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water spouts

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Upcoming NDSU Field Days and Other Crop-related Events

Carberry, Manitoba Crop Diversification Field Day	July 23	(204) 834-6000
Portage la Prairie, Manitoba Crop Diversification Field Day	July 24	(204) 834-6000
Oakes Irrigation Research Site	Aug. 14	(701) 742-2189
Carberry, Manitoba Potato Tour	Aug. 14	(204) 834-6000
Tappen Irrigated Potato Field Day I-94, Exit 217 (Pettibone), north side	Aug. 27	(701) 231-7076
Kidder County and Oakes Area Tour of Commercial Onion Production and Processing	Aug. 28	(701) 223-8332

Irrigated Potato Field Day at Tappen

The Irrigated Potato Field Day will be held on Monday, Aug. 27, at the irrigated potato research site near Tappen, N.D. The field day will begin at 4 p.m. and end with a meal sponsored by the Potato Associates.

Potato scientists at NDSU use the irrigated site to conduct research plot trials for disease management, variety evaluation and production under irrigated conditions for the benefit of the irrigated potato industry primarily in central North Dakota. Researchers from NDSU will be present to explain and discuss the trials. The speakers this year will include Gary Secor, plant pathologist; Susie Thompson, potato breeder; Harlene Hatterman-Valenti, high-value irrigated crops specialist; and Neil Gudmestad, potato pathologist.

The Northern Plains Potato Growers Association owns and supports the irrigated research site to conduct irrigated potato research. The research site is on the north side of Interstate 94 at Exit 217 (Pettibone exit). The field day is open to anyone interested in potato production and irrigation.

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Oakes Irrigation Research Site Field Day

The annual field day of the Oakes Irrigation Research Site will be held on Tuesday, Aug. 14, starting at 9:30 a.m. The research site is four miles south of Oakes on North Dakota Highway 1.

Stops on the tour will include:

- Onion, cabbage and carrot trials in 16-inch rows that have been planted no-till through the use of fall strip-tillage
- An onion weed control study with many herbicide options, combinations and rates
- Corn in 30-inch, 30-inch paired rows and 15-inch rows at three populations in its second year
- The third year of soybean research on 30-, 20- and 10-inch rows at three populations
- Soybean inoculant's effectiveness compared in three studies
- Head rot resistance among sunflower hybrids
- No-till corn in a continuous corn rotation and rotated with soybeans utilizing fall strip-till. The soybeans are no-tilled into corn stalks that were fall strip-tilled. Nitrogen rates in corn are compared in each rotation.
- Variety trials, including corn, soybeans, edible beans, cabbage, onions and carrots

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Irrigation Field Days in Manitoba

The Canada-Manitoba Crop Diversification Centre (CMCDC) will be hosting three field days. A crop diversification field day will be held at the CMCDC in Carberry on July 23. The research site is at the junction of Highways 1 and 5. The tour starts at 3 p.m. and topics will include hemp for

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grain and fiber, oriental vegetables, biofuel opportunities (camelina for biodiesel and wheat for ethanol) and crop variety trials. A barbecue will be served at 5:30 p.m.

A crop diversification field day will be held on July 24 at CMCDC-Portage la Prairie (370 River Road) starting at 3 p.m. Topics will include market potential of oriental vegetables and small fruits, management of fungicide applications on wheat, edible bean varieties and alfalfa in potato rotations. A barbecue will be served at 6 p.m.

A potato tour will held on Aug. 14 at CMCDC-Carberry. A free barbecue will be served from noon to 1:30 p.m., followed by an on-site potato tour. Topics will include nutrient management, nitrogen mineralization and potassium fertilizer studies, soil and water management, pest management, variety trials, potato rotations, potato disease management (early blight and PVY), green manure and nematodes. The tour also will include a discussion about the Assiniboine Delta aquifer agri-environmental plans, soil compaction and irrigation trials.

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Missouri Slope Irrigation Development Association (MSIDA) Annual Irrigation Tour

On Friday, July 27, the MSIDA irrigation tour will meet at 10 a.m. at the Carrington Research Extension Center (three miles north of Carrington on U.S. Highway 281) for a tour of irrigation and livestock. Following lunch, the tour will proceed to Patrie's Raspberry Farm and then to North Dakota Brand Beef and Pack near Harvey.

The Carrington Research Extension Center has three center pivots with the capability for precision application of water, an intensive irrigation site with water supplied to 16 one-acre plots and a research livestock unit. The intensive irrigation site is used to research control of diseases in sunflowers, dry beans, canola and other crops. To optimize pumping energy, three of the supply wells have variable-speed motor controls. One of the livestock unit's research projects includes feeding trials using byproducts from ethanol and biodiesel production.

Patries Raspberries is a six-acre you-pick/pre-pick red raspberry enterprise southeast of Bowdon in central North Dakota – just one mile south of the intersection of North Dakota Highway 200 and U.S. Highway 52.

North Dakota Branded Beef and Pack in Harvey processes and distributes only North Dakota-raised beef, elk, bison, sheep and pork. It is the only organic certified meat processing plant in the state.

The registration fee is $20. For people who want to carpool from the Bismarck/Mandan area, meet at Kist Livestock in Mandan at 7:30 a.m. Otherwise, contact your county MSIDA director to make travel arrangements.

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Devils Lake Basin Water Utilization Test Project: Project Overview and Progress through 2006

Water levels in the Devils Lake area of northeastern North Dakota have risen substantially since 1993, flooding homes, farmland and roads. The flooding situation has prompted the idea of conducting a test project to determine whether irrigation may be able to provide a beneficial use of some of the excess surface water in the Devils Lake watershed. The Devils Lake Basin Joint Water Resource Board is overseeing the project and NDSU is conducting the research. This article presents an overview of the research.

The objectives of the Devils Lake Basin Water Utilization Test Project are to: 1) determine how much additional surface water in the Devils Lake basin can be utilized via sprinkler irrigation of agricultural crops compared with nonirrigated crops, 2) evaluate the effects of irrigation on representative soil map units within the basin and 3) extrapolate results from the test project to the larger basin.

In 2003, approximately 9,000 to 10,000 acres of land were offered for participation in the project by 36 area landowners. In spring 2004, a soils consulting company selected 11 field sites (one of which was later dropped) that contained soil types representative of the distribution of soils in the basin as a whole. Landowner agreements were secured and irrigation systems installed in 2004 and early 2005, thus preparing the fields for the research.

The first phases of many research projects involving environmental work include determining the initial conditions of the study area and installing monitoring equipment. To address this need, David Hopkins of the NDSU Soil Science Department initiated a very intensive and extensive soil sampling effort in 2005. His research group sampled the soil at numerous locations in each field to determine morphological, chemical and physical properties. They also used global positioning system equipment, geographic information system (GIS) software and mapping techniques to determine the spatial variability of soil salinity across each field (Sharp, 2007). Hopkins' soil sampling work is ongoing; that is, the soil sampling and salinity mapping was used at first to assess field conditions prior to irrigation and the ongoing sampling is aimed at detecting changes in soil chemistry that may result from irrigation as the project progresses.

An important result of the soils investigation was the placement of 25 "A" stations distributed across the 10 sites on soils that represent the larger basin. These sites have been instrumented extensively for long-term monitoring. Twenty-five fluxmeters were installed, along with 18 shallow ground water monitoring wells and numerous access tubes and rain gauges. The fluxmeters are subsurface devices designed to capture water percolating through the soil profile, determine the volume of water leached and allow retrieval of water samples for laboratory analysis.

The ground water monitoring wells extend 12 feet below the soil surface and are screened from the bottom up to a depth of 2 feet below the soil surface. The wells enable us to measure the position of the water table and to sample the ground water for laboratory analysis. The access tubes are used with a soil moisture meter to determine soil moisture at various depths. The rain gauges allow us to measure irrigation and rainfall amounts. All of this equipment will be used to estimate water balances for the sites, ultimately leading to estimates of crop water use or evapotranspiration (ET).

In addition to the ground-based ET estimates, the project will use remote sensing techniques to estimate ET across a large area of the Devils Lake basin. Other researchers have developed procedures to use remotely sensed images and ground-based weather data to estimate ET. Landsat 5 satellite images include a thermal band – essentially a picture of surface temperatures – enabling the estimation of ET based on the assumption that when solar radiation reaches the ground surface, its energy is used to drive three processes: heating of the air, heating of the soil and evaporation of water. Mathematical models have been developed to estimate each of these quantities.

In 2006, crops planted at the test sites included corn, soybeans, potatoes, wheat, alfalfa, sunflowers and some specialty crops. We are using the NDSU "Checkbook" method for irrigation scheduling (Lundstrom and Stegman, 1989) to estimate ET based on daily maximum temperature forecasts from the National Weather Service for Devils Lake. Site operators are given weekly estimates of ET for their crops and are asked to apply that amount of water, plus 25 percent to account for losses and to promote water utilization for the project, minus any rainfall received. Tensiometers are used to indicate soil moisture levels. In 2006, an area-weighted average (total water volume pumped divided by total irrigated area) of 7.84 inches of irrigation was applied to the sites.

Most of the soils in the Devils Lake basin are classified as conditionally irrigable. Table 1 shows the area of occurrence and table 2 shows the irrigation suitability groups of the predominant soils in the Devils Lake basin (Franzen et al., 1996; SCS, 1982; and NRCS, 2006). As you can see from the tables, more than 80 percent of the soils in the basin have some restriction on irrigation. Thus, doing soil testing is important to ensure that irrigation on these soils does not negatively impact their long-term productivity.

Figure 1 shows the depth of the water table at two locations or monitoring stations within one of the field sites during 2006. Two items in the figure should be pointed out before discussing the data. First, sharp drops in the water table, such as on July 12 for station A1, likely are the result of pumping the well one day and sampling it the next. At station A1, the water level in the well did not completely recover its position from the previous day. Second, positive numbers for water table depth indicate the distance of the water table below the soil surface. Water was ponded on the soil surface at station A1 on Aug. 8, resulting in a small negative value for water table depth for that day.

Table 1. Occurrence of common soil types in the Devils Lake basin of North Dakota.

Soil Mapping Unit	Acreage	Percentage	Cumulative%
Svea-Buse-Hamerly	848,447	36.2%	36.2%
Barnes-Svea-Hamerly	589,233	25.1%	61.3%
Hamerly-Tonka-Svea	162,203	6.9%	68.3%
Svea-Cresbard-Hamerly	135,502	5.8%	74.0%
Barnes-Buse-Svea	94,879	4.0%	78.1%
Lallie-Parnell-Svea	91,192	3.9%	82.0%
(Other Soils)	422,088		
Total Area	2,343,544		

Table 2. Irrigation suitability groups of common soil types in the Devils Lake basin, North Dakota.

Soil Type	Irrigability	Group	Explanation
Hamerly	Conditional	3B	Need for supplemental surface and subsurface drainage
Svea, Buse (if slopes <5%), Barnes	Conditional	3D	Slow internal drainage and the hazard of salinity buildup
Buse (if slopes >5%)	Nonirrigable	1A	Slope
Lallie	Nonirrigable	1C	Salinity
Cresbard	Nonirrigable	2A	High salts in the subsoil
Parnell, Tonka	Nonirrigable	2C	Poor or very poor drainage, slow or very slow permeability

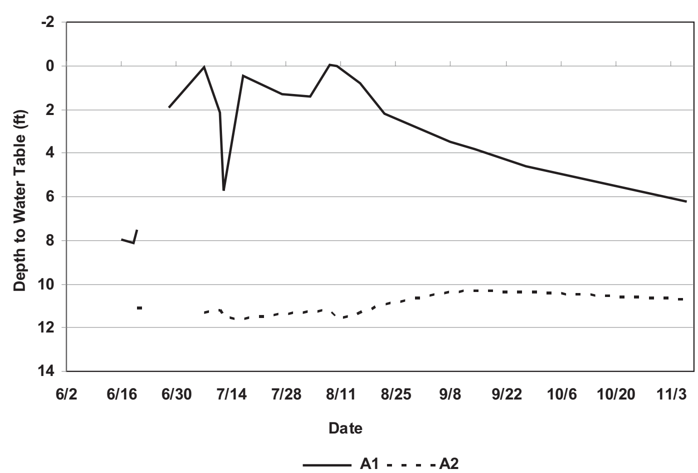

Figure 1. Water table position at two locations in one field for the 2006 growing season.

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The water table at station A2 remained relatively deep throughout the season and did not interfere with crop growth or irrigation management. By contrast, the shallow water table at station A1 caused crop water stress from too much water and the site operator had to avoid irrigating this part of the field until the water table subsided. The well at station A1 was in a slightly depressed area, perhaps causing a magnification of the water table's response to the addition of water. A difficulty of irrigating medium- and fine-textured soils with slow or poor drainage is that the water table can quickly rise into the root zone, restricting plant growth. Additional problems associated with poor internal drainage include accumulation of salts, denitrification losses of nitrogen fertilizer and increased plant disease problems (Franzen et al., 1996). Irrigation water management at this field must account for the spatial variability of the soil, the topography and the depth to ground water.

We plan to continue the soil sampling and irrigation scheduling work for the 2007 season. In research projects involving environmental monitoring, researchers typically need multiple seasons or years to observe changes in the soil-water-environment system and to account for year-to-year variations in weather patterns. The ultimate aim of the project is to use GIS techniques to extrapolate what we learn at the test sites to the larger basin.

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