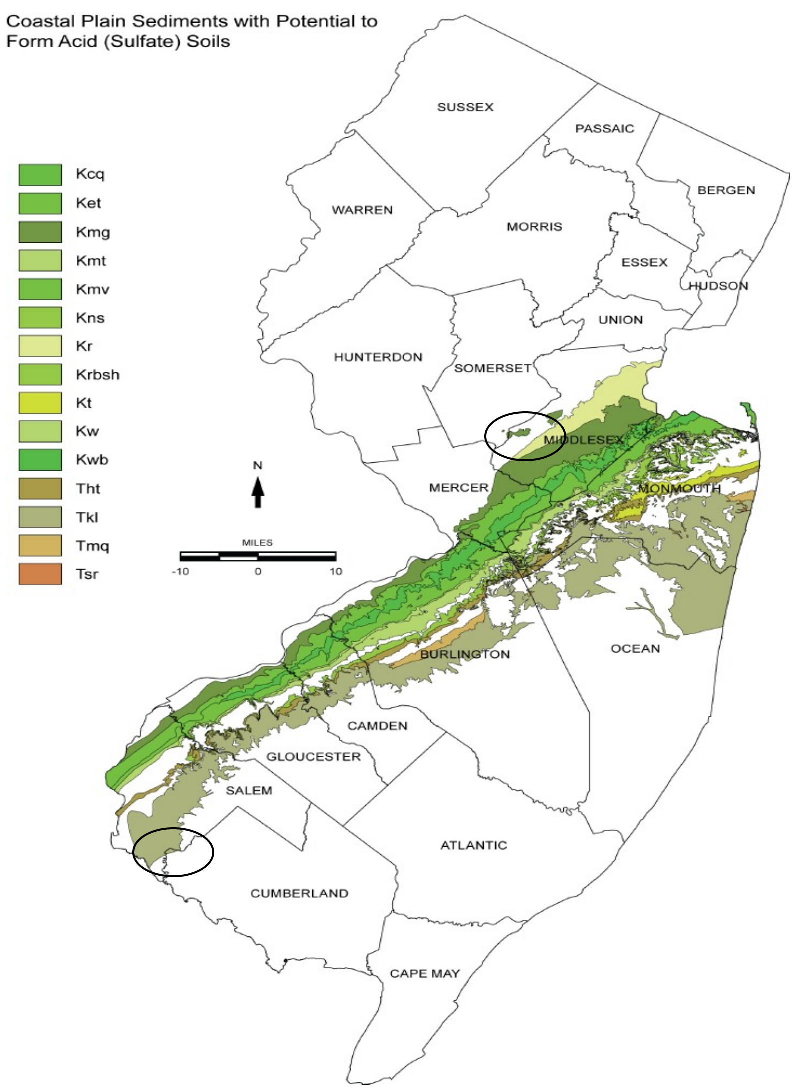
# 2014 Soil Erosion Control Standards Summary and Overview of Revisions

New Jersey Department of Agriculture
February 2014

# Vegetative Standards Overview

# ACID SOIL




- Added dredged sediment as a source of exposed Acid Soil in: *Definition*
- Expanded description of Acid Soil in: *Purpose*
- Added two counties to the list of: *Where Applicable*

- Added the limestone layer rate of 10 tons/acre under the cap: *Methods and Materials*

# Dune Stabilization

- Removed Rugosa Rose

  *(Rosa rugosa)*

- Removed Japanese Black Pine

  *(Pinus thunbergii)*

# Permanent Vegetation for Soil Stabilization

- Invasive species were removed from seed mixtures & were reconciled with New Jersey Department of Environmental Protection requirements

- Seed mixtures were revised along with seeding rates, optimal/acceptable planting dates, and fertilizer and lime requirements to be consistent with Rutgers recommendations

- A note regarding acceptable seed testing dates was incorporated

- Emulsified asphalt was removed as an acceptable option to bring the Standard up to date with current science.

# Permanent Vegetative Stabilization Standard- (new) Pinelands National Reserve Specifications

4-14 – "Where the intended land use permits or requires native plant re-growth, natural re-colonization by native plants is preferable."

These practices are limited to areas of relatively flat terrain which do not experience concentrated surface runoff

natural re-colonization = allow existing seedbed to grow (do not seed)

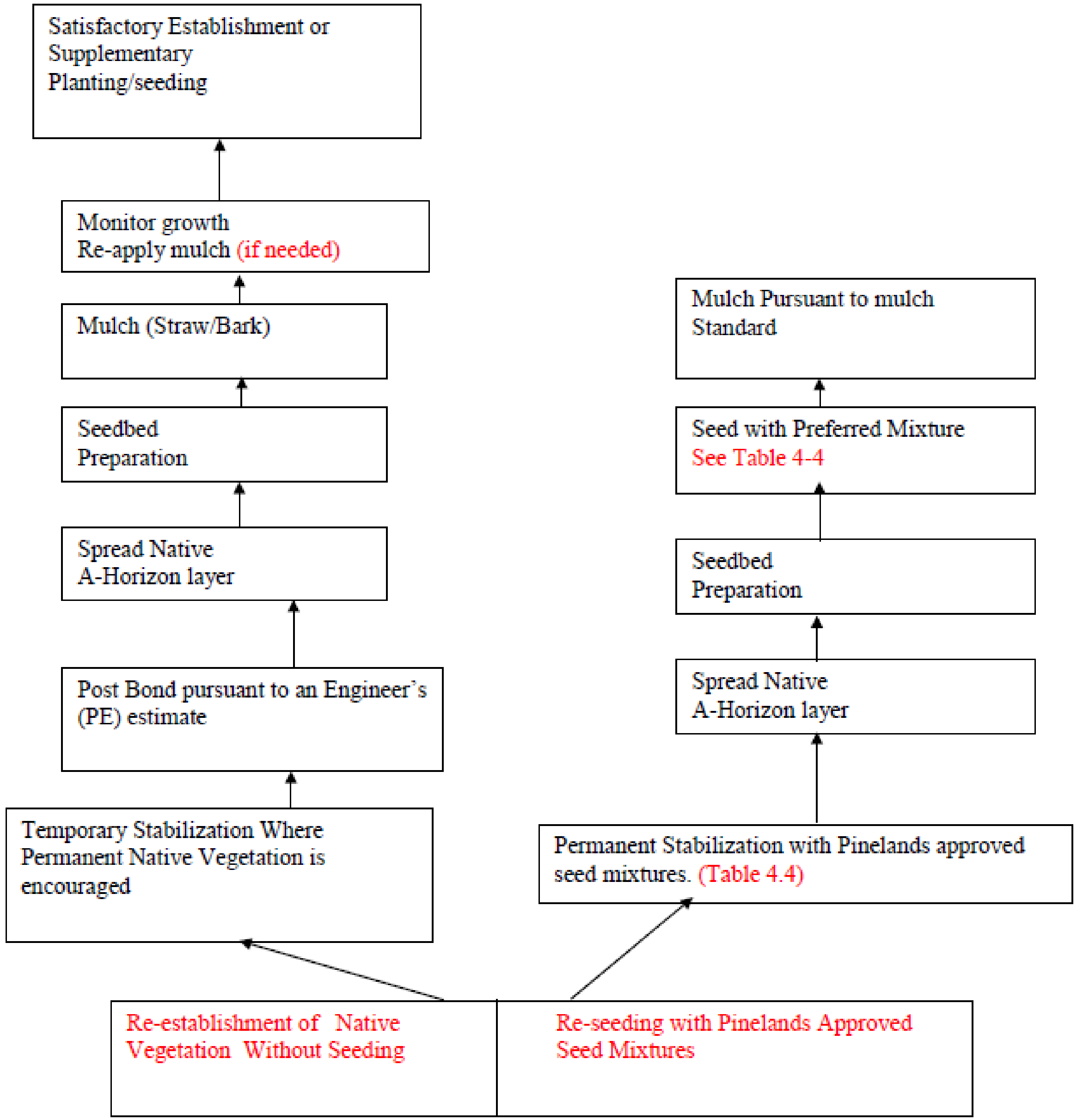
# Permanent Vegetation for Soil Stabilization

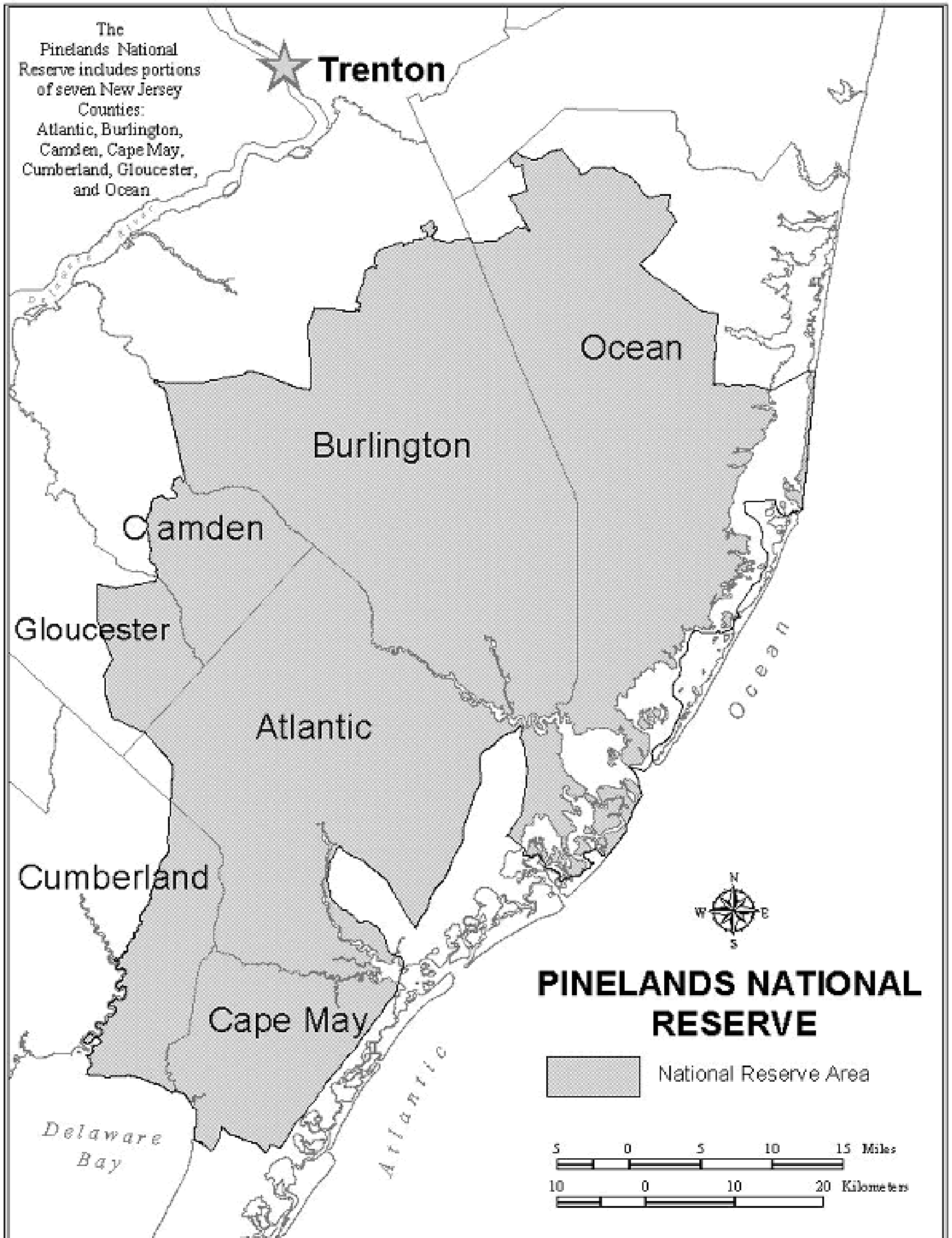
- Specific methods for alternative natural regeneration were established within the Pinelands National Reserve in areas of non-stormwater concentrated flows (roadbanks, site peripheral areas, etc.)

- Preferred Pinelands seed mixtures were provided, as well as reduced lime/fertilizer rates for natural regeneration areas

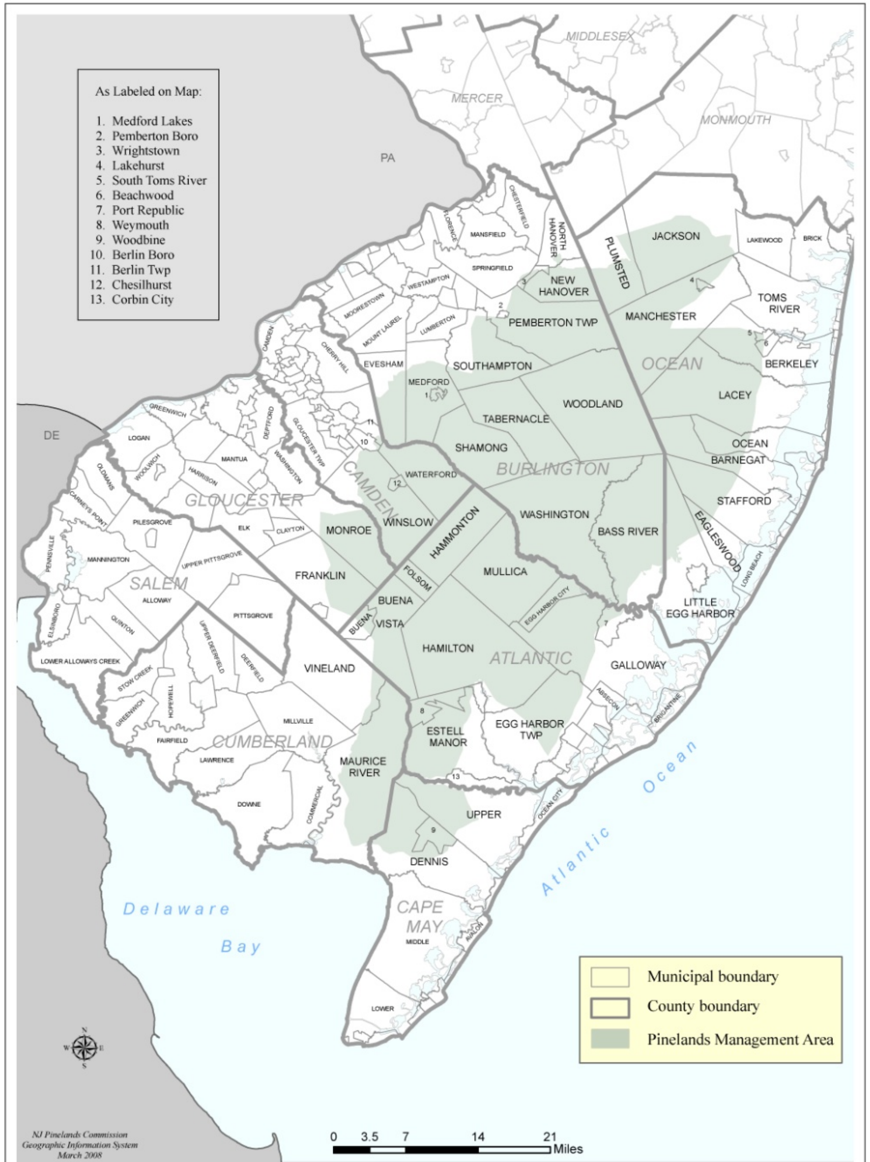
- A procedural flow chart was added for builders wishing to propose natural regeneration area(s)

# Pinelands National Reserve
# Natural Regeneration Process




The Pinelands National Reserve includes portions of seven New Jersey Counties: Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, and Ocean
Trenton
Ocean
Burlington
Camden
Gloucester
Atlantic
Cumberland
Cape May
Delaware Bay
Atlantic Ocean
N
W
E
S
PINELANDS NATIONAL RESERVE
National Reserve Area
5 0 5 10 15 Miles
10 0 10 20 Kilometers

# Municipalities of the Pinelands



# Standard for Stabilization with Mulch

- Removed Emulsified Asphalt from: *Methods and Materials*

# Standard for Permanent Stabilization with Sod

- Added a Kentucky bluegrass-Turf-Type Tall fescue sod as a recommendation for dry sites. (*MM* # 5)
- Added the incorporation of organic matter to: *Site Preparation, #1A*
- Brought fertilizer application rates and recommendations to current science: *Soil Preparation #2A*

# Temporary Vegetative Cover for Soil Stabilization

- Emulsified asphalt was removed as an acceptable option to bring the Standard up to date with current science

- Invasive species (weeping lovegrass) have been removed from seed mixtures

- Seed mixtures have been reconciled with New Jersey Department of Environmental Protection requirements

# Temporary Vegetative Cover for Soil Stabilization

- Seed mixtures, seeding rates, optimal/acceptable planting dates, as well as fertilizer and lime requirements have been revised to be consistent with Rutgers recommendations including a note regarding acceptable seed testing dates

- Annual ryegrass has been added as an alternative seed mixture under specified conditions.

# Standard for Top-soiling

- **This Standard is currently under revision for future release to address requirements for soil quality and restoration.  As of February 2014, the 1999 version of the Topsoiling Standard is in effect**

# Standard for Tree Protection During Construction

- Brought up to current science, added (protected root zone, PRZ)
- Inserted Figure 9-3 with PRZ calculation

*Standards for Soil Erosion and Sediment Control in New Jersey* *May 2012*

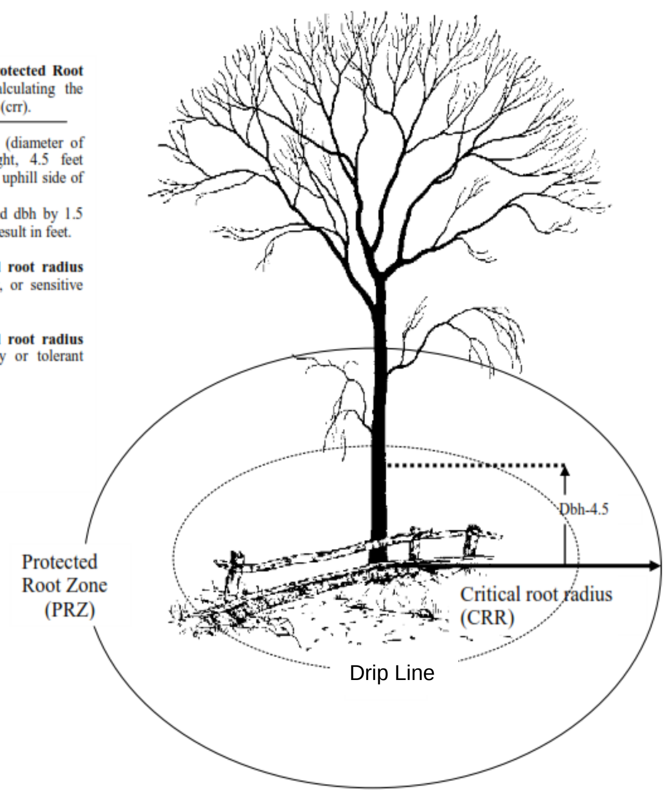
Figure 9-3: Root Protection During Construction Guide

Estimate a tree's **Protected Root Zone (PRZ)** by calculating the Critical Root Radius (crr).

1. Measure the dbh (diameter of tree at breast height, 4.5 feet above ground on the uphill side of tree) in inches.
2. Multiply measured dbh by 1.5 or 1.0. Express the result in feet.

Dbh x 1.5: **Critical root radius** for older, unhealthy, or sensitive species.

Dbh x 1.0: **Critical root radius** for younger, healthy or tolerant species.




1. *Protecting Trees from Construction Damage- A Homeowners Guide*, Gary R. Johnson, University Of Minnesota Extension Service, Saint Paul, MN, 1999.

# Standard for Tree Protection During Construction

- Added current science tables on potential construction impacts to tree genus/species

- Table 9-1



Tree Characteristics [1]

| SPECIES | ROOT SEVERENCE | SOIL COMPACTION & FLOODING | SOIL pH PREFERENCE | MATURE TREE HEIGHT (feet) | MATURE CROWN SPRED (feet) | HAZARD TREE RATING* | DAMAGE CAUSING ROOTS |
|---|---|---|---|---|---|---|---|
| American elm | Tolerant | Intermediate | 5.5-8.0 | 70-100 | 70-150 | Medium | Yes |
| Slippery elm | Tolerant | Intermediate | 6.6-8.0 | 60-70 | 40-60 | Medium | Yes |
| Hackberry | Tolerant | Intermediate | 6.6-8.0 | 30-130 | 50+ | Low | No |
| Hawthorn | Intermediate | Intermediate | 6.0-7.5 | 20-40 | 20-30 | Low | No |
| Bitternut hickory | Intermediate | Intermediate | 6.0-6.5 | 40-75 | 30+ | Medium | No |
| Honeylocust | Tolerant | Intermediate | 6.0-8.0 | 50-75 | 50-75 | Medium | Yes |
| Ironwood | Sensitive | Sensitive | 6.1-8.0 | 25-50 | 20-30 | Low | No |
| Basswood | Intermediate | Sensitive | 5.5-7.3 | 70-100 | 50-75 | High | No |
| Black locust | Tolerant | Sensitive | 4.6-8.2 | 30-60 | 20-50 | Medium | No |
| Red maple | Tolerant | Tolerant | 4.5-7.5 | 50-70 | 40-60 | Medium | Yes |
| Silver maple | Tolerant | Tolerant | 5.5-6.5 | 60-90 | 75-100 | High | Yes |
| Sugar maple | Intermediate | Sensitive | 5.5-7.3 | 60-80 | 60-80 | Medium | Yes |
| Mountain-ash | Tolerant | Intermediate | 4.0-7.0 | 15-25 | 15-25 | Medium | No |
| Black oak | Sensitive | Sensitive | 6.0-6.5 | 50-80 | 50-70 | Medium | No |
| Bur oak | Tolerant | Intermediate | 4.0-8.0 | 70-80 | 40-80 | Low | No |
| Pin oak | Sensitive | Sensitive | 5.5-7.5 | 50-75 | 30-50 | Medium | No |
| Red oak | Tolerant | Sensitive | 5.5-7.5 | 50-75 | 30-50 | Medium | No |
| Swamp white oak | Intermediate | Tolerant | 6.0-6.5 | 60-70 | 40-50 | Low | No |
| White oak | Sensitive | Sensitive | 6.5-7.5 | 60-100 | 50-90 | Low | No |
| Plum | Tolerant | Sensitive | 6.5-6.6 | 20-25 | 15-25 | Low | No |
| Serviceberry | Intermediate | Sensitive | 6.5-6.6 | 20-25 | 15-25 | Low | No |
| Black walnut | Sensitive | Intermediate | 6.6-8.0 | 70-100 | 60-100 | Medium | No |
| Black willow | Tolerant | Tolerant | 6.5-8.0 | 30-60 | 20-40 | High | Yes |

Table 9.1:

* **Hazard tree rating:** refers to the relative potential for a tree to become hazardous. For a tree to be considered hazardous, a potential "target" (e.g., a house, a sidewalk, pedestrians must be present. A high hazard tree rating does no imply that the tree will always fail.

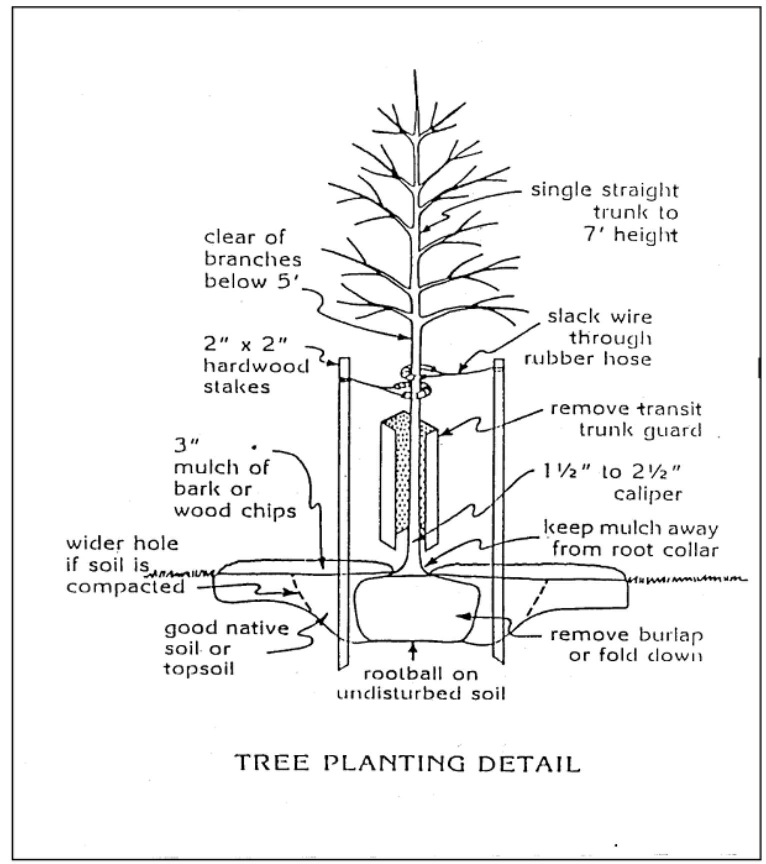
1, *Protecting Trees from Construction Damage- A Homeowners Guide,* Gary R. Johnson, University Of Minnesota Extension Service, Saint Paul, MN, 1999.

# Standard for Trees and Vines

- Removed any invasive species
- Included - current science tree planting detail. *Figure 10-1*

*Standards for Soil Erosion and Sediment Control in New Jersey* *May 2012*

FIGURE 10-1: TYPCIAL TREE PLANTING DETAIL



# Engineering Standards Overview

# Channel Stabilization-

Stream Restoration Guidelines

- Mimic natural conditions
- Soil Bioengineering for low risk areas
- Assess cause of degradation
- Avoid alignment changes
- <u>Avoid treatments in channels undergoing rapid changes in geometry</u>
- Use Toe Protection

# Detention Structures

- Combined Detention Basins, Rooftop, Parking Lot and Underground Storage since they all do the same thing.
- Clarified the use of infiltration:
  - Ok to use for offsite where reductions are proposed (low risk of failure)
  - Must still examine failure for point discharge stability
- Added restrictions for discharging to Ag fields
- Revised Detention Basin Summary Form to include information on Best Management Practices for water quality which may be used (on behalf of NJDEP). New form can be downloaded here: http://www.nj.gov/agriculture/divisions/anr/nrc/njerosion.html

# Grass Waterway

Added two additional levels of velocity increase with two new levels of TRM rating from Texas DOT Labs

| "Class 2" Flexible Channel Liner Designation | Allowable Shear Stress (psf) | Incremental increase in velocity (fps) |
|---|---|---|
| Type "E" | 0 to 2 | 1.0 |
| Type "F" | 0 to 4 | 1.5 |
| Type "G" | 0 to 6 | 2.0 |
| Type "H" | 0 to 8 | 3.0 |
| **Type "I"** | **0 to 10** | **4.0** |
| **Type "J"** | **0 to 12** | **5.0** |

# Offsite Stability

- Reorganized text to ‘flow’ more logically
- Added criteria for infiltration:
  - Ok to use for reductions (redundancy)
  - Not ok for point discharge stability (different criteria)
- Not intended to assess discharging to Ag fields; don’t use it for this condition
- Added option to use multiple outlets (for point discharge stability peak flow)
- Removed velocity from Table 21-1 since the primary criteria are slope, soils and veg

Point of Discharge Stability Analysis

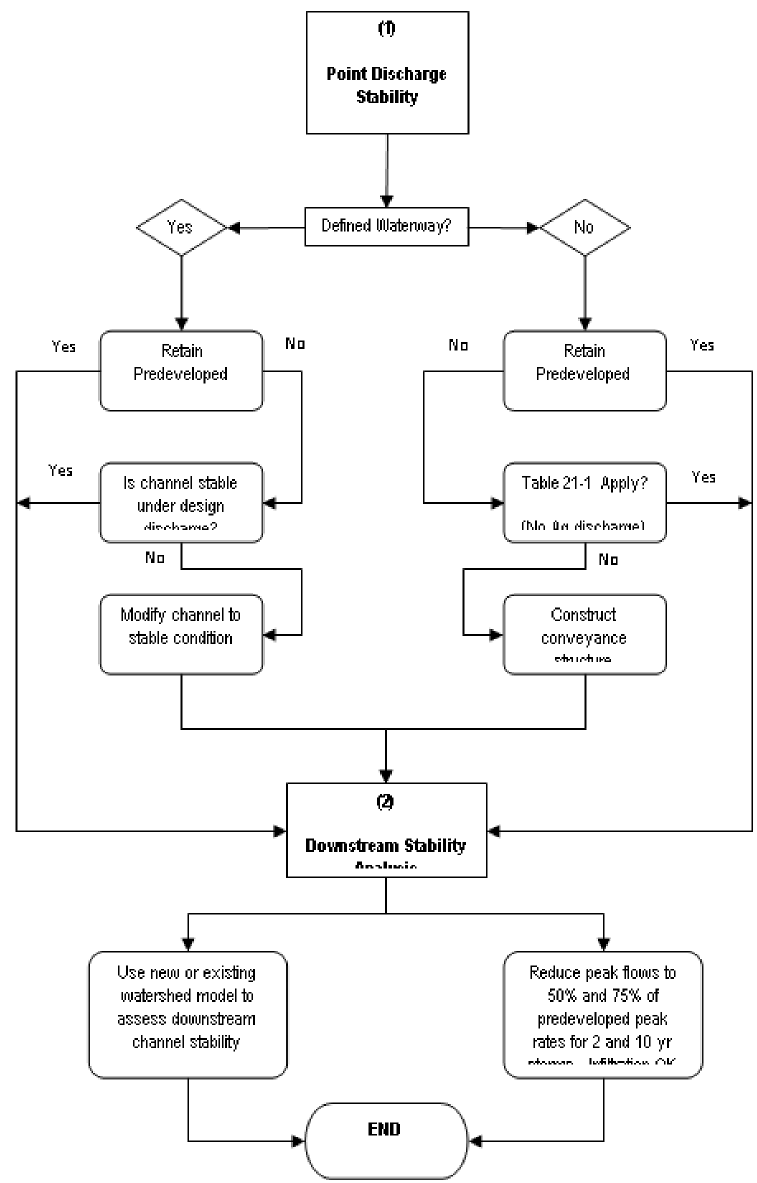
When infiltration practices are proposed, an alternate analysis (failure analysis) must be provided which ignores infiltration (no dead storage volume available, no static or dynamic infiltration loss rates in the routing calculations, etc) and demonstrates that no erosion will occur at the point of discharge if infiltration fails to function. Flow rates based solely upon basin inlet and outlet hydraulics must be used in comparison to table 21-1 (below) to document a stable outlet.

Downstream (off-site) Stability Analysis.

Infiltration may be used to meet peak flow reduction requirements (outlined below) for the purposes of documenting stability of the downstream receiving channel, provided that the complete loss of infiltration function does not result in an increase in peak flow values above the predevelopment levels..

# Offsite Stability Flow Chart

Figure 21–1



# Offsite Stability- Table 21-1

Table 21-1  Non-Erosive Conditions for Point Discharges

| Maximum Stable Slope for Point Discharges for Various Soils | |
|---|---|
| Soil Type | Perennial, Natural Vegetation |
| | Maximum Slope (%) |
| Sands | 1.8 |
| Sandy loam | 2.0 |
| Silt loam, loam | 2.5 |
| Sandy clay loam | 3.5 |
| Clay loam | 5.0 |
| Graded loam to gravel | 8.0 |

Velocity removed since Slope, soil and vegetation Are the primary criteria.

**Stability Criteria (in conjunction with table 21-1)**

i. The maximum discharge rate shall be 10 cfs or less for the twenty-five (25) year storm.
**ii. Multiple outlets may be utilized to reduce individual outlet flow rates to levels below the thresholds noted above.  Outlets should be spaced no closer than 50 ft horizontally to avoid re-mixing of flows**
iii. Flow over the outlet area shall be less than 0.5 cfs/ft.   Designers shall not design excessive widths which will cause flows to concentrate.
iv. Conduit outlet protection shall be provided in accordance with that Standard and may include: flat aprons, preformed scour holes, impact basins, stilling wells, plunge pools, etc. **Level  spreaders are not an acceptable design**

# Rip Rap

Added cross-reference to Soil Bioengieering:

Chpt. 16 of the NRCS EFH

Ishbash Curve or Lane's Method for sizing rip rap (used with veg)
Steeper than 2H:1V using Curve 22-6

Larger stone stacked 0.5h : 1 v (evaluate bank and bed conditions)

# Ishbash Curve

Note specific stone density

Enter here with v

Read this as D50

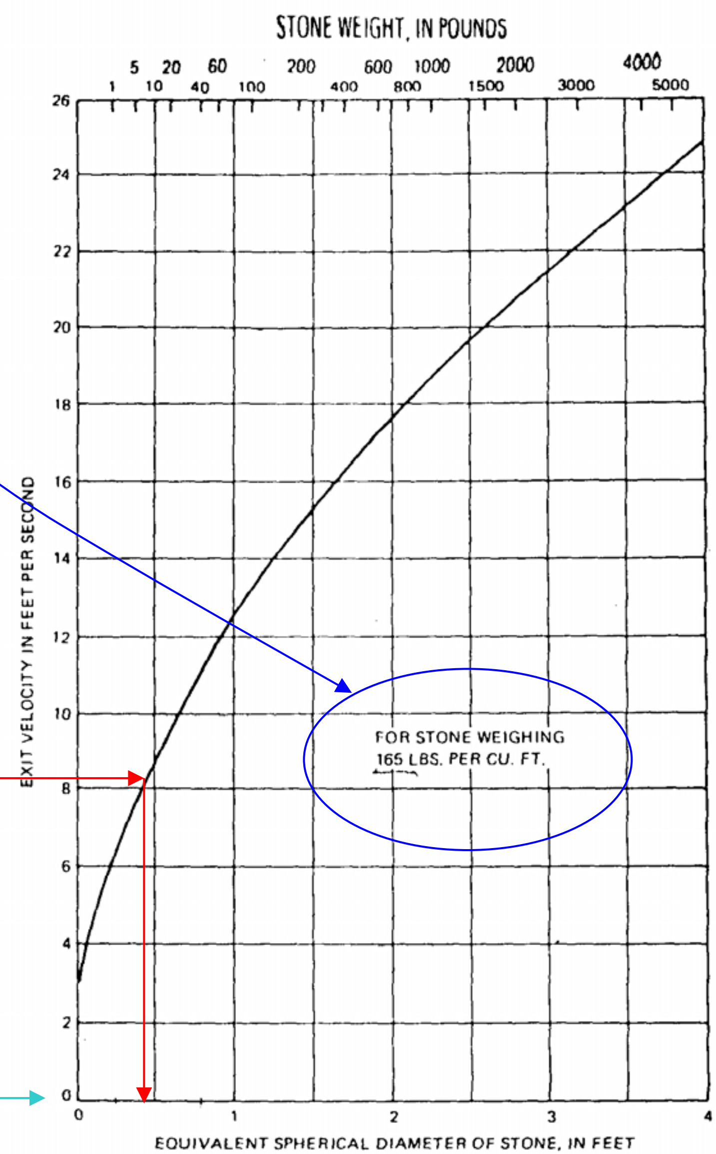



FIGURE II-C-1. RIPRAP SIZE FOR USE DOWNSTREAM OF ENERGY DISSIPATORS FROM REFERENCE II-C-1.

# Lane’s Method of sizing Rip Rap

Lane's Method is included in the NRCS Engineering Field Handbook, Chapter 16 for Streambank and Shoreline Protection... http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17553.wba

This chapter is referenced by NJDEP for stream work. Lane's Method is more of a tractive stress based approach condensed to one Figure. Note, it solves for D75 Not D50. Results are usually fairly consistent with Isbash and other procedures.

**Figure 16A–2** Rock size based on Far West States (FWS)-Lane method

D50 = D75/1.25

$D_s = \frac{3.5}{CK} w D S$ $D_s = D_{75}$ size rock in inches

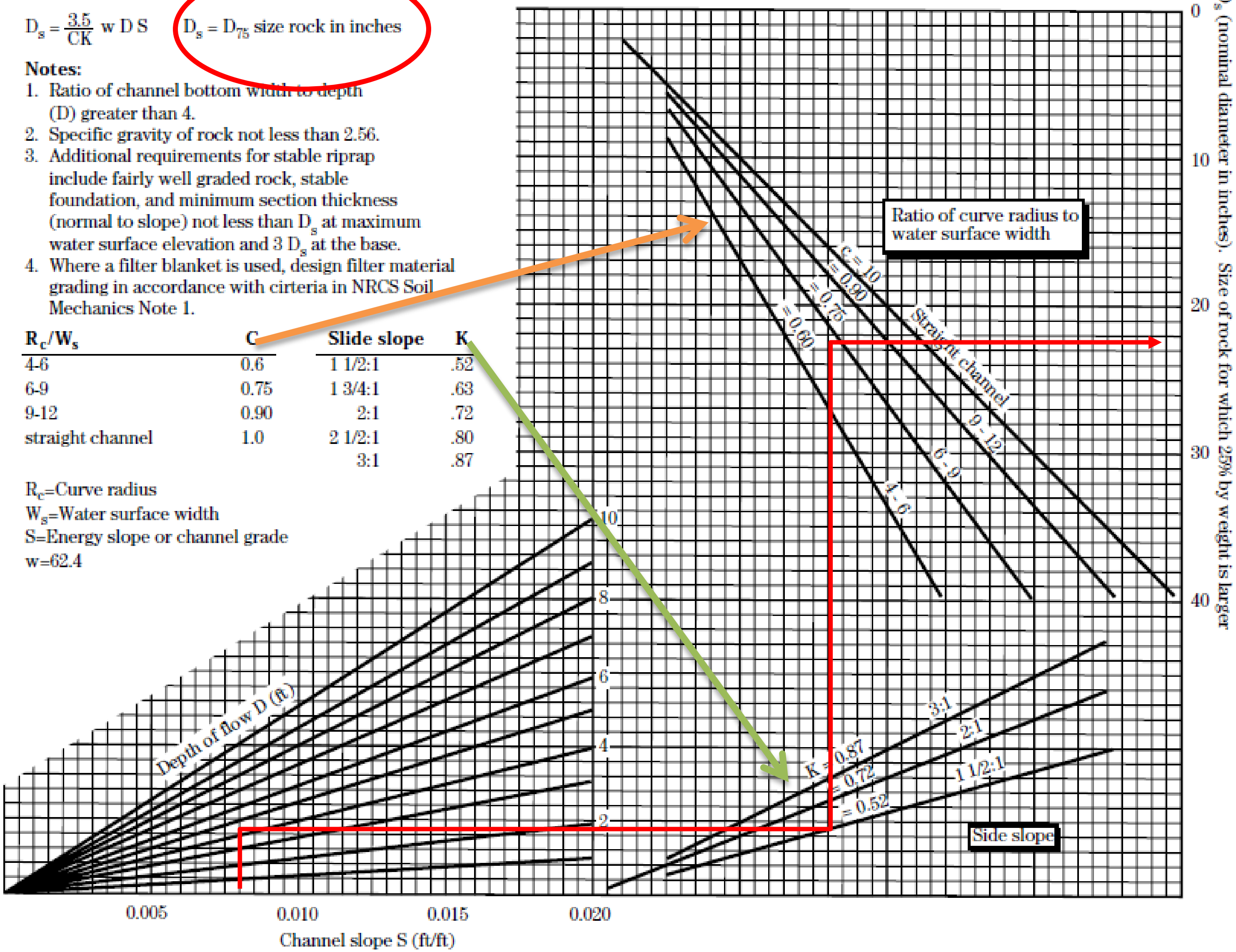
**Notes:**

1. Ratio of channel bottom width to depth (D) greater than 4.
2. Specific gravity of rock not less than 2.56.
3. Additional requirements for stable riprap include fairly well graded rock, stable foundation, and minimum section thickness (normal to slope) not less than $D_s$ at maximum water surface elevation and 3 $D_s$ at the base.
4. Where a filter blanket is used, design filter material grading in accordance with cirteria in NRCS Soil Mechanics Note 1.

| $R_c/W_s$ | C |
|---|---|
| 4-6 | 0.6 |
| 6-9 | 0.75 |
| 9-12 | 0.90 |
| straight channel | 1.0 |

| Slide slope | K |
|---|---|
| 1 1/2:1 | .52 |
| 1 3/4:1 | .63 |
| 2:1 | .72 |
| 2 1/2:1 | .80 |
| 3:1 | .87 |

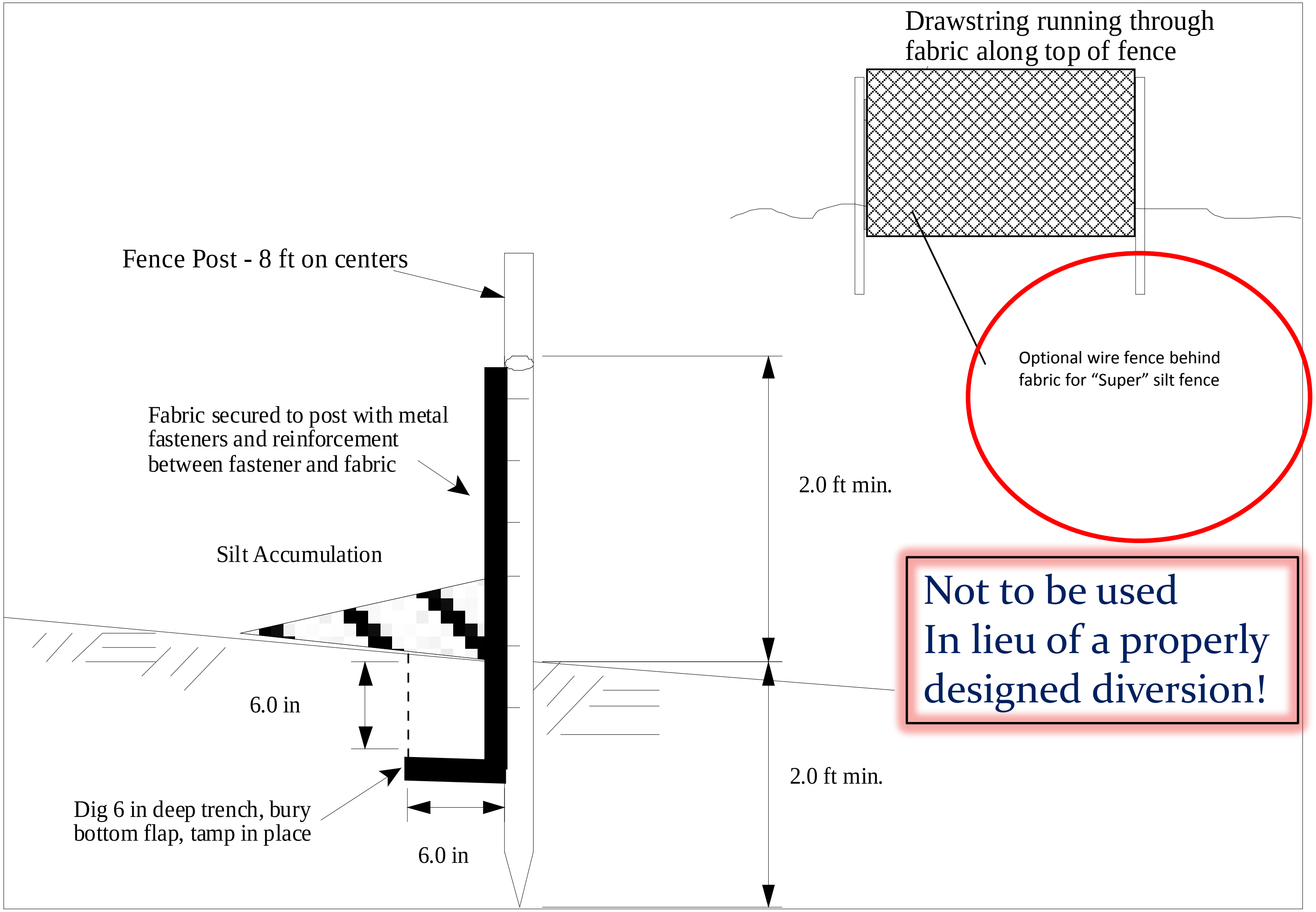
$R_c$=Curve radius
$W_s$=Water surface width
S=Energy slope or channel grade
w=62.4




**Procedure**

1. Determine the average channel grade or energy slope.
2. Enter fig. 16A-2 with energy slope, flow depth, and site physical characteristics to determine basic rock size.
3. Basic rock size is the $D_{75}$ size.

# Sediment Barrier – "Super Siltfence"



# Sediment Basins

Added references to floating risers or “skimmers” – now being required by EPA in the Stormwater Permit

Added references to dosing with flocculants – PAM with a source of Calcium ions to help in binding PAM to colloids

Reorganized text for clarity

# Slope Protection

Added simple method to calculate stone size for channels on slopes steeper than 10% (i.e.. Rock chutes down basin slopes )

For channel slopes between 2% and 10%:

$D_{50} = [q\,(S)^{1.5}/4.75(10)^{-3}]^{1/1.89}$

For channel slopes between 10% and 40%:

$D_{50} = [q\,(S)^{0.58}/3.93(10)^{-2}]^{1/1.89}$

$z = [n(q\,)/1.486(S)^{0.50}]^{3/5}$

$n = 0.047(D_{50}S)^{0.147}$

Where:

$D_{50}$ = Particle (stone) size for which 50% of the sample is finer, in.

S = Bed slope, ft./ft.

**z = Flow depth, ft. – note, z is depth, not side slope!**

q = Unit discharge, $ft^3/s/ft$ (Total discharge ÷ Bottom width)

Maximum Side Slope is 2:1 for this method

# Slope Protection Continued

Added guidance for draining **unconcentrated** runoff down a slope (i.e., runoff from a parking lot down into a swale or basin)

Reference to NJDEP BMP Manual for Vegetative Filter Strips (used to be NJDA Erosion Control Standard)

Maximum Slopes:

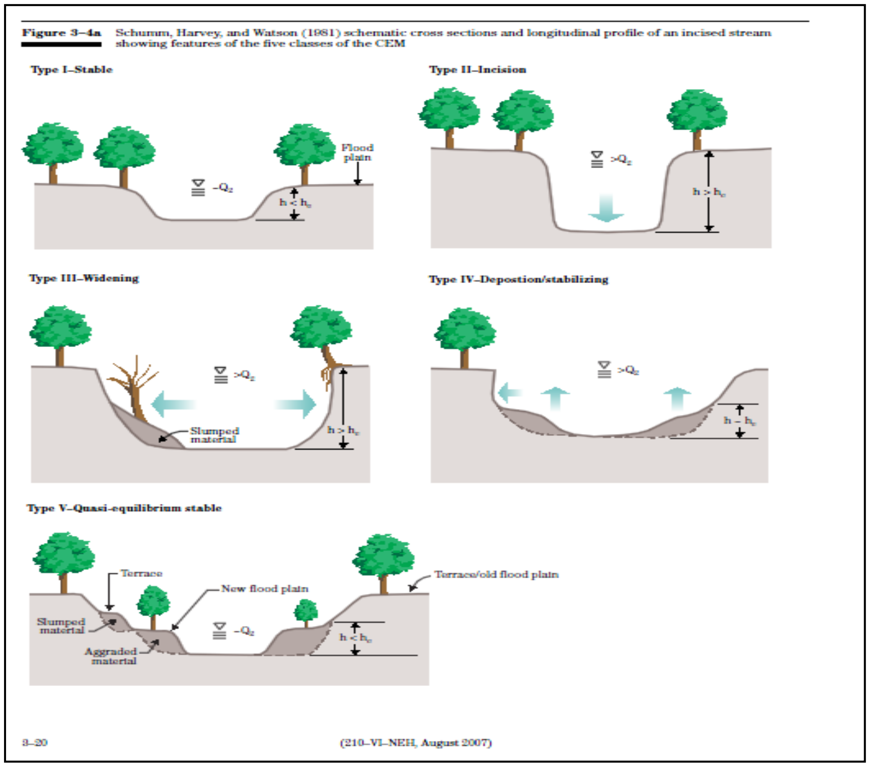
| Soil type | Maximum Slope (percent) |
|---|---|
| Sand | 7 |
| Sandy Loam | 8 |
| Loam, Silt Loam | 8 |
| Sandy Clay Loam | 8 |
| Clay Loam, Silty Clay, Clay | 8 |

8% slope = 12.5 : 1, or 4.6 degrees.

# Soil Bioengineering

## Added the following charts for design guidance:

Figure 26-1 – Simplified Channel Evolution Model




Design Approach based on Channel Boundary Conditions

| Channel Boundary Condition | Design Consideration Approach |
|---|---|
| Significant sediment load and moveable channel boundaries | Alluvial channel design techniques |
| Boundary material smaller than sand size | Allowable Velocity |
| Boundary material larger than sand size | Allowable shear stress |
| Boundary material does not act as discrete particles | Tractive Power |
| No base flow in channel. Climate can support permanent vegetation | Grass lined (retardance) / tractive stress |

# Stabilized Construction Access

WAS:

Where the slope of the access road exceeds 5%, a stabilized base course of ***fine aggregate bituminous concrete (FABC)*** shall be installed. The type and thickness of the FABC and use of a dense graded aggregate sub-base shall be as prescribed by local municipal ordinance or other governing authority.

IS:

Where the slope of the access road exceeds 5%, a stabilized base of ***Hot Mix Asphalt Base Course, Mix I-2*** shall be installed. The type and thickness of the base course and use of a dense graded aggregate sub-base shall be as prescribed by local municipal ordinance or other governing authority.

# Stream Crossing

Added guidance for permanent culvert crossing

Three (3) areas of concern should be must be considered for natural stream bed or three (3) sided "bottomless culvert" designs:

1. The corners and abutments of the Inlet section of the culvert
2. The barrel section of the culvert
3. The outlet or discharge section of the culvert

The Corners and Abutments of the Inlet Section of the Culvert –
*Avoid contraction and scour at the inlet or provide protection*.

The Barrel Section of the Culvert –
*erodability of the channel bed/bottom must be evaluated when designing open-bottom culverts. High velocities may require anti-scour measures*

The Outlet Section or the Discharge end of the Culvert –
*COP Standard may be required if the conduit contracts and/or causes higher velocities*

Questions and inquiries may be made to:

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2014 Standards and forms may be downloaded from:

http://www.nj.gov/agriculture/divisions/anr/nrc/njerosion.html