Cover Crops

MI Conservation Sheet ***340***

Natural Resources Conservation Service (NRCS) **June 2010**

WHAT ARE COVER CROPS?

Grasses, legumes, forbs, or other herbaceous plants established for seasonal cover and conservation purposes. Cover crops reduce erosion by water or wind by disrupting the impact of raindrops and the stinging forces of wind blown soil particles. Cover crops with tall above ground growth can help increase soil organic matter. Cover crops can capture and recycle excess nutrients like free nitrogen in the soil profile. Legume cover crops can be inter-seeded during the growing season to fix nitrogen for the next year's crop. Some cover crops can attract beneficial insects and provide over-wintering sites for the next year. Because of the potential allelopathic effect of weed seedlings rye and ryegrass cover crops can suppress weed populations. In addition cover crops can increase available soil moisture by providing insulating mulch if at least a 50% or more cover is maintained after planting.

CONSIDERATIONS

Timing:

Sow cover crops in a timely manner to maintain a good stand. See the MI NRCS 340 Cover Crop Standard for seeding rates and dates.

Maintain an actively growing cover crop as late as feasible to maximize plant growth, allowing time to prepare the field for the next crop.

Aerial seeded cover crops into soybeans, especially wheat, rye, and oats, are best if seeded prior to soybean leaf drop.

Aerial seeding of oats into soybeans (seeded prior to harvest) can add additional residue cover without the need to kill the cover crop the following spring.

Aerial seeded wheat or cereal rye into corn is best if seeded during the early dent stage. This generally occurs the last week of August to mid-September. Caution must be used when broadcasting or aerial seeding treated seed into a crop that is standing (to yet be harvested). Treated seed could show up in the harvested grain and result in rejection.

Consider potential herbicide carryover when selecting the species of the cover/green manure crop. Of the cover crops, rye is most tolerant of triazine carryover, followed by wheat, then oats, and lastly legumes. Legumes are extremely sensitive to triazine carryover released by liming low pH soils. Delay seeding legumes for one year if more than 1 pound of triazine was used the previous year and lime was recently applied.

Cereal rye will grow longer in the fall and begin growth earlier in the spring than wheat.

Crop Rotations

Crops planted late enough in spring to allow sufficient growth of cover crops prior to tillage are dry beans, soybeans, sweet corn, snap beans, cabbage, cucumbers, tomatoes, and late potatoes.

Inter-seed cover crops at the last weed control cultivation in corn, cabbage, cauliflower, peppers, or eggplant. Inter-seed into snap beans 10 days before the first harvest of beans. Or drill in cover crops and sow primary crop then kill cover with herbicides.

Consider sowing cover crops after the following crops: corn silage, dry beans, cucumbers, early soybeans, early corn, beets, spinach, carrots, lettuce, and potatoes.

Early planted crops such as carrots, beets, direct seeded cabbage, and early potatoes do not allow sufficient growth of cover crops in spring.

Consider cover crops after corn silage to reduce soil erosion, replace organic matter losses, and capture nitrogen where manure is fall applied.

Consider grass cover crops when a legume, like soybeans, is planned following the cover crop.

Consider legume cover or a green manure crop when a grass crop, like corn, is planned the following year.

Erosion Control:

Aerial seeded and early no-till established cover crops provide more erosion control the year of establishment.

Cover crop sown using conventional tillage for seedbed preparation after mid-October can cause more erosion during the establishment year than if a cover crop was not planted.

To obtain maximum erosion control from cover crops after soybeans or corn, allow them to mature to the specified height per the criteria for erosion control. No-till and mulch-till compliment the use of cover crops for controlling erosion.

Early planted crops such as carrots; beets, direct seeded cabbage, and early potatoes do not allow sufficient growth of cover crops in spring.

Interseeding of cover crops can be used with chemical suppression to reduce wind erosion and plant loss on sand or muck soils. Two rows of spring or winter barley are sown between carrot or onion rows to protect young seedlings from wind abrasion and burial loss.

Disease and Pests

Avoid cover crop species that harbor or carryover potentially damaging diseases or insects.

It is not recommended to plant mustards on the same field for more than two years in a row. Oil seed radish may be susceptible to club root disease or cabbage root maggot and should not be used in a rotation with vegetable crops susceptible to these pests.

Hairy vetch and clovers can serve as a host to the Soybean Cyst Nematode (SCN). Consider alternative cover crops when SCN is a concern in the rotation. Other SCN host plants include: common Mullen, wild mustard, chickweed, pokeweed, canola, purple deadnettle, shepard's purse and field pennycress. *Caution- Hairy Vetch can also be a weed in future wheat*.

For controlling sugar beet cyst nematodes, sow Colonel or Adagio oil seed radish varieties for trap crops after small grain harvest before planting sugar beets. Do not use Daikon or Common oilseed radish varieties as they lack the sugar beet cyst nematode trap crop properties.

For controlling root lesion, dagger or other herbivore nematodes Pacific Gold Mustard is the recommended Brassica cover crop before planting an orchard or potatoes.

Soil Quality

Cover crops may be used to improve site conditions for establishment of perennial species.

Use plant species for enhanced bio-fuel opportunities and replace removed crop residue with cover crops to maintain soil organic matter.

Pollination

Use plant species that enhance forage opportunities for pollinators. Crimson clover and buckwheat make excellent bee forage cover crops.

Grazing Concern

There is potential to kill livestock with prussic acid poisoning and nitrate poisoning from the young growth of Sudan grass and sorghum-Sudan grass hybrids used in rotational grazing or supplemental feeding.

OPERATION, MANAGEMENT AND MAINTAINENCE

Management:

Use weed-free and disease-free seed and establish cover crops by over-seeding, frost seeding, aerial seeding, broadcast seeding, air-flow broadcasting, drilling or manure slurry seeding.

Control growth of the cover crops to reduce competition from volunteer plants and shading.

Control weeds in cover crops by mowing or other pest management techniques.

Control soil moisture depletion by selecting water efficient plant species and terminating the cover crop before excessive transpiration.

Burn-down, chop, mow, or till to kill cover crops when planting corn prior to corn emergence. Cover crops such as rye can produce an alleopathic effect that can slow the germination and growth of corn and other competition. It may be best to kill some grass cover about a week prior to planting the corn to reduce alleopathic effects.

Frost seed legumes into small grain crops, from mid-March to mid-April or drill into small grain stubble after grain harvest

When seeding legumes it is best to inoculate just prior to planting and ensure the proper legume inoculant is used at planting time.

In row crops, over-seeding of legumes or small grains can improve soil tilth. In corn, spray an herbicide in a 10-inch band over the row and then follow by two cultivations. Over-seed cover crops at the second row cultivation. Timing is very important to successfully establishing a cover crop by over-seeding. Sow legumes between corn growth stages V-4 and V-6. Annual ryegrass should be seeded at V-6 to V-8. Small grains (rye) can be aerial seeded just prior to senescence (leaf drop) in soybeans and corn.

Nutrient management

Use deep-rooted species to maximize nutrient recovery.

Fertilize a green manure/cover crop in the spring with a high nitrogen fertilizer for maximum growth ahead of planting high nitrogen demanding vegetable crops. The recovery of the nitrogen applied to a green manure crop will amount to about 40 percent for the first vegetable crop.

Residual nitrogen is likely to be present after a dry season of below normal rainfall. A fall soil nitrate test or stalk nitrate test is recommended to determine the availability of nitrogen, as excess nitrates can be flushed from the soil into tile systems or groundwater. Rye, oil seed radish, or other small grains can capture about 50 percent of the available nitrates and prevent nitrogen losses.

To prevent nitrate leaching after corn/seed corn maturation on sandy soil, especially under irrigation, aerial seed ryegrass/rye in standing corn or broadcast after harvest.

Nitrate leaching can occur after winter wheat. Frost seed red clover or red/sweet clover mixes in mid-March or mid-April to alleviate this problem.

To reduce nitrate leaching and phosphorus runoff from fall manure applications, aerial seed rye/ryegrass or apply rye with liquid manure or oil seed radish (Manure Slurry Seeding). Direct drill rye/ryegrass after harvest.

To reduce nitrate leaching and phosphorus runoff from vegetable crops, broadcast or direct drill oil seed radish, ryegrass, or rye.

To reduce potassium leaching on muck and sandy soils, plant rye or ryegrass cover. Aerial seed cover crops into standing row crops; broadcast seed, and till 2-3 inches deep after harvest; or direct drill into crop residue.

Nitrogen credits from legume cover crops will be accounted for in the nutrient management plan. Credit for nitrogen produced by legumes is to be included in crop nutrient budgets.

Crownvetch can be living mulch in crop rotations with corn, hay, and small grain. See the Penn State University Bulletin, Crownvetch and No-Tillage Crop Production for Soil Erosion Control.

Erosion Control

To increase surface residue cover in no-till, ridge till, or strip till residue management systems seeded with small grain cover crops, delay killing the crop until it reaches a height of 8-10 inches. In mulch-till systems, to achieve the planned percent cover after planting, use secondary tillage only once to prepare a seedbed with adequate cover. Soil finishing combination tools work best for till then plant.

To increase surface residue cover in no-till, ridge till, or strip till residue management systems seeded with legumes as the cover crop, delay killing the cover until it reaches a height of 6-8 inches. In mulch-till systems, limit tillage to two passes (one primary tillage-chisel or deep disking and a secondary tillage pass), or two other trips.

To maintain organic matter in low residue producing crop systems like vegetables, sow Sorghum, Sorghum-Sudan hybrids, Sudan grass, or corn to produce a high level of biomass. Use a rate of nitrogen (100 lbs/ac) to get maximum growth. Kill the cover crop in late summer/early fall with herbicides or shallow tillage and drill a rye cover to increase organic matter and improve soil tilth Alfalfa, sweet clover, rye, ryegrass, and clovers in the crop rotation are excellent choices to help build or maintain organic matter in the soil.

To enhance carbon sequestration, use crop rotations with high residue producing crops such as corn, small grain, or alfalfa; plus no-till or mulch till; plus cover crops; plus straw bedded manure.

Weed and Pest Suppression

Cereal rye and annual ryegrass have alleopathic effects on weed seedlings. Allow rye or ryegrass to reach a minimum 8-inch height before killing with herbicides or tillage to encourage alleopathic effect.

When brassicas are seeded as bio-fumigants a mixture of brown, white and yellow mustard should be planted and allowed to reach green pod stage before incorporation. The goal is to prevent the brassicas from producing viable seed and the soil should be sealed after incorporation to increase the effectiveness of the glucosinolates bio-fumigation.

For long term weed suppression, including on sites to be planted to trees etc. perennials and biennial species can be used.

Michigan Cover Crop Certification Worksheet

Note: Yellow areas indicate required data. Blue areas indicate optional data.

Name:
Program:
Address:
Contract #:
Field No.:
Contract Item No.:
Section: **Township:** **Range:** **Acres:**

Indicate the decision-maker's objective(s) for applying cover crop, in priority order (1, 2, 3,etc.)

Reduce Erosion
Biological Nitrogen Fixation
Pest Suppression
Increase Soil Organic Matter
Increase Biodiversity
Utilize Excess Soil Moisture
Minimize or Reduce Soil Compaction
Capture Nutrients
Reduce Crop Abrasion
Other______________________

Cover Crop Certification Worksheet

Name: ______________________
Program: ______________________
Address: ______________________
Contract #: ______________________
Site location: ______________________
Contract Item #: ______________________
Section: **Township:** **Range:** **Acres Planted:**

Instructions: Document producer's actual cover crop planting information below. Attach or include photos of the cover

Species	Total	Plants per
Total Lbs:	**0**	

Practice Check Out Conditions

Site Preparation:

Fertility Used:

Date Planted:

Planting Depth: ______ **inches**

Planting Method: **Drilled** **Broadcast** **Aerial** (circle one)

Weed Control (chemical/mechanical):

Termination Method:

Cover Crop Height at Termination: ______ **inches**

Irrigated: **Yes** **No**
(circle one)

Notes and Comments:

____
Producer Signature

____
Date

I certify that the above information **does / does not** meet NRCS specifications for design and installation.

____
NRCS Signature

____
Date

Planner:			**Date:**
Name:		**Program**	
Address:		**Contract #**	
Field No.:		**Item #**	
Section:	**Twp:**	**Range:**	**Acres:**

Conservation Planning

Primary Crop		Soil Type	
Fertilizer Rate		Existing SCI	
Seeding Method		Planned SCI	
Termination Method		Δ Erosion	

Drilled	**Life***	**1000seeds**	**lb/ac**	2	**Cost**	**Cost**	**1000Seeds**
Species	**Cycle**	**/Pound**	***alone***	**SPECIES**	**/ lb.**	**/ac**	/acre
Legumes				**LB/AC**			
☐ Alfalfa	p	220	9 to 25	0.0	*5.49*	$ -	0
☐ Alfalfa Non-Dormant	a	220	12 to 16	0.0	*2.50*	$ -	0
☐ Alsike Clover	b/p	680	6 to 8	0.0	*3.99*	$ -	0
☐ Annual Medic	a	300	10 to 39	0.0	2.00	$ -	0
☐ Berseem Clover	sa	200	9 to 20	0.0	1.49	$ -	0
☐ Birdsfoot Trefoil	p	375	5 to 6	0.0	*4.99*	$ -	0
☐ Crimson Clover	sa	140	10 to 15	0.0	3.99	$ -	0
☐ Cowpeas	sa	3	45 to 60	0.0	*0.85*	$ -	0
☐ Field (W) Peas	a	3	60 to 90	0.0	*1.49*	$ -	0
☐ Hairy Vetch	p	20	15 to 22	0.0	*4.00*	$ -	0
☐ Ladino Clover	p	800	2 to 6	0.0	*5.49*	$ -	0
☐ Red Clover	p	280	8 to 12	0.0	*3.99*	$ -	0
☐ Soybeans	a	5	45 to 60	0.0	*2.99*	$ -	0
☐ Sweet Clover	b/p	260	6 to 10	0.0	*3.50*	$ -	0
☐ White Clover	p	800	2 to 6	0.0	*4.99*	$ -	0
☐ 60/40 SWC	b/p	270	8 to 12	0.0	*3.25*	$ -	0
☑ 80/20 SWC	b/p	216	8 to 12	7.0	*3.25*	$ 22.75	1512
Non legumes			***alone***	**LB/AC**			
☑ Annual Ryegrass	a	227	20 to 30	12.5	*0.50*	$ 6.25	2838
☐ Winter Barley	a	14	60 to 150	0.0	*0.25*	$ -	0
☐ Buckwheat	a	20	45 to 60	0.0	1.99	$ -	0
☐ Winter Cereal Rye	a	18	28 to 170	0.0	*0.50*	$ -	0
☐ Japanese Millet	a	86	20 to 25	0.0	*1.00*	$ -	0
☐ Pearl Millet	a	86	20 to 25	0.0	*1.00*	$ -	0
☐ Oats	a	13	30 to 100	0.0	*0.50*	$ -	0
☐ Sunflower	a	7	5 to 10	0.0	*0.45*	$ -	0
☐ Sudan Grass	a	55	25 to 30	0.0	*1.99*	$ -	0
☐ Winter Triticale	a	13	60 to 150	0.0	*0.21*	$ -	0
☐ Winter Wheat	a	12	60 to 150	0.0	*0.50*	$ -	0
Brassicas			***alone***	**Lbs/ac**			
☐ Dwarf Essex Rape	a	157	2 TO 5	0.0	*1.10*	$ -	0
☐ Forage Rape	a	270	2 TO 5	0.0	*3.99*	$ -	0
☐ Forage Turnip	a	270	1 TO 4	0.0	*3.99*	$ -	0
☐ Oilseed Radish	a	34	5 to 12	0.0	*3.99*	$ -	0
☐ Mustard	a	157	4 TO 8	0.0	*3.50*	$ -	0
Total				**Mix #/acre**		Mix $/acre	Seed/sqft
				19.5		$ 29.00	100

Line 41 OSR	sow only 1 lb/ac where P loss is a concern
*Life Cycle	p= Perennial a=Annual sa=Semiannual b/p=Biannual/Perrenial