

Indiana - August 2008 (ver. 1.1)

Indiana GUIDE SHEET

Prolonged flooding can be devastating to cropland soils. Flood waters can scour/erode top soil, destroy soil structure and tilth, and kill all beneficial soil organisms.

Adding cover crops into crop rotations is one of the quickest ways to restore soil quality benefits in fields that were damaged by floods, and will help prepare the field for following crops.



A key concept is to ensure that vegetation is green and growing during all times of the year. Cover crops are essential during summer months when primary crops aren't feasible (such as when crops are damaged and it's too late for replanting) and during the fall/winter months following harvest.

Loss of Topsoil: As excessive flood waters cut across fields, the top soil may be removed from scouring and erosion. With the productive topsoil gone, so too are the nutrients, organic matter, and soil biology. It can take years to rebuild topsoil, but by adding high biomass crops into the rotation, topsoil will rebuild quicker. Cover crops, along with primary row crops – especially if no-tilled, will add organic biomass both above and below ground to rebuild topsoil quicker than using row crops alone.

Soil Structure and Compaction: The weight of flood waters along with the saturated conditions destroys soil macro-pores and soil organisms that create soil structure. Under these conditions, the soils are also very subject to compaction, crusting, and high bulk density problems. Many post-flood field activities used to re-establish crops (re-planting, tillage, grading/shaping/leveling, etc.) have the potential to further compound soil structure problems.

Whether used alone or in conjunction with other compaction remediation activities (such as deep tillage), cover crops are essential to rebuild healthy soil structure. The roots of cover crops help to penetrate compacted zones, they hold soil aggregates together, and help sustain healthy organisms to restore soil structure. The above-ground biomass of cover crops will help protect the damaged soil from the forces of rain water and will also help reduce erosion.

Loss of Soil Biology: Many flood-damaged fields may experience “Post flood” or “fallow syndrome”. The symptoms may not occur until the following crop is planted. The symptoms are usually nutrient deficiency symptoms (particularly phosphorus and zinc) - severe stunting, purple or light green color, and poorly developed roots. Cause of this “fallow syndrome” appears to be loss of soil biology as a result of flooding, particularly the mycorrhizae fungi.

Cover crops help the soil regain its biological properties. The roots of cover crops re-establish the mycorrhizae in the soil, a key component to restoring the soil's functional properties. Cover crops also protect against erosion, build organic matter, and can sequester nutrients back to the soil to assist the beneficial organisms to recover.

Establishing a cover crop in conjunction with manure application, compost, or other sources of organic bio-mass will provide a greater total benefit. These amendments will boost the fertility and biological activity of the soil while the living cover crop will jumpstart nutrient cycling and protect against runoff and leaching. This results in a more rapid gain in soil biomass and a higher nutrient availability for subsequent crops.

Cover Crop Species Guidance:

Legumes (whether a cover crop or primary crop in the rotation) can add substantially more than grasses in terms of soil biology/biota restoration and are strongly encouraged on damaged soils alone or in mixtures.

One of the challenges for these mid-summer seedings is the timeliness of rainfall after seeding for germination. It is best if the seed is drilled. This will also address concern about scoured soil (and sediment deposits) and seed-to-soil contact.

Cover crop management in flooded fields should focus on maximizing both above and below-ground biomass and encouraging nutrient cycling as deep in the soil profile as possible. Therefore, cover crops should not be harvested for forage or grain (which would remove the organic matter benefits), and they should be killed (if needed) prior to seed-head formation (to ensuring rapid decomposition and leaving more nutrients in the below-ground plant material so that the nutrients will be available to soil organisms and subsequent crops).

Make sure all legume seed is inoculated.

Use the following tables and or the Indiana NRCS 340-Cover Crop and 313-Waste Utilization Practice Standards and job sheets, which can be found in the eFOTG at: <http://www.nrcs.usda.gov/technical/efotg/>

Summer Cover Crops

Plant Species	Seeding Rate (lbs/Ac of PLS ¹)	Seeding Dates	
		North of I-70	South of I-70
Spring Oats ³	60	3/15 to 5/31	3/1 to 5/15
Annual Ryegrass	15 - 20	3/15 to 6/15	3/1 to 5/31
Sudangrass & Sorghum- Sudangrass	20	5/15 to 6/15	5/1 to 5/31
Red Clover ⁴ (spring seeded)	3 - 6	3/15 to 5/31	3/1 to 5/15
Red Clover ⁴ (Frost-seeded into fall planted small grains)	4 - 6	12/15 to 3/15	12/15 to 2/15
Buckwheat	30 - 50	6/15 to 7/15	7/1 to 8/1
Millet	15	5/15 to 7/15	5/1 to 8/1

Winter Cover Crops

Plant Species	Seeding Rate (lbs/Ac of PLS ^{1,3})	Seeding Dates	
		North of I-70	South of I-70
Annual Ryegrass	15 - 20	8/15 to 10/1	8/15 to 10/10
<u>Cereal Grains</u> ³			
Cereal Rye ³	56 - 84	8/1 to 10/31	8/15 to 11/10
Winter Wheat ²³	60 - 90	FFD ² to 10/15	FFD ² to 10/31
Spring Oats ³	32 - 48	8/15 to 9/15	8/15 to 9/30
Winter Triticale ³	75	8/1 to 10/15	8/15 to 10/31
<u>Legumes</u> ⁴			
Hairy Vetch	30	8/1 to 9/15	8/1 to 9/30
Field Peas/ Winter Peas	50 drilled, 70-90 broadcast	8/1 to 9/15	8/1 to 9/30
Cow Peas	40 drilled, 70-90 broadcast	7/1 to 9/1	7/1 to 8/15
<u>Mixtures:</u>			
Hairy Vetch and Cereal Rye	20/40	8/15 to 9/15	8/15 to 9/30
Spring Oats and Brassicas	40/3-8	8/15 to 9/15	8/15 to 9/30
<u>Other:</u>			
Brassicas-Rape/Canola/Turnips	4 drilled, 8 broadcast	8/15 to 9/15	8/1 to 9/30
Oil Seed Radish	10 drilled, 12 broadcast	8/15 to 9/15	8/1 to 9/30

¹ Pure Live Seed (PLS) ² Not to be planted prior to Fly Free Date (FFD).

² Not to be planted prior to Fly Free Date (FFD)

³ Use the upper seeding rates of bulk seed for cereal grains that are cleaned but not certified.

⁴ Seed size can vary greatly. Rate can be adjusted up for large seed and down for small. Inoculate seed.

Additional References:

Indiana NRCS Agronomy page:

<http://www.in.nrcs.usda.gov/technical/agronomy/Indiana%20Agronomy%20Resources/Agronomy%20Resources.html>

Purdue University Cooperative Extension Service References:

Considerations for Replanting Soybean in Drowned out Corn Fields

[Johnson & Nice, 2008](#);

Effects of Flooding or Ponding on Young Corn [Nielsen, 2008a](#);

Recent Weather May Promote Unusual Disease Problems in Corn [Shaner, 2008](#);

Tillage System Choices for June Planting or Replanting after Flooding [Vyn, 2008](#).

Sustainable Agriculture Research and Education (SARE):

Managing Cover Crops Profitably <http://www.sare.org/publications/>

Natural Resources Conservation Service - Field Office Technical Guide (eFOTG):

<http://efotg.nrcs.usda.gov/treemenuFS.aspx>

Post Flood and Fallow Syndrome Examined, Paul Carter, Pioneer Hi-Bred International, Inc., and Dan Wiersma, University of Wisconsin.

USDA Agriculture Research Service, Soil Tilth Lab, Ames, IA

Seeding Recommendations of Vegetative Cover Post Flooding, 2008. Singer, 2008.