Erosion Control Technology

Waukesha County 2014 Storm Water Workshop – Wednesday, April 9 2014

Scott Bordeau CPESC

ERO TEX
THE GROUND CONTROL LEADERS

WI DOT PAL UPDATE

- Last update 7/2012 **February 20th 2014**
- 22 lines of updates
- Requirements for large scale testing of Ditch Checks and Inlet Protection changed to AASHTO's NTPEP program.

WI DOT PAL UPDATE

- Temporary Ditch Check added 10 products
- Added 6 more products to existing
- Removed 5 permanent products
- 6 line items about tackifers

What's new?

Interim Manufactured Perimeter Control and Slope Interruption Products (1071) born on 11/10

Only products approved by the Wisconsin Department of Commerce for use on projects regulated under the Uniform Dwelling Code or products listed on the WisDOT PAL for use as ditch checks,

Perimeter Control Socks

- Knitted socks
- Infilled with recycle wood, rubber, compost.
- Sizes diameter and continuous length.
- 8” – 12” diameter
- Low storage
- Easy to move/reuse.

(866) H2O-EELS

Let’s get the vegetation going

Amend the existing soil with the right organic matter, fertilizer, and tillage. By doing this, vegetation can be established without the need for importing TOPSOIL

Why Soil Amendments?
Use on soils where:

- there are minimal to no organics (< 2%)
- there is little to no soil structure
- application will occur over subsoil
- a moderate level of erosion control is required

BERNARD
ENSE IENCEMENT
HYD RAULIQUE

To Maximize Soil Amendments Performance

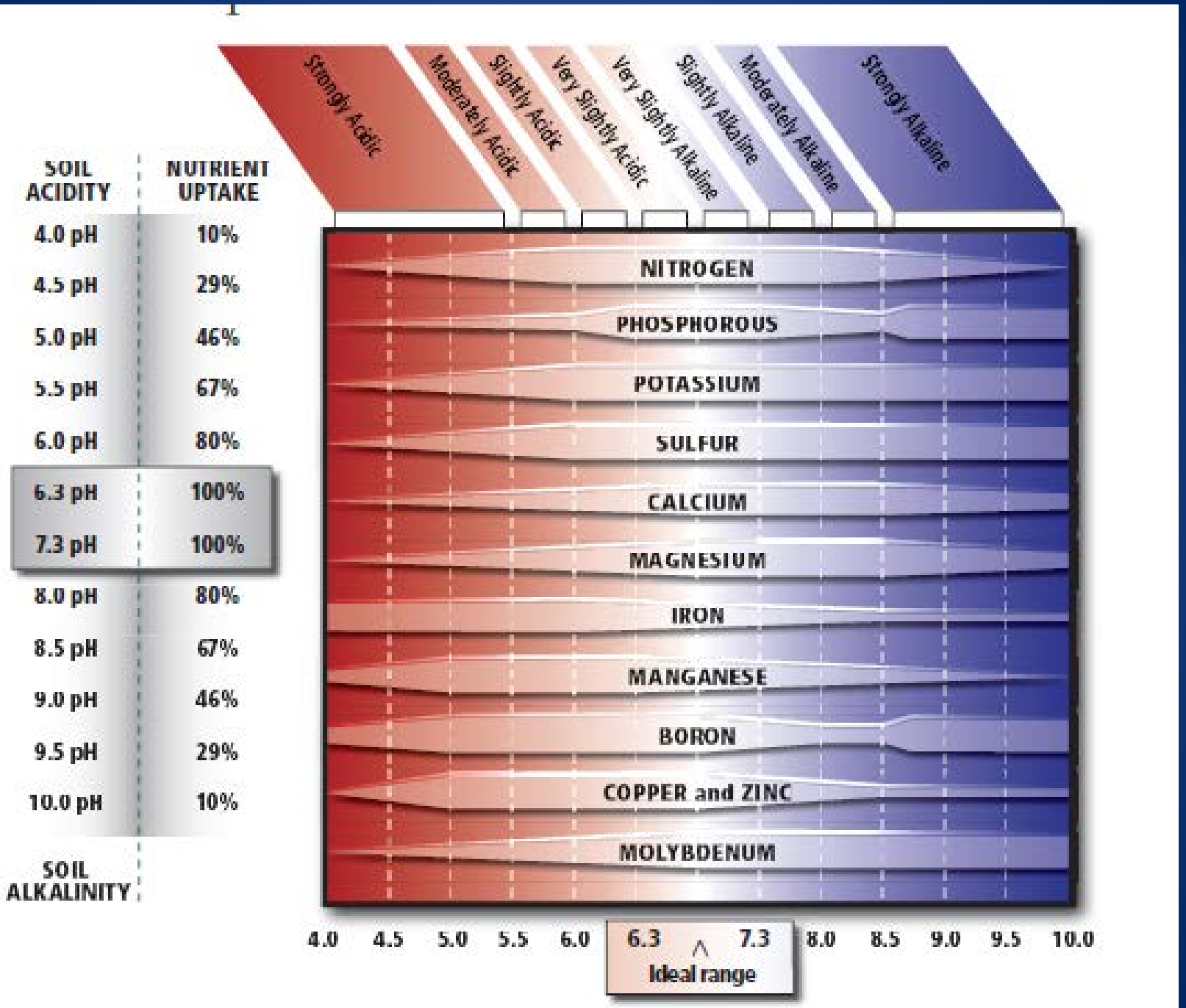
- Conduct a minimum of 3 soil tests to determine
  - Soil ph (do you need to add lime or Sulfur)
  - Fertility requirements
  - Organic content and requirement

Conducting these tests will help improve your vegetation long term.

pH Range

Table 4. *Recommendations for modifying soil pH in lawns.*

Soil pH	Recommendation
<6.0	Apply lime to increase soil pH and increase the availability of plant nutrients. See your soil test recommendations for exact application amounts. If you apply before planting, be sure to incorporate lime into the soil through tillage. After planting, do not apply more than 50 pounds of lime per 1,000 square feet per application. Lime is slow acting, so soil pH will not change quickly. Retest your soil pH in two years to check for a change in the pH.
6.0-7.5	This is the optimum soil pH range for turfgrass growth. No adjustment is needed.
> 7.5	It is difficult to lower the pH of a soil. Applying elemental sulfur can lower soil pH over a long period of time, but is often not feasible. It may be necessary to increase your annual application rates of nitrogen, phosphorus, and potassium by 25 percent to compensate for reduced nutrient availability in high-pH soils.


Strongly Acidic
Moderately Acidic
Slightly Acidic
Very Slightly Acidic
Very Slightly Alkaline
Slightly Alkaline
Moderately Alkaline
Strongly Alkaline
SOIL ACIDITY
NUTRIENT UPTAKE
4.0 pH 10%
4.5 pH 29%
5.0 pH 46%
5.5 pH 67%
6.0 pH 80%
6.3 pH 100%
7.3 pH 100%
8.0 pH 80%
8.5 pH 67%
9.0 pH 46%
9.5 pH 29%
10.0 pH 10%
SOIL ALKALINITY
NITROGEN
PHOSPHOROUS
POTASSIUM
SULFUR
CALCIUM
MAGNESIUM
IRON
MANGANESE
BORON
COPPER and ZINC
MOLYBDENUM
4.0 4.5 5.0 5.5 6.0 6.3 7.3 8.0 8.5 9.0 9.5 10.0
Ideal range

WI DOT Soil Stabilizer Type A

Wisconsin Department of Transportation

Soil Stabilizer Type A **Bid Item 628.6505**

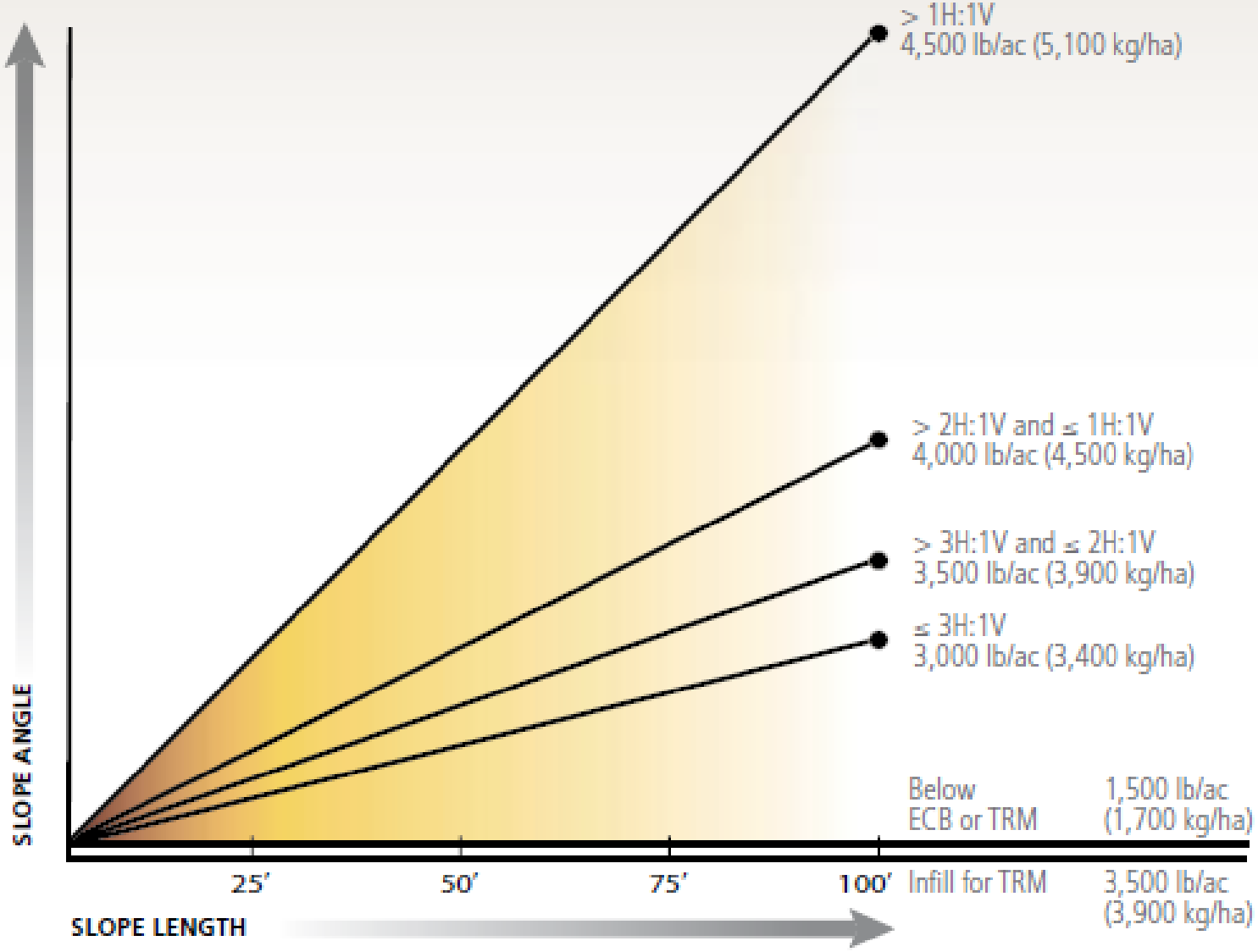
Prodcuts	Manufacturer	Application Rate (minimum)
Airtrol Plaster (to be used only in combination with a wood mulch)	US Gypsum Company	4500 lb/ac in addition to 1650 lb/ac of a standard processed wood fiber mulch
Soil Guard	Mat, Inc.	3500 lb/ac
Hydra CX-2	North American Green	3500 lb/ac
Hydra CM	North American Green	3500 lb/ac
Bindex BFM	American Excelsior	3200 lb/ac

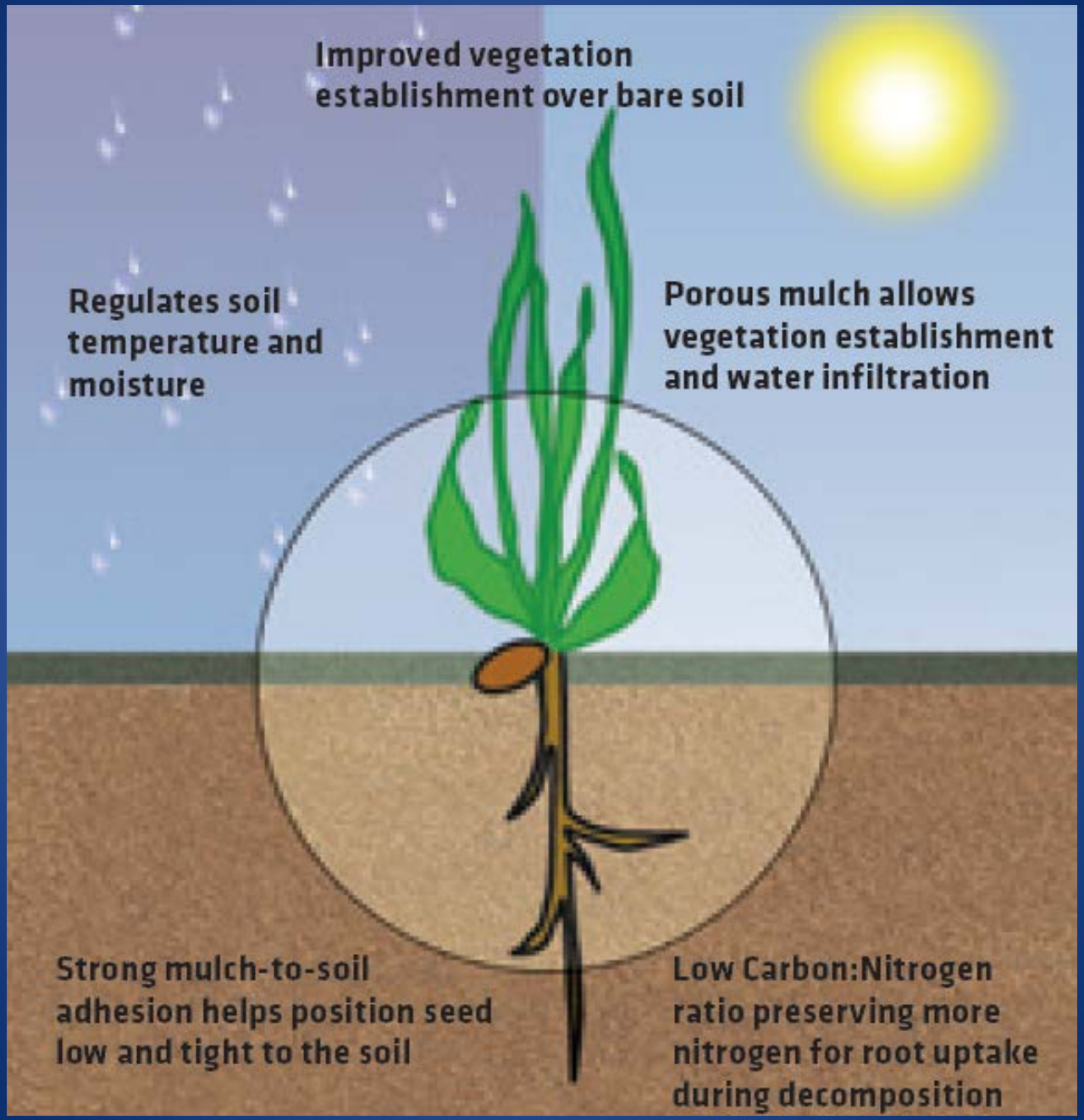
Hydromulch

- Paper
- Paper with tac (3%)
- Blend 50/50 60/40 70/30 (wood/paper)
- Blend with tac (3%)
- Wood
- Wood with tac
- BFM (10%)

A bonded fiber matrix is a continuous layer of elongated fiber strands held together by a water-resistant bonding agent.
It eliminates direct rain drop impact on soil (it has no holes greater than one millimeter in size), it allows no gaps between the product and the soil and it has a high water-holding capacity. A bonded fiber matrix will not form a water-insensitive crust that can inhibit plant growth, and it will biodegrade completely into materials known beneficial to plant growth

APPLICATION RATES BY SLOPE GRADIENT




Improved vegetation establishment over bare soil
Regulates soil temperature and moisture
Porous mulch allows vegetation establishment and water infiltration
Strong mulch-to-soil adhesion helps position seed low and tight to the soil
Low Carbon:Nitrogen ratio preserving more nitrogen for root uptake during decomposition

Bindex BFM is a one-step erosion control system that provides intimate protection.

Bindex BFM combines natural wood fibers, including Curlex fibers, with a cross-linked binder, tackifier, and dye that is mixed with water and applied hydraulically.

The resultant matrix becomes water insoluble for maximum protection and effective germination immediately after drying.

70% ± 3% mechanically processed straw;
20% ± 3% mechanically processed cotton plant material;
10% ± 1% proprietary blend of tackifiers, activators & additives

The Bonded Fiber Matrix shall be comprised of a long strand, thermally produced wood fibers
88% of total volume by weight) held together by
10% organic tackifiers
2% mineral bonding agents which upon drying, become insoluble and non- dispersible.

88.0% Natural Wood Fibers (including Curlex® fibers),
9% High Grade Organic Tackifier,
1.0% Proprietary, 1.0% Proprietary, 1.0% Green Dye

- HydraCM™ Steep Slope Matrix HydraCM Steep Slope Matrix scored 99.7% effective in reducing soil erosion under AASHTO's NTPEP testing.
- It's designed for medium-length, moderate to steep slope gradients of 4:1 to 1:1 (H:V). HydraCM HECP is a superior alternative erosion and establishing vegetation on steep, challenging slopes.

C Factor

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.029	NA	NA
20-50 ft	0.11	NA	NA
≥ 50 ft (15.2 m)	0.19	NA	NA

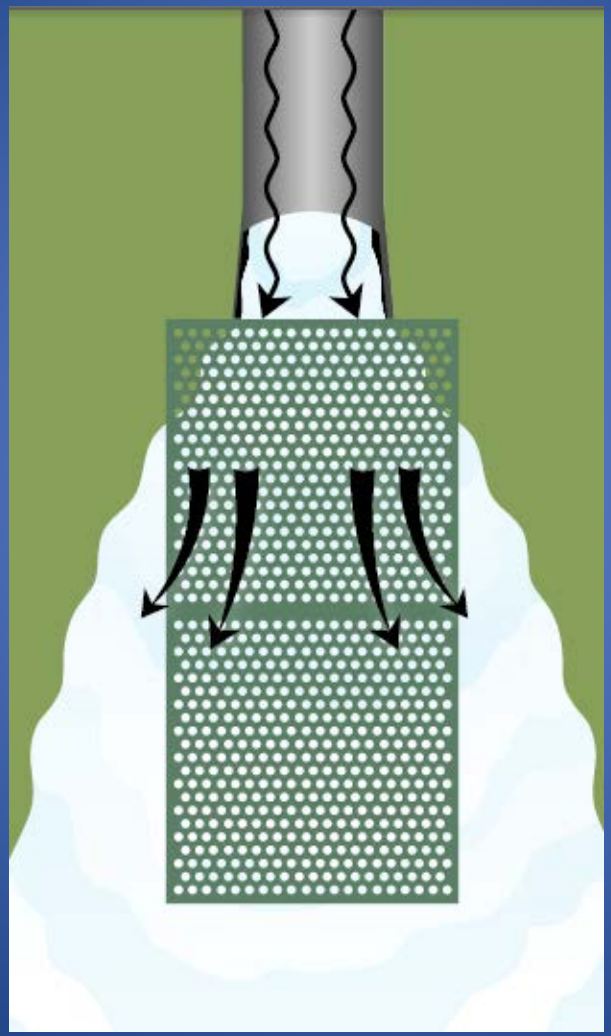
BFM's

Cover Factor ASTM D-6459 0.001 - 0.003

One minus Cover Factor multiplied by 100% equals % effectiveness.

Winter shut down done right!!!

Transition Mats



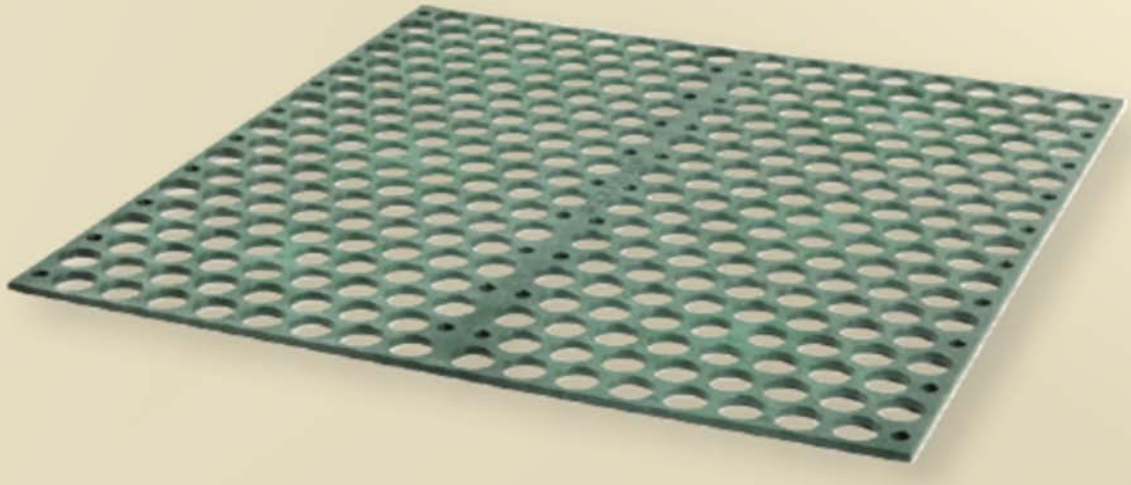
the green solution to rip rap

scourstop™

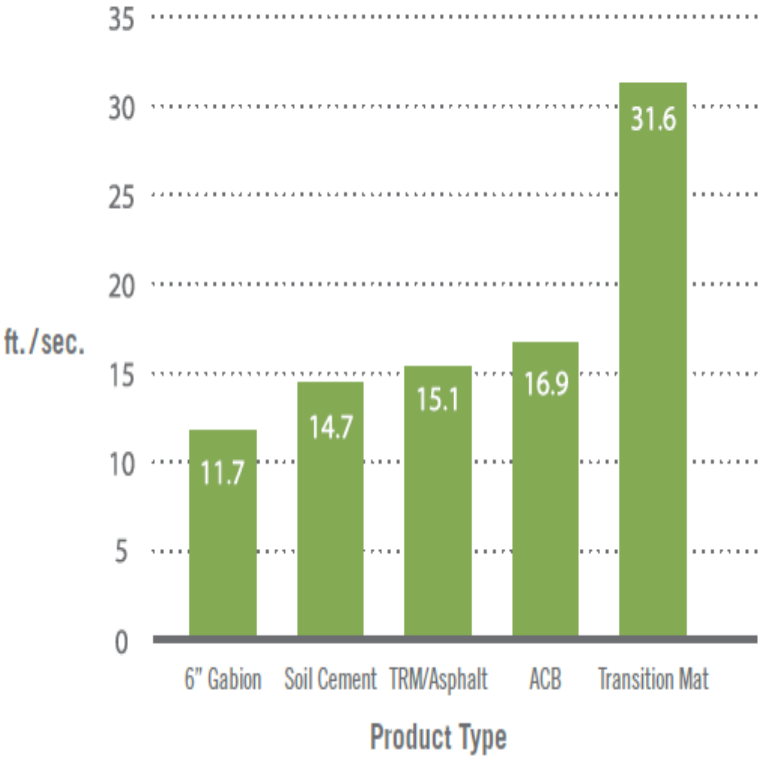
ScourStop mat – 48”x 48”x 0.5”

Green or tan (HDPE)

Black (recycled)



Comparison of Test Data with FHWA-RD-88-181



6" Gabion	11.7
Soil Cement	14.7
TRM/Asphalt	15.1
ACB	16.9
Transition Mat	31.6

FULLY VEGETATED
31 feet per second
16 pounds of shear

DAY ONE PERFORMANCE
19 feet per second
13 pounds of shear

Colorado State University Hydraulics Laboratory

PIPE OR OUTLET

Circular Culvert Outlet Protection

PIPE DIAMETER	VELOCITY ≤ 10 FT/SEC		10<VELOCITY<16 FT/SEC	
	TRANSITION MAT W x L	QUANTITY OF MATS	TRANSITION MAT W x L	QUANTITY OF MATS
12”	4’ x 4’	1	4’ x 8’	2
24”	4’ x 8’	2	4’ x 12’	3
36”	8’ x 12’	6	8’ x 20’	10
48”	12’ x 16’	12	12’ x 24’	18
60”	12’ x 20’	15	12’ x 32’	24
72”	16’ x 24’	24	16’ x 36’	36

Soil Cover:

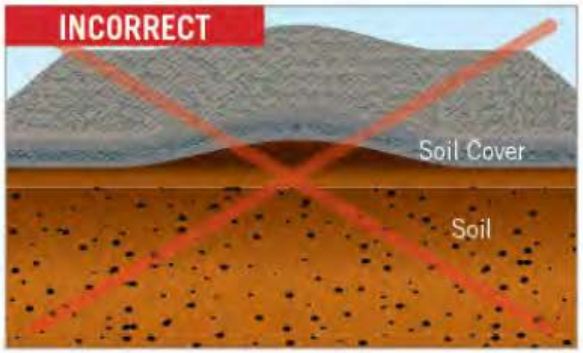
1 ScourStop must be placed over soil cover (sod, TRM, or geotextile) – Not over bare ground.

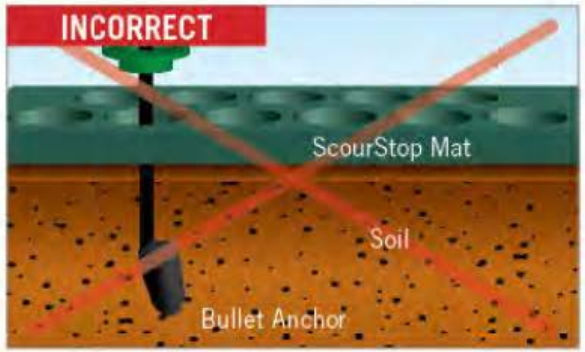
2 Channel flow data must be evaluated to determine proper soil cover.

3 Install sod; water thoroughly after completing installation.

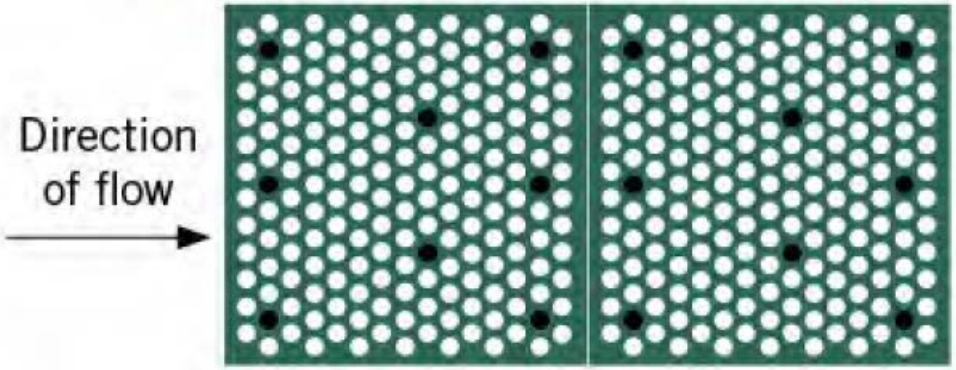
4 Or install turf reinforcement mat (TRM), after seed and fertilizer, then water thoroughly after completing installation.

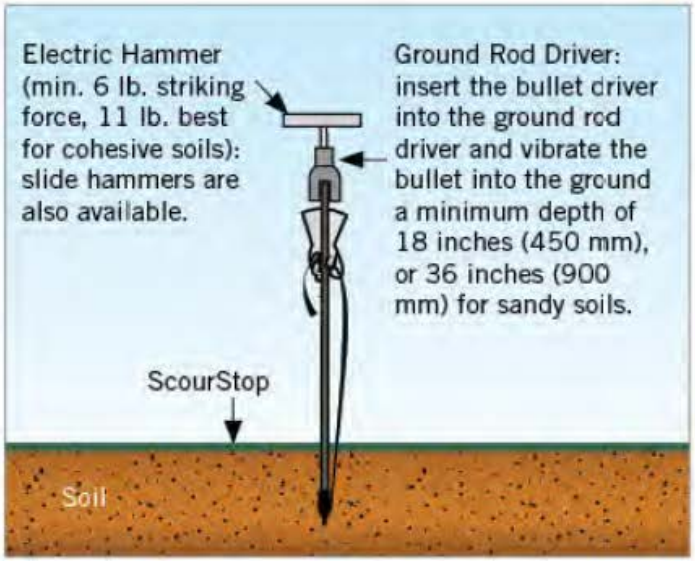
5 Un-vegetated: install geotextile (minimum 6 oz. non-woven geotextile fabric).

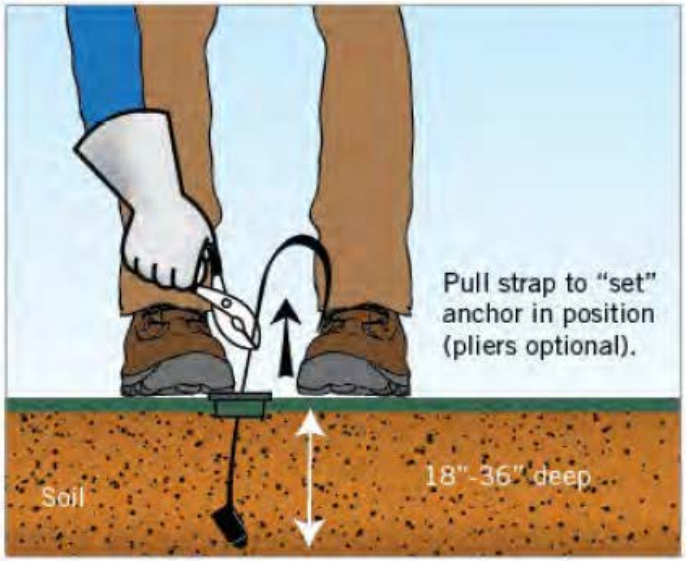




ScourStop Anchors:







- Scour Protection/Transition mat used in conjunction with TRMs, Geotextiles or Sod for dramatically increased scour resistance in pipe/culvert outfalls and high impact shoreline applications
  - Replaces rock and concrete
  - Highly flexible, UV-stabilized rubber
  - Green or Tan color
  - 3ft x 5ft rectangular mat
  - 15sf mat weighs approx 40lbs
  - Specific gravity = 1.45, non-buoyant

ShoreMax® Applications

ShoreMax mat culvert project, Installation through 4 weeks

- Much easier to transport and install than riprap with no heavy trucks or equipment required
- Four 15sf, 40 lb panels replace over 6 tons of rock!
- Greater flexibility than other PE based transition mats for easier installation and conformance to underlayment
- Non-buoyant rubber will not float as opposed to PE based mats

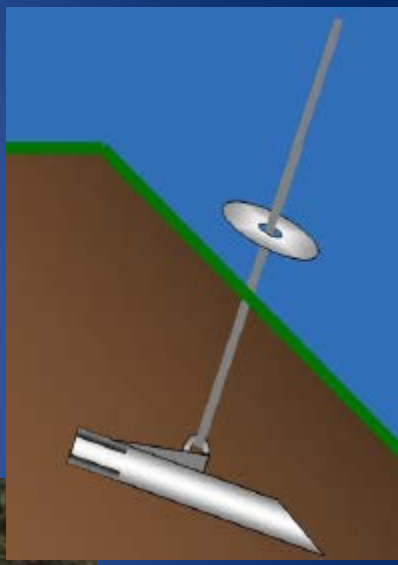
AASHTO's National Transportation Product Evaluation Program

Permissible Shear Stress (with Vmax P550 underlay) through AASHTO-NTPEP ASTM D6460 Large-Scale Channel Testing

- 8.6 lbs/sf Unvegetated (>24in Rock!)
- >12.5 lbs/sf Vegetated (>36in Rock)

Anchoring

- Installed with ShoreMax plastic stakes, Rebar stakes or Earth Anchors, depending on soil conditions and severity of application

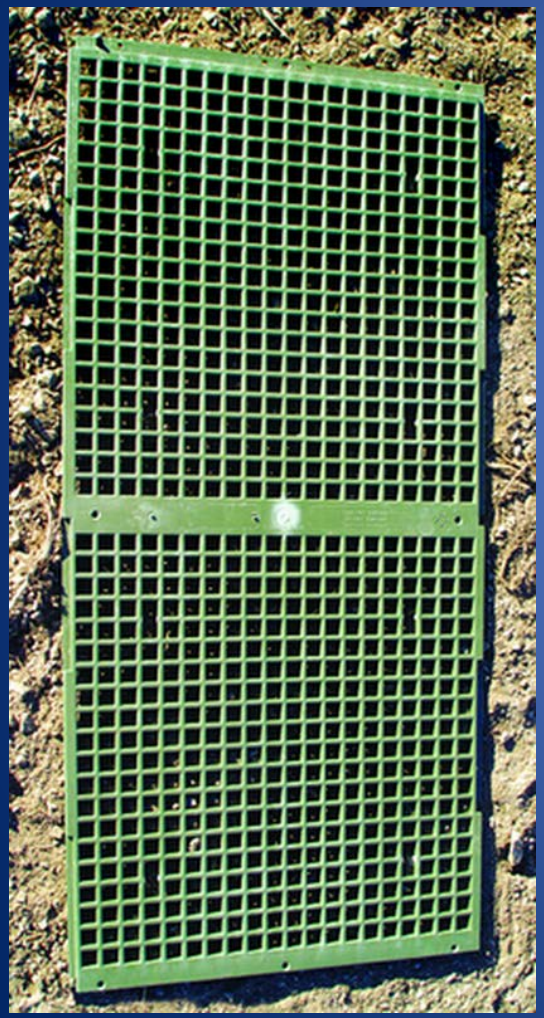


ShoreMax Install with Plastic Stakes

Meadowlark School Kearney, NE

Down Chute Protection

GEORUNNER® Surface Flow Protection System



- Light-weight, portable mats prevent scour caused by high velocity, intermittent flow
- Specifications
  - Coverage Area: 8 ft.^{2}
  - Dimensions: 2 ft. x 4 ft. x ½ in.- smaller size allows for more flexibility to shape for contours, ditches
  - Color: Sage Green
  - Open Area: 55% (high percentage for dense grass growth)-higher density of vegetation than the competition
  - Material: Polyethylene (safe, inert material –environmentally neutral.)

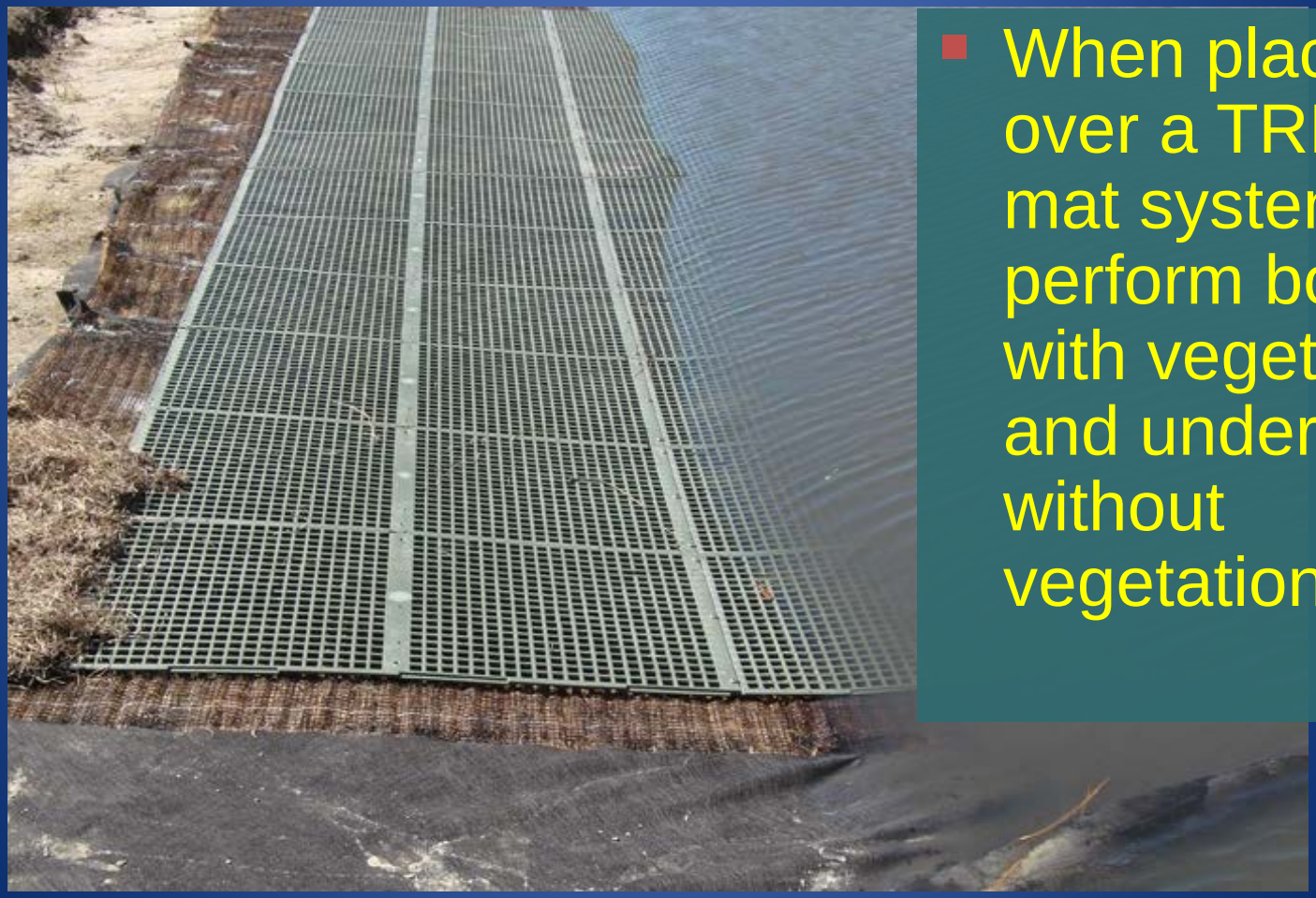
SURFACE FLOW PROTECTION

Allows dense, stabilizing vegetation growth.

- Unique lattice structure fully engages with grass root system for additional reinforcement.
- A sustainable “invisible” solution for problems that cannot be solved by ECBs or TRMs.
- Allows unimpeded access by mowing and lawn maintenance equipment.

- Intermittent surge and overflow solutions
- Hardened vegetated system that disappears after full vegetation growth.

Stormwater Channels & Shorelines



- When placed over a TRM, the mat system will perform both with vegetation and under water without vegetation.

Culvert Outfall Areas

Scour in Unprotected Outfall

Protected Outfall

Culvert Outfall Areas

Testing

- Tested at Colorado State University
- Per ASTM D6460

Colorado State University Testing

- placed over TRM/sod/ECB and anchored per recommendations

Colorado State University Testing

- Exposed to increasing velocity/shear stress until failure (defined as 0.5” topsoil loss)

Testing ongoing.
Results to be announced

System Components

- RIVETS-End to End Connection with Flush overlap
- “Shingling” which can lead to increased turbulence

System Components

- Side to Side Connection-Overlapping tabs provide integral connection laying side to side and joining with plastic straps
  -Units can slide and separate

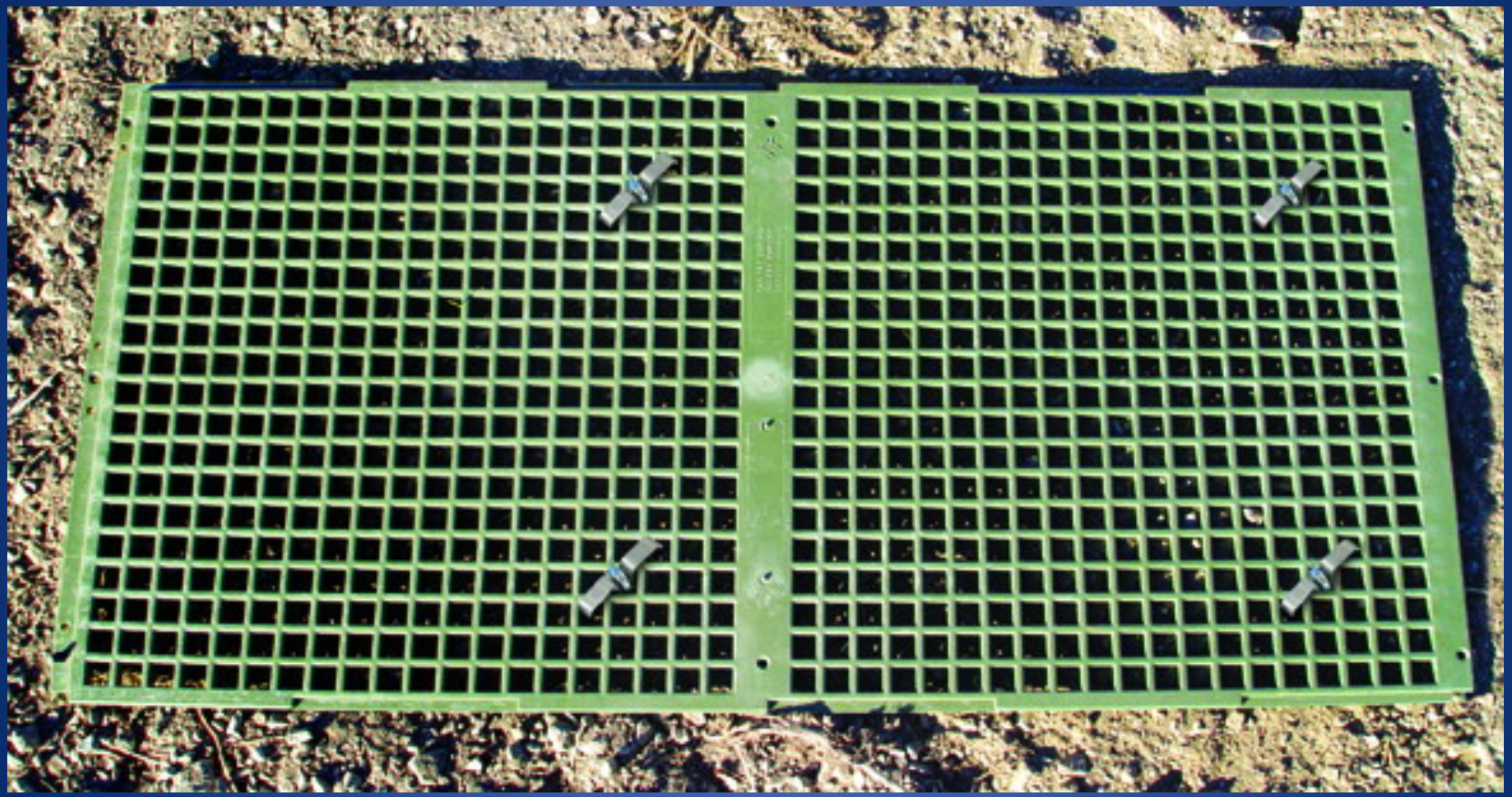
System Components

- SIDE CLIPS-Side to Side Connection
  - Do not allow separation or sliding

System Components

- ANCHOR-Duckbill anchor with 300 lb pullout and stainless steel cable

Anchor Placement



Flow Direction

SURFACE PROTECTION

Thank you