Stormwater Seminar XVIII

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Erosion Control Using Native Plantings "With Insect Benefits"

> Plant roots are the binders that holds soils in place. This presentation hopes to make the case for using native plants for erosion control and the increased benefits they bring to the environment.

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Objective: How do we meet these challenges?

> Reduce or eliminate silt run off entering our waterways.

> Quickly establish vegetation in less than ideal growing conditions.

> Plant a diverse seed mix that will provide quick coverage and benefit the environment.

> Reduce mowing and maintenance.

> Keep all involved safe.

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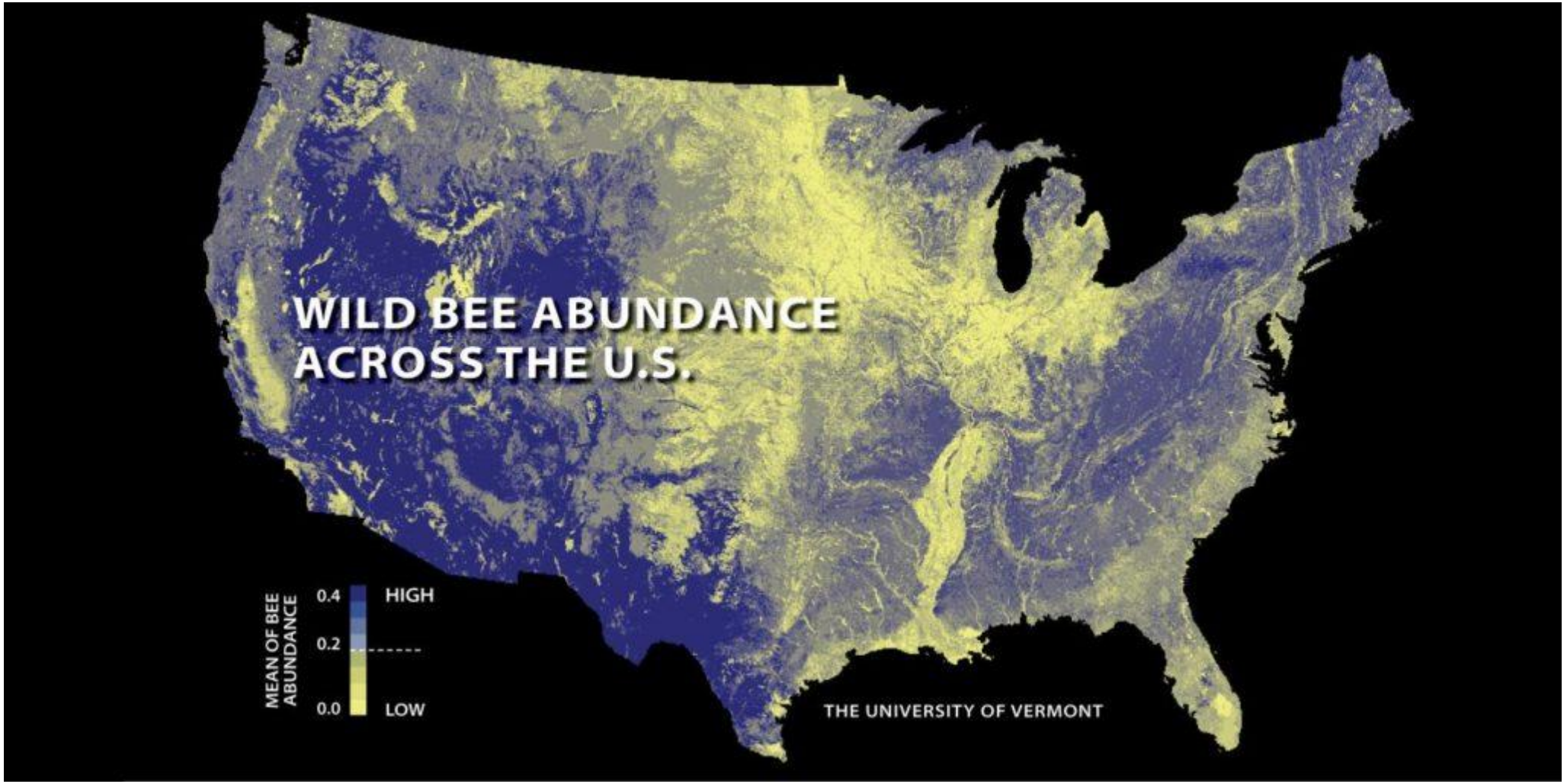
Native ?

What is the definition of a native plant?

A plant that lives and grows naturally in a particular region without direct or indirect human intervention.

Why



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Pollinators

- Animals pollinate approximately 75 percent of the crop plants grown worldwide for food, fiber, beverages, condiments, spices, and medicines. It has been calculated that one out of every three to four mouthfuls of food we eat and beverages we drink is delivered to us by pollinators.
- There is clear evidence of recent declines in both wild and domesticated pollinators, and parallel declines in the plants that rely upon them.

- Researchers cited 139 counties as especially worrisome, with wild bee numbers decreasing while farmland for crops dependent on such pollinators is increasing.
- The counties included agricultural regions of California such as the Central Valley, as well as the Pacific northwest, the upper Midwest and Great Plains, west Texas and the southern Mississippi river valley.

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Salix humilis – Prairie Willow

- **Faunal Associations:** The catkins of Prairie Willow attract primarily small bees and flies, including Cuckoo bees *(Nomada spp.),* Halictid bees *(Halictus spp., Lasioglossum spp.)*, Andrenid bees *(Andrena spp.)*, Syrphid flies, Calliphorid flies, Muscid flies, and others. Among the Andrenid bees, the following species are specialist pollinators *(oligoleges)* of willows (Salix spp.): *Andrena bisalicis, Andrena erythrogaster, Andrena fenningeri, Andrena illinoiensis, Andrena mariae,* and *Andrena salictaria*. These insects seek nectar and pollen from the florets of the catkins. Many other insects feed on the foliage, bore through the wood, or suck plant juices from willows. The following leaf beetles have been observed to feed on Prairie Willow: *Chrysomela knabi* (American Willow Leaf Beetle), *Chrysomela lineatopunctata, Chrysomela scripta* (Cottonwood Leaf Beetle), *Crepidodera decora, Crepidodera nana, Cryptocephalus leucomelas,* and *Disonycha alternata* (Striped Willow Flea Beetle). The Prairie Willow is also the preferred host plant for the leafhopper *Empoasca humilis*. Other insect feeders include the larvae of wood-boring beetles, weevils, the larvae of gall flies, plant bugs, stink bugs, aphids, the larvae of sawflies, and the caterpillars of many moths. Caterpillars of the butterflies *Satyrium acadicum* (Acadian Hairstreak) and *Limenitis archippus* (Viceroy) feed on the leaves of willows, as do the caterpillars of the skipper *Erynnis icelus* (Dreamy Duskywing). Among vertebrate animals, such birds as the Ruffed Grouse and White-Crowned Sparrow feed on the buds and catkins of willows. Other birds, such as the Northern Harrier, Wilson's Warbler, Yellow Warbler, American Goldfinch, Gray Catbird, and Willow Flycatcher, often construct their nests in willow thickets. The twigs and leaves are often browsed by White-Tailed Deer and Elk.
- **Lythrum salicaria** (purple loosestrife) Faunal Associations: The flowers attract long-tongued bees and butterflies, including *Bombus spp*. (Bumblebees) and the butterfly *Pieris rapae* (Cabbage White). The seeds are too small to be of any interest to birds, and it is unclear to what extent mammalian herbivores feed on the foliage.

Why: Reduce or eliminate silt run off entering our waterways

Image: INDOT Storm Water Field Guide.

Where

- Due to the height and potential for attracting wildlife it is important to chose the correct locations for a native planting.
- For highways, .no medians, no shoulders, no areas that obstruct views.
- The ditch to the fence.

Vegetation Coverage Challenge

> “The warranty period shall be one year for all seeding areas beginning at the time of installation. An inspection will be conducted at the end of the one-year warranty to determine acceptance of material. Vegetation coverage shall be 90% of each seeded area except for in planned open water pools. The Contractor shall reseed areas found to have substandard germination and coverage rates at no additional cost to the Department. All reseeding or over seeding shall take place during the appropriate planting season.”

Progress payment for seeding will be based on the premise that 50% of the work has been completed when the seed mixtures have been completely planted. The remaining portion of the payment will be for maintenance and reseeding until uniform vegetative cover at 70% density has been achieved throughout each planting zone.

Cover Crops

- Cover crops provide quick coverage, offer limited erosion control and are used as a carrier for native seed.
- *Avena sativa*, Common Oat – Germinates quickly 4-8 days - best used in spring as might rot over winter. More effective in upland plantings. We use a rate between 360 and 580 oz.. per acre (8,125 seeds per oz..). Inexpensive .80 cents per lb.
- *Lolium multiflorum*, Annual Rye – Germinates in 10 –15 days-overwinters well. Provides good coverage. May persist for a few seasons. We use a rate between 100 and 300 oz.. per acre (14,188 seeds per oz..). Inexpensive $1.90 per lb.
- *Elymus canadensis* – Canada Wild Rye – Germinates 30 to 60 days – short lived clump forming perennial. Upland planting 4,256 seeds per oz.. Sometimes used as a cover crop. $1.60 per oz..
- *Elymus virginicus* – Virginia Wild Rye – Germinates 30 – 60 days. Short lived clump forming perennial. Moist soils and tolerates shade. 4,375 seeds per oz.. Sometimes used as a cover crop $ 1.25 per oz..

Root Systems

In botany and dendrology, a rhizome is a modified subterranean stem of a plant that is usually found underground, often sending out roots and shoots from its nodes. Rhizomes are also called creeping rootstalks and rootstocks. Rhizomes develop from axillary buds and are diageotropic or grow perpendicular to the force of gravity.

Roots

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Native plants with spreading rhizomes - Wet

- *Bolboschoenus fluviatilis*
- *Carex stricta*
- *Carex lacustris*
- *Juncus canadensis*
- *Leerisa oryzoides*
- *Schoenoplectus americanus*
- *Schoenoplectus tabernaemontani*
- *Spartina pectinata*

Native plants with spreading rhizomes - Dry

- *Apocynum cannabinum*
- *Asclepias syriaca*
- *Conoclinium coelestinum*
- *Coreopsis palmata*
- *Euthamia graminifolia*
- *Helianthus mollis*
- *Helianthus tuberosus*
- *Pycnanthemum virginianum*
- *Silphium integrifolium*
- *Solidago canadensis*
- *Spartina pectinata (wet-dry)*

Roots

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Spartina pectinata – Prairie Cord Grass

Solidago speciose – Showy Goldenrod

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Late September and the following February

Diverse mixture of forbs and grasses provides food and cover

Native Grass and Forbs Enhancement Mix 1 acre 7seeds per sq. ft. Est cost $125.00 acre

Andropogon gerardii	big bluestem grass	2	seed oz.
Asclepias syriaca	common milkweed	0.5	seed oz.
Asclepias tuberosa	butterfly weed	0.25	seed oz.
Bouteloua curtipendula	side-oats grama	8	seed oz.
Chamaecrista fasciculata	partridge pea	2	seed oz.
Dalea purpurea	purple prairie clover	0.25	seed oz.
Echinacea purpurea	broad-leaved purple coneflower	1	seed oz.
Monarda fistulosa	wild bergamot	0.25	seed oz.
Oligoneuron rigidum	stiff goldenrod	0.25	seed oz.
Panicum virgatum	switch grass	1	seed oz.
Penstemon digitalis	foxglove beard tongue	0.25	seed oz.
Schizachyrium scoparium	little bluestem	8	seed oz.
Sorghastrum nutans	Indian grass	2	seed oz.
Symphyotrichum laeve	smooth blue aster	0.25	seed oz.
Tradescantia ohiensis	common spiderwort	0.25	seed oz.
Verbena stricta	hoary vervain	0.25	seed oz.

Native Wet Ditch Enhancement Mix 1 acre 49 seeds per sq. ft. Est cost $125.00 acre

Alisma subcordatum	common water plantain	0.5	seed oz.
Asclepias incarnata	swamp milkweed	0.5	seed oz.
Carex vulpinoidea	brown fox sedge	2	seed oz.
Eutrochium maculatum	spotted joe pye weed	0.25	seed oz.
Juncus effusus	common rush	1	seed oz.
Lobelia siphilitica	great blue lobelia	0.25	seed oz.
Scirpus cyperinus	wool grass	1	seed oz.
Senna hebecarpa	wild senna	1	seed oz.
Symphyotrichum novae-angliae	New England aster	0.25	seed oz.
Verbena hastata	blue vervain	1	seed oz.

Native Grass Enhancement Mix 1 acre 10 seeds per sq. ft. Est cost $ 100.00 acre.

Andropogon gerardii	big bluestem grass	3	Seed oz.
Bouteloua curtipendula	side-oats grama	16	Seed oz.
Panicum virgatum	switch grass	1	Seed oz.
Schizachyrium scoparium	little bluestem	24	Seed oz.
Sorghastrum nutans	Indian grass	4	Seed oz.

Tall Rigid Native Forbs That Benefit Pollinators

Asclepias syriaca – 2-4’ Jun-Aug

Echinacea pallida – 2-5’ May-Aug

Eryngium yuccifolium – 3-5’ Jul-Sept

Lespedeza capitate – 2-4’ Jul-Sept

Oligoneuron rigidum – 2-5’ Jul-Oct

Penstemon digitalis – 2-4’ May-Jul

Senna hebecarpa – 3-5’ Jul-Aug

Silphium laciniatum – 3-8’ Jun-Sept

Silphium terebinthinaceum – 3-8’ Jun-Sept

Symphyorichum laeve – 3-5’ Aug-Oct

Coreopsis tripteris – 4-8’ Aug-Sept

Echinacea purpurea – 3-4’ Jun-Aug

Eupatorium serotinum – 2-5’ Jul-Oct

Monarda fistulosa – 2-5’ Jul-Sept

Parthenium integrifolium – 2-3’ Jun-Sept

Rudbeckia subtomentosa – 3-5’Aug Sept

Silphium integrifolium – 2-6’ Jul-Sept

Silphium perfoliatum – 3-10’ Jul-Oct

Solidago speciose – 2-6’ Jul-Oct

Verbesina alternifolia – 3-7’ Jul-Oct

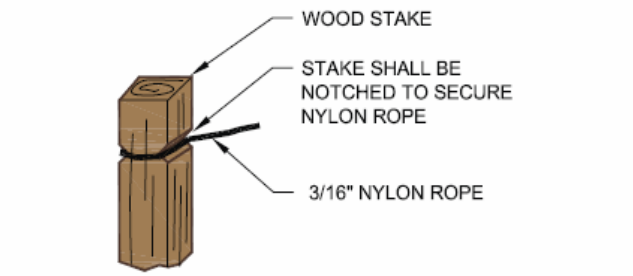
Coir Logs

Coir Logs

Specifications Coir log material: 100% Biodegradable coconut fiber, plugged with native wetland plants.

Vegetated coir logs can be custom grown based on your site conditions. Please allow 8-10 weeks lead time.
Plugs are planted 2 per linear foot (20 plants per log).
Larger diameters can be provided with sufficient lead time. Coir fiber density: 30cm x 3m – 11kgs/lm
Exterior net structure
Coir net - Diamond shape mesh and 14 knots circular wise
PP net – knotless diamond shape mesh

Net mesh size: 5cm x 5cm
Net thickness
Coir net – 4mm
PP net – 2mm



HARDWOOD STAKE NOTCH DETAIL
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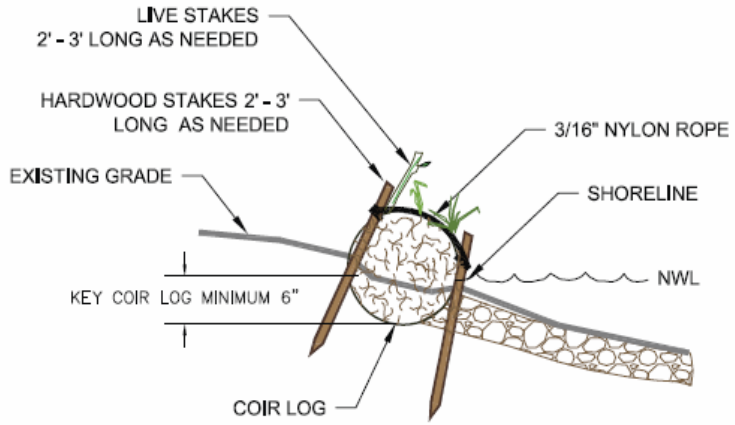

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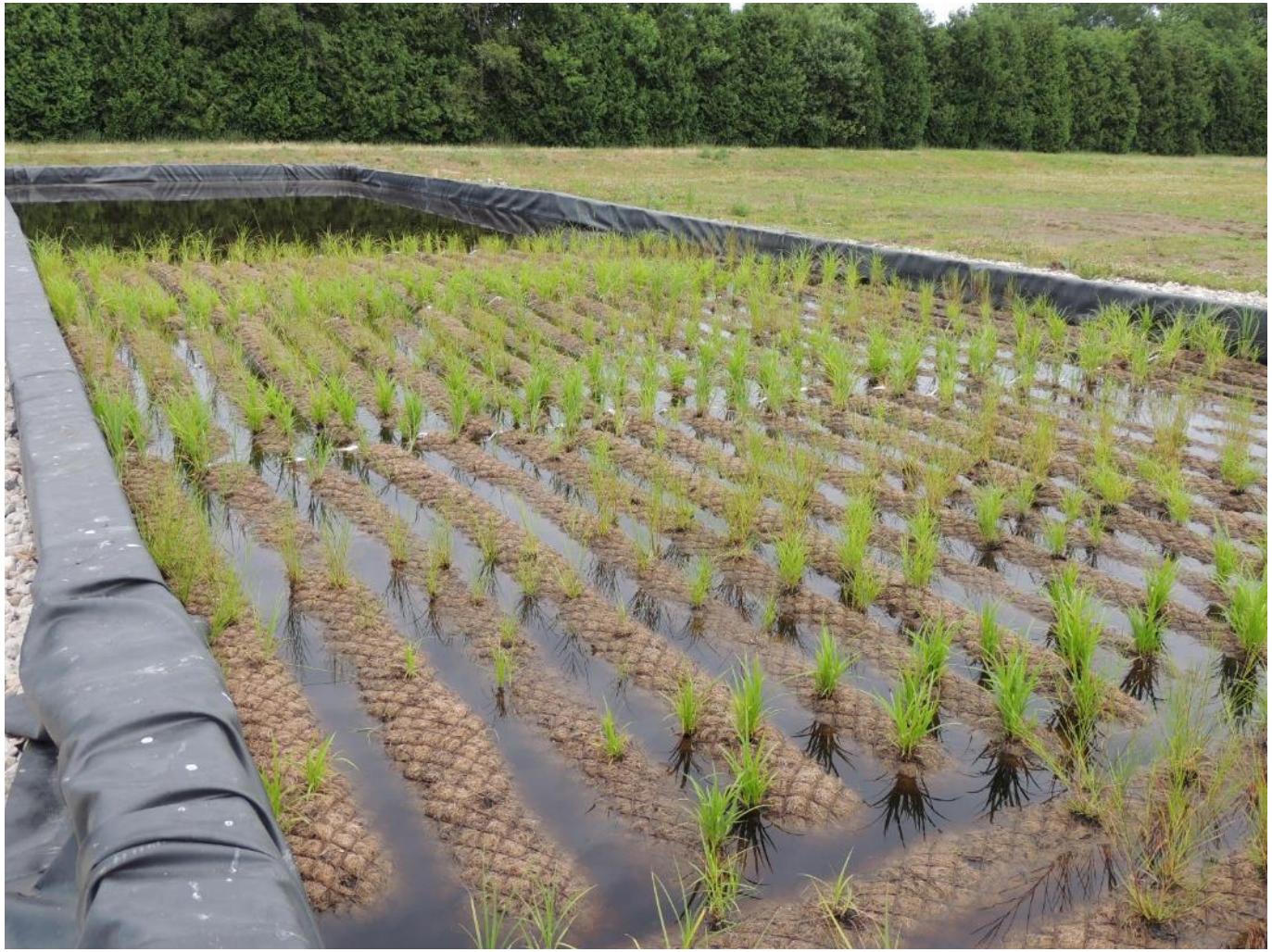
Wetland Coir Logs – 2 wetland plants per linear ft. 12 wks. to grow in season



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Chicago DOT Coir Logs

Chicago DOT

Hyalophora cecropia, the cecropia moth, is North America's largest native moth

Root Carpets 3 ft. x15 ft. 45 sq. ft.

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Specifications

Carpet material: 100% biodegradable coconut fiber, vegetated with native wetland plants.

Custom orders: RootCarpet™ can be custom grown to your specific needs based on your site conditions. Please allow 8 weeks lead time.

Native wetland plants are installed 10” to 12” on center (approximately 45-65 plants per blanket).

Length: 15 ft (4.6 m)

Width: 3 ft (.92 m)

Area: 45 ft² (4.23 m²)

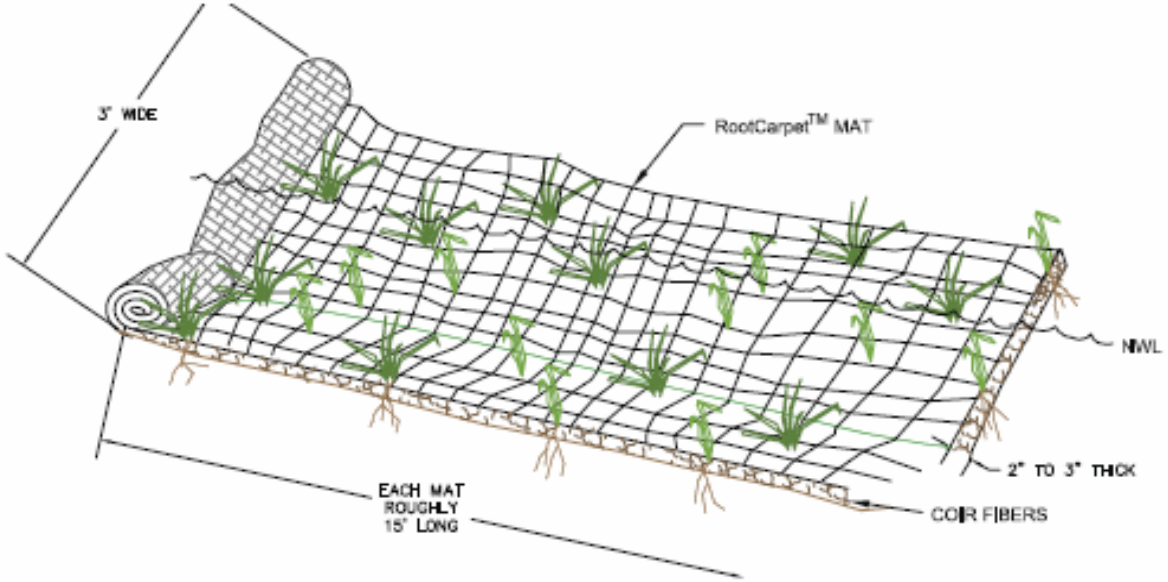
Coir mat thickness: 2.75” (7 cm)

Coir fiber density: 3’ x 15’ - 1.022 lbs/sqf

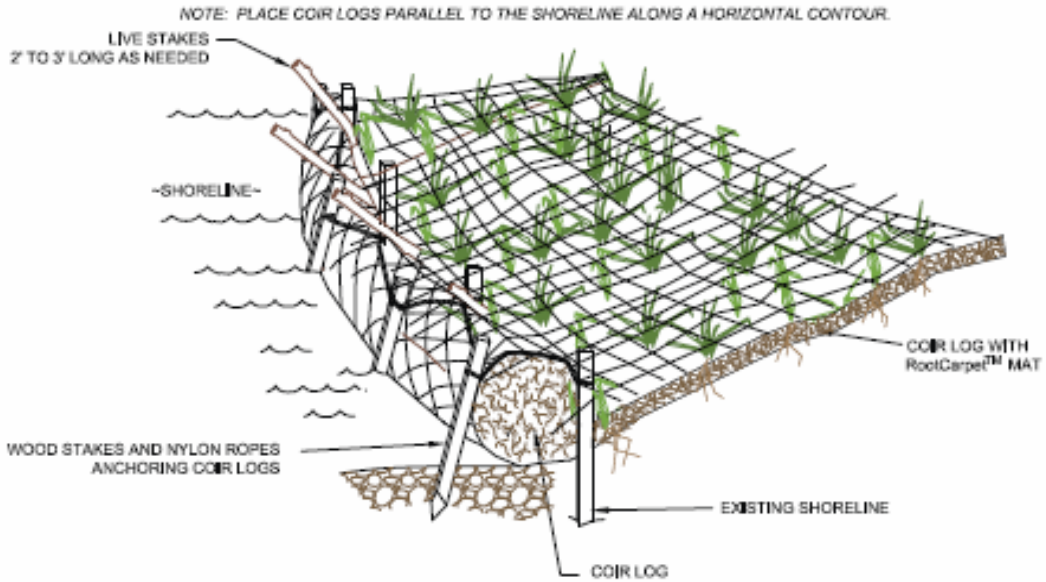
Exterior net structure: Square patterned coir net

Net mesh size: 0.75” x 0.75” (20 mm x 20 mm)

Net thickness: 0.16” (4 mm)



RootCarpet™ MAT DETAIL
NOT TO SCALE



COIR LOG WITH RootCarpet™ MAT
NOT TO SCALE

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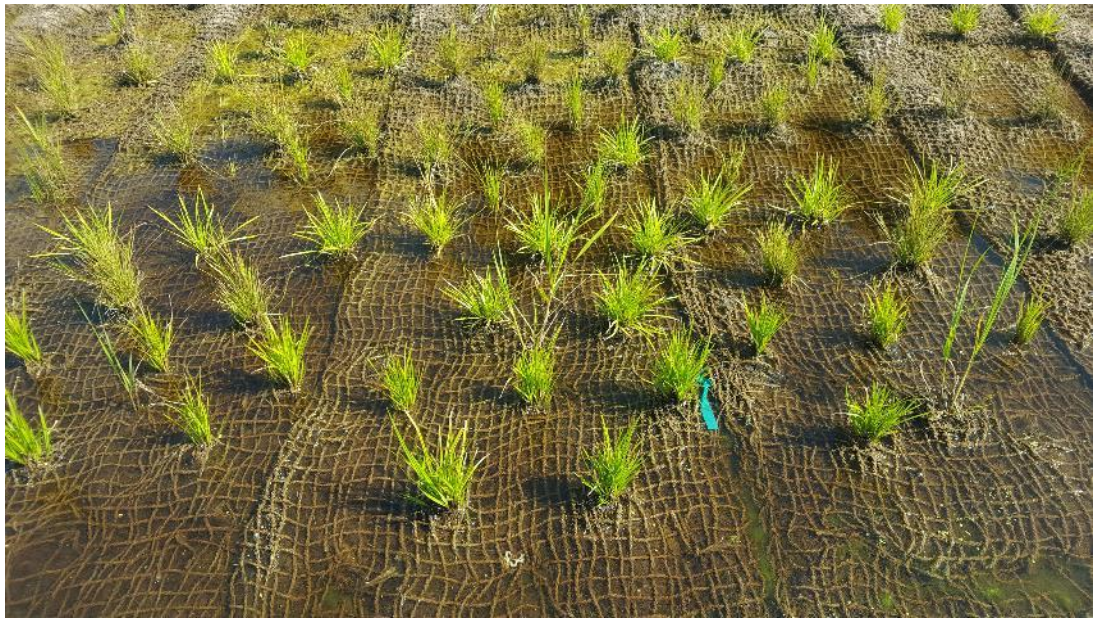
Root Carpets



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Rock Socks

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Rock Socks

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Goose Control Needed

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Goose Control

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Straight Line Winds

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Live Stake Specification

- Live stakes shall be installed in the appropriate zones following seeding and application of erosion control blanket as shown on the plans. Stakes shall be installed in a random manner in regards to species composition. Live stakes shall be trimmed with the buds facing up, a 45- degree angle cut at the bottom, and cut square at the top. Live stakes shall be tamped through the erosion control blanket or coir mat, where applicable, and into the soil with a dead blow hammer with buds oriented in an upward direction. A pilot hole shall be required in rocky, compacted, or frozen soils, or wherever the stakes are not able to be tamped into the soil without splitting.
- Installation
- Schedule:
- Installation of woody material shall be in accordance with 622.06.

- Approval of installation will be based on survival after one year. If a replant is required, request for release from warranty provisions can be submitted 60 days after the replant installation. The Contractor shall guarantee 90% survival for the planted trees and shrubs in accordance with the Warranty Bond.

Live Stakes

Live Stakes

Brush layering

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Brush Layering

Detailed Site Inspection

- Current vegetation will give insight into the species that will work and site preparation needed
- Soil types also determine what species to use and the rate of establishment
- Soil pH will dictate what species will have a better chance of long term success
- Compaction will effect germination and the rate of growth
- Exotic species will need to be controlled
- Surrounding vegetation will infringe on the site in time
- Vantage points should be considered on high profile projects
- Slopes need to be protected from erosion
- Safety is always a concern.

Site Preparation

- It’s been determined after a detailed site inspection that this site is good to seed.
- Prior to seeding, the site needs to be prepared properly.
- Soil tests if needed. Is the area void of vegetation? What’s up?
- Compaction?
- Identify existing vegetation. Can you live with it? Will it effect establishment?
- Stabilize erodible areas.
- Come up with a plan to remove unwanted vegetation.
- What is a realistic expectation of establishment time?

Seeding Guidelines

- What's the budget?
- The site conditions should dictate what species to use
- Determine a diverse mixture of natives with staggered bloom times.
- Specify regional geno-type
- Require pure live seed (PLS)
- Sow at a rate of 30 to 60 seeds per square foot.
- Proper site preparation.
- Optimal seeding time Oct. 1st to June 15th.
- Maintenance is critical
- Cover crop is recommended

Seeding Costs

Quoted per 1 acre.

- 1 application of herbicide $ 350 - $ 450 Price includes herbicide and labor.
- Native seed mix ---------- -$ 500 - $ 1,200
- Drill seeded ---------- $ 300 - $ 500
- Mowing for 2 seasons -- $ 500 - $ 750 Priced at 5 mows, 3 the first season and 2 the second. Critical maintenance factor needed the first few seasons.

Price range per acre ------$ 1,650.00 - $ 2,900.00

This is a contractors' cost. If a firm was contracted to install and maintain a 1-acre planting.

If a parks dept. or entity has the ability to broadcast their own seed and cover the mowing, the out-of-pocket cost would be reduced, and they could potentially seed a larger area.

No-Till Drill Seeding into Dead Vegetation

No-Till Native Drill for Vegetated Sites

- Broadcasts and firms seed into place
- 3 seed boxes to calibrate the seed d
- Most effective way to sow seed into
- Effective in getting the seed to the so
- Carefully calibrate the seed drop to c
- Don’t drill too deep

Bare Soil Seeding Tips

- Loosen firm soil with disc or ripper.
- Firm loose soil with a roller or cultipacker.
- Apply seed at design rates 30 to 60 seeds per square foot.
- Roll again to press seed into soil.
- Beware of existing weed seed bank that can produce a flush of weeds after soil disturbance.

May 2016

Mid August 2016

Seeding St Rd 24

Plant Diversity

Plant Diversity

Maintenance

Year 1

> Mowing is critical in controlling weeds the first few years.

> Most of your weed pressure comes from annuals. Keep them from re-seeding.

> Keep vegetation mowed to a height of 4-6 inches and mow when the vegetation reaches 12 inches or before it goes to seed.

Year 2

> Weeds will continue to be an issue in the second season.

> In year 2, mow vegetation to 8 inches and mow when vegetation reaches 12 to 18 inches or before it goes to seed.

Year 3

> Use mowing as a weed control and establishment tool when needed.

Midwestern Native Species

Grasses

- *Andropogon geradii* (Big Bluestem)
- *Bouteloua curtipendula* (Side Oats Grama)
- *Carex sp* (Sedges)
- *Elymus canadensis* (Canada Wild Rye)
- *Panicun virgatum* (Switch Grass)
- *Schizachyrium scoparium* (Little Bluestem)
- *Sorghastrum nutans* (Indian Grass)
- *Sporobolus heterolepis* (Prairie Dropseed)

Spring Flowering Native Species

- *Amelanchier's* (Serviceberry)
- *Amorphia fruiticosa* (Indigo Bush)
- *Anemone canadensis* (Meadow anemone)
- *Aquilegia canadensis* (Wild Columbine)
- *Baptisia's* (Wild Indigos)
- *Caltha palustris* (Marsh Marigold)
- *Cercis canadensis* (Redbud)
- *Coreopsis lanceolate* (Sand Coreopsis)
- *Iris virginica* (Blue Flag)
- *Lindera benzoin* (Spicebush)
- *Lupinus perennis* (Wild Lupine)
- *Prunus americana* (American Plum)
- *Salix* (Willow)
- *Zizia aptera* (Heart-Leaved Meadow Parsnip)
- *Zizia aurea* (Golden Alexanders)

Summer Flowering Native Species

- *Agastache foeniculum* (Lavender Hyssop)
- *Allium cernuum* (Nodding Onion)
- *Amorpha canescens* (Lead Plant)
- *Anemone cylindrical* (Thimbleweed)
- *Asclepias's* (Milkweeds)
- *Chamaecrista fasciculata* (Partridge Pea)
- *Dalea's* (Prairie Clovers)
- *Echinacea's* (Coneflowers)
- *Eryngium yuccifolium* (Rattlesnake Master)
- *Eutrochium maculatum* (Spotted Joe-Pye Weed)
- *Filipendula rubra* (Queen of the Prairie)
- *Helianthus's* (Sunflowers)
- *Liatris's* (Blazing Stars)
- *Monarda fistulosa* (Wild Bergamont)
- *Rudbeckia sumtomentosa* (Sweet Black-Eyed Susan)
- *Senna hebecarpa* (Wild Senna)
- *Silphium's* (Rosin Weed) (Compass Plant) (Cup Plant) (Prairie Dock)
- *Veronicastrum virginicum* (Culver's Root)

Fall Flowering Native Species

- *Agalinis's* (False Foxglove)
- *Ageratina altissima* (White Snakeroot)
- *Chelone glabra* (Turtlehead)
- *Conoclinium coelestinum* (Blue Mistflower)
- *Coreopsis tripteris* (Tall Coreopsis)
- *Eupatorium perfoliatum* (Common Boneset)
- *Lobelia cardinalis* (Cardinal Flower)
- *Lobelia siphilitica* (Great Blue Lobelia)
- *Oligoneuron's* (Goldenrods)
- *Pycnanthemum virginianum* (Common Mountain Mint)
- *Solidago's* (Goldenrods)
- *Symphyotrichum's* (Asters)
- *Vernonia missurica* (Missouri Ironweed)

Bee Friendly Lawns

- Bees and other pollinators are extremely attracted to clover flowers, and clover is an integral part of the delicate life cycle of honey bees. While a lawn teeming with bees may not be for everyone, it is a lot more interesting and interactive than most alternatives.
- Clover was actually a part of the typical American lawn prior to World War II. Clover along with fescues, rye grasses, and Kentucky bluegrass.

- Bumblebees, solitary bees and honeybees all visit dandelions for food, along with hoverflies, beetles, and butterflies such as the peacock and holly blue. Goldfinches and house sparrows eat the seed. Yet most of us gardeners miss out on the spectacle of watching wildlife feast on our dandelions because we wage such a war against them as weeds.

What went wrong?

Common causes of seeding failure

- Wrong plant in the wrong place.
- Failure to maintain the planting
- Planting too deep. Native seed should never be covered by more than 1/4” soil.
- Failure to maintain the planting
- Hydro seeding or applying native seed mixed with hydro mulch
- Failure to maintain the planting
- Poor quality seed: always specify PLS
- Failure to maintain the planting
- Failure is perceived due to the slow germination and growth of natives.
- Failure to maintain the planting

Nelumbo lutea - American Lotus

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Questions

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Thank you

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