnical streambank stabilization for the Indiana Department of Transportation (INDOT), a field assessment was undertaken of 26 sites, of which half were INDOT sites. Non-INDOT sites were considered in order to broaden the sample, particularly to include older, more fully established sites. This was important as vegetation techniques require several years to mature and become fully established, and examination of older sites permitted some long-term assessment. Multiple techniques were often installed in combination, which resulted in 47 samples of 12 different techniques at the 26 sites. Each site was visited at least once and the measures were visually inspected for evidence of damage either to the measure or to the streambank being protected. Field assessments were supplemented by interviews with designers involved in the INDOT projects. The general merits of biotechnical techniques were discussed together with those of specific techniques that might be included in a standard design. For one INDOT project, use was also made of annual monitoring reports.

Findings

The assessment resulted in grouping the techniques into three categories (see table that follows): (i) typically reliable techniques that could be used where tolerance for bank instability is very low, and generally involving hard armor, (ii) potentially reliable techniques where the tolerance for bank instability is low to moderate, and (iii) techniques appropriate only for special circumstances or to be used only in combination with measures from the other two groups.

In the table, "minor" and "major" problems are identified for each of the streambank stabilization measures and summarized by site. Minor problems are small in extent (a few feet) with minimal impact on overall bank stability. For example, poor plant growth without any significant erosion would be classified as a minor problem. A major problem implies that bank instability was judged a likely future result, or that the measure failed over an extensive area. When multiple measures were present at a single site, they were assessed separately where possible.

Percentages in the table are simply based on the number of sites with problems, i.e. [number of sites with problems]/[number of valid sites]. Every site is therefore weighted equally and the percentage does not take into account the size of the site (length of protection measure) or the flow intensity. For example, vegetated soil lifts tended to be installed at sites with severe erosion and steep banks, i.e., at sites with the most difficult problems, but this is not reflected in the percentages. The percentages provide a simple quantification of the results, should be interpreted cautiously, and should not be considered an absolute ranking system.

Costs in the table are relative to other protection measures within the same category. For example, a medium relative cost ranking for joint planting does not necessarily imply that joint planting is more expensive than using a permanent mat, which received a low ranking, because the two techniques are not in the same category. Where costs were not available, literature was consulted.

Implementation

The field assessment (including interviews with designers) reported herein will be used to develop design guidelines for biotechnical techniques for streambank stabilization to be included in INDOT standards.

Summary of technique assessments.

Protection Measure	No. of Sites	No. of INDOT Sites	% Minor Prob.	% Major Prob.	Relative Cost
i. Typically reliable measures—potentially suitable near structures					
Joint planting	2	0	0%	0%	Medium
Articulated concrete mat	2	2	50%	0%	High
ii. Potentially reliable measures—for low risk areas (used with hard toe)					
Regrading (with permanent or temporary erosion mat)	2	2	50%	0%	Variable
Permanent mat (and seeding)	6	3	0%	17%	Low
Vegetated soil lifts (with hard toe)	8	3	75%	38%	High
Insufficient evidence: Cellular soil confinement system	1	0	100%	0%	n/a
iii. Measures used under special conditions or in conjunction with other measures					
Live stakes	11	6	18%	0%	Low
Rootwads	4	2	50%	25%	High
Vegetated coir roll	8	4	88%	25%	Med-high
Tree revetment	1	1	100%	100%	High
Cribwall	1	0	100%	100%	High
Live fascines	1	1	100%	100%	Medium

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