NRCS Opportunities for Increasing Continuous Living Cover Farming Systems

Environmental Quality Incentives Program, Conservation Stewardship Program, and Continuous Living Cover Farming Systems

June 2018

The Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program (CSP) are United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) programs that improve water quality and soil health and address many other agricultural resource concerns. Green Lands Blue Waters (GLBW) promotes five Continuous Living Cover (CLC) farming strategies in the U.S. Upper Midwest: agroforestry, cover crops, perennial forage, perennial grains, and biomass. The goal of CLC farming is to keep living plant cover and roots in the ground on farmland year-round. This paper describes ways to optimize EQIP and CSP support for CLC farming systems.

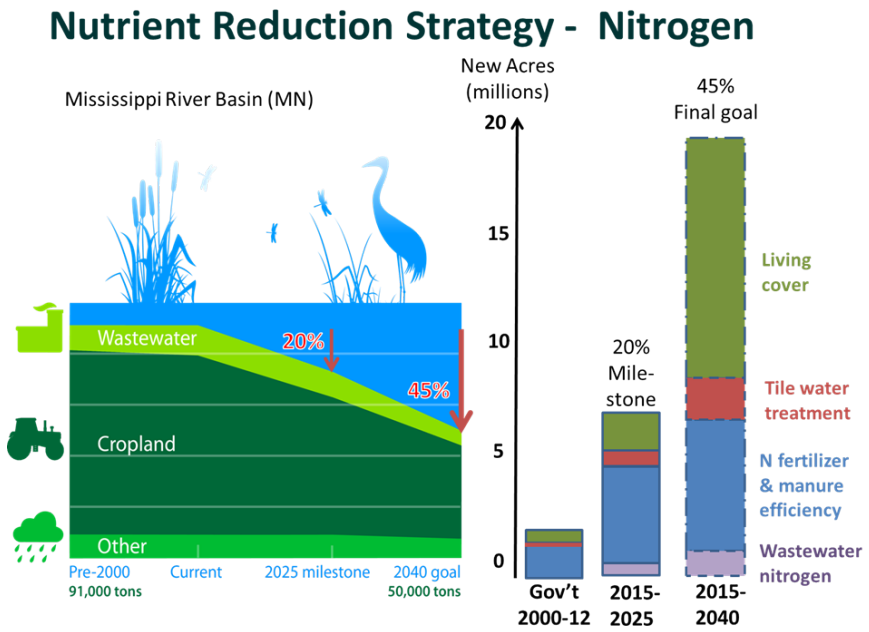
Why Optimize NRCS Support for Continuous Living Cover Farming Systems?

Support for CLC farming is among the most efficient uses of NRCS funding. CLC farming can significantly improve conditions for resources of concern to NRCS, GLBW partners, farmers, and communities.
Figure 1 (page 2) highlights the Minnesota Nutrient Reduction Strategy projection that "living cover" on cropland will account for more than half of the nitrogen (N) load reduction to surface water. This is required to meet the goal of 45% reduction in N in the Mississippi River. Initial gains (2025 milestone) in reducing N loading to surface water are expected to come primarily from improved efficiency in management of fertilizers, manure, and water in agricultural drain tiles. The Minnesota plan projects that a significant increase in acreage of CLC farming systems will be needed to achieve the 2040 water quality goal of a 45% reduction in N loading.

Multiple Minnesota agencies are collaborating on Minnesota's Nutrient Reduction Strategy. The strategy will guide existing state-level programs to reduce nutrients in Minnesota waters to improve the health of aquatic life there, attract more water recreation, and improve the hypoxia problem in the Gulf of Mexico and in other waters downstream of Minnesota.

Figure 1. Minnesota's Nutrient Reduction Strategy Projections for Nitrogen (N) Load Reduction for Surface Water

Analysis from the Minnesota Reduction Strategy (Minnesota Pollution Control Agency, 2014) projects living cover on agricultural lands will be the primary strategy for reaching the 2040 goal of reducing N load to surface water by 45%.

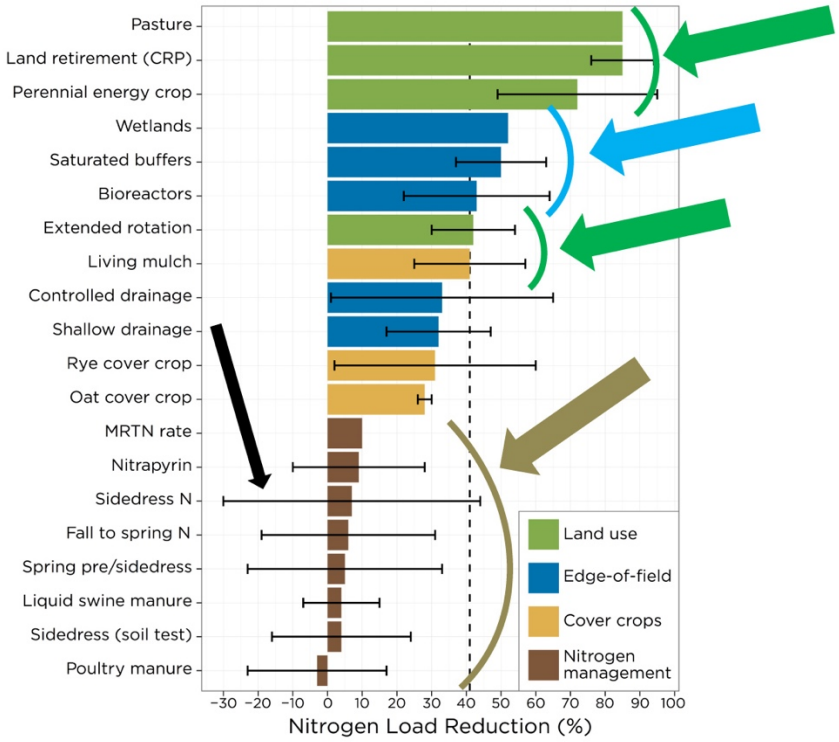


From the Minnesota Pollution Control Agency.

Data from the Iowa Nutrient Reduction Strategy in Figure 2 (below) also point to the potential for CLC farming systems to have a prominent role in reducing N loading in surface water. The analysis shows that perennial vegetative systems have the greatest potential by area for addressing N loading to surface waters.

Figure 2. Iowa's Nutrient Reduction Strategy Projections for Nitrogen (N) Load Reduction for Surface Water

Analysis from the Iowa Nutrient Reduction Strategy shows that perennial vegetation on agricultural lands is one of the most effective methods for reducing nitrogen loading to surface water (green arrows). Retaining, slowing movement, and treating agricultural drainage water are also among the most effective methods for reducing nitrogen loading to surface water (blue arrow). Nitrogen management methods (brown arrow) are less effective at reducing nitrogen loading to surface water. Error bars (narrow black arrow) highlight findings that nitrogen management methods are often ineffective at reducing nitrogen loading to surface water.



Adapted from Chris Hay, Iowa Soybean Association; original based on data from the Iowa Nutrient Reduction Strategy (IDALS, IDNR, and ISU CALS, 2014). Creative Commons BY-SA 4.0.
Arrows and brackets added by GLBW. The original graphic included the following notes:

- Average nitrate-nitrogen concentration or load reduction as a percentage.
- Error bars represent one standard deviation above and below the mean.
- Dashed line represents the 41% nitrogen reduction goal for nonpoint sources.
- Pasture: Based on the land retirement (CRP) value.
- Wetlands: Based on one report looking at multiple wetlands in Iowa (Helmers et al., 2008).
- Oat cover crops: Based on one study with three years of corn and two years of soybeans.
- MRTN: Reduction calculated based on estimated application rate for each Major Land Resource Area in Iowa.

While the state nutrient reduction strategies highlight CLC farming benefits to surface water, CLC farming can also improve soil health, protect groundwater, support wildlife and pollinators, and reduce greenhouse gas emissions from agriculture.

In 2016 EQIP and CSP funded contracts in the five states included in this analysis that totaled $140,248,900 and $210,303,000, respectively. There is lots of potential to improve conservation outcomes if more of these funds are invested in CLC farming systems.

Opportunity: Expand ongoing and new research to document the environmental and economic benefits of CLC farming systems.

Optimizing NRCS Technical Guides to Support Continuous Living Cover Farming Systems

The Environmental Quality Incentives Program (EQIP) provides financial, technical, and educational assistance to agricultural producers to help plan and implement practices that address identified resource concerns on agricultural land. Producers can also use EQIP to help comply with environmental regulations. EQIP is voluntary and contracts can last up to ten years.

The Conservation Stewardship Program (CSP) is the largest agricultural conservation program in the U.S. It rewards producers with an annual payment for improving, maintaining, and managing existing conservation activities and adding new conservation activities. Farmers are scored on current conservation performance and must score above a certain level to qualify for CSP payments. If the score is too low to qualify for CSP funding, EQIP funding can be used to implement practices that raise the score. CSP is voluntary; contracts last five years and can be renewed.

EQIP and CSP use conservation practices and enhancements to address resource concerns like water quality, soil health, wildlife, pollinators, and greenhouse gas emissions. NRCS produces technical guides that describe how practices and enhancements should be implemented to meet conservation and resource management goals. The national version of a technical guide describes minimum requirements. States often add requirements, making the technical guide more restrictive, yet more specific to local conditions.
Figure 3 (page 5) shows a subset of EQIP conservation practices and Figure 4 (page 6) shows a subset of CSP enhancements, selected because they have the potential to support CLC farming systems in the Upper Midwest states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The tables provide an overview of the actual or potential relationships between conservation practices and enhancements and CLC strategies. More detailed descriptions of the selected conservation practices and enhancements with potential associated CLC strategies are outlined in Annex 1 (page 21) and Annex 2 (page 27).

Historically, intermediate wheatgrass (IWG) has been planted as a forage grass. Since 2003, The Land Institute has been working with research partners like the University of Minnesota to develop a perennial IWG as a grain crop that—while still undergoing research and development—is beginning to be sold commercially in beer, breads and other food products. The Land Institute created the registered trademark for the grain, called Kernza®, which is harvested from the most advanced perennial IWG plants.

Figure 3. EQIP Practices and CLC Strategies

The following table shows Environmental Quality Incentives Program (EQIP) conservation practices as of 2017 and the Continuous Living Cover (CLC) strategies that could be supported by each practice in the Upper Midwest. Practices approved by NRCS Minnesota to include Kernza® planted at 100% are marked with an *.

Practice #	Practice Name	Continuous Living Cover Strategies				
		Forage	Biomass	Perennial Grains	Agroforestry	Cover Crops
311	Alley Cropping	X	X	X	X	X
327	Conservation Cover				X	
328	Conservation Crop Rotation	X	X	X		X
332*	Contour Buffer Strips	X	X	X		
331	Contour Orchard & Other Perennial Crops	X	X	X	X	
340	Cover Crop					X
342	Critical Area Planting	X	X	X	X	
589c*	Cross-Wind Trap Strips	X	X	X		
647	Early Successional Habitat Development/ Management	X			X	
386	Field Border	X	X	X	X	
393*	Filter Strip	X		X		
512	Forage and Biomass Planting	X	X	X		
511	Forage Harvest Management	X	X	X		
412	Grassed Waterway	X	X	X		
422	Hedgerow Planting				X	
603	Herbaceous Wind Barriers	X	X	X		
604	Saturated Buffer	X	X	X		
595	Integrated Pest Management	X	X	X	X	X
379	Multi-Story Cropping		X	X	X	X
528	Prescribed Grazing	X		X		X
550	Range Planting	X		X		X
391	Riparian Forest Buffer				X	
390	Riparian Herbaceous Cover	X	X	X		
381	Silvopasture Establishment	X		X	X	
580	Streambank & Shoreline Protection	X	X	X	X	
612	Tree & Shrub Establishment	X	X		X	
490	Tree & Shrub Site Preparation			X	X	
645	Upland Wildlife Habitat Management	X		X	X	
601	Vegetative Barriers		X			
380	Windbreak/Shelterbelt Establishment	X			X	
650	Windbreak/Shelterbelt Renovation	X			X	

Figure 4. CSP Practices and CLC Strategies

The following table shows Conservation Stewardship Program (CSP) enhancements as of fiscal year 2018 and the Continuous Living Cover strategies that could be supported by each practice in the Upper Midwest.

Activity Code	**Enhancement Name**	**Continuous Living Cover Strategies**				
		Forage	Biomass	Perennial Grains	Agroforestry	Cover Crops
E340101Z	Cover crop to reduce water erosion Conservation Practice 340: Cover Crop					X
E340102Z	Cover crop to reduce wind erosion Conservation Practice 340: Cover Crop					X
E340106Z2	Use of multi-species cover crop to improve soil health and increase soil organic matter Conservation Practice 340: Cover Crop					X
E340107Z	Cover crop to minimize soil compaction Conservation Practice 340: Cover Crop					X
E340118Z	Cover crop to reduce water quality degradation by utilizing excess soil nutrients – surface water Conservation Practice 340: Cover Crop					X
E340119Z	Cover crop to reduce water quality degradation by utilizing excess soil nutrients-ground water Conservation Practice 340: Cover Crop					X
E340134Z	Cover crops to suppress excessive weed pressures and break pest cycles Conservation Practice 340: Cover Crop					X
E381133Z	Silvopasture for wildlife habitat (structure and composition)	X	X	X	X	
E381137Z	Silvopasture for wildlife habitat (cover and shelter) Conservation Practice 381: Silvopasture Establishment	X	X	X	X	
E386101Z	Enhanced field borders to reduce water induced erosion along the edge(s) of a field Conservation Practice 386: Field Border	X	X	X	X	
E386102Z	Enhanced field borders to reduce wind induced erosion along the edge(s) of a field Conservation Practice 386: Field Border	X	X	X	X	
E386106Z	Enhanced field borders to increase carbon storage along the edge(s) of a field Conservation Practice 386: Field Border	X	X	X	X	
E386128Z	Enhanced field borders to decrease particulate emissions along the edge(s) of a field Conservation Practice 386: Field Border	X	X	X	X	
E386139Z	Enhanced field borders to increase wildlife habitat continuity along the edge(s) of a field. Conservation Practice 390: Riparian Herbaceous Cover	X	X	X		
E390118Z	Increase riparian herbaceous cover width for nutrient reduction Conservation Practice 390: Riparian Herbaceous Cover	X	X	X		

Activity Code	Enhancement Name	Continuous Living Cover Strategies				
E391118Z	Increase riparian forest buffer width for nutrient reduction Conservation Practice 391: Riparian Forest Buffer	X	X	X	X	
E391126Z	Increase riparian forest buffer width to reduce sediment loading Conservation Practice 391: Riparian Forest Buffer	X	X	X	X	
E391136Z	Increase riparian forest buffer width to enhance wildlife habitat Conservation Practice 391: Riparian Forest Buffer	X	X	X	X	
E393118Z	Extend existing filter strip to reduce excess nutrients in surface water. Conservation Practice 393: Filter Strip	X	X	X		
E393122Z	Extend filter strip to reduce excess pathogens and chemicals in surface water. Conservation Practice 393: Filter Strip	X	X	X		
E393126Z	Extend existing filter strip to reduce excess sediment in surface water. Conservation Practice 393: Filter Strip	X	X	X		
E511137Z2	Forage harvest management that helps maintain or improve wildlife habitat (cover and shelter) Conservation Practice 511: Forage Harvest Management	X	X	X		
E511139Z2	Forage harvest management that helps maintain wildlife habitat continuity (space) Conservation Practice 511: Forage Harvest Management	X	X	X		
E512101Z1	Cropland conversion to grass-based agriculture to reduce water erosion Conservation Practice 512 - Conservation Forage and Biomass Planting	X	X	X		
E512101Z2	Forage and biomass planting for water erosion control to improve soil health Conservation Practice 512: Forage and Biomass Planting	X	X	X		
E512132Z1	Forage and biomass planting that produces feedstock for biofuels or energy production Conservation Practice 512: Forage and Biomass Planting	X	X	X		
E512139Z1	Establish wildlife corridors to provide habitat continuity Conservation Practice 512: Forage and Biomass Planting	X	X	X	X	
E528132Z2	Stockpiling cool season forage to improve plant productivity and health Conservation Practice 528: Prescribed Grazing	X		X		
E528133Z1	Stockpiling cool season forage to improve structure and composition Conservation Practice 528: Prescribed Grazing	X		X		

Activity Code	Enhancement Name	Continuous Living Cover Strategies				
E528133Z2	Grazing management for improving quantity and quality of plant structure and composition for wildlife Conservation Practice 528: Prescribed Grazing	X				
E528140Z1	Maintaining quantity and quality of forage for animal health and productivity Conservation Practice 528: Prescribed Grazing	X		X		
E550106Z	Range planting for increasing/maintaining organic matter Conservation Practice 550: Range Planting	X	X	X	X	
E554118Z2	Saturated Buffer Drain Outlet	X	X	X	X	
E612126Z	Cropland conversion to trees or shrubs for long term improvement of water quality Conservation Practice 612: Trees/shrub Establishment				X	
E612130Z	Planting for high carbon sequestration rate Conservation Practice 612: Tree/Shrub Establishment				X	
E612133X2	Cultural plantings. Conservation Practice 612: TREE/SHRUB ESTABLISHMENT				X	
E612133X3	Sugarbush Management. Conservation Practice 612: TREE/SHRUB ESTABLISHMENT				X	
E612133X1	Adding food-producing trees and shrubs to existing agroforestry plantings Conservation Practice 612: Tree/Shrub Establishment				X	

NRCS periodically reviews and updates EQIP national practice standards. This is a cyclical process, whereby some standards enter the review process each year and most standards are updated about every five years. Once published, the national standards set the bar for that practice for the next five years. Individual state NRCS offices choose which conservation practices from the national list it will include in their state program based on local needs; not all of the listed practices are available in every state. After a national practice standard is updated, state NRCS technical teams update the state standard within the limits set by the national standard.

NRCS promotes farming systems that combine practices and enhancements to maximize achievement of conservation objectives. CLC farming practices and enhancements can support multi-year rotations, including winter annuals (e.g., cover crops) in rotation with summer annual crops, and may include perennial crops (e.g., alfalfa). They can also be combined over the landscape, including strips of perennial crops within fields of annual crops and as buffers along ditches and streams. It is possible to combine CLC strategies under a single contract by using multiple contracts on one farm.

Opportunity: Organize and provide scientific data that NRCS can use at the national and state levels to revise technical guides in ways that expand potential applications for CLC farming.

Optimizing NRCS Programs and Ranking Criteria to Support Continuous Living Cover Farming Systems

NRCS funds programs that may be called initiatives, sub-accounts, or simply funding pools. While technical guides describe minimum requirements for how practices and enhancements can be implemented to achieve desired conservation outcomes, the program guidelines, funding allocations, and program ranking criteria influence which contracts are funded. Figure 5 (page 10) describes the EQIP and CSP funding pools for fiscal year 2018 in our five-state region. State NRCS offices allot funds among these programs and may choose to create additional state-specific sub-accounts (e.g., Missouri EQIP sub-account for Agroforestry, Illinois EQIP sub-account for Cook County Urban Ag). Funding is available in all states for most general EQIP sub-accounts and geographically applicable national and regional initiatives. CSP funds are allocated to in-state regions and each region has identified priority resources of concern. A percentage of funds from CSP, EQIP, and other NRCS programs are committed each year to Regional Conservation Partnership Programs (RCPPs). Additionally, 60% of EQIP funding goes to livestock operations. The USDA considers all practices implemented by livestock producers to be livestock-related practices.

Competition for funds within a state or local district is further guided by ranking criteria established in the contract application for each program. Thus, the allocation of funds among programs, program descriptions, and ranking criteria determine and limit which practices and enhancements will be funded in a state and local district.

Figure 5. Funding Pools for EQIP and CSP in Fiscal Year 2018

Note: Before further targeted outreach regarding funding pools, current status in each state should be verified by NRCS.

	IL	IA	MN	MO	WI
General EQIP (sub-accounts below)	X	X	X	X	X
- Cropland				X	
- Beginning Farmer Rancher (and Forestland producers)			X	X	
- Drainage Water Management Implementation	X				
- Forestland (Forest Management Implementation; Tree-shrub)	X		X	X	
- Social Disadvantage Producer			X	X	
- Livestock – Grazing (Grazing Land Operations; Pasture/Hay)	X		X	X	
- Livestock & Ag-Waste (Confined Livestock & Manure Management	X		X	X	
- Specialty Crop	X				X
- Wildlife – Statewide (Wildlife Habitat Conservation)	X		X	X	
- Conservation Activity Plan (CAP; separate for Forestland in MO)	X		X	X	X
- Urban Ag – Cook County	X				
- Soil Health (croplands and pasturelands)				X	X
- Agroforestry				X	
National Initiatives					
- National Water Quality Initiative (NWQI)	X	X	X	X	X
- On-Farm Energy Initiative	X	X	X	X	X
- Organic Initiative	X	X	X	X	X
- High Tunnel System Initiative (Hoop Houses)	X	X	X	X	X
Regional Initiatives					
- Driftless Area Initiative	X	X	X		X
- Great Lakes Restoration Initiative (GLRI)	X		X		X
- Honey Bee Effort (Pollinator Health Initiative)			X		X
- Mississippi River Basin (Healthy Watersheds) Initiative (MRBI)	X	X	X	X	X
- Red River Basin Initiative			X		

	IL	IA	MN	MO	WI
- Watersheds Initiative	X	X	X	X	X
RCPP-EQIP Funding Pools					
- Upper Macoupin Creek Watershed Partnership	X				
- BMP Implementation for Nutrient & Sediment Loss Reduction in Macon County, Illinois	X				
- Shorebird Conservation Acreage via Drainage Water Runoff Control (SCARC)	X				
- Improving Oak-Hickory Forestland Health in Illinois	X				
- Precision Conservation Management	X				
- Innovative Conservation Agriculture		X			
- Fox River Water Quality Project		X			
- Upper Cedar Watershed Urban-Rural Partnership		X			
- Midwest Agriculture Water Quality Partnership		X			
- Improving Working Lands for Monarch Butterflies	X	X	X	X	X
- Middle Cedar Partnership Project		X			
- Iowa Targeted Demonstration Watersheds Partnership Project		X			
- ABC Improving Forest Health for Wildlife Resource			X		
- Minnesota Agricultural Water Quality Certification			X		
- Driftless Area - Habitat for the Wild and Rare			X		X
- Lower Mississippi River Feedlot Management in MN			X		
- Camp Ripley Sentinel Landscape			X		
- Prairie Pothole Working Lands Partnership			X		
- Red River Basin of the North Flood Prevention Plan			X		
- Regional Grassland Bird and Grazing Lands Enhancement Initiative		X		X	
- Our Missouri Waters Targeted Conservation				X	
- Restoring Glades and Woodland Communities for Threatened Species in the Ozarks of Southeast Missouri				X	
- NW Missouri Urban and Rural Farmers United for Conservation				X	
- Cover Crops for Soil Health and Water Quality				X	

	IL	IA	MN	MO	WI
- Water Quality Improvement (Oconomowoc, Baraboo, Milwaukee, Yahara, and portions of the Pecatonica River Basins)					X
- Baraboo River Watershed					X
- Little Plover River Watershed					X
- Tall Pines Conservancy Farmland Protection Program					
- Lafayette County Agricultural Enterprise Area Water Quality Project					X
- Milwaukee River Watershed Conservation Partnership					X
- Golden-winged Warblers (and other forest bird species)					X
- Baraboo River					X
- Yahara River					X
- Oconomowoc River					X
CSP sub-accounts for in-state regions / priority resource concerns	X	X	X	X	X

Figure 6 (page 14) summarizes how NRCS program policies and conservation practices are updated, prioritized, and implemented and where there are opportunities to participate in this process.

At the national level, many organizations are engaged with Congress and with NRCS to support or oppose Farm Bill conservation programs, lobby for annual appropriations, and contribute to the writing of national guidelines for EQIP, CSP, and other NRCS conservation programs. In 2017, 25 organizations in the Farm Bill Conservation Coalition presented a full list of recommendations to strengthen the conservation provisions in the 2018 Farm Bill, including specific recommendations for EQIP and CSP. These efforts are intended to maintain and improve these programs and preserve annual appropriations.

Opportunities: Prepare case studies and publish analyses that document the success of NRCS conservation programs that use CLC farming in the Midwest. Make these available to NRCS, state agencies, and congressional delegations from the region. Work with members of the Farm Bill Conservation Coalition to more broadly share the information with USDA and Congress.

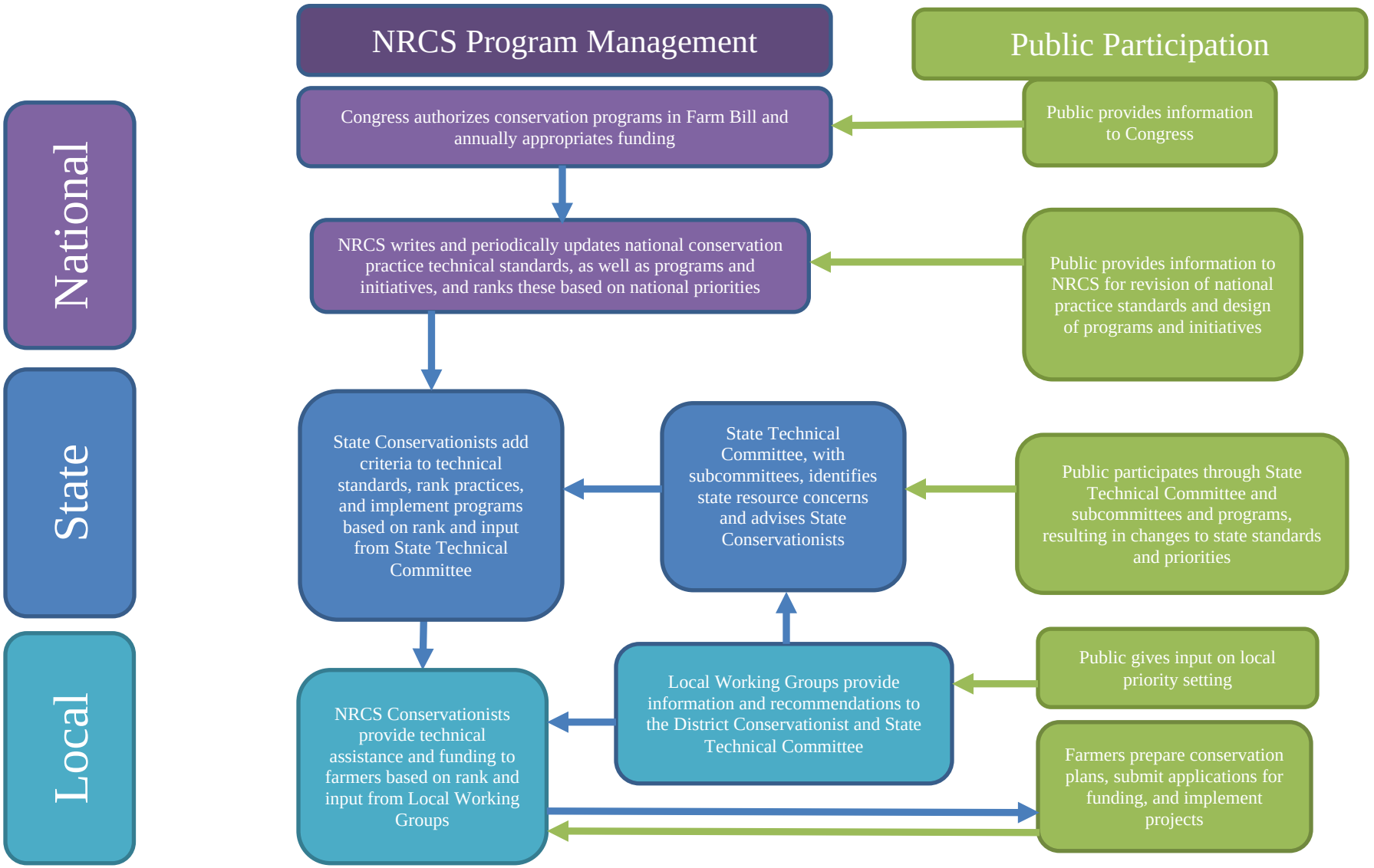
State Technical Committees (STCs) have a critical role in NRCS decision-making, as they advise the NRCS State Conservationists in making technical and programmatic decisions, including how to allocate funds among programs, determining program priorities, and ranking criteria used to select which proposals will be funded. The STCs receive recommendations from subcommittees, and from county-level Local Working Groups (LWGs). Subcommittees of the STCs are particularly influential in this process. Membership of the STCs, its subcommittees, and LWGs include representatives from federal and state agencies, farmers, nonprofit organizations, agribusiness, and individuals with knowledge of conservation techniques and farm programs.

Opportunities: Participate in State Technical Committees, State Technical Subcommittees, and Local Working Groups to promote program descriptions, funding allocations, and ranking criteria that expand the potential for contracts that use CLC farming systems.

NRCS program priorities are driven largely by what farmers request. Hence, conservation planning at the farm-level and subsequent proposals or requests from farmers to NRCS are the key to driving changes to programs and ranking criteria.

Opportunities: Provide technical support to farmers for conservation planning and applying for NRCS contracts that use CLC farming systems. Help farmers implement these contracts.

Figure 6. How NRCS Conservation Practices are Prioritized and Approved



The following examples show how EQIP and CSP can support CLC farming to meet resource concerns. The examples focus on water quality as a resource concern in the Upper Midwest states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The CLC strategies highlighted here can significantly contribute to meeting the goals of state Nutrient (Loss) Reduction Strategies and can also apply to other resource concerns.

Over the next two years, GLBW will coordinate an Upper Midwest cohort of partners to collectively promote integration of CLC into NRCS programs. Cohort members will develop a "CLC Agenda" of targeted NRCS changes that the group will promote to NRCS State Technical Committees. GLBW will also develop a summary document of the cohort's work to inform Federal-level NRCS policy changes. GLBW welcomes inquiries regarding participation in this cohort.

Buffers with Kernza®

In 2015 Minnesota enacted a law requiring buffers on many streams and ditches in the state. For details about the law and subsequent amendments see: www.bwsr.state.mn.us/buffers. Implementation of the law is well underway, with 98.5% compliance by the first deadline in the fall of 2017. Two key features of the law are: 1) the buffer vegetation will be perennial in most situations and 2) they can be harvested. The law does not require or encourage taking the land out of production.

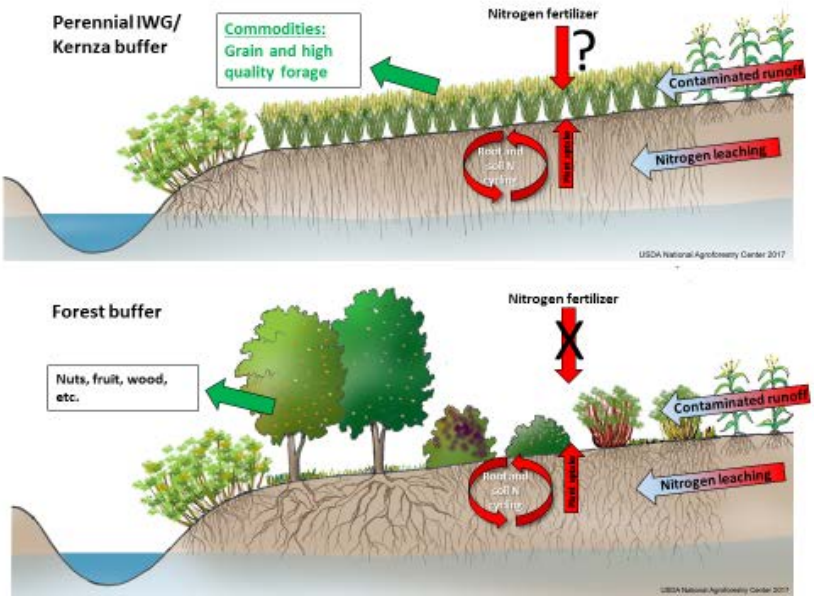
In February 2017, supported by scientific input provided by GLBW partners, the Minnesota NRCS State Technical Committee approved changes that allow for planting Kernza® in 100% stands under three practices: Contour Buffer Strips (332), Filter Strips (393), and Cross Wind Traps (589c). The seeding rate for Kernza® was changed from 50% to 100%. This seemingly small change is significant, as it allows for planting 100% Kernza® stands in the cited conservation practices.

Green Lands Blue Waters has since helped state agencies promote the use of Kernza® in buffers, including the possible use of NRCS practices. For example, in the fall of 2017, Richard Warner, Director of GLBW at the time, participated in the Minnesota Board of Water and Soil Resources (BWSR) training program on buffer law implementation. The training was attended by about 150 resource professionals.

He presented two sessions on the use of Kernza® in buffers. The first inquiry about the use of Kernza® in buffers came to a Minnesota Association of Soil and Water Conservation District (SWCD) office in late November.

Kernza® is not the only Continuous Living Cover crop that can be planted to meet requirements of the Minnesota Buffer Law. Perennial hay crops, perennial bioenergy crops, pastures, and agroforestry can also be used in buffers (Figure 7). EQIP and CSP programs can support any of these CLC strategies in buffers.

Figure 7. Kernza® and Agroforestry in Buffers



Adapted from image created by Gary Bentrup, U.S. Forest Service, USDA National Agroforestry Center.

Perennials for Source Water Protection

A broad partnership formed in 2017 to protect groundwater used by public water utilities by replacing annual crops with perennial crops on wellhead management areas. The problem of nitrates and agrochemicals in rural water systems has been around for decades, with few practical solutions. The recognized solution of returning the land to prairie and forest has two significant downsides. First, it is expensive—the typical approach uses federal and state programs to pay farmers to place land in the Conservation Reserve Program (CRP). That solution is effective only as long as payments are made to the farmers. When payments stop, farmers are free to return the land to annual cropping systems, and this can cause a significant and rapid increase in groundwater nitrates. Second, putting land in the CRP takes the land out of production, which reduces agricultural production, employment, and the tax base at all levels of government.

Perennial crops, on the other hand, have deep root systems and provide year-round cover similar to native prairies. They achieve the same benefits of source water protection, but keep the land in production. A change to perennial crops is supported by markets rather than taxes. Farmers can keep farming *and* have clean drinking water. The simplicity of this solution is clear to those working in source water protection.

The idea to use perennials like Kernza® for source water protection was discussed in 2017 by source water teams in Illinois, Iowa, Minnesota, and Wisconsin, and at the EPA Regional 5 annual meeting of state source water protection managers. The program gained greatest traction in Minnesota, with presentations at numerous meetings at the state, regional (regional SWCD meetings), and county (hosted by SWCDs) levels, as well as a well-attended field day hosted by a farmer with five years of experience growing Kernza®. In September 2017, Kernza® fields were planted over two wellhead management areas in Minnesota and research was expanded to document how Kernza® limits nitrates from reaching the water supply.

Green Lands Blue Waters partners, in consultation with NRCS, have identified practices that can support Kernza® for source water protection (Figure 8, page 18).

Figure 8. NRCS Conservation Practices and Enhancements That Support Use of Kernza® for Source Water Protection in the Midwest

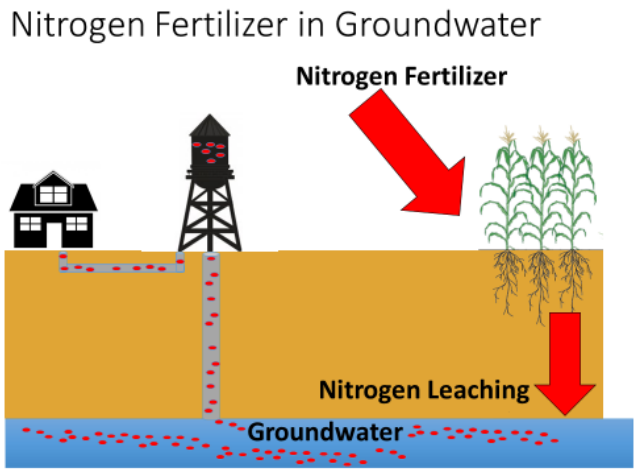
Practices approved by NRCS Minnesota for 100% are marked with an *.

Practice #	**Practice Name**	**CLC strategies**				
		Forage	Biomass	Perennial Grains	Agroforestry	Cover Crops
327	Conservation Cover				X	
332*	Contour Buffer Strips	X	X	X		
386	Field Border	X	X	X	X	
393*	Filter Strip	X		X		
512	Forage and Biomass Planting	X	X	X		
511	Forage Harvest Management	X	X	X		
528	Prescribed Grazing	X		X		X
550	Range Planting	X		X		X
381	Silvopasture Establishment	X		X	X	
Activity Code	**Enhancement Name**					
ANM29	On-Farm Forage Based Grazing System	X		X		
ANM37	Prescriptive Grazing Management System	X		X		
ANM40	Extending Existing Field Borders for Water Quality Protection and Wildlife Habitat		X	X	X	
CCR98	Improved Resource Conservation Crop Rotation	X	X	X		
PLT16	Intensive Rotational Grazing	X		X	X	
SQL05	Use of Deep Rooted Crops to Breakup Soil Compaction	X	X	X		
SQL09	Conversion of Cropped Land to Grass-Based Agriculture	X	X	X		
SQL14	Integrate Grazing into Crop and Forest Systems	X		X	X	
WQL26	Reduce the Concentration of Nutrients Imported on Farm	X		X		

Presentation materials and training tools have been developed to describe the opportunity for protecting groundwater with Kernza®. Figures 9, 10, and 11 (pages 19-20) compare conventional cropping systems with alternatives that leach fewer nutrients to groundwater.

Figure 9. Nitrogen Fertilizer and How it Impacts Drinking Water

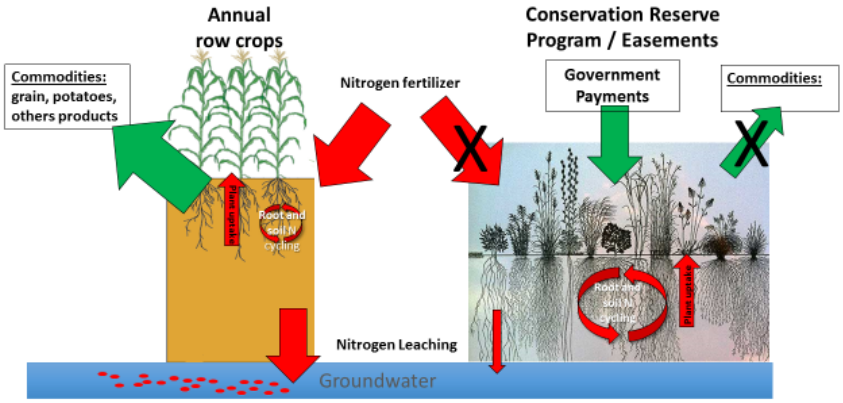
Corn and other conventional crops can leach significant nitrogen (N) to groundwater where the N then enters public water sources.



From Jacob M. Jungers, Department of Agronomy and Plant Genetics, University of Minnesota.

Figure 10. Nitrate Leaching from Annual Crops and Conservation Reserve Program/Easements

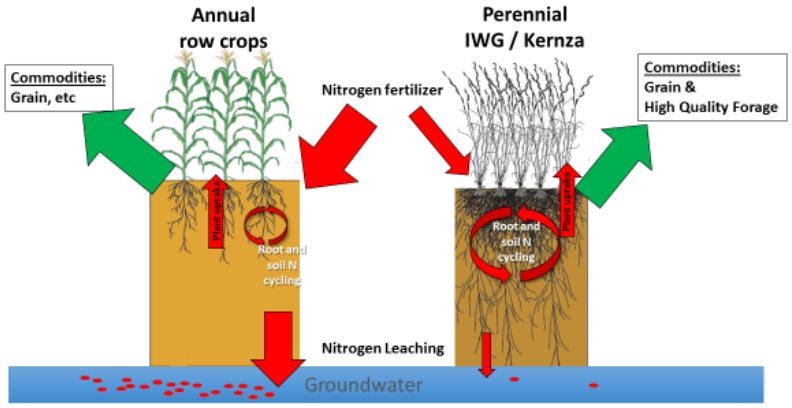
The perennial grain crop Kernza® provides living cover and roots and requires fewer added nutrients than corn and most other annual crops and so greatly reduces nitrogen (N) leaching to groundwater. Furthermore, the harvested Kernza® grain and hay provide a market-driven solution to the problem of contaminated groundwater. Government payments in the form of EQIP and CSP can encourage farmers to adopt new CLC farming systems that result in cleaner groundwater. Other perennial crops and pasture/forage systems can provide similar environmental and economic benefits.



Adapted from images created by Jacob M. Jungers, Department of Agronomy and Plant Genetics, University of Minnesota.

Figure 11. Nitrogen Leaching from Annual Row Crops and Perennial Crops

Commodities produced by conventional crops are the economic driver of the farming system that is the source of nitrogen (N) in groundwater. Converting cropland to CRP provides living cover and roots and eliminates the need for added nutrients, thereby ending most N leaching to groundwater. The CRP system requires continuous government subsidies, because farmland is taken out of production and no crop is harvested.



Adapted from images created by Jacob M. Jungers, Department of Agronomy and Plant Genetics, University of Minnesota.

Annex 1. Descriptions of Natural Resource Conservation Service conservation *practices* and their potential relevance to Continuous Living Cover (CLC) strategies in the U.S. Midwest as of fiscal year 2017.

EQIP PRACTICE AND COMMONLY ASSOCIATED PRACTICES	PRACTICE DESCRIPTION† AND APPLICATION TO CLC
311 Alley Cropping Associated Practices ▪ 612 Tree and Shrub Establishment ▪ 384 Woody Residue Treatment	Alley cropping is a practice that could support multiple CLC strategies. By definition, alley cropping is the planting of a vegetative crop in areas between rows of a woody species. Because of the woody species rows, alley cropping automatically has an agroforestry component. The areas between the woody species rows could be planted to a perennial forage crop, a biomass crop, or a perennial grain. If annual row crops or small grains are planted between the woody rows, then cover crops could be used along with those annual crops. Therefore, alley cropping is a practice with potential to support CLC in each of the five CLC categories. Alley cropping will also support "stacking" of CLC strategies.
327 Conservation Cover Associated Practices ▪ 314 Brush Management ▪ 342 Critical Area Planting ▪ 612 Tree and Shrub Establishment ▪ 645 Upland Wildlife Habitat Management	Conservation Cover was developed to protect soil and water resources on lands that require permanent cover. While the Practice Standard does not allow haying or grazing, it does mention that "Periodic removal of some products such as high value trees, medicinal herbs, nuts, and fruits is permitted…" and therefore supports CLC in an agroforestry system.
328 Conservation Crop Rotation Associated Practices ▪ 329 Residue and Tillage Management, No Till ▪ 330 Contour Farming ▪ 340 Cover Crops ▪ 345 Residue and Tillage Management, Reduced Till ▪ 600 Terraces	Conservation Crop Rotation is defined by the NRCS as "a planned sequence of crops grown on the same ground over a period of time." This conservation practice supports the use of CLC strategies cover crops, pasture and forage, biomass as well as perennial grains.
332 Contour Buffer Strips Associated Practices ▪ 329 Residue and Tillage management, No-Till ▪ 412 Grassed Waterway ▪ 345 Residue and Tillage Management, Reduced Till ▪ 595 Integrated Pest Management	Contour Buffer Strips uses herbaceous vegetative cover to prevent erosion and improve water infiltration on hillslopes. This practice has the potential to be used as a forage crop with some restrictions on time of harvest. Additional CLC strategies include biomass and perennial grain production.
331 Contour Orchard & Other Perennial Crops Associated Practices	Contour Orchard & Other Perennial Crops are planted to reduce erosion, reduce

▪ 327 Conservation Cover ▪ 560 Access Road ▪ 595 Integrated Pest Management ▪ 620 Underground Outlet	transport of contaminants and sediment, and improve water efficiency. Perennial tree crops and vineyards are suggested, however CLC strategies such as biomass planting, perennial grain, or perennial grains might also be supported.
340 Cover Crop Associated Practices ▪ 328 Conservation Crop Rotation ▪ 329 Residue and Tillage management, No-Till ▪ 345 Residue and Tillage Management, Reduced Till ▪ 590 Nutrient Management ▪ 595 Integrated Pest Management	Cover Crops are grown during times of the year when no cash crop is being grown. The benefits of growing cover crops are many, including improved soil health and water infiltration. Some cover crops can be harvested or grazed.
342 Critical Area Planting Associated Practices ▪ 315 Herbaceous Weed Control ▪ 484 Mulching ▪ 590 Nutrient Management	Critical Area Planting deals with the seeding and establishment of permanent vegetation in highly erodible areas, or areas where establishing vegetation is difficult. Areas of steep slope and/or rough terrain qualify for this practice. An agroforestry crop that is hand-picked, such as fruits or nuts or grazing by sheep or goats may be opportunities to integrate a harvestable crop along with this practice.
589c Cross-Wind Trap Strips Associated Practices ▪ 315 Herbaceous Weed Control ▪ 328 Conservation Crop Rotation ▪ 329 Residue and Tillage management, No-Till ▪ 340 Cover Crop ▪ 345 Residue and Tillage Management, Reduced Till ▪ 645 Upland Wildlife Habitat Management	Cross Wind Trap Strips are herbaceous strips planted perpendicular to the prevailing winds to prevent wind erosion and protect growing crops. Potential CLC strategies to be used with Cross Wind Trap Strips include biomass, pasture and forage, and perennial grains.
647 Early Successional Habitat Development/Management Associated Practices ▪ 386 Field Borders ▪ 511 Forage Harvest Management ▪ 460 Land Clearing ▪ 595 Integrated Pest Management ▪ 612 Tree/Shrub Establishment ▪ 645 Upland Wildlife Habitat Management	The purpose of the Early Successional Habitat Development/Management practice is to create and maintain wildlife habitat and/or natural communities. Grazing can be used as a management strategy and there is potential to use this practice in an agroforestry setting.
386 Field Border Associated Practices ▪ 328 Conservation Crop Rotation ▪ 329 Residue and Tillage management, No-Till ▪ 345 Residue and Tillage Management, Reduced Till ▪ 644 Wetland Wildlife Habitat Management ▪ 645 Upland Wildlife Habitat Management	Field Borders provide many ecosystem services and can be profitable as well. Plant field borders to prevent wind and water erosion, protect soil and water quality. Harvest perennial grains, biomass, and/or forage.

▪ 647 Early Successional Habitat Development/Management	
393 Filter Strip Associated Practices ▪ 329 Residue and Tillage management, No-Till ▪ 345 Residue and Tillage Management, Reduced Till ▪ 590 Nutrient Management ▪ 595 Integrated pest management ▪ 633 Waste Recycling	Filter Strips are planted to remove contaminants from overland water flow. The strip should be permanent, herbaceous vegetation. Management plans may include grazing or harvest of biomass. There is potential for harvesting perennial grains.
512 Forage and Biomass Planting Associated Practices ▪ 315 Herbaceous Weed Control ▪ 511 Forage and Biomass Harvest ▪ 528 Prescribed Grazing ▪ 590 Nutrient Management ▪ 645 Upland Wildlife Habitat Management	Forage and Biomass Planting is a multi-purpose practice. Reduce erosion while increasing livestock health and/or produce feedstock for biofuel or energy production. CLC strategies supported are biomass, pasture and forage, and perennial grains.
511 Forage Harvest Management Associated Practices ▪ 528 Prescribed Grazing ▪ 590 Nutrient Management ▪ 633 Waste Utilization	Forage Harvest Management includes timely cutting and removal of forages and biomass from the field as hay, greenchop, or in silage with the goal of optimizing the desired forage stand, plant community, and stand life. This practice can support CLC farming through the management of forages, biomass, and perennial grains.
412 Grassed Waterway Associated Practices ▪ 600 Terrace ▪ 342 Critical Area Planting ▪ 362 Diversion ▪ …"and other erosion control practices"	A Grassed Waterway is a shaped or graded channel that is established with suitable vegetation to convey surface water at a non-erosive velocity. Biomass harvest and prescribed grazing can be practiced on the waterways. Perennial grains and biomass crops are potentially suitable vegetation for grassed waterways.
422 Hedgerow Planting Associated Practices ▪ 612 Tree/Shrub Establishment ▪ 645 Upland Wildlife Habitat Management	Hedgerow Planting has many purposes including, but not limited to: living fences, barriers to noise and dust, and wildlife/pollinator habitat. The CLC practice that can be supported here is agroforestry if a harvestable fruit or nut crop is planted.
603 Herbaceous Wind Barriers Associated Practices ▪ 315 Herbaceous Weed Control ▪ 328 Conservation Crop Rotation ▪ 329 Residue and Tillage management, No-Till ▪ 340 Cover Crop ▪ 345 Residue and Tillage Management, Reduced Till ▪ 645 Upland Wildlife Habitat Management	Herbaceous Wind Barriers are strips of herbaceous plants planted across prevailing winds. The purpose is to reduce wind erosion, protect crops, and to control snow deposition to increase plant-available moisture. Potential CLC strategies include perennial grain, pasture and forage, and biomass.

595 Integrated Pest Management Associated Practices ▪ 327 Conservation Cover ▪ 328 Conservation Crop Rotation ▪ 340 Cover Crop ▪ 590 Nutrient Management	Integrated Pest Management uses practices that prevent, avoid, monitor, and suppress pests. Some of these practices support CLC farming such as using cover crops, agroforestry, biomass production, pasture and forage, and perennial grains.
379 Multi-Story Cropping Associated Practices ▪ 472 Access Control ▪ 490 Tree/Shrub Site Preparation ▪ 612 Tree/Shrub Establishment ▪ 660 Tree/Shrub Pruning ▪ 666 Forest Stand Improvement	Multistory cropping requires the development and implementation of a forest management plan that incorporates the growth, management and harvest of non-timber forest products (e.g., foliage, mushrooms, berries, roots, nuts, etc.) while maintaining the option to manage the timber crop as a long-term economic investment. This practice does not apply to land that is grazed. Possible CLC strategies include agroforestry, biomass production, perennial grains, and cover crops.
528 Prescribed Grazing Associated Practices ▪ 314 Brush Management ▪ 382 Fence ▪ 512 Forage and Biomass Planting ▪ 550 Range Planting	Prescribed Grazing can be implemented to meet financial as well as conservation objectives. Prescribed grazing could be applied using cover crops, pasture and forage, and perennial grain CLC strategies.
550 Range Planting Associated Practices ▪ 314 Brush Management ▪ 338 Prescribed Burning ▪ 528 Prescribed Grazing ▪ 548 Grazing Land Mechanical Treatment	Range planting is establishment of adapted perennial vegetation on grazing land. This practice applies to rangeland, native or naturalized pasture, grazed forest, or other suitable land areas where the principle method of vegetation management is grazing. Applicable CLC strategies include perennial grain, grazing and forage, and possibly agroforestry.
391 Riparian Forest Buffer Associated Practices ▪ 390 Riparian Herbaceous Cover ▪ 395 Stream Habitat Improvement and Management ▪ 580 Streambank and Shoreline Protection ▪ 612 Tree/Shrub Establishment	A Riparian Forest Buffer is an area predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies. Plant trees suitable for timber, fruit, or nut crops to add income. CLC practice agroforestry applies here and possibly biomass production.
390 Riparian Herbaceous Cover Commonly Associated Practices ▪ 327 Conservation Cover ▪ 382 Fence ▪ 472 Use Exclusion ▪ 528 Prescribed Grazing ▪ 578 Stream Crossing ▪ 580 Stream bank and Shoreline Protection	Riparian Herbaceous Cover consists of grasses, sedges, rushes, ferns, legumes, and forbs tolerant of intermittent flooding or saturated soils, established or managed as the dominant vegetation in the transitional zone between upland and aquatic habitats. Perennial grains and biomass crops could be planted as CLC strategies. Additionally, the area can be grazed with limitations.

▪ 614 Watering Facility ▪ 644 Wetland Wildlife Habitat Management	
604 Saturated Buffer Associated Practices ▪ 554 Drainage Water Management ▪ 590 Nutrient Management	A Saturated Buffer is a vegetated, riparian buffer where the water table is raised by diverting water from field subsurface drainage along the buffer to reduce nitrate loading to surface water. These buffers can be covered with permanent vegetation such as perennial grain, biomass crop, or native prairie plants. This area can be harvested as forage, biomass, perennial grain, or grazed with some limitations.
381 Silvopasture Establishment Commonly Associated Practices ▪ 512 Forage and Biomass Planting ▪ 528 Prescribed Grazing ▪ 612 Tree/Shrub Establishment ▪ 660 Tree/Shrub Pruning ▪ 666 Forest Stand Improvement	Silvopasture establishment involves establishing a combination of trees or shrubs, and compatible forages on the same acreage. Agroforestry, pasture and forage, and perennial grains could all be stacked as CLC farming under this practice.
580 Streambank & Shoreline Protection Associated Practices ▪ 382 Fence ▪ 390 Riparian Herbaceous Buffer ▪ 391 Riparian Forest Buffer ▪ 582 Open Channel ▪ 584 Channel Bed Stabilization	Streambank and Shoreline Protection supports treatments to stabilize banks of water bodies. This practice suggests perennial plants that have multiple values such as biomass, nuts, fruit, and browse. Therefore, this practice could support agroforestry, biomass, perennial grain, or pasture and forage.
612 Tree & Shrub Establishment Associated Practices ▪ 472 Access Control ▪ 590 Nutrient Management ▪ 595 Integrated Pest management ▪ 660 Tree/Shrub Pruning ▪ 666 Forest Stand Improvement	Tree and Shrub Establishment is establishing woody plants by planting or seeding. One could apply this practice in an agroforestry setting, woody biomass production, or pasture and forage (silvopasture).
490 Tree & Shrub Site Preparation Associated Practices ▪ 380 Windbreak/Shelterbelt Establishment ▪ 384 Woody Residue Treatment ▪ 612 Tree/Shrub Establishment ▪ 645 Upland Wildlife Habitat Management	Tree/shrub site preparation involves the treatment of areas to improve site conditions for establishing trees and/or shrubs. This practice could be used in conjunction with Tree & Shrub Establishment (612) and would therefore apply to the same CLC strategies: agroforestry, biomass, and pasture and forage (silvopasture).
645 Upland Wildlife Habitat Management Associated Practices	Upland wildlife habitat management offers guidance on establishing and managing

▪ 472 Use Exclusion ▪ 614 Watering Facility ▪ 643 Restoration, Management of Rare or Declining Habitats ▪ …"and many more"	upland habitats and connectivity within the landscape for wildlife. A farmer could put together a plan that includes woody-species corridors for wildlife movement, perennial forage areas, vegetative strips harvestable as biomass after the nesting season, and could also use cover cropping as part of a plan to create a season-long food supply for wildlife.
601 Vegetative Barriers Associated Practices ▪ 328 Crop Rotation ▪ 329 Residue and Tillage management, No-Till ▪ 345 Residue and Tillage Management, Reduced Till ▪ 590 Nutrient Management ▪ 595 Integrated Pest Management	A vegetative barrier is a permanent strip of stiff, dense vegetation established along the general contour of slopes or across concentrated flow areas. Due to the types of vegetation required for this practice, it is not suitable for grazing or woody plants. However, a non-woody biomass crop might be a good option for this practice.
380 Windbreak/Shelterbelt Establishment Associated Practices ▪ 328 Conservation Crop Rotation ▪ 340 Cover Crop ▪ 344 Residue Management ▪ 490 Tree/Shrub Site Preparation ▪ 612 Tree/Shrub Establishment ▪ 645 Upland Wildlife Management ▪ 660 Tree/Shrub Pruning	Windbreaks or shelterbelts are single to multiple rows of trees and possibly shrubs planted in a linear fashion. Use this practice to protect grazing livestock and/or consider using species that provide additional income such as fruit and nut trees and shrubs. In this way, windbreaks and shelterbelts support the agroforestry and silvopasture components of CLC.
650 Windbreak/Shelterbelt Renovation Associated Practices ▪ 328 Conservation Crop Rotation ▪ 340 Cover Crop ▪ 344 Residue Management ▪ 490 Tree/Shrub Site Preparation ▪ 612 Tree/Shrub Establishment ▪ 645 Upland Wildlife Management 660 Tree/Shrub Pruning	When renovating windbreaks or shelterbelts, incorporate species that diversify and create added income such as fruit and nut species of shrubs or trees. Like Windbreak/Shelterbelt Establishment (380) this practice can support agroforestry and silvopasture CLC strategies.
† More information and details regarding NRCS conservation practices can be found in the Conservation Standards on the NRCS website. www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/cp/ncps/	

Annex 2. Descriptions of Natural Resource Conservation Service conservation *enhancements* and their potential relevance to Continuous Living Cover (CLC) strategies in the U.S. Midwest as of fiscal year 2018. Note: Enhancement names and codes are changed periodically. Confirm here: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/csp/?cid=nrcseprd1389217

	EQIP ENHANCEMENT	PRACTICE DESCRIPTION‡ AND APPLICATION TO CLC
ANM21	Prairie Restoration for Grazing and Wildlife Habitat	This enhancement includes the implementation of a grazing management plan and therefore applies to permanent pasture. Potential for use with STRIPS.
ANM29	On-Farm Forage Based Grazing System	Applies to the implementation and management of a perennial-based pasture system.
ANM32	Extend Existing Filter Strips or Riparian Herbaceous Cover for Water Quality Protection and Wildlife Habitat	Applies to the extension/widening of existing perennial buffers. Grazing is allowed with this enhancement if a grazing management plan is in effect.
ANM35	Enhance Wildlife Habitat on Expired Grass/legume Covered CRP Acres or Acres with Similar Perennial Vegetated Cover Managed as Hayland	This enhancement applies to perennial grass/legume hayland managed for both wildlife and forage production.
ANM37	Prescriptive Grazing Management System for Grazing Lands	For the implementation of a prescriptive grazing management system. Also applies to silvopasture.
ANM39	Extending Riparian Forest Buffers for Water Quality Protection and Wildlife Habitat	Applies to the widening of existing forest buffers only. May be grazed if a grazing management plan is in place.
ANM40	Extending Existing Field Borders for Water Quality Protection and Wildlife Habitat	This enhancement applies to the extension or widening of existing field borders using perennial forbs and/or shrubs. Vegetation can be harvested for bio-energy.
ANM41	Multi-Species Native Perennials and Native Self-Seeding Annuals for Biomass/wildlife Habitat	This enhancement consists of establishing native perennial and native self-seeding annual vegetation for biomass production and wildlife habitat. The biomass may be harvested for renewable energy or forage, grazed, or left in place.
CCR98	Improved Resource Conservation Crop Rotation	This enhancement applies to existing resource-conserving crop rotation. Improvements include adding a growing year for perennial crops, a perennial crop substituted for a row crop, and changing a perennial legume to a perennial grass or grass/legume.
CCR99	Resource-Conserving Crop Rotation	Applicable crops include perennial grass, legume as forage or green manure, legume-grass mixture, and other mixtures. This is a potential fit for pasture/forage systems.
ENR11	Improving Energy Feedstock Production Using Alley Cropping Systems with Short Rotation Woody Crops	Short rotations woody crops grown for energy feedstock directly support the CLC strategies of biomass and agroforestry.

ENR12	Use of Legume Cover Crops as a Nitrogen Source	This enhancement directly supports the CLC strategy of using cover crops to keep living plants on the land when row crops are not currently growing.
PLT06	Renovation of a Windbreak, Shelterbelt or Hedgerow for Wildlife Habitat	Harvest of wood products is allowed under this enhancement that supports renovation of existing windbreaks, shelterbelts, or hedgerows. This enhancement has the potential to support the CLC strategy of agroforestry.
PLT15	Establish Pollinator and/or Beneficial Insect Habitat	Haying and grazing may be used as maintenance practices with some restrictions therefore this enhancement has the potential to support forage/grazing.
PLT16	Intensive Rotational Grazing	This enhancement is for the harvest efficiency of grazing livestock to increase forage harvest, and to improve forage quality and livestock health. It directly supports perennial forage/grazing systems.
PLT20	High Residue Cover Crop or Mixtures of High Residue Cover Crops for Weed Suppression and Soil Health	By utilizing biomass from a cover crop or cover crop mixture as a living or killed mulch to suppress weed seed germination and to add carbon to the terrestrial carbon pool, this enhancement supports the CLC strategy of cover crops.
SQL04	Use of Cover Crop Mixes	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.
SQL05	Use of Deep Rooted Crops to Breakup Soil Compaction	Deep rooted crops that are supported by this enhancement include perennials and annuals that have the potential to align with CLC strategies forage and perennial grains.
SQL09	Conversion of Cropped Land to Grass-Based Agriculture	Grass-based agriculture aligns with CLC practices forage, biomass, and perennial grains.
SQL10	Crop Management System where Crop Land Acres were Recently Converted from CRP Grass/legume Cover or Similar Perennial Vegetation	This enhancement supports the use of high residue cover crops to stabilize or increase carbon sinks in croplands recently converted from perennial vegetation to annually planted crops. The CLC strategy of cover crops has the potential to be supported by this enhancement.
SQL11	Cover Cropping in Orchards, Vineyards and Other Woody Perennial Horticultural Crops	This enhancement has the potential to support the CLC strategy of cover crops in an agroforestry operation.
SQL12	Intensive Cover Cropping in Annual Crops	This enhancement directly supports the CLC strategy of using cover crops. Under this particular enhancement, the cover crop is not to be harvested or grazed.
SQL14	Integrate Grazing into Crop and Forest Systems	Because this enhancement supports grazing in crop as well as forest systems, it potentially aligns with forage, perennial grain, and agroforestry CLC strategies.
SQL16	High Species Diversity Grazing Lands	With this enhancement, warm-season perennial grazing lands will be overseeded with a multi-species diverse mixture of annual grasses, clovers, and broadleaf species. This has the potential to support the forage CLC strategy.

SQL18	Soil Health Crop Rotation	This enhancement supports the implementation of a crop rotation which addresses the four principle components of a soil health: adds diversity to the cropping system; maintains residue throughout the year; keeps a living root; and minimizes soil chemical, physical and biological disturbance. There is potential for this enhancement to align with CLC strategies, perennial grain, forage, and biomass. This enhancement does not apply to permanent hayland, orchards, or vineyards.
WQL10	Plant a Cover Crop that will Scavenge Residual Nitrogen	This enhancement has the potential to support the CLC strategy of cover crops when crops with at least a "very good" rating for scavenging nitrogen as documented in "*Managing Cover Crops Profitably, 3rd Edition*" (Sarrantonio, 1998), Chart 2 Performance & Roles, page 67, are planted.
WQL26	Reduce the Concentration of Nutrients Imported on Farm	By growing the majority of feed for livestock on the farm and properly accounting for the nutrients in the manure when applying it to crop land, better nutrient cycling is achieved. Nutrients are not concentrated on the farm and a more sustainable operation is possible. This enhancement has to potential to support CLC strategies forage and perennial grain.
	‡More information and details regarding NRCS enhancements can be found in the Enhancement Activity Job Sheets on the NRCS website. www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/csp/?cid=nrcseprd421806	