(pwgassma@iastate.edu)

Fayette, IA 52142

Maquoketa Headwaters (MHW) Livestock Operation Locations and Landuse Maps

Precise location of livestock operations, cropped fields, and other landuse in the MHW was determined primarily from reconnaissance performed by ISU Extension. Some refinement of this information occurred from discussions with producers and other people who lived in or near the watershed. Each livestock operation simulated in APEX was identified as being located in a specific SWAT subwatershed. The predicted nutrient and sediment losses from the manured fields were input into SWAT at the subwatershed outlet for subsequent routing through the stream system. Less detailed landuse data derived from the landuse map shown here was used in both APEX and SWAT; this less refined data was adequate for capturing the MHW cropping and other landuse patterns (a similar approach was used for the soil and topographic inputs to both models).

Survey of MHW Producers

A survey instrument for the MHW was collaboratively developed by TIAER, CARD, and ISU Extension staff. Slightly over 20 percent of the 90 MHW producers, who had livestock at the time of the study, were interviewed one-on-one by ISU Extension to determine typical cropping, tillage, fertilizer and manure application, and other practices used by livestock producers in the watershed. Additional interviews were also conducted with other producers who did not have livestock. The majority of the baseline tillage, crop rotation, manure and fertilizer application rates, and timing, and other management assumptions were based on the results of these surveys. Key survey summary results for expected yields and fertilizer rates are listed in the table.

Expected yields and fertilizer rates based on MHW survey results

Crop	Crop sequence	Expected yield (bu/ac)	Main N fert. appl. (lb/ac)[a]	Fall crop removal fert. appls. (lb/ac)[b] Manured fields N	Manured fields P_2O_5	Nonmanured fields N	Nonmanured fields P_2O_5
corn	after corn	155	142	16	41	25	61
corn	after soybean	160	114	9	23	25	61
corn	after alfalfa	158	89	9	23	25	61
soybean	after corn	55	0	13.7	35	25	61

[a]Same rate assumed applied to manured and nonmanured fields
[b]Applied as diammonium phosphate (DAP)

Dissemination of MHW Simulation Results

Over 20 different simulation scenarios were performed for the MHW, some of which are listed here. The final list of scenarios was arrived at by an iterative process that included input from members of the the MHW Watershed Council. Presentation of the simulation results were packaged in different formats to accommodate both local citizens (pie charts) and the scientific community in general (graphs), and were presented as percent differences relative to baseline conditions. Selected scenario results were incorporated into the goals set by the MHW Watershed Council for improving water quality. A subset of the scenario results is presented in Gassman et al. (2002); the complete set of results is discussed in Keith et al. (2000).

Scenario codes and descriptions

Code Description

Manure Application (M)
- M1 Manure applied at the N rate and manure nutrient crediting[a]
- M2 Manure applied at the high P rate and manure nutrient crediting[a]
- M3 Manure applied at the low P rate and manure nutrient crediting[a]
- M6 Incorporation of solid manure
- M7 Injection of liquid manure

Fertilizer Application (F)
- F1 Elimination of fall crop removal fertilizer applications on all cropland
- F2 Reduced N application on all cropland[a]
- F3 Reduced and split N application on all cropland[a]

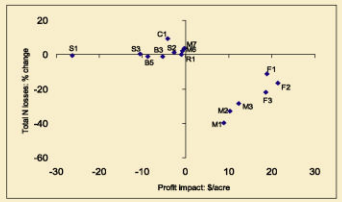
Cropland tillage (C)
- C1 No-till on all cropland

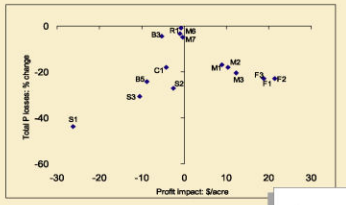
Soil Management (S)
- S1 Terraces on cropland with slopes greater than 2 percent
- S2 Contouring on cropland and pastureland with slopes greater than 2 percent
- S3 Contour buffer strips on cropland with slopes greater than 2 percent

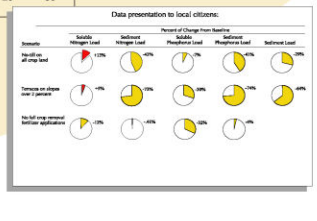
Ration Modifications (R)
- R1 Phytase-supplemented rations for swine farms

Structural BMPs (B)
- B3 Filter strips on manure application fields
- B5 Enhancing and developing waterways for all cropland

[a]These scenarios also include estimation of fall crop removal fertilizer applications.







Citizen Involvement

Mineral Creek Watershed (MCW) Livestock Operation Locations and Landuse Maps

The survey developed for the MHW was modified for the MCW in consultation with the MCW Watershed Council "modeling subcommittee." The survey was mailed to producers and other land owners in the watershed, who were requested to provide information on cropping, management, and other practices, and also identify the location of their operation in one of six "watershed segments." General locations of the livestock operations and associated herd sizes within the six segments were translated into total numbers of livestock in each subwatershed, based on the survey information; ISU Extension reconnaissance; and consultations between Extension, the modeling team, and the MCW Watershed Council modeling subcommittee. Greater precision was used in identifying the livestock operations (and associated livestock distributions) located in subwatershed 8, to facilitate a Variable Rate Technology (VRT) scenario that is being developed for that subwatershed. Crop rotation distributions in each subwatershed were determined by ISU Extension in consultation with the modeling team and the council modeling subcommittee.

Other MCW Survey Results

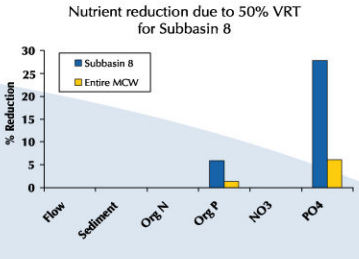
Similar to the MHW, the MCW baseline cropping, tillage, nutrient application, and management assumptions were based primarily on results of the returned surveys. Some modifications were made to these assumptions as a result of further input from the council modeling subcommittee. Key survey summary results for expected yields and fertilizer rates are again listed here.

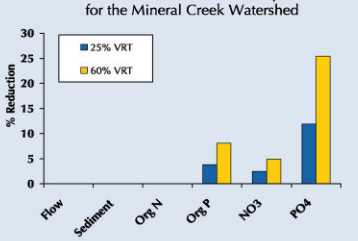
Expected yields and fertilizer rates based on MCW survey results

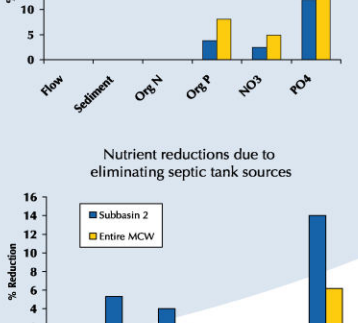
Crop	Crop sequence	Expected yield (bu/ac)	Manured fields (lb/ac) Main N appl.	Manured fields (lb/ac) Fall crop removal[a] N	Manured fields (lb/ac) Fall crop removal[a] P_2O_5	Nonmanured fields (lb/ac) Main N appl.	Nonmanured fields (lb/ac) Fall crop removal[a] N	Nonmanured fields (lb/ac) Fall crop removal[a] P_2O_5
corn	after corn	146	115	9	43	130	9	43
corn	after soybean	146	92	0	0	107	0	0
corn	after alfalfa	146	74	9	43	89	9	43
soybean	after corn	51	0	20	94	0	20	94

Dissemination of MCW Simulation Results

A smaller set of scenarios has been identified for the MCW simulation applications, relative to the MHW. These scenarios were selected through a series of iterative discussions with the MCW Watershed Council. The idea for the VRT scenario originated with the council; the goal is to assess the water quality impacts of reduced phosphorus (P_2O_5) applications (and associated nitrogen applications) that result from application of VRT to each acre of a crop field. To date, only preliminary results have been presented to the local watershed council for the following scenarios: (1) subwatershed 8 VRT, (2) entire MCW VRT, and (3) improvement of septic nutrient discharges from the town of Center Junction. These results are again presented in terms of relative impacts as compared to baseline conditions. A final set of results for both these and other scenarios will be presented to the council in 2003.







Conclusions

The application of the integrate
environmental modeling systen
robust for capturing baseline co
alternative scenarios, for both t
The involvement of local citizer
aspect of the process, especially
the models for each watershed,
simulation scenarios, and revie
The analysis of the MCW is stil
be completed during calendar y

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