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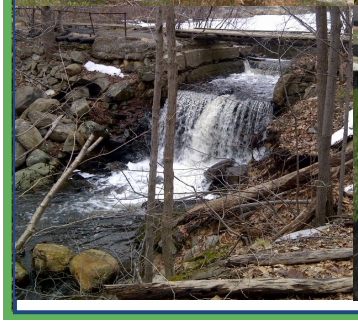

The Standards for Soil Erosion and Sediment Control In New Jersey

7th Edition, January 2014

Cover: Restoration of 800 feet of the Ramapo River bank after damage by Hurricane Irene in August 2011. Restoration by the Boro of Oakland, Bergen County NJ Spring 2013 (completed). Technical and funding assistance from the USDA Natural Resources Conservation Service. Erosion Control oversight by the Bergen County Soil Conservation District.

STANDARDS

FOR

SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY

Adopted
December 2013

Vegetative and Engineering Standards, chapters 1 - 32 inclusive are promulgated as "Standards" pursuant to the Soil Erosion and Sediment Control Act of 1975 as amended (N.J.S.A. 4:24-39 et seq.) and New Jersey Administrative Code (N.J.A.C. 2:90-1.1 et seq.).

By the

NEW JERSEY STATE SOIL CONSERVATION COMMITTEE

Douglas H. Fisher, Chairman, Secretary, New Jersey Department of Agriculture

Robert Martin, Commissioner, New Jersey Department of Environmental Protection

Dr. Robert M. Goodman, Exec. Dean, School of Environmental and Biological Sciences, Rutgers University

Dr. Larry Katz, Director, Rutgers Cooperative Extension, Cook College

Carrie Mosley, State Conservationist, USDA Natural Resources Conservation Service

Raymond Cywinski, Supervisor, Bergen County Soil Conservation District

Priscilla Hayes, Supervisor, Mercer County Soil Conservation District

Barbara Rosko, Supervisor, Sussex County Soil Conservation District

Anthony DiLodovico, Supervisor, Ocean County Soil Conservation District

Charles Buscaglia, Supervisor, Freehold Soil Conservation District

Joseph Lomax, Supervisor, Cape-Atlantic Conservation District

John Kocubinski, Governor's Appointee

Frank Minch, Executive Secretary, State Soil Conservation Committee

FOREWORD AND ACKNOWLEDGMENTS

2014 marks the 38th year of service to New Jersey by the Soil Erosion and Sediment Control Program administered by the Department of Agriculture and the New Jersey Soil Conservation Districts. Since the inception of the idea to apply conservation practices to urban development in 1976, New Jersey has significantly evolved in its approach to erosion control. From simple hay bales for filtering runoff, to advanced computer simulations which model watershed runoff, New Jersey's erosion control practices have taken advantage of developing technologies. Periodically the Department, and Soil Conservation Districts update the "*Standards for Soil Erosion and Sediment Control* " to reflect the ongoing emergence of science and technology.

The *Standards* are a blend of agronomic science and state of the art engineering practices, embodied in 32 individual design chapters and detailed appendices that enable developers to successfully design erosion control practices for construction sites. Soil loss prevention is addressed both during as well as after construction to safeguard New Jersey's natural resources.

Since 1976, more than 920,000 acres of land have been protected from erosion by the application of construction site best management practices to control erosion. This equates to more than 28 million tons of soil that have been prevented from entering the state's waterways. Erosion protection allows for the continuation of recreational opportunities, aids in flood prevention efforts and minimizes the need for water treatment.

The seventh edition of the *Standards* has been revised to include additional guidance for assessing downstream stability, rip rap design, the use of infiltration and additional options for vegetation used in the Pinelands National Reserve. Future revisions are planned to enhance the quality of soil used in establishing vegetation for stabilization of development sites.

The New Jersey Department of Agriculture acknowledges its long-time partners - the United States Department of Agriculture – Natural Resources Conservation Service, the state's 15 Soil Conservation Districts, Rutgers University and the New Jersey Department of Environmental Protection for their assistance in developing these *Standards*. Additionally, the Department appreciates the valued expertise of the New Jersey Pinelands Commission, the New Jersey Department of Transportation and the many representatives of the New Jersey Builders Association and Professional Consulting Engineers who assisted in this project. These partnerships have achieved great success in the minimization of damage due to excessive stormwater runoff and related soil loss from construction sites while at the same time promoting concepts of good stewardship of the state's resources to all of New Jersey's residents.

Douglas H. Fisher
Secretary, New Jersey Department of Agriculture
January 2014

COMMITTEE FOR REVIEW AND DEVELOPMENT OF

STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL

January 2014

Mr. William Brash
District Director
Mercer County Soil Conservation District

Mr. Anthony DiLodivico
President
Tony D Environmental Permitting, LLC

Mr. Steven Jacobus
Watershed Team Leader
Division of Watershed Management N.J. Department of Environmental Protection

Mr. David Lamm, P.E.
State Conservation Engineer
Natural Resources Conservation Service
U.S. Department of Agriculture

Mr. John Showler, P.E.,
State Erosion Control Engineer
State Soil Conservation Committee
N.J. Department of Agriculture

Mr. Angelo Caruso
District Manager
Bergen County Soil Conservation District

Mr. David Earl, ASLA
Section Chief
Office of Landscape Architecture
NJ Department of Transportation

Mr. Paul Schiariti, P.E.
NPS Coordinator
Mercer County Soil Conservation District

Mr. Anthony Castillo, P.E.
Principal
SESI Consulting Engineers, Inc.

Mr. Wayne Birchler, P.E.
Former District Engineer
Gloucester County Soil Conservation District

Mr. Ken Marsh, P.E.
Supervisor (retired)
Somerset-Union Soil Conservation District

Mr. David Kreck, P.E.
Senior Managing Engineer
Rodriguez Consulting, LLC

Mr. Richard Eigenbrood
Natural Resource Conservationist (retired)
Gloucester County Soil Conservation District

Ms. Stephanie Murphy, PhD.
Soil Scientist
Rutgers University

Mr. Ernest Thurlow, PhD.
Manager (retired)
Somerset-Union Soil Conservation District

Mr. Don Kinesik
President
Pinelands Nursery

Mr. David Friedman
Manager (retired)
Ocean County Soil Conservation District

Ms. Amy Karpati, PhD
Director for Conservation Science
Pinelands Preservation Alliance

Ms. Valarie Hrable, P.E.
Manager, Hydrology & Hydraulics
Greenman &Pedesen, Inc.

Mr. Robert McCarthy, P.E.
Principle
DW Smith, Inc.

Mr. Brian McClendon
Section Chief
Stormwater Permitting NJDEP

Mr. Ron Bannister
Environmental Specialist
Groundwater NJDEP

Mr. Fred Bowers, PhD
Section Chief (retired)
Groundwater NJDEP

Mr. Barry Chalofsky
Bureau Chief (retired)
Stormwater Permitting, NJDEP

Ms. Robyn Jeney
Regulatory Programs Specialist
New Jersey Pinelands Commission

Developing a Successful Plan to Control Soil Erosion on Construction Sites

"He who fails to plan, plans to fail…." is an oft-quoted proverb. Its original author is unknown, but it is frequently attributed to such famous individuals as Benjamin Franklin, Abraham Lincoln and Winston Churchill. Regardless of who coined the phrase, failure to plan (properly) is never more evident than in a poorly thought out erosion and sediment control plan. Once a slope has eroded, or an infiltration basin has failed, it is too late to 'plan'. It is only time to react and correct. And usually, it costs more to do something twice, than to do it right the first time.

Though not an exhaustive list, the following represent many of the primary design considerations and constraints in preparing an effective erosion control plan. Effective erosion control should be integrated into planning for stormwater management, and not done as an after-thought. A properly developed plan should address the following aspects of site construction when designing for erosion control:

General Considerations-

1. Design report included and submitted to the district
2. Table of Contents for the design report denoting location of erosion control designs
3. Plan drawn at proper scale (usually not less than 1:50)
4. Erosion Control Plan sheets labeled, signed and sealed by a NJ Licensed Engineer or Architect
5. Pre and post construction contours clearly labeled and depicted
6. Limits of disturbance clearly delineated and corresponding to area of disturbance on the application form
7. Temporary controls such as sediment barriers, inlet filters graphically depicted on plan sheets
8. Details for erosion control applications clearly shown on a 'detail sheet'; dimensions correspond to deign report
9. District notes, vegetative stabilization specifications and other notes shown on the detail page
10. Soil delineations shown on the erosion control plan sheets
11. Other natural features, such as streams, wetlands and buffers delineated on plan sheets
12. Permanent structures graphically depicted on plan sheets (piping, basins, rip rap outlets, swales, basins etc)
13. Offsite improvements (sewer, water, storm drainage, electrical utilities) shown and included in area calculations
14. Proposed staging and stockpile areas depicted (on and off site).

Construction Disturbance Considerations-

1. Phasing of disturbed areas (minimizing open soil areas)
2. Sequence of construction specific to the site (avoid generic sequencing)
3. Stormwater management on a construction site
    a. Temporary sediment basins with design support and appropriate details
    b. Diversions & swales
    c. Grading
    d. Filtering via pumped discharge
    e. Dewatering excavations and points of discharge
4. Temporary stabilization with vegetation, mulch, man-made materials etc.
5. Location of temporary controls such as inlet filters, sediment barriers, construction entrances
6. Soil movement – cuts, fills, removal, stockpiles and importation shown on plans
7. Minimization of soil compaction – restrict vehicle travel, avoid working wet soils, restore if needed

Hydrologic Design Considerations-

1. Correct application of hydrologic analysis both onsite and within the local drainage area
    a. Correct unit hydrograph (i.e., Delmarva for coastal plain areas)
    b. Pre and post drainage area maps with Tc flow paths and POI's identified
    c. Realistic sheet flow length in time of concentration (in all cases, not to exceed 100')
    d. Correct pre and post development runoff coefficients
    e. Influence of geology (esp. limestone prone areas)
    f. Submission of electronic modeling files to the district
    g. Submission of Hydrologic Summary forms for each basin
2. Assessment of pre and post development flows for the 2, 10 and 25 (rip rap) year storm events

3. Determination of soil types and their associated limitations (i.e., depth to ground water, slope stability) using the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm)
4. Final points of discharge from the site and stability at those locations
5. Discharging to agricultural fields (generally not permitted due to stability concerns)
6. Infiltration and failure analysis for stability
7. Impact of discharge beyond the limits of the project (off site stability)
8. Stability of slopes – both from overland flow as well as impacts due to infiltration saturation
9. Proper use of permanent vegetative cover – species selection, irrigation, soil quality, maintenance
10. Use of turf reinforcement matting on steep slopes or channel lining
11. Rock rip rap sizing, gradation and availability; alternate use of gabions or reinforced concrete
12. Grass water way designs using vegetative retardance (D & E) factors, soil conditions, velocity, proper vegetation and reinforcement mating

Requirements of Other Agencies-

1. NJ Department of Environmental Protection-
    a. Stormwater Rules
    b. Wetlands
    c. Highlands
    d. Stream Encroachment
2. Residential Site Improvement Standards
3. NJ Department of Transportation
4. NJ Pinelands Commission
5. County and municipal construction codes

When preparing an erosion control plan, one resource which should not be overlooked is New Jersey's 15 Soil Conservation Districts. With a broad spectrum of expertise in the areas of erosion and sediment control, agronomy, horticulture and stormwater management, District staff are available to assist designers with development of reliable and effective strategies for controlling erosion from construction sites. A list of New Jersey Soil Conservation District contact information is found in Appendix E of the Standards.

Procedure for the evaluation of new erosion control technologies, products and services for compliance with the Standards for Soil Erosion and Sediment Control in New Jersey

In order to address opportunities to utilize new and innovative technologies, products and services (TPS) for sediment and erosion control, the New Jersey Department of Agriculture, State Soil Conservation Committee (SSCC) has adopted the following evaluation process which is intended to provide compliance with the Standards.

The Standards include, where appropriate and necessary, design and performance specifications so that any TPS which meets these specifications would be acceptable for use on construction sites in New Jersey for compliance with the Act without the need for extensive (and expensive) laboratory testing. A new TPS which differs from design or performance standards, or which attempts to define a non-standardized practice must be field tested in New Jersey prior to acceptance.[1]

Field performance will be monitored by Soil Conservation District personnel as well as the NJDA State Erosion Control Engineer (as needed). The process for TPS field evaluation is as follows:

1. The vendor will provide a written request for evaluation to the State Engineer and the local Soil Conservation District where the product is to be evaluated. The request must include a physical/chemical description of the product, design limitations (if any), what function the product is intended to perform, and which Standard it is to be used in compliance for. Laboratory or other supplier-derived test data may also be submitted if desired.

2. The State Engineer will review the request and consult with the respective district or districts to verify that the TPS being proposed is appropriate for the intended application and site location. Alternative locations may be suggested if the proposed location is not deemed adequate for a complete evaluation. Written permission and agreement for allowing the evaluation must be secured from the site owner and is the responsibility of the vendor, with a copy provided to the district and State Engineer.[2] The State Engineer can provide written confirmation to the site owner that for testing and evaluation purposes, the owner is assisting the State in its evaluation of a new product and will not be liable for a lack of erosion control compliance with their certified plan due to product failure as long as the product is properly installed and is provided with the appropriate routine maintenance, as would be the case for the use of any erosion control product.

3. The State Engineer will advise the SSCC and other districts of the request for testing at the next SSCC meeting.

4. Once a proper location is secured, the vendor will oversee and provide training (if necessary) for proper installation of the product to ensure an adequate evaluation is performed. During the evaluation, District staff and/or the State Engineer will monitor and observe the performance of the TPS and maintain observations in project record notes as part of routine inspections. The TPS must be properly installed and in good working order during a test event to be considered as a viable test. Unintentional damage or improper installation and subsequent failure will not count as a viable test. The State Engineer may consult with other experts, as needed, to ensure comprehensive evaluation. The vendor will be notified if any product failure or damage occurs so that corrective action may be taken, if appropriate, to restore proper functioning of the TPS.

5. TPS's which are intended to secure against erosion by resisting the forces of water and/or wind will be evaluated for 3 discrete events, each of which must meet the minimum event criteria (such as minimum precipitation depth, flow rate, velocity, etc.) prescribed by the vendor or as stipulated in the applicable Standard. For TPS's intending to promote or enhance vegetative stabilization an evaluation period of two consecutive growing seasons will be observed to determine product performance.

6. The State Engineer will review notes, photos, etc. and present findings and conclusions to the SSCC with recommendations. These recommendations may be:

   (1) the TPS is acceptable for use anywhere in NJ;

   (2) the TPS is acceptable for use only in particular locations in NJ

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1 Not every Standard is based on design and/or performance criteria. Certain Standards require computation or specific materials in their application for compliance.

2 Neither the Soil Conservation District nor the State Engineer may compel a project owner to allow the use of a new product for testing on his or her site. Assistance is strictly voluntary on the part of the owner.

(3) the TPS is acceptable for use only for particular site and/or weather conditions

(4) the TPS is not acceptable for use in NJ.

The SSCC may, at is pleasure and discretion, accept, accept with modifications or reject the recommendations.

7. A TPS that is found to be acceptable for use in NJ (with or without conditions) will be identified in a TPS Bulletin (PSB) to be maintained and published by NJDA-SSCC. Conditions or limitations of the TPS will be identified in the bulletin, which will be published on the Department's website and will be available for public download. The vendor will be provided a copy of the findings and conclusions along with a copy of a TPS Bulletin, if one is issued.

8. Once a TPS Bulletin is issued, no further written approval or requests for use will be required for inclusion on soil erosion and sediment control plans or as an equivalent substitute to controls that are already shown on a plan. All manufacturer installation details, maintenance requirements and limitations must be included on the plan adjacent to the installation details.

Compliance with the Standards is required by N.J.S.A. 4:24-39 et seq. for all construction sites in New Jersey which meet the definition of a soil disturbance 'project' as defined in the Act. As a result, the specific inclusion of proprietary, manufactured products, product names, technologies or services is prohibited in that this may constitute the endorsement of one product over another by the State. Generic products which have historically been used for controlling erosion and are considered to be in the public domain may be generically referenced in the Standards without the use of trade-marked ™ names.

State Soil Conservation Committee

Standards For Soil Erosion and Sediment Control in New Jersey

Table of Contents

Appendices

STANDARD FOR MANAGEMENT OF HIGH ACID-PRODUCING SOILS

Definition

High acid-producing soils are soils with a pH of 4.0 or less or contain iron sulfide.

Purpose

To prevent or limit exposure area, time, and spreading by equipment or rainfall on- and off-site and to minimize erosion, sedimentation and acid leachate-related damages. High acid-producing soil may be exposed during excavation and land grading activities, or may be introduced in dredged sediment. Soils and sediment containing iron sulfide, characterized by pyrite or marcasite nuggets or greensands, are chemically oxidized when exposed to air, producing sulfuric acid and result in soil pH levels falling to pH 4.0 and lower. Most vegetation is incapable of growth at this pH level. Adjacent land and receiving waters will be negatively impacted by the acid leachate. Calcium-containing materials such as sidewalks, culverts and other structures and some metallic materials are also susceptible to degradation. Agricultural limestone materials applied at rates of 8 tons per acre have resulted in only a temporary buffering effect, and "liming-only" is therefore not considered an acceptable mitigation practice.

Water Quality Enhancement

Protects onsite soils and offsite streams and lakes from sulfuric acid leachate that creates soil pH conditions unsuitable for growth of vegetation.

Where Applicable

This practice is applicable to any high acid-producing soil materials. Such materials have been found in the Coastal Plain areas of Burlington, Camden, Cumberland, Gloucester, Mercer, Middlesex, Monmouth, Ocean, Salem and Somerset Counties.

Planning Criteria

Early recognition and burial, removal or disposal of high acid-producing soils is essential for limiting the amount of acidic material produced.
Review a surface geology map for the proposed site to investigate the presence of geologic formations which commonly contain high acid-producing deposits. The geologic formations are as follows:

Cheesequake	Manasquan	Red Bank, Sandy Hook Member
Englishtown Sand	Marshalltown	Shark River
Hornerstown	Merchantville	Tinton
Kirkwood	Navesink	Wenonah
Magothy	Raritan	Woodbury Clay

Figure 1-1 shows areas where these deposits may be present.

Contact the local Soil Conservation District to determine the historical presence of high acid-producing soils in the vicinity of the proposed development site.

High acid-producing soils may be present in undisturbed soils at varying depths, including near the soil surface to excavations or deep disturbances. Its presence on a site may be significant or limited in the soil profile. High acid-

producing soils are commonly black, dark brown, gray or greenish with silvery pyrite or marcasite nuggets or flakes. Alternatively, sandy soils or reddish, yellowish or light to medium brown soil materials are usually free of high acid-producing deposits.

Methods and Materials

1. Limit the excavation area and exposure time when high acid-producing soils are encountered.

2. Topsoil stripped from the site shall be stored separately from temporarily stockpiled high acid-producing soils.

3. Stockpiles of high acid-producing soil should be located on level land to minimize its movement, especially when this material has a high clay content.

4. Temporarily stockpiled high acid-producing soil material to be stored more than 48 hours should be covered with properly anchored, heavy grade sheets of polyethylene where possible. If not possible, stockpiles shall be covered with a minimum of 3 to 6 inches of wood chips to minimize erosion of the stockpile. Silt fence shall be installed at the toe of the slope to contain movement of the stockpiled material. Topsoil shall not be applied to the stockpiles to prevent topsoil contamination with high acid-producing soil.

5. High acid-producing soils with a pH of 4.0 or less or containing iron sulfide (including borrow from cuts or dredged sediment) shall be ultimately placed or buried with limestone applied at the rate of 10 tons per acre (or 450 pounds per 1,000 square feet of surface area) and covered with a minimum of 12 inches of settled soil with a pH of 5.0 or more except as follows:

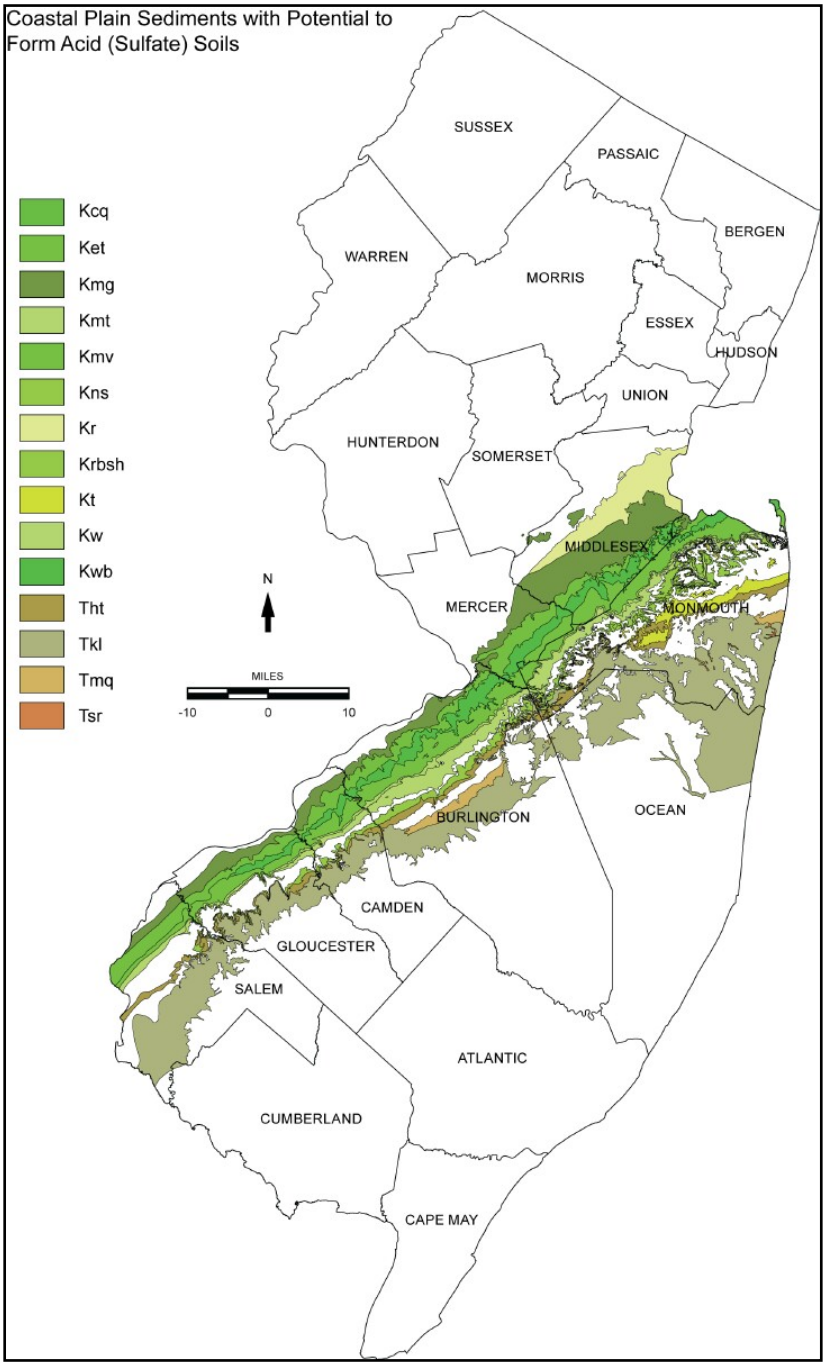
a. Areas where trees or shrubs are to be planted shall be covered with a minimum of 24 inches of soil with a pH or 5 or more.
b. Disposal areas shall not be located within 24 inches of any surface of a slope or bank, such as berms, stream banks, ditches, and others, to prevent potential lateral leaching damages.

6. Equipment used for movement of high acid-producing soils should be cleaned at the end of each day to prevent spreading of high acid-producing soil materials to other parts of the site, into streams or stormwater conveyances, and to protect machinery from accelerated rusting.

7. Non-vegetative erosion control practices (stone tracking pads, strategically placed limestone check dam, sediment barrier, wood chips) should be installed to limit the movement of high acid-producing soils from, around, or off the site.

8. Following burial or removal of high acid-producing soil, topsoiling and seeding of the site (see Temporary Vegetative Cover for Soil Stabilization, Permanent Vegetative Cover for Soil Stabilization, and Topsoiling), **monitoring must continue for a minimum of 6 months** to ensure there is adequate stabilization and that no high acid-producing soil problems emerge. If problems still exist, the affected area must be treated as indicated above to correct the problem.

Figure 1-1. NJ sedimentary units with potential to produce acid:



Tkl=Kirkwood, Tsr=Shark River, Tmq=Manasquan, Tht=Hornerstown, Kt=Tinton, Krbsh=Sandy Hook Member of the Red Bank, Kns=Navesink, K2=Wenonah, Kmt=Marshalltown, Ket=Englishtown, Kwb=Woodbury, Kmv=Merchantville, Kcq=Cheesequake, Kmg=Magothy, and Kr=Raritan Formations. Credit: NJ Geological Survey, http://www.state.nj.us/dep/njgs/geodata/dgs09-2.htm

STANDARD FOR DUNE STABILIZATION

Definition

Controlling surface movement of sand dunes or shifting sand by vegetative or mechanical means.

Purpose

To reduce wind erosion and the encroachment of shifting sands, to provide a barrier against tide water, and to make the areas useful for other purposes.

Water Quality Enhancement

Reduces wind erosion, sand movement by storms and tides and facilitates dune building at ocean, bay frontal and back bay areas.

Where Applicable

Along ocean and bay shorelines where blowing sands and storm waters may cause erosion damage. Stay at least one hundred feet (horizontal distance) from mean high tide water line (MHT).

Methods and Materials

Sand dunes naturally form on barrier islands, shorelines exposed directly to the ocean, and inland sand deposits. The source of this wind born sand is the ocean or its bays. These parallel ridges of sand form perpendicular to prevailing winds and grow toward its source of sand. Periodic storm events and human activity continually alter their development and original configuration. Once developed the sand dunes provide protection from moderate storms and tides. The existence and maintenance of vegetation on dunes provides a network of root and foliage which holds unconsolidated sand in place. American beachgrass is the dominant, naturally occurring, vegetation of the frontal dunes of New Jersey. When beachgrass is established with structural resources and other dune species, a formidable well anchored storm barrier is established.

1. VEGETATION

   A. Materials: The foliage of most sand dune species filters sand from the wind. The reduction of wind velocity near the dune's surface by vegetation allows sand to be deposited. The root mass of these plant species of the sand dunes are typically deep and extensive, anchoring the dunes to their foundation. When possible certified cultivars, which have been tested on similar sites, should be utilized.

   B.

      1. To promote biodiversity species planting is preferred however, cultivar releases recommended for NJ sand dunes; all listed were released by the USDA, Natural Resources Conservation Service Cape May Plant Material Center, located in Swainton, NJ. a.
         'Cape` **American Beachgrass** (*Ammophila breviligulata*)
         b. 'Atlantic` **Coastal Panicgrass** (*Panicum amarum var. amarulum*)
         c. 'Avalon` **Saltmeadow Cordgrass** (*Spartina patens*)
         d. 'Wildwood` **Bayberry** (*Myrica pensylvanica*)
         e. 'Ocean View` **Beach Plum** (*Prunus maritima*)

2. Non-Cultivar releases suitable for NJ sand dunes
    a. **Switchgrass** (*Panicum virgatum*)
    b. **Bitter Panicgrass** (*Panicum amarum*)
    c. **Seashore Little Bluestem** (*Schizachyrium scoparium* var. *litoris*)
    d. **Seaside Goldenrod** (*Solidago sempervirens*)
    e. **Eastern Red Cedar** (*Juniperus virginiana*)

C. Establishment: Online information concerning dune stabilization may be found at the uSDA-NRCS Plant Materials Center (PMC) website: http://plant-materials.nrcs.usda.gov/njpmc/

1. American Beachgrass - Beachgrass is successionally classified as a pioneering type species; it is the hardiest species **capable of surviving the harsh environmental conditions of the frontal dunes**. For initially stabilizing a dune system, this species is the most reliable and commercially available option. Once established it rapidly spreads by a rhizomatous root system, developing a soil binding network of inter-woven roots.

    Planting Dates: October 15 to April 1; under non frozen soil conditions

    Planting Unit: a minimum of two stems (culms) per hole

    Method: hand placement, or use of a vegetable or tree planter

    Size: 16 to 18 inch long stems, > ¼ inch in diameter

    Depth: approximately 8 inches deep (≥ 7" but ≤ 9" is acceptable)

    Spacing : severe sites = 12" X 12"
    normal sites = 18" X 18"
    stable sites = 24" X 24"

    Notes:
    - Plant ≥ 100 feet of horizontal distance from the mean high tide water line to ensure success
    - Plant a minimum of 10 parallel rows; stagger (off-set) rows to maximize protection
    - Firm soil around plants to eliminate air pockets
    - If utilizing dredged fill allow salts to leach out before planting and allow rains to compact sands.

2. Coastal Panicgrass - This warm season bunch-like grass is a post stabilization species **thriving from the crest of the frontal dune to inland sites.** It is the only dune stabilization species which has been directly seeded on to the sand dunes successfully. Potted plants and stem divisions can also be successfully established on these severe sites. The annual foliage emerges from a deep fibrous perennial root system with short lateral rhizomes. This species can be successfully planted with or over seeded into stands of American beachgrass. The same plant and seed establishment techniques outlined below, also pertain to Switchgrass, Seashore Little Bluestem, and Seaside Goldenrod.

    Seeding Dates: over seeding: April 1 to May 1
    dormant seeding: November 1 to April 15
    planting plugs or transplants: April 1 to May 15

    Planting Unit: single bare-root or containerized seedling or division; 12 - 18 inches tall

    Seeding rate: 8 to 12 Lbs. of Pure Live Seed (PLS) per acre

    Depth: plants: 2 inches deeper than the nursery depth

seed: drilled 1½ to 2½ inches deep

Method plants: hand placed, or use a vegetable or tree planter
seed: hand or mechanically operated drill or seeder

Spacing: plants: 4' X 4'
seed: 3' to 10' row spacing

3) Saltmeadow Cordgrass - Although typically associated with tidal salt marshes, this cordgrass also naturally occurs in the **secondary and back dune areas,** predominantly inhabiting inter-dune troughs and low blow-out areas. It is dominate in these micro-sites since most other sand dune species can not tolerate wet to saturated soil conditions. The trailing rhizomes of saltmeadow cordgrass are slender, but form dense mats near the surface. It is vegetatively established on normal sites using freshly harvested stems (culms) or containerized plants on severe locations.

Planting Date: May 1 to June 15

Planting Unit: 3 to 5 live stems placed bare-root or containerized

Depth: 2 inches below the nursery grown depth

Method: hand placed, or vegetable planter

Size: > 12 inches

Spacing: 18 to 36 inches depending on the severity of the planting site

Note: Utilize this species in low elevation sites of sand dunes which are frequently inundated.

4. Shrubs and Trees - Medium sized shrubs and small trees naturally **dominate the back dune** zone of New Jersey's barrier islands. The shrubs begin to **co-inhabit the mid secondary dunes**. Once extensive stands of bayberry, beach plum, pitch pine and other woody species covered these islands where houses now stand. The shrub species which are well adapted to the dune ecosystem are capable of either layering or root suckering.

The trees and shrubs of the sand dunes have deep tap root systems for supplying adequate moisture and nutrients. Each species utilized for back dune stabilization has its own unique attributes. **Beach plum** has a colorful bloom in spring which yields a tasty succulent cherry like fruit. **Bayberry** roots have nodules which enable it to fix atmospheric nitrogen similar to legumes; it also produces aromatic fruit and leaves. The **junipers** which are adapted to sand dunes provide the visual appeal of evergreens in the back dunes.

The major function of tree and shrub vegetation on sand dunes is still the permanent solid structural stabilization. All of trees and shrubs of the sand dunes produce viable seed, but intentional establishment occurs using bare-rooted or potted seedlings.

Planting Date: March 15 to April 15; unless soil is frozen

Planting Unit: 1/0 or 2/0 bare-root seedlings or containerized transplants

Depth: 2 inches below the nursery grown depth

Method: hand placement or using a tree planter

Size: > 12 inches tall

Spacing: 4 to 6 feet apart; off-set (stagger) rows for maximum protection

Note: to ensure establishment (first 2 years) all competing vegetation must be removed from within 2 feet of each plant; it is important not fertilize the surrounding vegetation which will potentially out-compete the tree or shrub

C. Maintenance

1. Fertilizer

Date: May through July; no sooner than 30 days after planting

Rate: $\leq$ 50 lbs. of nitrogen (N) per acre < 25 lbs. of phosphorus (P) and 25 lbs. potassium (K) per acre

Frequency:

- Apply N for the first two years after planting, then as needed to maintain stem density and plant health.
- Single or split applications are acceptable if not applied before May 1 or after July 30. Split applications must be at least 30 days apart.
- It is only necessary to apply (P) and (K) in alternate years.

Recommended Formulations:

- 10-10-10, 20-10-10, 15-10-10, etc. are acceptable as long as the maximum rates per nutrient are not exceeded.
- Time release fertilizers are encouraged that will provide the target amounts of the primary nutrients per acre.

Notes: Fertilize dune grass planting by mechanical or broadcast application, except where woody species are planted. Only apply fertilizer within the drip line of shrubs and trees. Not following this procedure will result in excessive herbaceous growth, which will out compete newly established trees and shrubs. Where woody plants are established, fertilizer may be broadcast applied.

2. Replanting

- Like a chain, a dune system is no stronger than its weakest link. Uniform, unbroken dune lines are essential to the protection a system can provide.

- Uncontrollable events (i.e. Storms, construction, etc.) may damage sand dunes. If such damage occurs between October and April replant within a month. If the damage is experienced from May to September, utilize the outlined sand fencing or excavation procedures listed below, then plant during the recommended establishment period.

D. Dune Crossing Areas

Where foot or vehicular traffic is expected over dunes, it is recommended a curvilinear path be constructed to direct traffic. These paths can be constructed with boards or be of a gravel

base and should be bordered by sand fence to funnel the traffic to and from the beach.

2. SANDFENCING:

A quick and effective way to build temporary sand dunes is with the use of sand fencing (standard snow fence). Utilizing lines of fencing and wooden posts, orientated parallel to the beach approximately 140 feet (horizontal distance) from mean high tide. A source of sand is necessary for this technique to be effective, but it is not limited by time of establishment.

A. Materials

1. Fencing
   - Standard 4 ft. slatted wood snow fencing; wood must be decay free.
   - Polyvinyl fencing material with 50% porosity may be used as an alternative.
   - Four wire ties (> 12 ga.) must be used to secure fencing to each post.

2. Posts
   - Wooden posts must be > 6½ ft. long, with a minimum diameter of 3 inches; typical length ranges from 7 to 8 ft.
   - The posts should be made from black locust, eastern red cedar, Atlantic white cedar, or other species of similar durability and strength.
   - Space posts 10 ft. apart, and set them > 3 feet deep.

B. Technique

1. Position - orientation of fence line is parallel to waterline of the beach, at least 140 feet (horizontal distance) from mean high tide (see figure 2).

2. Height - with adequate sand sources, dune elevations can be increased annually by at least four foot increments (approximately the maximum height of the fencing, this can be increased with vegetation). The maximum dune height which is attainable will range from 12 to 15 feet, but is greatly influenced by prevailing wind velocities and sand grain size.

3. Installation - weave fencing in front of and behind alternating posts to attain maximum strength.

4. Number of Rows - When the distance to the MHT water line is 100 feet or more, 2 parallel rows spaced 30 to 40 feet apart are ideal; but single rows with 30 foot perpendicular spurs, spaced 40 feet apart are also acceptable if there is less than 100 feet from the MHT and a protective dune is desired. A zigzag pattern may also be considered. Where there is less than _50__ feet from the MHT it may not be feasible to build dunes.

5. Replacement - sand will typically fill fencing to ¾ of its total height at a maximum; upon reaching maximum fence capacity, additional lines of fence can be added until maximum planned dune height is reached; replace damaged fencing and posts within one month of storm damage to maintain a contiguous dune line.

C. Comments

1. This method is more expensive per lineal foot than building dunes with vegetation

alone, but less expensive than using earth moving machinery to construct dunes.

2. Although dune height can be increased faster, it is limited by the fence height and ability to continually add more lines of fencing.

3. Planting parallel rows of vegetation on either side of fences is usually more effective than either vegetation or fencing techniques alone.

4. When complementing fencing with vegetation, do not plant closer than ten feet and no further than 15 feet from the fence lines. Vegetative strips should be about 20 feet wide (see figure 2-2 & 2-3).

3. MECHANICAL EXCAVATION

A With the use of various earth moving machines temporary, excavated sand dunes are quickly created.

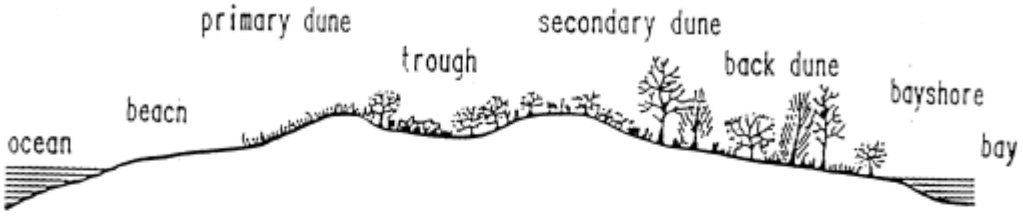
B. Since time is required for settling and cohesion to occur, such dunes are often short lived and only provide minimal protection to the public and private resources behind them.

C. This method is often useful in the repair of storm damaged sand dunes during the fall and winter months. Any blow-out areas can be quickly filled.

D. Front-end loaders of all sizes can be used. Various grading machines are also useful.

E. Pumped sand from off shore dredging can be shaped and positioned with machinery.

Figure 2-1

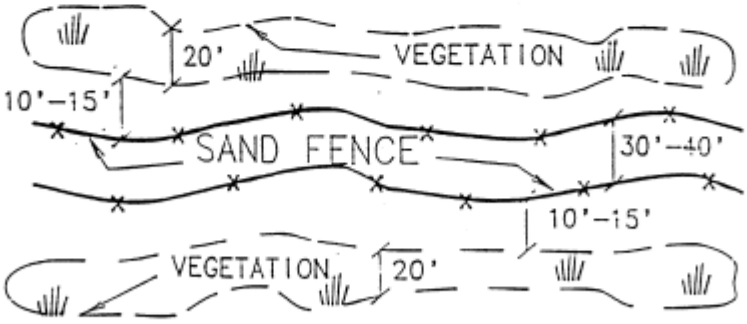


TYPICAL BARRIER ISLAND CROSS SECTION

Figure 2-2

COMBINATION OF SAND FENCE AND VEGETATION FOR DUNE BUILDING

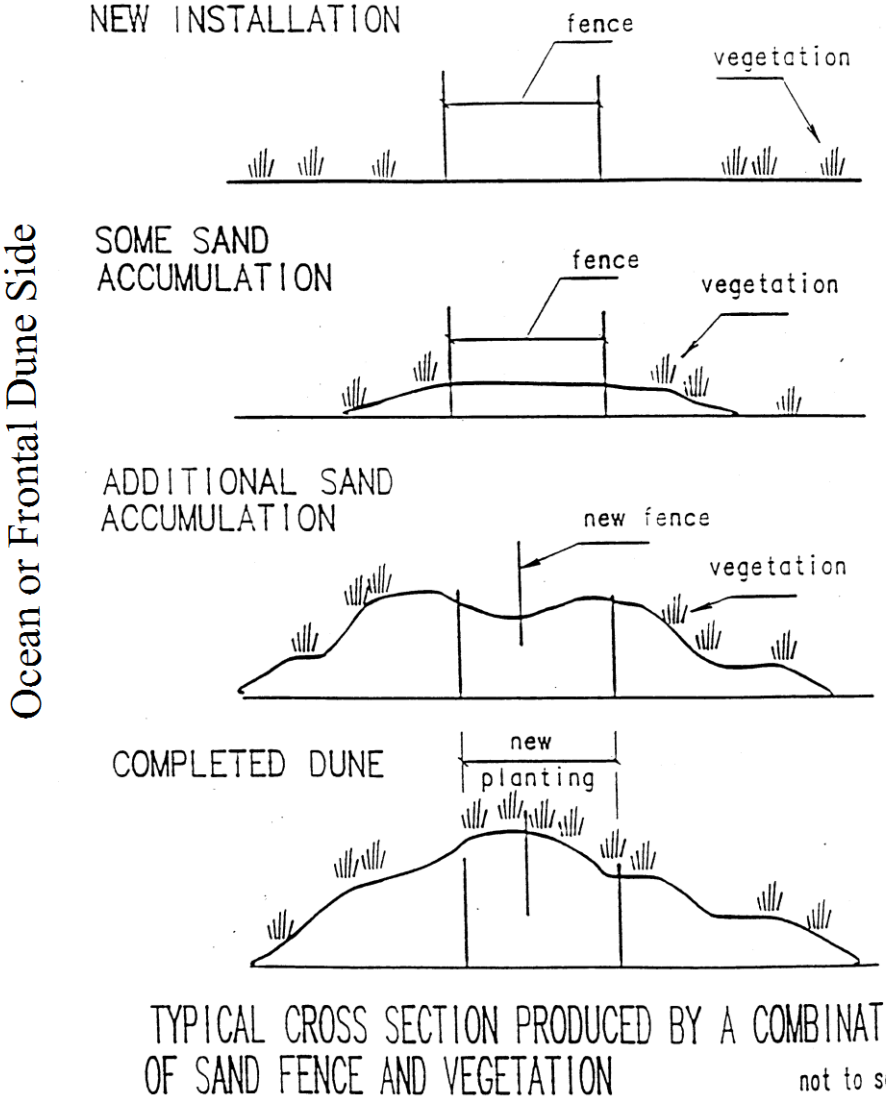
not to scale



OCEAN

Source: USDA

Figure 2 -3



TYPICAL CROSS SECTION PRODUCED BY A COMBINATION OF SAND FENCE AND VEGETATION

not to scale

Source: USDA

STANDARD FOR MAINTAINING VEGETATION

Definition

The perpetuation of vegetative cover.

Purpose

To ensure the continuing vigor and function of vegetative cover and enhance the environment. It is usually less costly to carry on a maintenance program than it is to make repairs after an extended period of neglect.

Water Quality Enhancement

Ensures adequate permanent cover and prevents exposure of soils to erosion and off site sedimentation from stormwater runoff impacts.

Where Applicable

On areas where existing vegetation protects or enhances the environment.

Methods and Materials

A preventive maintenance program anticipates requirements and accomplishes work when it can be done with least effort and expense to insure adequate vegetative cover.

Maintenance should occur on a regular basis, consistent with favorable plant growth, soil, and climatic conditions. This involves regular seasonal work for mowing, fertilizing, liming, watering, pruning, fire control, weed and pest control, reseeding, and timely repairs.

The degree of preventive maintenance needed depends upon the type of vegetation and its proposed function or use.

1. Mowing is a recurring practice and its intensity depends upon the function of the ground cover. On high to moderate (A to B) maintenance areas, such as lawns, certain recreation fields, and picnic areas, mowing will be frequent (2 to 7 day intervals) and typically at a height of 2.5 to 3 inches. Return clippings from mowing (mulching mower) to the turf to reduce the amount of fertilizer needed to maintain the turf by as much as 50%. Some turf mixtures can be managed as naturalized stands requiring only one (cool season mixtures) or two (warm season mixtures) mowings per year. Mowing of naturalized areas is typically done at heights no less than 4 inches and should not be done between April 1st and July 15th to avoid disturbing ground nesting birds. The large amount of clipping debris generated by mowing naturalized areas will need to be removed and/or dispersed so the vegetation is not smothered. Burning of naturalized areas is another procedure used to manage naturalized turfs. Low maintenance (D) areas may be left unmowed to permit natural succession. See pg. 4-13 footnote #4, Maintenance Levels A, B, C and D in the Standard for Permanent Vegetative Cover, Table 4-3.

2. Incorporation of organic matter (for example, mature compost) into the soil will substantially reduce the need for fertilizer and irrigation inputs.

3. Fertilizer and lime should be applied as needed to maintain a dense stand of desirable species. Frequently mowed areas and those on sandy soils will require more frequent fertilization but at lower nutrient rates per application.

4. Lime requirement should be determined by soil testing every 2 or 3 years. Fertilization may increase the need for liming. Contact the local county extension office for details on soil testing and fertilization and pest control recommendations online at http://njaes.rutgers.edu/county/.

5 Fertilization and additions of other soil amendments are not recommended for managing native vegetation such as in the Pinelands National Reserve. See the Standard for Permanent Vegetative Stabilization for specific requirements in the PNR.

6. Weed invasion may result from abusive mowing and from inadequate fertilizing and liming. Many newly established grasses will not survive if mowed at heights below 2.5 inches and at intervals greater than 7 days. Brush invasion is a common consequence of lack of mowing. The amount of weeds or brush that can be tolerated in any vegetated area depends upon the intended use of the land. Drainage ways are subject to rapid infestation by weed and woody plants. These should be controlled, since they often reduce drainage way efficiency. Control of weeds or brush is accomplished by using herbicides or mechanical methods.

7. Fire hazard is greater where dry vegetation has accumulated. The taller the vegetation, the greater the hazard.

8. Prune trees and shrubs to remove dead or damaged branches. Remove undesirable or invasive plants to maintain integrity of the landscape and enhance quality of permanent vegetative cover.

STANDARD FOR PERMANENT VEGETATIVE COVER FOR SOIL STABILIZATION

Definition

Establishment of permanent vegetative cover on exposed soils where perennial vegetation is needed for long-term protection.

Purpose

To permanently stabilize the soil, ensuring conservation of soil and water, and to enhance the environment.

Water Quality Enhancement

Slows the over-land movement of stormwater runoff, increases infiltration and retains soil and nutrients on site, protecting streams or other stormwater conveyances.

Where Applicable

On exposed soils that have a potential for causing off-site environmental damage.

Methods and Materials

1. Site Preparation

   A. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application, and mulch anchoring. All grading should be done in accordance with Standard for Land Grading.

   B. Immediately prior to seeding and topsoil application, the subsoil shall be evaluated for compaction in accordance with the Standard for Land Grading .

   C. Topsoil should be handled only when it is dry enough to work without damaging the soil structure. A uniform application to a depth of 5 inches (unsettled) is required on all sites. Topsoil shall be amended with organic matter, as needed, in accordance with the Standard for Topsoiling.

   D. Install needed erosion control practices or facilities such as diversions, grade-stabilization structures, channel stabilization measures, sediment basins, and waterways.

2. Seedbed Preparation

   A. Uniformly apply ground limestone and fertilizer to topsoil which has been spread and firmed, according to soil test recommendations such as offered by Rutgers Co-operative Extension Soil sample mailers are available from the local Rutgers Cooperative Extension offices (http://njaes.rutgers.edu/county/). Fertilizer shall be applied at the rate of 500 pounds per acre or 11 pounds per 1,000 square feet of 10-10-10 or equivalent with 50% water insoluble nitrogen unless a soil test indicates otherwise and incorporated into the surface 4 inches. If fertilizer is not incorporated, apply one-half the rate described above during seedbed preparation and repeat another one-half rate application of the same fertilizer within 3 to 5 weeks after seeding.

   B. Work lime and fertilizer into the topsoil as nearly as practical to a depth of 4 inches with

a disc, spring-tooth harrow, or other suitable equipment. The final harrowing or disking operation should be on the general contour. Continue tillage until a reasonable uniform seedbed is prepared.

C. High acid producing soil. Soils having a pH of 4 or less or containing iron sulfide shall be covered with a minimum of 12 inches of soil having a pH of 5 or more before initiating seedbed reparation. See Standard for Management of High Acid-Producing Soils for specific requirements.

3. Seeding

A. Select a mixture from Table 4-3 or use a mixture recommended by Rutgers Cooperative Extension or Natural Resources Conservation Service which is approved by the Soil Conservation District. Seed germination shall have been tested within 12 months of the planting date. No seed shall be accepted with a germination test date more than 12 months old unless retested.

1. Seeding rates specified are required when a report of compliance is requested prior to actual establishment of permanent vegetation. Up to 50% reduction in rates may be used when permanent vegetation is established prior to a report of compliance inspection. These rates apply to all methods of seeding. Establishing permanent vegetation means 80% vegetative coverage with the specified seed mixture for the seeded area and mowed once.

2. Warm-season mixtures are grasses and legumes which maximize growth at high temperatures, generally 85^{o} F and above. See Table 4-3 mixtures 1 to 7. Planting rates for warm-season grasses shall be the amount of Pure Live Seed (PLS) as determined by germination testing results.

3. Cool-season mixtures are grasses and legumes which maximize growth at temperatures below 85^{o}F. Many grasses become active at 65^{o}F. See Table 4-3, mixtures 8-20. Adjustment of planting rates to compensate for the amount of PLS is not required for cool season grasses.

B. **Conventional Seeding** is performed by applying seed uniformly by hand, cyclone (centrifugal) seeder, drop seeder, drill or cultipacker seeder. Except for drilled, hydroseeded or cultipacked seedings, seed shall be incorporated into the soil within 24 hours of seedbed preparation to a depth of 1/4 to 1/2 inch, by raking or dragging. Depth of seed placement may be 1/4 inch deeper on coarse-textured soil.

C. After seeding, firming the soil with a corrugated roller will assure good seed-to-soil contact, restore capillarity, and improve seedling emergence. This is the preferred method. When performed on the contour, sheet erosion will be minimized and water conservation on site will be maximized.

D. **Hydroseeding is** a broadcast seeding method usually involving a truck, or trailer-mounted tank, with an agitation system and hydraulic pump for mixing seed, water and fertilizer and spraying the mix onto the prepared seedbed. **Mulch shall not be included in the tank with seed**. Short-fibered mulch may be applied with a hydroseeder following seeding. (also see Section 4-Mulching below). Hydroseeding is not a preferred seeding method because seed and fertilizer are applied to the surface and not incorporated into the soil. When poor seed to soil contact occurs, there is a reduced seed germination and growth.

4. Mulching

Mulching is required on all seeding. Mulch will protect against erosion before grass is established and will promote faster and earlier establishment. The existence of vegetation sufficient to control soil erosion shall

be deemed compliance with this mulching requirement.

A. Straw or Hay. Unrotted small grain straw, hay free of seeds, to be applied at the rate of 1-1/2 to 2 tons per acre (70 to 90 pounds per 1,000 square feet), except that where a crimper is used instead of a liquid mulch-binder (tackifying or adhesive agent), the rate of application is 3 tons per acre. Mulch chopper-blowers must not grind the mulch. Hay mulch is not recommended for establishing fine turf or lawns due to the presence of weed seed.

Application - Spread mulch uniformly by hand or mechanically so that at least 85% of the soil surface is covered. For uniform distribution of hand-spread mulch, divide area into approximately 1,000 square feet sections and distribute 70 to 90 pounds within each section.

Anchoring shall be accomplished immediately after placement to minimize loss by wind or water. This may be done by one of the following methods, depending upon the size of the area, steepness of slopes, and costs.

1. Peg and Twine. Drive 8 to 10 inch wooden pegs to within 2 to 3 inches of the soil surface every 4 feet in all directions. Stakes may be driven before or after applying mulch. Secure mulch to soil surface by stretching twine between pegs in a criss-cross and a square pattern. Secure twine around each peg with two or more round turns.

2. Mulch Nettings - Staple paper, jute, cotton, or plastic nettings to the soil surface. Use a degradable netting in areas to be mowed.

3. Crimper (mulch anchoring coulter tool) - A tractor-drawn implement, somewhat like a disc harrow, especially designed to push or cut some of the broadcast long fiber mulch 3 to 4 inches into the soil so as to anchor it and leave part standing upright. This technique is limited to areas traversable by a tractor, which must operate on the contour of slopes. Straw mulch rate must be 3 tons per acre. No tackifying or adhesive agent is required.

4. Liquid Mulch-Binders - May be used to anchor salt hay, hay or straw mulch.

   a. Applications should be heavier at edges where wind may catch the mulch, in valleys, and at crests of banks. The remainder of the area should be uniform in appearance.

   b. Use one of the following:

      (1) Organic and Vegetable Based Binders - Naturally occurring, powder-based, hydrophilic materials when mixed with water formulates a gel and when applied to mulch under satisfactory curing conditions will form membraned networks of insoluble polymers. The vegetable gel shall be physiologically harmless and not result in a phytotoxic effect or impede growth of turf grass. Use at rates and weather conditions as recommended by the manufacturer to anchor mulch materials. Many new products are available, some of which may need further evaluation for use in this state.

      (2) Synthetic Binders - High polymer synthetic emulsion, miscible with water when diluted and, following application of mulch, drying and curing, shall no longer be soluble or dispersible in water. Binder shall be applied at rates recommended by the manufacturer and remain tacky until germination of grass.

      Note: All names given above are registered trade names. This does not constitute a recommendation of these products to the exclusion of other products.

B. Wood-fiber or paper-fiber mulch - shall be made from wood, plant fibers or paper containing no

growth or germination inhibiting materials, used at the rate of 1,500 pounds per acre (or as recommended by the product manufacturer) and may be applied by a hydroseeder. **Mulch shall not be mixed in the tank with seed**. Use is limited to flatter slopes and during optimum seeding periods in spring and fall.

C. Pelletized mulch - compressed and extruded paper and/or wood fiber product, which may contain co-polymers, tackifiers, fertilizers, and coloring agents. The dry pellets, when applied to a seeded area and watered, form a mulch mat. Pelletized mulch shall be applied in accordance with the manufacturer's recommendations. Mulch may be applied by hand or mechanical spreader at the rate of 60-75 lbs/1,000 square feet and activated with 0.2 to 0.4 inches of water. This material has been found to be beneficial for use on small lawn or renovation areas, seeded areas where weed-seed free mulch is desired, or on sites where straw mulch and tackifier agent are not practical or desirable. Applying the full 0.2 to 0.4 inches of water after spreading pelletized mulch on the seed bed is extremely important for sufficient activation and expansion of the mulch to provide soil coverage.

5. Irrigation (where feasible)

If soil moisture is deficient supply new seeding with adequate water (a minimum of 1/4 inch applied up to twice a day until vegetation is well established). This is especially true when seedings are made in abnormally dry or hot weather or on droughty sites.

6. Topdressing

Since soil organic matter content and slow release nitrogen fertilizer (water insoluble) are prescribed in Section 2A - Seedbed Preparation in this Standard, no follow-up of topdressing is mandatory. An exception may be made where gross nitrogen deficiency exists in the soil to the extent that turf failure may develop. In that instance, topdress with 10-10-10 or equivalent at 300 pounds per acre or 7 pounds per 1,000 square feet every 3 to 5 weeks until the gross nitrogen deficiency in the turf is ameliorated.

7. Establishing Permanent Vegetative Stabilization

The quality of permanent vegetation rests with the contractor. The timing of seeding, preparing the seedbed, applying nutrients, mulch and other management are essential. The seed application rates in Table 4-3 are required when a Report of Compliance is requested prior to actual establishment of permanent vegetation. Up to 50% reduction in application rates may be used when permanent vegetation is established prior to requesting a Report of Compliance from the district. These rates apply to all methods of seeding. **Establishing permanent vegetation means 80% vegetative cover (of the seeded species) and mowed once.** Note this designation of mowed once does not guarantee the permanency of the turf should other maintenance factors be neglected or otherwise mismanaged.

Table 4-2

Table 4-2
Permanent Stabilization Mixtures for Various Uses

Application	PLANTING MIXTURES BY SOIL DRAINAGE CLASS/[1] (see Table 4-3)		
	Excessively Drained	Well to Moderately Well Drained	Somewhat Poorly to Poorly Drained
Residential/commercial lots	10, 12, 15	6, 10, 12, 13, 14, 15	16
Pond and channel banks, dikes, berms and dams	2, 5, 6, 10	5, 6, 7, 8, 9, 15	2, 8, 16, 17
Drainage ditches, swales, detention basins	2, 9, 11	2, 7, 9, 11, 12, 17	2, 9, 16, 17
Filter Strips	12	11, 12	11, 12
Grasses waterway, spillways	2, 3, 9, 10, 12	6, 7, 9, 10, 11, 12	2, 9, 11,12
Recreation areas, athletic fields	5, 12, 15, 18	12, 13, 14, 15, 18	16
Special Problem Sites Steep slopes and banks, roadsides, borrow areas	2, 3, 4 ,6	2, 3, 5, 7, 8, 9, 10, 15, 18	2, 9, 10, 11, 12
Sand and gravel pits, Sanitary landfills	1, 2, 3, 4, 6, 20	1, 2, 3, 4, 5, 6, 8, 15, 20	2, 8
Dredged material, spoilbanks, Borrow areas	2, 3, 6, 20	2, 3, 6, 11,	2,8
Streambanks & shorelines [2]	2, 8, 20, 21a	2, 8, 19b, 20, 21a, 21b	2, 8, 19a, 21a,b,c,d
Utility rights-of-way	3,7,180	3, 7	8, 9, 17

1. Refer to Soil Surveys for drainage class descriptions.
2. Refer to Soil Bioengineering Standard for additional seed mixtures.
3. Spillways only
4. See Appendix E for description of turf grasses and cultivars

PERMANENT VEGETATIVE MIXTURES, PLANTING RATES AND PLANTING DATES[1]

SEED MIXTURE [2]	**PLANTING RATE** /3		**PLANTING DATES.** O = Optimal Planting period A = Acceptable Planting period									**MAINTENANCE LEVEL** /4	**REMARKS**
			PLANT HARDINESS ZONES (see Figure 4-1)										
			Zone 5b, 6a			**Zone 6b**			**Zone 7a, 7b**				
	lbs/acre	lbs/1000 sq. ft.	**3/15-5/31**	**6/1-7/31**	**8/1-10/1**	**3/1-4/30**	**5/1-8/14**	**8/15-10/15**	**2/1-4/30**	**5/1-8/14**	**8/15-10/30**		
WARM SEASON SEED MIXTURES													
1A. For Pinelands National Reserve Seed mixtures see Table 4-4 page 4-17			**O**			**O**			**O**				
1. Switchgrass and/or Coastal panicgrass plus or Flatpea	15 15 ~~20~~ 20	.35 .35 ~~.45~~ .45	**O**			**O**			**O**			C-D	

2. Deertongue or Switchgrass Redtop	15 20 1 ~~10~~	.35 .45 .1 ~~.23~~	**O**			**O**			**O**			C-D	Use Deertongue if pH < 4.0. Switchgrass is superior wildlife plant. Use for waterways. Redtop provides quick cover.
3. Switchgrass Deertongue Little Bluestem Sheep fescue plus Partridge pea	15 10 20 20 10	.35 .25 .45 .45 .25	**O**			**O**			**O**			C-D	Pinelands mixture.
4. Switchgrass Big Bluestem Little Bluestem Sand lovegrass Coastal panicgrass	10 5 5 4 10	.25 .10 .10 .10 .25	**O**			**O**			**O**			C-D	Native warm-season mixture.
5. Bermudagrass Zoysiagrass (seed) Zoysiagrass (sprigs)	15 30	0.35 0.70	**O**			**O**			**O**			A-D	Bermudagrass has superior salt tolerance. Zoysia has greater wear tolerance
COOL SEASON SEED MIXTURES	130	3	**A**	**A[5]**	**O**	**A**	**A[5]**	**O**	**A**	**A[5]**	**O**		General low-maintenance mixture.

6. Fine Fescue (Blend) Hard Fescue Chewings fescue Strong Creeping Red Fescue Kentucky bluegrass Perennial ryegrass plus White clover (see note at right)	45 20 5	.1 ..5 .10										B-D	White clover can be removed when used to establish lawns
7. Strong Creeping red fescue Kentucky bluegrass Perennial ryegrass or Redtop plus White clover	130 50 20 10 5	3 1 .5 .25 .10	**A**	A[5]	**O**	**A**	A[5]	**O**	**A**	A[5]	**O**	B-D	Suitable waterway mix. Canada bluegrass more drought tolerant. Use Redtop for increased drought-tolerance.
8. Tall fescue (turf-type) or Strong Creeping red fescue or Perennial ryegrass Flatpea	30 30 30 25	.7 .7 .7 .60	**O**	A[6]		**O**	A[6]		**O**	A[6]		B-D	Tall fescue best selected for droughty conditions. Use Creeping red fescue in heavy shade. Use Flatpea to suppress woody vegetation.
9. Deertongue Redtop Wild rye (Elymus) Switchgrass	20 2 15 25	.45 .05 .35 .60	**O**			**O**			**O**			C-D	Native wet mix.

10. Tall fescue (turf-type) Perennial ryegrass or White clover (see note at right)	265 20 ~~10~~ 5	6 5 ~~.25~~ .10	**O**	A[5]	**A[5]**	**O**	A[5]	**A[5]**	**O**	A[5]	**A[5]**	C-D	white clover can be excluded on lawn sites
11 Kentucky Bluegrass Turf-type Tall fescue	~~15~~ 45 22	~~0.33~~ 1 5	A	A[5]	O	A	A[5]	O	A	A[5]	O	C-D	Filter strip use for nutrient uptake.
12. Turf-type Tall fescue (Blend of 3 cultivars)	350	8	A	A[5]	O	A	A[5]	O	A	A[5]	O	C-D	Use in a managed filter strip for nutrient uptake.
13. Hard Fescue and/or Chewing fescue and/or Strong creeping red fescue Perennial ryegrass Ky. bluegrass (blend)	175 45 45	4 1 1	A	A[5]	O	A	A[5]	O	A	A[5]	O	A-C	General lawn/recreation.
14. Tall fescue Ky. bluegrass (blend) Perennial ryegrass (blend)	265 20 20	6 0.50 0.50	A	A[5]	O	A	A[5]	O	A	A[5]	O	A-B	Athletic field/ 3 cultivar mix of Kentucky Bluegrass.
15. Hard fescue Chewings fescue Strong Creeping red fescue Perennial ryegrass	130 45 45 10	3 1 1 .25	A	A[5]	O	A	A[5]	O	A	A[5]	O	C-D	Low-maintenance fine fescue lawn mix.
16. Rough bluegrass Strong Creeping red fescue	90 130	2.0 3	A	A[5]	O	A	A[5]	O	A	A[5]	O	C-D	Moist shade.

17. Creeping bentgrass Creeping red fescue Alkali saltgrass	45 45 45	1 1 1	A	A[5]	**O**	**A**	A[5]	**O**	**A**	A[5]	**O**	B-D	Use bentgrass under wetter conditions. Saltgrass will only persistent under saline conditions.
18. Hard or Sheeps fescue N. E. wildflower mixture	25 12	0.60 0.35	**O**	**A**	**O**	**O**	**A**	**O**	**O**	**A**	**O**	C-D	Regional Wildflower mix Hydroseeding not recommended.
19. a. Smooth cordgrass b. Saltmeadow cordgrass	veg veg					**O**	Before July 1		**O**	Before July 1		D	Planted in the intertidal zone. Planted above mean high tide.
20. American Beachgrass Coastal Panicgrass	Veg 20	.45				Before April 1			**O**			D	Coastal Panicgrass may be interseeded between rows of beachgrass
21. a. Purpleosier willow b. Dwarf willow c. Redosier dogwood d. Silky dogwood	veg veg. veg. veg.		Before May 10			Before May 10			**Before May 1**			D	Also refer to Chapters 16 and 18 of USDA NRCS Engineering Field Handbook

Table 4-3 Footnotes:

1. See Appendix B for descriptions of turf grass mixtures and cultivars. The actual amount of warm-season grass mixture used in Table 3 (seed mix 1-7) shall be adjusted to reflect the amount of PLS as determined by germination testing results. No adjustment is required for cool-season grasses (seed mixtures 8-20).

2. Seeding mixtures and/or rates not listed above may be used if recommended by the local Soil Conservation District, Natural Resources Conservation Service; recommendations of Rutgers Cooperative Extension may be used if approved by the Soil Conservation District. Legumes (white clover, flatpea, lespedeza) should be mixed with proper innoculant prior to planting.

3. Seeding rates specified are required when a report of compliance is requested prior to actual establishment of permanent vegetation. Up to 50% reduction in rates may be used when permanent vegetation is established prior to a report of compliance inspection. These rates apply to all methods of seeding. Establishing permanent vegetation means 80% vegetative coverage of the seeded area and mowed once. Grass seed mixture checked by the State Seed Analyst, New Jersey Department of Agriculture, Trenton, New Jersey, will assure the purchaser that the mixture obtained is the mixture ordered, pursuant to the N.J. State Seed Law, N.J.S.A. 4:8-17.13 et. seq.

   O = optimal planting period **A** = acceptable planting period

4. Maintenance Level:

   A: Intensive mowing, (2-4 days), fertilization, lime, pest control and irrigation (Examples – high-maintenance lawns, commercial and recreation areas, public facilities).

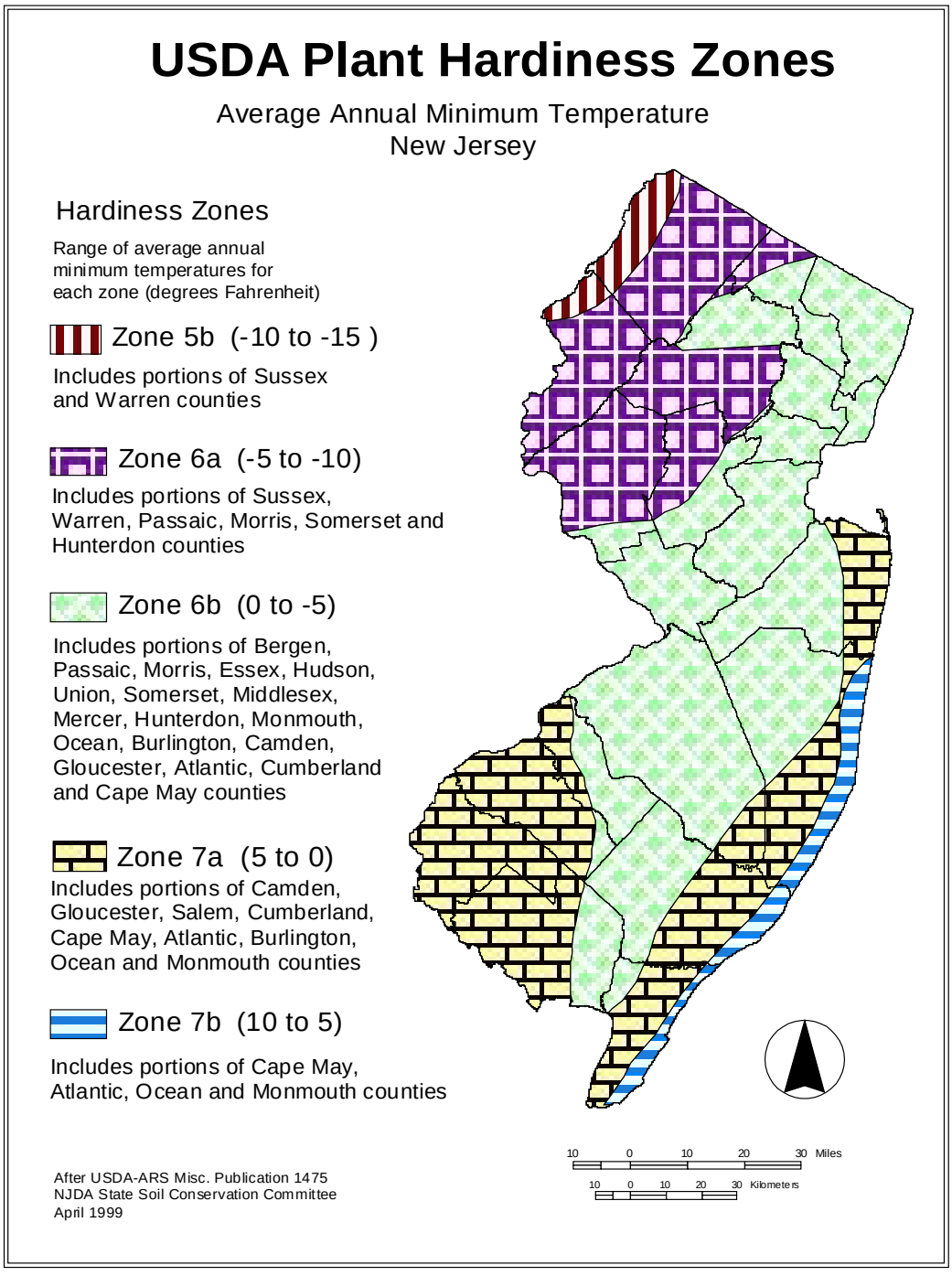
   B: Frequent mowing, (4-7 days), occasional fertilization, lime and weed control (Examples - home lawns, commercial sites, school sites).

   C: Periodic mowing (7-14 days), occasional fertilization and lime (Examples - home lawns, parks).

   D: Infrequent or no mowing, fertilization and lime the first year of establishment (Examples - roadsides, recreation areas, public open spaces)

5. Summer seedings should only be conducted when the site is irrigated. Mixes including white clover require that at least six weeks of growing season remain after seeding to ensure establishment before freezing conditions.

Figure 4-1: Plant Hardiness Zones in New Jersey



Pinelands National Reserve Specifications

Methods and Materials

Due to the low fertility of native soils and other related factors, indigenous Pinelands vegetation can be relatively slow to re-colonize disturbed areas. Natural re-colonization by native plants is preferable however, where the intended land use permits or requires native plant re-growth

The following approaches shall be used for post-development soil stabilization in the Pinelands National Reserve (PNR) in areas where it is a desire for native plant materials to be used. These practices are limited to areas where slope is less than 2% which do not experience concentrated surface runoff.

Note: areas requiring traditional turf-type vegetation either by seeding or sodding shall be subject to the Standards for Topsoiling or Sodding and the prior portions of this Standard which detail methods for permanent vegetative stabilization. Table 4-4 below contains the required cool season turf mixture suitable for use in the PNR.

PNR A-horizon soil shall be segregated and stockpiled separately to maintain seed and root stock remnants for revegetation efforts outlined below.

Site / Seedbed Preparation.

1. The reuse of stockpiled Pinelands A-Horizon soils to the depth found prior to construction (1.0" minimum) is required for all permanent stabilization efforts involving native plant materials.
2. pH, organic matter, texture and cation exchange capacity (CEC) (as estimated by sum of cations, CEC_{sum}) of any non-native PNR soil shall be equal to or less than that of the native soil on the project site.
   - See Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx for typical soil measurements for pH, soil texture, organic matter and CEC.
3. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application and mulch anchoring. All grading shall be done in accordance with Standards for Land Grading, including methods to alleviate soil compaction (the addition of compost for organic matter shall not exceed the in-situ composition).
4. Sand fencing - Sand fencing (standard snow fence) may be used to address potential wind erosion on large sites (See Sand fencing, Dune Stabilization Standard). Sand fencing shall be used in combination with other permanent stabilization methods to prevent erosion.

Reseeding with Pinelands Approved Seed Mixtures

Appropriate seed mixtures shall be selected from Table 4-4 below. Seed shall be broadcast or drill seeded directly into the A-horizon soils. ÷ Mulch consistent with the Standard.

Re-establishment of Native Vegetation without seeding.

1. In cases where it is desirable or required for native vegetation to be re-established by unassisted re-colonization, A-horizon soils (without added seeding) shall be protected from erosion by any of the following measures until native plant materials (seed and root stock preserved in A-horizon soils and other native volunteer vegetation) re-colonize the area:

a. Unrotted small-grain straw, at 2.0 to 2.5 tons per acre, is spread uniformly at 90 to 115 pounds per 1,000 square feet and anchored with a mulch anchoring tool, liquid mulch binders, or netting tie down. Other suitable materials may be used if approved by the Soil Conservation District. The approved rates above have been met when the mulch covers the ground completely upon visual inspection.

b. Light layer (2 inches thick maximum) of wood chips (locally sourced from within the Pinelands National Reserve if available)

c. Unseeded, Type A[1] (or greater) biodegradable erosion control blanket.

d. Combinations of the above.

e. Re-apply mulch materials as needed (to limit erosion) until an adequate cover of native plants is established. * This may require several growing seasons to adequately establish native vegetation.

f. A bond (estimate to be prepared by a NJ licensed Engineer) may be required by the local Soil Conservation District to ensure the suitable establishment of native vegetation is accomplished. A Final Certificate of Compliance shall not be issued to the overall project site until adequate, permanent vegetative cover is established.

g. If natural re-colonization fails after 2 growing seasons, vegetative establishment will require the area to be mechanically seeded with a suitable mixture from Table 4-4 below or otherwise replanted with live vegetation.

***** Adequate cover is defined as no visible evidence of off-site erosion with the natural re-colonization appearing to have the same spacing (if not height) as undisturbed vegetation in the immediate vicinity.

[1] Type A – Texas DOT testing labs for non-channel liner blankets

h. Table 4-4 Seeding Rates for Pinelands National Reserve Seed Mixtures

Name	Common name	Growth habit	Soil Drainage Tolerance	Height	Seeding rate lbs./acre
Non-Roadside Pinelands Mixture					
Schizachyrium scoparium	Little bluestem	PlB	EXDR-WD	2-3'	5
Dichanthelium clandestinum	Deertongue	PlB	EXDR-SWPD	1-3'	5
Panicum virgatum	Switchgrass	PlB	EXDR-PD	4-6'	5
Chamaecrista fasciculata	Partridge pea	AB	EXDR-WD	3'	5
Recommended Optional Addition (See recommended Pinelands species for mixture augmentation. Not for Roadsides)					
Andropogon virginicus	Broomsedge	PlB	EXDR-SWPD	18"-3'	5
Solidago bicolor	White (Silver rod) Goldenrod	P	EXDR-WD	1-4’	.5
Lespedeza capitata	Roundheaded bushclover	PlB	EXDR-WD	2-4'	2
Baptisia tinctoria	Wild indigo	PlB	EXDR	1-3’	5
Carex pensylvanica	Pennsylvania sedge	PlS	EXDR-WD	16"	Plugs
Temporary Seeding/Nurse Crops (choose one as a nurse crop where quick germination is needed)					
Hordeum vulgare	Barley	AsB	EXDR-WD	8”-3’	30
Avena sativa	Oats	AB	EXDR-WD	1-3’	30
Elymus canadensis	Canada wildrye	PsB	WD-MWD	3-6’	30
Roadside Native Seed Mixture					
Schizachyrium scoparium	Little bluestem	PlB	EXDR-WD	2-3'	5
Dichanthelium clandestinum	Deertongue	PlB	EXDR-SWPD	1-3'	5
Chamaecrista fasciculata	Partridge pea	AB	EXDR-WD	3'	5
Cool Season Turf Mixture					
Festuca longifolia	Hard fescue	PlB	EXWD-WD	2-3’	50
Festuca rubra ssp. rubra	Strong Creeping red fescue	PlB	EXWD-WD	1-2’	50
Festuca rubra ssp. fallax	Chewings fescue	PlB	EXWD-MWD	1-2’	50
Lolium perenne	Turf-type perennial ryegrass	PsB	EXWD-WD	1-2’	50

Key	
Growth Habit	**Soil Drainage Tolerance**
A-Annual	EXDR-Excessively drained
P-Perennial	WD-Well-drained
l-Long lived	MWD-Moderately well-drained
s-short lived	SWPD-Somewhat poorly drained
R-rizomatous	PD-Poorly drained
S-stoloniferous	
B-bunch	

Additional Pinelands Approved Species for Augmentation

NOT Recommended for Roadside Plantings

Annual Grasses:
1. Six Weeks Fescue (Vulpia octoflora)
2. Three-Awn Grass (Aristida longispica)

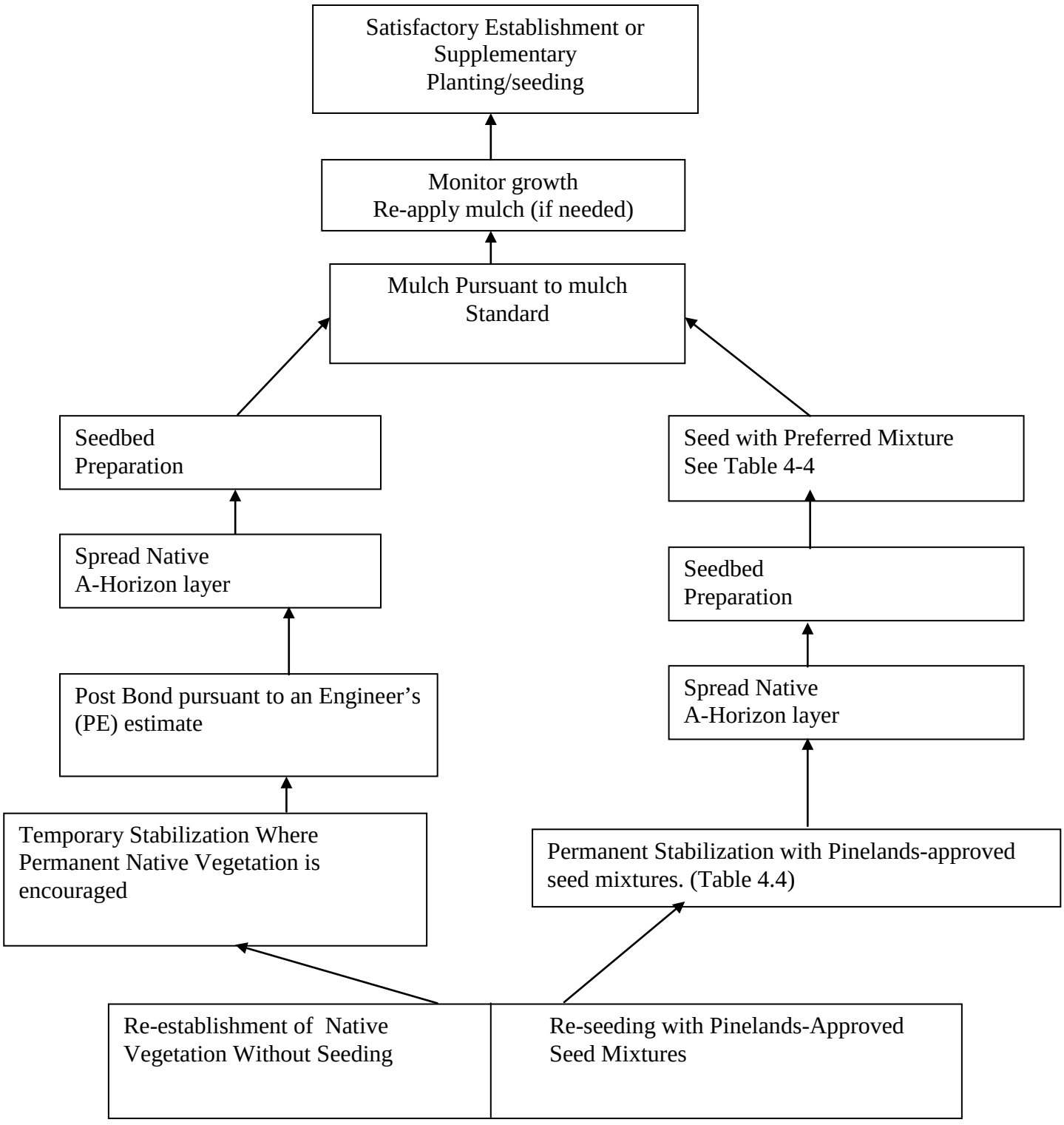
Perennial Cool-Season Grasses:
1. Poverty Oat Grass (Danthonia spicata)
2. Silky Wild Oat Grass (Danthonia sericea)
3. Ticklegrass (Agrostis hyemalis)

Perennial Warm-Season Grasses:
1. Dichanthelium species
2. Dichanthelium sphaerocarpon
3. Dichanthelium depauperatum
4. Dichanthelium meridionale
5. Dichanthelium sabulorum

Perennial Herbs:
1. Butterfly-weed (Asclepias tuberosa)
2. Grass-leaf Blazing-star (Liatris pilosa)
3. Hyssop-leaved Boneset (Eupatorium hyssopifolium)
4. Maryland Goldenaster (Chrysopsis mariana)
5. Sweet Goldenrod (Solidago odora)
6. Toothed Whitetop Aster (Sericocarpus asteroides)
7. Trailing Tick-Trefoil (Desmodium rotundifolium)

Species which may be more difficult to obtain but whose listing could encourage propagation include:
1. Bearberry (Arctostaphylos uva-ursi)
2. Orange-grass, (Hypericum gentianoides)
3. Teaberry (Gaultheria procumbens)
4. Pine Barren Sandwort (Minuartia caroliniana)
5. Hudsonia (Hudsonia ericoides)

Pinelands National Reserve
Natural Regeneration Process



STANDARD FOR STABILIZATION WITH MULCH ONLY

Definition

Stabilizing exposed soils with non-vegetative materials exposed for periods longer than 14 days

Purpose

To protect exposed soil surfaces from erosion damage and to reduce offsite environmental damage.

Water Quality Enhancement

Provides temporary mechanical protection against wind or rainfall induced soil erosion until permanent vegetative cover may be established.

Where Applicable

This practice is applicable to areas subject to erosion, where the season and other conditions may not be suitable for growing an erosion-resistant cover or where stabilization is needed for a short period until more suitable protection can be applied.

Methods and Materials

1. Site Preparation

   A. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application, and mulch anchoring. All grading should be done in accordance with Standards for Land Grading

   B. Install needed erosion control practices or facilities such as diversions, grade stabilization structures, channel stabilization measures, sediment basins, and waterways. See Standards 11 through 42.

2. Protective Materials

   A. Unrotted small-grain straw, at 2.0 to 2.5 tons per acre, is spread uniformly at 90 to 115 pounds per 1,000 square feet and anchored with a mulch anchoring tool, liquid mulch binders, or netting tie down. Other suitable materials may be used if approved by the Soil Conservation District. The approved rates above have been met when the mulch covers the ground completely upon visual inspection, i.e. the soil cannot be seen below the mulch.

   C. Synthetic or organic soil stabilizers may be used under suitable conditions and in quantities as recommended by the manufacturer.

   D. Wood-fiber or paper-fiber mulch at the rate of 1,500 pounds per acre (or according to the manufacturer's requirements) may be applied by a hydroseeder.

   E. Mulch netting, such as paper jute, excelsior, cotton, or plastic, may be used.

   F. Woodchips applied uniformly to a minimum depth of 2 inches may be used. Woodchips will not be used on areas where flowing water could wash them into an inlet and plug it.

G. Gravel, crushed stone, or slag at the rate of 9 cubic yards per 1,000 sq. ft. applied uniformly to a minimum depth of 3 inches may be used. Size 2 or 3 (ASTM C-33) is recommended.

3. Mulch Anchoring - should be accomplished immediately after placement of hay or straw mulch to minimize loss by wind or water. This may be done by one of the following methods, depending upon the size of the area and steepness of slopes.

A. Peg and Twine - Drive 8 to 10 inch wooden pegs to within 2 to 3 inches of the soil surface every 4 feet in all directions. Stakes may be driven before or after applying mulch. Secure mulch to soil surface by stretching twine between pegs in a criss-cross and a square pattern. Secure twine around each peg with two or more round turns.

B. Mulch Nettings - Staple paper, cotton, or plastic nettings over mulch. Use degradable netting in areas to be mowed. Netting is usually available in rolls 4 feet wide and up to 300 feet long.

C. Crimper Mulch Anchoring Coulter Tool - A tractor-drawn implement especially designed to punch and anchor mulch into the soil surface. This practice affords maximum erosion control, but its use is limited to those slopes upon which the tractor can operate safely. Soil penetration should be about 3 to 4 inches. On sloping land, the operation should be on the contour.

D. Liquid Mulch-Binders

1. Applications should be heavier at edges where wind catches the mulch, in valleys, and at crests of banks. Remainder of area should be uniform in appearance.

2. Use one of the following:

a. Organic and Vegetable Based Binders - Naturally occurring, powder based, hydrophilic materials that mixed with water formulates a gel and when applied to mulch under satisfactory curing conditions will form membrane networks of insoluble polymers. The vegetable gel shall be physiologically harmless and not result in a phyto-toxic effect or impede growth of turfgrass. Vegetable based gels shall be applied at rates and weather conditions recommended by the manufacturer.

b. Synthetic Binders - High polymer synthetic emulsion, miscible with water when diluted and following application to mulch, drying and curing shall no longer be soluble or dispersible in water. It shall be applied at rates and weather conditions recommended by the manufacturer and remain tacky until germination of grass.

STANDARD FOR PERMANENT STABILIZATION WITH SOD

Definition

Establishing permanent vegetation using sod.

Purpose

To permanently stabilize topsoil with an immediate aesthetic covering, thus assuring conservation of soil and water, and to enhance the environment.

Water Quality Enhancement

Provides an immediate, permanent vegetative cover to the soil from the impacts of wind or rain and prevents soil and nutrient losses to streams and other stormwater conveyances from stormwater runoff.

Where Applicable

On exposed soils that have a potential for causing off-site environmental damage where an immediate, permanent, vegetative cover is desired. Water (rain or irrigation) is required for success; access to irrigation is essential during drought.

Methods and Materials

1. High quality cultivated sod is preferred over native or pasture sod.

2. Sod should be free of broadleaf weeds and undesirable coarse and fine weed grasses.

3. Sod should be of uniform thickness, typically 5/8 inch, plus or minus 1/4 inch, at time of cutting (excludes top growth.).

4. Sod should be vigorous and dense and be able to retain its own shape and weight when suspended vertically with a firm grasp from the upper 10 percent of the strip. Broken pads and rolls or torn and uneven ends will not be acceptable.

5. For droughty sites, a sod of turf-type tall fescue or turf-type tall fescue mixed with Kentucky bluegrass is preferred over a 100% Kentucky bluegrass sod. Although not widely available, a sod of fine fescue is also acceptable for droughty sites.

6. Only moist, fresh, unheated sod should be used. Sod should be harvested, delivered, and installed within a period of 24 hours or less during summer months.

1. Site Preparation

    A. Grade as needed and feasible to permit the use of conventional equipment for liming, fertilizing, incorporation of organic matter, and other soil preparation procedures. All grading should be done in accordance with Standard for Land Grading.

    B. Topsoil should be handled only when it is dry enough to work without damaging the soil structure. A uniform application to a depth of 6 inches (unsettled) is required on all sites.

See the Standard for Topsoiling for topsoil and amendment requirements.

C. Install needed erosion control practices or facilities such as diversions, grade stabilization structures, channel stabilization measures, sediment basins, and waterways

2. Soil Preparation

A. Uniformly apply ground limestone, and fertilizer according to soil test recommendations such as offered by Rutgers Co-operative Extension. Soil sample mailers are available from the local Rutgers Cooperative Extension offices (http://njaes.rutgers.edu/county/). Fertilizer shall be applied at the rate of 500 pounds per acre or 11 pounds per 1,000 square feet using 10-10-10 or equivalent with 50% water insoluble nitrogen unless a soil test indicates otherwise and incorporated into the surface 4 inches. If fertilizer is not incorporated, apply ½ the rate described above during seedbed preparation and repeat another ½ rate application of the same fertilizer within 3 to 5 weeks after seeding**.** Apply limestone at the rate of 2 tons/acre unless soil testing indicates otherwise. Calcium carbonate is the equivalent and standard for measuring the ability of liming materials to neutralize soil acidity and supply calcium and magnesium to grasses and legumes. Table 6-1 is a general guideline for limestone application rates.

Table 6-1

Limestone [1.] Application Rate by Soil Texture

SOIL TEXTURE	TONS/ACRE	LBS./1000 SQ. FT.
Clay, clay loam, and high organic soil	3	135
Sandy loam, loam, silt loam	2	90
Loamy sand, sand	1	45

1. Pulverized dolomitic limestone is preferred for most soils south of the New Brunswick-Trenton line; however, this should be confirmed by soil testing.

B. Work lime, and fertilizer into the topsoil as nearly as practical to a depth of 4 inches with a disc, springtooth harrow, or other suitable equipment. The final harrowing or disking operation should be on the general contour. Continue tillage until a reasonably uniform, fine seedbed is prepared.

C. Remove from the surface all objects that would prevent good sod to topsoil contact and remove all other debris, such as wire, cable, tree roots, pieces of concrete, clods, lumps, or other unsuitable material.

D. Inspect site just before sodding. If traffic has left the soil compacted, the area must be retilled and firmed in accordance with the above.

3. Sod Placement

A. Sod strips should be laid on the contour, never up and down the slope, starting at the bottom of the slope and working up. On steep slopes, the use of ladders will facilitate the

work and prevent damage to the sod. During periods of high temperature, lightly irrigate the soil immediately prior to laying the sod.

B. Place sod strips with snug, even joints (seams) that are staggered. Open spaces invite erosion.

C. Lightly roll or tamp sod immediately following placement to insure solid contact of root mat and soil surface. Do not overlap sod. All joints should be butted tightly to prevent voids which would cause drying of the roots and invasion of weeds.

D. On slopes greater than 3 to 1, secure sod to surface soil with wood pegs, wire staples biodegradable plastic spikes, or split shingles (8 to 10 inches long by 3/4 inch wide).

E. Surface water cannot always be diverted from flowing over the face of the slope, but a capping strip of heavy jute or plastic netting, properly secured, along the crown of the slope and edges will provide extra protection against lifting and undercutting of sod. The same technique can be used to anchor sod in water-carrying channels and other critical areas. Wire staples must be used to anchor netting in channel work.

F. Immediately following installation, sod should be watered until water penetrates the soil layer beneath sod to a depth of 1 inch. Maintain optimum water for at least two weeks.

4. Topdressing - Since soil organic matter and slow release nitrogen fertilizer (water insoluble) are prescribed in Sections 1 and 2in this Standard, a follow-up topdressing is not mandatory, except where gross nitrogen deficiency exists in the soil to the extent that turf failure may develop, topdressing shall then be applied. Topdress with 10-0-10 or equivalent at 400 pounds per acre or 7 pounds per 1,000 square feet every 3 to 5 weeks until the gross nitrogen deficiency in the turf is ameliorated.

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TEMPORARY VEGETATIVE COVER FOR SOIL STABILIZATION

Definition

Establishment of temporary vegetative cover on soils exposed for periods of two to 6 months which are not being graded, not under active construction or not scheduled for permanent seeding within 60 days.

Purpose

To temporarily stabilize the soil and reduce damage from wind and water erosion until permanent stabilization is accomplished.

Water Quality Enhancement

Provides temporary protection against the impacts of wind and rain, slows the over land movement of stormwater runoff, increases infiltration and retains soil and nutrients on site, protecting streams or other stormwater conveyances.

Where Applicable

On exposed soils that have the potential for causing off-site environmental damage.

Methods and Materials

1. Site Preparation

    A. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application, and mulch anchoring. All grading should be done in accordance with Standards for Land Grading, pg. 19-1.

    B. Install needed erosion control practices or facilities such as diversions, grade stabilization structures, channel stabilization measures, sediment basins, and waterways. See Standards 11 through 42.

    C. Immediately prior to seeding, the surface should be scarified 6" to 12" where there has been soil compaction. **This practice is permissible only where there is no danger to underground utilities (cables, irrigation systems, etc.)**.

2. Seedbed Preparation

    A. Apply ground limestone and fertilizer according to soil test recommendations such as offered by Rutgers Co-operative Extension. Soil sample mailers are available from the local Rutgers Cooperative Extension offices. Fertilizer shall be applied at the rate of 500 pounds per acre or 11 pounds per 1,000 square feet of 10-20-10 or equivalent with 50% water insoluble nitrogen unless a soil test indicates otherwise**.** Apply limestone at the rate of 2 tons/acre unless soil testing indicates otherwise. Calcium carbonate is the equivalent and standard for measuring the ability of liming materials to neutralize soil acidity and supply calcium and magnesium to grasses and legumes.

    B. Work lime and fertilizer into the soil as nearly as practical to a depth of 4 inches with a disc, springtooth harrow, or other suitable equipment. The final harrowing or disking operation should

be on the general contour. Continue tillage until a reasonable uniform seedbed is prepared.

C. Inspect seedbed just before seeding. If traffic has left the soil compacted, the area must be retilled in accordance with the above.

D. Soils high in sulfides or having a pH of 4 or less refer to Standard for Management of High Acid Producing Soils, pg. 1-1.

3. Seeding

A. Select seed from recommendations in Table 7-2.

TABLE 7-2

TEMPORARY VEGETATIVE STABILIZATION GRASSES, SEEDING RATES, DATES AND DEPTH.

SEED SELECTIONS	SEEDING RATE [1] (pounds)		OPTIMUM SEEDING DATE [2] Based on Plant Hardiness Zone [3]			OPTIMUM SEED DEPTH [4] (inches)
	Per Acre	Per 1000 Sq. Ft.	ZONE 5b, 6s	ZONE 6b	ZONE 7a, b	
COOL SEASON GRASSES						
1. Perennial ryegrass	100	1.0	3/15-6/1 8/1-9/15	3/1-5/15 8/15-10/1	2/15-5/1 8/15-10/15	0.5
2. Spring oats	86	2.0	3/15-6/1 8/1-9/15	3/1-5/15 8/15-10/1	2/15-5/1 8/15-10/15	1.0
3. Winter Barley	96	2.2	8/1-9/15	8/15-10/1	8/15-10/15	1.0
4. Annual ryegrass	100	1.0	3/15-6/1 8/1-9/15	3/15-6/1 8/1-9/15	2/15-5/1 8/15-10/15	0.5
5. Winter Cereal Rye	112	2.8	8/1 - 11/1	8/1 - 11/15	8/1 - 12/15	1.0
WARM SEASON GRASSES						
6. Pearl millet	20	0.5	6/1-8/1	5/15-8/15	5/1-9/1	1.0

7. Millet (German or Hungarian)	30	0.7	6/1-8/1	5/15-8/15	5/1-9/1	1.0

1 Seeding rate for warm season grass, selections 5 - 7 shall be adjusted to reflect the amount of Pure Line Seed (PLS) as determined by a germination test result. No adjustment is required for cool season grasses.
2 May be planted throughout summer if soil moisture is adequate or seeded area can be irrigated.
3 Plant Hardiness Zone (see figure 7-1, pg. 7-4.)
4 Twice the depth for sandy soils

B. Conventional Seeding. Apply seed uniformly by hand, cyclone (centrifugal) seeder, drop seeder, drill or cultipacker seeder. Except for drilled, hydroseeded or cultipacked seedings, seed shall be incorporated into the soil, to a depth of 1/4 to 1/2 inch, by raking or dragging. Depth of seed placement may be 1/4 inch deeper on coarse textured soil.

C. Hydroseeding is a broadcast seeding method usually involving a truck or trailer mounted tank, with an agitation system and hydraulic pump for mixing seed, water and fertilizer and spraying the mix onto the prepared seedbed. Mulch **shall not** be included in the tank with seed. Short fibered mulch may be applied with a hydroseeder following seeding. (also see Section IV Mulching) Hydroseeding is not a preferred seeding method because seed and fertilizer are applied to the surface and not incorporated into the soil. Poor seed to soil contact occurs reducing seed germination and growth. Hydroseeding may be used for areas too steep for conventional equipment to traverse or too obstructed with rocks, stumps, etc.

D. After seeding, firming the soil with a corrugated roller will assure good seed-to-soil contact, restore capillarity, and improve seedling emergence. This is the preferred method. When performed on the contour, sheet erosion will be minimized and water conservation on site will be maximized.

4. Mulching

Mulching is required on all seeding. Mulch will insure against erosion before grass is established and will promote faster and earlier establishment. The existence of vegetation sufficient to control soil erosion shall be deemed compliance with this mulching requirement.

A. Straw or Hay. Unnrotted small grain straw, hay free of seeds, applied at the rate of 1-1/2 to 2 tons per acre (70 to 90 pounds per 1,000 square feet), except that where a crimper is used instead of a liquid mulch-binder (tackifying or adhesive agent), the rate of application is 3 tons per acre. Mulch chopper-blowers must not grind the mulch. Hay mulch is not recommended for establishing fine turf or lawns due to the presence of weed seed.

Application. Spread mulch uniformly by hand or mechanically so that approximately 95% of the soil surface will be covered. For uniform distribution of hand-spread mulch, divide area into approximately 1,000 square feet sections and distribute 70 to 90 pounds within each section.

Anchoring shall be accomplished immediately after placement to minimize loss by wind or water. This may be done by one of the following methods, depending upon the size of the area, steepness of slopes, and costs.

1. Peg and Twine. Drive 8 to 10 inch wooden pegs to within 2 to 3 inches of the soil surface every 4 feet in all directions. Stakes may be driven before or after applying mulch. Secure mulch to soil surface by stretching twine between pegs in a cris-cross and a square pattern. Secure twine around each peg with two or more round turns.

2. Mulch Nettings. Staple paper, jute, cotton, or plastic nettings to the soil surface. Use a degradable netting in areas to be mowed.

3. Crimper (mulch anchoring tool). A tractor-drawn implement, somewhat like a disc harrow, especially designed to push or cut some of the broadcast long fiber mulch 3 to 4 inches into the soil so as to anchor it and leave part standing upright. This technique is limited to areas traversable by a tractor, which must operate on the contour of slopes. Straw mulch rate must be 3 tons per acre. No tackifying or adhesive agent is required.

4. Liquid Mulch-Binders. – May be used to anchor hay or straw mulch.

   a. Applications should be heavier at edges where wind may catch the mulch, in valleys, and at crests of banks. The remainder of the area should be uniform in appearance.

   b. Use one of the following:

   (1) Organic and Vegetable Based Binders – Naturally occurring, powder based, hydrophilic materials when mixed with water formulates a gel and when applied to mulch under satisfactory curing conditions will form membraned networks of insoluble polymers. The vegetable gel shall be physiologically harmless and not result in a phytotoxic effect or impede growth of turfgrass. Use at rates and weather conditions as recommended by the manufacturer to anchor mulch materials. Many new products are available, some of which may need further evaluation for use in this state.

   (2) Synthetic Binders – High polymer synthetic emulsion, miscible with water when diluted and following application to mulch, drying and curing shall no longer be soluble or dispersible in water. It shall be applied at rates recommended by the manufacturer and remain tacky until germination of grass.

   Note: All names give above are registered trade names. This does not constitute a commendation of these products to the exclusion of other products.

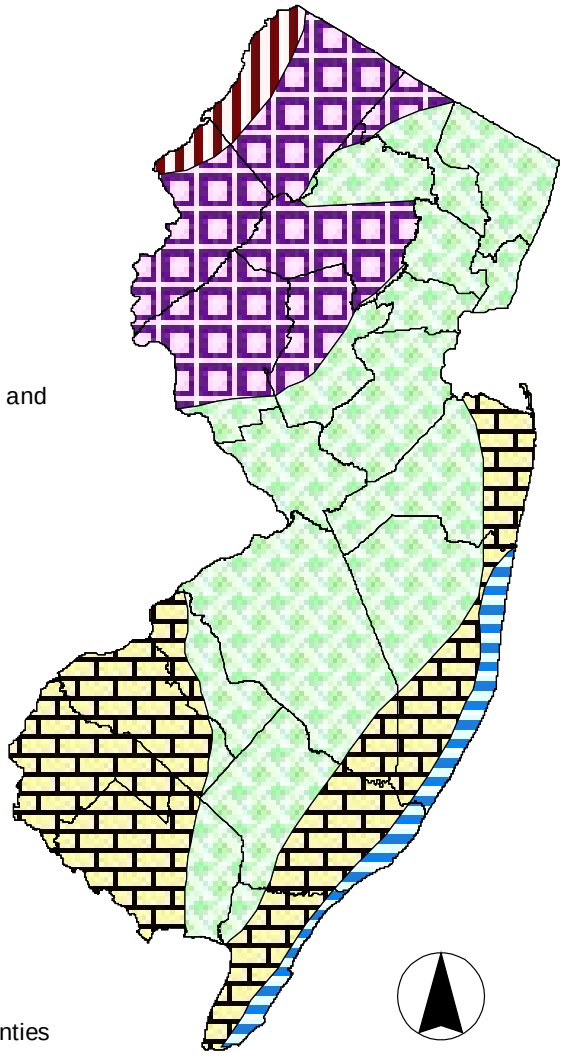
B. Wood-fiber or paper-fiber mulch. Shall be made from wood, plant fibers or paper containing no growth or germination inhibiting materials, used at the rate of 1,500 ponds per acre (or as recommended by the project manufacturer) and may be applied by a hydroseeder. This mulch shall not be mixed in the tank with seed. Use is limited to flatter slopes and during optimum seeding periods in spring and fall.

C. Pelletized mulch. Compressed and extruded paper and/or wood fiber product, which may contain co-polymers, tackifiers, fertilizers and coloring agents. The dry pellets, when applied to a seeded area and watered, forma mulch mat. Pelletized mulch shall be applies in accordance with the manufacturers recommendations. Mulch may be applied by hand or mechanical spreader at the rate of 60-75 lbs./1,000 square feet and activated with 0.2 to 0.4 inches of water. This material has bee found to be beneficial for use on small lawn or renovation areas, seeded areas where weed-seed free mulch is desired or on sites where straw mulch and tackifier agent are not practical or desirable.

   Applying the full 0.2 to 0.4 inches of water after spreading pelletized mulch on the seed bed is extremely important for sufficient activation and expansion of the mulch to provide soil coverage.

USDA Plant Hardiness Zones

Average Annual Minimum Temperature
New Jersey



Hardiness Zones

Range of average annual minimum temperatures for each zone (degrees Fahrenheit)

Zone 5b (-10 to -15)

Includes portions of Sussex and Warren counties

Zone 6a (-5 to -10)

Includes portions of Sussex, Warren, Passaic, Morris, Somerset and Hunterdon counties

Zone 6b (0 to -5)

Includes portions of Bergen, Passaic, Morris, Essex, Hudson, Union, Somerset, Middlesex, Mercer, Hunterdon, Monmouth, Ocean, Burlington, Camden, Gloucester, Atlantic, Cumberland and Cape May counties

Zone 7a (5 to 0)

Includes portions of Camden, Gloucester, Salem, Cumberland, Cape May, Atlantic, Burlington, Ocean and Monmouth counties

Zone 7b (10 to 5)

Includes portions of Cape May, Atlantic, Ocean and Monmouth counties

10 0 10 20 30 Miles

10 0 10 20 30 Kilometers

After USDA-ARS Misc. Publication 1475
NJDA State Soil Conservation Committee
April 1999

STANDARD FOR TOPSOILING

Definition

Topsoiling entails the distribution of suitable quality soil on areas to be vegetated.

Purpose

To improve the soil medium for plant establishment and maintenance.

Water Quality Enhancement

Growth and establishment of a vigorous vegetative cover is facilitated by topsoil, preventing soil loss by wind and rain offsite and into streams and other stormwater conveyances.

Where Applicable

Topsoil shall be used where soils are to be disturbed and will be revegetated..

Methods and Materials

1. Materials

   A. Topsoil should be friable[1], loamy[2], free of debris, objectionable weeds and stones, and contain no toxic substance or adverse chemical or physical condition that may be harmful to plant growth. Soluble salts should not be excessive (conductivity less than 0.5 millimhos per centimeter. More than 0.5 millimhos may desicate seedlings and adversely impact growth). Topsoil hauled in from offsite should have a minimum organic matter content of 2.75 percent. Organic matter content may be raised by additives.

   B. Topsoil substitute is a soil material which may have been amended with sand, silt, clay, organic matter, fertilizer or lime and has the appearance of topsoil. Topsoil substitutes may be utilized on sites with insufficient topsoil for establishing permanent vegetation. All topsoil substitute materials shall meet the requirements of topsoil noted above. Soil tests shall be performed to determine the components of sand, silt, clay, organic matter, soluble salts and pH level.

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1 Friable means easily crumbles in the fingers, as defined in most soils texts.

2 Loamy means texture groups consisting of coarse loamy sands, sandy loam, fine and very fine sandy loam, loam, silt loam, clay loam, sandy clay loam and silty clay loam textures and having less than 35% coarse fragments (particles less than 2mm in size) as defined in the Glossary of Soil Science Terms, 1996, Soil Science Society of America.

2. Stripping and Stockpiling

   A. Field exploration should be made to determine whether quantity and or quality of surface soil justifies stripping.

   B. Stripping should be confined to the immediate construction area.

   C. Where feasible, lime may be applied before stripping at a rate determined by soil tests to bring the soil pH to approximately 6.5. In lieu of soil tests, see lime rate guide in seedbed preparation for Permanent Vegetative Cover for Soil Stabilization, pg. 4-1.

   D. A 4-6 inch stripping depth is common, but may vary depending on the particular soil.

   E. Stockpiles of topsoil should be situated so as not to obstruct natural drainage or cause off-site environmental damage.

   F. Stockpiles should be vegetated in accordance with standards previously described herein; see standards for Permanent (pg. 4-1) or Temporary (pg.7-1) Vegetative Cover for Soil Stabilization. Weeds should not be allowed to grow on stockpiles.

3. Site Preparation

   A. Grade at the onset of the optimal seeding period so as to minimize the duration and area of exposure of disturbed soil to erosion. Immediately proceed to establish vegetative cover in accordance with the specified seed mixture. Time is of the essence

   B. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application and anchoring, and maintenance.
   See the Standard for Land Grading, pg. 19-1.

   C. As guidance for ideal conditions, subsoil should be tested for lime requirement. Limestone, if needed, should be applied to bring soil to a pH of approximately 6.5 and incorporated into the soil as nearly as practical to a depth of 4 inches.

   D. Immediately prior to topsoiling, the surface should be scarified 6" to 12" where there has been soil compaction. This will help insure a good bond between the topsoil and subsoil. **This practice is permissible only where there is no danger to underground utilities (cables, irrigation systems, etc.)**.

   E. Employ needed erosion control practices such as diversions, grade stabilization structures, channel stabilization measures, sedimentation basins, and waterways. See Standards 11 through 42.

4. Applying Topsoil

   A. Topsoil should be handled only when it is dry enough to work without damaging soil structure; i.e., less than field capacity (see glossary).

   B. A uniform application to a depth of 5 inches (unsettled) is recommended. Soils with a pH of 4.0 or less or containing iron sulfide shall be covered with a minimum depth of 12 inches of soil having a pH of 5.0 or more, in accordance with the Standard for Management of High Acid Producing Soil (pg. 1-1).

STANDARD
FOR TREE PROTECTION DURING CONSTRUCTION

Definition

The protection of trees from environmental and mechanical injury during construction activities.

Purpose

To protect trees for erosion and sediment control, shade, aesthetics, wildlife, dust control, noise abatement, and oxygen production.

Water Quality Enhancement

Limiting areas of site disturbance and re-vegetating with permanent cover, minimizes off site and negative downstream water quality impacts caused by stormwater runoff. Mature trees provide structural stability for soils, promote proper water movement through the soil profile and moderate changes in temperature along streams and other water bodies.

Where Applicable

On new development sites with existing trees.

Methods and Materials

1. Reconnaissance should be performed before land clearing begins to identify dead and weak trees to be removed and healthy trees to remain, to create aesthetically pleasing development site with vegetation rather than the presence of dead or dying trees. Inventory the site and clearly mark the trees and stands of trees to be saved. Consider relocating streets, houses, or other structures if necessary and feasible. Once clearing begins and damage to the trees occurs, valuable specimens may be lost.

   A. Characteristics of trees to be protected and saved. The following lists characteristics that should be evaluated before deciding to remove or protect a tree.

      1. **Tree Vigor**

         Tree health is the overall condition of the tree. A tree of low vigor is more susceptible to damage by environmental changes than healthy trees and is more susceptible to insect and disease attacks. Indications of poor vigor include the dying of the tips of branches and entire limbs, small annual twig growth, stunted leaf size, sparse foliage, and poor foliage color. Avoid saving hollow or rotten trees, trees cracked, split, leaning or crooked, oozing sap, or with broken tops. Use woodchips generated from removal of trees of poor health and spread them around the root zones to help protect the trees that remain.

      2. **Tree Age**

         Large, picturesque trees may be more aesthetically valuable than smaller, young trees, but also require more extensive protection measures. If leaving an older tree, be sure it is sound and healthy.

3. **Species** (the right trees for the right locations)

Many species of trees found in New Jersey woodlands are not suitable for shade tree uses around buildings. Avoid protecting trees that are short-lived, brittle, have soft wood, messy leaves, fruit, or are frequently attacked by insects and disease. Tree root systems which do not adapt well to cuts and fills may not be a suitable alternative. The following are severely affected by compacted construction fills: Aspen, Beech, Paper birch, Eastern red cedar, Black cherry, Dogwood, Katsura tree, Linden, Paperbark maple, Sugar maple, Black oak, Pin oak, Red oak, White oak, Pines, and Tuliptree. See Table 9-1 for a more complete list of construction impacts to individual tree species.

4. **Resistant to Insects and Diseases**

Avoid leaving trees in highly visible areas or specimens that are frequent targets of insects and diseases. American Elm, for example, could be lost due to Dutch Elm Disease. Wild Cherry, another example, is a favorite host of the tent caterpillar, which causes defoliation of the trees in early summer. The following are susceptible to insects (I) and disease (D): White Ash(D), Birch (I), Butternut (D), Crabapples (D), some Elms (D), Hawthorn (D), Hemlock (I), Linden (I), Sugar Maple (D), Mountain Ash (D), Sassafras (I), Scholartree (D), Redbud (D)

5. **Tree Aesthetics**

Choose trees that are aesthetically pleasing, exhibiting good shape and form. Avoid leaning, crooked, and misshapen trees. Occasionally, an odd-shaped tree or one of unusual form may add interest to the landscape if strategically located. Be sure the tree is structurally sound and vigorous.

6. **Spring and Autumn Coloration**

Species differ in fall color. Some are bright red, others orange and yellow. Other species exhibit no autumn color, such as walnut, locust, and sycamore.

7. **Wildlife Benefits**

Favor trees that are preferred by wildlife for food, cover, and nesting. A mixture of evergreens and hardwoods is beneficial. Evergreen trees are important for cover during the winter months. The hardwoods are more valuable for food.

8. **Air Pollution Susceptibility**

Tree species vary greatly to susceptibility to air pollution. Symptoms vary from browning on the edges of the leaves and needles, to stunting of growth, to death of the tree. The following show tolerance to urban stress and are less likely to present problems with sidewalks: Baldcypress, Corktree, Amur maple, Kentucky coffee tree, Crabapple, Dawn redwood, Ginkgo (male), Goldenraintree, Hackberry, Hawthorn, Honeylocust, European hornbeam, Horsechestnut, Lindens, Oaks (excluding pin), Pear, Scholartree, Sourgum (tupelo), Sweetgum, Yews, Zelkova.

9. **Species Longevity**

Favor trees whose life span is long, such as oak, beech, and tulip poplar. Short-lived

trees; (Black locust, Gray birch, Aspen) should be avoided for use as shade, lawn or specimen trees. Although some short-lived trees have an attractive form or pleasing coloration in the spring or fall, such trees may not live for a long time and thus may not be worth preserving.

B. Criteria for protecting remaining trees:

1. General mechanical damage - see Figure 9.3 for correct root zone calculation and placement of tree protection.

2. Box trees within 25 feet of a building site to prevent mechanical injury. Fencing or other barrier should be installed beyond the *Critical Root Radius* See Figure 9.3. Tree root systems commonly extend well beyond the drip line.

3. Boards will not be nailed to trees during building operations.

4. Feeder roots should not be cut in an area inside the *Protected Root Zone* (PRZ).

5. Damaged trunks or exposed roots should have damaged bark removed immediately and no paint shall be applied. Exposed roots should be covered with topsoil immediately after excavation is complete. Roots shall be pruned to give a clean, sharp surface amenable to healing. Roots exposed during hot weather should be irrigated to prevent permanent tree injury. Care for serious injury should be prescribed by a professional forester or licensed tree expert.

6. Tree limb removal, where necessary, will be done as natural target pruning to remove the desired branch as close as possible to the branch collar. There should be NO flush cuts. Flush cuts destroy a major defense system of the tree. See Figure 9-1. No tree paint shall be applied. All cuts shall be made at the outside edge of the branch collar (fig. 9-1 and 9-2). Cuts made too far beyond the branch collar may lead to excess sprouting, cracks and rot. Removal of a "V" crotch should be considered for free standing specimen trees (see Figure 9-2) to avoid future splitting damage.

Note: For more specific data on certain tree characteristics by species, see Table 9.1, *Tree Characteristics* or consult with a Licensed Professional Tree Expert, Soil Conservation District or Rutgers Cooperative Extension.

Figure 9-1- Removal of Tree Limb

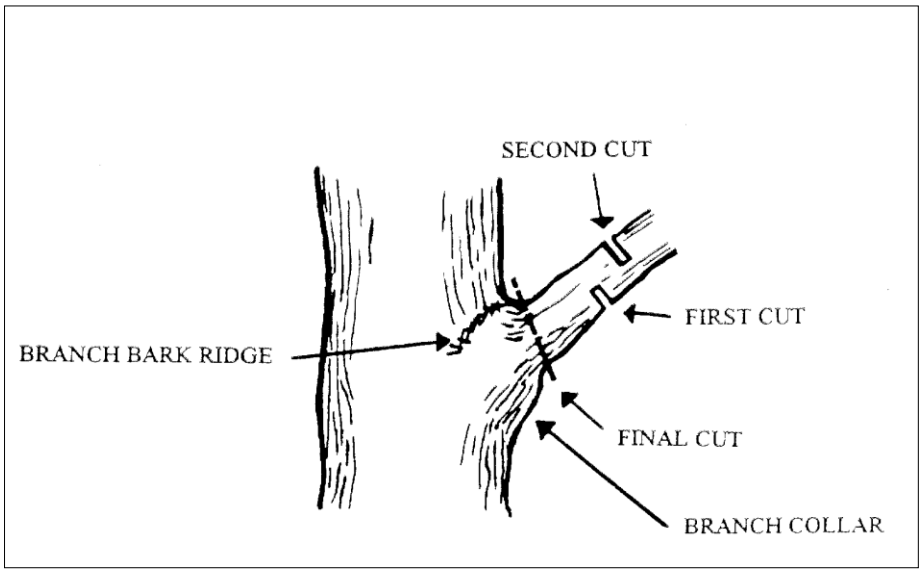


Figure 9-2 - Removal of "V" Crotch Limb

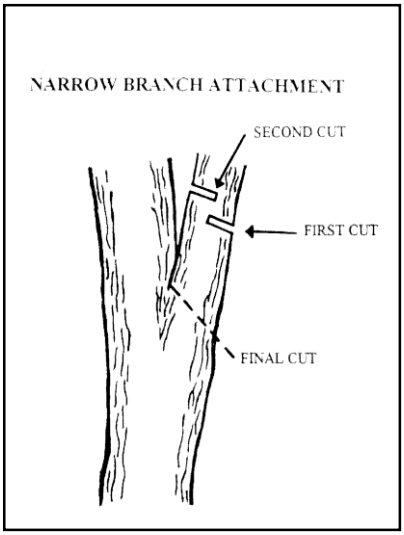


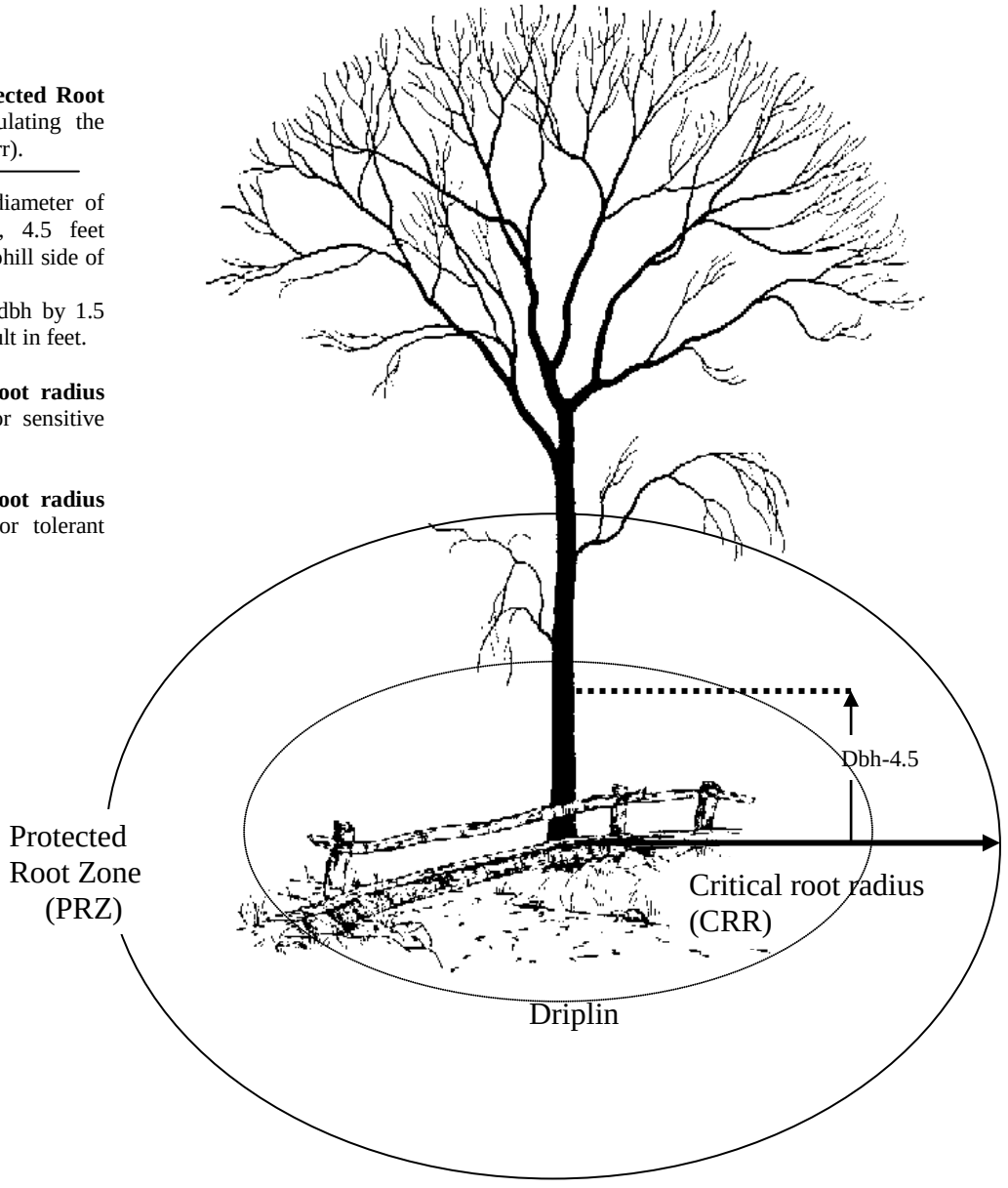
Figure 9-3: Root Protection During Construction Guide

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.

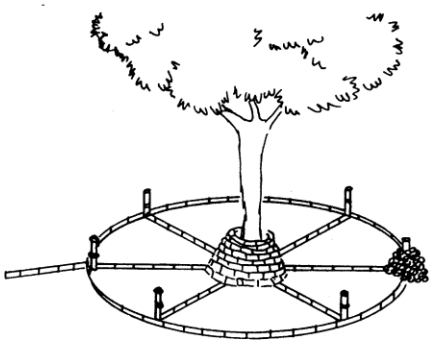
Dbh x 1.5: **Critical root radius** for older, unhealthy, or sensitive species.

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

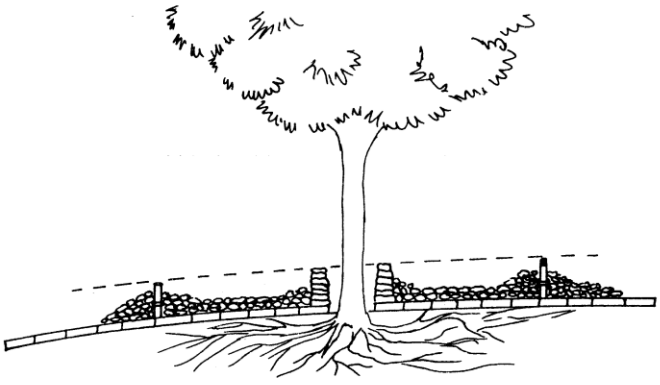


1. *Protecting Trees from Construction Damage- A Homeowners Guide*, Gary R. Johnson, University Of Minnesota Extension Service, Saint Paul, MN, 1999.

Figure 9-4: Tree Protection in Fill Areas



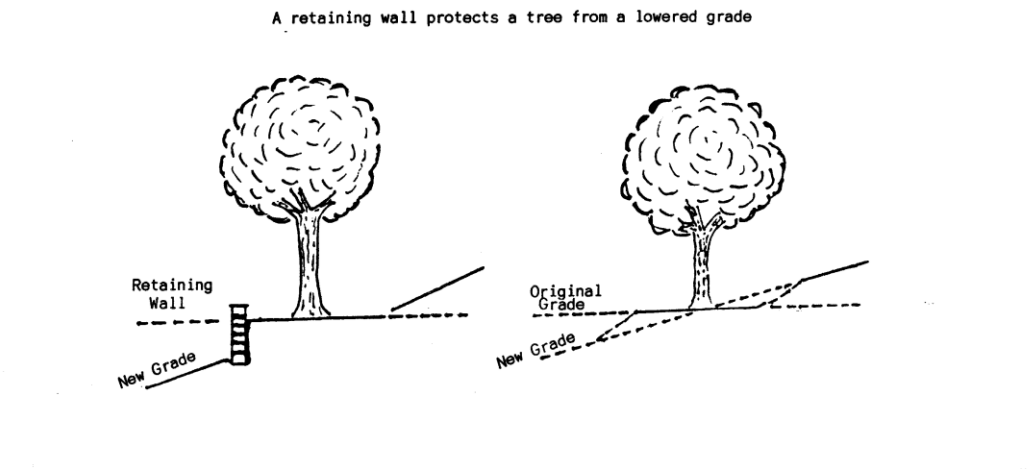
Isometric

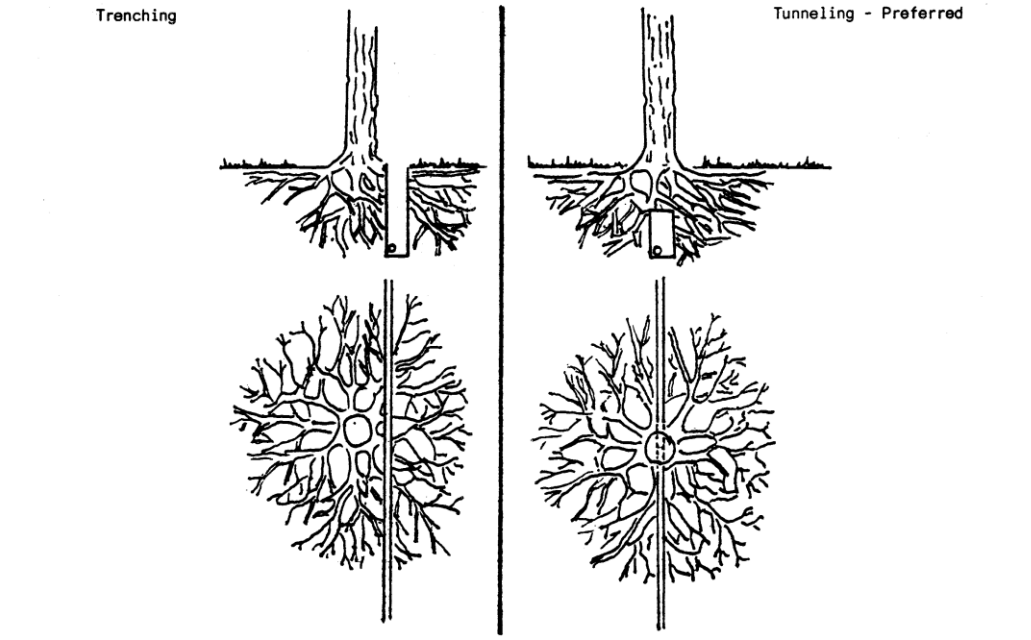


Section

Tree protection - tile and gravel will allow air circulation to root zone under a fill

Figure 9-5: Tree Protection in Cut Areas





Utilities should be tunneled beneath tree roots. The drawings on the left show trenching that would probably kill the tree. The drawings on the right show how tunneling under the tree will preserve many of the important feeder roots.

Figure 9-6: Tree Protection - Underground Utility Installation

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
Northern white cedar	Tolerant	Tolerant	6.0-8.0	40-50	10-20	Low	No
Balsam fir	Tolerant	Tolerant	4.0-6.0	40-60	20-35	Medium	No
White fir	Tolerant	Sensitive	4.0-6.5	50-75	10-20	Medium	No
Tamarack (Larch)	Tolerant	Tolerant	4.0-7.5	50-75	15-25	Medium	No
White pine	Tolerant	Sensitive	4.5-6.5	80-100	50-80	Medium	No
Jack pine	Tolerant	Sensitive	4.5-6.5	30-80	20-30	High	No
Red pine	Tolerant	Sensitive	4.5-6.0	50-80	20-40	Medium	No
Scotch pine	Tolerant	Sensitive	4.0-6.5	60-100	30-50	Medium	No
Eastern redcedar	Tolerant	Sensitive	4.7-7.8	40-50	10-20	Low	No
Black spruce	Tolerant	Tolerant	3.5-7.0	30-70	15-30	Medium	No
Colorado spruce	Intermediate	Tolerant	4.6-6.5	50-100	20-30	Medium	No
White spruce	Tolerant	Intermediate	4.5-7.5	40-80	20-30	Medium	No
Black ash	Tolerant	Tolerant	4.1-6.5	40-70	30-60	Medium	No
Green ash	Tolerant	Tolerant	6.0-7.5	30-60	30-50	Medium	No
White ash	Tolerant	Intermediate	5.0-7.5	70-80	50+	Medium	No
Bigtooth aspen	Tolerant	Sensitive	4.8-6.3	50-75	20-35	Medium	Yes
Trembling aspen	Tolerant	Sensitive	4.8-6.5	40-60	20-35	Medium	Yes
Blue beech	Sensitive	Sensitive	6.5-7.5	20-30	15-20	Low	No
Paper birch	Intermediate	Sensitive	5.0-8.0	50-70	30-50	Medium	No
River birch	Tolerant	Tolerant	4.0-6.5	40-70	30-50	Low	No
Yellow birch	Intermediate	Sensitive	4.5-8.0	50-70	50-70	Medium	No
Boxelder	Tolerant	Tolerant	6.5-7.5	40-60	35-50	High	Yes
Ohio buckeye	Intermediate	Intermediate	6.1-6.5	30-50	30-40	Medium	Yes
Butternut	Sensitive	Intermediate	6.6-8.0	40-60	50-60	Medium	No
Catalpa	Intermediate	Tolerant	6.1-8.0	50-80	30-50	Medium	No
Black cherry	Intermediate	Sensitive	6.0-7.5	50-70	40-50	Low	No
Kentucky coffeetree	Intermediate	Intermediate	6.5-7.5	50-80	40-50	Low	No
Eastern cottonwood	Tolerant	Tolerant	5.5-8.0	80-100	80-100	High	Yes
Red-osier dogwood	Tolerant	Intermediate	6.1-8.5	8-10	10-12	Low	No

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
SELECTION OF TREES, SHRUBS
AND VINES FOR PLANTING

Definition

Plants to aesthetically enhance and restore disturbed soils.

Water Quality Enhancement

Integrating trees, shrubs and vines with permanent turf grasses provides a protective vegetative cover against wind and rain, to minimize or negate water quality degradation downstream.

Where Applicable

Graded or cleared areas subject to erosion, where a permanent, long-lived vegetative cover other than turf alone is desired.

Plant Material

Although this is by no means a complete listing of the available plant material in these categories, it does include most of that which is commonly used throughout the State of New Jersey. The services of a Landscape Architect or a Horticulturalist should be utilized for the selection of plant material for specific sites where problems exist due to soil or other ecological conditions. See fig. 10-1, ATree Planting Detail@ for an example of a typical detail for tree establishment.

EVERGREEN TREES

Latin Name	Common Name
Abies concolor	White Fir
Ilex opaca	American Holly
Juniperus virginiana	Eastern Red Cedar
Picea abies	Norway Spruce
Picea pungens	Colorado Spruce
Pinus strobus	White Pine
Pinus thunbergi	Japanese Black Pine
Pseudotsuga menziesii	Douglas-fir

DECIDUOUS TREES

Latin Name	Common Name
Acer rubrum & varieties	Red Maple or Swamp Maple
Acer saccharum	Sugar Maple
Aesculus hippocastanum	Horsechestnut
Carya ovata	Shagbark Hickory
Celtis occidentalis	Common Hackberry
Fagus grandifolia	American Beech
Fagus sylvatica & varieties	European Beech
Quercus alba	White Oak
Quercus rubra	Northern Red Oak

Quercus coccinea	Scarlet Oak
Pin Oak	Quercus palustris
Quercus phellos	Willow Oak
Tilia americana	American Linden
Tilia cordata & varieties	Littleleaf Linden
Tilia tomentosa	Silver Linden
Zelkova serrata	Japanese Zelkova

SMALL DECIDUOUS TREES

Acer campestre	Hedge Maple
Acer ginnala	Amur Maple
Amelanchier canadensis	Shadblow Serviceberry
Betula varieties	Birch
Carpinus betulus	European Hornbeam
Carpinus caroliniana	American Hornbeam
Cercis canadensis	American Redbud
Cornus florida	Flowering Dogwood
Cornus kousa	Japanese Dogwood
Cornus mas	Cornelian Cherry Dogwood
Cotinus coggygria	Smokebush
Crataegus crusgalli	Cockspur Thorn
Crataegus phaenopyrum	Washington Hawthorn
Hibiscus syriacus	Shrub Althea
Magnolia virginiana	Sweetbay Magnolia
Malus varieties	Crabapples
Oxydendron arboreum	Sorrel Tree or Sourwood
Prunus varieties	Cherries
Salix caprea	Goat or Willow

SHRUBS

Latin Name	Common Name
Aronia arbutifolia	Red Chokeberry
Aronia arbutifolia brilliantissima	Brilliant Chokeberry
Chaenomeles lagenaria	Flowering Quince
Clethra alnifolia & varieties	Summersweet Clethra
Cornus varieties	Dogwood
Forsythia intermedia & varieties	Border Forsythia
Forsythia suspensa	Weeping Forsythia
Hamamelis varieties	Witchhazel
Ilex glabra	Inkberry
Ilex verticillata	Winterberry Holly
Kalmia latifolia	Mountain Laurel
Myrica pensylvanica	Northern Bayberry
Rhododendron maximum	Rosebay Rhododendron
Rhus varieties	Sumac
Rosa varieties	Rose
Salix discolor	Pussy willow
Syringa vulgaris	Common Lilac

Vaccinium corymbosum	Highbush Blueberry
Viburnum varieties	Viburnum

VINES AND PERENNIAL GROUND COVER

Campsis radicans	Trumpetcreeper
Euonymus fortunei vegetus	Wintercreeper Euonymus
Juniperus conferta	Shore Juniper
Juniperus horizontalis plumosa	Andorra Juniper
Pacysandra terminalis	Packasandra
Parthenocissus quinquefolia	Virginia Creeper
Vitis sp.	Grapes sp.

FIGURE 10-1: TYPCIAL TREE PLANTING DETAIL