

Hydroseeding 101



**Clearwater Alabama 2021
Healthy Streams for Healthy Lakes**

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John Wolery, PLA

Championship Enterprises, Inc.

jwolery@champsinc.us

Alabaster, AL

(205) 979-7212



What is Hydroseeding?

Definition

Seed Mixes

Fertilizers

Mulches / Erosion Control Products

Causes of Failures

What is Hydroseeding?

Definition - Hydroseeding is a method for planting vegetation, usually over large areas or on slopes that are difficult to plant. The process is a substitution for dry seeding and involves using a slurry of seed and water, (and may also include mulch, dyes, fertilizer, tackifiers, lime, polymers, etc.), using a Hydroseeder.

Hydroseeder:

Hydroseeders use hydraulically driven, mechanical paddle agitation and liquid recirculation to enhance the loading, mixing, and discharge operation



Hydroseeder Paddle Agitator:



Hydroseeder Nozzles: Different nozzles are used depending on the materials used and the distances being covered.



Hydroseeding Video: *Planted April 6, 2021*



Hydroseeding with a Slope Seed Mix, Fertilizer and Lime

Hydroseeding: Established Grass, August 10, 2021



Mowed: August 20, 2021

Hydroseeder Working Capacities:

500 Gallons of water per acre of Seed and Fertilizer

4,000 Gallons of water per acre of Hydromulch (Hydraulic Mulch, HM) at 2,000-pounds per acre (100-gallons per 50-pounds of Mulch)

6,000 Gallons of water per acre of Bonded Fiber Matrix Hydromulch (Hydraulic Erosion Control Product, HECP) at 3,000-pounds per acre (100-gallons per 50-pounds of Mulch)

Hydroseeder Working Capacities:

Commercially Available Hydroseeder Sizes:

Listed Size	Working Capacity	Seed Ac/load	HM load/ac	HEC load/ac
900	800 gal	1.6	5.0	7.5
1200	1000 gal	2.0	4.0	6.0
1700	1500 gal	3.0	2.7	4.0
3300	3000 gal	6.0	1.4	2.0
4000	3600 gal	7.2	1.1	1.7

Seed: Seed and Fertilizer

HM: Hydraulic Mulch at 2,000-pounds per acre

HECP: Hydraulic Erosion Control Product at 3,000-pounds per acre

Hydraulic ECP: Close Range Fantail Nozzle



Hydraulic ECP: Long Range Nozzle



Hydraulic ECP: Excess Water



Seed Mixes:

Temporary Seed Mixes: For use in short term erosion control on stockpiles and areas of the site that have been cleared, or otherwise disturbed, but not yet graded to the final configuration. (Always used with mulch).

Permanent Seed Mixes: For use in long term site stabilization and erosion control after the site has been finished graded and topsoiled. (Always used with mulch or other erosion control products).

Temporary Seed Mix Selection:

Remember that weather delays are inevitable, consider possible delays before specifying or using a single season temporary seed mix.

The seed planted on topsoil stockpiles may reseed and be spread over the site when the topsoil is respread. Especially true of Brown Top Millet.

Vegetation and seeds that are on-site when the topsoil is stripped will regrow when the topsoil is respread.

Topsoil: Regrowth of Existing Vegetation



Regrowth in Centipede Sod under the Birmingham CBD Bridges

Temporary Seed Mix Selection:

Alabama Handbook: TS-1 Commonly Used Plants for Temporary Cover

Species	Seeding Rate/Ac PLS	North	Central	South
		-----	Seeding Dates	-----
Millet, Browntop or German	40 lbs	May 1-Aug 1	Apr 1-Aug 15	Apr 1-Aug 15
Rye	3 bu	Sept 1-Nov 15	Sept 15-Nov 15	Sept 15-Nov 15
Ryegrass	30 lbs	Aug 1-Sept 15	Sept 1-Oct 15	Sept 1 -Oct 15
Sorghum-Sudan Hybrids	40 lbs	May 1-Aug 1	Apr 15-Aug 1	Apr 1-Aug 15
Sudangrass	40 lbs	May 1-Aug 1	Apr 15-Aug 1	Apr 1-Aug 15
Wheat Common	3 bu	Sept 1-Nov 1	Sept 15-Nov 15	Sept 15-Nov 15
Common	10 lbs	Apr 1-July 1	Mar 15-July 15	Mar 1-July 15
Bermudagrass Crimson Clover	10 lbs	Sept 1-Nov 1	Sept 1-Nov 1	Sept 1-Nov 1

Temporary Seed Mix Selection:

ALDOT - 2018 Standard Specifications

Section 665.02 Materials. (a) Temporary Seeding.

September through December

Annual Ryegrass	25 pounds per acre {28 kg per hectare}
Kentucky 31 Fescue	30 pounds per acre {34 kg per hectare}
Reseeding Crimson Clover	10 pounds per acre {11 kg per hectare}

January through April 15

Kentucky 31 Fescue	30 pounds per acre {34 kg per hectare}
Reseeding Crimson Clover	30 pounds per acre {34 kg per hectare}
Annual Ryegrass	15 pounds per acre {18 kg per hectare}

April 16 through August

Brown Top Millet	30 pounds per acre {34 kg per hectare}
Kentucky 31 Fescue	30 pounds per acre {34 kg per hectare}
Hulled Bermuda Grass	10 pounds per acre {11 kg per hectare}

Permanent Seed Mix Selection:

Are invasive vegetation species go to be eradicated from the site before work begins?

What type of soil is on the site, is topsoil going to be imported if there is not enough?

How is each area of the site going to be used?

Is the site going to be irrigated?

What type of maintenance is in the budget? Does the budget allow for the purchase of slope mowers?

Scheduling - What time of year will the permanent planting take place?

Importance of all Season Permanent Seed Mixes:

2021 Alabama NPDES General Permit

PART III: Stormwater Pollution Prevention Requirements Section C. Soil Stabilization

3. Final stabilization of disturbed areas must, at a minimum, be initiated immediately whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site.
4. The requirement to initiate stabilization immediately is triggered as soon as you know that construction work on a portion of the site has permanently ceased. **In the context of this provision, “immediately” means as soon as practicable, but no later than the end of the next business day, following the day when the construction activities have permanently ceased.**

Permanent Seed Mix Selection:

Alabama Handbook: Table FS-1 Commonly Used Plants for Permanent Cover

Species	Seeding Rates/Ac PLS ¹	North	Central	South
		Seeding Dates -----		
Bahiagrass, Pensacola	40 lbs	--	Mar 1-July 1	Feb 1-Nov 1 ²
Bermudagrass, Common	10 lbs	Apr 1-July 1	Mar 15-July 15	Mar 1-July 15
Bahiagrass, Pensacola	30 lbs			
Bermudagrass, Common	5 lbs	--	Mar 1-July 1	Mar 1-July 15
Fescue, Tall	40-50 lbs	Sep 1-Nov 1	Sep 1-Nov 1	--
Sericea	40-60 lbs	Mar 15-July 15	Mar 1-July 15	Feb 15-July 15
Sericea & Common	40 lbs			
Bermudagrass	10 lbs	Mar 15-July 15	Mar 1-July 15	Feb 15-July 15
Switchgrass, Alamo	4 lbs	Apr 1-Jun 15	Mar 15-Jun 15	Mar 15-Jun 15

Permanent Seed Mix Selection:

2018 ALDOT Section 860: ZONE 1 - AREAS SUBJECT TO FREQUENT MOWING

REQUIRED POUNDS PER ACRE {KILOGRAMS PER HECTARE} OF PLS

<u>Date of Planting</u>	<u>Aug. 16 to Feb. 29</u>	<u>Mar. 1 to May 15</u>	<u>May 16 to August 15</u>
Annual Ryegrass	10 {11} 25 {28}		
Hulled Bermudagrass		18 {20}	24 {27}
Unhulled Bermudagrass	30 {34}	12 {13}	
Annual Lespedeza (Kobe)			38 {43}
White Dutch Clover	5 {6}	6 {7}	
Notes	1	2	
Required Permanent Plant	Bermudagrass		

1. During this season Ryegrass, Bermudagrass and Clover are required where vegetation must be established within an area no further than 15 feet {3 m} from the edge of mainline pavement. (This is usually required for short duration work that is done on pavement resurfacing projects.)
2. Annual Ryegrass is required where vegetation must be established within an area that extends further than 15 feet {3 m} from the edge of mainline pavement. Seeding in stubble for the establishment of permanent vegetation is required during the following month of March.

Permanent Seed Mix Selection:

2018 ALDOT Section 860: ZONE 1 - AREAS NOT SUBJECT TO FREQUENT MOWING

REQUIRED POUNDS PER ACRE {KILOGRAMS PER HECTARE} OF PLS

<u>Date of Planting</u>	<u>Nov. 16 to Feb. 29</u>	<u>Mar. 1 to Aug. 15</u>	<u>Aug. 16 to Nov. 15</u>
Annual Ryegrass	15 {17}	15 {17}	
Hulled Bermudagrass		18 {20}	
Unhulled Bermudagrass	35 {39}	12 {13}	18 {20}
Tall Fescue	35 {39}	35 {39}	35 {39}
Weeping Lovegrass		2 {2}	
Hulled Sericea Lespedeza		38 {43}	38 {43}
Unhulled Sericea Lespedeza	38 {43}		
Reseeding Crimson Clover			29 {33}
Required Permanent Plant	Mixed		

- Bermudagrass needs 80-degree days and 60-degree nights to germinate
- Nov. 16 – Feb. 29 needs a cool season legume, add 25-lbs. Crimson Clover
- Lovegrass is only needed in rocky ground, omit it on topsoiled areas
- Too much Ryegrass competes for soil nutrients and will shade out the other vegetation when it germinates, reduce the Ryegrass to 10-lbs. per acre.

Permanent Seed Mix: Late Planting

1992 Standard Specifications for Highway Construction

Section 860 Roadside Improvement Material

Seeding Mixture Group "B" North Alabama - Medians and Slopes Flatter than 3:1

REQUIRED POUNDS PER ACRE {KILOGRAM PER HECTARE} OF PLS

Date of Planting September through March

Kentucky 31 or Alta Fescue	25 {28}
Reseeding Clover	30 {34}
Unhulled Bermudagrass	30 {34}
Annual Ryegrass	10 {11}

For use in areas where permanent seeding needs to be established during the winter months, including where traffic shifts will limit further access and in areas requiring Rolled or Hydraulic Erosion Control Products.

Fertilizers:

If time and conditions allow, the use of a soil test is recommended.

These tests need to be performed on each topsoil source by the project manager and the test results made available to the Hydroseeding Contractor with ample time to order and receive the proper soil amendments.

ALDOT specifies a base fertilizer rate of 120 pounds per acre of nitrogen (**N**), phosphate (**P₂O₅**) and potassium (**K₂O**). This rate equals 1,500 lbs. of 8-8-8 (30-50 lb. bags) or 630 lbs. of 19-19-19 (13-50 lb. bags). This rate can be adjusted if a soil test is performed.

Fertilizers:

Soil Test from Auburn University: 22-Acre Site, 3-topsoil sources - Rates for Lime, nitrogen (N), phosphate (P₂O₅) and potassium (K₂O)

					SOIL TEST RESULTS				RECOMMENDATIONS			
L A B No.	S a m p l e Designation	C r o p	S o i l Group*	pH**	Phosphorus	Potassium	Magnesium	Calcium	LIME-STONE	N	P ₂ O ₅	K ₂ O
					P***	K***	Mg***	Ca***				
					Pounds/Acre				Tons/Acre	Pounds/Acre		
12537	Top soil on site See Comment 1 See Comment 2	R o a d s i d e Establishment	3	7.5	H 32	M 153	H 955	H 4719	0.0	120	0	90
12538	Top soil borrow pit See Comment 1 See Comment 2	R o a d s i d e Establishment	3	6.9	H 47	H 404	H 1082	H 9243	0.0	120	0	0
12539	Top soil shop stock See Comment 1 See Comment 2	R o a d s i d e Establishment	3	6.9	VL 6	L 117	H 387	H 2425	0.0	120	130	110

Mulches/Erosion Control Products

Alabama Handbook: Mulching is extremely important for successful seeding. Whether the mulching material is straw or a manufactured product, the material needs to be applied properly. Uniformly spread organic mulches by hand or with a mulch blower at a rate which provides about 75% ground cover. Spread HECs utilizing appropriate equipment and at rates as specified in the plan or by the manufacturer.

Mulches/Erosion Control Products

Vegetative Mulches: Natural Hay or Straw

Hydraulic Mulches: Natural fibers with or without tackifier adhesives.

Hydraulic Erosion Control Products: shall be composed of photodegradable or biodegradable natural or polymer fibers that chemically bond together and form a continuous matrix of material

Rolled Erosion Control Products: shall be composed of photodegradable or biodegradable mesh, netting fibers, yarns or twines. Components shall be mechanically interlocked or chemically bonded together to form a continuous matrix of material.

Vegetative Mulch Video:



Mulching Crew and Blower:

Vegetative Mulch Video:



Interstate Ramp Widening: 2-tons per acre hay mulch

Hydraulic Mulch:

Field Day at Auburn Test Facility: November 18, 2016



HM and HECP Selection:

The steeper a slope, the dryer the slope and the longer it takes to establish vegetation.

Look closely at the following properties:

- Functional Longevity
- Maximum Uninterrupted Slope
- Maximum Slope Gradient

Table MU-1 Hydraulic Erosion Control Products (HECP) Specification Chart ¹

Hydraulic Erosion Control							
Type HECP ²	Term	Functional Longevity ³	Typical Application Rates Lbs/acre (kg/ha)	Typical Maximum Slope Gradient (H:V)	Maximum Uninterrupted Slope Length (ft)	Maximum C Factor ^{4, 5} (3:1 test)	Minimum Vegetation Establishment ⁶
1	Ultra Short	1 month	1500—2500 (1700—2800)	≤ 4:1	20	0.75	150 %
2	Short Term	2 month	2000—3000 (2250—3400)	≤ 3:1	25	0.5	150 %
3	Moderate	3 month	2000—3500 (2250—3900)	≤ 2:1	50	0.15	200 %
4	Extended Term	6 month	2500—4000 (2800—4500)	≤ 1:1	75	0.1	300 %
5	Long Term	12 month	3000—4500 (3400—5100)	≤ 0.5:1	100	0.02	400 %

¹ This table is for general guidelines only. Refer to manufacturer for application rates, instructions, gradients, maximum continuous slope lengths and other site specific recommendations.

² These categories are independent of rolled erosion control products (RECPs) categories, despite the identical names.

³ A manufacturer's estimated time period, based upon field observations, that a materials can be anticipated to provide erosion control as influenced by its composition and site-specific conditions.

⁴ "C" Factor calculated as ratio of soil loss from HECP protected slope (tested at specified or greater gradient, h:v) to ratio of soil loss from unprotected (control) plot based on large-scale testing.

⁵ Acceptable large-scale test methods may include ASTM D 6459, or other independent testing deemed acceptable by the engineer.

⁶ Minimum vegetation establishment is calculated as outlined in ASTM D 7322 being a percentage by dividing the plant mass per area of the protected plot by the plant mass per area of the control plot.

EROSION CONTROL TECHNOLOGY COUNCIL —WWW.ECTC.ORG

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(Source: Erosion Control Technology Council, August 2010)

Hydraulic Mulch (HM) Uses:

Hydraulic Mulch (Hydromulch) is used in place of vegetative mulch in locations such as airports where the seed contained in the vegetative mulch may attract birds or other wildlife. It is also used where vegetative mulches are not commonly available or when the contractor chooses to use only a Hydroseeder.

Hydraulic Mulches are available with or without tackifiers. They are best used on moderate slopes and flat areas. Of the four listed Mulch/Erosion Control Products they are the most susceptible to impact erosion, they are the second least expensive mulch.

2018 ALDOT Standard Specification: “Hydraulic Mulch products shall be applied at the rate designated by the manufacturer for the specific slope where they are being applied to provide a solid blanket of the mulch product with no soil showing. In no case shall the applied rate be less than 1 ton per acre”.

Hydraulic Erosion Control Product (HECP) Uses:

Hydraulic Erosion Control Products (HECP) can be used in place of Rolled Erosion Control Products (RECP), on slopes that are too steep for the placement of RECPs and where long-term cover is required.

Hydraulic Mulches (HM) and Hydraulic Erosion Control Products (HECP) are not the same and are not interchangeable.

Hydraulic Mulch / Hydraulic ECP:



HECP: On Rocky Soils

Hydraulic Erosion Control Product (HECP) – Used on a weathered rock cut during new railroad passing track installation

The rock is too close to the surface to allow RECP installation.



HECP: On inaccessible slopes

Hydraulic Erosion Control Product (HECP) – Used on weathered rock cuts during new railroad passing track installation



Slope 1:1 and steeper

Hydroseeding with RECP:



Rolled Erosion Control Product:



103,000 SY of 2:1 Slopes

Hydroseeding: Reasons for Failures

Hydraulic Mulches (HM) and Hydraulic Erosion Control Products (HECP) must have time to dry before a rain event. Rain too soon after installation is the biggest cause of failure of these products.



Hydroseeding: Reasons for Failures

Quality topsoil, free of deleterious materials, is essential for quality vegetative establishment. The ALDOT topsoil specification changed in 2008 limiting deleterious material, enforcement is not consistent.



2007 Photo

2018 Photo



Hydroseeding: Reasons for Failures



Water from an off-site road above the slope drained down the slope causing a slope failure before vegetation was established. There was nowhere else for the water to go so the slope was excavated and rip-rap installed.

Hydroseeding: Reasons for Failures



Slopes that can be vegetated are often too steep to be mowed without being damaged. Soil type and depth of topsoil, or lack of topsoil, plays an important part in long term stability. Due to schedules, slopes are often mowed while wet which leads to the beginning of the rutting shown here.

Hydroseeding 101: References

ADEM - Alabama Department of Environmental Management

AASHTO - American Association of State Highway and Transportation Officials:

NTPEP – National Transportation Product Evaluation Program:

Alabama Department of Transportation – Standard Specifications for Highway Construction (2018 Edition; Current):

Alabama Department of Transportation – 2018 General Application Special Provisions:

Alabama Soil & Water Conservation Committee – 2018 “The Alabama Handbook for Erosion Control, Sediment Control, and Stormwater Management on Construction Sites and Urban Areas”:

Hydroseeding 101 – Questions ?



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