Soil Quality Enhancement Activity – SQL01 – Controlled traffic system

**Enhancement Description**
Controlled traffic confines heavy traffic from tractor drive wheels/tracks, combine wheels, fertilizer or manure spreaders and grain carts to specific lanes in crop fields year after year.

**Land Use Applicability**
Crop

**Benefits**
Controlled traffic systems will reduce soil compaction, increase infiltration, and improve crop yields. Additional benefits include reductions in erosion, runoff and sedimentation as well as energy savings as the need for sub-soiling decreases and firm traffic tracks form for better traction.

**Conditions Where Enhancement Applies**
This enhancement applies to all annually planted crop land use acres.

**Criteria**
Implementation of this enhancement requires the use of a controlled traffic system on annually planted cropland that includes the following:
1. Limit wheel/track traffic to no more 50 percent of the row middles or a maximum of 50 percent of the area of the field.
2. Wheel/track traffic is in the same lanes for all passes, all equipment and years.
3. No tire or rubber track that is greater than 26 inches wide (for 30-inch rows). For 20-inch or 15-inch rows, use skip rows to provide space for primary tracks (36-inch maximum width tires/tracks for a 40-inch space).

The minimum components required to maintain the controlled traffic system enhancement activity are:
1. All equipment must cover the same width or multiples of that width (See Figure 1),
2. Number of traffic lanes are minimized (See Table 1),
3. For full width tillage Geographic Positioning System (GPS) is required to maintain the designated traffic lanes,
4. For narrow width or drilled crops, a skip row system or GPS is required, and
5. Do not deep till (> 4 inches) the controlled traffic paths.

**Adoption Requirements**
This enhancement is considered adopted when all three of the criteria above have been implemented on the land use acre.
Documentation Requirements
A description of the controlled traffic system that includes:
1. List of fields with controlled traffic system,
2. Crops rotation for the fields,
3. Equipment used,
4. Row spacing and number of planter units,
5. Planting width for drills,
6. Wheel/track spacing and operational width for tractors, combines, grain carts, harvesters, sprayers, manure spreaders, etc. Tires on planters and drill can be ignored, and
7. Sketch of the traffic paths and wheel/track spacing.

Figure 1. Example of Wheel/Track Spacing and Paths Using Multiples of the Basic Width (units are in inches or number of rows):
Situation: 12 row planters with 30 inch rows for corn, 15 foot grain drill, and 6 row corn head on combine, 30 foot grain table on combine, 15 foot tillage tools.
1. If 2 or more tillage operations have the same width and tractor tire configuration the operations are only entered once.
2. If 2 or more combine/harvesting operations have the same width and tire configuration the operation is only entered once.

Note: The 6 row corn head begins by taking the center 6 rows of the 12 row configuration, then harvesting the three outside rows along with 3 outside rows from the adjacent planter pass. This reduces the number of row middles receiving wheel traffic (down to 33% in this example). This applies for any system where the combine is one-half the planter width.
Table 1. Examples of traffic patterns for controlled traffic systems.

<table>
<thead>
<tr>
<th>Number of rows</th>
<th>Tractor (in)</th>
<th>Combine (in)</th>
<th>Number of paths</th>
<th>% Trafficked</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Assumes 20” tires</td>
</tr>
<tr>
<td>30” row spacing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>60</td>
<td>120</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>6</td>
<td>120</td>
<td>120</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>8</td>
<td>120</td>
<td>120</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>8</td>
<td>60 &amp; 120</td>
<td>120 &amp; 180</td>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>12</td>
<td>60 &amp; 120</td>
<td>120 (6-row)</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>16</td>
<td>60 &amp; 120</td>
<td>120 &amp; 180 (8-row)</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>24</td>
<td>60 &amp; 120</td>
<td>120 &amp; 180 (12-row)</td>
<td>12</td>
<td>33</td>
</tr>
<tr>
<td>36” row spacing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>72</td>
<td>144</td>
<td>4</td>
<td>37</td>
</tr>
<tr>
<td>8</td>
<td>72</td>
<td>144</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>12</td>
<td>72</td>
<td>144</td>
<td>4</td>
<td>18</td>
</tr>
</tbody>
</table>

Note: In the first scenario (line 1), the tractor tire spacing is 60 inches and the combine tire spacing is 120 inches. Each set of six rows has four tire paths. By increasing the tractor tire spacing to match the combine tire spacing, (lines 2 and 3) the number of paths and area trafficked are cut in half.

References


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This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.
**Soil Quality Enhancement Activity – SQL04 – Use of cover crop mixes**

**Enhancement Description**
This enhancement is for the use of cover crop mixes that contain two (2) or more different species of cover crops or cultivars of a single species.

**Land Use Applicability**
Crop

**Benefits**
The use of a cover crop mixture that contains two (2) or more species is often more effective than a planting of single species cover crop. Cover crop mixtures adapt to variation in soils, increase biomass production, provide broader spectrum of weed control, have better winter survival and ground cover and attract a range of beneficial insects. Nutrients can be trapped or produced depending on existing soil conditions and plants used. Mixes can be a grass/legume, multiple cultivars of a single species, or a mix containing plants with different growth patterns, e.g. fast and slow, tall and short.

**Conditions Where Enhancement Applies**
This enhancement applies to all crop land use acres (excluding permanent hayland).

**Criteria**
1. Cover crop mixes must contain a minimum of two (2) different plant species or two (2) different cultivars of a single species with differing maturity dates.
2. Cover crop species will be selected from state specific lists. The list of approved cover crops is available at the local NRCS Field Office.
3. Crops planted following cover crop must be no-tilled.
4. Nutrient applications for crops following cover crop should consider nitrogen fixation from leguminous cover crops.

**Adoption Requirements**
This enhancement is considered adopted when two different plant species or cultivars of a single species are being grown on the land use acre.

**Documentation Requirements**
1. Written documentation for each year describing, in detail, the following items:
   a. Cover crop species used and dated planted,
   b. Date and amount of fertilizer applied,
   c. Method to kill cover crop and date completed, and
   d. Crop planted after cover crop and method used.
2. A map showing fields where the enhancement is applied.
3. Photographs of a representative number of fields showing cover crop mix.
References

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See Wisconsin Agronomy Technical Note 7 for cover crop species:


Record seeding rate and establishment method for each cover crop.

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.
Soil Quality Enhancement Activity – SQL05 – Use of deep rooted crops to break up soil compaction

Enhancement Description
This enhancement is for the use of deep rooted crops to break up compacted soils and improve soil quality. Deep rooted crops can be perennial plants like alfalfa or annual plants like forage radish.

Land Use Applicability
Crop

Benefits
Soils can have naturally occurring compacted layers (hard pans) or those that have been created through tillage or other farming activities. Deep rooted crops with large taproots can alleviate the effects of soil compaction by penetrating the compacted layer, creating pore space that allows air, water and crop roots to penetrate deeper in the soil profile. Eliminating soil compaction through the use of deep rooted crops increases infiltration, reduces surface runoff, improves soil tilth and overall soil quality. It also eliminates the need for sub-soiling with a plow, thus saving fuel, reducing erosion and enhancing water quality.

Conditions Where Enhancement Applies
This enhancement applies to all crop land use acres.

Criteria
1. The selected crop must be one that has been identified as having the capability of alleviating soil compaction. State specific lists are available at your local NRCS Field Office.
2. If perennial plants are used and once established, they must be maintained annually by proper fertilization and mowing/harvesting.
3. Annual crops should be seeded early enough in the fall to allow for adequate growth to occur prior to winter. Follow specifications provide by your local NRCS Field Office.
4. No deep tillage is allowed to remove compacted layer.

Adoption Requirements
This enhancement is considered adopted when the selected deep rooted cover crop has been grown in a given rotation on the land use acre.

Documentation Requirements
1. Written documentation for each year describing the following items:
   a. Deep rooted crop(s) used and dated planted.
b. Cash crop planted and method used.
2. A map showing fields where the enhancement is applied.
3. Photographs of a representative number of fields showing deep rooted crops.

References


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Suitable cover crop species include: Alfalfa, Sorghum Sudangrass, Tillage Radishes and other species with prior approval from NRCS.

Follow Wisconsin NRCS Conservation Practice Standard 340 (Cover Crop) and Wisconsin Agronomy Technical Note 7:


Record seeding rate and establishment method for each cover crop.

This is a ‘System’ type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.
Soil Quality Enhancement Activity – SQL08 – Intercropping to improve soil quality and increase biodiversity

Enhancement Description
This enhancement involves the use of intercropping principles (i.e., growing two or more crops in close proximity to each other during part or all of their life cycles) to promote interactions that improve soil and water quality via increased biodiversity and contribute to pest management.

Land Use Applicability
Crop

Benefits
Incorporating intercropping principles into an agricultural operation increases diversity and interaction between plants, arthropods, mammals, birds and microorganisms resulting in a more stable crop-ecosystem and a more efficient use of space, water, sunlight and nutrients. Furthermore, soil health is benefited by increasing ground coverage with living vegetation, which reduces erosion, and by increasing the quantity and diversity of root exudates, which enhance soil fauna. This collaborative type of crop management mimics nature and is subject to fewer pest outbreaks, improved nutrient cycling and crop nutrient uptake, and increased water infiltration and moisture retention. Soil quality, water quality and wildlife habitat all benefit.

Conditions Where Enhancement Applies
This enhancement applies to all crop land use acres (excluding permanent hayland).

Criteria
One or more of the following intercropping systems shall be used. Systems can be mixed during the contract period allowing for within year diversity on the same field.

1. Relay intercropping – grow two or more crops on the same field with the planting of the second crop after the first one (e.g., over seeding of a clover cover crop into cotton during defoliation; planting of clover at lay by time in corn).
2. Row intercropping – grow two or more crops simultaneously in the same field with at least one crop planted in rows (e.g., planting corn in the rows and interseeding sorghum between the rows, harvesting all as silage; plant vegetables, cereal grains, perennial covers or annual covers between orchard tree rows).
3. Strip intercropping – grow crops in alternate strips wide enough to permit separate crop production machinery, but close enough for crops to interact (e.g., planting alternating strips of corn and soybeans 6 rows each or alternating strips of corn and Sudan grass). Generally, the maximum width of individual strips for effective interaction of crop pests and their...
natural enemies is about 30 ft. Note: this criterion is not the same as NRCS Conservation Practice Stripcropping Code 585.

Considerations for system design:
1. Adjustments in plant density to avoid overcrowding.
2. Maturity dates and/or development periods to maximize use of nutrients, water and other resources.
3. Combining deep and shallow rooted crops to optimize use of soil moisture and nutrients
4. Utilizing complementary plant structures and crop heights to:
   a. provide support for others to grow (e.g., corn supporting climbing beans),
   b. provide partial shade and a cooler micro-climate for the other (e.g., lettuce and other greens between rows of taller crops),
   c. low-growing living mulch between rows of taller crops to control erosion, reduce soil displacement onto fruit, or suppress weeds.
5. Intercropping a legume with a nitrogen requiring crop to reduce fertilizer N requirements of the system,
6. Adjustments in nutrient application rates to account for nutrients being supplied (e.g., sequestered N from legume sources), recycled or consumed by the components of the intercropping system used,
7. Companion crops that provide food or habitat for natural enemies of key pests of the production crop(s), and
8. Companion crops that serve as alternate hosts of pests of production crops.

Adoption Requirements
This enhancement is considered adopted when one or more of the three listed intercropping systems in the criteria above have been implemented on the crop land use acre where this enhancement applies.

Documentation Requirements
1. Written documentation for each year describing by field:
   a. Intercropping system(s) used
   b. Crops planted
2. A map showing fields where enhancement was applied
3. Photographs of one or more representative number of fields showing the intercropping system(s) used.

References

Wisconsin Supplement 12/30/2013

This is a ‘System’ type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.
Soil Quality Enhancement Activity – SQL09 – Conversion of cropped land to grass-based agriculture

Enhancement Description
Conversion of cropped land to grass-based agriculture is the establishment of mixtures of perennial grasses, forbs and legume species on cropland where annually-seeded cash crops have been grown in monocultures. Select perennial species based on species compatibility, forage quality potential, improvements to soil quality, beneficial effects for wildlife and/or production of biomass.

Landuse Applicability
Crop

Benefits
Perennial plants maintain a living root system throughout the year that provides habitat and organic exudates (food) for soil biota responsible for decomposition and nutrient cycling. Perennials provide soil cover for most of the year and are managed with little or no physical disturbance of the soil. High plant biomass production contributes to increased soil organic matter accumulation. Plant mixtures provide diversity in plant structure, soil cover that moderates soil temperature extremes, rooting depths that improve soil structure and residue quality that stimulates microbial activity. The combination of these factors results in improved soil quality, reduced runoff and erosion and improved water quality.

Many species of birds and animals, including song birds, quail, turkey, pheasants, deer and rabbits, use grasslands as cover and nesting areas, to find food and to rear their young. Managing grassland harvesting techniques can be beneficial to the survival of ground nesting birds and other wildlife species. Altering harvesting patterns can provide escape routes for hens, hens with broods, and hiding fawns. Delaying harvest or leaving portions of a field unharvested can provide nesting habitat. When grassland management and harvesting schedules are planned to alleviate man-made pressures on wildlife, high biomass producing, perennial species can provide desirable habitat for wildlife populations.

Conditions Where Enhancement Applies
This enhancement applies to cropland that is currently in annual crop production. It does not apply to cropland that is currently in a permanent perennial crop such as permanent hay, orchards or vineyards.

Criteria
1. Establish perennial grassland species (e.g., switchgrass, big bluestem, indiangrass, eastern gamagrass, etc.) on cropland according to the NRCS Pasture and Hay Planting (512)
conservation practice standard. Plant species listed on the federal, state or local noxious or invasive species list shall not be selected for establishment or planted.

2. Minimize soil erosion and disturbance when establishing perennials by using techniques such as no-till planting, use of nurse crops that germinate quickly and/or the use of suitable erosion control practices.

3. Use seeding mixtures of at least three perennial grasses plus a mixture of three to six perennial forbs and/or perennial legumes. For the perennial forb-legume mixture, the mixture must include at least one perennial forb and one perennial legume.

4. Use plant density observations from multiple areas in the field(s) to confirm successful establishment two years from the planting date; compare the actual to the recommended plant density for the seeding mix and region (e.g., at least 10 plants of the seeded mixture per square yard).

5. If the field will be grazed, a grazing management plan that meets CSP eligibility requirements must be developed and followed.

6. If the field will be harvested for hay or biomass, a harvest plan to enhance wildlife must be developed and followed.

**Adoption Requirements**

This enhancement is considered adopted on each acre when the annually planted cropland acre has been successfully established to the chosen perennial grass species mix.

**Documentation Requirements**

1. Provide a map showing the location of the field(s) that were converted from cropland to grassland.

2. List the species that were included in the planting mix for each field.

3. Provide a record of plant density by species (seeded and volunteer; number of plants/sq yd for each species present) for multiple areas in the field(s) prior to harvest each year.

4. Grazing management plan (as applicable), and

5. Harvest plan (as applicable).

**References**


In lieu of the Pasture and Hay Planting Standard, refer to the Forage and Biomass Planting Practice Standard (512) or Wisconsin Agronomic Technical Note 5 and/or 6:


This is an 'Actual' type enhancement. Actual type enhancements must be installed in the year(s) scheduled in the contract and maintained for the duration of the contract.
Soil Quality Enhancement Activity – SQL10 – Crop management system where crop land acres were recently converted from CRP grass/legume cover or similar perennial vegetation

**Enhancement Description**
Implement a prescriptive crop management system on crop land acres that have been recently converted from CRP grass/legume conservation cover or similar perennial vegetated cover to a rotation of annually planted crops. Note: this enhancement is limited to acres where the conversion event took place not more than 2 years prior (not including hayland).

**Land Use Applicability**
Crop (excluding Hayland)

**Benefits**
CRP grass/legume covered acres or acres with similar perennial vegetated cover that have been recently converted to annually planted crop systems have the potential to lose some or all of the soil health improvements generated from the years of CRP conservation cover. Depending on the new management system being used, the recalcitrant carbon pool in the system could be stable or declining, especially if a form of full width or deep tillage is being used in the new management system. In order to prevent further degradation of the accumulated carbon pool, there is a necessity to implement a crop management system to stabilize or increase these sites as carbon sinks. Utilizing a crop management system on working lands that integrates residue management systems with high residue cover crops will create systems with net carbon inputs and greater conservation benefits than lands that are absent of some degree of residue management.

**Conditions Where Enhancement Applies**
This enhancement only applies to crop land use acres (excluding hayland) that have been converted from CRP grass/legume conservation cover or acres with similar perennial vegetated cover to a rotation of annually planted crops. Note: this enhancement is limited to acres where the conversion event took place not more than 2 years prior.

**Criteria**
Develop a crop rotation on the acres where this enhancement applies that implements each of the following components:
1. Sites where burning of any plant materials have occurred during the last year of the CRP contract or since the termination of the CRP contract, are NOT eligible for this enhancement.
2. For each crop rotation, the average annual Soil Tillage Intensity Rating (STIR) as determined by RUSLE2 must be \( \leq 10 \).
3. All residues must be uniformly distributed over the entire field,
4. No full-width tillage is permitted regardless of the depth of the tillage operation,
5. Field(s) must have a soil loss at or below the one-half soil tolerance (0.5T) level as determined by approved tools for wind and/or water erosion for the crop rotation, and
6. Between each crop in the rotation, except double cropped situations, seed a high residue cover crop or mixture of high residue cover crops. Each cover crop or mixture shall meet the following requirements:
   a. Seed a cover crop or cover crop mixture at a rate and within a planting date range as determined or agreed to by the NRCS State Agronomist.
   b. Cereal grain cover crops or mixtures shall be top dressed with nitrogen at rates determined or agreed to by the NRCS State Agronomist.
   c. The cover crop or mixture shall reach a maturity level (i.e., growth stage) to ensure 100% soil coverage in the row middles for 3 months of the growing season. For example, cereal rye shall reach the soft dough stage before termination. The NRCS State Agronomist can determine a specified maturity level or desired residue quantity (dry matter basis) for the selected cover crop cultivar.
   d. Termination of all cover crops shall be accomplished by chemical methods, non-chemical methods (such as flail mowing or roller crimper), or a combination of both.

Adoption Requirements
The enhancement is considered adopted when all the criteria above has been fully implemented.

Documentation Requirements
Documentation for each field where this enhancement is applied:
1. Planned crop rotation showing cover crops that will be used after low residue crops,
2. Planting method used for each crop in the rotation (no-till, strip till, direct seeding),
3. List of all other potential ground disturbing farming operations,
4. Method of cover crop termination, e.g. chemical, flail mowing, roller crimper, or combination,
5. Dates for farming operations,
6. Map showing fields and acreage, and
7. Photographs of planted crops.

References


**Wisconsin Supplement 12/30/2013**

See Wisconsin Agronomy Technical Note 7 for cover crop species and rates:


Record seeding rate and establishment method for each cover crop.

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.
Soil Quality Enhancement Activity – SQL11 – Cover cropping in orchards, vineyards and other woody perennial horticultural crops

**Enhancement Description**
Grow perennial or annual cover crop mixtures of grass, legumes, native flowering plants and/or other forbs year round to provide soil coverage, organic mulch, beneficial insect habitat, and other conservation benefits in orchards, vineyards or other perennial horticultural crops. Cover crops, once planted, are replanted annually or maintained year after year.

**Land Use Applicability**
Crop

**Benefits**
Maintaining orchard and vineyard floors or row middles of perennial horticultural crops with continuous cover protects the soil resource from erosion, enhances soil quality, reduces compaction and rutting from field operations, and suppresses weeds. Cover crops provide habitat for pollinators and natural enemies of crop pests, fix nitrogen (legumes), and conserve moisture via organic mulch and suppress weeds.

**Conditions Where Enhancement Applies**
This enhancement only applies to acres of orchards, vineyards, and other woody perennial cropping systems.

**Criteria**
1. Plant cover crops in the inter-row spaces to be compatible with optimum yield and quality of the fruit crop. Grow cover crops on a minimum of 60% of the field area year annually. When annual cover crops are used, plant each succeeding cover crop within as soon as possible after termination of the preceding cover. Residue from the previous cover crop must be left on the soil surface until immediately before the next cover crop is planted.
2. Areas near crop rows or young, establishing trees that must be kept free from competing vegetations shall be maintained with organic mulch to control erosion, conserve soil moisture, and sustain soil quality. Select mulching material, application rate, and placement compatible with needs of the production crop. Total soil coverage (living cover + mulch) shall be maintained at a minimum of 85% of the field area. Replenish mulch as needed. Exception: In lieu of using mulch to meet the 85% minimum requirement, the area beyond the 60% minimum shall be seeded to a cover crop for systems where the mulching material would hinder harvest operations.
3. Select and seed cover crop mixtures at rates and within planting date ranges as determined or agreed to by the NRCS State Agronomist. Perennial mixtures must consist of at least two
species from different plant families. Annual cover crops must include at least three species from a minimum of two different plant families.

4. Select a mixtures and sequence of cover crop species to accomplish two or more of the following objectives:
   a. High biomass and root mass to build soil organic matter. Expect at least 2 tons/ac of aboveground biomass annually.
   b. Biologically fixed nitrogen for the production crop. Choose a mixture that will provide sufficient but not excessive amounts of N to the crop. Schedule mowing or termination of the cover to optimize rate and timing of N release for crop needs. Leave clippings near crop rows for desired N delivery.
   c. Mulch generation. Plant mixtures which can be cut periodically to generate mulch material for application to crop rows or areas not protected by living cover.
   d. Weed suppression. Select covers that establish rapidly form a heavy canopy and suppress weeds without competing excessively with the production crop. Schedule mowing of perennial covers to optimize weed control and prevent weed propagation.
   e. Habitat for beneficial insects. Select a mixture of flowering plants based on the habitat needs of key predators or parasitoids to control the most economically important pests of the crop to be protected.
   f. Pollinator habitat. Select a mixture of flowering plants to provide food and habitat for desired pollinators. Time mowing and other management operations to minimize competition for pollinators while the fruit crop is blooming.

Adoption Requirements
This enhancement is considered adopted when cover crop mixture are established and total ground coverage (living cover + organic mulch) reaches 85% of the field area.

Documentation Requirements
1. Cover crop species mix, planting dates, mowing dates and (for annual species) termination dates and methods.
2. Pattern and layout of production and cover crops plus mulch used to document how soil coverage criteria were reached.
3. The accomplished items from “Criteria #4.”
4. Photographs of representative fields showing cover crops added to the rotation, timing and method of cover crop establishment, and cover crop management.
5. Seed and legume inoculant tags and receipts.

References


**Wisconsin Supplement 12/30/2013**

See Wisconsin Agronomy Technical Note 7 for cover crop species and rates:


Record seeding rate and establishment method for each cover crop.

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.
Soil Quality Enhancement Activity – SQL12 – Intensive cover cropping in annual crops

**Enhancement Description**
Grow and manage *seasonal* cover crops of grasses, legumes or forbs to maintain soil coverage and other conservation benefits during all the non-crop production periods in an annual crop rotation. Intensive cover cropping is applicable to conventional, specialty and organic crop production systems.

**Landuse Applicability**
Crop

**Benefits**
Using seasonal cover crops during all non-production periods between annually produced crops reduces wind and water erosion. When managed appropriately for local conditions, cover crops can restore and maintain soil productivity and soil quality over a wide range of climates and crop species. Cover crops restore and maintain soil properties by increasing organic matter, relieving compaction, improving soil tilth and fertility, fixing nitrogen (legumes), recycling nutrients in the soil profile, breaking pest cycles and providing habitat for soil biota, such as beneficial bacteria, mycorrhizal fungi and earthworms.

**Conditions Where Enhancement Applies**
This enhancement applies to all acres of annually planted cropland. These acres can be organic, transitioning to organic, or non-organic.

**Criteria**
Implementation of this enhancement requires the use of cover crops to provide soil coverage during the non-crop production periods of the rotation. To minimize periods of soil exposure, plant cover crops as soon as practical after harvest of each production crop. Use cover crop species appropriate to the season and seeding as well as seeding rates and methods that will yield a uniform stand and rapid ground coverage. Cover crops may be seeded into standing production crops provided seeding rates and methods, soil moisture levels and other environmental conditions are adequate to yield a satisfactory cover crop stand.

For the purposes of this enhancement, the cover crop shall not be harvested or grazed.

Each cover crop in the rotation shall meet the criteria for at least one of the following purposes. Over the duration of the crop rotation, cover crops shall be utilized to meet two or more of the criteria.
1. High bio-mass cover crops for erosion control and increased soil organic matter improvement.
a. Plant a cover crop with a growth potential to produce a minimum of 3,000 lbs/acre (dry weight) above ground bio-mass when terminated by seasonal temperature changes (frost or heat), mechanical action (mowing, tillage, crimping, etc.) and/or herbicides in preparation for the following crop. Use seeding rates and row spacing (for drilled cover crop) that will provide rapid canopy closure and adequate ground coverage to prevent erosion between production crops, with a minimum of 90% cover by the time of cover crop termination.

b. Leave the entire biomass in the field (i.e., do not harvest or graze the cover crop)

c. Growth potential lists and recommended seeding rates and methods for selected cover crops are available in “Managing Cover Crops Profitably, 3rd Edition” (Clark, 2007).

2. Legume cover crops for biological nitrogen fixation.

a. Plant a leguminous cover crop between two primary crops in the rotation. This option does not apply to legumes that are normally part of the crop rotation. The legume shall be seeded at a rate recommended by the NRCS Field Office Technical Guide. Estimate nitrogen credits from the leguminous crop and base any additional N applications according to the guidelines of the Land Grant University, as approved by the NRCS State Agronomist.

b. Manage legume N to minimize N loss. In climates and soils where rapid N mineralization and/or leaching are likely, plant a legume-grass mixture to increase the biomass C: N ratio. This will decrease the N release rate.

3. Non-leguminous cover crops to capture and recycle residual nitrogen.

a. Plant a cover crop with a growth rate and rooting depth sufficient to scavenge excess/unused nitrogen remaining in the upper soil profile. Select cover crops, planting dates and seeding rates as determined or agreed to by the NRCS State Agronomist.

b. Consider reducing the N recommendation for the following crop by an estimated amount based on the site conditions both before and during the cover crop’s growing period, the cover crop species, and the termination phase of the cover crop.

Note: This option does not apply to the same acres on which a leguminous cover crop is applied.

4. Cover crops for weed suppression.

a. Plant a cover crop with the chemical and physical characteristics necessary to suppress or compete with the identified target weed species. Leave cover crop residues on the soil surface to maximize the allelopathic (chemical) and mulching (physical) effects. Select cover crops, planting dates and seeding rates as determined or agreed to by the NRCS State Agronomist.

5. Biodiversity improvement with cover crops.

a. Plant cover crop species with the characteristics to attract beneficial insects such as pollinators and/or predator insects, serve as trap crops for damaging insects, and/or provide natural bio-fumigation for soil dwelling pests. Select cover crops, planting dates and seeding rates as determined or agreed to by the NRCS State Agronomist.

Adoption Requirements
This enhancement is considered adopted when two or more of the criteria are met on land use acreage.
**Documentation Requirements**

1. Crop rotation records, including rotation length in years, crops and cover crops planted,
2. Sequence and description of operations for each crop and cover crop including harvest, tillage, nutrient placement and planting/seeding,
3. Photographs of representative fields showing cover crops added to the rotation, timing and method of cover crop establishment, and extent of cover crop growth just before termination, and
4. Seed and legume inoculant tags and receipts.

**References**


**Wisconsin Supplement 12/30/2013**

See Wisconsin Agronomy Technical Note 7 for cover crop species and rates:


Record seeding rate and establishment method for each cover crop.

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.