Measuring Nonpoint Source Nutrient Reductions in the Mississippi River Basin:

Summary of Agricultural Nonpoint Source Conservation Practices Providing Water Quality Benefits

The Conservation Tracking Framework team has worked to develop a working list of conservation practices likely to reduce nitrogen and phosphorus losses from agricultural land. The resulting working list will be used throughout all other aspects of the Conservation Tracking Framework project. Practices include agricultural conservation practices and landscape scale reduction practices. The project team used this process to standardize the agricultural nonpoint source practice list by limiting it to those which provide the most benefit to states.

The working list consists of approximately 60 water quality practices and was compiled using data from not only the two pilot states, but from the entire Hypoxia Task Force (HTF) region. The working list is the aggregation of practices listed under water quality in each state's Soil and Water Resources Conservation Act (RCA) report. Each state's RCA report lists conservation practices related to specific resource concerns, such as cropland soil quality, fish and wildlife habitat, etc., and water quality is included in each. RCA reports are available through the USDA Natural Resources Conservation Service.

This working list, shown in Table 1, will serve as the standard set of practices for the Conservation Tracking Framework, however, if a state has included an innovative and impactful conservation practice in their standard accounting, provisions will be made to include it.

Table 1. Working list of conservation practices with water quality benefits. Presented alphabetically.

Practice Name	Practice Code
Access Control	472
Access Road	560
Alley Cropping	311
Animal Mortality Facility	316
Apply controlled release nitrogen fertilizer	WQL06
Apply enhanced efficiency fertilizer products	WQL24
Apply nutrients no more than 30 days prior to plan	WQL05
Apply phosphorus fertilizer below soil surface	WQL09
Apply split applications of nitrogen based on a pr	WQL08
Channel Bank Vegetation	322
Closure of Waste Impoundment	360
Composting Facility	317
Conservation Cover	327
Conservation Crop Rotation	328
Constructed Wetland	656

Contour Buffer Strips	332
Contour Farming	330
Contour Orchard and Other Perennial Crops	331
Cover Crop	340
Critical Area Planting	342
Denitrifying Bioreactor	605
Denitrifying Bioreactor	747
Diversion	362
Drainage Water Management	554
Filter Strip	393
Forage and Biomass Planting	512
Grade Stabilization Structure	410
Grass Waterway	412
Heavy Use Area Protection	561
Injecting or incorporating manure	AIR01
Integrated Pest Management	595
Irrigation System, Microirrigation	441
Irrigation System, Tailwater Recovery	447
Irrigation Water Management	449
Land Reclamation, Abandoned Mined Land	543
Land Reclamation, Currently Mined Land	544
Mulching	484
Nitrification inhibitors or urease inhibitors	AIR08
Nitrification inhibitors or urease inhibitors	AIR09
Nitrogen stabilizers for air emissions control	AIR02
Nutrient Management	590
Prescribed Grazing	528
Residue and Tillage Management - No-Till	329
Residue and Tillage Management, Mulch Till	345
Residue and Tillage Management, Ridge Till	346
Riparian Forest Buffer	391
Riparian Herbaceous Cover	390
Roof Runoff Structure	558
Salinity and Sodic Soil Management	610
Saturated Buffer	604
Sediment Basin	350
Split applications of nitrogen based on a PSNT	WQL25
Split nitrogen applications 50% after crop/pasture	WQL07
Stream Crossing	578
Stream Habitat Improvement and Management	395
Streambank and Shoreline Protection	580

Stripcropping	585
Structure for Water Control	587
Terrace	600
Tree & Shrub Establishment	612
Vegetated Treatment Area	635
Waste Storage Facility	313
Waste Transfer	634
Waste Treatment	629
Waste Treatment Lagoon	359
Waste Utilization	633
Water and Sediment Control Basin	638
Well Decommissioning	351
Wetland Creation	658
Wetland Enhancement	659
Wetland Restoration	657
Windbreak/Shelterbelt Establishment	380
Windbreak/Shelterbelt Renovation	650

ADDITIONAL LIST SOURCES

Two additional list sources from the USDA NRCS were examined but not used at this time. They are provided in the Appendix for potential future list refinement.

The first list source is the Conservation Practice Physical Effects (CPPE) matrix provided by Hal Gordon, a USDA NRCS economist in Oregon. This source lists water quality benefits associated with each conservation practice and ranks them on a scale of -5 to 5 with 5 being the most beneficial. Those practices with a net benefit to surface and groundwater are included in Appendix A.

The second list source, included in Appendix B, was developed by Craig Goodwin, a water quality specialist and aquatic ecologist with USDA NRCS. The list highlights nitrogen and phosphorus reductions from the CPPE results. This list also includes whether the practice was included in the National Water Quality Initiative (NWQI), the Mississippi River Basin Initiative (MRBI), or the Great Lakes Restoration Initiative (GLRI) as water quality practices. Though only 31 practices are included in this list, there are ten practices which were not included in Table 1. These ten practices will likely be included in future water quality practice lists.

A supplemental work group, led up by Purdue University, was developed to evaluate these practices and include Conservation Stewardship Program (CSP) practices on the working list. The results from this work group will be incorporated upon completion and the working list will be amended to reflect the results of this work group when working with future states.

CORRESPONDING AUTHOR

Reid D. Christianson, P.E., Ph. D.
(217) 300-5886
ReidDC@illinois.edu

Appendix A

NRCS CPPE WATER QUALITY PRACTICE LIST

Table 2. List of water quality practices with a net positive impact on water quality (surface and groundwater). This list was modified from the Conservation Practice Physical Effects on Soil, Water, Air, Plants, Animals, Energy, People; National Summary Tool 2017 spreadsheet. Presented in source ranked order.

Practice Name	Practice Code
Agrichemical Handling Facility	309
Riparian Forest Buffer	391
Riparian Herbaceous Cover	390
Nutrient Management	590
Conservation Cover	327
Filter Strip	393
Short Term Storage of Animal Waste and Byproducts	318
Waste Storage Facility	313
Waste Treatment Lagoon	359
Saturated Buffer	604
Constructed Wetland	656
Silvopasture Establishment	381
Sediment Basin	350
Watering Facility	614
Alley Cropping	311
Wetland Creation	658
Wetland Enhancement	659
Wetland Restoration	657
Denitrifying Bioreactor	605
Conservation Crop Rotation	328
Cover Crop	340
Irrigation Land Leveling	464
Irrigation System, Microirrigation	441
Irrigation Water Management	449
Karst Sinkhole Treatment	527
Amendments for Treatment of Agricultural Waste	591
Animal Mortality Facility	316
Composting Facility	317
Emergency Animal Mortality Management	368
Feed Management	592
Pond Sealing or Lining, Concrete	522
Pond Sealing or Lining, Compacted Soil Treatment	520

Pond Sealing or Lining, Flexible Membrane	521A
Roof Runoff Structure	558
Waste Facility Closure	360
Waste Recycling	633
Waste Separation Facility (no)	632
Waste Transfer	634
Waste Treatment	629
Livestock Shelter Structure	576
Sprinkler System	442
Critical Area Planting	342
Prescribed Burning	338
Land Smoothing	466
Precision Land Forming	462
Forest Stand Improvement	666
Vegetated Treatment Area	635
Residue and Tillage Management, Reduced Till	345
Cross Wind Trap Strips	589C
Grassed Waterway	412
Stripcropping	585
Vegetative Barrier	601
Hedgerow Planting	422
Anaerobic Digester	366
Bivalve Aquaculture Gear and Biofouling Control	400
Stormwater Runoff Control	570
Windbreak/Shelterbelt Establishment	380
Windbreak/Shelterbelt Renovation	650
Field Border	386
Prescribed Grazing	528
Range Planting	550
Access Control	472
Irrigation System, Surface & Subsurface	443
Tree/Shrub Establishment	612
Tree/Shrub Pruning	660
Irrigation Ditch Lining	428
Road/Trail/Landing Closure and Treatment	654
Shallow Water Development and Management	646
Lined Waterway or Outlet	468
Well Decommissioning	351
Residue and Tillage Management, No Till	329
Anionic Polyacrylamide (PAM) Erosion Control	450
Contour Buffer Strips	332

Irrigation System, Tailwater Recovery	447
Mulching	484
Contour Farming	330
Contour Orchard and Other Perennial Crops	331
Waterspreading	640
Pond	378
Multi-Story Cropping	379
Forage Harvest Management	511
Cross Wind Ridges	588
Forage and Biomass Planting	512
Herbaceous Wind Barriers	603
Dust Control from Animal Activity on Open Lot Surfaces	375
Forest Trails and Landings	655
Grazing Land Mechanical Treatment	548
Heavy Use Area Protection	561
Irrigation Pipeline	430
Streambank and Shoreline Protection	580
Stream Crossing	578

Appendix B

NRCS WATER QUALITY PRACTICE SUMMARY

Table 3. Water Quality Practice list as evaluated by Craig Goodwin with USDA NRCS. This list considers the purpose of the practice and whether practices were included as water quality practices in the National Water Quality Initiative (NWQI), the Mississippi River Basin Initiative (MRBI), or the Great Lakes Restoration Initiative (GLRI). Presented alphabetically.

Practice Name	Practice Code	N or P reduction	NWQI	MRBI	GLRI	CPS Water Quality Purpose	Notes
Agrichemical Handling Facility	309	X				Reduce pollution to surface water, ground water, air, and/or soil.	
Alley Cropping	311	X				Decrease offsite movement of nutrients or chemicals. Reduce surface water runoff and erosion.	
Amending Soil Properties with Gypsum Products	333	X				Improve surface water quality by reducing dissolved phosphorus concentrations in surface runoff and subsurface drainage.	New practice that was not in CPPE last year
Amendments for Treatment of Agricultural Waste	591	X				Improve or protect water quality	
Animal Mortality Facility	316	X	X			Reduce pollution impacts to surface water and groundwater resources	
Conservation Cover	327	X	X	X	X	Reduce ground and surface water quality degradation by nutrients and surface water quality degradation by sediment.	
Conservation Crop Rotation	328	X	X	X	X	Reduce water quality degradation due to excess nutrients.	

Constructed Wetland	656	X		X		For improving the quality of storm water runoff or other water flows lacking specific water quality discharge criteria.	
Cover Crop	340	X	X	X	X	Reduce water quality degradation by utilizing excessive soil nutrients.	
Denitrifying Bioreactor	605	X		X		Improve water quality by reducing the nitrate nitrogen content of subsurface agricultural drainage flow.	
Drainage Water Management	554	X	X	X	X	Reduce nutrient, pathogen, and/or pesticide loading from drainage systems into downstream receiving waters.	Negative GW effect
Field Border	386	X	X		X	Protect soil and water quality – excess nutrients in surface and ground waters.	
Filter Strip	393	X	X	X	X	Reduce dissolved contaminant loadings in runoff – Excess nutrients in surface and ground waters. Reduce suspended solids and associated contaminants in runoff – Excess nutrients in surface and ground waters, Excessive sediment in surface waters.	
Forage and Biomass Planting	512	X		X		Improve soil and water quality.	

Grassed Waterway	412	X	X	X	X	To protect/improve water quality.	
Heavy Use Area Protection	561	X	X		X	To protect or improve water quality	
Irrigation System, Tailwater Recovery	447	X				Improve offsite water quality	Negative GW effect
Irrigation Water Management	449	X	X	X		Decrease degradation of surface and groundwater resources.	
Nutrient Management	590	X	X	X	X	To minimize agricultural nonpoint source pollution of surface and groundwater resources.	
Prescribed Grazing	528	X	X	X	X	Improve or maintain surface and/or subsurface water quality and quantity.	
Range Planting	550	X				Improve water quality and quantity.	
Riparian Forest Buffer	391	X	X	X	X	Reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow ground water flow.	
Riparian Herbaceous Cover	390	X	X	X	X	Improve and maintain water quality.	
Roof Runoff Structure	558	X				Protect surface water quality by excluding roof runoff from contaminated areas	
Short Term Storage of Animal Waste	318	X				Protect surface and groundwater resources.	

and Byproducts							
Silvopasture Establishment	381	X				Improve water quality.	
Stripcropping	585	X		X		Reduce soil erosion from water and transport of sediment and other waterborne contaminants	
Tree/Shrub Establishment	612	X	X	X	X	Long-term erosion control and improvement of water quality	
Vegetative Barrier	601	X	X	X	X	Improve water quality by trapping sediment.	
Waste Facility Closure	360	X	X			Protect the quality of surface water and groundwater resources.	
Waste Separation Facility (no)	632	X				Improve or protect water quality	