Wisconsin Potato and Vegetable Growers Association Groundwater Task Force

Accomplishments, 2009-2012

Background:

The WPVGA Groundwater Task Force was formed in 2009 to bring together resources and expertise to foster the sustainable use of water resources in the Central Sands.

The Task Force meets monthly and encompasses a broad diversity of expertise from the following groups

Co-Chairs: Nick Somers, grower, Plover River Farms and Jeremie Pavelski, grower, Heartland Farms

Growers: Andy Wallendal (Wallendal Supply), Steve Diercks, Andy Diercks (Coloma Farms), Mike Copas, Jeff Sommers, Jim Wysocki (Russet Potato Exchange), Jim Okray, Mike Finnessy (Okray Family Farms), Mike Carter (Bushman's Inc), Denis Zeloski, Ron Krueger (Felix Zeloski Farms), Curt Soik, Mark Soik (Soik Farms), Gary Barton (B&D Farms), Ken Feltz (Feltz Farms), Lonnie Firkus (Firkus Farms), Mark Haynes (Mortenson Farms), Dick Pavelski, TJ Kennedy, Wes Meddaugh, Alicia Pavelski (Heartland Farms), Steve Kizewski (Kizewski Farms), Kiley Stucker (Paramount Farms), Dan Reid (James Burns and Sons), Dave Zwicki (Zwicki Farms)

Processors: Stewart Higgins (Del Monte Foods), Kevin Hirst (Seneca Foods), Nick George (Midwest Food Processors Assn.), Kerry Larson, Doug Nelson (McCain Foods)

Support Expertise: Duane Maatz, Julie Braun, Dana Rady (WPVGA), Dale Bowe (Wis Public Service Corp), Julie Ammel (USDA NRCS), Paul Cieslewicz (Sand County Equipment), Marv Hopp (Roberts Irrigation), Ron Kuehn (De Witt, Ross and Stevens), Paul Peters (ADM Wisconsin), Nate Peterson (WRC), Roger Putnam (PRW Communications)

Rural Communities: Dan Mahoney (Village of Plover), Steve Diercks (Village of Coloma)

University of Wisconsin: AJ Bussan (Horticulture), Jed Colquhoun (Horticulture), Russ Groves (Entomology), Amanda Gevens (Plant Pathology), Matt Ruark (Soils), Bill Bland (Soils), Sam Kung (Soils), Birl Lowrey (CALS), Pete Nowak (Nelson Inst.), Mack Naber (Soils), Ken Schroeder (UWEX), Jeff Wyman (Wis. Institute for Sustainable Agriculture)

Goals: Be an advocate for responsible water use and informed, science-based public policy that will protect the Central Sands groundwater aquifer and its associated streams, lakes and wetlands; promote and maintain a sustainable agricultural industry; and foster vibrant rural communities.

Objectives: The Task Force is pursuing 4 primary objectives which support the Statewide Water Conservation and Water Use efficiency goals released by DNR in 2011.

Ongoing activities associated with each objective are listed below with specific outcomes, projected benefits and anticipated future directions.

Objective 1. Consolidate, and build on the extensive existing data-bases related to the hydrogeology of the Central Sands, and the potential impacts of water use (agricultural, community and industrial), climate and other factors on the groundwater aquifer and associated surface water bodies.

Activity1a: Create a data-base that tracks groundwater depth associated with irrigation wells through time across the Central Sands region. This ongoing activity was initiated in 2011 and tracks groundwater elevations 2-4 times annually in privately owned irrigation wells across the sands.

***Outcomes*:** With more than 100 wells sampled 2 to 4 times per year since 2010 from over 20 landowners this database provides the first comprehensive documentation of ground water fluctuation across space and time in Central Wisconsin. This data is currently being incorporated into a commercially available farm management software package (Conservis) which enables growers to evaluate trends and fluctuations in water table elevation. The software also enables the incorporation of state and federal agency monitoring well data to verify grower-collected data.

Projected benefits: This expanding database will provide the opportunity to relate groundwater fluctuations through time with water use, climate, precipitation, crop cover and natural landscape.

Future: This database provides extensive information on water table fluctuations through time and across space which will be essential components of the 3D modeling efforts projected to examine potential solutions to water management issues.

Activity1b: Continually monitor groundwater fluctuations in existing monitoring wells (State and Federal) and in strategically-placed, nested groups of wells placed in areas designated as high risk for surface water impacts. (2011-2013)

Outcomes: nests of 4-6 wells capable of monitoring groundwater fluctuations at up to 15 min intervals have been installed in 3 of 4 high risk areas: the Little Plover River, Long Lake and Pleasant Lake. These wells are linked to both permanent monitoring wells and irrigation wells (activity 1a) and thus provide valuable cross checking capability.

Projected benefits: This intensive monitoring, when completed, will greatly improve understanding of the relationships between irrigation, climate, precipitation and crop production.

Future: The continual monitoring of groundwater fluctuation over time and the relationship to irrigation, precipitation, climate and recharge of the aquifer will be essential drivers in 3D modeling of high risk areas to test potential solutions.

Activity1c: Investigate the hydrogeology of Long Lake and improve understanding of the formation of tunnel channel lakes and the potential impact of silt-clay layers deposited in this process on interactions between groundwater and lake depths (2012-13). Long Lake in Waushara Co. is a frequently cited example of a lake that experiences periodic drying and has been identified as a high risk area.

Outcomes: This comprehensive study, funded by the Task Force and conducted by the Wisconsin Geological and Natural History Survey, has greatly increased understanding of the formation of these lakes and the role of clay layers deposited in this process on water fluctuations in the lake. The study is ongoing. In addition to the specific hydrogeological study on Long Lake an extensive literature review was conducted which is the first comprehensive compilation of research studies on the hydrogeology of central Wisconsin.

Projected benefits: This study and the accompanying literature review will improve our ability to understand surface water fluctuations in Long Lake and similar lakes in the Central Sands. Some of these lakes undergo periodic drying while others do not and the information generated by this study will underpin the ability to link lake levels to surrounding farming activities and or climate.

Future: This study has led directly to a proposal to expand the hydrogeological investigation of Long Lake to similar lakes as a component of proposed modeling of localized high risk situations.

Activity1d: Engage the services of an independent hydrogeology consultant from outside Wisconsin to assess the strengths and weaknesses of ongoing Task Force activities and existing studies identifying irrigation as the sole cause of groundwater fluctuation (2012-2013)

Outcomes: initial analyses of the potential causes of groundwater fluctuations indicate that a complex set of factors are involved that may include climate, irrigation and others.

Potential benefits: the addition of hydrogeological expertise from outside Wisconsin will broaden the Task Force perspective by including the experiences of other states and regions of the US where similar water related problems have occurred.

Future: It is anticipated that the Central Sands will benefit from approaches and solutions implemented elsewhere in the US and hasten our ability to provide viable solutions in Wisconsin.

Objective 2: Identify, implement and evaluate strategies to increase the efficiency of irrigation

Activity 2a: Survey growers on irrigation practices

Outcomes: Provided baseline information on current irrigation practices used by growers , including equipment, calibration, maintenance, scheduling methods, energy use and water use

Projected benefits: Enabled growers to identify weaknesses in current practices and target improvements to improve water use efficiency.

Activity 2b: Develop new irrigation scheduling software (2011-2013).

Outcomes: as a result of the survey in 2a, irrigation scheduling was identified as a weakness where improvements could be made and a new software package was developed to incorporate new technologies in use in Western states. The software was beta-tested in 2012 and shown to provide more efficient water use with reduced waste.

Projected benefits: When implemented across the industry, the new irrigation scheduling software will reduce water need, increase water use efficiency and energy use.

Future: The software is currently being incorporated into existing farm management software which will increase distribution.

Activity 2c:) ***Evaluate site specific, precision irrigation (2012-ongoing)***

Outcomes: Precision irrigation where water application is matched precisely with variable soil types and water-holding capacities across fields is on the cutting edge of irrigation technology. This approach was beta-tested by 2 growers in 2012 and shown to improve water use efficiency and increase yield.

Projected benefits: It is anticipated that precision irrigation, when adopted broadly, will significantly improve water use efficiency, improve crop yield and quality and reduce leaching.

Future: Although the increased costs associated with this technology have slowed its adoption, the benefits demonstrated in increased efficiency and improved yield, in combination with anticipated benefits from reduced leaching and better pest management, are expected to speed adoption.

Activity 2d: Investigate the potential for deficit irrigation in crops grown in the Sands. (2011-ongoing)

Outcomes: Research and grower on-farm trials have demonstrated that some high water demand crops such as soybean and field corn can have water withheld during vegetative growth stages without impacting yield or quality resulting in significantly lower water use on these crops. In shorter season crops such as snap beans and sweet corn the water management can be manipulated but precision is critical to avoid yield loss.

Potential benefits: The ability to employ deficit irrigation in high usage crops will enable growers to use less water and reduce potential groundwater stress while lowering costs and energy use.

Future: as research in this area continues, it will allow growers to design crop landscapes that significantly reduce water use, increase recharge potential and lessen impacts of irrigation on groundwater in critical areas.

Activity 2e: Investigate the potential for drip irrigation to improve water use efficiency. (2010-ongoing)

Outcomes: Research evaluating the potential benefits of drip irrigation in potatoes in grower fields has clearly shown that this delivery system for irrigation water is highly efficient, delivering water in the precise amounts, timings and locations needed and resulting in greatly reduced water use without yield or quality impacts.

Potential benefits: The ability to deliver water “on demand” to potatoes will significantly reduce water need for this crop. In addition, this technology will provide a precise delivery system for nutrients and pesticides that will reduce leaching and improve performance.

Future: the high cost of this technology is limiting its use in potatoes but as ancillary benefits accumulating from improved pesticide delivery, reduced leaching and drift, reduced pest pressure and lower ecosystem impacts are demonstrated, it is expected that drip irrigation will become a viable option, particularly in high risk areas.

Activity 2f: Investigate the potential for modification of the Central Sands drainage system to manage water more efficiently and increase recharge. (2013-ongoing)

Outcomes: monitoring wells have been purchased for installation in the Little Plover area to track the impact of dams in holding drainage water in place over longer periods to increase recharge. Existing models were evaluated which indicated that dams would not provide long term recharge and that ground truthing will enable us to determine if short term benefits can be achieved.

Potential benefits: Drainage systems were designed over a century ago, prior to the expansion of irrigated agriculture with the goal of moving excess water out of the Central Sands. In the current situation a $6 billion irrigated vegetable production industry has evolved and the goal is now to conserve any excess water to recharge the aquifer or potentially irrigated crops. Currently, the drainage system removes an equivalent volume of water to that used in irrigation. The potential benefits of re-designing this system to retain water and recharge the aquifer are unlimited.

Future: In other regions of the US where irrigation has impacted groundwater, the redirection of drainage systems through pumping, retention ponds, reservoirs and other innovative solutions has been successful in maintaining agriculture and protecting and even expanding water resources

Objective 3: Investigate the relationships between evapotranspiration among crop types, crop and natural landscapes, climate, irrigation and groundwater fluctuation and recharge.

Activity 3a: determine the year-round water consumption of crops, cover crops, bare soil and non-crop natural communities. (2011-ongoing)

Outcomes: This ongoing research has increased our understanding of the water demand of both crop and non-crop plant communities and the potential for aquifer recharge throughout the year.

Potential benefits: This knowledge of how much water is used across plant types throughout the year, its interaction with climate, recharge and the resulting impacts on groundwater provides the foundation for models that can examine specific solutions.

Future: The models that result from this activity will enable us to design landscapes that will sustain water resources and preserve agricultural productivity.

Activity3b: ***Establish a digital data base that tracks land use across the Central Sands that incorporates crops and native communities by plant type and urban development. (2012-ongoing)***

Outcomes: Working with digital database layers from the National Ag Statistics Service and Central Wisconsin counties, maps have been developed that are capable of tracking the distribution of different crops, natural plant communities and rural developments across the Central Sands for the past 5 years.

Potential benefits: This database will allow us to track changing landscapes across space and time, both historically and in real time and begin to link this database to fluctuations in groundwater and associated surface water bodies.

Future: This evolving data base will allow us link with ongoing modeling efforts and begin to design crop landscapes more effectively to manage water use, maximize recharge and minimize groundwater fluctuation.

Objective 4: Communicate Task Force activities and accomplishments to the farming community, the citizens of the Central Sands and general public throughout Wisconsin: Seek broad input from all concerned parties to determine potential solutions.

Activity 4a: assist in bringing together all facets of the existing science surrounding water issues in the Central Sands (2010-2011).

Outcomes: The Task Force participated in and encouraged a series of 4 mini-conferences on the UW Madison Campus organized by Dr Sam Kung as a component of the Central Sands Groundwater Initiative, a grant funded by the Wisconsin Institute for Sustainable Agriculture. These conferences "Setting the Stage – the Central Sands, Hydrogeology and Agriculture", "ET trends along the Western Great Lakes", "Water Level and Streamflow declines in the Central Sands", and " Water Issues and Research Priorities in the Central Sand Areas of Wisconsin", brought together scientists from 6 CALS departments, 3 Colleges, 2 Institutes, 3 UW campuses, UWEX, State Agencies (DNR, DATCP), and Federal Agencies (NRSS, USGS) to share research and discuss potential solutions to the groundwater issues facing Central Wisconsin.

Potential benefits: All solutions that may ultimately be implemented to address the water issues facing the Central Sands must be based in the science underpinning our understanding of the hydrogeology and agriculture of the region and their interaction with rural communities and citizens. This initial series of conferences was used to design the research addressed in this report.

Future: It is anticipated that a major modeling initiative that can address local issues and evaluate local solutions will be undertaken in 2013 and beyond. These projects have evolved from the mini-conference series and the Long Lake research funded by the Task Force

Activity 4b: Seek input from all concerned parties in the assessment of and development of solutions for the groundwater issues of the Central Sands (2010-ongoing).

Outcomes: To network the inputs of the broad diversity of the citizens of central Wisconsin, a series of 4 citizen gatherings , Groundwater I-IV, were co- sponsored by the Task Force, The Lakes Association, CALS and UWEX in Central Wisconsin in 2012. All vested interests associated with waters on the Central Sands were brought together to share and examine mutual concerns. Scientific presentations were

used to stimulate discussions on what is known and what needs to be explored. A common theme was the need for more information to develop effective solutions, balanced with the need for immediate actions. 3 overall goals were accepted as part of this collaborative process: 1) maintain the healthy waters and ecological resources of the region; 2) restore or maintain the waters of central Wisconsin; and 3) promote and maintain a vibrant agricultural industry in the region.

Potential benefits: The citizen forums provided an extended opportunity for all concerned parties to share concerns and discuss solutions. The complexity of the issues and the need for holistic, localized solutions was recognized and will provide the foundation for future work.

Future: The citizen forums emphasized the differences between interested parties and opened avenues for future collaboration.

Activity 4c: Provide educational opportunities to the citizens of central Wisconsin and the agricultural community to learn more about the agriculture of the Central Sands and the activities of the Task Force (2011-2012).

Outcomes: the citizen forums emphasized the lack of effective communication and the minimal knowledge of the differing points of view of interested parties as an important impediment to mutual understanding. To address these issues the Task Force, in collaboration with CALS and UWEX conducted two field tours where citizens and farmers were able to visit farms, wetlands, rivers and lakes and view ongoing farming operations and research activities first hand. Interaction between farmers, researchers and citizens was excellent and will facilitate future interactions.

Projected benefits: The mutual understanding of how farms operate and how lake and stream issues need to be addressed will be essential in the development of holistic solutions.

Future: It is anticipated that additional hands on tours that highlight ongoing research, farming operations and ecologically sensitive sites will be needed as local solutions are developed with input from all vested interests.

Activity 4d: Communicate water issues to the broad farming community to encourage greater understanding and participation (2010-ongoing).

Outcomes: The Task Force has broad representation of the farming and food processing community and active involvement of the WPVGA and the MWFPA but this represents a small segment of the potato and vegetable growers in Wisconsin. It is thus essential to involve the majority of growers through educational opportunities. The Task force has achieved this through the presentation of extensive learning sessions on water issues at the annual Grower Educational Meetings which are attended by most growers in the state. This is an annual commitment.

Potential benefits: As the Task Force sponsors and conducts new research which may ultimately contribute to solutions, this research is initially conducted in experimental settings with progressive growers. To be effective, this research must be adopted broadly across the industry and the educational meetings and field tours are the most efficient vehicle to achieve this. Educational publications are also

a good mechanism to communicate new thoughts and ideas to the broader farming community and in 2011 the Task Force sponsored a unique UWEX publication, “Walking on Water” which contains a series of essays by Central Sands citizens, farmers and educators that present various points of view on water issues.

Future: The educational meetings will continue to be an important way to engage broad industry participation and a second edition of “Walking on Water” focusing on solutions is planned for 2013.

Activity 4e: Engage public relations expertise to improve our ability to communicate achievements (2012-ongoing).

Outcomes: The potato and vegetable growers in Central Wisconsin are recognized nationally as leaders in ecologically based farming and received the secretary’s Award from the USDA in recognition of its work in “protecting the natural resources of the country.” Yet, the industry generally has achieved little success in communicating its achievements to the general public. In 2012 the WPVGA and the Task Force took positive steps to achieve better communication with Wisconsin citizens by engaging two companies to carry its message forward more effectively.

Potential benefits: It is anticipated that professional public relations expertise will enable the Task Force to communicate its accomplishments more effectively and facilitate our ability to collaborate with diverse interest groups as we seek solutions to the water issues of the Central Sands.