

**Iowa Nutrient Reduction Strategy: Annual Measurement of Quantitative Indicators**

*This is a working document that will be revised on an ongoing basis*

*Last updated 6 June 2020*

Dimension	Component	Measurable Indicator	Indicator Code	Measure	Unit	Spatial and Temporal Resolution	Data Sources	Ready to include in A.R.?	Next Steps
INPUTS	People	Total NRS-related staff	I01a	Partner Organizations' staff working toward NRS goals: 1. Infrastructure Staff 2. Research Staff 3. On-the-ground Implementation Staff 4. Other	FTE/Year	Statewide; Annual	NRS Partner Reports (see Part Three of 2019 NRS Annual Progress Report)	Revisiting for future reports	Explore inconsistencies between 2019 NRS Partner Reports and previous years to maintain consistent year-to-year comparisons.
	Funding	Public "NRS-Focused" Funding	I02a	Partner Organizations' reported public funding sources for NRS-related work; specifically, the annual obligations for new programs that are generally focused on NRS implementation	\$/Year	Statewide; Annual	NRS Partner Reports (see Part Three of 2019 NRS Annual Progress Report)	Yes	Specify "new" public funding programs in this document
		Public "Base" Funding	I02b	Partner Organizations' reported public funding sources for NRS-related work; annual obligations for all public programs that are not included in indicator I02a (i.e. were in place prior to NRS but contribute to NRS implementation)	\$/Year	Statewide; Annual		Yes	Specify "base" public funding programs in this document
		Private "New" Funding	I02c	Partner Organizations' reported annual obligations from private funding sources for NRS-related work	\$/Year	Statewide; Annual		Yes	
		Farmer/Landowner Spending on Cost-Share for Nonpoint Source Practices	I02d	Sum of the following for each practice: 1. Applicants' share for state cost-share contracts 2. Estimate of applicant share for NRCS cost-share contracts: 50% • (Mean cost per acre treated for state contracts) • NRCS cost-share acres treated  Currently calculated for the following practices for which there are sufficient data: cover crops, terraces, WASCObS, and grade stabilization structures.	\$/Year	HUC12; Annual	NRCS Cost-Share Programs, IDALS Cost-Share Programs	Yes, for Statewide	Refine the 50% cost-share assumption to reflect each NRCS program more accurately; many state and federal programs currently offer greater than 50% cost-share). Estimate investment for additional practices.
		Funding for Point Source-Specific Efforts	I02e		\$/Year	Statewide; Annual	NRS Partner Reports (see Part Three of 2019 NRS Annual Progress Report)	No	This funding is currently included with "NRS-Focused" Funding category (I02a), but it may be broken out separately in subsequent reports, depending on the ability to separate point source-related funding from other funding categories.
	Point Source Engagement	Number of reissued permits	I03a		Total number completed; Number completed per year	Statewide; HUC8	DNR Point Source Permits Database	Yes	
		Number of feasibility studies completed and submitted	I03b					Yes	

Dimension	Component	Measurable Indicator	Indicator Code	Measure	Unit	Spatial and Temporal Resolution	Data Sources	Ready to include in A.R.?	Next Steps
HUMAN	Farmer Knowledge/Attitude	Knowledge	H01a	Farmers' responses to question regarding NRS Knowledge (self-reported)	Annual percent of respondents (1-5 scale: Not at all knowledgeable to Very knowledgeable)	HUC8; temporal resolution varies by watershed	NRS Farmer Survey	Yes	Complete analysis for 2019 wave of survey.
		Measured Attitude	H01b	Farmers' responses to questions regarding attitudes and concerns related to NRS, water quality, nutrient management	Annual percent of respondents (1-5 scale: Strongly disagree to Strongly agree)	HUC8; temporal resolution varies by watershed		Yes	
		Farmer Characteristics and Contextual Factors that Predict Conservation Adoption	H01c	Factors that show statistically significant relationship with conservation adoption on farms	Odds ratio demonstrating increased or decreased likelihood of conservation adoption	N/A; these analyses control for location and year of survey		Yes	
	Outreach/Education	# Outreach Events	H02a	Number of events conducted by partner organizations: 1. Field Days: on farms or at urban conservation sites, with the general goal of spreading awareness about specific conservation practices and methods 2. Community Outreach: conducted with the general public, with the goal of spreading awareness of and education about Iowa water quality issues or the NRS 3. Youth-Focused: conducted at schools, summer camps, or other youth setting to promote awareness of NRS and/or Iowa water quality issues 4. Conferences 5. Workshops: Training sessions with a narrowly defined audience to develop capacity in a certain skill (e.g. conservation practice, software, manure management) 6. Supplemental Workshop Topics: Training sessions that feature, in part, training and skills related to water quality improvement and/or NRS goals (e.g. pesticide applicator trainings with a featured focus on saturated buffers and perennial pollinator habitat)	Events/Year	County; Annual	NRS Partner Reports (see Part Three of 2019 NRS Annual Progress Report)	Yes	
		Event Attendance	H02b	Total number of attendees reported for the above categories of events (H02a)	Attendees/Year	County; Annual		Yes	
		Distribution of Outreach	H02c	Visual display of number of events or attendees in each Iowa county	Events/County/Year, Attendees/County/Year	County; Annual		Yes	

Dimension	Component	Measurable Indicator	Indicator Code	Measure	Unit	Spatial and Temporal Resolution	Data Sources	Ready to include in A.R.?	Next Steps	
LAND	"Every Acre Treated"		L01a	Potential measure for the overall extent of conservation implementation relative to all agricultural acres.				No	This measure is being preliminarily explored, but constraints exist, including the ability to track some NRS practices and the ability to assess "stacked" practices (i.e. multiple practices occurring in one field).	
	Land-Use	Perennial Retired	L02a	1. USDA Census of Agriculture and NASS Surveys: Annual acres of row crops, pasture, hay/haylage 2. USDA Cropland Data Layer: Rolling five-year crop rotations for individual fields (method described in 2019 Annual Report) 3. FSA Crop Acreage Data: Annual planted acres of corn and soybeans	Acres	Census/NASS: County, CDL: Field, FSA: County; Annual	USDA Census of Agriculture and NASS Surveys, USDA Cropland Data Layer, FSA Crop Acreage Data	Yes	Work with USDA-ARS to refine metric based on remote sensing USDA Cropland Data Layer; Work with FSA to better incorporate crop acreage data, where appropriate. For perennial crops, working with CDL and other available data sources to distinguish between acres of pasture, hay, and perennial crops. For forest, next steps are to work with specialists on identifying the most appropriate data source for tracking acres (e.g. CDL or others).	
		Perennial Crops	L02b		Acres			No		
		Pasture	L02c		Acres			Yes		
		Extended Rotation	L02d		Acres			Yes, and Revisit for Future Reports		
		Forest	L02e		Acres			No		
	N & P Conservation Practice Adoption	Cover Crops	L03a	USDA Census of Agriculture, 2012 and 2017 (indicating planting the prior fall)	Acres	2012: Statewide, 2017: County; Conducted every five years	USDA Census of Agriculture	Yes	Incorporate emerging data source: INREC Survey of Agricultural Retailers (statewide, annual). Evaluate the utility and validity of data provided by remote sensing projects (e.g. Operational Tillage Information System).	
		Stream Buffers	L03b					No	Coordinate with researchers associated with efforts to detect buffers via satellite imagery. Outline challenges faced in these projects and identify future needs.	
		In-Field Nitrogen and Phosphorus Management	L03c	INREC Survey: Emerging data source, results described in 2019 Annual Report <i>[Descriptions of the process for integrating fertilizer management data into the tracking system are being developed for this document. Practices include changes in the timing, placement, source, and rate of fertilizer/manure application.]</i>	Acres (for fertilizer timing, method, and source); Pounds per Acre (for fertilizer rate)	Statewide; Annual	INREC Survey of Agricultural Retailers	No	Incorporate emerging data source: INREC Survey of Agricultural Retailers (statewide, annual). Replicate the analysis that was conducted for the NRS Science Assessment using more recent fertilizer sales data.	
	N Conservation Practice Adoption	Drainage Water Management	L04a						No	Tabulate data for these practices provided in cost-share databases. Coordinate with agricultural drainage researchers and professionals to determine whether cost-share is the appropriate data source for this practice.
		Shallow Drainage	L04b							
		Bioreactors	L04c	1. IDALS cs + NRCS-EQIP cs 2. Partners' non-cost shared bioreactor and saturated buffer projects	Acres Treated	HUC12; Annual	NRCS EQIP, IDALS Cost-Share Programs, NRS Partner Reports	Yes		
		Saturated Buffers	L04d					Yes		

Dimension	Component	Measurable Indicator	Indicator Code	Measure	Unit	Spatial and Temporal Resolution	Data Sources	Ready to include in A.R.?	Next Steps
LAND, cont'd	N Conservation Practice Adoption, continued	CREP-Style Wetlands	L04d	IDALS CREP wetlands	Acres Treated	HUC12; Annual	IDALS CREP wetland data	Yes	Assess whether tile-zone wetlands that capture tile drainage should be incorporated, and how.
		Multi-Purpose Oxbows	L04e					No	Explore whether multi-purpose oxbows are listed in cost-share databases, and if so, how many are typically cost-shared? Evaluate existing NRS partner reports to identify multipurpose oxbows that were constructed without cost-share.
		Living Mulches	L04f					No	There are currently no known data sources for tracking this practice. Explore whether remote sensing data has some utility or potential for tracking this practice over time. Consult with on-farm research nongovernmental organizations on potential estimates of adoption/use.
	P Conservation Practice Adoption	Tillage	L05a	USDA Census of Agriculture, 2012 and 2017: Acres no-till and acres conservation tillage	Acres	County; collected every five years	USDA Census of Agriculture	Yes	Incorporate emerging data source: INREC Survey of Agricultural Retailers (statewide, annual); Evaluate the utility and validity of data provided by remote sensing projects (e.g. Operational Tillage Information System).
		Terraces	L05b	IDALS cs + NRCS-EQIP cs	Acres Treated	HUC12; Annual	NRCS EQIP, IDALS Cost-Share Programs	Yes	Integrate data from the BMP Mapping Project and estimate acres treated by the terraces identified through that project.
		WASCOBs, Grade Stabilization Structures, and Farm Ponds	L05c	IDALS cs + NRCS-EQIP cs	Acres Treated	HUC12; Annual	NRCS EQIP, IDALS Cost-Share Programs	No	Assess inconsistencies and unfeasibly low numbers in NRCS database, for including this metric in subsequent reports. Complete the summary of the BMP Mapping Project data, to show change in these practices over time, extrapolated from selected watersheds for multiple time periods.
		Blind Inlets	L05d					No	Explore whether blind inlets are listed in cost-share databases, and if so, how many are typically cost-shared? Identify additional potential data sources for tracking, if possible.
	Point Source Facility Upgrades and Improvements	Construction Schedules and Commitments	L06a			Statewide; HUC8; Annual	DNR Point Source Permits Database	Yes	Develop method for projecting point source loads into the future based on future reductions from new construction and upgrades

Dimension	Component	Measurable Indicator	Indicator Code	Measure	Unit	Spatial and Temporal Resolution	Data Sources	Ready to include in A.R.?	Next Steps	
WATER	Calculated Load Changes from Nonpoint Source Practices		W01a	<i>[Description of this process is being developed for this document; see the NRS Nonpoint Source Science Assessment for details on the procedure and models developed for the NRS]</i>	Pounds/Year, Tons/Year	Major Land Resource Area; Annual for selected practices	Various: agronomic, climatological, geological, and practice estimates based on indicators I02-I05	Yes, for Selected Practices	Incorporate additional nonpoint source practices	
	Calculated Load Changes in Priority Watersheds	Boone	W02a			HUC8; Annual for selected practices			No	Coordinate with NRS Nonpoint Source Science Team and Iowa Nutrient Research Center to assess the model's capacity to produce HUC8-level calculations (as opposed to current MLRA-based calculations)
		E. Nishnabotna	W02b							
		Floyd	W02c							
		Middle Cedar	W02d							
		N. Raccoon	W02e							
		Skunk	W02f							
		S. Skunk	W02g							
		Turkey	W02h							
	W. Nishnabotna	W02i								
	Extent of monitoring for nitrate and turbidity at varying scales	Edge-of-field/"delivery"	W03a			Number of sites	Centroid of township; Annual	ISA Edge-of-Field monitoring sites	Yes, and Revisit for Future Reports	Update dataset based on recent NRS Partner Reports and refine geospatial display of monitoring sites; highlight the extent of monitoring at watershed projects and nonpoint source practices (e.g. CREP wetlands)
Small watersheds		W03b			<100 sq mi; Annual					
Medium watersheds		W03c			100-1,000 sq mi; Annual		DNR/IIHR/USGS sites			
Large watersheds		W03d			>1,000 sq mi; Annual					
Statewide Load Estimates From Monitoring Sites' Measurements		W04a	1. DNR's linear interpolation method for annual nitrate loads 2. DNR's P load estimate using turbidity data (currently being developed)	Tons/Year	Statewide; Annual	DNR/IIHR/USGS sites	Yes	Work with water resources researchers to determine ability to detect trends over time, given the strong relationship between load and streamflow.		
Point Source Nutrient Loss Reductions	Percent removal capacities for municipal and industrial facilities	W05a	<i>[Description of this process is being developed for this document]</i>	Percent	Statewide; Annual	DNR Point Source Permits Database	Yes			

#### Acronyms

A.R.	NRS Annual Report
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
cs	Cost-share
DNR	Iowa Department of Natural Resources
FSA	Farm Service Agency
FTE	Full-time equivalent
HUC	Hydrologic unit code
IDALS	Iowa Department of Agriculture and Land Stewardship
IIHR	IIHR--Hydrosience & Engineering
ILF	Iowa Learning Farms
INREC	Iowa Nutrient Research and Education Council
ISA	Iowa Soybean Association
NRCS	USDA Natural Resource Conservation Service
NRS	Iowa Nutrient Reduction Strategy
P	Phosphorus
PFI	Practical Farmers of Iowa
USDA-ARS	USDA Agricultural Research Service
USGS	US Geological Survey
WASCOB	Water and sediment control basin