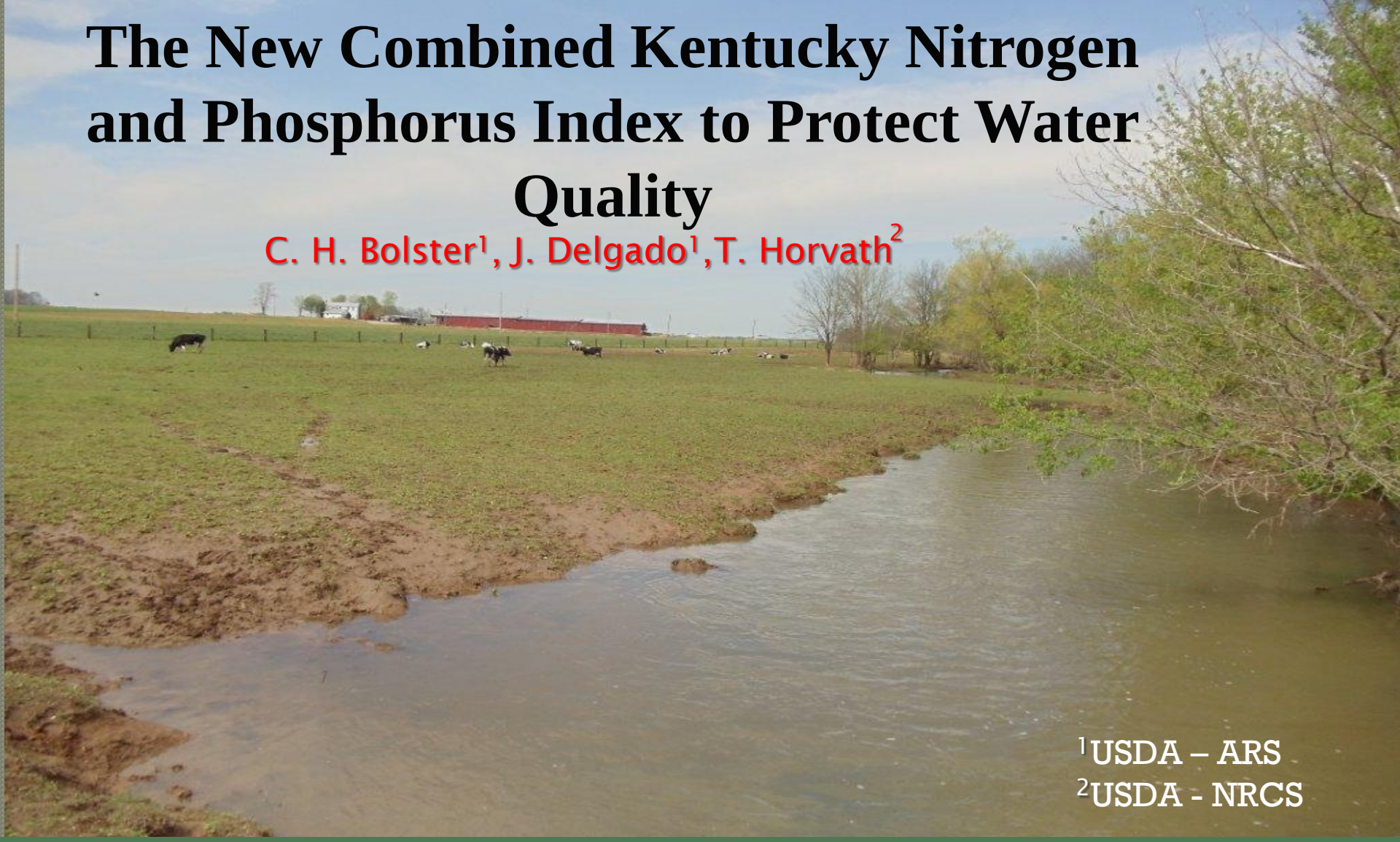
The New Combined Kentucky Nitrogen and Phosphorus Index to Protect Water Quality

C. H. Bolster[1], J. Delgado[1], T. Horvath[2]

[1]USDA – ARS
[2]USDA - NRCS



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

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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.

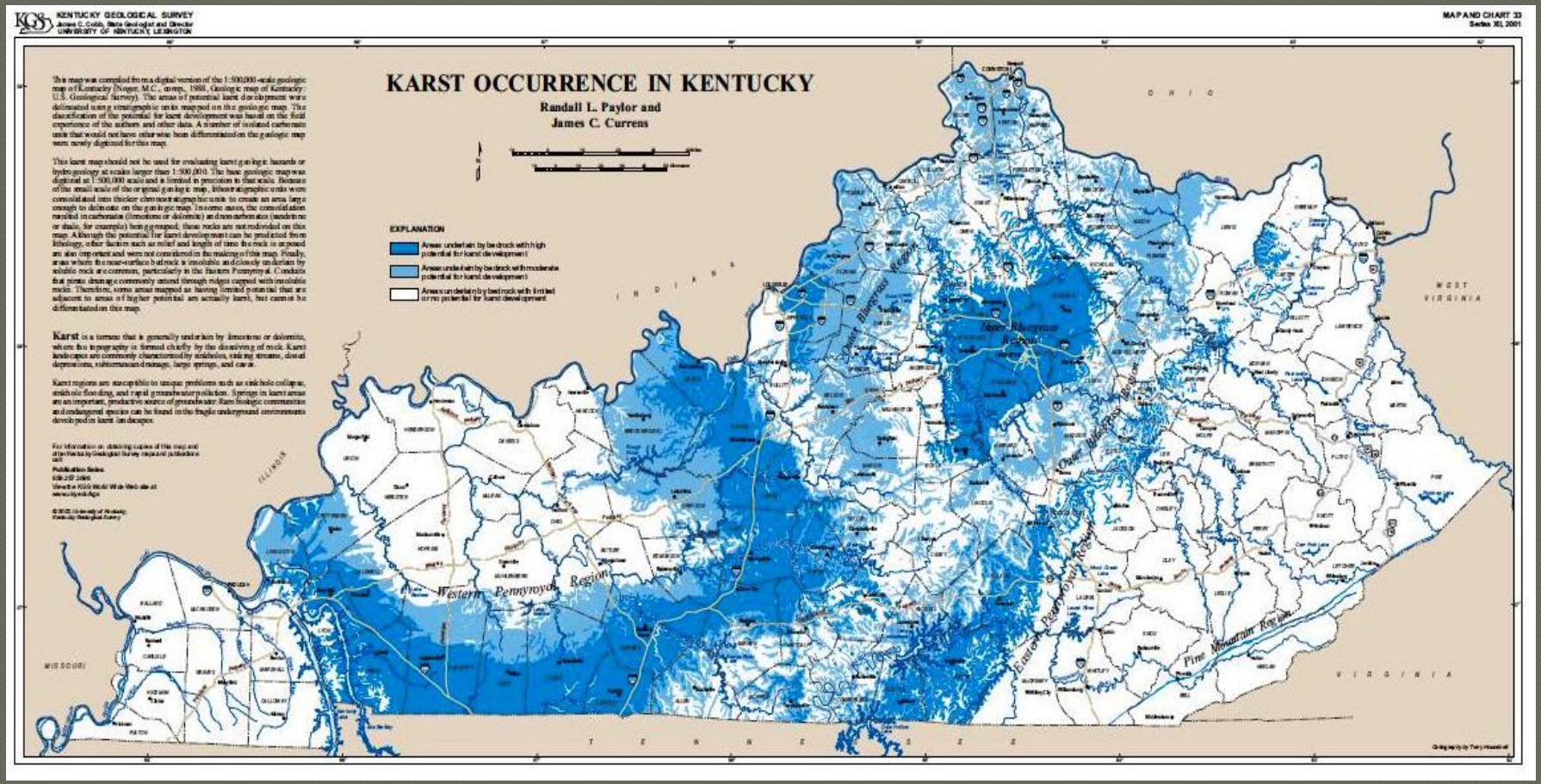
E. Nitrogen and Phosphorus risk assessments must be required in accordance with National Instruction, Title 190, Part 302, Nutrient Management Policy Implementation, and CPS Code 590, Nutrient Management.

(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?



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Groundwater Sensitivity Regions of Kentucky

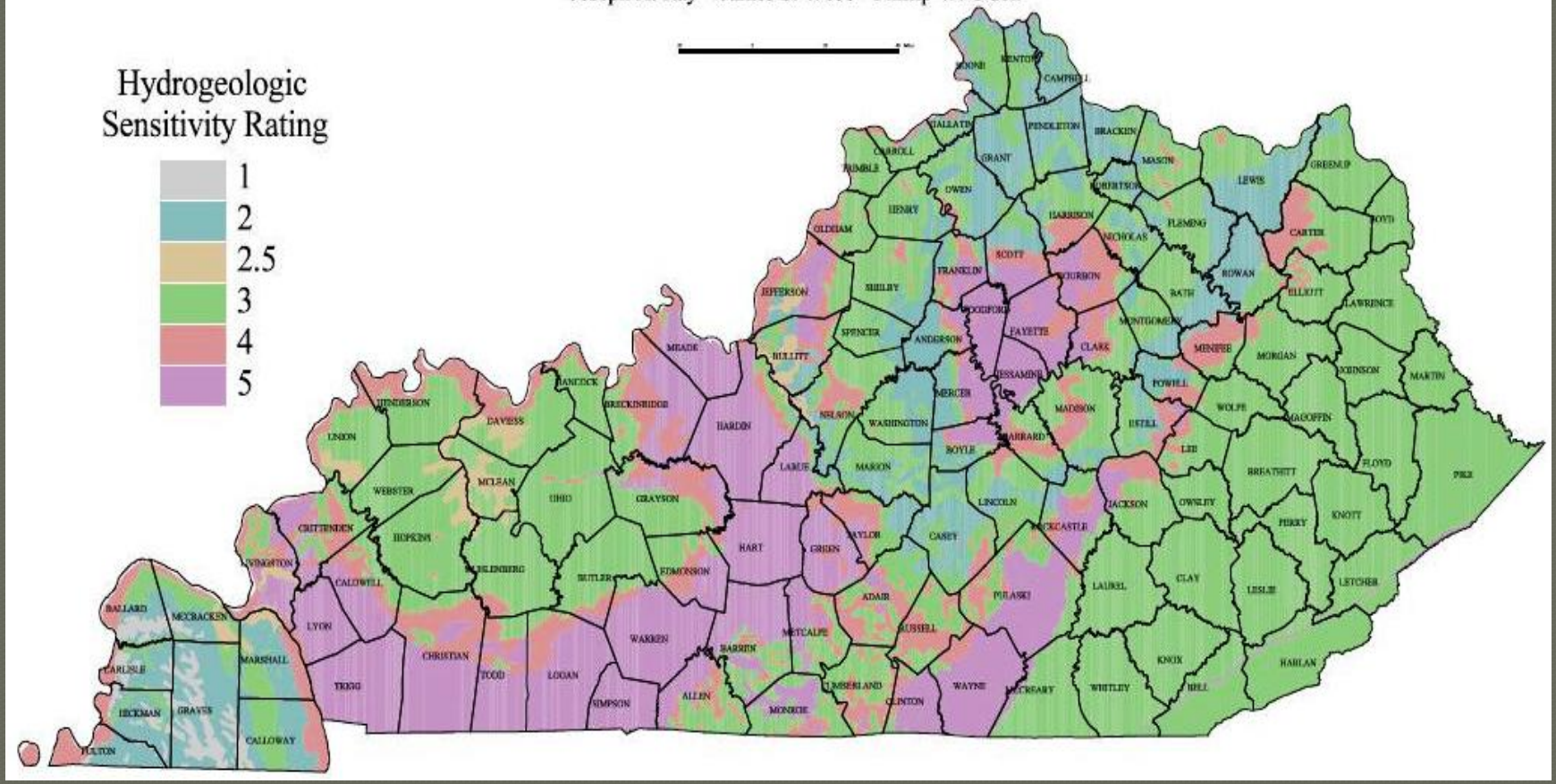
by

Kentucky Department for Environmental Protection
Division of Water
Groundwater Branch

1994

Interpreted by

Joseph A. Ray - James S. Webb - Phillip W. O'dell



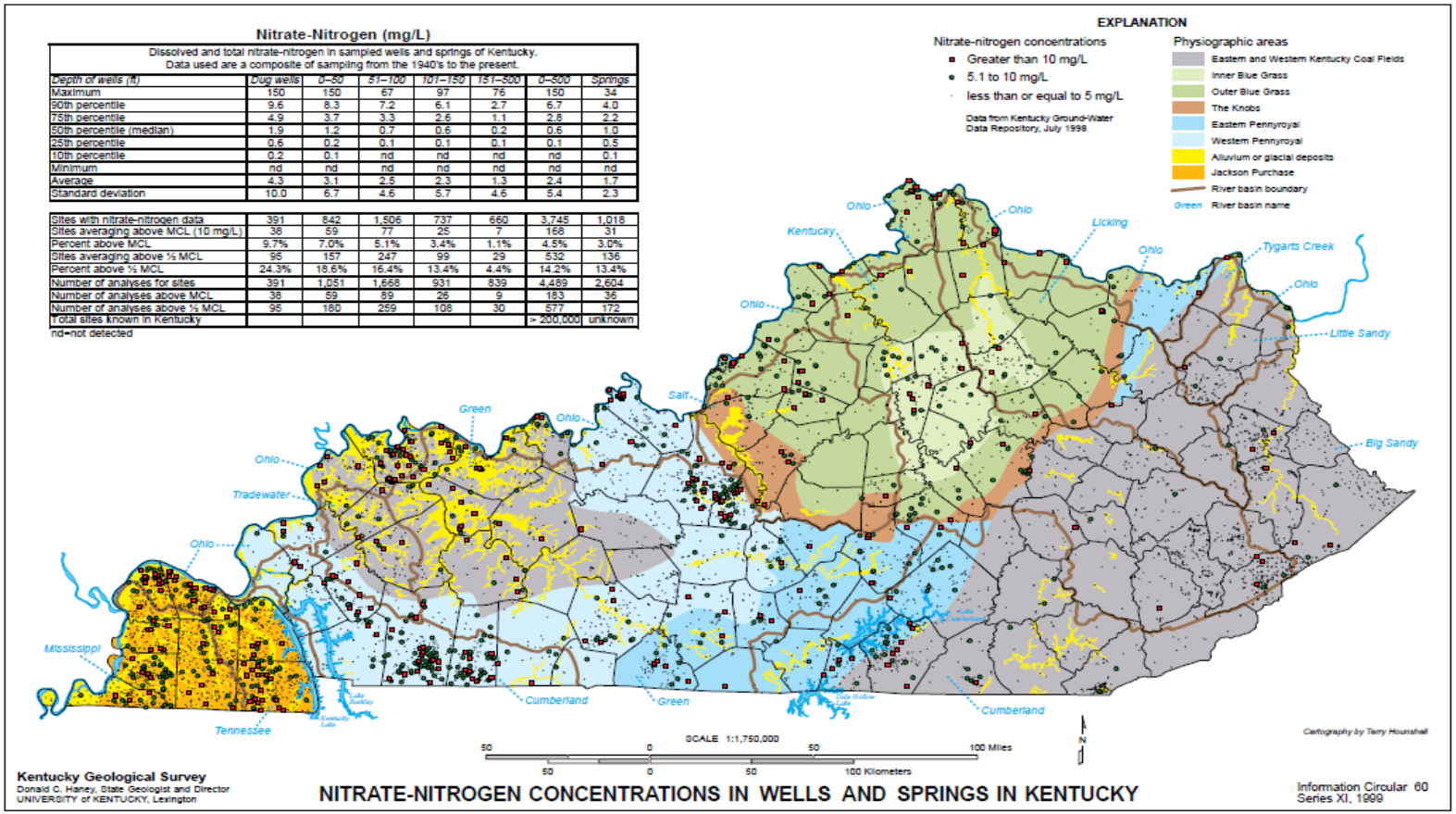
Nitrate-Nitrogen (mg/L)

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*	*151–300*	*0–300*	*Springs*
Maximum	150	150	67	97	76	150	34
90th 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 ½ MCL	95	157	247	99	29	532	136
Percent above ½ 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 ½ MCL	95	180	259	108	30	577	172
Total sites known in Kentucky						> 200,000	unknown

nd=not detected



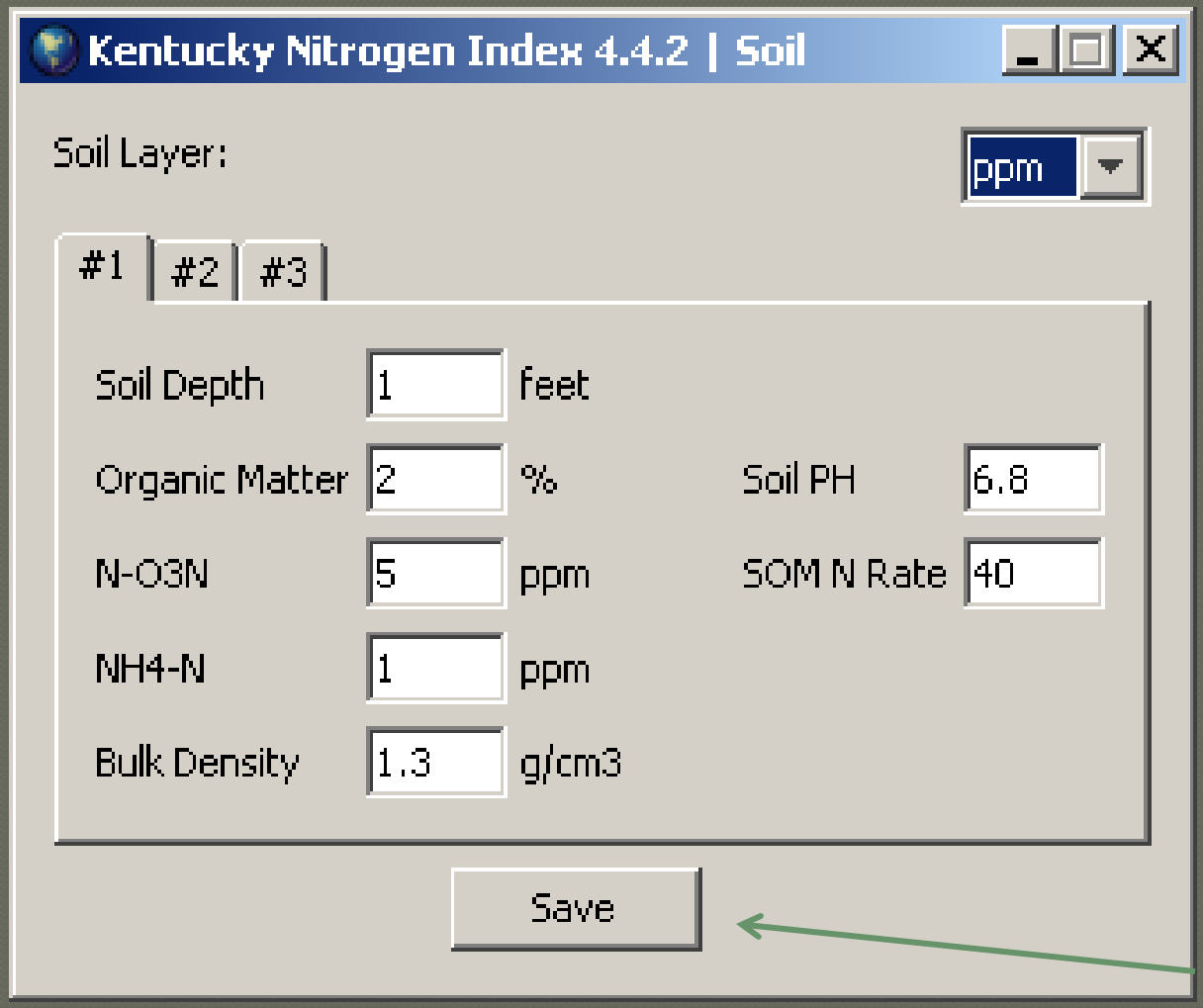
Kentucky Geological Survey
Donald C. Haney, State Geologist and Director
UNIVERSITY of KENTUCKY, Lexington

NITRATE-NITROGEN CONCENTRATIONS IN WELLS AND SPRINGS IN KENTUCKY

Information Circular 60
Series XI, 1999

Kentucky N & P Index Users' Guide

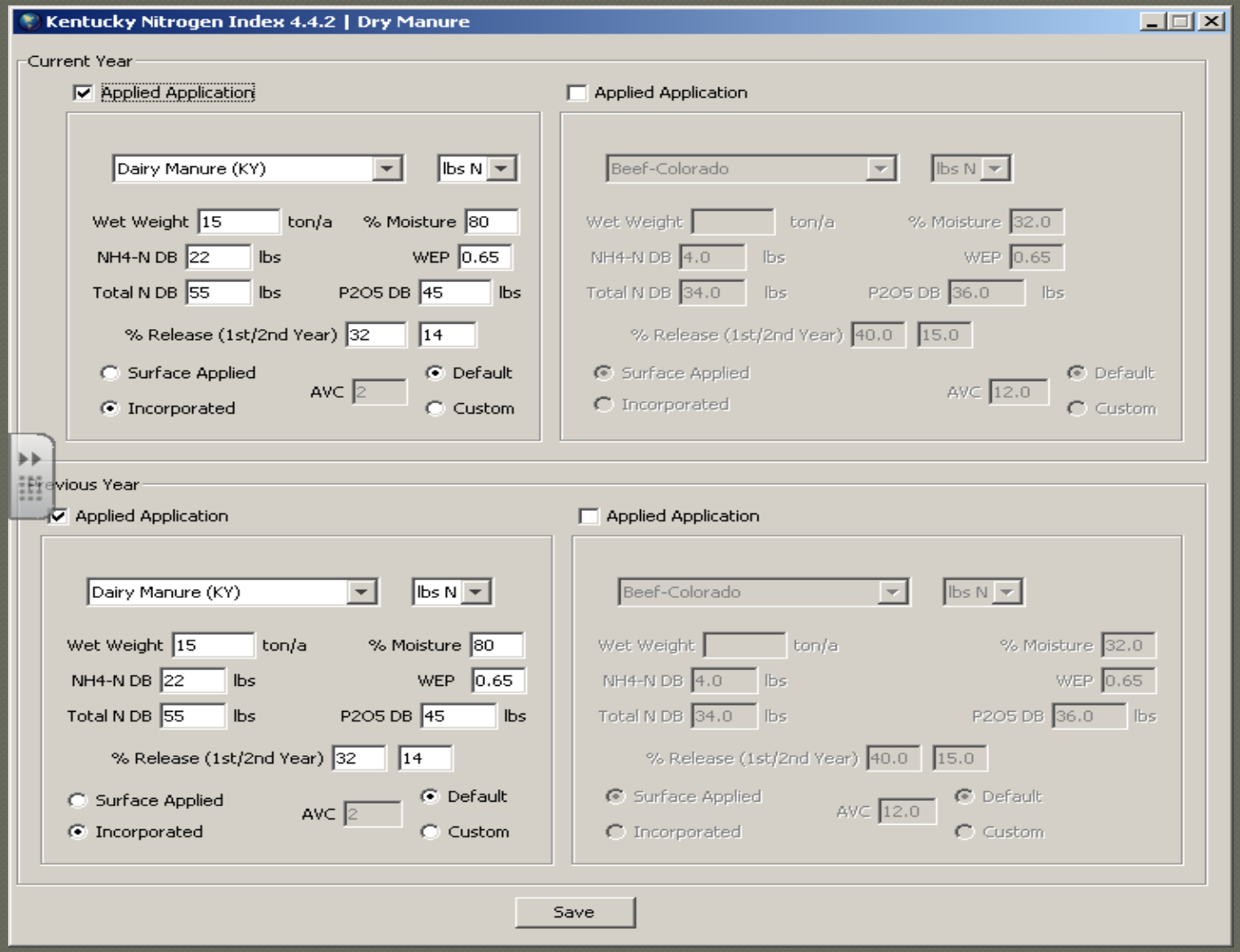
Kentucky N & P Index
Soils Information Data Input Screen



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

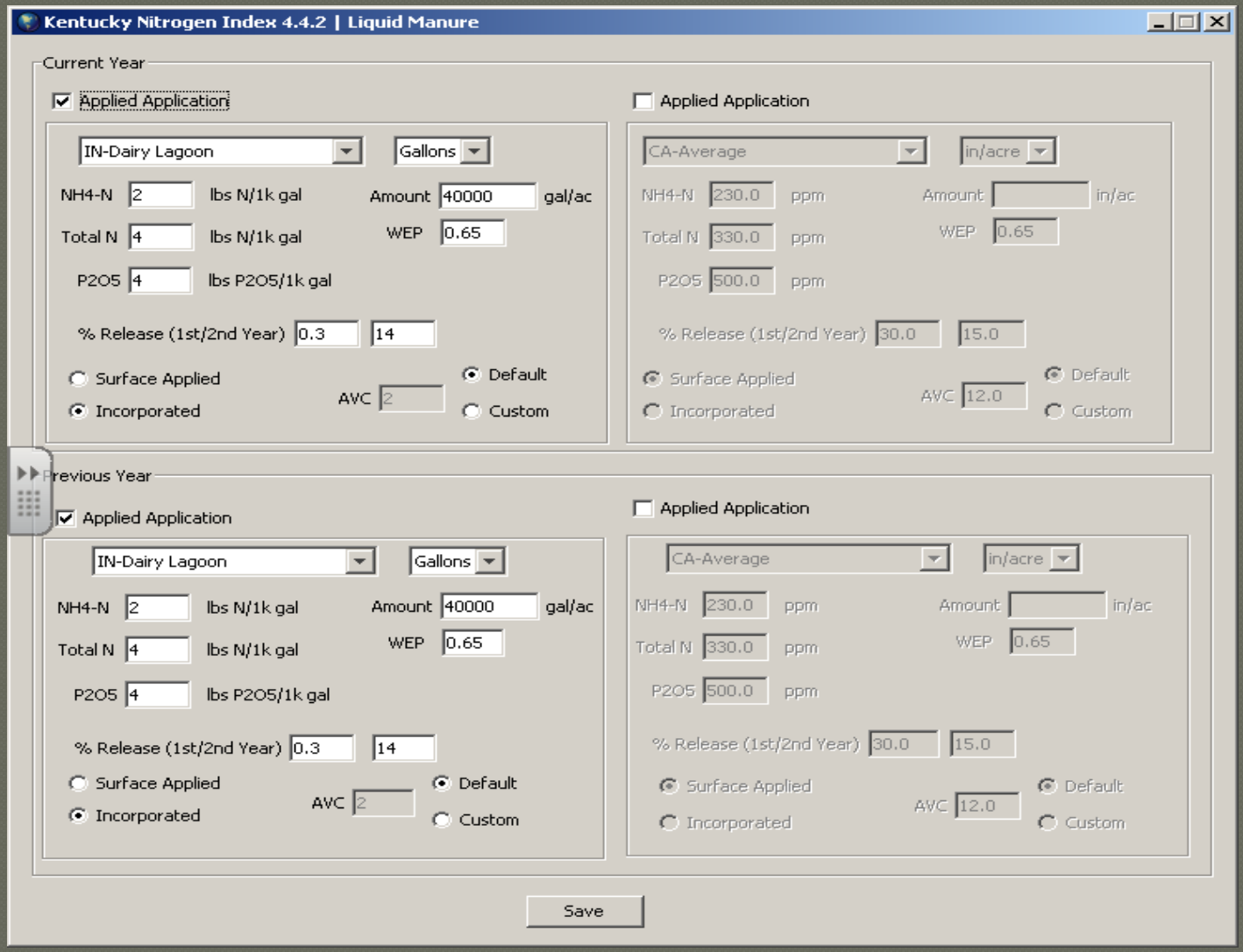


Select the manure type applied and rate, incorporation method for current and previous years. Use right side input tables if multiple manure applications occur in a year. Enter manure analysis report data to replace book values.

Then click "Save"

Kentucky N & P Index

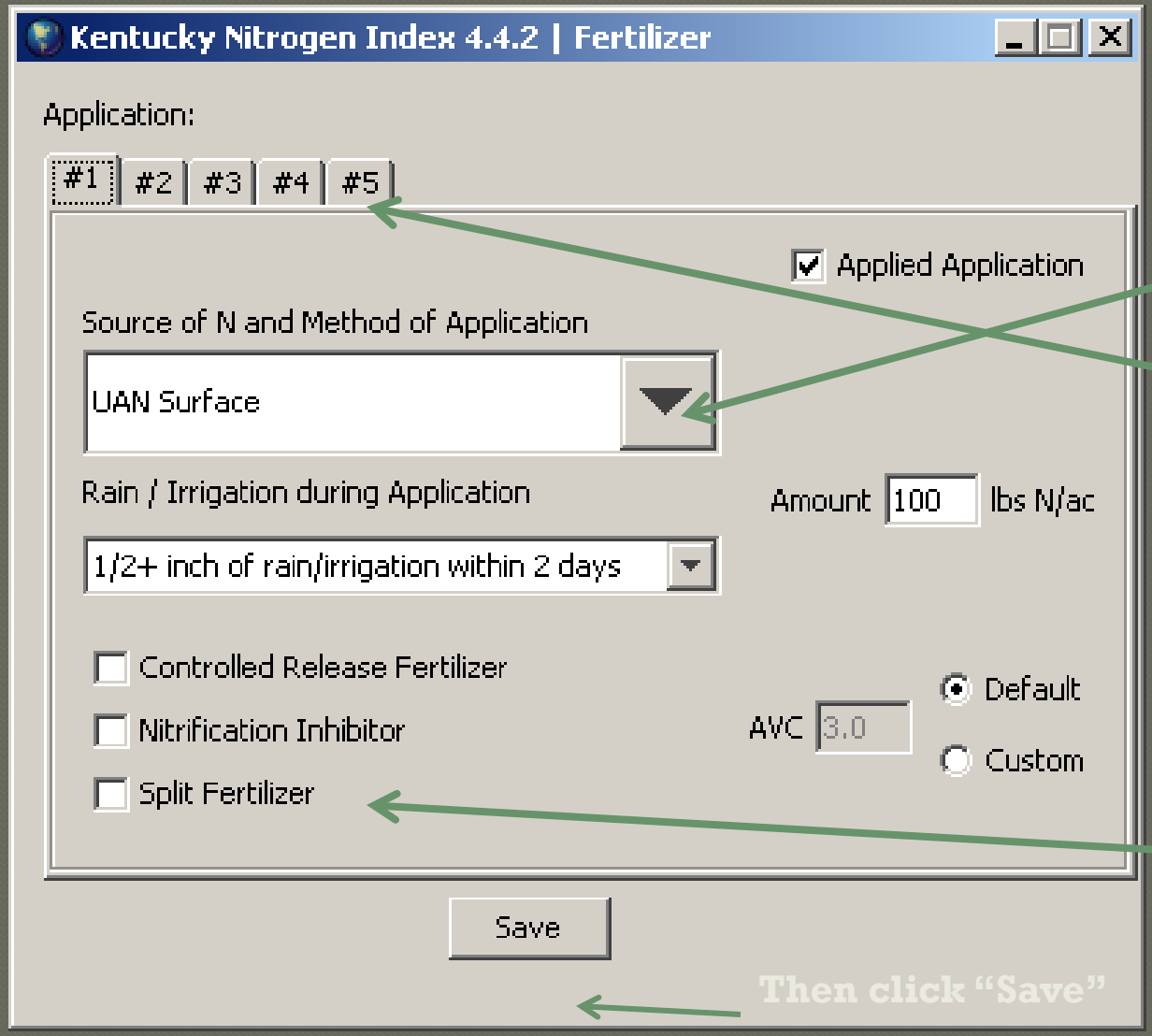
Liquid Manure Information Data Input Screen



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

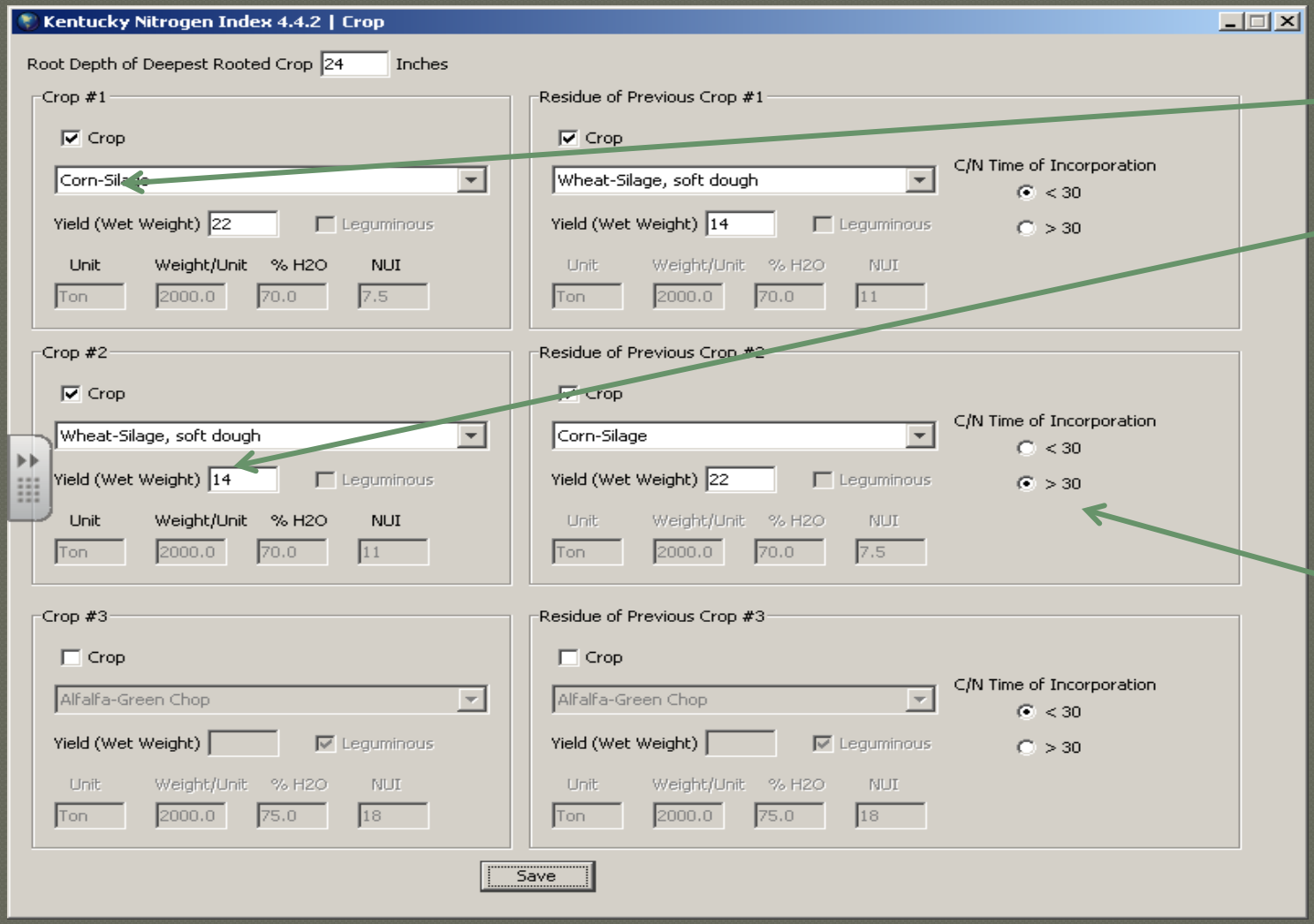


Select the fertilizer type, application rate and application method.

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



Enter crop data and yields.

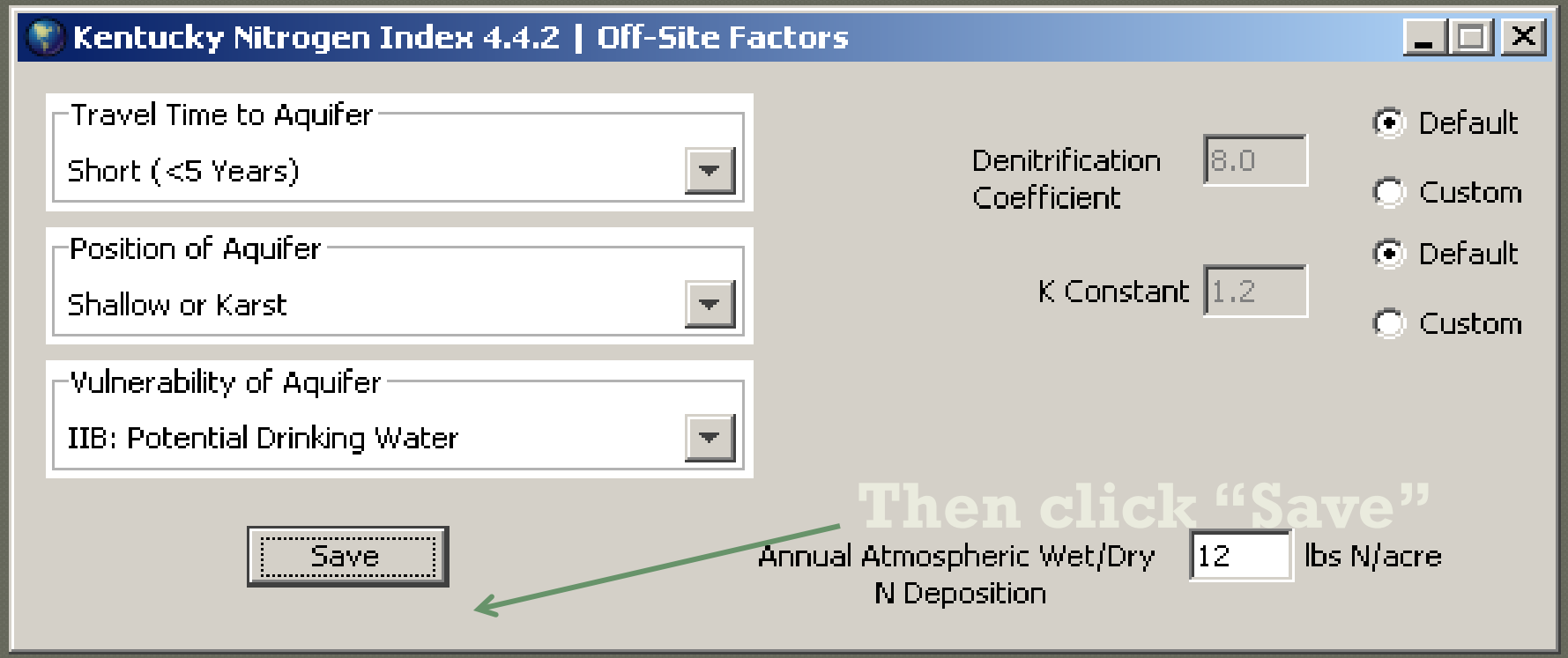
Select the previous crop's residue C/N ratio values.

Then click "Save"

Kentucky N & P Index

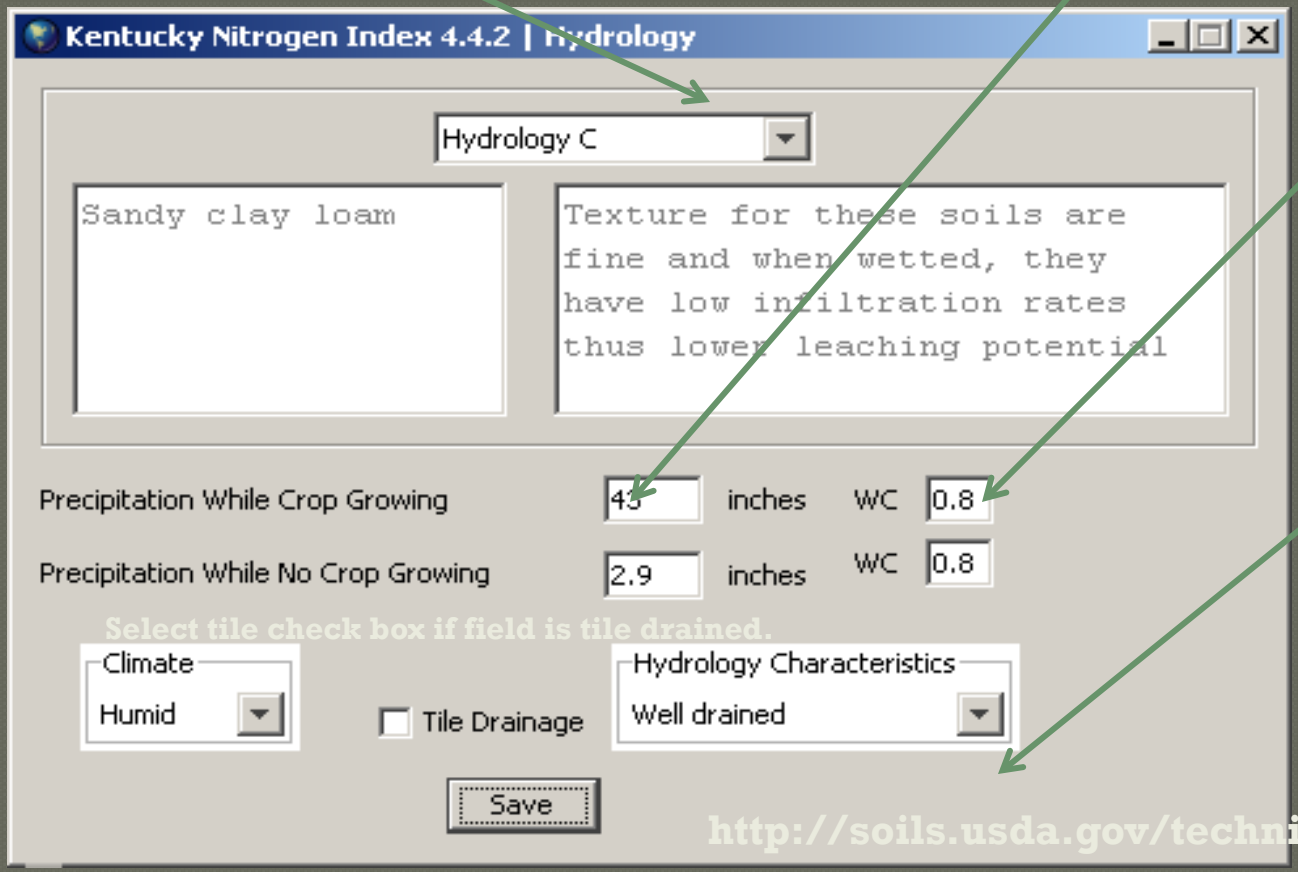
Off-Site Factors Information Data Input Screen

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 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)



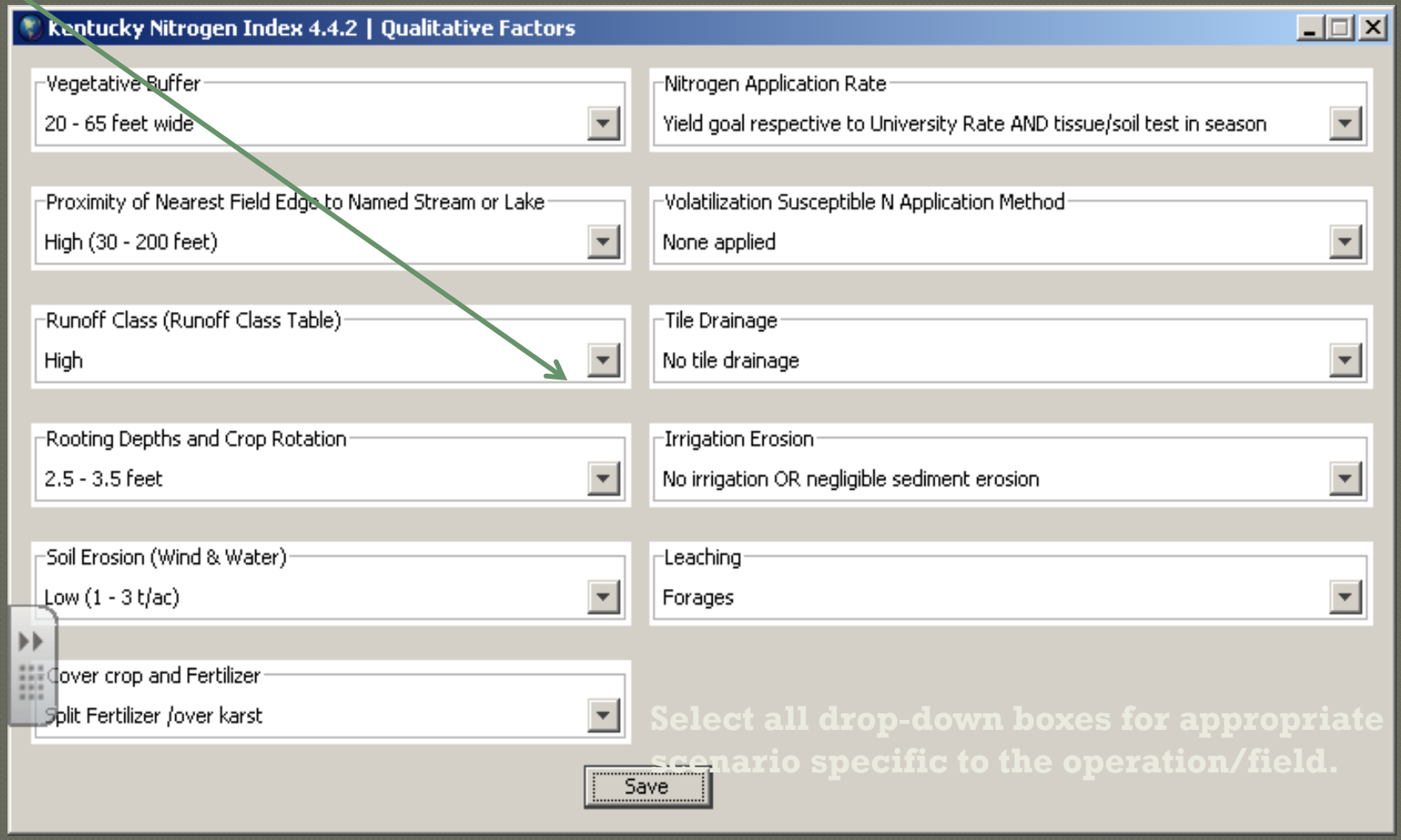
WC Water infiltration coefficient: enter 0.9 for Excessively well drained; 0.8 for Well drained; 0.7 for Moderately well drained; 0.6 for Somewhat poorly drained and 0.5 for Poorly drained soils. Hydrology Characteristics can be found at soil series description web site.

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

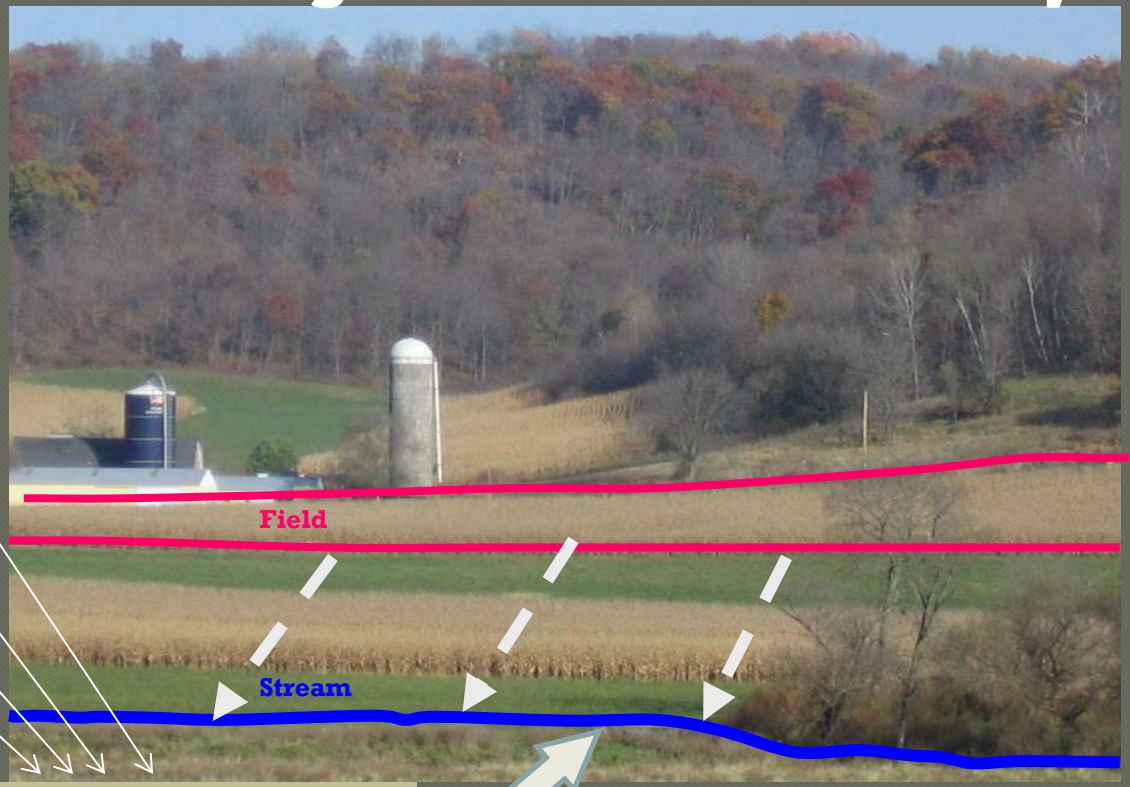


Select all drop-down boxes for appropriate scenario specific to the operation/field.

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

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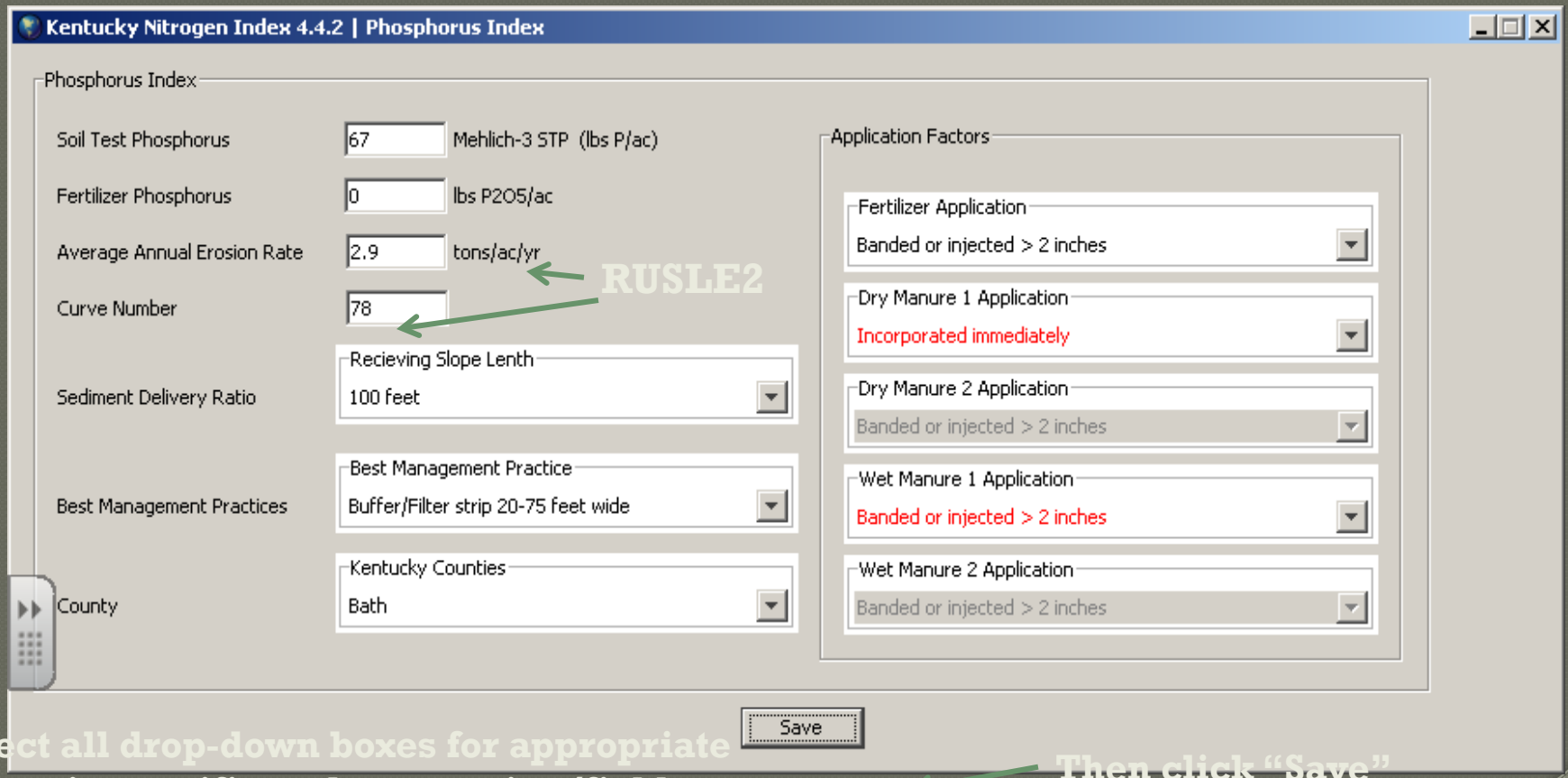
Kentucky N & P Index

Phosphorus Index Information Data Input Screen

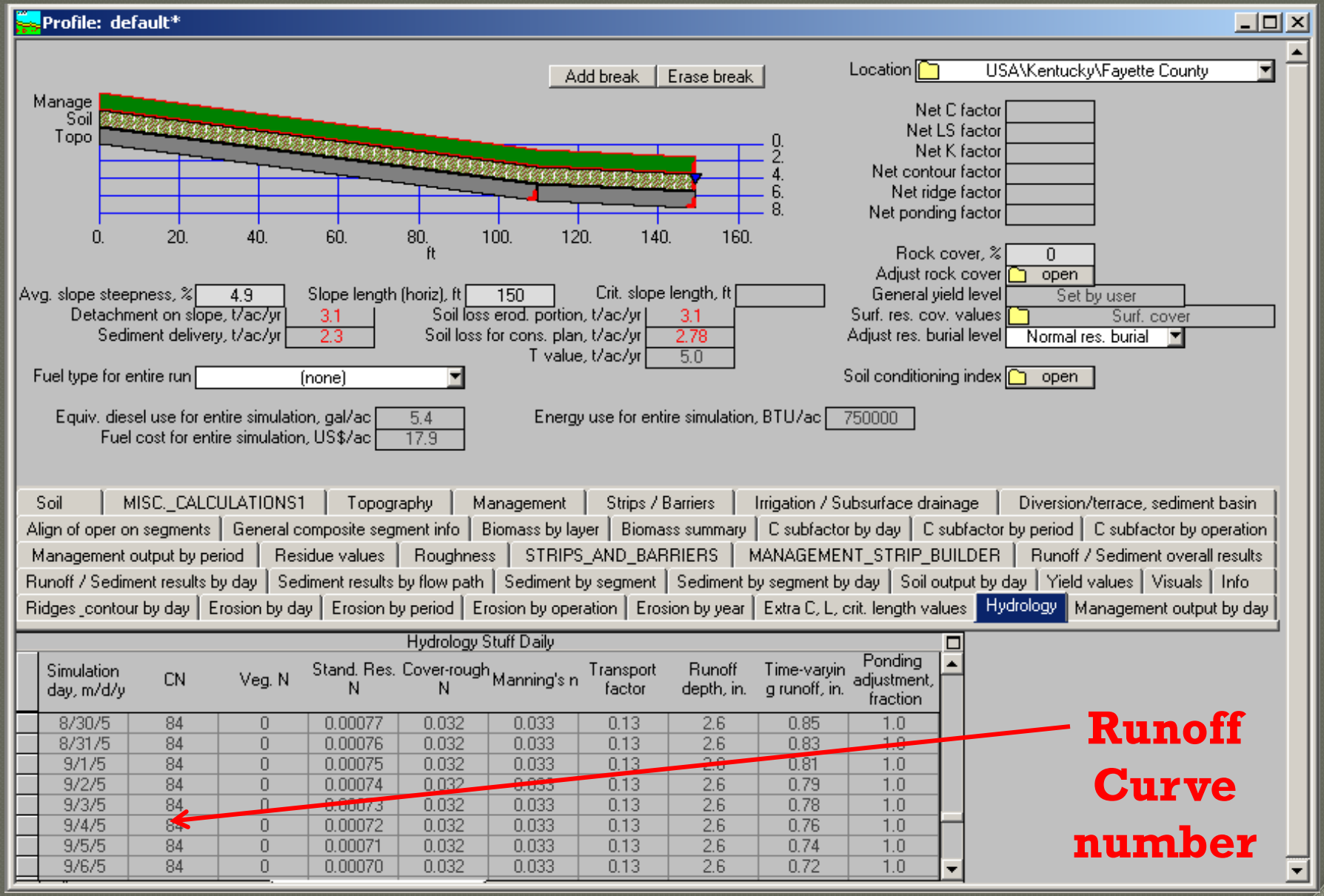
See following slides explaining how to extract Curve Number (CN) from RUSLE2 and how to determine the receiving slope length for the Sediment Delivery Ratio (SDR).



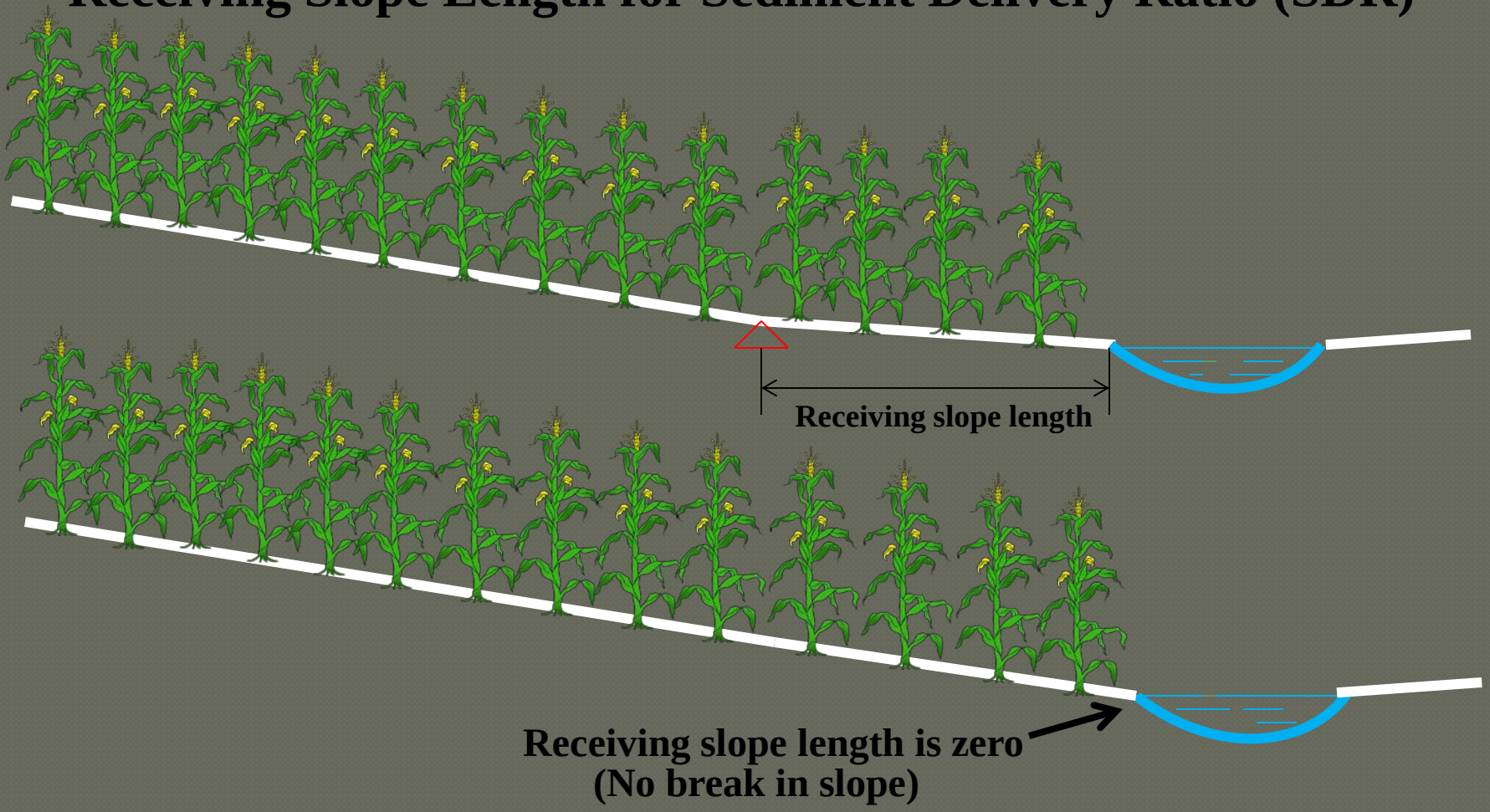
Select all drop-down boxes for appropriate scenario specific to the operation/field.

Then click "Save"

RUSLE2 Soil Erosion Prediction Software



Receiving Slope Length for Sediment Delivery Ratio (SDR)



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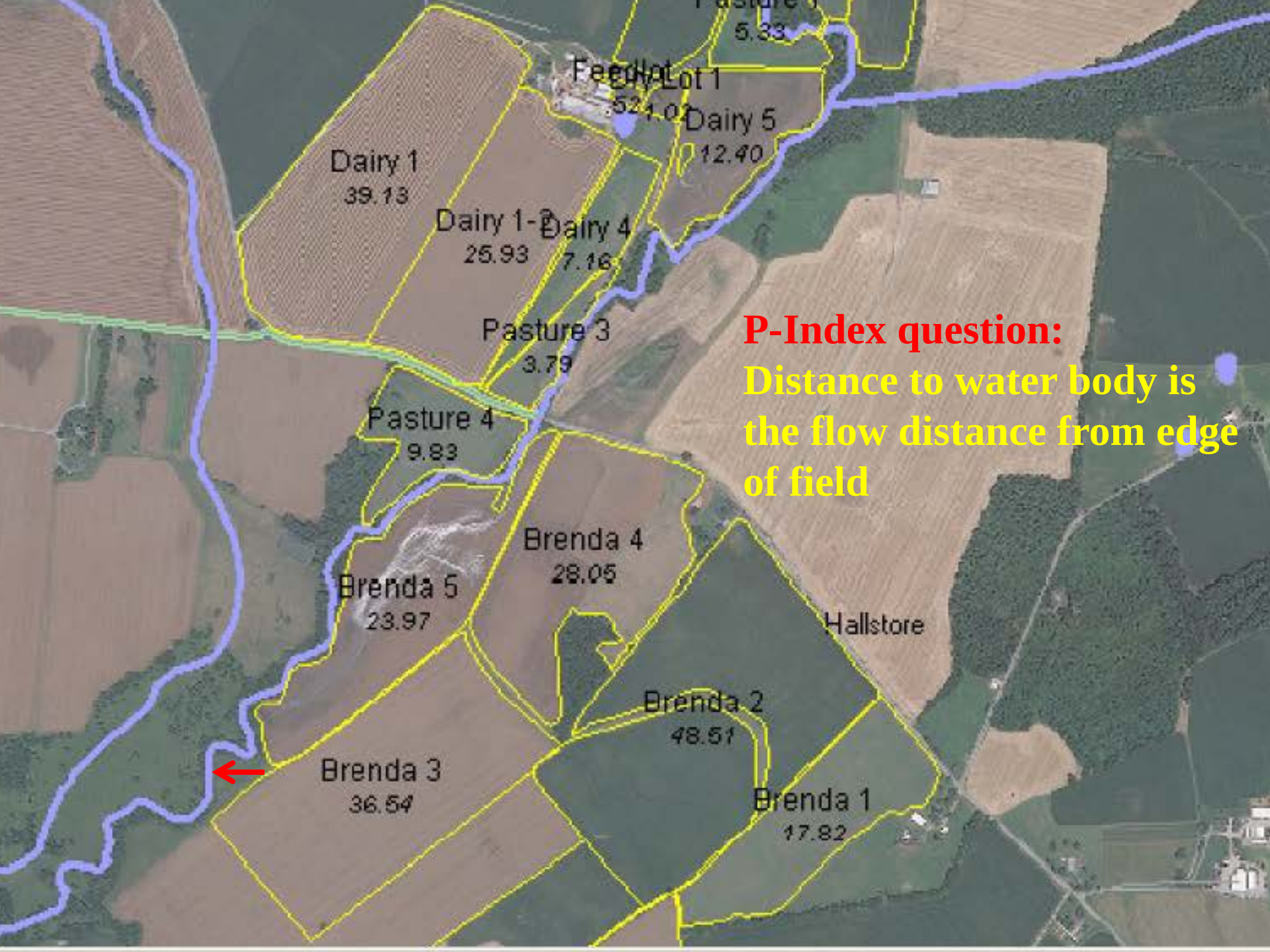
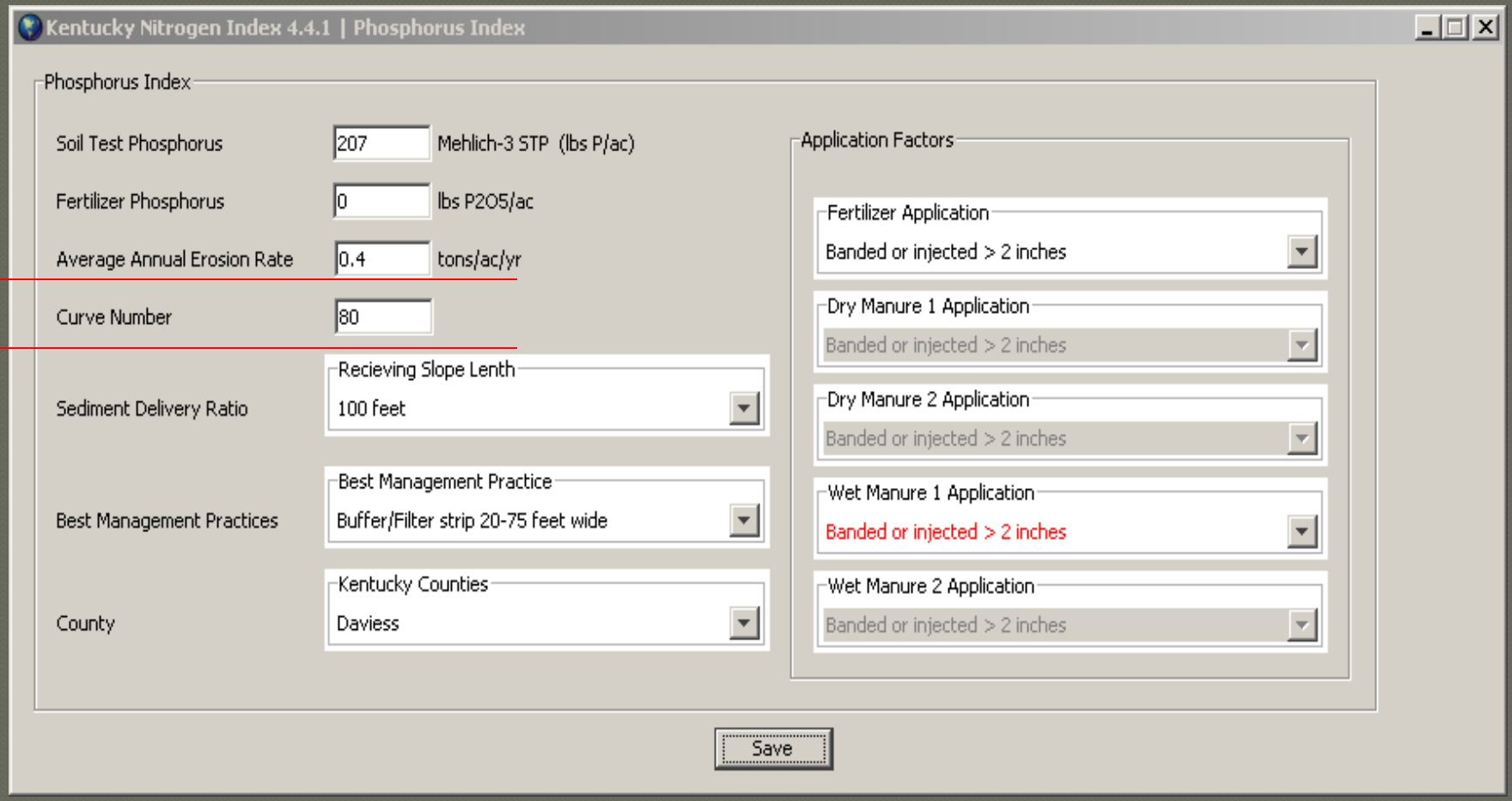

5.33
Feedlot
Dairy Lot 1
Dairy 5
12.40
Dairy 1
39.13
Dairy 1-2
25.93
Dairy 4
7.16
Pasture 3
3.79
Pasture 4
9.83
Brenda 4
28.05
Brenda 5
23.97
Hallstore
Brenda 2
48.51
Brenda 3
36.54
Brenda 1
17.82
P-Index question:
Distance to water body is the flow distance from edge of field

New Kentucky Phosphorus Index Risk Categories and Limitations

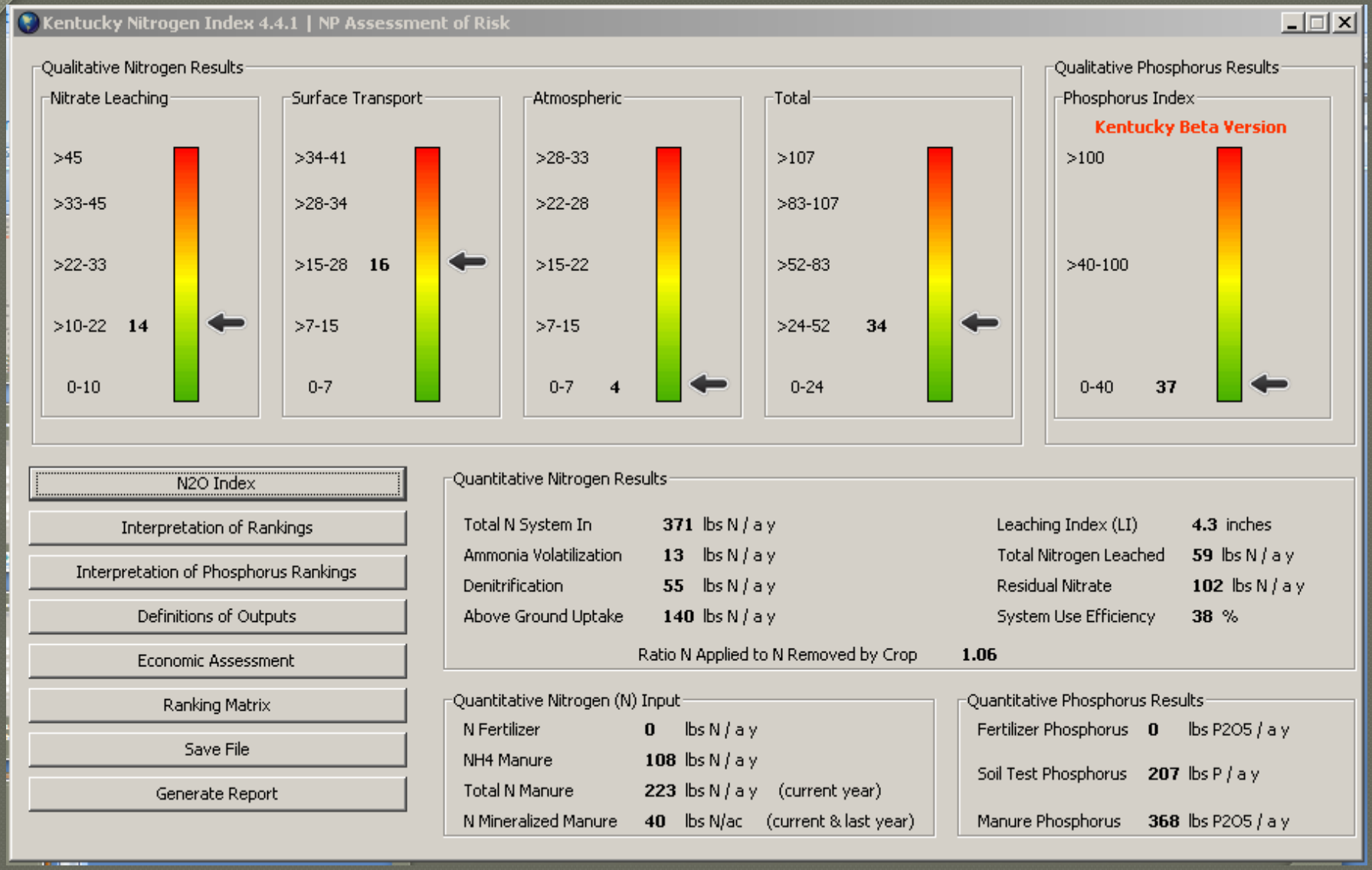
Range	Category	Interpretation
0-40	**Low**	Phosphorus can be applied at rates greater than crop requirement not to exceed the nitrogen requirement for the succeeding crop. ***If the soil total Phosphorus level is 800 or higher no P application of any kind allowed.***
40-100	**Moderate**	Phosphorus can be applied not to exceed the crop requirement rate. ***If the soil total Phosphorus level is 600 or higher no P application of any kind allowed.***
>100	**High**	Phosphorus can be applied not to exceed the crop removal rate if the following requirements are met: • **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.** • ***If the soil total Phosphorus level is 400 or higher no P application of any kind allowed.*** • **Any deviation from these high risk requirements must have the approval of the Chief of NRCS.**

Example farm is applying 40,000 gallons of liquid swine manure per acre per year that delivers 368 lbs/acre/year of P_2O_5 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

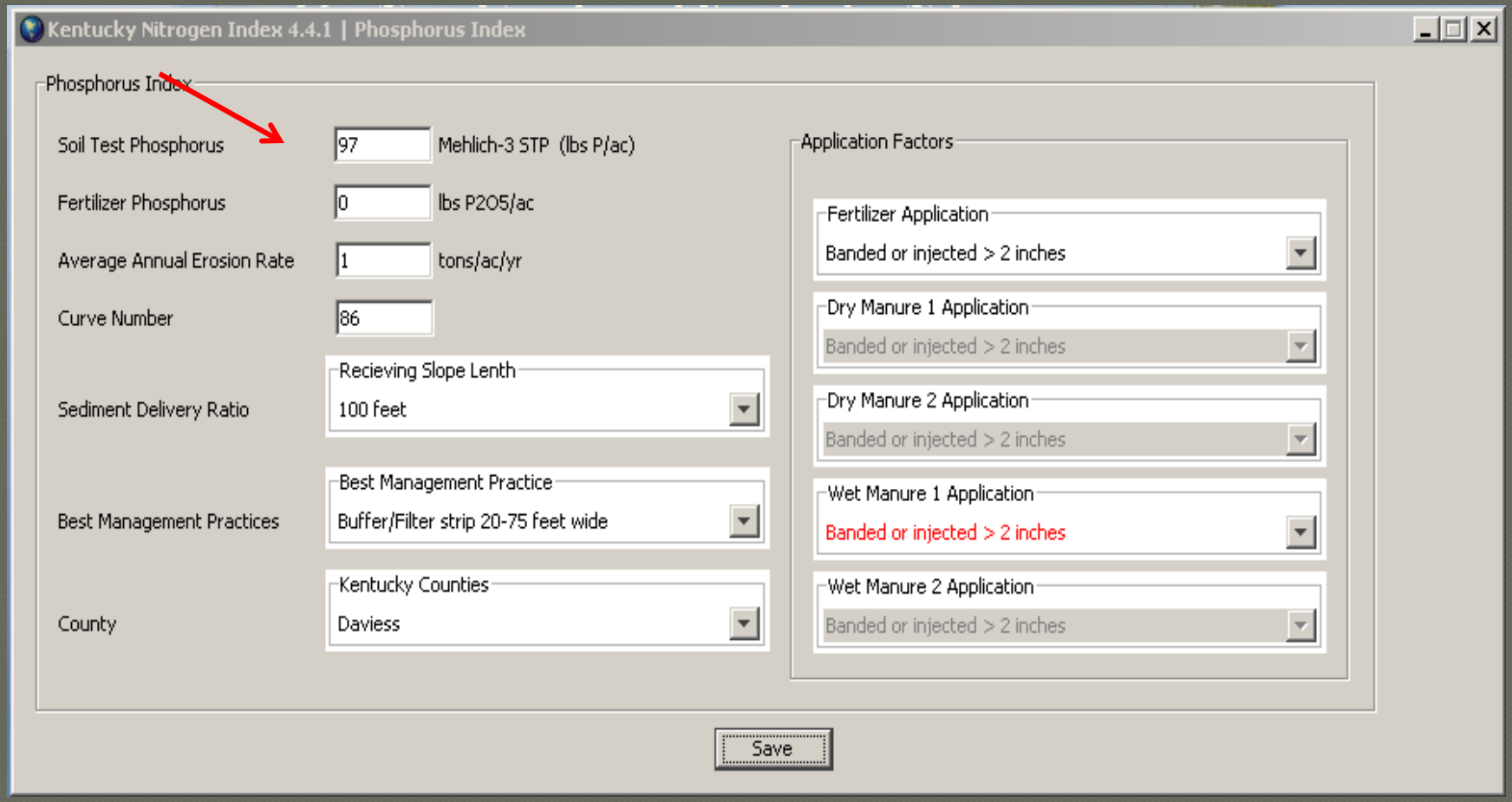


Changing the tillage to no-till would reduce soil erosion to 0.4 Tons/acre/year and the runoff curve number to 80

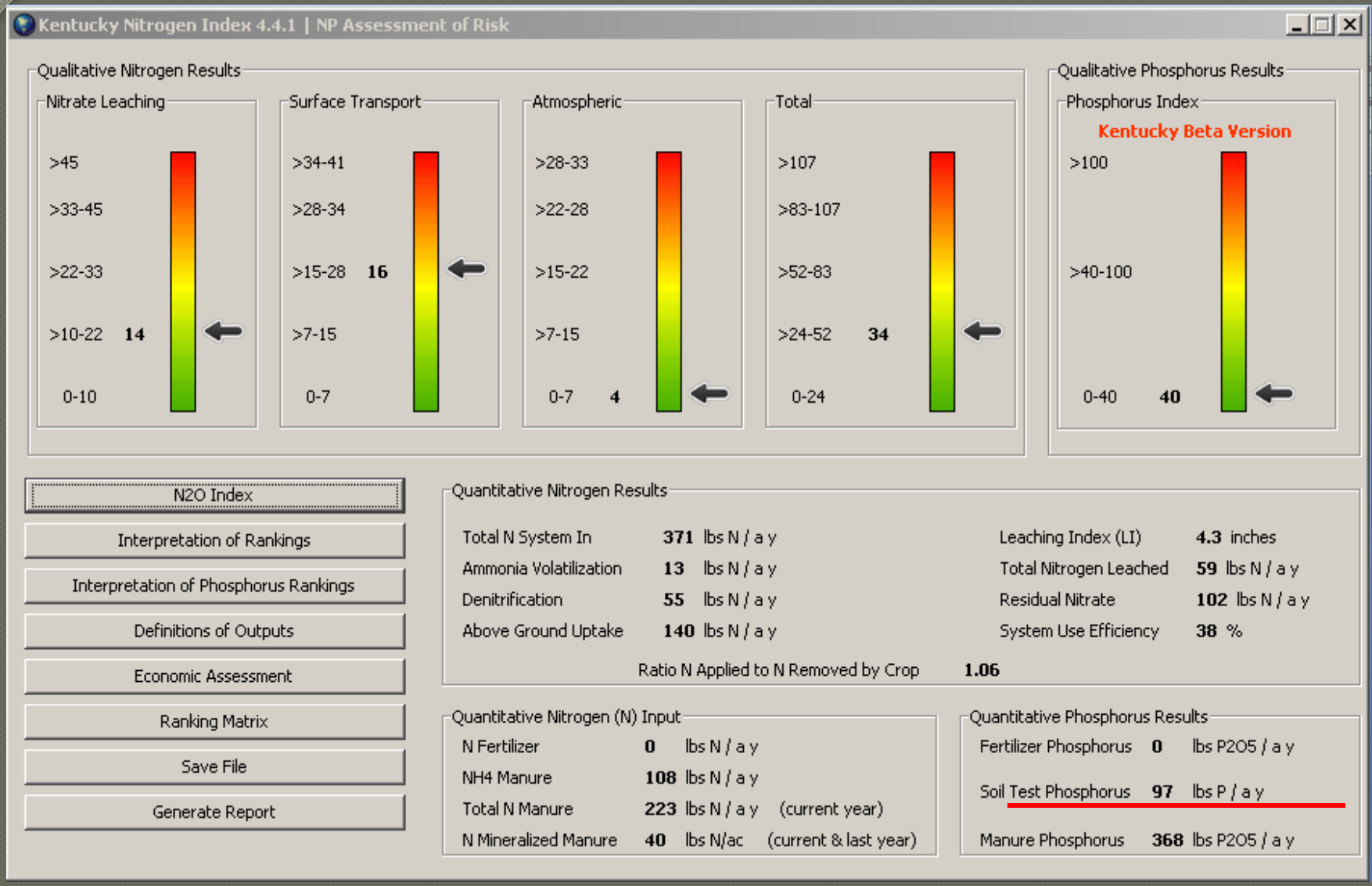


Changing to no-till reduced the Phosphorus risk category to Low that allows the producer to apply manure based on the crop's Nitrogen need.

The swine operation Phosphorus data input screen



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.



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!
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