

Evaluation of Manure Storage Capital Projects in the Yahara River Watershed (to align with the objectives of the RCPP)

A Coordinated Effort of the University of Wisconsin-Madison & Dane County Land Conservation

Background. The Yahara River Watershed has been a focus of continued efforts to improve water quality due to eutrophication of the lakes within the watershed. This has led to development of the strategy to reduce the phosphorus load from direct drainage sources to the Yahara River watershed to by ~50% (Clean Lakes Alliance, 2012). This plan includes urban and rural activities, including farm level management strategies to attain this reduction. In addition, the county in collaboration with MMSD and other partners, has developed an Adaptive Management Plan that begin to align the practices within the agricultural community to meet phosphorus (P) water quality goals. Meeting 50% or higher agricultural runoff P reductions watershed-wide will be difficult and require extensive management at the watershed level.

One major factor in addressing P losses associated with manure is to provide cost effective storage and processing options for land limited facilities so they can apply manure at recommended agronomic rates. One major factor to address P losses associated with manure is to provide facilities that are stressed for the land base to apply manure at recommended agronomic rates potential cost effective solutions which can increase their options for manure land application which meet the needs of their nutrient management plans. This includes providing manure storage and processing options which reduce the environmental impact while providing producers alternative practices to their current land application strategies which are economically feasible. By providing these options, the goal is to provide producers with alternatives to manure applications during periods of high runoff risk and over application of P to fields with high P runoff risk. In addition, as we examine the manure movement in the watershed, there may be additional P reductions and cost reductions based on site selection and type of processing and storage selected for these capital projects. The evaluation of central or distributed manure processing/storage centers will play a significant role in managing phosphorus in the watershed and guiding county capital investment on manure projects.

Objectives. The proposed work has the overall objective to guide investment for manure storage and processing facilities in Yahara River Watershed which reduce the loading of nutrients to surface waters. Specific objectives include:

- 1) assessment and quantification of the total amount of manure produced and total nutrients applied in the Yahara Watershed and how increasing storage capacity can impact water quality;
- 2) recommendations on the amount of storage needed in the county, how the location of collective or individual storage structures be can be optimized to facilitate a reduction in the importation and release of nutrients to the Yahara watershed;
- 3) develop a strategy to identify storage locations that would have the greatest impact on water quality of the Yahara Lakes by reducing the necessity of winter spreading or other criteria;

- 4) develop outreach efforts that can be utilized to encourage implementation by individual farms or groups of farms to have the most impact on water quality.

It is important to note that the above objectives are intended to fall in line with current county-wide strategies for P management. It is critical to promote the continuation of the current activities within the watershed which reduce the risk of P loss. By promoting practices which keep P in the soils, crop uptake and nutrient densification strategies will eventually lead to products which can then be shipped out of the watershed.

Methods. The overall goal of this project is to develop a manure storage plan which will outline the potential options for manure storage capital project in the Yahara River Watershed while also providing relevant costs and quantify water quality impacts. In order to develop a strategy which will have a significant impact on P loading to surface waters while also maintaining economic feasibility, evaluation must include multiple manure storage options. We propose that the most effective way to achieve a P reduction and cost of implementation balance is to target the highest risk area within the watershed for evaluation (i.e. the area of the watershed with both high animal density and high risk of field P losses). Developing a map of manure phosphorus stores within the watershed using county based manure storage maps and data on other livestock facilities is the first step in developing a manure management plan.

The following steps outline the tasks necessary to identify the target area of the watershed and achieve the objectives listed above:

1. Map animal densities within the county. There is currently data within the Dane County Land Conservation Division which includes animal numbers for many farms. This data needs to be assessed to determine the age of the data and the accuracy to report on the confidence of the density information, and when lacking outline where increased data collection may be necessary or may greatly improve estimates. Following data collection, mapping can be completed to identify the highest animal density areas with reported data confidence. Information will also be included to identify areas when the animal density has been increasing over time. Average manure nutrient content will then be used to calculate the total manure nutrients in a given sub-watershed.
2. Develop manure production estimates based on animal numbers for high animal density areas and evaluate storage capacity within these areas. Manure storage systems are tracked at the Dane County Land Conservation Department through permitting requirements when installed. These permits can be used in addition to current manure storage maps held by the Dane County Land Conservation Department to provide accurate manure storage estimates.
3. Use manure estimates and cropland availability to determine areas where there is significant need for increased land base as well as increased storage capacity (i.e. a significant amount of winter or spring periods of application). This task will be completed with help from partners at the Clean Lakes Alliance and Yahara Pride.
4. Identify high risk target site. Identification of high risk target sites will use P runoff estimates already conducted in the watershed to identify sites with high P runoff risk, low storage to total

manure ratios, increasing animal density, low cropland availability per volume of manure. With high risk areas identified, researchers will evaluate site characteristics, available county land, and with the assistance of Yahara pride identify producers willing to participate in a manure storage program in order to select the a site for detailed assessment.

When one site is selected as a potential for evaluation, data will be used to assess numerous different storage management strategies. For each of the storage strategies assessed researchers will report the cost per gallon to implement the plan and provide a basic estimate of P loss reduction. All strategies evaluated will report cost estimates as well as operational feasibility including potential pitfalls or limitations. Dane County Land Conservation will then evaluate the potential options and proceed with any strategies them deem to be operationally and economically feasible.

Throughout the plan development regular meetings with researchers, county personnel, producers, and manure industry representatives will be held to refine ideas and ensure stakeholders have representation during development. Continuous meetings with producers and the Clean Lakes Alliance and Yahara Pride representatives will allow researchers to develop outreach plans and identify interested parties in participating in the project following evaluation. Efforts will then be placed to connect producers with the developed plan for implementation. Continued outreach will continue after the project period to integrate findings within the watershed and the state.

Outcomes. The main outcomes of this work will include a report to the county and presentations to relay the findings. The content within these materials will include the following (which relate to the numbered objectives):

1. Total manure production estimates in the Yahara watershed including N & P content and the estimated impact to P in surface waters under specific manure storage scenarios (N impacts will be assessed where sufficient data is present). These assessments/scenarios may include assumptions where necessary, but these assumptions will be clearly defined.
2. Identify locations within the Yahara watershed where manure storages are estimated to have the greatest reduction in P (and N when possible) loss to surface waters (identification of high impact areas) and make recommendations for manure storage capacity.
3. Document the selection process/strategy to identify manure storage placement which will have the greatest impact on reducing P (and N when possible) loading to surface waters.
4. Conduct outreach to highlight findings and encourage implementation of on individual farms.

Impact. The development of a watershed manure storage plan will provide a long-term strategy for a reduction in manure phosphorus losses that will serve all stakeholders. Increasing management options for producers will reduce application of manure during high risk periods and on fields with high manure runoff risk. And if possible, promoting local phosphorus use for fields needing phosphorus for crops will lead to an over-all reduction in the surplus phosphorus content stored in watershed soils, this draw-down will occur gradually over the long term. The development of manure storage plan will allow policy makers, regulatory agencies, community interest groups and farm operators located throughout the watershed to compare various practices in terms of economics and impact to phosphorus reduction and

water quality goals. Overall, it is anticipated that detailed study and analysis of the potential capital investment in manure systems to increase water quality in the watershed will allow all stakeholders within the watershed to continue to move forward in a unified strategy to address this very complex water quality issue in our lakes and rivers.

Budget. This project will require salary of \$21,500 and fringe of \$5,010 for a 50% research associate for 1 year of the project to complete data collection, facilitate meetings, and complete the scenario assessment. An additional \$16,250 is requested in salary for project coordination with stakeholders and outreach activities with \$7,556 requested for fringe. Salary for technical assistance (GIS mapping etc.) is requested at \$30,000 with fringe of \$13,950. An additional \$4,814 in supplies and \$3,000 for travel is requested over the 1 year project. The total direct cost request to complete all outlined activities is \$100,000.

References

Clean Lakes Alliance. 2012. Yahara CLEAN Strategic Action Plan for Phosphorus Reduction. Prepared by D.L. Converse. <http://www.cleanlakesalliance.com/wp-content/uploads/2012/11/Strategic-Action-Plan-11092012.pdf>