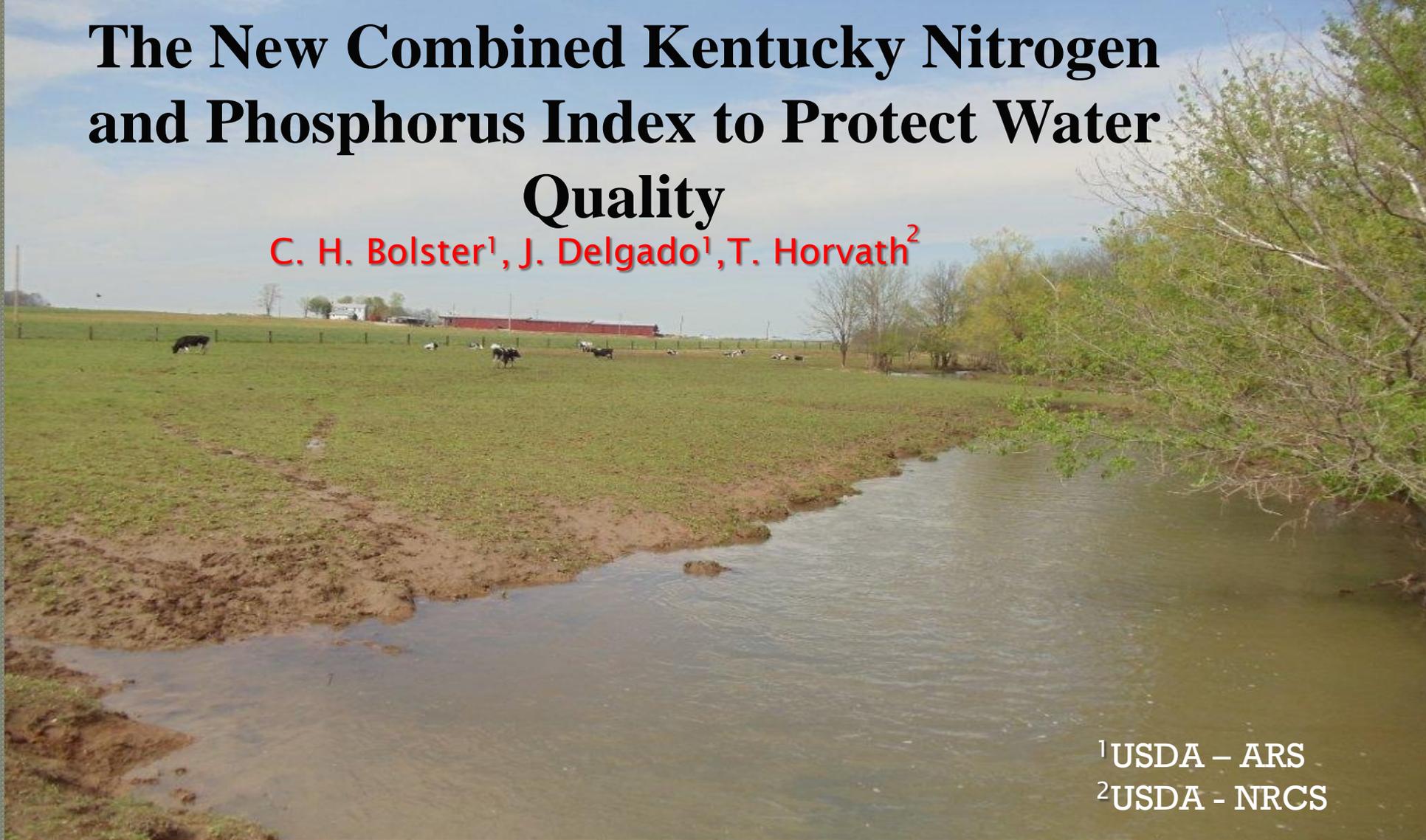


The New Combined Kentucky Nitrogen and Phosphorus Index to Protect Water Quality

C. H. Bolster¹, J. Delgado¹, T. Horvath²



¹USDA – ARS

²USDA - NRCS

*Kentucky Agricultural Science and Monitoring Committee Meeting
Murray, Kentucky - July 23-24, 2013*

402.4 Nutrient Management Plans

A. Plans for nutrient management may be stand-alone or be elements of a more comprehensive conservation plan. When plans for nutrient management are part of a more comprehensive conservation plan, the provisions for nutrient management are compatible with other provisions of the plan.

B. Plans for nutrient management are developed in accordance with this policy, the technical requirements as described in National Instruction (NI) 190-302, Nutrient Management Policy Implementation, and CPS Code 590, Nutrient Management, and States' NRCS FOTG information.

C. When applicable, plans for nutrient management should include other practices or management activities as determined by specific regulation, program requirements, or producer goals.

D. States are encouraged to adopt protocol for the format and appearance of nutrient management plans that is in accordance with Title 190, General Manual (GM), Part 402, Nutrient Management, and Part 405, Comprehensive Nutrient Management Plans, technical criteria contained in the FOTG, and other State-developed guidance.

E. Nitrogen and Phosphorus risk assessments must be required in accordance with National Instruction, Title 190, Part 302, Nutrient Management Policy Implementation, and CPS Code 590, Nutrient Management.

- (1) When such risk assessments are made, nutrient management plans will include:
 - (i) A record of the site risk assessment rating for each field, and
 - (ii) Information about conservation practices and management actions that are planned to minimize the offsite movement of nutrients.
- (2) The results of the nitrogen and phosphorus risk assessment(s) and recommendations must be discussed with the producer as a normal part of the planning process.
- (3) When NRCS and State water quality control officials, based on previous risk assessments from locations with similar site and transport factors, have determined that additional site-specific assessment(s) of risk are not required (nitrogen and phosphorus), sufficient documentation establishing why the site was excluded must be provided.

F. Sheet, rill and wind erosion must be managed to protect soil and water quality. Concentrated flow erosion (ephemeral and gully) must be managed with appropriate conservation practices. When site erosion rates are greater than soil loss tolerance ("T"), a site assessment for nutrient and soil loss must be conducted to determine if mitigation practices are required to protect water quality.

G. Review and Revision of Nutrient Management Plans

Why Kentucky is in need of a Nitrogen Index?

KGS KENTUCKY GEOLOGICAL SURVEY
James C. Curren, Area Geologist and Director
UNIVERSITY OF KENTUCKY LEONOVILLE

MAP AND CHART 33
Series XI, 2001

KARST OCCURRENCE IN KENTUCKY

Randall L. Paylor and
James C. Curren

This map was compiled from a digital version of the 1:500,000-scale geologic map of Kentucky (Noyes, M.C., compiler, 1988). Geologic maps of Kentucky (U.S. Geological Survey). The areas of potential karst development were delineated using stratigraphic units mapped on the geologic map. The classification of the potential for karst development was based on the field experience of the authors and other data. A number of isolated carbonate units that would not have otherwise been differentiated on the geologic map were newly digitized for this map.

This karst map should not be used for evaluating karst geologic hazards or hydrogeology at scales larger than 1:500,000. The base geologic map was digitized at 1:500,000 scale and is limited in precision at that scale. Because of the small scale of the original geologic map, lithologic stratigraphic units were consolidated into thicker chronostratigraphic units to create an area large enough to delineate on the geologic map. In some cases, the consolidation resulted in carbonate (limestone or dolomite) and non-carbonate (sandstone or shale) units being grouped; these rocks are not subdivided on this map. Although the potential for karst development can be predicted from lithology, other factors such as mineral and length of time the rock is exposed are also important and were not considered in the making of this map. Finally, areas where the rock-surface contact is insoluble and closely associated by soluble rock are common, particularly in the Eastern Pennyroyal. Conditions that promote drainage commonly occur through ridges capped with insoluble rock. Therefore, some areas mapped as having limited potential that are adjacent to areas of higher potential are actually karst, but cannot be defined based on this map.

Karst is a term that is generally used to describe limestone or dolomite, when the topography is formed chiefly by the dissolving of rock. Karst landscapes are commonly characterized by sinkholes, sinking streams, closed depressions, subterranean drainage, large springs, and caves.

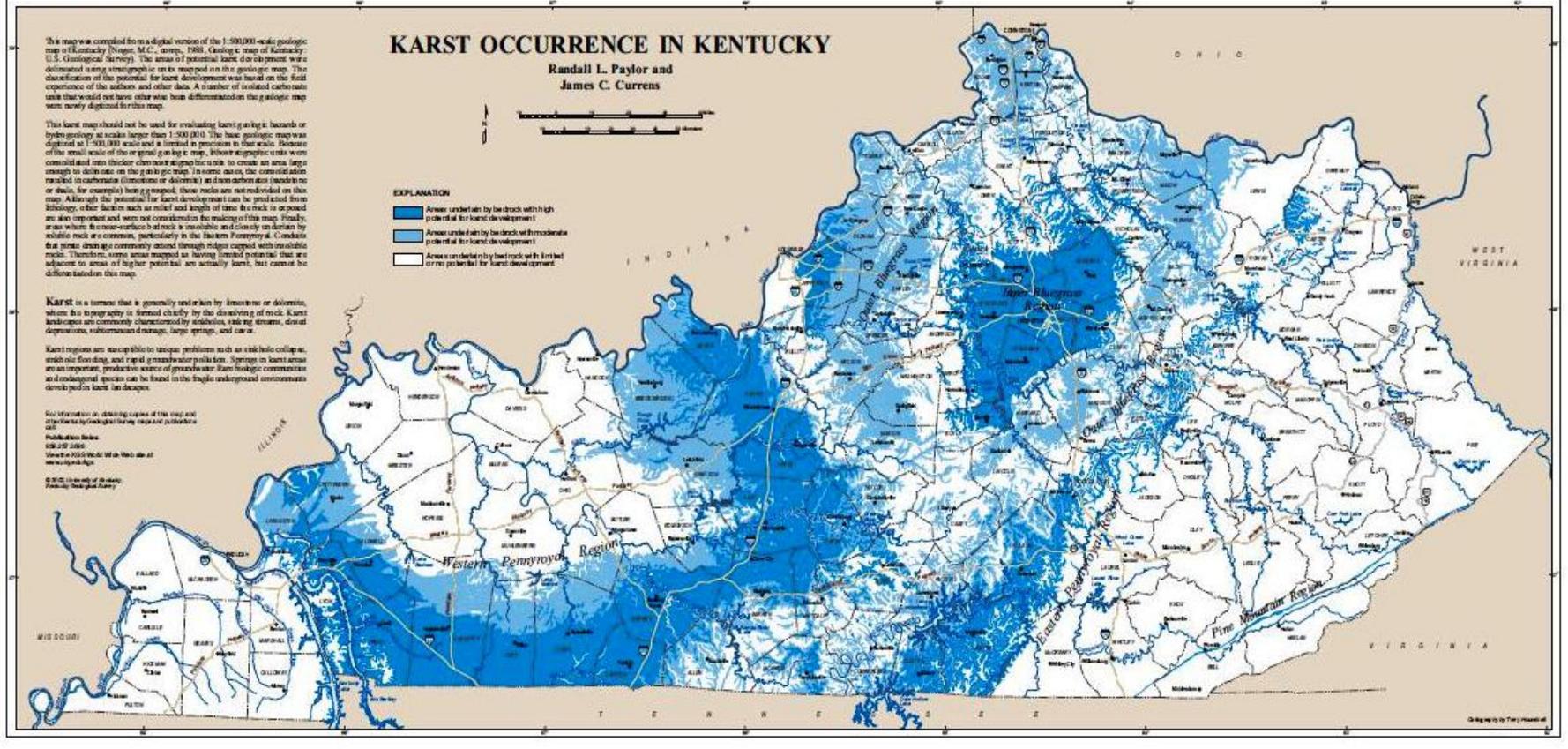
Karst regions are susceptible to unique problems such as sinkhole collapse, unstable foundations, and rapid groundwater pollution. Springs in karst areas are an important, productive source of groundwater. Karst biologic communities and endangered species can be found in the fragile underground environments developed in karst landscapes.

For information on obtaining copies of the map and its metadata, contact the map manager and publisher at:
Publication Sales
606-257-2386
View the KGS Web site at
www.kgs.uky.edu

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Digitized by GeoQuest

EXPLANATION

- Areas underlain by bedrock with high potential for karst development
- Areas underlain by bedrock with moderate potential for karst development
- Areas underlain by bedrock with limited or no potential for karst development



Nitrate-Nitrogen (mg/L)

Dissolved and total nitrate-nitrogen in sampled wells and springs of Kentucky.
Data used are a composite of sampling from the 1940's to the present.

Depth of wells (ft)	Dug wells	0-50	51-100	101-150	151-200	2-500	Springs
Maximum	150	150	67	97	76	150	34
50th percentile	9.6	8.3	7.2	6.1	2.7	6.7	4.0
75th percentile	4.9	3.7	3.3	2.6	1.1	2.8	2.2
50th percentile (median)	1.9	1.2	0.7	0.6	0.2	0.6	1.0
25th percentile	0.6	0.2	0.1	0.1	0.1	0.1	0.5
10th percentile	0.2	0.1	nd	nd	nd	nd	0.1
Minimum	nd	nd	nd	nd	nd	nd	nd
Average	4.3	3.1	2.5	2.3	1.3	2.4	1.7
Standard deviation	10.0	6.7	4.6	5.7	4.6	5.4	2.3

Sites with nitrate-nitrogen data	391	842	1,506	737	660	3,745	1,018
Sites averaging above MCL (10 mg/L)	38	59	77	25	7	168	31
Percent above MCL	9.7%	7.0%	5.1%	3.4%	1.1%	4.5%	3.0%
Sites averaging above 1/2 MCL	95	157	247	99	29	532	136
Percent above 1/2 MCL	24.3%	18.6%	16.4%	13.4%	4.4%	14.2%	13.4%
Number of analyses for sites	391	1,051	1,668	931	839	4,489	2,604
Number of analyses above MCL	38	59	89	26	9	183	36
Number of analyses above 1/2 MCL	95	180	259	108	30	577	172
Total sites known in Kentucky						> 200,000	unknown

nd-not detected

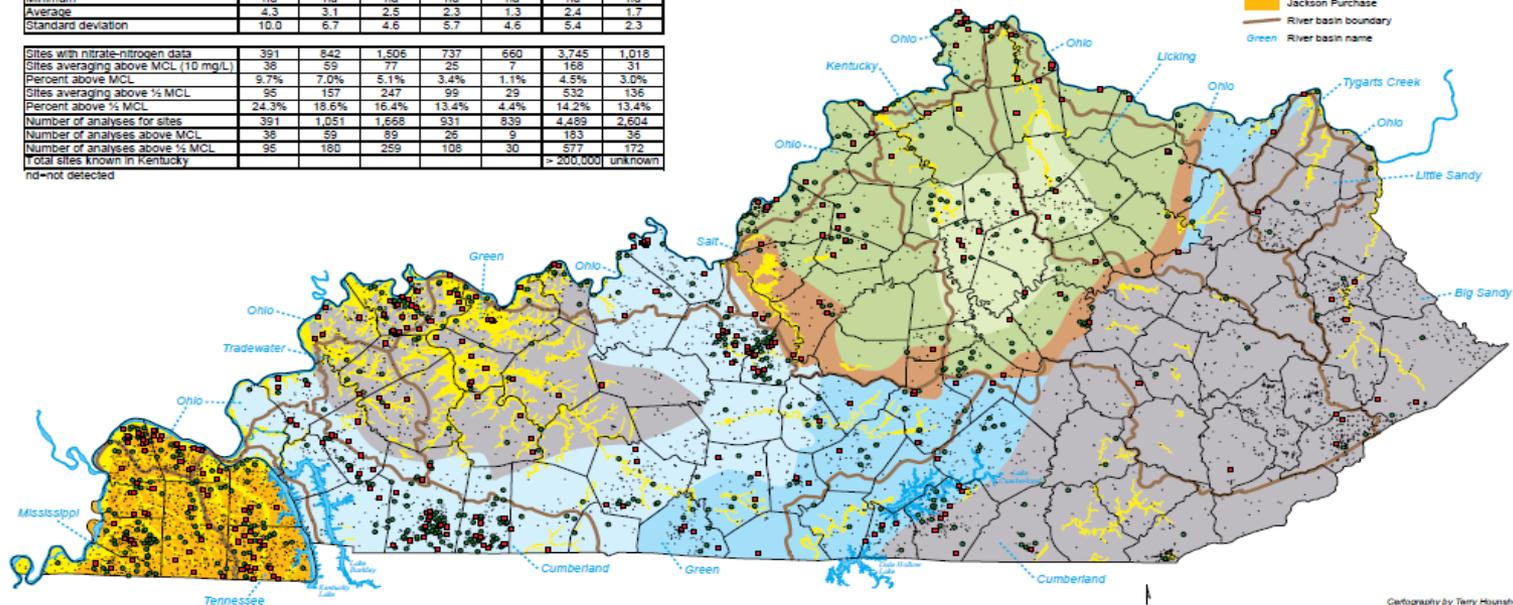
EXPLANATION

Nitrate-nitrogen concentrations

- Greater than 10 mg/L
 - 5.1 to 10 mg/L
 - less than or equal to 5 mg/L
- Data from Kentucky Ground-Water Data Repository, July 1998

Physiographic areas

- Eastern and Western Kentucky Coal Fields
- Inner Blue Grass
- Outer Blue Grass
- The Knobs
- Eastern Pennyroyal
- Western Pennyroyal
- Alluvium or glacial deposits
- Jackson Purchase
- River basin boundary
- Green River basin name



Kentucky Geological Survey
Donald C. Harey, State Geologist and Director
UNIVERSITY OF KENTUCKY, Lexington

NITRATE-NITROGEN CONCENTRATIONS IN WELLS AND SPRINGS IN KENTUCKY

Cartography by Terry Hounshell

Information Circular 60
Series XI, 1999

Kentucky N & P Index Users' Guide



Kentucky N & P Index

Soils Information Data Input Screen

Kentucky Nitrogen Index 4.4.2 | Soil

Soil Layer: ppm

#1 #2 #3

Soil Depth	<input type="text" value="1"/>	feet	Soil PH	<input type="text" value="6.8"/>
Organic Matter	<input type="text" value="2"/>	%	SOM N Rate	<input type="text" value="40"/>
N-O3N	<input type="text" value="5"/>	ppm		
NH4-N	<input type="text" value="1"/>	ppm		
Bulk Density	<input type="text" value="1.3"/>	g/cm ³		

Save

If there is no soil test available for NO₃ and NH₄ just enter 5 ppm for NO₃ and 1 ppm for NH₄. Enter data for layer #2 and #3 only if soil tests are available for different depths.

Then click "Save"

Kentucky N & P Index

Dry Manure Information Data Input Screen

Kentucky Nitrogen Index 4.4.2 | Dry Manure

Current Year

Applied Application

Dairy Manure (KY) lbs N

Wet Weight 15 ton/a % Moisture 80

NH4-N DB 22 lbs WEP 0.65

Total N DB 55 lbs P2O5 DB 45 lbs

% Release (1st/2nd Year) 32 14

Surface Applied Default

Incorporated AVC 2 Custom

Applied Application

Beef-Colorado lbs N

Wet Weight ton/a % Moisture 32.0

NH4-N DB 4.0 lbs WEP 0.65

Total N DB 34.0 lbs P2O5 DB 36.0 lbs

% Release (1st/2nd Year) 40.0 15.0

Surface Applied Default

Incorporated AVC 12.0 Custom

Previous Year

Applied Application

Dairy Manure (KY) lbs N

Wet Weight 15 ton/a % Moisture 80

NH4-N DB 22 lbs WEP 0.65

Total N DB 55 lbs P2O5 DB 45 lbs

% Release (1st/2nd Year) 32 14

Surface Applied Default

Incorporated AVC 2 Custom

Applied Application

Beef-Colorado lbs N

Wet Weight ton/a % Moisture 32.0

NH4-N DB 4.0 lbs WEP 0.65

Total N DB 34.0 lbs P2O5 DB 36.0 lbs

% Release (1st/2nd Year) 40.0 15.0

Surface Applied Default

Incorporated AVC 12.0 Custom

Save

Select the manure type applied and rate, incorporation method for current and previous years. Use right side input tables if multiple manure applications occur in a year. Enter manure analysis report data to replace book values.

Then click "Save"

Kentucky N & P Index

Liquid Manure Information Data Input Screen

Kentucky Nitrogen Index 4.4.2 | Liquid Manure

Current Year

Applied Application

IN-Dairy Lagoon Gallons

NH4-N 2 lbs N/1k gal Amount 40000 gal/ac

Total N 4 lbs N/1k gal WEP 0.65

P2O5 4 lbs P2O5/1k gal

% Release (1st/2nd Year) 0.3 14

Surface Applied Default

Incorporated AVC 2 Custom

Applied Application

CA-Average in/acre

NH4-N 230.0 ppm Amount in/ac

Total N 330.0 ppm WEP 0.65

P2O5 500.0 ppm

% Release (1st/2nd Year) 30.0 15.0

Surface Applied Default

Incorporated AVC 12.0 Custom

Previous Year

Applied Application

IN-Dairy Lagoon Gallons

NH4-N 2 lbs N/1k gal Amount 40000 gal/ac

Total N 4 lbs N/1k gal WEP 0.65

P2O5 4 lbs P2O5/1k gal

% Release (1st/2nd Year) 0.3 14

Surface Applied Default

Incorporated AVC 2 Custom

Applied Application

CA-Average in/acre

NH4-N 230.0 ppm Amount in/ac

Total N 330.0 ppm WEP 0.65

P2O5 500.0 ppm

% Release (1st/2nd Year) 30.0 15.0

Surface Applied Default

Incorporated AVC 12.0 Custom

Save

Select the manure type applied and rate, incorporation method for current and previous years. Use right side input tables if multiple manure applications occur in a year. Enter manure analysis report data to replace book values.

Then click "Save"

Kentucky N & P Index

Fertilizer Information Data Input Screen

Kentucky Nitrogen Index 4.4.2 | Fertilizer

Application:

#1 #2 #3 #4 #5

Applied Application

Source of N and Method of Application

UAN Surface

Rain / Irrigation during Application

Amount lbs N/ac

Controlled Release Fertilizer

Nitrification Inhibitor

Split Fertilizer

AVC Default Custom

Then click "Save"

Select the fertilizer type, application rate and application method.

Select Application #2, #3 if multiple fertilizer applications conducted on the farm.

Select check boxes applicable for the operation.

Kentucky N & P Index

Crops Information Data Input Screen

Kentucky Nitrogen Index 4.4.2 | Crop

Root Depth of Deepest Rooted Crop Inches

Crop #1

Crop

Yield (Wet Weight) Leguminous

Unit	Weight/Unit	% H2O	NUI
<input type="text" value="Ton"/>	<input type="text" value="2000.0"/>	<input type="text" value="70.0"/>	<input type="text" value="7.5"/>

Residue of Previous Crop #1

Crop

C/N Time of Incorporation
 < 30
 > 30

Yield (Wet Weight) Leguminous

Unit	Weight/Unit	% H2O	NUI
<input type="text" value="Ton"/>	<input type="text" value="2000.0"/>	<input type="text" value="70.0"/>	<input type="text" value="11"/>

Crop #2

Crop

Yield (Wet Weight) Leguminous

Unit	Weight/Unit	% H2O	NUI
<input type="text" value="Ton"/>	<input type="text" value="2000.0"/>	<input type="text" value="70.0"/>	<input type="text" value="11"/>

Residue of Previous Crop #2

Crop

C/N Time of Incorporation
 < 30
 > 30

Yield (Wet Weight) Leguminous

Unit	Weight/Unit	% H2O	NUI
<input type="text" value="Ton"/>	<input type="text" value="2000.0"/>	<input type="text" value="70.0"/>	<input type="text" value="7.5"/>

Crop #3

Crop

Yield (Wet Weight) Leguminous

Unit	Weight/Unit	% H2O	NUI
<input type="text" value="Ton"/>	<input type="text" value="2000.0"/>	<input type="text" value="75.0"/>	<input type="text" value="18"/>

Residue of Previous Crop #3

Crop

C/N Time of Incorporation
 < 30
 > 30

Yield (Wet Weight) Leguminous

Unit	Weight/Unit	% H2O	NUI
<input type="text" value="Ton"/>	<input type="text" value="2000.0"/>	<input type="text" value="75.0"/>	<input type="text" value="18"/>

Enter crop data and yields.

Select the previous crop's residue C/N ratio values.

Then click "Save"

Kentucky N & P Index

Off-Site Factors Information Data Input Screen

Select the right information from the drop-down menus for Travel Time to Aquifer, Position of Aquifer and Vulnerability of Aquifer.

Use the Kentucky Groundwater Sensitivity Regions Map to determine each category. The 12 lbs N/acre atmospheric deposition is a good average for KY. (See maps on next two slides for Aquifer informations.)

 Kentucky Nitrogen Index 4.4.2 | Off-Site Factors _ □ ×

Travel Time to Aquifer Short (<5 Years) 	Denitrification Coefficient <input style="width: 60px;" type="text" value="8.0"/> <input checked="" type="radio"/> Default <input type="radio"/> Custom
Position of Aquifer Shallow or Karst 	K Constant <input style="width: 60px;" type="text" value="1.2"/> <input checked="" type="radio"/> Default <input type="radio"/> Custom
Vulnerability of Aquifer IIB: Potential Drinking Water 	

Then click "Save"
Annual Atmospheric Wet/Dry N Deposition lbs N/acre



Kentucky N & P Index

Hydrology Information Data Input Screen

Hydrologic class A, B, C and D information can be found in RUSLE2 soils database. Monthly precipitation data also available in RUSLE2 climate tab. (rain cloud tab)

Kentucky Nitrogen Index 4.4.2 | Hydrology

Hydrology C

Sandy clay loam

Texture for these soils are fine and when wetted, they have low infiltration rates thus lower leaching potential

Precipitation While Crop Growing: 43 inches WC: 0.8

Precipitation While No Crop Growing: 2.9 inches WC: 0.8

Select tile check box if field is tile drained.

Climate: Humid

Tile Drainage

Hydrology Characteristics: Well drained

Save

WC Water infiltration coefficient: enter 0.9 for Excessively well drained; 0.8 for Well drained; 0.7 for Moderately well drained; 0.6 for Somewhat poorly drained and 0.5 for Poorly drained soils. Hydrology Characteristics can be found at soil series description web site.

<http://soils.usda.gov/technical/classification/osd/>

Kentucky N & P Index

Qualitative Factors Information Data Input Screen

Runoff Class info can be found in RUSLE2 soils database

Kentucky Nitrogen Index 4.4.2 | Qualitative Factors

Vegetative Buffer 20 - 65 feet wide	Nitrogen Application Rate Yield goal respective to University Rate AND tissue/soil test in season
Proximity of Nearest Field Edge to Named Stream or Lake High (30 - 200 feet)	Volatilization Susceptible N Application Method None applied
Runoff Class (Runoff Class Table) High	Tile Drainage No tile drainage
Rooting Depths and Crop Rotation 2.5 - 3.5 feet	Irrigation Erosion No irrigation OR negligible sediment erosion
Soil Erosion (Wind & Water) Low (1 - 3 t/ac)	Leaching Forages
Cover crop and Fertilizer Split Fertilizer /over karst	

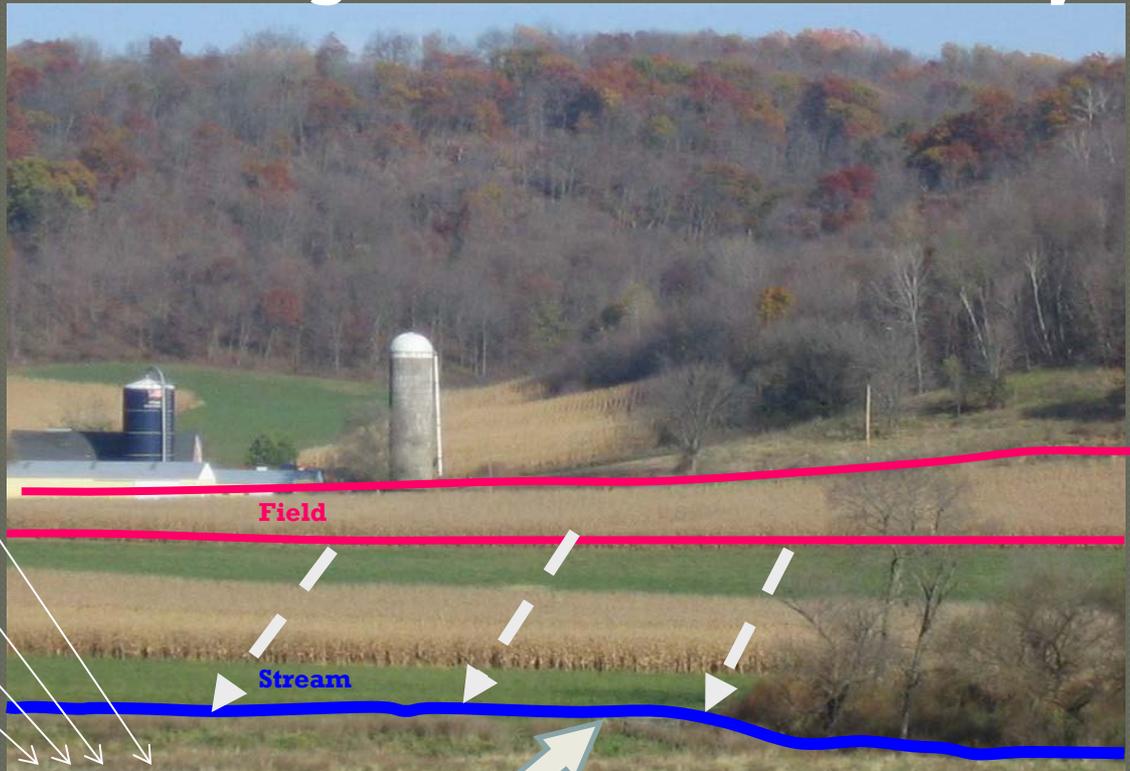
Save

Select all drop-down boxes for appropriate scenario specific to the operation/field.

Then click "Save"

P Index Estimates Average Annual P Delivery

- County
- Soil Type
- Soil Test P and Organic Matter
- Field Slope
- Field Slope Length
- Contour and filter practices
- Tillage
- Rotation crops and yields
- Manure Applications
- P Fertilizer Applications
- Downfield Slope to Surface Water
- Distance to Surface Water



**New
Phosphorus
Index**

Kentucky Nitrogen and Phosphorus Index

Kentucky N & P Index

Phosphorus Index Information Data Input Screen

See following slides explaining how to extract Curve Number (CN) from RUSLE2 and how to determine the receiving slope length for the Sediment Delivery Ratio (SDR).

Kentucky Nitrogen Index 4.4.2 | Phosphorus Index

Phosphorus Index

Soil Test Phosphorus: 67 Mehlich-3 STP (lbs P/ac)

Fertilizer Phosphorus: 0 lbs P2O5/ac

Average Annual Erosion Rate: 2.9 tons/ac/yr

Curve Number: 78

Receiving Slope Length: 100 feet

Sediment Delivery Ratio: 100 feet

Best Management Practices: Best Management Practice: Buffer/Filter strip 20-75 feet wide

Kentucky Counties: Bath

Application Factors

Fertilizer Application: Banded or injected > 2 inches

Dry Manure 1 Application: Incorporated immediately

Dry Manure 2 Application: Banded or injected > 2 inches

Wet Manure 1 Application: Banded or injected > 2 inches

Wet Manure 2 Application: Banded or injected > 2 inches

County: Bath

Save

Select all drop-down boxes for appropriate scenario specific to the operation/field.

Then click "Save"

RUSLE2 Soil Erosion Prediction Software

Profile: default*

Add break Erase break

Location: USA\Kentucky\Fayette County

Net C factor
Net LS factor
Net K factor
Net contour factor
Net ridge factor
Net ponding factor

Rock cover, %: 0
Adjust rock cover: open
General yield level: Set by user
Surf. res. cov. values: Surf. cover
Adjust res. burial level: Normal res. burial

Fuel type for entire run: (none)

Soil conditioning index: open

Avg. slope steepness, %: 4.9
Slope length (horiz), ft: 150
Crit. slope length, ft:

Detachment on slope, t/ac/yr: 3.1
Soil loss erod. portion, t/ac/yr: 3.1

Sediment delivery, t/ac/yr: 2.3
Soil loss for cons. plan, t/ac/yr: 2.78

T value, t/ac/yr: 5.0

Equiv. diesel use for entire simulation, gal/ac: 5.4
Energy use for entire simulation, BTU/ac: 750000

Fuel cost for entire simulation, US\$/ac: 17.9

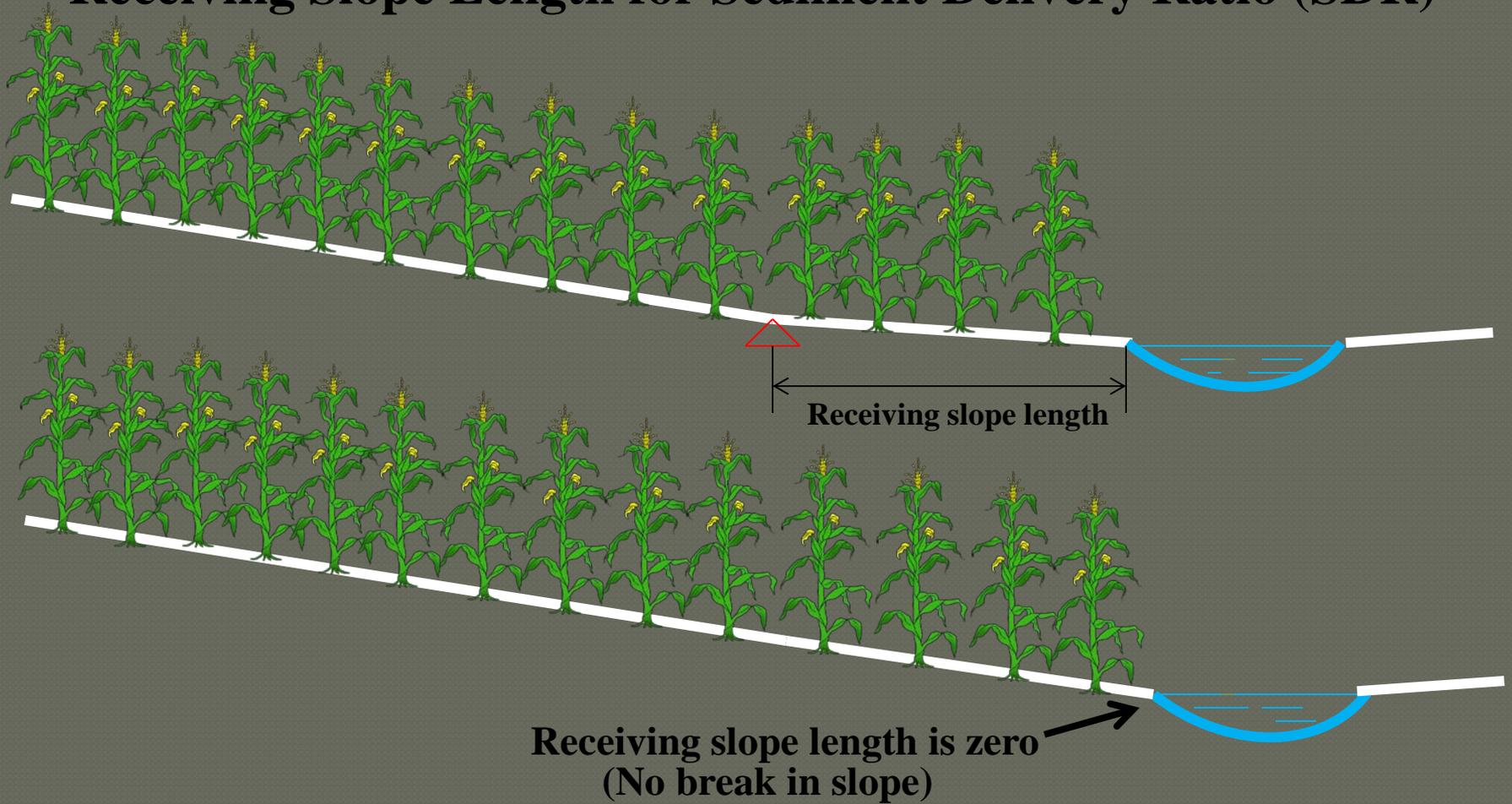
Soil	MISC_CALCULATIONS1	Topography	Management	Strips / Barriers	Irrigation / Subsurface drainage	Diversion/terrace, sediment basin
Align of oper on segments	General composite segment info	Biomass by layer	Biomass summary	C subfactor by day	C subfactor by period	C subfactor by operation
Management output by period	Residue values	Roughness	STRIPS_AND_BARRIERS	MANAGEMENT_STRIP_BUILDER	Runoff / Sediment overall results	
Runoff / Sediment results by day	Sediment results by flow path	Sediment by segment	Sediment by segment by day	Soil output by day	Yield values	Visuals Info
Ridges_contour by day	Erosion by day	Erosion by period	Erosion by operation	Erosion by year	Extra C, L, crit. length values	Hydrology Management output by day

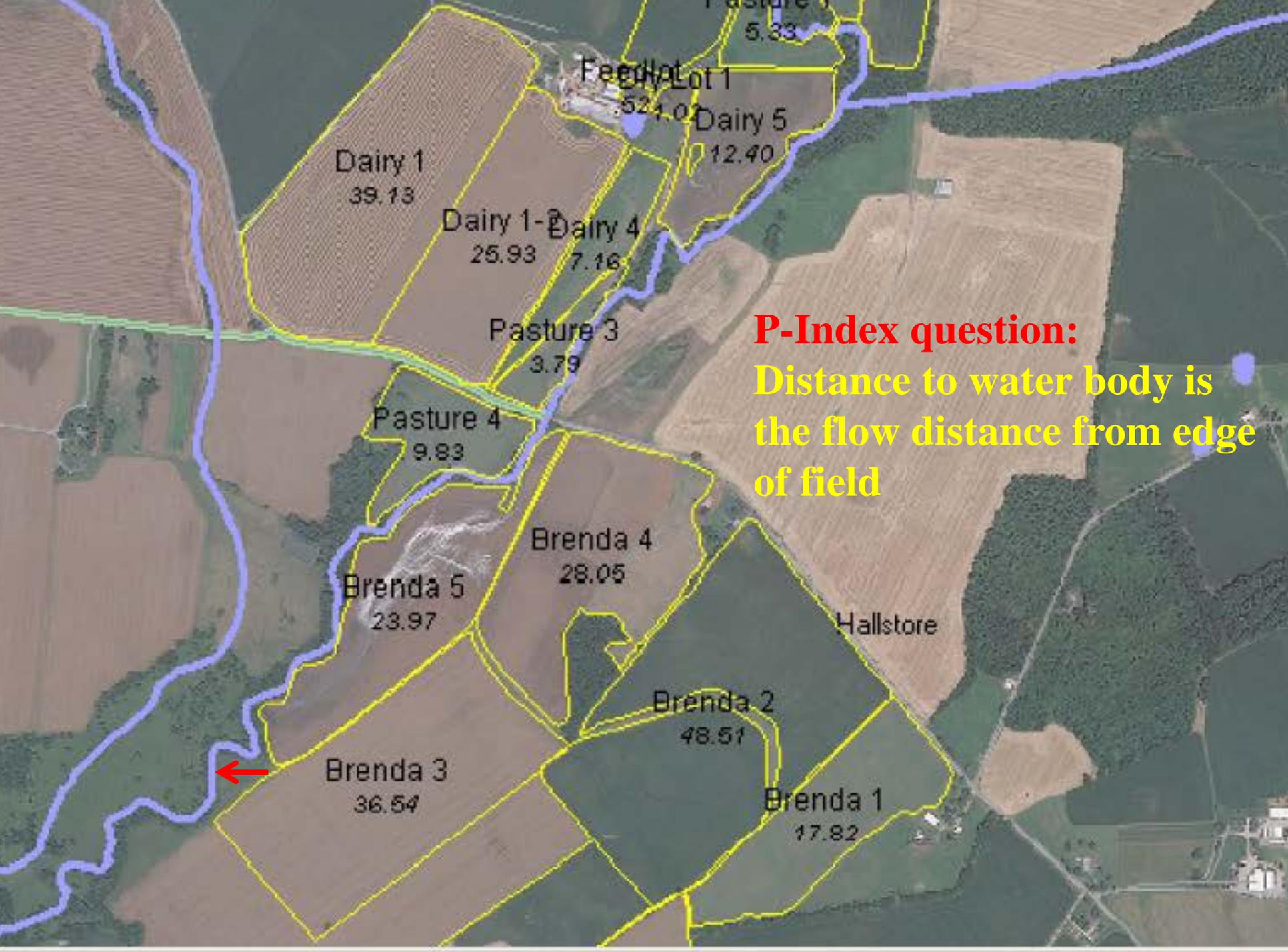
Hydrology Stuff Daily

Simulation day, m/d/y	CN	Veg. N	Stand. Res. N	Cover-rough N	Manning's n	Transport factor	Runoff depth, in.	Time-varyin g runoff, in.	Ponding adjustment, fraction
8/30/5	84	0	0.00077	0.032	0.033	0.13	2.6	0.85	1.0
8/31/5	84	0	0.00076	0.032	0.033	0.13	2.6	0.83	1.0
9/1/5	84	0	0.00075	0.032	0.033	0.13	2.6	0.81	1.0
9/2/5	84	0	0.00074	0.032	0.033	0.13	2.6	0.79	1.0
9/3/5	84	0	0.00073	0.032	0.033	0.13	2.6	0.78	1.0
9/4/5	84	0	0.00072	0.032	0.033	0.13	2.6	0.76	1.0
9/5/5	84	0	0.00071	0.032	0.033	0.13	2.6	0.74	1.0
9/6/5	84	0	0.00070	0.032	0.033	0.13	2.6	0.72	1.0

Runoff Curve number

Receiving Slope Length for Sediment Delivery Ratio (SDR)





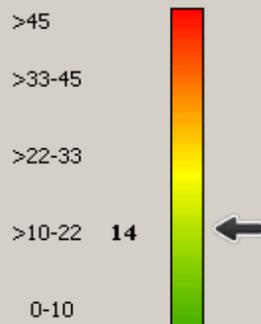
P-Index question:
Distance to water body is the flow distance from edge of field

New Kentucky Phosphorus Index Risk Categories and Limitations

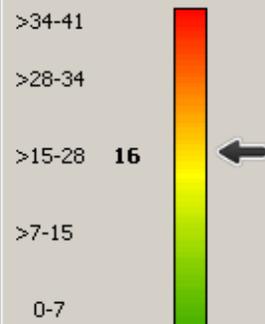
Range	Category	Interpretation
0-40	Low	<p>Phosphorus can be applied at rates greater than crop requirement not to exceed the nitrogen requirement for the succeeding crop.</p> <p><i>If the soil total Phosphorus level is 800 or higher no P application of any kind allowed.</i></p>
40-100	Moderate	<p>Phosphorus can be applied not to exceed the crop requirement rate.</p> <p><i>If the soil total Phosphorus level is 600 or higher no P application of any kind allowed.</i></p>
>100	High	<p>Phosphorus can be applied not to exceed the crop removal rate if the following requirements are met:</p> <ul style="list-style-type: none"> • A soil phosphorus drawdown strategy has been implemented, and • A site assessment for nutrients and soil loss has been conducted to determine if mitigation practices are required to protect water quality. • <i>If the soil total Phosphorus level is 400 or higher no P application of any kind allowed.</i> • Any deviation from these high risk requirements must have the approval of the Chief of NRCS.

Qualitative Nitrogen Results

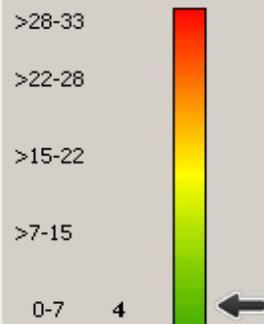
Nitrate Leaching



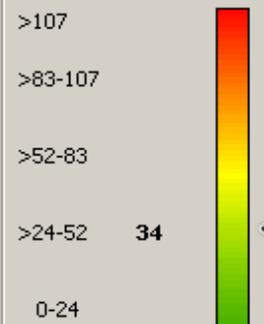
Surface Transport



Atmospheric



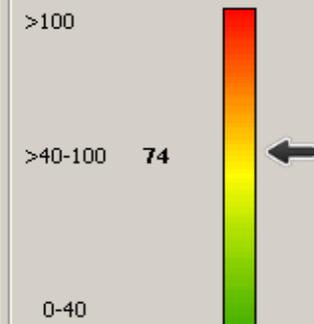
Total



Qualitative Phosphorus Results

Phosphorus Index

Kentucky Beta Version



- N2O Index
- Interpretation of Rankings
- Interpretation of Phosphorus Rankings
- Definitions of Outputs
- Economic Assessment
- Ranking Matrix
- Save File
- Generate Report

Quantitative Nitrogen Results

Total N System In	371 lbs N / a y	Leaching Index (LI)	4.3 inches
Ammonia Volatilization	13 lbs N / a y	Total Nitrogen Leached	59 lbs N / a y
Denitrification	55 lbs N / a y	Residual Nitrate	102 lbs N / a y
Above Ground Uptake	140 lbs N / a y	System Use Efficiency	38 %
Ratio N Applied to N Removed by Crop		1.06	

Quantitative Nitrogen (N) Input

N Fertilizer	0 lbs N / a y
NH4 Manure	108 lbs N / a y
Total N Manure	223 lbs N / a y (current year)
N Mineralized Manure	40 lbs N/ac (current & last year)

Quantitative Phosphorus Results

Fertilizer Phosphorus	0 lbs P2O5 / a y
Soil Test Phosphorus	207 lbs P / a y
Manure Phosphorus	368 lbs P2O5 / a y

Example farm is applying 40,000 gallons of liquid swine manure per acre per year that delivers 368 lbs/acre/year of P2O5 while the crop (corn-minimum till) uptake is only 80 lbs/acre/year. The new combined N & P Index tool considers this application a moderate risk and recommends phosphorus applications based on crop uptake. The 207 lbs/acre/year high soil test phosphorus level, in combination with the hydrologic soil group D that induces high volume of runoff and the 1 ton/acre/year of soil erosion resulted in the increased risk rating.

The swine operation Phosphorus data input screen

Kentucky Nitrogen Index 4.4.1 | Phosphorus Index

Phosphorus Index

Soil Test Phosphorus Mehlich-3 STP (lbs P/ac)

Fertilizer Phosphorus lbs P2O5/ac

Average Annual Erosion Rate tons/ac/yr

Curve Number

Sediment Delivery Ratio 100 feet

Best Management Practices Buffer/Filter strip 20-75 feet wide

County Daviess

Application Factors

Fertilizer Application
Banded or injected > 2 inches

Dry Manure 1 Application
Banded or injected > 2 inches

Dry Manure 2 Application
Banded or injected > 2 inches

Wet Manure 1 Application
Banded or injected > 2 inches

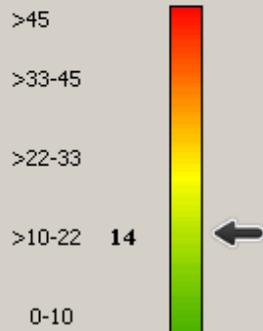
Wet Manure 2 Application
Banded or injected > 2 inches

Save

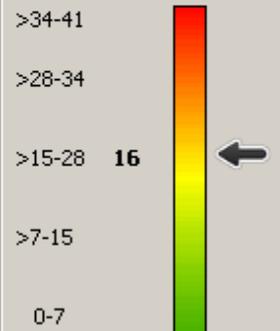
Changing the tillage to no-till would reduce soil erosion to 0.4 Tons/acre/year and the runoff curve number to 80

Qualitative Nitrogen Results

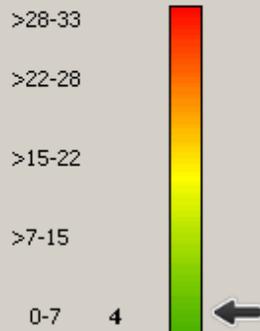
Nitrate Leaching



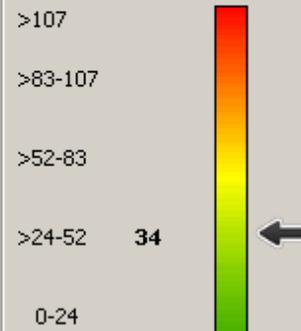
Surface Transport



Atmospheric



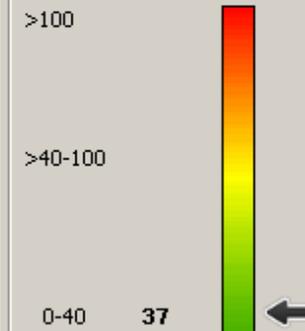
Total



Qualitative Phosphorus Results

Phosphorus Index

Kentucky Beta Version



- NZO Index
- Interpretation of Rankings
- Interpretation of Phosphorus Rankings
- Definitions of Outputs
- Economic Assessment
- Ranking Matrix
- Save File
- Generate Report

Quantitative Nitrogen Results

Total N System In	371 lbs N / a y	Leaching Index (LI)	4.3 inches
Ammonia Volatilization	13 lbs N / a y	Total Nitrogen Leached	59 lbs N / a y
Denitrification	55 lbs N / a y	Residual Nitrate	102 lbs N / a y
Above Ground Uptake	140 lbs N / a y	System Use Efficiency	38 %
Ratio N Applied to N Removed by Crop		1.06	

Quantitative Nitrogen (N) Input

N Fertilizer	0 lbs N / a y
NH4 Manure	108 lbs N / a y
Total N Manure	223 lbs N / a y (current year)
N Mineralized Manure	40 lbs N/ac (current & last year)

Quantitative Phosphorus Results

Fertilizer Phosphorus	0 lbs P2O5 / a y
Soil Test Phosphorus	207 lbs P / a y
Manure Phosphorus	368 lbs P2O5 / a y

Changing to no-till reduced the Phosphorus risk category to Low that allows the producer to apply manure based on the crop's Nitrogen need.

The swine operation Phosphorus data input screen

Kentucky Nitrogen Index 4.4.1 | Phosphorus Index

Phosphorus Index

Soil Test Phosphorus  Mehlich-3 STP (lbs P/ac)

Fertilizer Phosphorus lbs P2O5/ac

Average Annual Erosion Rate tons/ac/yr

Curve Number

Receiving Slope Length

Sediment Delivery Ratio

Best Management Practice

Best Management Practices

Kentucky Counties

County

Application Factors

Fertilizer Application
Banded or injected > 2 inches

Dry Manure 1 Application
Banded or injected > 2 inches

Dry Manure 2 Application
Banded or injected > 2 inches

Wet Manure 1 Application
Banded or injected > 2 inches

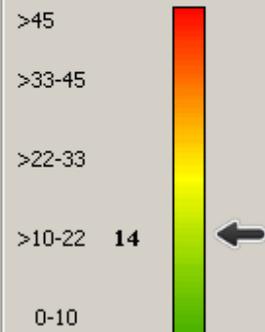
Wet Manure 2 Application
Banded or injected > 2 inches

Save

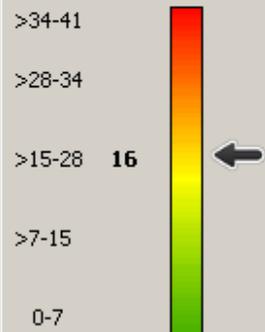
The operation could apply the 40,000 gallons of swine manure per acre per year on fields where the soil test Phosphorus is 97 lbs/acre or less.

Qualitative Nitrogen Results

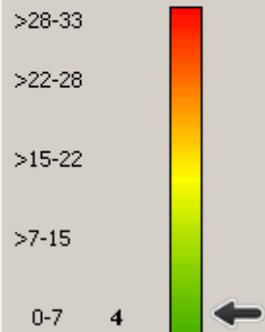
Nitrate Leaching



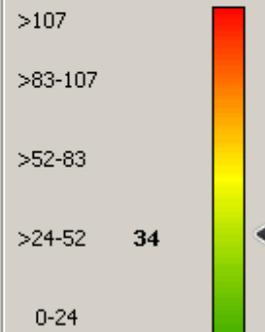
Surface Transport



Atmospheric

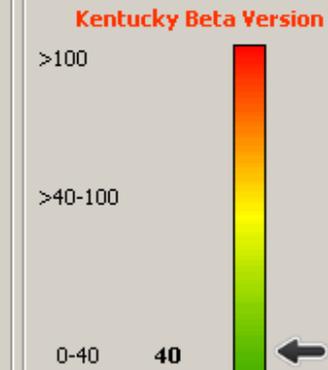


Total



Qualitative Phosphorus Results

Phosphorus Index



N2O Index

Interpretation of Rankings

Interpretation of Phosphorus Rankings

Definitions of Outputs

Economic Assessment

Ranking Matrix

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Manure Phosphorus	368 lbs P2O5 / a y

The “breaking point” when the operator still could apply the 40,000 gallons of swine manure is 97 lbs/acre soil test Phosphorus if they continue the disking operation for the corn grain.

For more information and help please call Tibor Horvath at (859) 224-7413 or email Tibor.Horvath@ky.usda.gov

THANK YOU!