PHASE 6 COVER CROPS EXPERT PANEL

JUNE 16, 2016

IDENTITY AND EXPERTISE OF PANEL MEMBERS

Name	Affiliation	Role
Ken Staver	University of Maryland	Panel Chair
Charlie White	Penn State University	Panel Member
Jack Meisinger	USDA – Agriculture Research Service	Panel Member
Paul Salon	USDA-Natural Resources Conservation Service	Panel Member
Wade Thomason	Virginia Tech	Panel Member
Jason Keppler	Maryland Department of Agriculture	Watershed Technical Workgroup representative
David Wood	Chesapeake Bay Program Office	Modeling Team representative

Technical support provided by Mark Dubin (University of Maryland), Lindsey Gordon (CRC Staffer), and Don Meals (Tetra Tech).

PRACTICE NAME(S)

- Traditional Cover Crops
- Commodity Cover Crops

DEFINITION OF THE PRACTICE

The Traditional Cover Crops BMP previously has been defined as a crop grown after the main cropping season to reduce nutrient losses to ground and surface water by sequestering soluble nutrients and reducing soil erosion. Previously, no additional nutrient applications have been permitted, and the cover crop is terminated without harvesting. Because design of manure storage structures typically is not for a full year of production, fall manure applications are known to occur in the Chesapeake Bay watershed, especially associated with semi-solid and liquid manures; (e.g. dairy production). It also is known that winter cover crops can play a critical role in reducing nutrient losses from these fall applications. To account for this potential impact of cover crops, the panel is recommending to add an additional management modifier to the Traditional Cover Crops BMP; (e.g. species, planting date, planting method, etc.) that will apply to crop land receiving a fall

manure application. The following traditional cover crop species have associated N, P, and sediment reduction efficiencies in the Phase 5.3.2 model:

- Rye
- Wheat
- Barley
- Annual Ryegrass
- Annual Legumes
- Annual Legume plus Grass Mixtures
- Brassica (winter hardy)
- Forage Radish
- Forage Radish plus Grass Mixtures
- Triticale
- Oats (winter hardy)
- Oats (winter killed)

The Phase 5.3.2 Cover Crops Panel did an in depth review of the literature to determine relative effects on nitrate leaching of various cover crop management options including species, planting date, and planting method, as well as the physiographic region that affects the relative importance of groundwater versus surface runoff flow paths. Major changes in values determined by that panel are not anticipated as this report was just finalized in 2015 Since the matrix of values developed by the 5.3.2 panel describes the relative effectiveness of various cover crop options on N leaching, this Panel also intends to address surface losses associated cover crops N, P, and sediment effectiveness values. Cover crop effects on surface runoff N, P and sediment have been much less studied in the Bay watershed and were not determined by the previous panel. This Panel will continue to explore modeling approaches for estimating cover crop effects on surface runoff nutrient and sediment losses.

While ideally manure is not applied on cropland in the fall, because manure storage structures for non-stackable manure generally are not designed to hold 365 days of production, manure is applied to significant crop land areas in the bay watershed in late summer and early fall. These situations are prone to high nitrate losses, and cover crops have been shown to be useful for reducing those losses. For harvested crops in the following year, either for forage or grain, winter cereals following fall manure applications are reported through the USDA-NASS annual reports and five-year Agricultural Census, which allows current modeling approaches to explicitly simulate nutrient uptake and surface cover during the winter months. However, winter cereals that are planted following fall manure applications that are not harvested in the following year are typically not captured in reporting, and are currently not considered to be a cover crop BMP even though they can greatly reduce the nutrient losses associated with unavoidable fall manure applications. For example, Maryland currently provides cost share funds and tracks cover crop planting on cropland where fall manure application is unavoidable. However, these acres are not reported to the Bay Program because currently this use of cover crops is not recognized as a BMP.

The Commodity Cover Crops BMP is currently defined as a modification of winter cereal grain production to reduce nutrient losses to ground and surface water by scavenging soil nutrients and delaying nutrient applications until close to the period of peak uptake the following spring. N and P nutrients are not allowed to be applied in the fall, however additional N and P nutrients can be applied in the spring after March 1, and commodity cover crops can be harvested for either forage or grain production. This panel is only going to consider the effects of elimination of the fall N and P nutrient applications since the baseline nutrient application practices after January 1 are not well quantified historically, and studies are very limited regarding how these adjustments would affect nitrate leaching losses.

In addition, the Nutrient Management Panel will be considering adjustments in N applications to winter cereals for harvest within the calendar year of winter cereal land uses that have been proposed for the Phase 6 model. Although the Commodity Cover Crops BMP mechanistically provides the same fall soil scavenging benefit as the Traditional Cover Crop BMP, an important distinction is that the baseline for Traditional Cover Crops is a winter fallow condition, while for the Commodity Cover Crops the baseline is winter cereal production with standard fall nutrient applications application. The following commodity cover crops have an associated N reduction efficiency: rye, wheat, and barley. This Panel recommends adding triticale to that existing list of recognized species.

A complicating factor for the Commodity Cover Crop practice in the Phase 6 model is that currently proposed land uses do not represent the fall establishment portion of the winter cereal grain production cycle. This panel is proposing that the Commodity Cover Crop BMP reduction be applied to the land uses where winter cereals for harvest are planted, primarily corn and soybean land uses. It is the fall soil residual nitrate in these land uses that winter cereal grains scavenge and prevent from being lost to groundwater. The panel will use the same general approach as described above for the fall manure application, in that the 5.3.2 matrix of efficiency values developed for Traditional Cover Crops will be the basis since it describes the relative nitrate leaching reduction benefit of various winter cereal planting options. It is anticipated that the matrix values will be reduced by some consistent value since only reduction in nitrate leaching losses due to elimination of fall N applications will be considered.

QUALIFYING PRACTICE CONDITIONS

Fall application of N and P nutrients currently disqualifies a winter cereal crop from consideration as a either a Traditional or Commodity Cover Crop BMP, but as discussed above, the Panel will modify the 5.3.2 N reduction matrix to represent the condition where cover crops are used to reduce N and P losses in settings where fall manure application cannot be prevented. This additional fall manure application modifier will be eligible only for the Traditional Cover Crops BMP and not the Commodity Cover Crops BMP.

PRACTICE MODEL SIMULATION DESCRIPTION

Traditional cover crops will be represented as annual efficiency practice on all eligible row crop land uses. The Panel is considering how best to represent water quality improvements related to Commodity Cover Crops, but is proposing that N and P reduction efficiencies be applied to the land uses where the cover crops are established in the fall. Both Traditional and Commodity Cover crops are annual practices.

LAND USES TO WHICH THE PRACTICE IS APPLIED

Traditional and Commodity Cover Crop practices apply to the following partnership approved Phase 6 agricultural land uses with the following applications:

- Traditional Cover Crops are applicable to all row crop land that do not include a fall planted crop that overwinters for harvest the following year. Since cover crops can be planted

following the fall harvest of double cropped systems, double cropped systems are also eligible for applying Traditional Cover Crop BMPs.

- Commodity Cover Crops also are applicable to all row crop land uses that do not include a fall planted crop that overwinters (e.g. spinach) representing double cropped eligible row crops. This is based on the proposal that the N and P reduction efficiencies are being applied to the cover crop establishment year land use; e.g. corn, soybeans, etc.

Land Use	Description
Full Season Soybeans	Soybeans ineligible for double cropping
Grain with Manure	Corn or sorghum for grain eligible for manure application and ineligible for double cropping
Grain without Manure	Corn or sorghum for grain ineligible for manure application and ineligible for double cropping
Silage with Manure	Corn or sorghum for silage eligible for manure application and ineligible for double cropping
Silage without Manure	Corn or sorghum for silage ineligible for manure application and ineligible for double cropping
Small Grains and Grains	Small grains and grains other than corn or sorghum eligible for manure and ineligible for double cropping
Small Grains and Soybeans	Soybeans double cropped with small grains and ineligible for manure
Specialty Crop High	Specialty crops with relatively high nutrient inputs with some crops eligible for manure
Specialty Crop Low	Specialty crops with relatively low nutrient inputs with some crops eligible for manure
Other Agronomic Crops	Other high commodity row crops such as tobacco, cotton, etc., with some crops eligible for manure

UNIT OF MEASURE

Cover crops can be reported in acres or percentage of acres implementing the practice.

LOCATIONS WITHIN THE CHESAPEAKE BAY WATERSHED WHERE THIS PRACTICE IS APPLICABLE

Cover crops can be applied to specified land uses everywhere within the Chesapeake Bay watershed. Opportunities for adequate establishment and growth of both traditional and commodity cover crops may diminish in northern regions of the watershed due to shorter growing season.

The Panel is considering a heat unit approach as a way to normalize planting times across the watershed. Historically, first frost dates for growth regions have been utilized for defining

efficiencies for both Traditional and Commodity Cover Crops. The Panel is proposing to retain this definition, but also provide a heat unit approach to address yearly variability of weather conditions, as well as climate change.

Potential Methods to Estimate Historic Implementation Units

Identification of potential methods to estimate historical cover crops – especially commodity cover crops – is challenging. The Panel has discussed the fact that baseline conditions with respect to cover crops have never been fully laid out. Over the last several decades, changes in crop varieties, crop yields, the amount of N recommended or applied, the timing of nutrient applications, and tillage practices have changed so significantly that establishing historical cover crop implementation has been difficult.

Potential for Panel adjustments in final report

The Panel is generally satisfied with the basic definition of a cover crop and with the recommended nutrient reduction efficiencies reported in Phase 5.3.2. This Panel will add a subcategory modifier to the 5.3.2 table to address the impact of traditional cover crops on cropland receiving unavoidable fall manure applications. In addition, the Panel notes that the Phase 5.3.2 EP evaluated the reduction efficiencies of individual species primarily as pure stands, with only a simplistic averaging approach to estimating efficiencies of mixed cover crop stands. The Phase 6 EP intends to apply current research data to improve estimates of nutrient reduction efficiencies for mixed-species cover crops.

The Panel also recognizes that data on P reduction efficiency of cover cropping is scarce and that it be would be difficult to model cover crop effects on P losses without assumptions about soil test P levels to accompany soil loss modeling. As a result, the Panel may choose to not present any new recommendations for P reduction efficiencies after consideration of field-scale modeling options.