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Great Lakes Chapter

Toronto and Region Conservation for The Living City

3rd Annual TRIECA Conference – March 25 & 26, 2014
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Vegetation Establishment on Construction Sites

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Practical Land Improvement Solutions for Over 40 Years

Overview

- Basics of Soil Stabilization
- Vegetative Stabilization – Long Term Erosion and Sediment Control
  - Planning for Vegetative Establishment
  - Implementing Vegetative Stabilization
    - Ground Preparation
    - Seeding Methods
    - Mulching/Erosion Controls
  - Temporary Seeding
  - Permanent Seeding/Native Planting

Why Soil Stabilization Matters

- Lots left after mass grading and infrastructure improvement
- Exposed soils with sparse vegetation
- Disturbed Land Areas exposed to rainfall and runoff

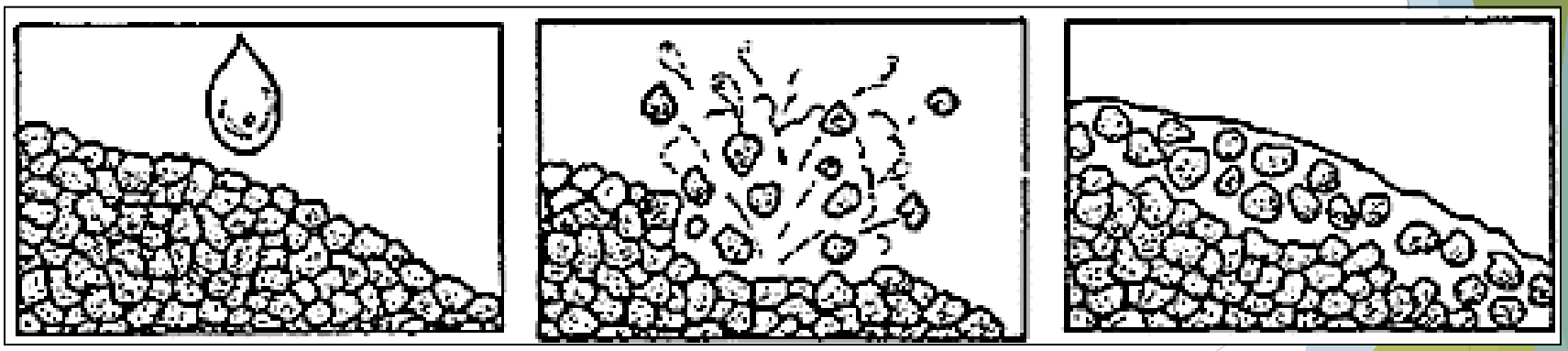
Exposed Soils

- Rainsplash Erosion
- This is where it starts
- Rain drops act as bombs
  - They dislodge soil particles and allow for transport

Photo credit USDA NRCS

Raindrop Erosion

- Rain drops striking bare soil directly
  - Detaches soil particles
  - Particles can then be transported by the action of water and/or wind



Erosion is a Source Problem

- It’s ugly, but is it that bad?

Erosion Leads to…..

- It’s ugly, but is it that bad?

- Then it rains…….

No Erosion Control Results In…

- Unstabilized soils results in sediment control issues

- Then the trouble really starts

Results of Poor Erosion Control

- And it rains some more …..

And rains…..

Results of Poor Soil Stabilization

- Ultimately the public waterways, ponds, and wetlands are impacted

What are the Regulatory Issues?

- Ontario Ministry of Environment
  - Clean Water Act
- County/Regional and Municipal Stormwater Ordinances
- NPDES – ILR10 Construction General Permit
  - Site Stabilization
  - Turbidity Reduction
  - Runoff Control

Regulatory Requirements (Stateside)

- Disturbed areas that shall remain inactive for a period of greater than 14 days require stabilization practices to be installed by the 7th day. (2008 ILR10 General Construction Permit)

- Many counties require that permanent stabilization occur within 7 days of reaching final grade.

- 70% Vegetative cover is required for a site to be considered "stabilized"

Is this site stabilized?

Is this site stabilized?

Is this site stabilized?

Stabilization Practices

Stabilizing disturbed areas can protect your investment

Stabilization Practices

Stabilizing disturbed areas can protect your investment

Focus on Results and Efficiency

- What's the goal of stabilization practices?
- What's the easiest and most cost effective means of maintaining a stabilized site?

Long Term Erosion Control

- The most effective and efficient means of controlling soil erosion on construction sites is a healthy and full stand of vegetation.

That's great, but how do we get there?

Long Term Temporary Site Stabilization

- Isn't that an Oxymoron?
  - Annual vs. Perennial
  - Final Grade vs. Construction Complete

- Stabilization Requirements
  - Timing
  - Definition

- Factors in Developing A Healthy Vegetative Cover
  - Throw and Grow (and Hope) vs. Technical Approach

Challenges to Vegetative Stabilization

- Typical construction sites provide challenges in stabilizing soils
- Vegetation establishment is difficult at best
  - Low nutrient content
  - Little natural soil structure
  - Clay soils are prone to sealing off
  - High soil compaction
  - Little moisture retention
  - Low temperature moderation

Planning Vegetative Stabililzation

1. Time of Planting - Spring, Summer or Fall Planting?
   - Germination dependent on:
     - Water
     - Temperature
     - Oxygen
   - Dormant seeding

2. Soils Type
   - Acidic or Alkaline (Scale from 0 to 14)
   - Extremes limit the availability of nutrients
   - Clays/Silts compact easily → Limit root growth
   - Sands drain easily → Limit moisture & nutrient retention
   - Topsoil is best case scenario
     - Organic matter and biological activity provide long term nutrients

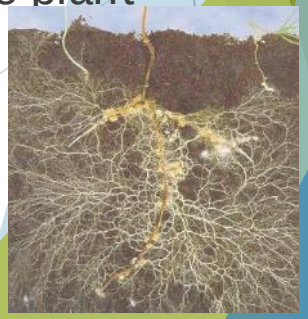
Planning Vegetative Stabilization

3. Site Conditions
   - Flat, sloping or holding water?
   - Is there evidence of concentrated flows or gully erosion?
   - Are roads and underground utilities installed?
     - B-boxes, sewer services, hydrants, manholes, etc.
     - Presence of leftover bedding stone?
     - Miscellaneous construction debris

4. Soil / Seedbed Preparation
   - Reduced compaction via scarification & tillage
   - Scarified soil; usually = Good seed/soil contact
   - Slight firming (Cultipacking) after seeding enhances contact
   - Depth →Grasses typically germinate at approximately 1/4 inch deep
   - Seeding Methods
     - Broadcasting
     - Drop seeder (Trillion or Brillion)
     - Drilling
     - Hydro-seeding

Planning Vegetative Stabilization

5. Additives
   - Fertilizers
     - Artificially supplies the lacking nutrients
     - Soil testing (pH and N-P-K values)
     - Organic vs. Inorganic
   - Moisture Retention
     - Mulches
       - Hydro-mulch
       - Straw mulch
       - Compost
     - Polymers
       - Water absorbing crystals act as a reservoir
   - Mycorrhizae
     - Symbiotic relationship between fungus and roots of the plant
       - Plant supplies food
       - Fungus aides in water and nutrient uptake



Planning Vegetative Stabilization

6. Seed Mix

- Modified Pasture Blend
  - No single species grows well all year long
    - Cool season grasses
    - Warm season grasses
    - Legumes
      - Nitrogen fixing → Converts unusable N_2 to plant usable NH_3
  - Typical heights of stabilization mixes is 12” to 18”

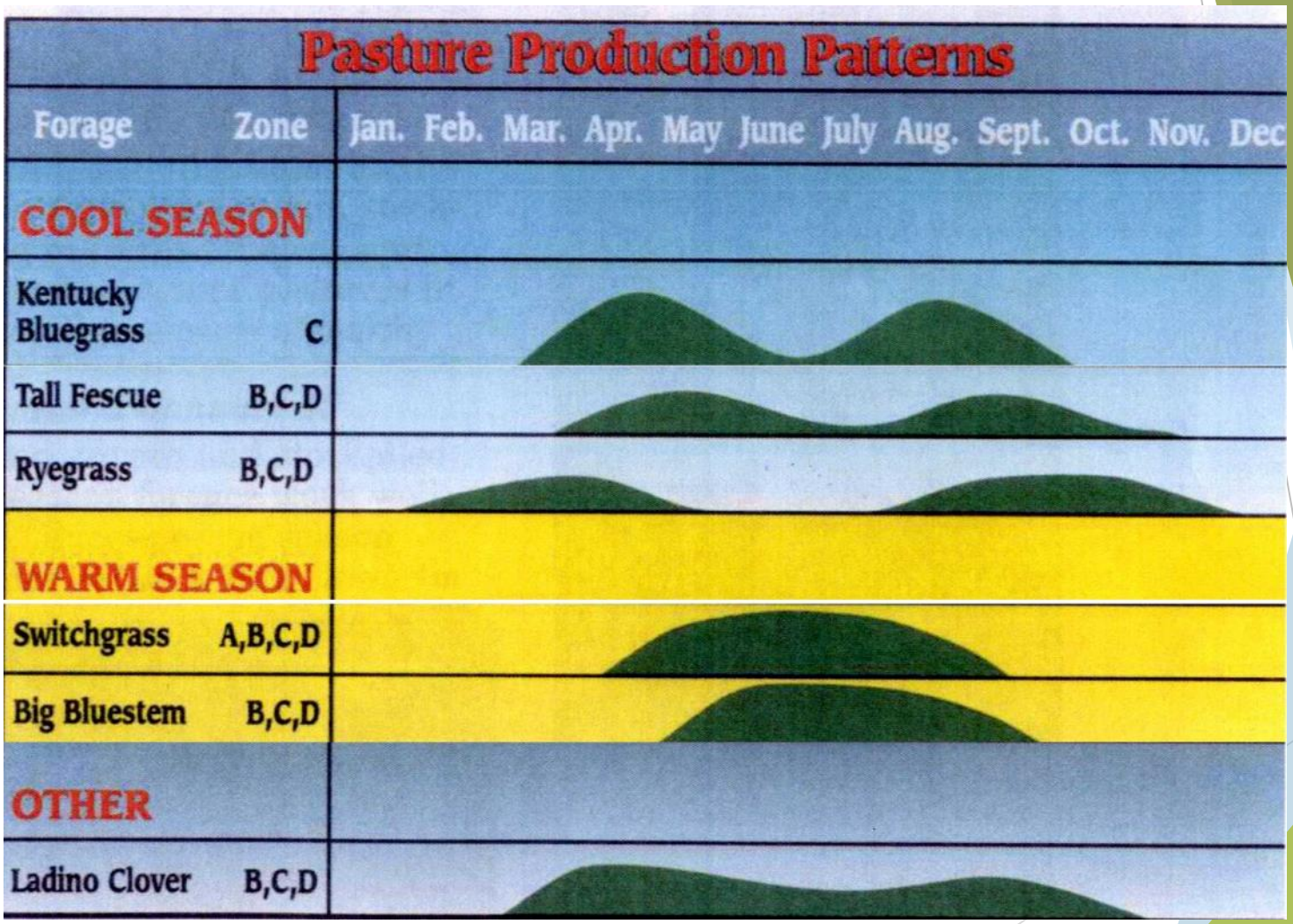
Spring Mixture
Ryegrass (Annual & Perennial)
Oats (Annual)
Fescue (Perennial)
Timothy (Perennial)
Clover (Legume)

Fall Mixture
Wheat (Annual)
Ryegrass (Annual & Perennial)
Fescue (Perennial)
Clover (Legume)

Temporary Seeding Mixtures

- Seed Mixes
  - Annuals
    - Seed Oats – Hearty, Fast Germinating & Growing, Frost Intolerant, Good in Spring
    - Annual Rye – Fast Germinating & Growing, Will Reseed, Great quick cover all year, slightly more frost tolerant
    - Cereal Rye / Winter Wheat – Great in Fall, Germinates in colder temps, winter survivorship
  - Perennials
    - Perennial Rye – Durable, Fast Germinating, Dense
    - Timothy – Pasture Grass, Very fine Seed, Durable
    - Creeping Red Fescue – Simple durable and fast growing
    - Tall Fescue – Good cover, grows dense and tolerates drought
    - Aliske Clover – Not always desirable (especially in native areas) but fast growing, spreads in, tolerant of both drought & wetness,

Growth Factors in Species Selection



Implementing Vegetative Stabilization

- Keys to Success
  - Ground Preparation
  - Proper Seed Selection
  - Soil Amendments
  - Proper Installation
  - Mulching / Temporary Erosion Controls

No matter what, seeding on clay pads takes additional time to mature and fill in.

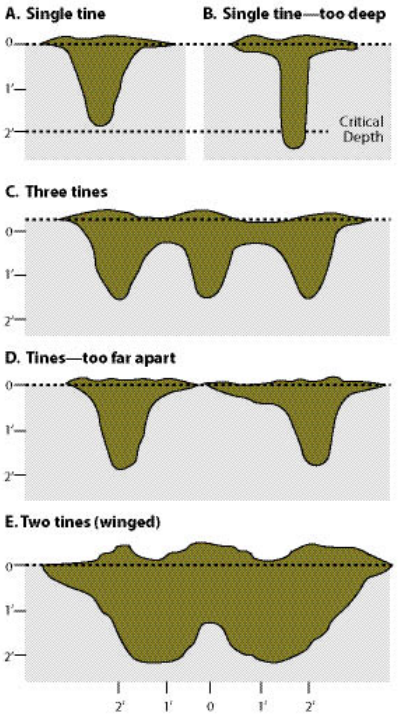
Ground Preparation for Seeding

- Landscape Rake

- Power Rake

Ground Preparation for Seeding

- Tandem Harrow/Disk



- Deep Tine Rippers

Methods of Seeding

- Broadcast

Methods of Seeding

- Mechanical

Seed Boxes

Methods of Seeding

- Mechanical

Methods of Seeding

- Hydroseeding

Mulching / Erosion Control Blanket

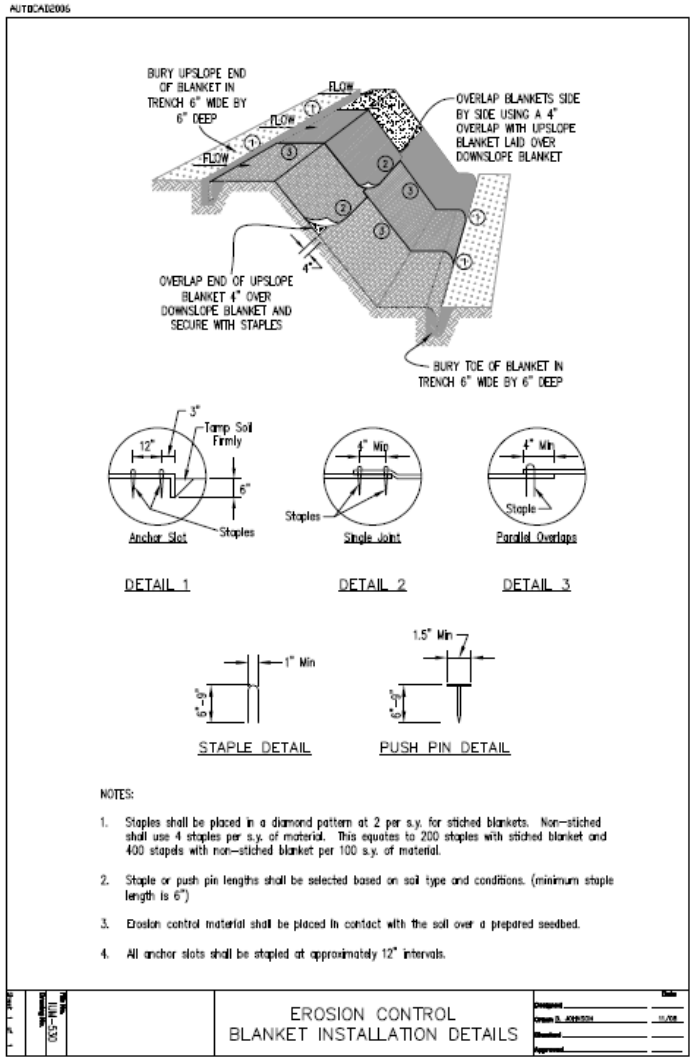
- The job of any mulching is to stabilize soils and provide ideal growing conditions for seeding.
  - Erosion Control
  - Moisture Retention
  - Temperature Moderation
  - Nutrients and Organic Material
- Compost mulching provides the optimum of all four conditions.

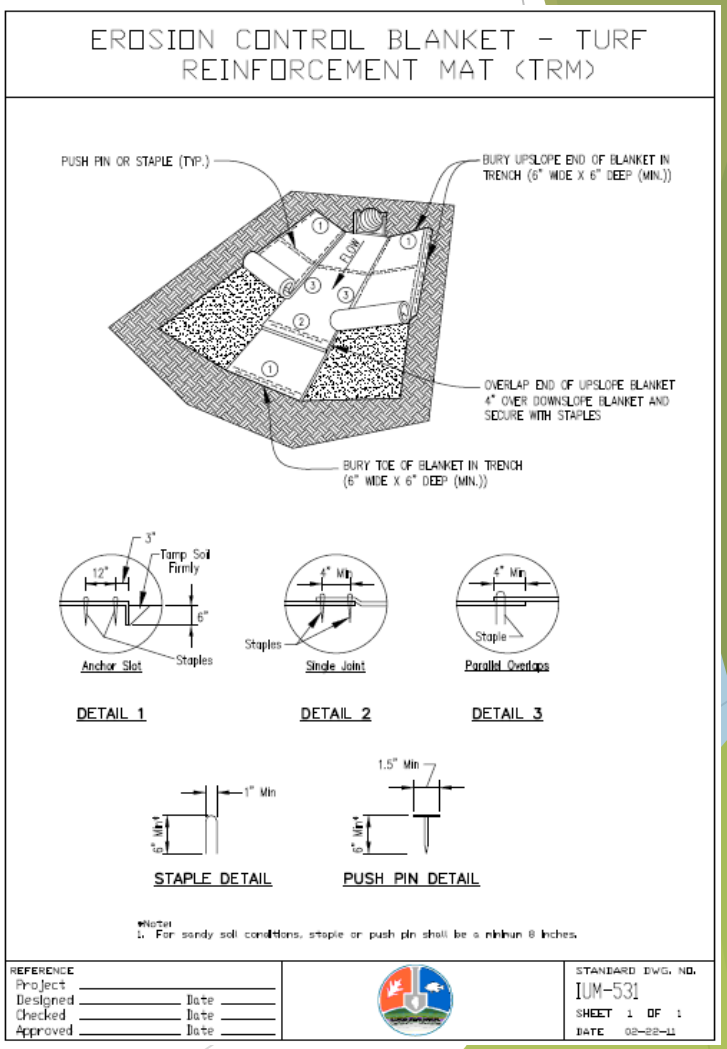
RECPs – Rolled Erosion Control Products

Practice & Product Selection Criteria

- Slope Steepness & Length
- Functional Longevity
- Velocities & Sheer Stresses
- Staple Pattern
- Soil Conditions

Erosion Blanket / TRM Installation



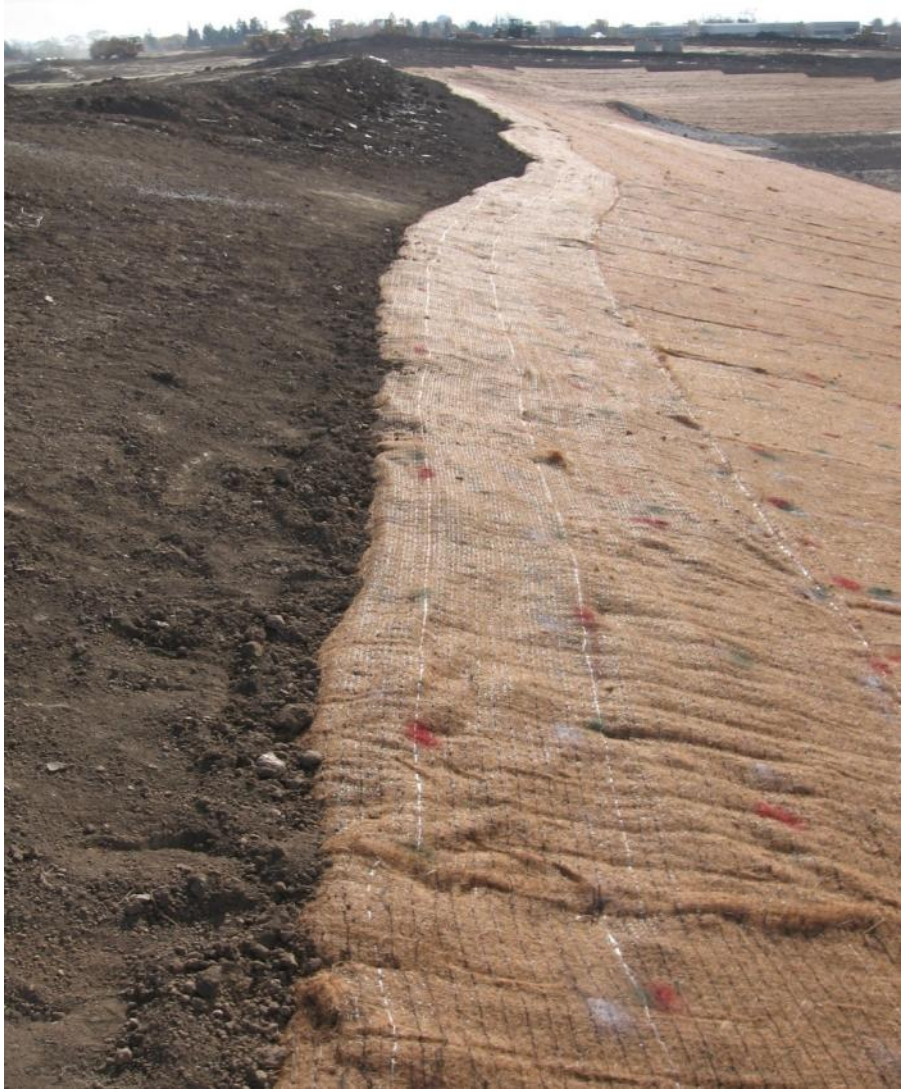


Erosion Control Blanket

Installation

- Soil surface stable and free of rocks and obstructions
- Material meets specifications
- Protected from contributing disturbed areas
- Direct contact with soil

Erosion Control Blanket



INSTALLATION

- Anchored on summit of slope
- Unrolled parallel to primary direction of flow
- Overlapped in the direction of flow
- Staple Pattern & Quantity is Correct

Mulching

Practice & Product Selection Criteria

- Slope
- Soil Conditions
- Duration Needed
- Access
- Cost

Options for Mulching

- Straw Mulching
- Hydromulching
- Compost Mulching (Terraseeding)

Straw Mulching

- Application Rate of 2 Tons per Acre
- Crimping necessary

Straw Mulching

- Find the most efficient method to apply mulch to large areas

Mulching!!!!

Straw Crimping

Hydromulching

Considerations

- Slope
- Access
- Duration
- Types of Fiber
- Bonding Agent / Tackifier
- Seeding with mulching?
- Mix Ratio
- Rate of Application

Hydromulching

INSTALLATION

- Mix Thoroughly
- Add water first, then lightest to heaviest elements
- Spray from two opposing directions
- Ensure appropriate application rate

What is Compost Mulching?

- A layer of loosely applied compost or composted material that is placed on the soil in disturbed areas to control erosion and retain sediment resulting from sheet-flow runoff.[1]

[1] USEPA – NPDES Stormwater Menu of BMPs

How Does Compost Mulching Work?

- Compost blankets provide greater coverage for temporary soil stabilization (95-100% mulch coverage vs. 65-70% for straw)
- Compost stimulates microbial activity and provides more available nutrient for plant growth
- Pollutant Removal
  - Studies have shown reduced pollutant loading in discharge through compost
- Compost provides greater moisture holding capacity than other BMPs
  - Results in less runoff volume in small storm events and reduced time of concentration
  - Seed germination and plant growth is enhanced with greater moisture holding capacity

Compost Mulching Considerations

- Compost should be spread between ½ inch and 2 inches thick
- Seed should be mixed into the compost as it is spread (Terraseeding)
- Additional seed can be broadcast over the compost blanket/mulching to provide additional coverage
- Slopes steeper than 2:1 should have additional netting or cellular confinement system for long term stability
- COMPOST MULCHING IS NOT FOR USE IN CONCENTRATED FLOW PATHS

Yorkville, IL – Residential Site

- Application of Compost – ½ inch thick with seed - November 5

Yorkville, IL – Residential Site

- Application of Compost – ½ inch thick with seed

March 18 - Rainfall

May 7 - Rainfall

Yorkville, IL – Residential Site

- Application of Compost – ½ inch thick with seed

June 6 – 70%?

August 8

Compost Mulching (Terraseeding)

Other methods of Application

Compost Mulching (Terraseeding)

Costs on Terraseeding

- Material costs differ depending on distance from nearest facility and quantity of material
- Thickness of application also matters, as does application area
- Ranges from $3,000 - $5,250 per acre
- Georgia estimates $0.98 - $1.08 per square yard
- Typically less costly than blanket

Vegetative Stabilization Practices

Temporary Seeding

Permanent Seeding - Natives

Temporary Seeding

- Provide quick, vigorous, and durable vegetation
- Reduce erosion from rainfall and runoff
- Low maintenance
- Provide vegetative coverage for as long a period as necessary until project is complete

Temporary Seeding

- The Moonscape – Seeding September 30th

Temporary Seeding

- 45 Days after seeding – November 15th

Temporary Seeding

- The following Spring – April 30th

Temporary Seeding

- June 1st

Temporary Stabilization

Temporary Stabilization

Temporary Stabilization

- Some sites are on-going challenges

May 15, 2008

Temporary Stabilization

- Some sites are on-going challenges

June 25, 2008

Some areas are nearly barren

Some areas are establishing

Temporary Stabilization

- Some sites are on-going challenges

September 5, 2008

Some areas are nearly barren

Some areas are establishing

Temporary Stabilization

- Some sites are on-going challenges

Goose predation

October 10, 2008

Other re-seeded areas still sparse

Temporary Seeding Maintenance

- Mowing to Control Weeds and Promote Growth
  - Mowing should take place when growth reaches 12” to 18” in height
  - Mow to a height of 6”, No less than 4”
  - 2x per year
    - Mid-Summer
    - Early Fall
- Fertilizer Application
- Aeration

Temporary Seeding Summary

Keys to Success

- Ground Preparation
- Soil Amendments
- Proper Seed Selection
- Proper Installation
- Timing

No matter what, seeding on clay pads without topsoil takes additional time to mature and fill in.

Temporary Seeding Budgeting

Factors:

- Topsoil re-spread (Scraper, backhoe, trucks & dozer) = $4/CY
  - Material availability
  - Haul length
  - Stage of development
- Typical Ground Preparation / Seeding = $850/Acre
- Additives
  - Fertilizer (250 lbs/acre) = $225/Acre
  - Moisture Retention = $10/Acre to $2,000/Acre
  - Mycorrhizae = $5/Acre
- Mulching
  - Erosion Control Blanket = $1.25/SY
  - Blown Straw Mulch (2 Tons/Acre) = $2,000/Acre
  - Compost = $40/CY
- Maintenance
  - Mowing = $100/Acre
  - Re-seeding / Over-seeding = $600/Acre

Permanent Seeding – Native Landscaping

Native Plantings

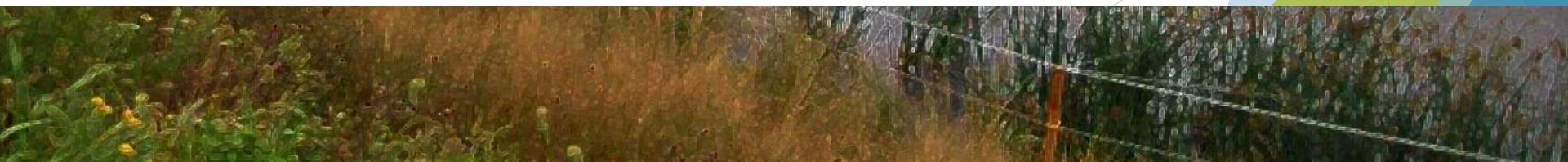
Open Water Naturalized Detention Basin

Wetland Bottom Naturalized Detention Basin

1st Year Native Planting

TYPICAL YEAR 1:

- SEEDING OCCURS
- TEMPORARY ANNUAL COVERCROP APPEARS
- WEEDY SPECIES APPEAR (FOXTAIL, BARNYARD GRASS)
- PLANTS / PLUGS INSTALLED WHEN CONDITIONS ARE CORRECT
- FENCING INSTALLED TO PROTECT YOUNG PLANTS FROM GEESE
- WEEDY SPECIES MAY EMERGE (CATTAIL)



2nd Year Native Planting

TYPICAL YEAR 2

TYPICAL YEAR 2:

- COVER CROP SHOULD DISAPPEAR
- PERMANENT NATIVE PLANTS START TO EMERGE
- WEEDS MAY BECOME PROBLEMATIC, REQUIRING CONTROL
- PLANTS / PLUGS START TO ESTABLISH
- CATTAILS MAY BEGIN TO APPEAR

3rd Year Native Planting

TYPICAL YEAR 3

TYPICAL YEAR 3:

- PERMANENT NATIVE PLANTS SHOULD BE DOMINANT
- SHOWY FLOWERS SHOULD BE VISIBLE
- NATIVE PLANTS BEGIN TO REPRODUCE AND PRODUCE SEEDS
- PLANTS COULD BE APPROXIMATELY WAIST HIGH
- PLUGS CONTINUE TO COLONIZE ALL OF THE EMERGENT AREA
- CATTAIL MAY REQUIRE MANAGEMENT/ CONTROL
- REMOVE PROTECTIVE FENCING AS PLANTS MATURE AND FLOURISH

Typical Native Plant Species

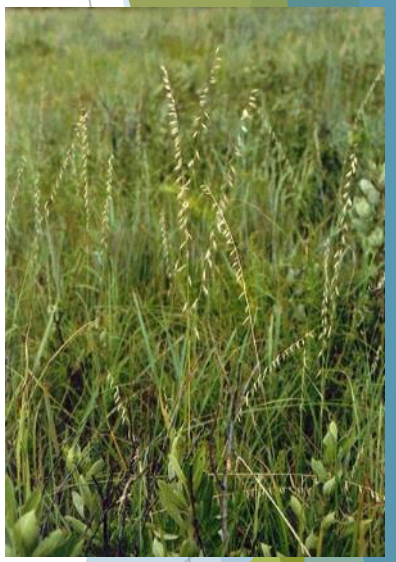
INDIAN GRASS

WHITE PRAIRIE CLOVER

PURPLE CONE FLOWER

BLACK EYED SUSAN

SOFT STEM BULRUSH



SIDE OATS GRAMA

Management & Monitoring

Managing Your Natural Area

SEEDING AND PLANTING OF NATURAL AREAS OCCUR ONCE THROUGHOUT THE MANAGEMENT PERIOD UNLESS SUPPLEMENTAL SEEDING IS DEEMED NECESSARY.

HERBICIDE APPLICATIONS TO CONTROL WEEDS OCCUR AS NEEDED THROUGHOUT THE GROWING SEASON. MECHANICAL CONTROL OF WEEDS, SUCH AS CUTTING, IS USED FREQUENTLY IN ADDITION TO HERBICIDE APPLICATIONS.

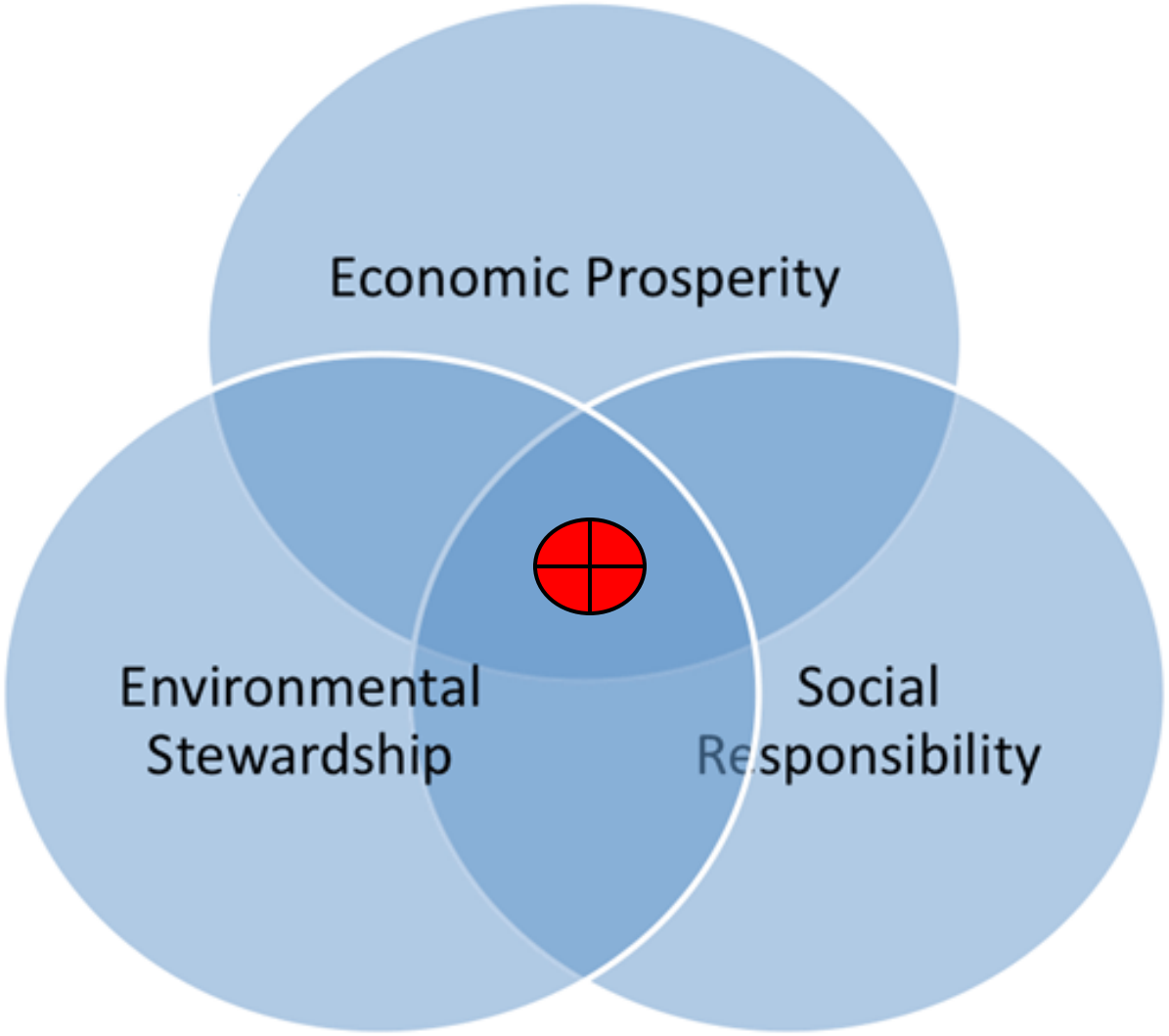
PRESCRIBED BURNS ARE RECOMMENDED.

The End Result

Why A Focus on Vegetative Establishment Makes Sense

- Erosion Control vs. Sediment Control
- Protect Your Investment
- Minimize Your Exposure
- Long Term Success

Vegetative Establishment Success



Questions?

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