Vegetative Stabilization

R. Deans
December 2024

Sources

- NCDEQ Erosion and Sediment Control Planning and Design Manual, Rev. May 2013
- NCDEQ Erosion and Sediment Control Inspector's Guide, Rev. May 1992
- https://www.deq.nc.gov/energy-mineral-and-land-resources/stormwater/npdes-general-permits

Erosion Control Principles

- Bare soil is the problem!
- Phasing to minimize exposure (extent and duration)
- Install diversions and measures to keep runoff velocities low
- Stabilize as soon as possible
  - Completed areas and areas that will be inactive for >21 days
  - Timeframes depend on slope and location
  - 7 or 14 Days

NEW STABILIZATION TIMEFRAMES

(Effective Aug. 3, 2011)

SITE AREA DESCRIPTION	STABILIZATION	TIMEFRAME EXCEPTIONS
 Perimeter dikes, swales, ditches, slopes	7 days	None
 High Quality Water (HQW) Zones	7 days	None
 Slopes steeper than 3:1	7 days	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed.
 Slopes 3:1 or flatter	14 days	7 days for slopes greater than 50' in length.
 All other areas with slopes flatter than 4:1	14 days	None, except for perimeters and HQW Zones.

Final Grade: Permanent Ground Stabilization

- No longer than 90 days after last land-disturbing activity
- Applies to all areas/phases of the project individually

Types of Stabilization

- Hardscape
- Rock/gravel
- Vegetation

Vegetative cover types

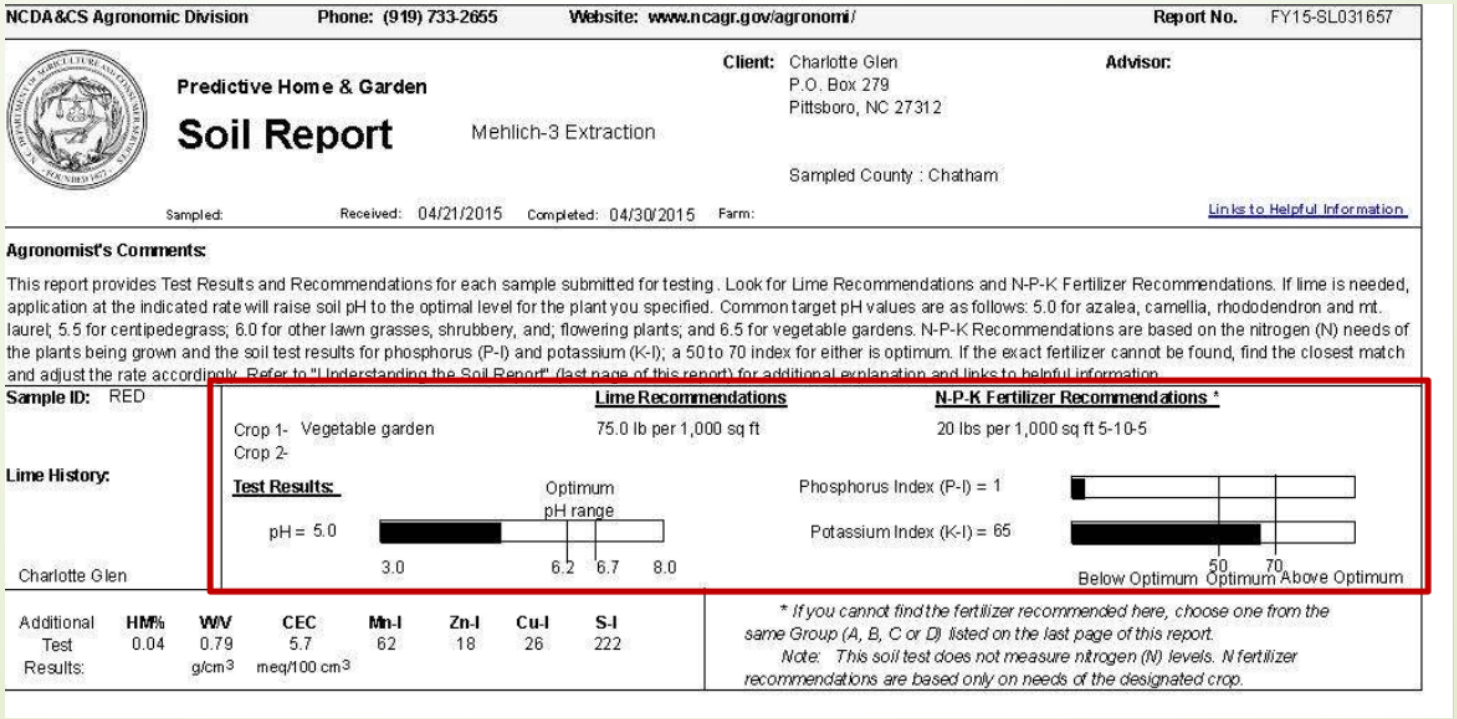
- Landscape plantings – wood mulch and perennial/woody plants
- Sod
- Seeding:
  - Grasses – fast-growing, fibrous roots good for stabilization
  - Legumes (pea family) – nitrogen fixers, less fertilizer needed

Soil Preparation

- Grading often exposes very poor soils
  - Lack of nutrients and organic matter
  - Acidic
  - Toxic levels of metals
  - Compaction
- Soil amendments can fix these problems
  - Liming = higher pH = most toxins insoluble (2000 lbs/acre ground limestone)
  - Fertilizer to add nutrients (750 lbs/acre 10-10-10 fertilizer)
  - *Rhizobium* for legumes
  - Roughening/tracking
- Topsoiling is also a good option

Soil testing

- NC Coop Extension
- https://union.ces.ncsu.edu/soil-testing-kits/



NCDA&CS Agronomic Division Phone: (919) 733-2655 Website: www.ncagr.gov/agronomi/ Report No. FY15-SL031657

Predictive Home & Garden

Soil Report Mehlich-3 Extraction

Client: Charlotte Glen
P.O. Box 279
Pittsboro, NC 27312

Advisor:

Sampled County : Chatham

Sampled: Received: 04/21/2015 Completed: 04/30/2015 Farm:

Links to Helpful Information

Agronomist's Comments:

This report provides Test Results and Recommendations for each sample submitted for testing. Look for Lime Recommendations and N-P-K Fertilizer Recommendations. If lime is needed, application at the indicated rate will raise soil pH to the optimal level for the plant you specified. Common target pH values are as follows: 5.0 for azalea, camellia, rhododendron and mt. laurel; 5.5 for centipedegrass; 6.0 for other lawn grasses, shrubbery, and; flowering plants; and 6.5 for vegetable gardens. N-P-K Recommendations are based on the nitrogen (N) needs of the plants being grown and the soil test results for phosphorus (P-I) and potassium (K-I); a 50 to 70 index for either is optimum. If the exact fertilizer cannot be found, find the closest match and adjust the rate accordingly. Refer to "Understanding the Soil Report" (last page of this report) for additional explanation and links to helpful information.

Sample ID: RED

Lime History:

Charlotte Glen

Lime Recommendations

Crop 1- Vegetable garden — 75.0 lb per 1,000 sq ft

Crop 2-

N-P-K Fertilizer Recommendations *

20 lbs per 1,000 sq ft 5-10-5

Test Results:

pH = 5.0 (Optimum pH range 6.2 – 6.7; 3.0 – 8.0)

Phosphorus Index (P-I) = 1

Potassium Index (K-I) = 65

50 – 70

Below Optimum | Optimum | Above Optimum

Additional Test Results:	HM%	W/V g/cm³	CEC meq/100 cm³	Mn-I	Zn-I	Cu-I	S-I
	0.04	0.79	5.7	62	18	26	222

** If you cannot find the fertilizer recommended here, choose one from the same Group (A, B, C or D) listed on the last page of this report.*

Note: This soil test does not measure nitrogen (N) levels. N fertilizer recommendations are based only on needs of the designated crop.

What seed mix should I use?

- Permanent vs. Temporary
- Generally two "windows" for permanent seeding
  - March - May (warm season species)
  - August – October (cool season species)
- Temporary seeding has higher success outside of these windows
- Mixtures are usually used (except for lawns)
- Often most successful with all combinations of cool/warm and temporary/permanent species.

E&SC Planning and Design Manual

- Chapter 6: Practices and Specifications
  - 6.10: Temporary Seeding
  - 6.11: Permanent Seeding

Table 6.10a Temporary Seeding Recommendations for Late Winter and Early Spring

Seeding mixture

Species	Rate (lb/acre)
Rye (grain)	120
Annual lespedeza (Kobe in Piedmont and Coastal Plain, Korean in Mountains)	50

Omit annual lespedeza when duration of temporary cover is not to extend beyond June.

Seeding dates

Mountains—Above 2500 feet: Feb. 15 - May 15
Below 2500 feet: Feb. 1- May 1
Piedmont—Jan. 1 - May 1
Coastal Plain—Dec. 1 - Apr. 15

Soil amendments

Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10-10-10 fertilizer.

Mulch

Apply 4,000 lb/acre straw. Anchor straw by tacking with asphalt, netting, or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring tool.

Maintenance

Refertilize if growth is not fully adequate. Reseed, refertilize and mulch immediately following erosion or other damage.

How can grass seed grow enough to stabilize a slope in 7 days?!

Mulching/matting: temporary stabilization

- Benefits
  - Holds seeds and soil amendments in place
  - Holds moisture
  - Insulation of temperature
  - Encourages seed germination

Mulching/matting: temporary stabilization

- Material
  - Straw
  - Cellulose fiber (hydro-seeding)
  - Jute/burlap net
  - Excelsior mat
  - Wood chips/bark
- Coverage: 80%
- Anchoring method
  - Tackifier/asphalt
  - Staples
  - Crimping/disking

What inspectors look for in seeded areas

- Seedbed shows sign of being prepped
- Proper mulching and anchoring
- Germination, growth, species used
- Maintenance
- Are timelines being followed?

Problems?

- Mulch too thin
- Not anchored

Problems?

Problems?

Closure requests

Closure requests

- Permanent ground cover sufficient to restrain erosion
- At least 80% coverage in all areas of project


Temporary or Permanent?

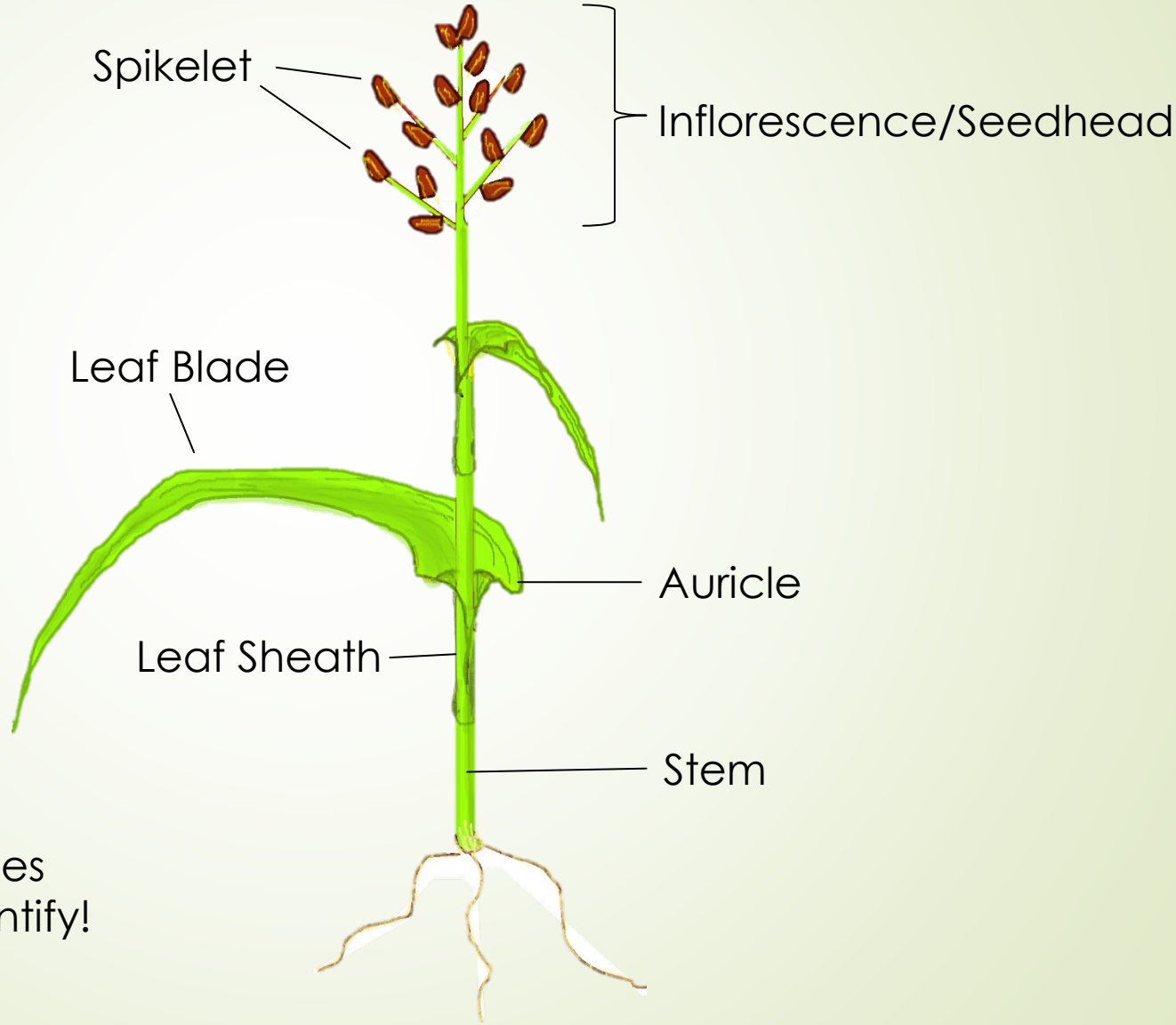
Temporary Seeding

- Annuals – plants die completely once mature
- Fast-growing and can grow in unfavorable seasons
- May or may not re-seed and persist through multiple seasons
- Planted as a cover crop or nursery crop, must be supplemented with permanent seeding

Common Species for Temporary Seeding

- Cool Season
  - Cereal/Winter Rye
  - Annual Rye
  - Crimson Clover
- Warm Season
  - Millet Grasses
  - Sudan Grass
  - Lespedezas

Grass morphology



"Grain" of salt: grasses are very hard to identify!

Temporary Seeding

Cereal/Winter Rye (*Secale cereale*)

- Cool season
- Bluish, wheat-like
- Seedhead with ascending spikes (awns)
- 3-5 feet tall
- Does not re-seed

Temporary Seeding

Annual Rye (*Lolium multiflorum*)

- Cool season
- Spikelets attached directly to stem on alternating sides
- 2-3 feet tall
- Often re-seeds readily
- Some perennial species very similar (e.g. *Lolium perenne*)
- Not recommended in NC as it can outcompete perennial species

Temporary Seeding

Browntop Millet (*Urochloa ramosa*)

- Warm season
- Wide green blades
- Somewhat sparse, branching inflorescence of round spikelets
- 1-2 feet tall
- Re-seeds

Temporary Seeding

German/Foxtail Millet (*Setaria italica*)

- Warm season
- Wide green blades, very dense inflorescence
- 2-3 feet tall
- New seeds have low viability

Temporary Seeding

Sudan Grass
(*Sorghum × drummondii*)

- Warm season
- Thick blades with white center stripe
- Quite tall, usually 4-6 feet
- Re-seeds

Temporary Seeding

Legumes: Annual Lespedezas

Kobe or Striate Lespedeza
(*Kummerowia striata*)

Korean Clover/Lespedeza
(*Kummerowia stipulacea*)

- ≤1 foot tall
- Clover-like, but flowers single
- Small Leaves and Flowers

Other Legumes

Crimson Clover
(*Trifolium incarnatum*)

- Cool season
- 1-2 feet tall
- Seeds have low viability

Partridge Pea
(*Chamaecrista fasciculata*)

- Warm Season
- 2-4 feet tall
- Re-seeds (but native!)

Permanent Seeding

- Perennials – plants survive many years
- Slower growing and generally have a smaller window to plant (spring or fall)
- Cool season vs. warm season growth periods
- Often mowed (high maintenance vs. low maintenance)

Common Species for Permanent Seeding

- Cool Season
  - Tall Fescue
  - Kentucky Bluegrass
  - Crownvetch
- Warm Season
  - Bermudagrass
  - Bahiagrass
  - Centipedegrass
  - Weeping Lovegrass
  - Chinese Lespedeza

Permanent Seeding

Tall Fescue (*Festuca arundinacea*)

- Cool season
- Perhaps the most common permanent planting
- Cheap and readily available seed
- Thin, long green blades
- Varieties: KY-31, Rebel, Falcon, etc.
- Commonly used as a mowed lawn grass

Permanent Seeding

Photo: Alison Northup

Kentucky Bluegrass (*Poa pratensis*)

- Cool season
- Shorter, thin blades
- Dark blue-green color, lighter florets
- Commonly used as a mowed lawn grass
- Not to be confused with Kentucky-31, a variety of tall fescue

Permanent Seeding

Photo: Alison Northup

Bermudagrass (*Cynodon dactylon*)

- Warm Season
- Short, very thin blades
- Fuzzy leaves and auricles
- Creeps along the ground (rhizomes)
- Light green
- Commonly used as a mowed lawn grass

Permanent Seeding

Photo: Alison Northup

Bahiagrass (*Paspalum sp.*)

- Warm Season
- Wide blades
- Generally low-growing, but inflorescence is 2+ feet tall
- Distinctive branched inflorescence with dense spikelets on each branch
- Commonly used as a mowed lawn grass

Permanent Seeding

African/Weeping Lovegrass
(*Eragrostis curvula*)

- Warm Season
- Short stems with long, very thin blades
- Tolerates dry conditions
- Forms “bunches” and should not be used by itself

Permanent Seeding

Centipedegrass
(*Eremochloa ophiuroides*)

- Warm Season
- Short stems and leaves
- Tolerates dry conditions
- Spreads by stolons (underground stems)

Legumes

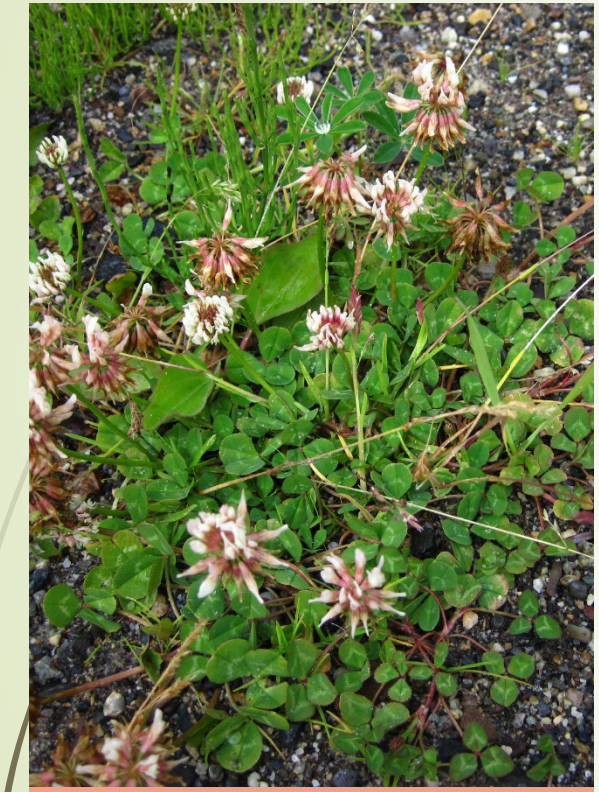
Crownvetch
(Coronilla/Securigera varia)

- Cool Season
- Vine-like
- Re-seeds (invasive!)

Sericia/Chinese Lespedeza
(Lespedeza cuneata)

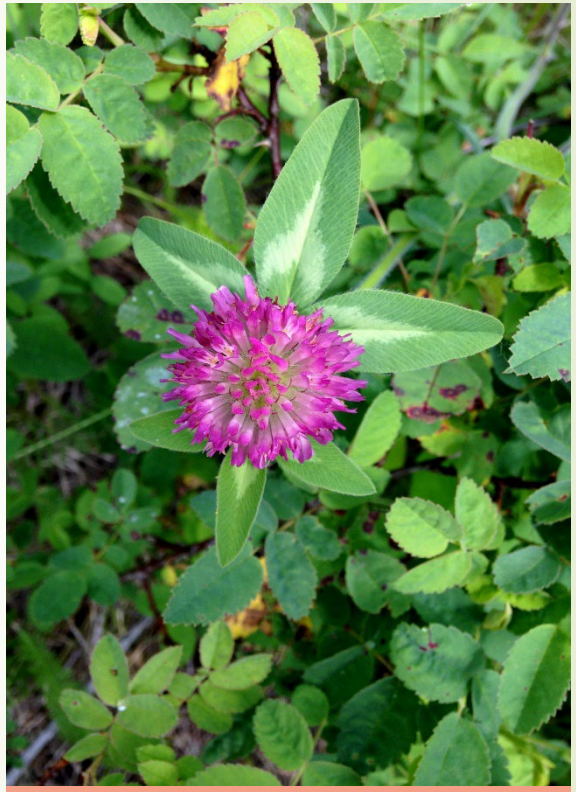
- Warm Season
- 2-3 feet tall
- Re-seeds (invasive!)

Legumes: Perennial Clovers



White Clover
(*Trifolium repens*)

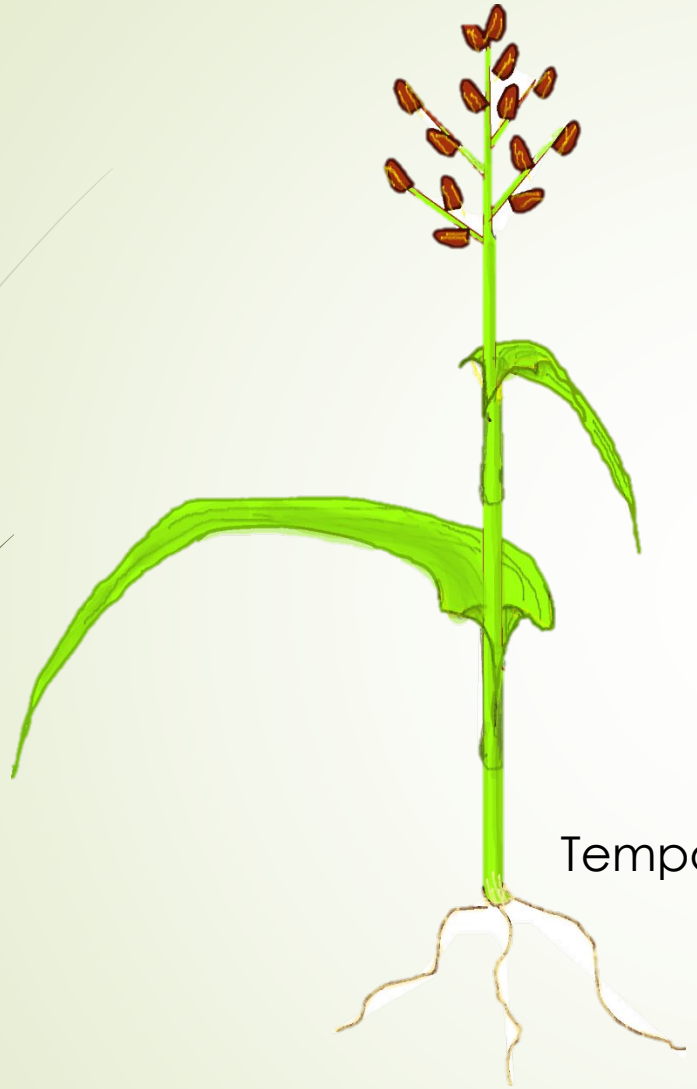
Alsike Clover
(*Trifolium hybridum*)



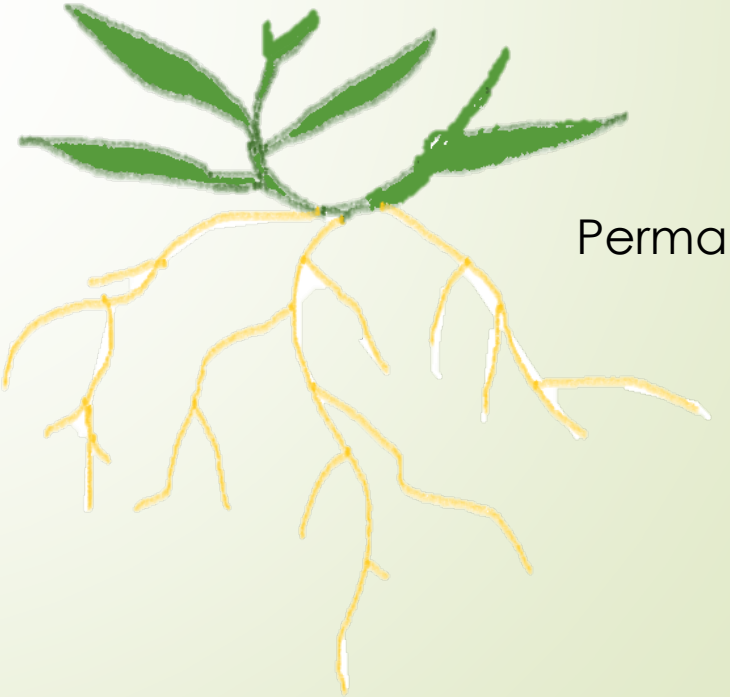
Red Clover
(*Trifolium pratense*)

What if plants are young?

~3 weeks of growth



Temporary



Permanent

What if the plants are dead?

August 2023

March 2024

A note about native species

- Most vegetation planted for erosion control is not native to NC
- Native species on active construction sites are often “wild” volunteers
- The NCDEQ Erosion and Sediment Control Planning and Design Manual does, however, recommend the use of native species
- Seed maybe hard to find or more expensive
- Invasive = good at stabilization?

Permanent Seeding

Cool Season native grass suggestions

Bentgrass
(Agrostis sp.)

Photos: Alison Northup

Photo: Alison Northup

Indiangrass
(Sorghastrum nutans)

Native Fescues
(Festuca sp.)

Permanent Seeding

Cool Season native grass suggestions (continued)

Deertongue
(Dichanthelium clandestinum)

Inland seaoats
(Chasmanthium latifolium)

Permanent Seeding

Warm Season native grass suggestions

Bluestem grasses
(*Andropogon sp., Schizachyrium sp.*)

Switchgrass
(*Panicum virgatum*)

Permanent Seeding

Native Lespedezas

Roundhead Lespedeza
(Lespedeza capitata)

Slender Lespedeza
(Lespedeza virginica)

Violet Lespedeza
(Lespedeza violacea)

Wetland/Riparian Seed Mixes

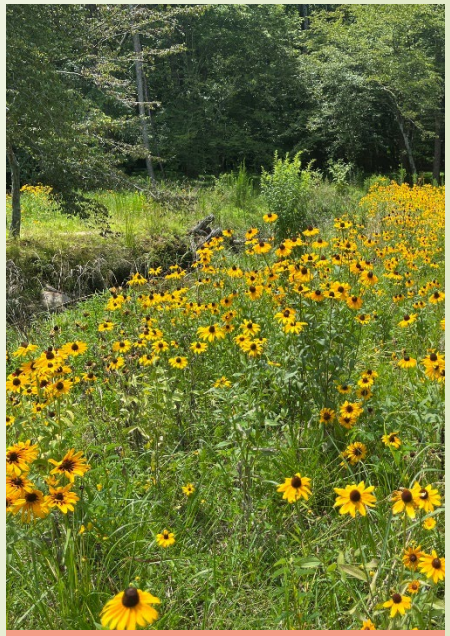
- Must be native species
- Generally, a mix of sedges, grasses, rushes, and wildflowers

Sallow Sedge
(*Carex lurida*)

Rice Cutgrass
(*Leersia oryzoides*)

Soft Rush
(*Juncus effusus*)

Lance-leaf Coreopsis
(*Coreopsis lanceolata*)



Black-eyed Susan
(*Rudbeckia hirta*)

Other Common Plants on Construction Sites

Species with seeds dispersed by animals

Beggar's Ticks
(*Desmodium* sp.)

Blackberry/Brambles
(*Rubus* sp.)

Pokeweed
(*Phytolacca americana*)

Other Common Plants on Construction Sites

Species with seeds dispersed by wind

Asters
(*Symphyotrichum* sp.)

Goldenrod
(*Solidago sp.*)

Dogfennel, Boneset
(*Eupatorium sp.*)

Blustems
(*Andropogon sp.*)

For more Information

- NC Erosion and Sediment Planning and Design Manual
  - Chapter 3: Vegetation Considerations
  - Chapter 6: Practices and Specifications
    - 6.10: Temporary Seeding
    - 6.11: Permanent Seeding
  - Chapter 8: Appendix
    - 8.02: Vegetation Tables
- NC Coop Extension Erosion Control page: https://brunswick.ces.ncsu.edu/erosion-control/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Thank you!

2024 NC E&SC Workshop

- **End of Workshop & PDH Evaluation:**

- https://bit.ly/2024EscEval

NC STATE UNIVERSITY
Crop & Soil Sciences

NORTH CAROLINA
DEQ
Department of Environmental Quality

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Southeast Chapter