

Turf Reinforcement Matting: An EPA Recognized Storm Water Best Management Practice (BMP)



Authors

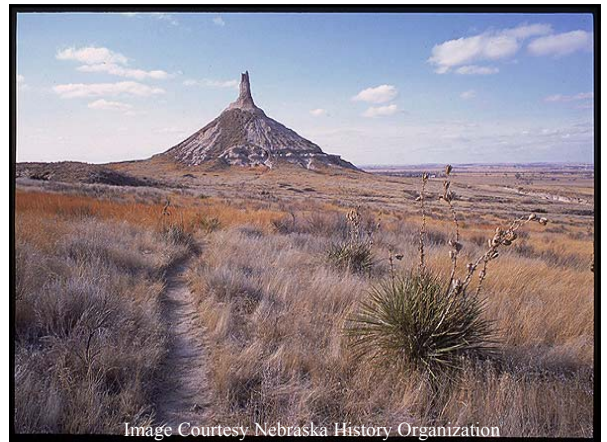
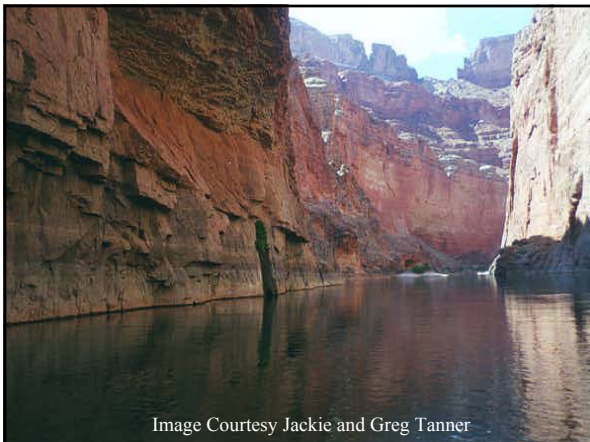
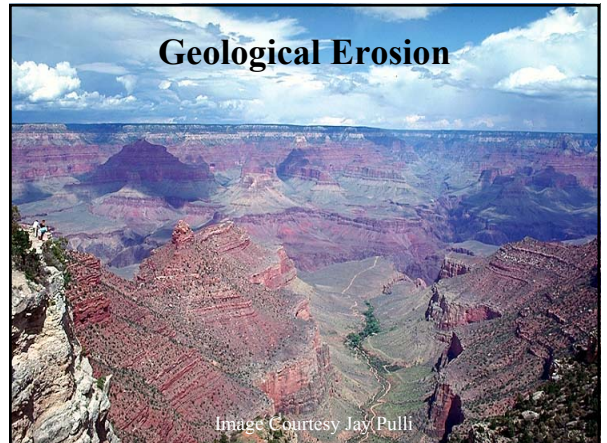
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Who is



- Formed in 1992
- Composed of Manufacturer's of Rolled Erosion Control Products (RECPs), Suppliers, Distributors, Engineering Firms, Universities, Testing and Research Laboratories
- Serve as IECA Standards Committee D
- Work with ASTM, AASHTO, FHWA and other State & Federal Agencies

Geological Erosion



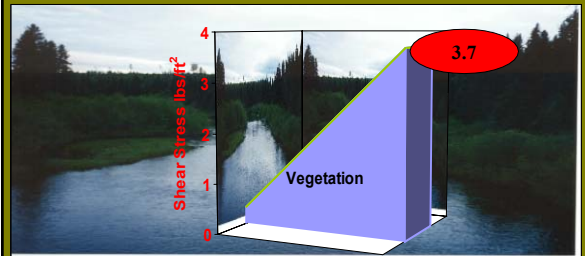




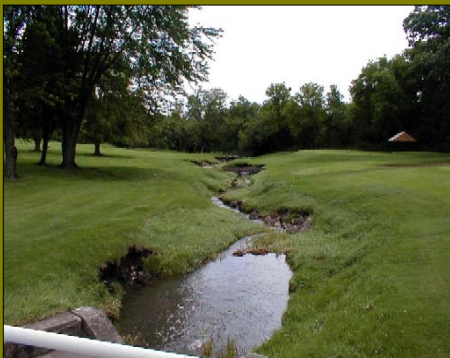
Vegetation For Erosion Control



Performance Limits of Vegetation



For Example!



When Forces Exceed Capabilities of Vegetation



Devastation Can Be The Result



Historically Rock Riprap



Results From Rock Were Mixed



Geosynthetic Reinforced Vegetation Using Turf Reinforcement Mats

What are TRMs?

Turf reinforcement mat (TRM) - A long term non-degradable RECP composed of UV stabilized, non-degradable, synthetic fibers, nettings and/or filaments processed into three-dimensional reinforcement matrices designed for permanent and critical hydraulic applications where design discharges exert velocities and shear stresses that exceed the limits of mature, natural vegetation.

EPA Storm Water Technology Fact Sheet Turf Reinforcement Mats

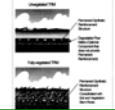
DESCRIPTION

This fact sheet describes the use of turf reinforcement mats (TRMs). TRMs combine vegetative growth and synthetic materials to form a high strength mat that helps to prevent soil erosion in drainage areas and on steep slopes. TRMs are classified as a "soil engineering practice," in contrast to concrete and riprap, which they may replace in certain erosion control situations.

High-volume and high-velocity storm water runoff erode soil within open channels, drainage

enhance vegetative root and stem development. By protecting the soil from scouring forces and enhancing vegetative growth, TRMs can reduce the likelihood of natural vegetation to withstand higher hydraulic forces on stabilization slopes, embankments, and channels. In addition to reducing flow velocities, the use of natural vegetation provides particulate sediment removal through sedimentation and soil infiltration, and improves the aesthetics of a site.

TRMs offer high shear strength, resistance to ultraviolet (UV) degradation, and resistance to



- Reduce water conveyance system cross channel length (Figure 3)
- Reduce erosion of slopes
- Pipe inlets and outlets
- Headcut and walls

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm>

<http://www.epa.gov/owm/mtb/turfrein.pdf>

TRMs enhance the natural ability of vegetation to permanently protect soil from erosion. TRMs are composed of interwoven layers of non-degradable geosynthetic materials such as polypropylene, nylon and poly-nylon chloride (PVC) netting, stretched together to form a three-dimensional matrix. They are thick and porous enough to allow for soil filling and retention. In addition to providing some protection, the mesh netting of TRMs is designed to



allowable regions with limited vegetation growth. In these areas, vegetation establishment is slow or difficult, and the TRM matrix is typically filled with water until the protection needs for the soil are no longer present (permanent).

FIGURE 3 TRMs and PROTECTIVE CHANNELS, CHANNELS

Continuity Equation

$$Q = A \times V$$

where:

Q = Discharge - m³/sec (ft³/sec)

A = Cross Sectional Area of Flow - m² (ft²)

V = Velocity - m/sec (ft/sec)

Manning's Equation

For Metric Units: $V = (1.49/n)(R^{2/3})(S_f^{1/2})$

For English Units: $V = (1.49/n)(R^{2/3})(S_f^{1/2})$

where:

V = average flow velocity m/sec. (ft./sec.)

n = Manning's roughness coefficient for lining

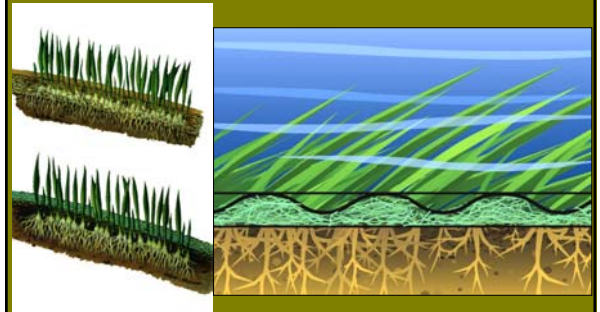
R = Hydraulic radius m (ft.)

S_f = Friction slope or bed slope of channel m/m (ft./ft.)

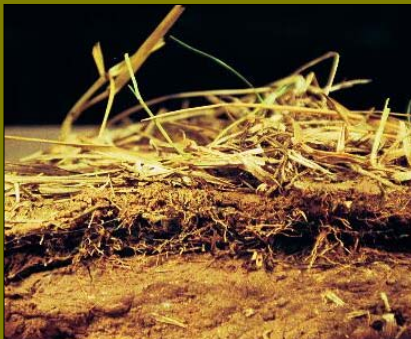
How Do TRMs Function?

- TRMs Extend the Performance Limits of Natural Vegetation By:
 - Retaining Soil Particles and Seeds
 - Accelerating Vegetative Development
 - Reinforcing the Vegetative Cover
 - Vegetation Improves Performance

Function of TRMs

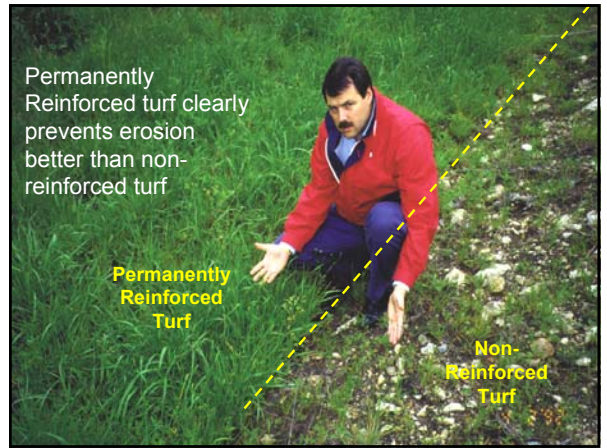


Permanent Root & Stem Reinforcement



Where The TRM Stops Erosion Begins





Applications & Uses For TRMs



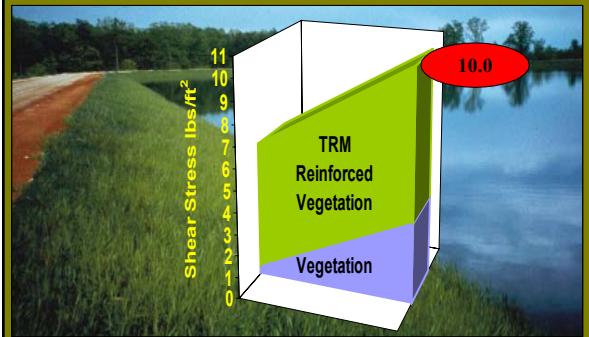
High Shear Stress/velocity Channels



Shorelines Where Soils Can Be Exposed to Constant Erosive Conditions



Performance



Adapted from "Green Engineering Optimizing Erosion Control with Vegetation and RECPs". Sprague, 1999

Benefits of Reinforced Vegetation

- Aesthetics
- Water Quality & Pollutant Removal
- Reduced Thermal Heating
- Groundwater Recharge
- Wildlife Habitat
- Construction Impact



Aesthetics



United States Environmental Protection Agency Office of Water Washington, D.C. EPA 832-F-99-002 September 1999

Storm Water Technology Fact Sheet Turf Reinforcement Mats

In addition to reducing flow velocities, the use of natural vegetation provides particulate contamination removal through sedimentation and soil infiltration, and improves the aesthetics of a site.

High-volume and high-velocity storm water runoff TRMs offer high shear strength resistance to

Environmentally Friendly...

Enhanced Water Quality Through Filtration and Infiltration, Reduced Site Disturbance and Elimination of Thermal Pollution.



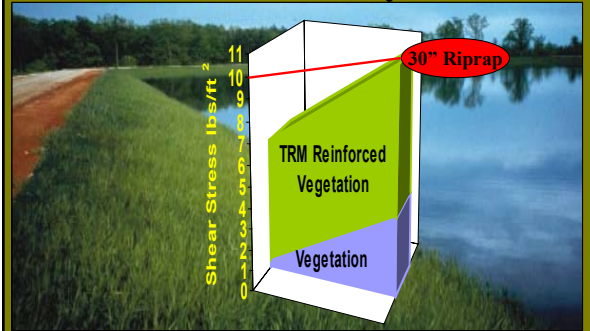
TRM Reinforced Vegetation Offers Beneficial Wildlife Habitat.



TRMs Are Easily Installed Without the Need for Heavy Equipment

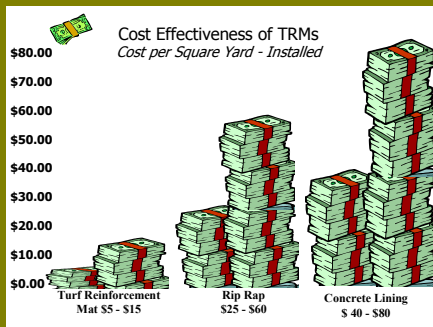


Performance Comparison of Erosion Control Systems



Adapted from "Green Engineering Optimizing Erosion Control with Vegetation and RECPs". Sprague, 1999

Economic Comparison of Erosion Control Methods



All values are provided by the ECTC for approximate installation costs in U.S. Dollars.

Thank You!
For More Information On
TRMs Visit www.ectc.org

