Local Conditions - NE Minnesota

- Identifying Regional Stormwater Challenges
- Selecting BMPs for our area
- Experience & observations from MNDOT & MPCA
- BMPs that work / don’t work in NE Minnesota

Regional Construction Stormwater Challenges
- Special Waters
- Clayey soils
- Poor quality topsoil
- Steep slopes
- Shallow depth to bedrock
Local Conditions-NE Minnesota

- Special Waters
  - Lake Superior
  - Trout Streams
- Clayey Soils
  - Very common throughout region: Duluth, North Shore, North-central MN

Local Conditions-NE Minnesota

- Poor Quality Topsoil
  - In general, the forested region of MN
  - Particularly the Canadian Shield terrain
- Steep Slopes
  - Common throughout region: Duluth, North Shore
- Shallow Depth to Bedrock
  - Canadian Shield
Local Conditions - NE Minnesota

- Shaded areas at or below 15 m (50') BGS
- Shallow depth to bedrock
- Poor quality topsoil
- Steep slopes along North Shore
- Special Waters

Definitions

- Erosion Control
  - Preventing (or minimizing) the dislodgment of soil particles
- Sediment Control
  - Controlling the movement of soil particles dislodged by failed erosion control practices
Definitions

- Stabilized
  - Mulch, ECBs, sod, rip rap, aggregate surfacing, pavement or other materials that prevent erosion

- Surface Water
  - Streams, rivers, lakes, ponds, wetlands, ditches, storm sewer systems (including curb & gutter)

BMPs for Northeast Minnesota

- EROSION CONTROL
  - Up-gradient runoff diversion
  - Temporary slope drains
  - Rapid Stabilization Methods
    - Seed w/ oats (Spring, Summer)
    - Seed w/ winter wheat (Fall)
    - Straw, or ECBs
  - Temporary covering w/ geotextile, tarps, poly sheeting, etc.
**MnDOT Rapid Stabilization Methods**

- Method 1 – Type 1 Mulch, Disc Anchor
- Method 2 – Type 1 Mulch & tack w/HSS
- Method 3 – Seed, Fert., Type 6 HSS
- Method 4 – Seed, Fert., & cat. 3 ECBs
- Method 5 – Geotextile & class II rip rap

**BMPs for Northeast Minnesota**

- SEDIMENT CONTROL BMPs
  - Phased construction
    - Construct sensitive areas **first**
    - Final grade & stabilize perimeter areas early
    - Disturb only what is needed for short-term construction activities
**BMPs for Northeast Minnesota**

- SEDIMENT CONTROL BMPs (cont)

  - Perimeter Sediment Control (Overland Sheet Flow)
    - Silt Fence
      - Machine Sliced monofilament fabric
      - MNDOT Heavy Duty
      - Preassembled
    - Biorolls / Compost tubes
    - Topsoil berms

- SEDIMENT CONTROL BMPs (cont)

  - Stormwater Conveyance Channels
    - Riffle & Pool effect
    - Rock ditch checks/ Stone weepers/ gabions
    - Biorolls
    - Sod lined swales
    - Rip rap
    - Hay bales
BMPs for Northeast Minnesota

- SEDIMENT CONTROL BMPs (cont)
  - Inlet Protection
    - Inlet Weir
    - Pop-up retractable riser (Wimco) type
    - Dandy bag type
    - Rock snake, rock log (Sac Bag type)
  - Ponding
    - Sediment settling
    - Perf. Riser / monofilament geotextile / pea gravel
    - Chitosan treatment

- SEDIMENT CONTROL BMPs (cont)
  - Dewatering (pumping)
    - Discharge to:
      - Flat surface energy diffuser (plate, plywood, etc.)
      - Natural basin
      - Vegetated area
      - Sanitary sewer (with approval)

  - Longer discharge hose !!
**BMPs for Northeast Minnesota**

- **Poor Quality Topsoil**
  - Salvage & re-use existing topsoil
  - Import from adjacent projects
  - Amend topsoil with:
    - Organic materials (black dirt, manure, etc.)
    - Wood chips from land clearing
    - Commercial fertilizer
    - compost

- **Steep Slopes**
  - Flow diversion
  - Slope drains
  - Riffle & Pool effect
  - Terracing, benching
  - Cat tracking (aka horizontal slope grading)
  - Rip Rap (well defined channel, geotextile)
  - Drop structure
BMPs for Northeast Minnesota

- Shallow Depth to Bedrock
  - Riffle & Pool effect
  - Utilize rock checks to slow runoff
  - Commonly associated with significant elevation differences

MPCA Observations

- Erosion control is far more effective than sediment control
- Proper installation of ECBs is more important than ECB selection
- Don’t expect miracles from silt fence
- Silt fence not trenched in = no silt fence
MPCA Observations

Every construction project should include:
- Knowledgeable person responsible for ESC work
- Project SWPPP (on NPDES permitted projects)
- Landscape rake & shovel
- Hand seeder, seed appropriate for the application, 10-0-10 commercial fertilizer
- Straw mulch and/or ECB’s
- Minimum 200’ of discharge hose for dewatertng

MPCA Observations

- The root cause of nearly all ESC problem sites is a poor (or non-existent) erosion control effort.
- A great SWPPP is worthless if not followed in the field.
- Communication breakdown during construction phase
- Owner/Consultant should identify exactly what ESC work is required
- Make all ESC work pay items
MPCA Observations

- Complying with NPDES permit requirements takes:
  - Knowledge
  - Sense of Planning
  - Resources
  - Attitude

MPCA Observations

- Erosion Control is far more effective than Sediment Control
- Sediment Control
  - Think “riffle & pool” affect
    - Sheet flow and concentrated flow runoff
    - Micro and macro scale
MnDOT’s experience

Todd Campbell, P.E.
District Hydraulics Engineer – MnDOT
District 1

Wood chip mulch & rock checks
Rock gutter check

Rock Sock flow diversion
Divert flow around erosive soils

Temporary sediment basin
Temporary Stabilization

Wood Chip Entrance
Fortified Rock Ditch Check

Bioroll on Ledge Rock
ECB installation

Bonded Fiber Matrix
Ditch check types

Machine Sliced Mono Silt Fence
Vegetated Swale / Rock Checks

Floatation silt curtain – low flow stream
Properly stabilized slope

Compost log perimeter sediment control
Combination of correct BMPs

Protect trout streams!
Stabilizing a difficult site

Questions?
Riffle & Pool Affect

(Sheet Flow, Micro scale)

- Typical grading practice
  - Dozer travels parallel to contour
  - Mini-rills develop from dozer pad imprints
- Common result of grading on the contour
  - Sheet flow transforming to rill erosion

- Rock Check
- Sump
- Stabilized Ditch
- Stabilized Grading
Failed Erosion & Sediment Control
Failed Erosion & Sediment Control
Construction Practices to Avoid

Successful Erosion Control Practices
Successful Sediment Control Practices

- Excavate with teeth of bucket traveling parallel to contour
- Riffle & Pool
- Loosened, roughened subgrade

10/26/2004
Successful Sediment Control Practices

[Images of sediment control practices]
Successful Dewatering Practices
Successful Construction Practices

- Perimeter Control
- Erosion Protection
- Sand Bag Diversion Berm
- Pump, Long Discharge Hose
Successful Perimeter Sediment Control

Silt Fence properly installed
Sequencing Construction...

- Establish Final Grade Early at Sensitive & Perimeter Areas

Sequencing Construction...

- Timely Stabilization w/ Appropriate BMPs
Sequencing Construction

- Relax & Watch
  - Your Risks
  - Diminish

Successful Construction Practices

- Vegetated Strip Between
  - Disturbed areas and Silt Fence
Successful Perimeter Sediment Control

Water Quality Benefits

- Erosion control
- Sediment removal
- Nutrient & pollutant removal
- Flow retention
- Runoff cooling
Local Support for NPDES Permit – NE Minnesota

- MPCA internet site @ http://www.pca.state.mn.us/water/stormwater/stormwater-c.html
  - General information
  - NPDES Permit requirements
  - Permit forms
  - Special waters search
Local Support for NPDES Permit – NE Minnesota

  - Fact Sheets & Guidance Tools
  - Training Opportunities
  - MPCA staff contacts

Local Support for NPDES Permit – NE Minnesota

- Permit and Program Forms
  - permit application
  - Permit Transfer/Modification
  - Subdivision Registration
  - Notice of Termination
  - Inspection checklist
Local Support for NPDES Permit – NE Minnesota

- Special Waters
  - Special Waters list
  - Special Waters Search Tool
- Fact Sheets and Guidance Tools
  - Overview of NPDES Permit
  - E & S Control for New Homeowners
  - Stormwater Compliance Tool Kit for Small Construction Operators
  - Construction SWPPP Template

Local Support for NPDES Permit – NE Minnesota

- Additional Training Opportunities
  - MECA
    - Annual Conference
    - E & S control lab at Rice Lake, WI
  - MNDOT/ U of MN
    - Inspector/Installer
    - Site Manager
    - Design
  - Resource Professionals Alliance
    - January 19-21, 2005 - Minneapolis, MN
Local Support for NPDES Permit – NE Minnesota

- **MPCA Staff Contacts**
  - NE Minnesota (Aitkin, Carlton, Itasca, Koochiching, St. Louis, Lake, Cook Counties)
  - Jim Dexter
    MPCA Northeast Regional Office
    525 S. Lake Avenue, Suite 400
    Duluth, MN 55802
    218-529-6253
    james.dexter@pca.state.mn.us