United States Department of Agriculture
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Cover Crops to Improve Soil in Prevented Planting Fields

Natural Resources Conservation Service (NRCS)
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Iowa Fact Sheet
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Prolonged rain and flooding has resulted in many fields that will go unplanted this year. Farmers in this situation need to weigh not only their program and insurance options ("prevented planting"), but should also assess agronomic options to ensure long-term productivity from this difficult situation.

Producers should explore the benefits of planting a **cover crop** that has the potential to capture applied nutrients, fix nitrogen, build organic matter, control weeds, control erosion and/or improve soil health and biology during the remainder of the season. These together can build considerable yield potential for following crops. With the potential "prevented planting" payment and the improved yield potential following a full season "green manure" crop, their economic potential for the whole rotation could be considerable.

Producers are advised to check with their crop insurance agents on prevented planting requirements and harvest restrictions for cover crops.

A key soil health concept is to ensure that there is vegetation green and growing during all times of the year.

Building vs. Losing Topsoil

As excessive rainfall runoff or flood waters cut across unprotected fields, the top soil may have been lost from erosion and scouring. With the productive topsoil lost, so too are the nutrients, organic matter, and soil biology. If tillage is applied to these water-damaged fields to control weeds or smooth them out, even relatively flat soils will lose carbon, nitrogen and biomass.

Above-ground biomass of cover crops helps protect the soil from further sun, wind and water damage.

Selecting high bio-mass cover crop mixes will rebuild topsoil. Cover crops, especially if no-tilled, will add organic biomass both above and below ground to rebuild topsoil quicker than if left to grow weeds or especially if left with no cover.

Avoid removing biomass from the field by harvesting for forage or grain before Nov. 1, which will reduce the organic matter benefits, and instead consider killing or mowing prior to seed-head formation, particularly if reseeding could be incompatible with subsequent crops. This will also ensure rapid decomposition and leave more nutrients in the roots that are available to soil organisms and subsequent crops. Grazing is not a concern because biomass and nutrients are returned to the soil.

Soil Biology, Structure and Compaction

Many fields saturated for long periods lose soil organisms that create soil macro-pores and cycle nutrients and lose beneficial soil biology, such as mycorrhizal fungi and rhizobia bacteria that build structure and tilth. Without these organisms, the soils are very subject to compaction, crusting, and high bulk density problems.

Some fields may be so compacted that remediation activities are needed. However, cover crops, whether used alone or in conjunction with other compaction remediation activities, are essential to rebuild healthy soil structure. The roots of cover crops help to penetrate compacted zones, hold soil aggregates together, and sustain healthy organisms to restore soil structure. Growing roots are essential to re-establish the mycorrhizae in the soil and to create pathways for air and water to move through the soil profile, which are key components to restoring the soil's functional properties and will keep the pathways more open to result in a quicker fix of the compacted layers.

Building vs. Losing Nitrogen

Cover crops can build organic nitrogen, and/or sequester residual Nitrogen in the soil.

A legume or legume mix planted in early summer can easily provide 60-100% of the needed Nitrogen of a following corn crop.

A brassica or grass, or brassica+grass mix can scavenge over 40 pounds of residual N from the soil, and even more in situations where manure or preplant nutrients have been recently applied. Additionally, this results in a more rapid gain in total soil biomass and a higher total nutrient availability for subsequent crops.

Herbicide Concerns

A broassey test is recommended to determine if a herbicide carry over is present. For amine herbicides, sorghum-sudangrass is the most tolerant of cover crop species.

Cover Crop Species Guidance

Cover crop selection and management should focus on maximizing both above and below-ground biomass and encouraging nutrient cycling as deep in the soil profile as possible. Choosing a mix of a grass with a fibrous root system and a legume or brassica with a tap root will usually provide the widest range of benefits.

Planting wildlife friendly cover crops such as buckwheat or brassicas and leaving the growth and/or the grain can be a very valuable winter food source for a wide variety of wildlife and pollinators.

Legumes alone or in combination with grasses can provide quicker soil biology/biota restoration and Nitrogen fixation. Nitrogen fixation is directly related to growth and development of the legume. An early summer planted legume such as cow peas, will grow rapidly and fix a good amount of N prior to a killing frost when it will be terminated. For later plantings, an over wintering legume such as Red Clover should be considered. Make sure all legume seed is inoculated.

Brassicas provide excellent weed control and Nitrogen scavenging potential. The tap roots are excellent at penetrating tillage pans and dense soil layers.

Seeding and Establishment

One of the challenges an early to mid-summer seeding is the timeliness of rainfall after seeding for germination. It is best if the seed is drilled. This will also address concern about crusted soil and seed-to-soil contact.

Additional References

Midwest Cover Crop Council: www.mccc.msu.edu

Sustainable Agriculture Research and Education (SARE): *Managing Cover Crops Profitably* www.sare.org/publications

Natural Resources Conservation Service - Field Office Technical Guide (eFOTG): efotg.nrcs.usda.gov/treemenuFS.aspx

Use the following table and/or the Iowa NRCS Cover Crop Decision Tool at: http://mcccdev.anr.msu.edu/VertIndex.php

Cover Crops Recommendations by Resource Concern

Resource Concern	Species	Pure Stand Rate lbs./ac. of PLS[1]	Seeding Dates
SUMMER COVER			
Erosion Control	Spring Oats	60	4/1 - 6/15
	Annual Ryegrass	20	4/1 - 6/15
	[3]Sudangrass and Sorghum/Sudangrass	25	5/15 - 8/1
	Buckwheat	50	6/1 - 8/15
	Millet	25	5/15 - 8/1
	Corn	40,000+ plants/acre	5/15 - 8/1
Compaction	Oil Seed Radish	8 drilled - 12 broadcasted	4/1 - 5/15
	Rape/Turnips/Canola	4 drilled - 8 broadcasted	4/1 - 5/15
Nitrogen Fixing	Alfalfa	15 drilled - 20 broadcasted	4/1 - 6/1
	Red Clover	8 drilled - 12 broadcasted	4/1 - 6/1
	Soybean	50	5/1 - 7/1
	Cow Peas	50	5/15 - 8/1
Herbicide Concern[4]	Sorghum/Sudangrass	25	5/15 - 8/1
FALL/WINTER COVER			
Soil Building/N Scavenge	Annual Ryegrass	20	8/1 - 10/1
	Cereal Rye	75	8/1 - 10/15
	Winter Wheat[2]	75	FFD - 10/15
	Spring Oats	60	7/15 - 9/15
	Winter Triticale	75	8/1 - 10/15
Nitrogen Fixing	Hairy Vetch	15	8/1 - 10/1
	Winter Peas	50	8/1 - 10/1
	Crimson Clover	10 drilled - 15 broadcasted	8/1 - 9/15
	Alfalfa	15 drilled - 20 broadcasted	4/1 - 6/1
	Red Clover	8 drilled - 12 broadcasted	4/1 - 6/1
	Soybean	50	5/1 - 7/1

[1]Pure Live Seed (PLS) [2]Not to be planted prior to Fly Fee Date (FFD) [3]Concern with grazing after frost
[4]Sorghum/Sudangrass is the most tolerant to amine herbicides.

This is not an all-inclusive list of species. See Midwest Cover Crop Council-Cover Crop Decision Tool – Cover Crop Selector for Iowa Counties.

It is recommended that you plant diverse cover crop mixes. The rates listed are for pure stand seedings. When developing a cover crop mix, take the percent desired by the pure stand rate to determine seeding rate by species. (Example 60% Cereal Rye 40% radish would have a seeding rate of .6 X 75 = 45 lbs. cereal rye and .4 X 8 = 3.2 lbs. radish)

Examples of Diverse Cover Crop Mixes

See Midwest Cover Crop Council-Cover Crop Decision Tool – Cover Crop Selector for Iowa Counties for an all-incluse species list.

Resource Concern	Species Mix	% of Pure Stand Rate	lbs./ac. of PLS	Seeding Dates
SUMMER COVER				
Erosion Control Mix	Annual Ryegrass	20	4	5/15 - 8/1
	Sorghum/Sudangrass	15	4	
	Oats	15	9	
	Buckwheat	15	8	
	Oil Seed Radish[1]	20	2	
	Cow Peas	15	8	
Compaction Mix	Oil Seed Radish[1]	20	2	4/1 - 5/15
	Turnips[1]	20	2	
	Rape/Canola[1]	30	2	
	Millet (Pearl or Japanese)	30	8	
Nitrogen Fixing Mix 1	Alfalfa	50	8	4/1 - 6/1
	Red Clover	50	5	
Nitrogen Fixing Mix 2	Cow Peas	30	15	7/1 - 8/1
	Crimson Clover	40	6	
	Hairy Vetch	30	5	
Grazing/Compaction Mix	Cow Peas	20	10	5/15 - 8/1
	Millet (Pearl of Japanese)	20	5	
	Sorghum/Sudangrass	20	5	
	Turnip[1]	20	2	
	Forage Radish[1]	20	2	
FALL/WINTER COVER				
Soil Building/N Scavenge Mix	Cereal Grain (Cereal Rye, Winter Wheat, Winter Triticale)	50	38	8/1 - 10/15
	Oil Seed Radish	50	5	
Erosion Control Mix	Cereal Grain (Cereal Rye, Winter Wheat, Winter Triticale)	60	45	8/1 - 10/15
	Hairy Vetch	40	6	
Nitrogen Fixing Mix	Cereal Rye	40	30	8/1 - 10/1
	Winter Peas	30	15	
	Hairy Vetch	30	5	
Grazing/Compaction Mix	Cereal Grain (Cereal Rye, Winter Wheat, Winter Triticale)	50	38	8/1 - 10/1
	Oil Seed Radish	25	3	
	Turnip	25	3	

[1]Brassicas will bolt when seeded in the spring, and will produce seed.