

Final Report
Iowa Highway Research Board
HR-349

Earth-Gard
Recycled Paper
Erosion Control Mat

By

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Performed in cooperation with the City of Cedar Rapids, the City of Oskaloosa, Davis County, Polk County and Story County

8. ABSTRACT

The objective of this research project was to evaluate field application results and determine whether the Earth-Gard mat made from recycled material would successfully control erosion and allow vegetation to establish in ditch bottoms and steep slopes. The research would also help determine how steep a grade in the ditch bottoms can be protected from rill and gully erosion and how steep and long a backslope or foreslope can be protected from sheet and rill erosion by the recycled material and allow establishment of vegetation. The Earth-Gard gave satisfactory performance on areas with limited drainage and gradual slopes. Earth-Gard had a longevity of only six months. It was eroded away when used on areas with greater flow or steeper slopes.

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DISCLAIMER

The contents of this report reflect the views of the author and do not necessarily reflect the official views of the Iowa Department of Transportation. This report does not constitute any standard, specification or regulation.

INTRODUCTION

Current special ditch control and slope protection mat specifications require the mat be made of interlocking wood fibers or straw with a plastic netting applied to both sides for holding the excelsior or straw in place. The purpose of the ditch control and slope protection mat is to cover and protect the soil surface disturbed during construction from the erosive effects of wind and rain and to shade the small grass seedlings and help retain moisture during hot dry periods of the growing season. The mat must also allow the vegetation to grow up through the material to establish a permanent, self-sustaining cover and contain no toxic materials to inhibit the germination of the seeds or growth of the plants. The mat is most effective when it maintains structural integrity over a 2-3 year time period while allowing vegetation to establish before it decomposes. The use of recycled materials would be especially beneficial in the state's effort to be environmentally conscientious by helping to relieve landfill problems and reduce the number of trees cut down to make the wood excelsior.

OBJECTIVE

This research project was initiated to determine the ability of the erosion control mat made of recycled material to effectively control erosion in the ditch bottoms and steep slopes. The mat would need to maintain structural integrity long enough to protect the soil surface while vegetation establishes,

approximately 2-3 years or two growing seasons. Another aspect of this project was to take a subjective look at the type of ditch grade, volume and velocity of water flowing in a ditch and drainage area flowing across a slope that would cause a failure in the erosion control mat made of recycled materials.

PROJECT LOCATION AND DESCRIPTION

City, county, and state locations were used to install and monitor the erosion control mat made of recycled materials. Three erosion control projects on state highways were used, Audubon County, IA 44 from Kimballton to Hamlin; Dallas County, I-80 from the Redfield interchange to county road P58; and Lucas/Monroe Counties, US 34 from west of IA 97 east to IA 68 in Monroe County. The new Tama maintenance garage site was also used. Davis County, Polk County, Story County, the City of Cedar Rapids and the City of Oskaloosa participated in this project as well.

MATERIAL

Earth-Gard biodegradable soil erosion control blanket is made from 100% recycled "post consumer" paper designed to decompose over a period of 4-6 months. The wood excelsior mat currently specified by the Iowa DOT is made using wood fibers contained between two layers of plastic netting designed to decompose over a period of 2-4 years.

COST

The cost of the recycled mat is similar to the cost of the wood excelsior and straw mat currently specified for special ditch control and slope protection.

CONSTRUCTION

Erosion control contractors installed the Earth-Gard mat on the three erosion control projects. Sites were chosen to provide various ditch grades and lengths to test the materials under different water velocities and volumes of flow in the ditches. State maintenance workers at the Tama maintenance garage site installed the material on slopes and in ditches. City and county personnel installed the Earth-Gard mat at the various sites in the cities and counties involved in the project. The light weight of the rolls of Earth-Gard mat made installation somewhat easier but this was offset by difficulty in installation when windy or rainy conditions occurred.

PERFORMANCE

The performance of the Earth-Gard mat in ditches with grades approximately 2.5 percent or less or lengths 300-500 ft. or less was generally satisfactory. The vegetation grew up through the mat and established good ground cover when subjected to less stress, see Figures A, B and C on page 8. When steeper, longer ditches were tested, the higher velocity and volume of drainage water caused a failure in the recycled mat, see Figures E and F.

on page 8. Similarly the Earth-Gard mat on slopes with a limited drainage area performed adequately, but when larger volumes of water flowed across slopes, a failure occurred. The rate at which the recycled material decomposes is considerably faster than that of wood excelsior and straw, see Figure D on page 8. Under normal rainfall conditions during the growing season the recycled material was 95 percent decomposed within a 6-month period of time. It is generally advantageous to maintain cover with the mat through two growing seasons to assure establishment of adequate vegetative ground cover before complete decomposition of the mat occurs.

CONCLUSIONS

This research of Earth-Gard mat made of recycled material supports the following conclusions:

1. The installation of the Earth-Gard mat is somewhat easier than the wood excelsior mat but windy or rainy conditions can hamper the laying of the recycled mat.
2. The Earth-Gard gives satisfactory performance in gradual ditch grades and slopes with limited runoff.
3. The Earth-Gard does not provide satisfactory protection on steep, long ditch grades or steep slopes with greater drainage areas.

4. The Earth-Gard deteriorates more rapidly and provides protection for only six months.

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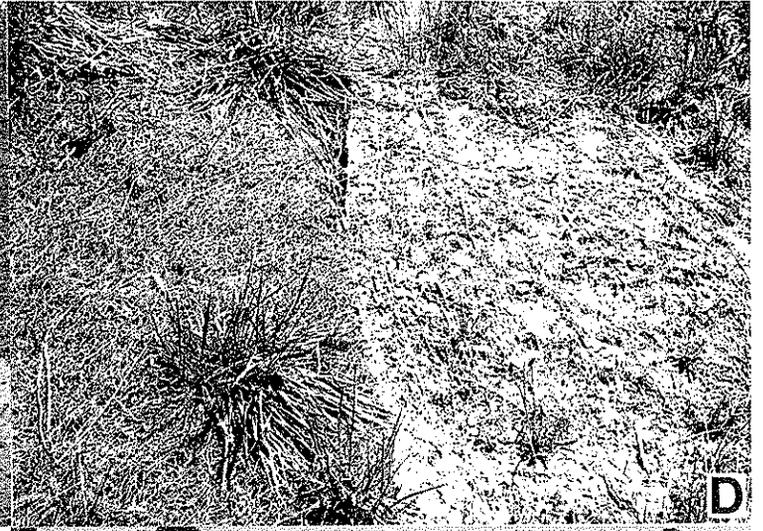
The author wishes to extend appreciation to the personnel at Story County, Davis County, Polk County, Cedar Rapids, Oskaloosa, and the Tama maintenance workers for their help installing and monitoring the research material at their sites. Vernon Marks and Kathy Davis also deserve thanks for their assistance with this report.

Appendix A
Project Photographs

- Figure A Newly installed Earth-Gard mat.
- Figure B Earth-Gard mat 3 months after installation showing good vegetative growth.
- Figure C Earth-Gard mat one year after installation showing almost complete vegetative ground cover. Different seed mixtures were used on ditch and slopes.
- Figure D Wood excelsior mat - Left, Earth-Gard mat - Right four months after installation illustrates the rapid rate of decomposition of the recycled material.
- Figure E&F Illustrates failure of Earth-Gard mat in ditches due to high volume and velocity of water flow and rapid decomposition rate.



A



D



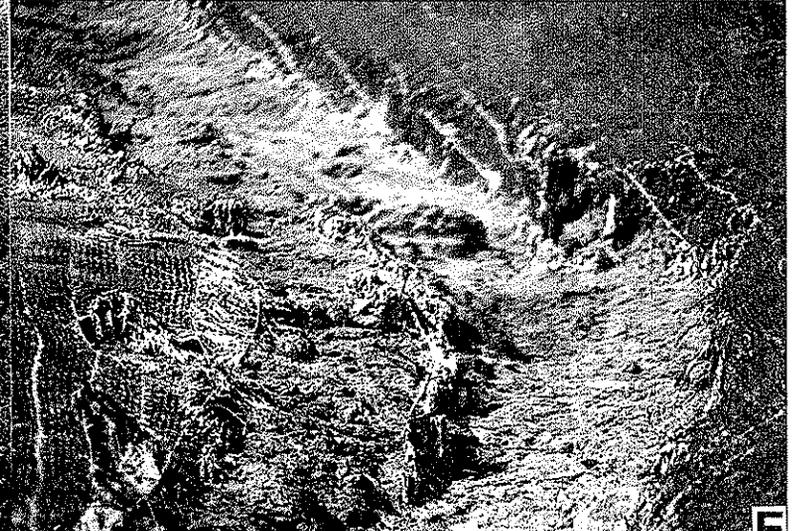
B



E



C



F