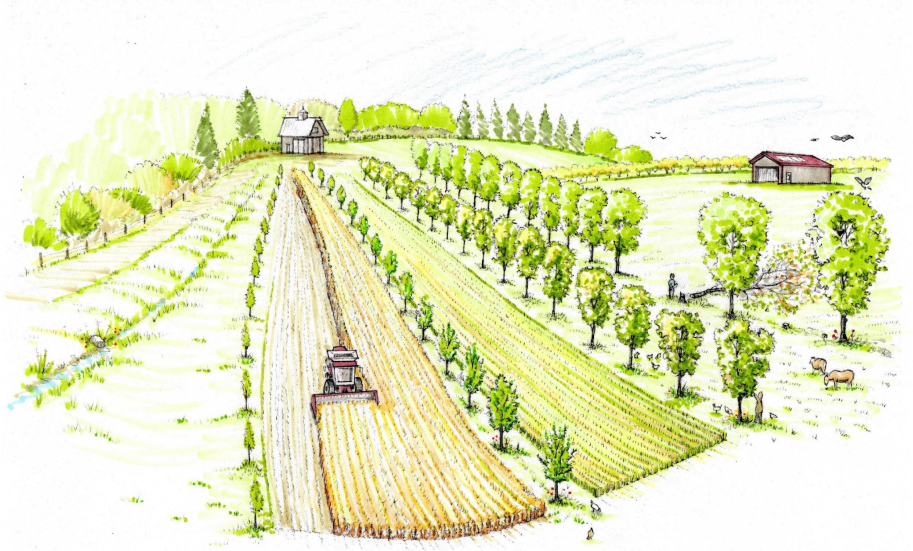

Opportunities on the Horizon
Commercial Scale Agroforestry

2022 Conservation Cropping Seminar

SAVANNA INSTITUTE

Laying the groundwork for widespread agroforestry in the Midwest

Kaitie Adams
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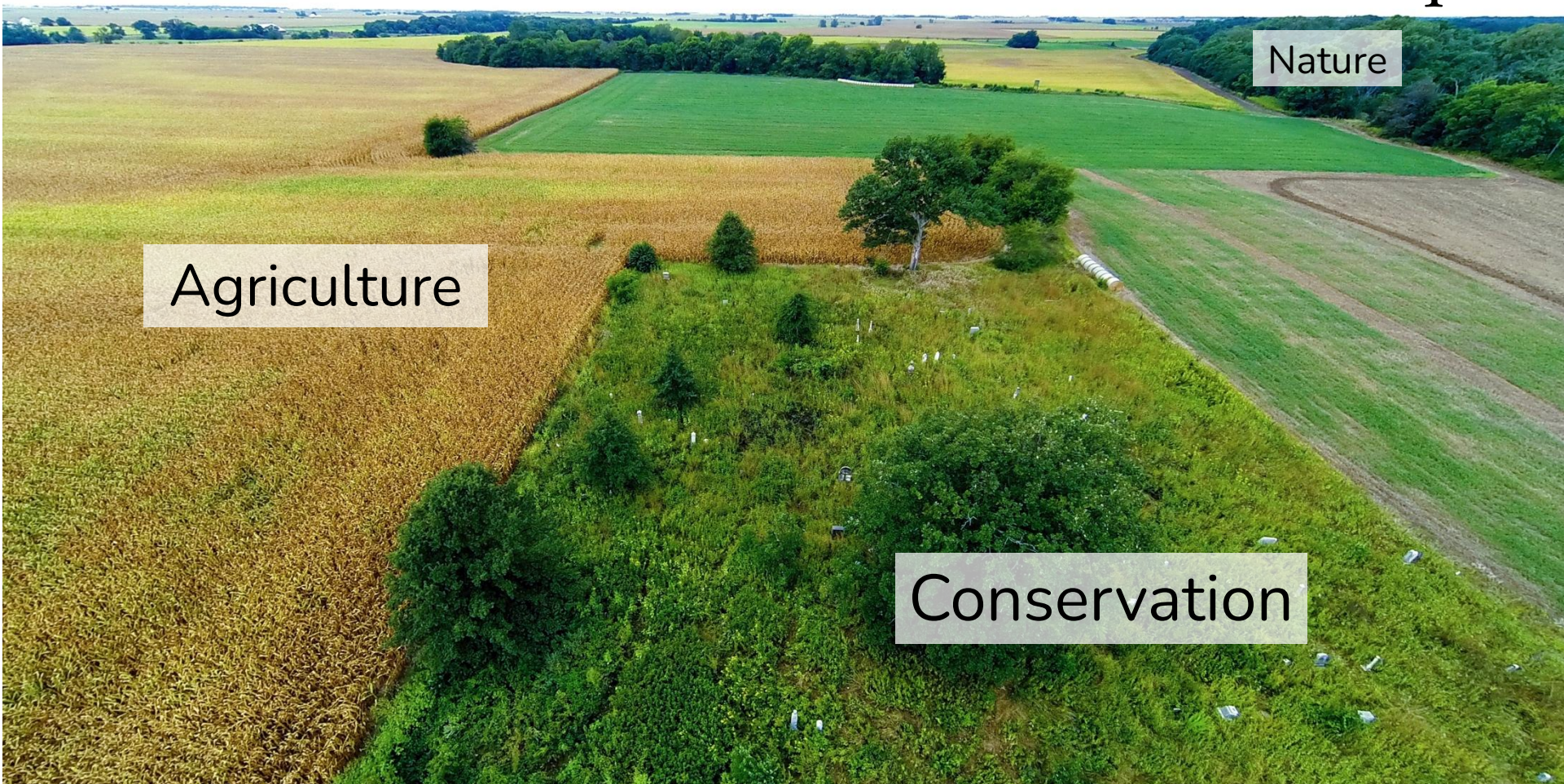
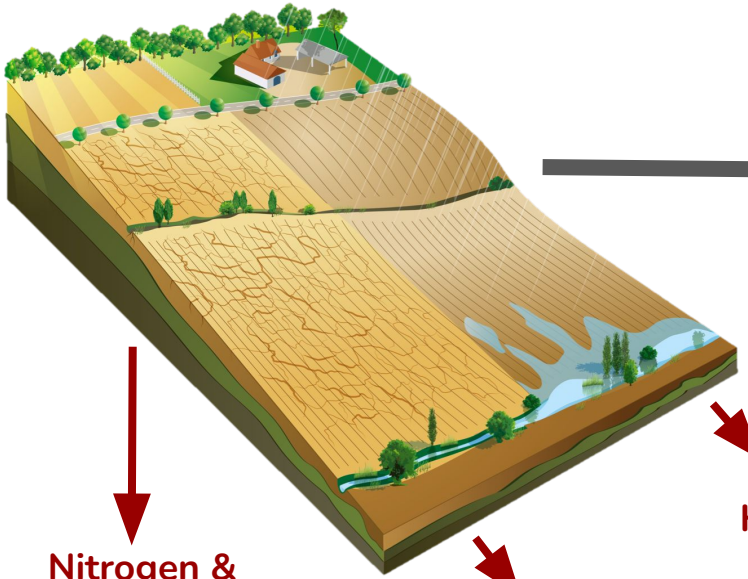
How We Often View the Farm Landscape



The Root of the Matter

Non-Conservation, Annual Production

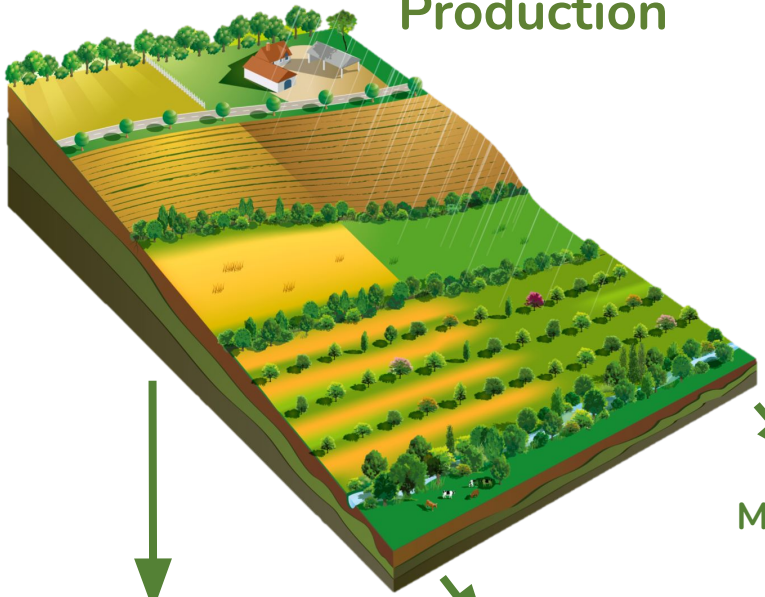


Input Heavy

Nitrogen & Phosphorus Water Pollution

Soil Erosion

Conservation, Perennial Production



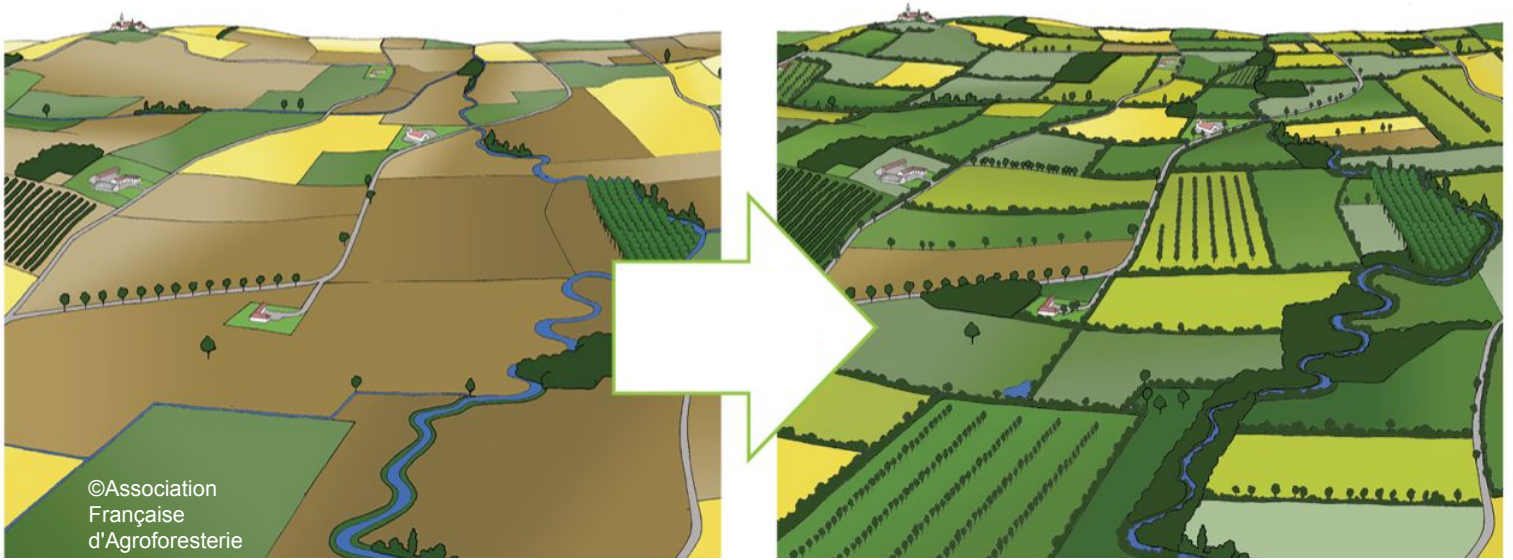
Minimized Inputs

Perennial Roots Capture Nutrients

Perennial Roots Stabilize Soil

Agroforestry

A transformative tool for agriculture



Annual → Perennial

Herbaceous → Woody

Monoculture → Polyculture

Open System → Closed System

What is Agroforestry?

Forest Farming **Silvopasture** **Alley Cropping** **Riparian Forest Buffers** **Windbreaks**

USDA National Agroforestry Center

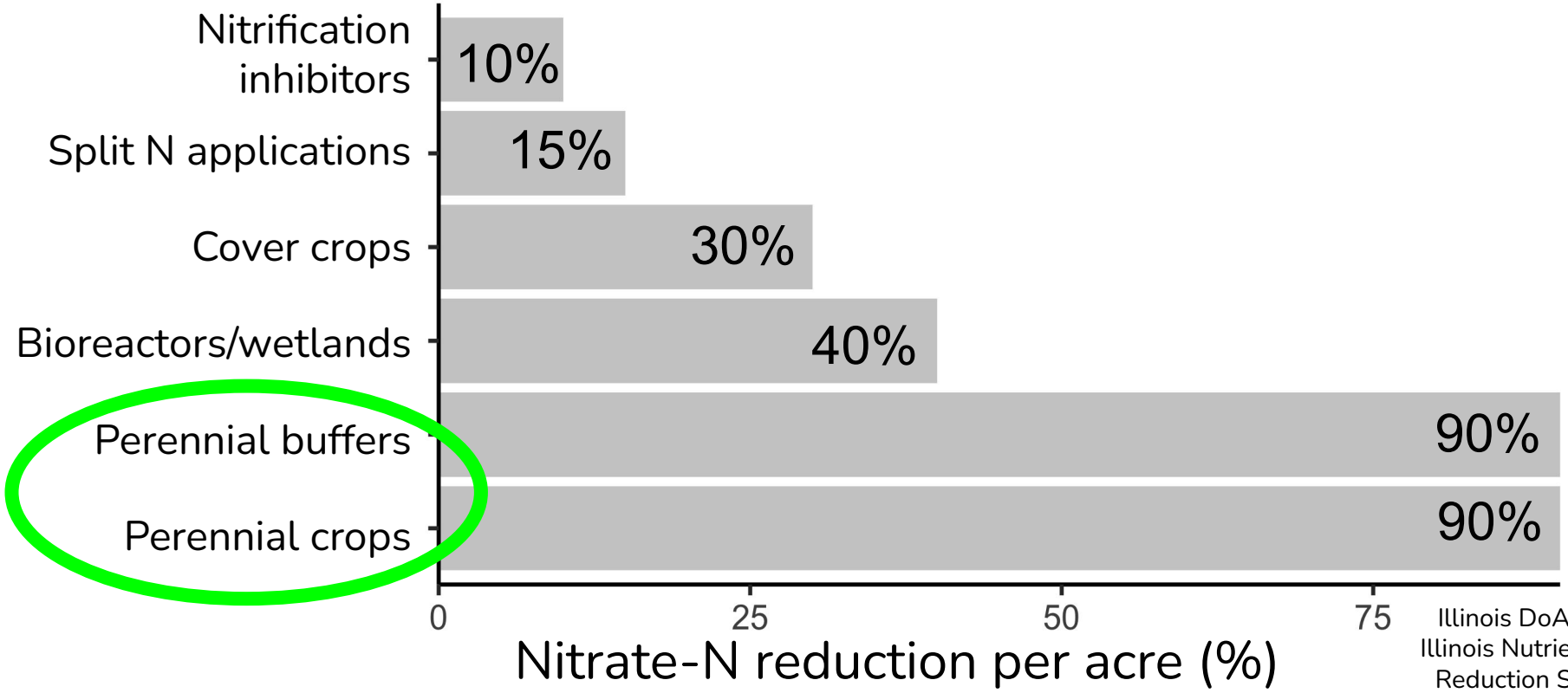
Agroforestry

Trees, crops & pastured livestock

Courtesy Rob Myers

WATER QUALITY ON FARMLAND

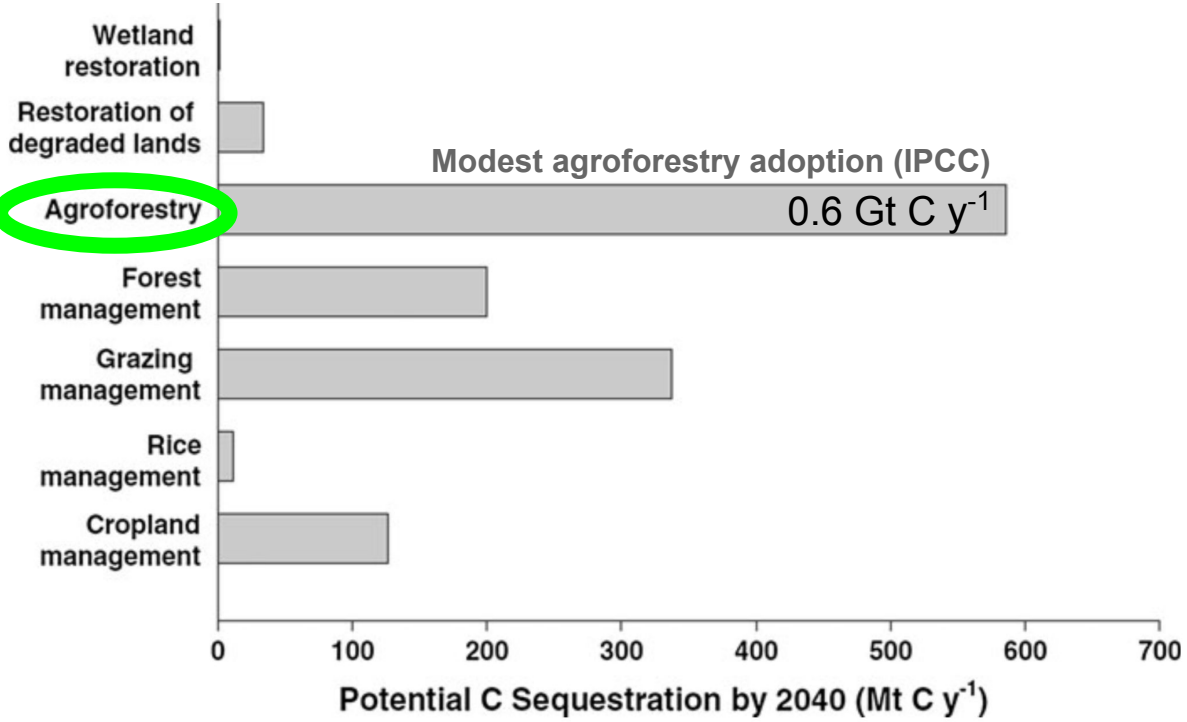
Agroforestry & tree crops recognized by Midwestern states as land-use with most potential to improve water quality



Illinois DoA (2015)
Illinois Nutrient Loss Reduction Strategy

CARBON DRAWDOWN ON FARMLAND

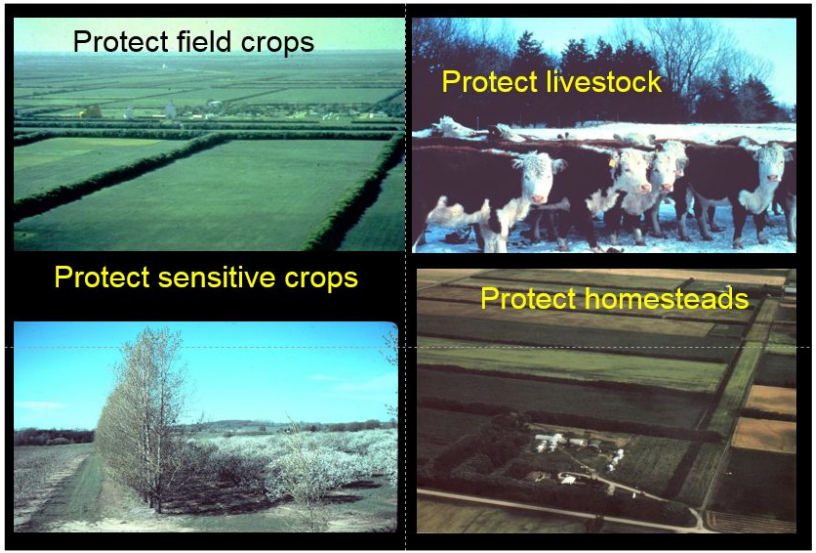
Agroforestry recognized by IPCC as land-use with most carbon sequestration potential globally



IPCC (2000)
Jose & Bardhan (2012) *Agroforestry Systems*

Windbreaks

Windbreak Advantages



University of MO Center for Agroforestry

- Enhance crop production
- Improve crop pollination
- Earlier crop maturity
- Control soil erosion
- Protect sensitive crops
- Protect livestock
- Manage snow distribution
- Reduce odors or unappealing sights

Effective Windbreak Functions

- **Protection and safety**
  - < wind velocity and associated hazards
  - Modify microclimates
  - > habitat for predators of pests
  - < flood water and erosion hazards
- **Productive soils**
  - < runoff and wind energy
  - Remove soil pollutants, capture soil nutrients
  - Stabilize soil, > soil quality
- **Water quality**
  - > infiltration
  - Trap pollutants in surface runoff and subsurface flow and surface runoff
  - < runoff, soil erosion, bank erosion
- **Biodiversity**
  - > wildlife habitat (ex. pollinators)
  - Protect sensitive habitats
  - Restore connectivity
- **Economic opportunities**
  - Produce marketable products
  - Reduce energy consumption
  - Increase property value
  - > ecosystem services value (ex. >yield, <inputs)
- **Aesthetics, visual quality**
  - Screen undesirable views/ odors/ noise
  - Create visual interest, colorful displays
- **Recreational opportunities**
  - Corridor for movement (trails/ hunting leases)

From Hannah Hemmelgarn from University of Missouri Center for Agroforestry

Crop Yields & Windbreaks

Crop Windbreaks: Weighted Average Crop Yield Increase			
Corn	12%	Soybeans	13%
Barley	25%	Winter Wheat	23%
Hay	20%	Spring Wheat	8%

USDA National Agroforestry Center

Cultural measures to decrease competition

- Root pruning
- Careful adjacent tree/shrub species choice
- Harvesting crops within the windbreak
- Design of windbreak rows
  - Spacing
  - number of rows

Design Considerations

The Windbreak

- Height
- Planting density
- Orientation
- Length
- Width
- Continuity/uniformity
- Cross-section shape
- Access areas
- Genetic choices
- What are you protecting? From what?

What the Windreak Affects

- Windspeed
- Field evaporation
- Air temperature
- Air flow pattern
- Snow deposition

Rock Creek Farm Peotone, IL

Windbreak Design

	Row #	1	2	3	4	5	6	7	8
	Within-Row Spacing	5	5	8	12	12	12	10	12
	Row Length	9,800	9,632	9,464	9,296	9,128	8,960	8,792	8,624
Salix sp.	Willow	100%							
Cornus sericea	Redosier Dogwood		20%						
Cornus racemosa	Grey Dogwood		20%						
Cornus amomum	Silky Dogwood		20%						
Physocarpus opulifolius	Ninebark		20%						
Malus sargentii	Sargent Crabapple		20%						
Viburnum recognitum	Arrowwood			20%					
Viburnum lentago	Nannyberry			20%					
Viburnum trilobum	Highbush Cranberry			20%					
Corylus americana	American Hazelnut			20%					
Ilex verticillata	Winterberry			20%					
Prunus virginiana	Chokecherry				20%				
Prunus americana	American Plum				20%				
Amelanchier canadensis	Shadblow Serviceberry				20%				
Cercis canadensis	Eastern Redbud				20%				
Diospyros virginiana	American Persimmon				20%				
Populus deltoides x nigra	Hybrid Poplar					50%	50%		
Juniperus virginiana	Eastern Red Cedar					12.5%	12.5%		
Pinus strobus	Eastern White Pine					12.5%	12.5%		
Picea glauca	White Spruce					12.5%	12.5%		
Thuja occidentalis	Arborvitae					12.5%	12.5%		
Asimina triloba	Paw Paw							100%	
Carya ovata	Shagbark Hickory								33%
Quercus bicolor	Swamp White Oak								33%
Quercus macrocarpa	Bur Oak								33%

Willow	1,960	-	-	-	-	-	-	-
Redosier Dogwood	-	385	-	-	-	-	-	-
Grey Dogwood	-	385	-	-	-	-	-	-
Silky Dogwood	-	385	-	-	-	-	-	-
Ninebark	-	385	-	-	-	-	-	-
Sargent Crabapple	-	385	-	-	-	-	-	-
Arrowwood	-	-	237	-	-	-	-	-
Nannyberry	-	-	237	-	-	-	-	-
Highbush Cranberry	-	-	237	-	-	-	-	-
American Hazelnut	-	-	237	-	-	-	-	-
Winterberry	-	-	237	-	-	-	-	-
Chokecherry	-	-	-	155	-	-	-	-
American Plum	-	-	-	155	-	-	-	-
Shadblow Serviceberry	-	-	-	155	-	-	-	-
Eastern Redbud	-	-	-	155	-	-	-	-
American Persimmon	-	-	-	155	-	-	-	-
Hybrid Poplar	-	-	-	-	380	373	-	-
Eastern Red Cedar	-	-	-	-	95	93	-	-
Eastern White Pine	-	-	-	-	95	93	-	-
White Spruce	-	-	-	-	95	93	-	-
Arborvitae	-	-	-	-	95	93	-	-
Paw Paw	-	-	-	-	-	-	879	-
Shagbark Hickory	-	-	-	-	-	-	-	240
Swamp White Oak	-	-	-	-	-	-	-	240
Bur Oak	-	-	-	-	-	-	-	240

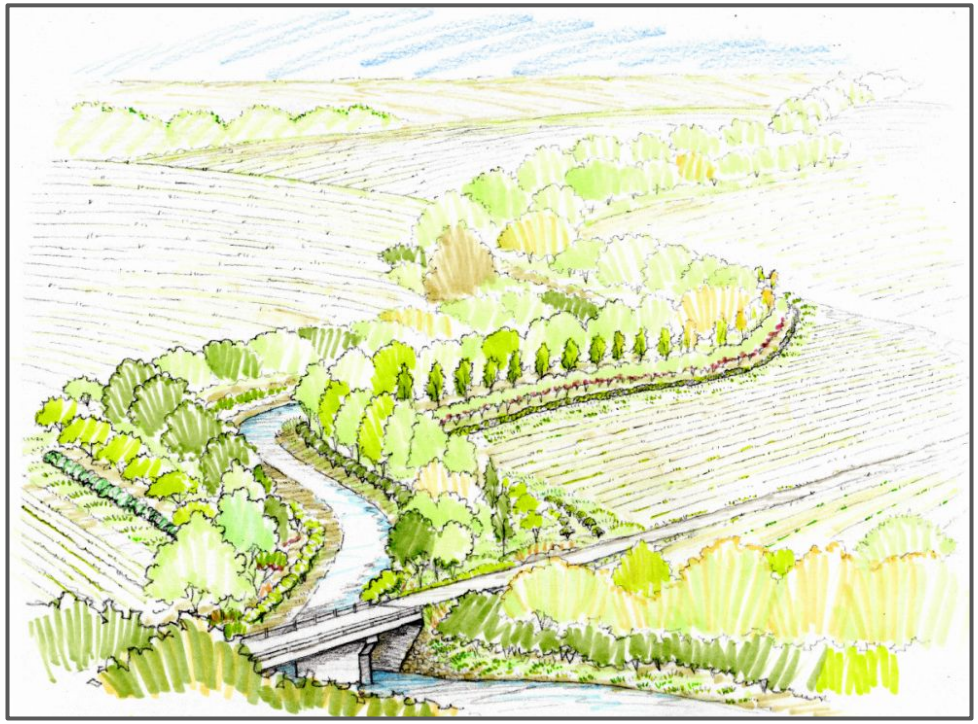
Design Factors

- Demonstration
- CRP enrolled
- Wind protection
- Drift protection
- Noise protection
- Beautification
- Potential harvest after CRP ends

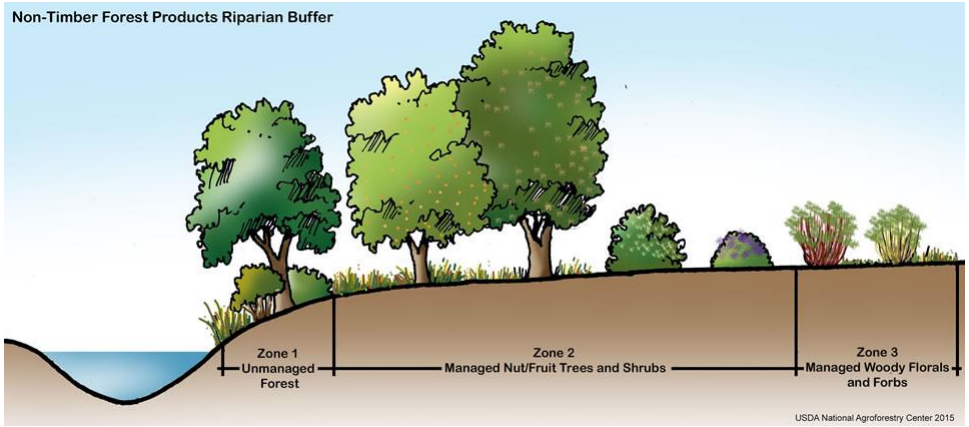
Vulcan Farm

Sidney, IL

Riparian Buffers



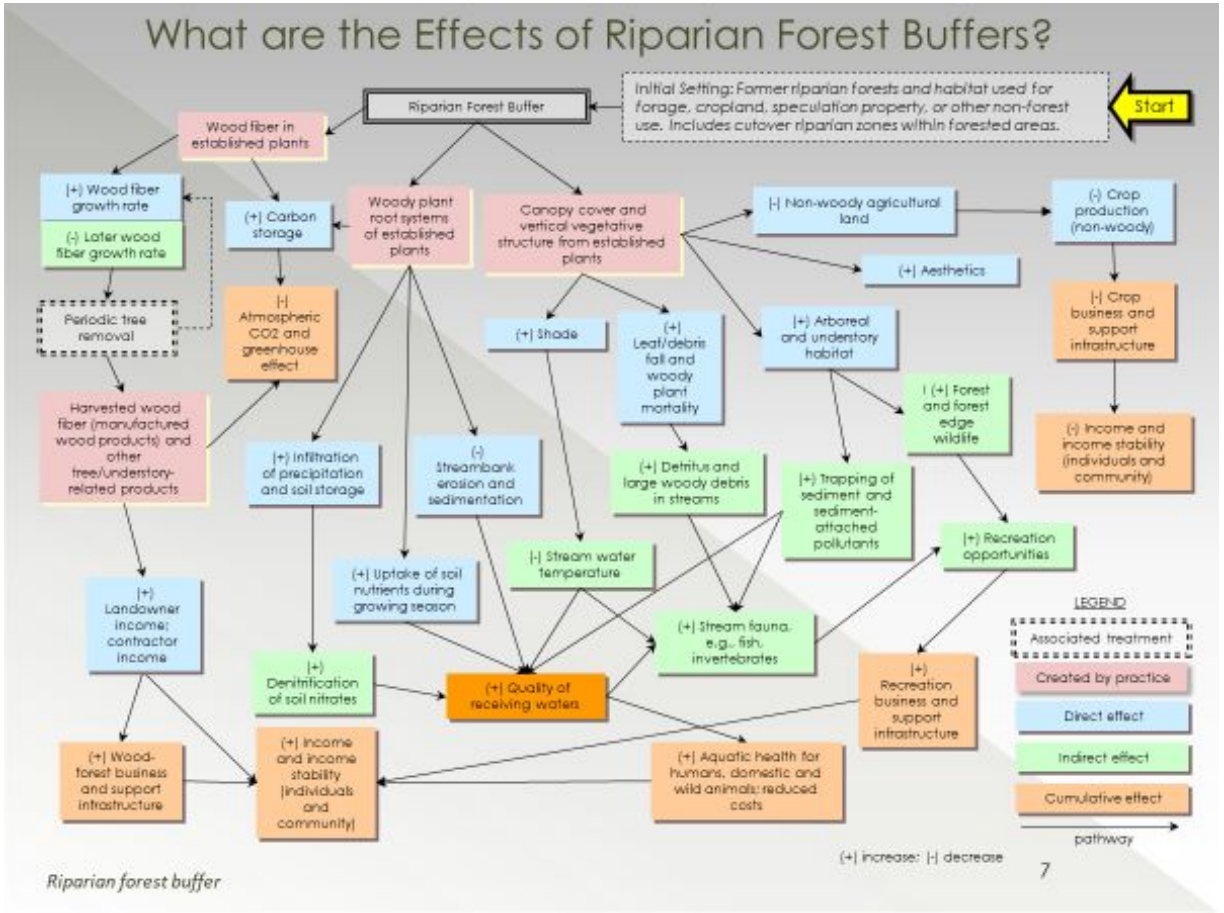
Riparian Buffer Advantages



USDA National Agroforestry Center

- Reduce excess amounts of sediment, organics, nutrients and pesticides in surface runoff
- Reduce excess nutrients and other chemicals in groundwater
- Create and improve terrestrial and aquatic wildlife habitat
- Restore natural riparian plant communities
- Provide a harvestable crop of timber, fiber, forage, fruit, or other crops
- Provide floodplain protection
- Increase carbon storage

Riparian Buffer Effects



USDA National Agroforestry Center

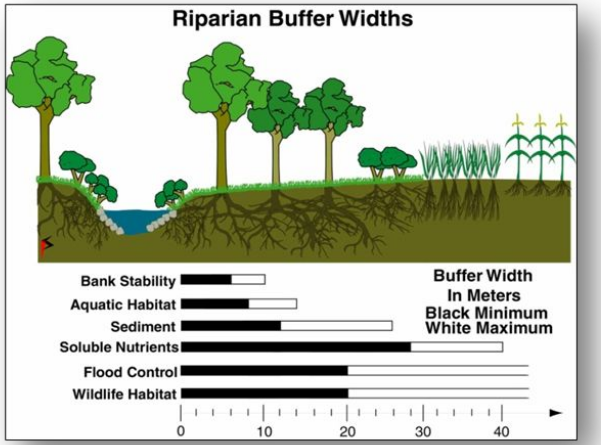
Riparian Buffer Design Considerations

Buffer Design

- Location
- Species
- Height
- Density
- Length
- Management and use
- Operation and Maintenance
- Upland habitat
- Long-term goals

The Three-Zone Buffer

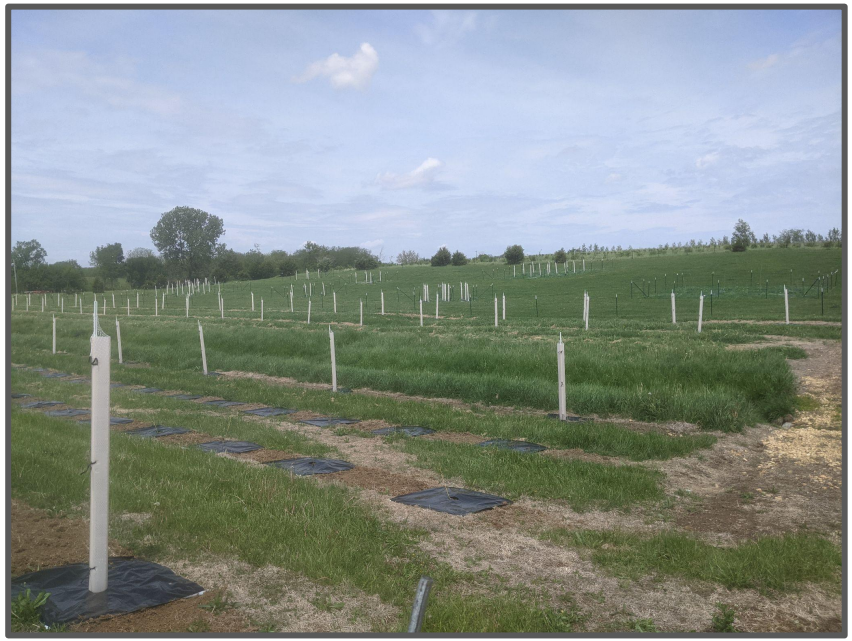
- Buffer widths and zones influence use and functionality
- Minimum zone width will vary by region



USDA National Agroforestry Center

Fields Restored Oregon, IL

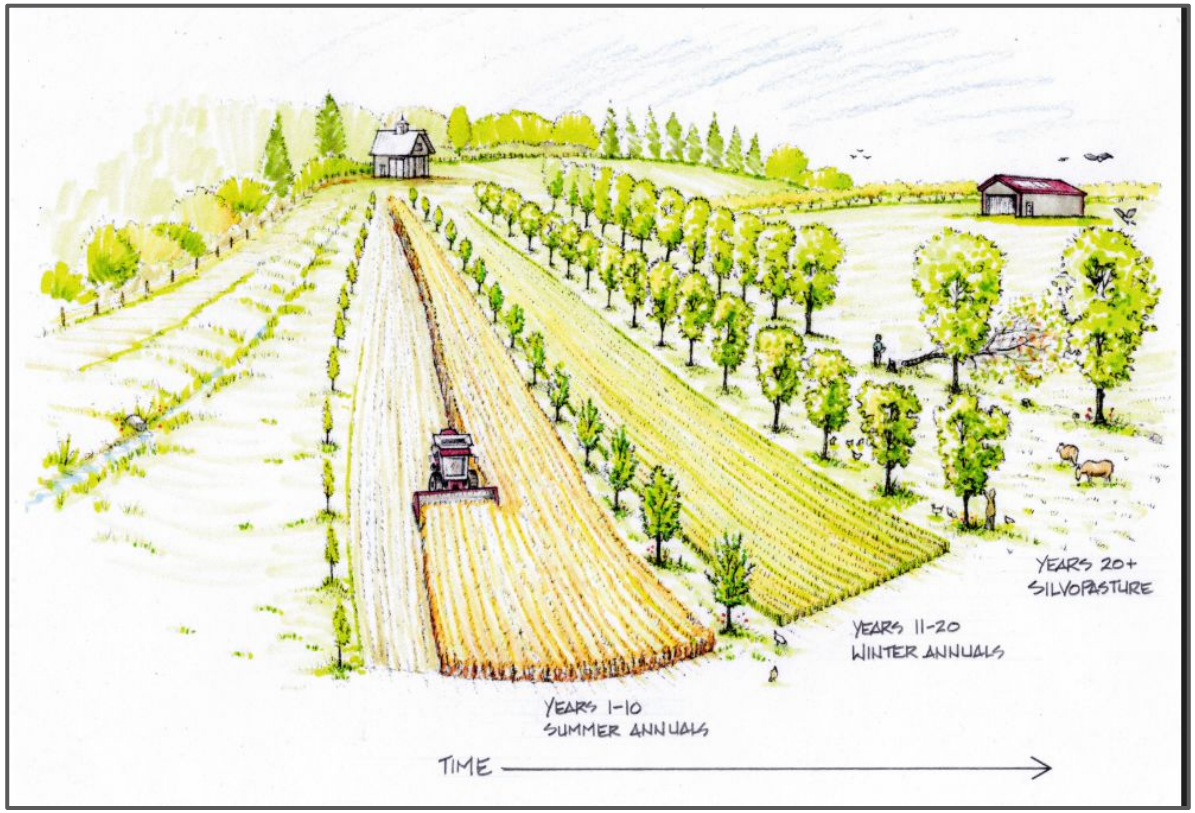
Multi-functional, Edible Riparian Buffer



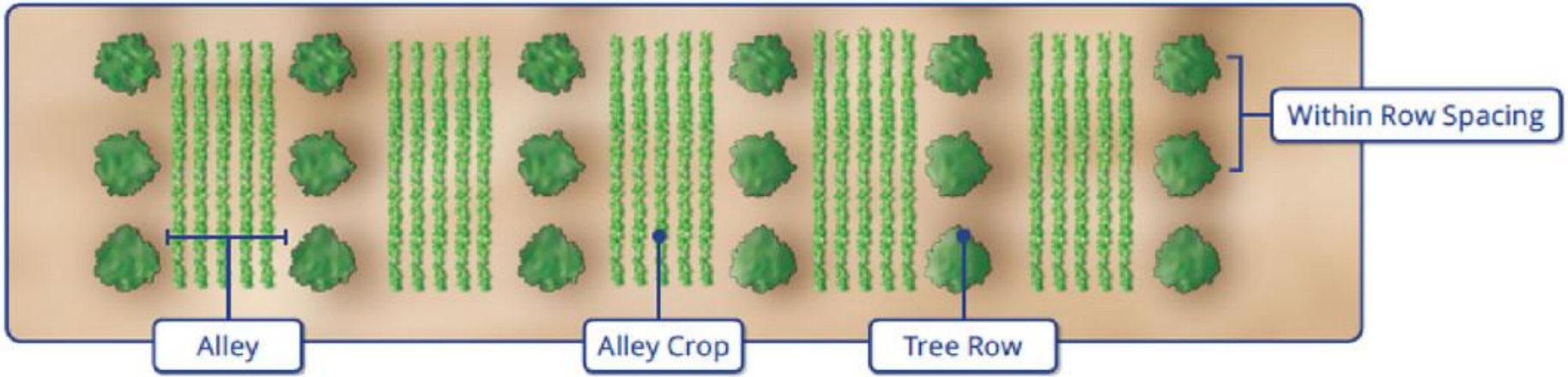
Design Factors

- Demonstration
- Nutrient & erosion capture
- Wildlife support
- Beautification
- Carbon storage
- Saleable crop that fits whole farm business planning

Alley Cropping



Alley Cropping



Common terminology used when discussing alley cropping systems are alley, alley crop, tree row, and within row spacing. (USDA National Agroforestry Center)

Alley Cropping Advantages

Photo: USDA National Agroforestry Center

- Enhance crop production
- Improve crop pollination
- Reduce wind & water erosion
- Create advantageous microclimates
- Improve soil health & fertility
- Create wildlife habitat
- Sequester carbon
- Slow or stop nutrient runoff
- Diversify farm income with long-term and short-term yields on one landscape

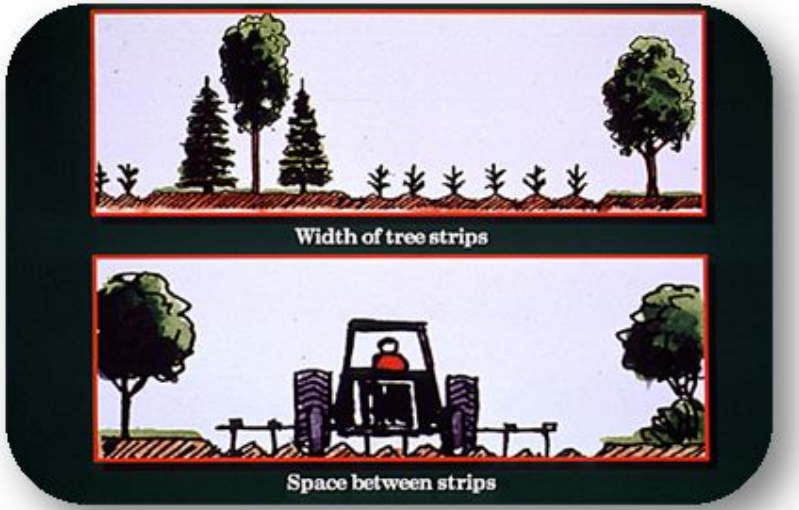
Alley Cropping Potential Challenges

- Intensive management
- Takes land out of annual production
- Different marketing and markets
- Different management systems in one space
- If herbicides are part of the annual system, alley cropping may change that program
- Perennial crops take longer to produce a salable product

Design Considerations

The Big 4

1. Landscape Conditions
2. Light Requirements
3. Root Competition
4. Size & Type of Equipment



Tree Species	Shade Produced	Root Competition
Black walnut	Low	Low
Pecan	Medium	Medium
Oak	High	Medium
Pine	High	Medium-high

Illustrations courtesy of USA National Agroforestry Center

Alley Cropping Design Considerations

The Trees

- Height
- Planting density
- Orientation
- Row length
- Row width
- Root competition
- Access areas
- Genetic choices
- Site & Soils
- Markets
- What are your goals with this planting?

The Alley

- Equipment
- Work timing & path
- Tree interactions
- Root competition
- Transition plan

Memorial 4H Camp Monticello, IL

Row Crop & Timber Alley Cropping

Species

Swamp White Oak, Shagbark Hickory, Black Walnut, Black Locust, Native Tree & Shrub Mix

Spacing

Alleys 200 ft Tree Paddocks 30 ft In-row 10 ft

Savanna Institute
Agroforestry Technical Service Program

Client fills out Savanna Institute intake form via website

Community Agroforester:

- Responds to client and shares Agroforestry resources
- Schedules Orientation meeting with Client and collects landscape information & client goals

Agroforestry Technical Service Provider:

- Reviews collected Client information
- Schedules site visit and meets with Client
- Analyzes biophysical data from the site and compares with client goals
- Creates sketches of Agroforestry practices to scale and shares with client for review
- Completes NRCS Implementation Requirement (IR) documentation for NRCS
- NRCS reviews IR and enters into their system
- Provides ongoing support

Illinois Working Lands, Water and Wildlife Conservation Partnership (IL-RCPP 1910)

March 4th
Application Deadline

Soil Health Management Plan (116)

Pollinator Habitat Design & Implementation Activity (148)

Soil Testing (216)

Alley Cropping (311)

Waste Storage Facility (313)

Brush Management (314)

Herbaceous Weed Treatment (315)

Composting Facility (317)

Seasonal High Tunnel (325)

Conservation Cover (327)

Conservation Crop Rotation (328)

Contour Buffer Strips (332)

Prescribed Burning (338)

Cover Crop (340)

Critical Area Planting (342)

Diversion (362)

Windbreak/Shelterbelt Establishment (380)

Silvopasture Establishment (381)

Fence (382)

Field Border (386)

Riparian Herbaceous Cover (390)

Riparian Forest Buffer (391)

Filter Strip (393)

Stream Habitat Improvement & Management (395)

Hedgerow Planting (422)

Irrigation Pipeline (430)

Irrigation System—Micro-irrigation (441)

Irrigation Water Management (449)

Mulching (484)

Tree & Shrub Site Preparation (490)

Forage & Biomass Planting (512)

Pipeline (516)

Pumping Plant (533)

Roof Runoff Structure (558)

Access Road (560)

Heavy Use Area Protection (561)

Streambank & Shoreline Protections (580)

Stripcropping (585)

Structure for Water Control (587)

Nutrient Management (590)

Subsurface Drain (606)

Tree & Shrub Establishment (612)

Underground Outlet (620)

Waste Transfer (634)

Vegetated Treatment Area (635)

Restoration of Rare or Declining Natural Communities (643)

Early Successional Habitat Management & Development (647)

Wetland Restoration (657)

Wetland Enhancement (659)



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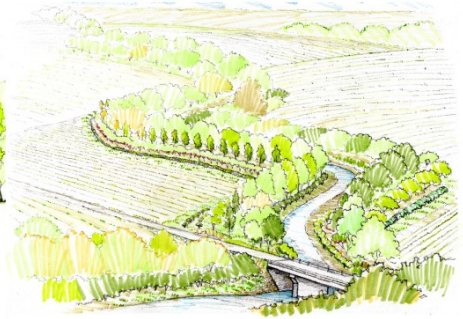

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