

water spouts

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<http://www.ext.nodak.edu/extnews/spouts/>

Upcoming NDSU Field Days

Streeter Central Grasslands Research Extension Center	June 23	(701) 424-3606
Casselton Agronomy Seed Farm	July 12	(701) 347-4743
Hettinger Research Extension Center	July 13	(701) 567-4323
Dickinson Research Extension Center	July 14	(701) 483-2348
Williston Research Extension Center	July 15	(701) 774-4315
Carrington Research Extension Center	July 20	(701) 652-2951
Minot North Central Research Extension Center	July 21	(701) 857-7677
Langdon Research Extension Center	July 22	(701) 256-2582
Oakes Irrigation Research Site	July 28	(701) 742-2189
Williston Area Nesson Valley Irrigation Research Site	July 29	(701) 774-613
Williston Mon-Dak Ag Open	Aug. 3-5	(701) 577-8110

Devils Lake Solutions – June 23

The Devils Lake outlet is complete. It is a critical and controversial component of the state's three-pronged approach to flood relief for the Devils Lake area, which includes upper-basin storage and infrastructure protection. The city of Devils Lake one again faces another dike raise to protect the city. This tour focuses on the numerous water-related issues in Devils Lake and the surrounding area, including the outlet, fish and wildlife, water quality, agriculture, recreation, infrastructure and economics. The tour begins and ends in Devils Lake.

To register online, go to www.ndwater.com or send a check to NDWEF, P.O. Box 2254, Bismarck, ND 58502. Please indicate which tour you want to attend and include the number of people. For more information on the tours, give us a call or send an e-mail.

North Dakota Water Education Foundation,
(701) 223-8332
Fax (701) 223-4645
Ndwaterusers@btinet.net

Elk Valley and Inkster Aquifers

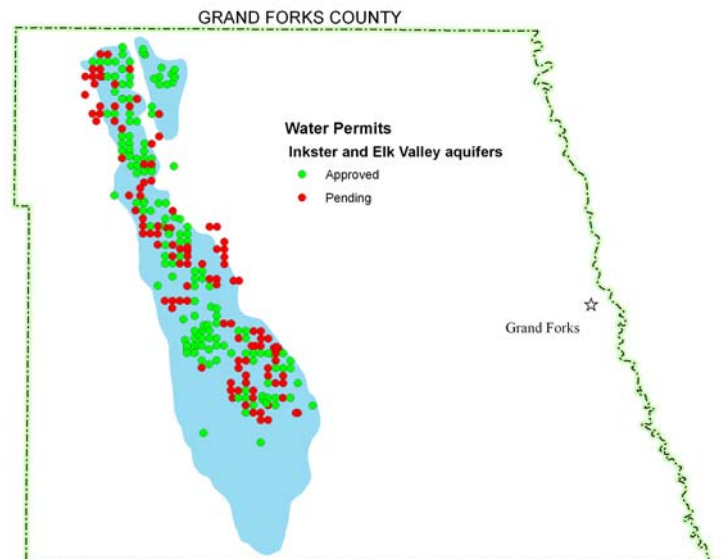
The Elk Valley and Inkster aquifers underlie 200 square miles in western Grand Forks County (see figure below). These aquifers were created as rivers flowed into the enormous glacial Lake Agassiz and deposited their

Summer Water Tours – North Dakota Water Education Foundation

This summer, the North Dakota Water Education Foundation will offer six water tours. The first tour will start on June 23 and the last will be on Sept. 16. These tours provide a firsthand look at North Dakota's critical water issues. Registration is \$15 per person and includes tour transportation, meals, refreshments, informational materials and a one-year subscription to *North Dakota Water* magazine.

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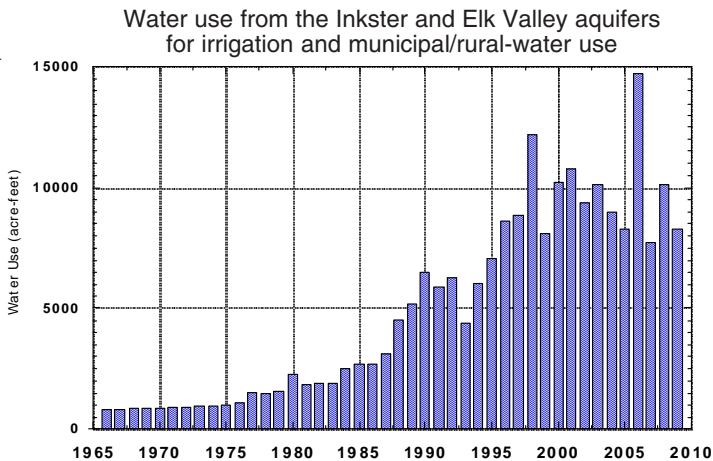
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sediment load in a deltaic environment. The aquifers supply both irrigation and rural/municipal water in an area of the state that otherwise lacks abundant good-quality water. Three rural water companies use these aquifers as their source of supply to serve approximately 25,000 people in and near the Red River Valley.

Irrigation from these aquifers totals about 19,000 acres. Eighty permits allocate water for irrigation, and 48 applications are being held in abeyance.

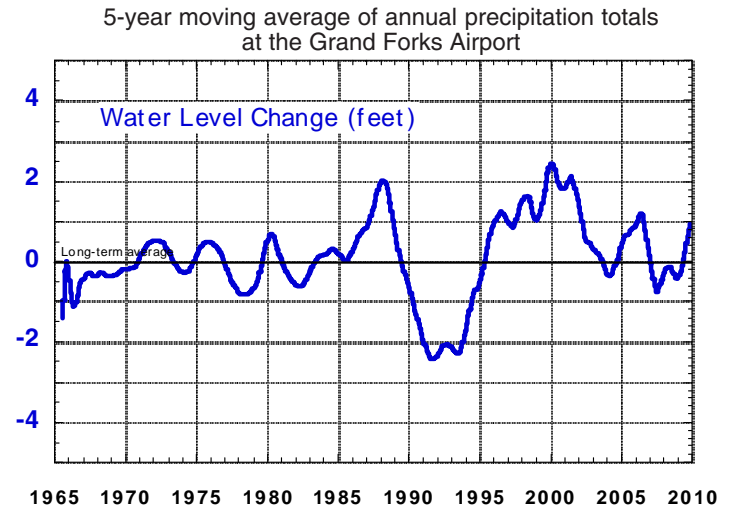
Certain statutory criteria must be met before the state engineer can appropriate water. One of the criteria is that prior or "senior" appropriators will not be unduly affected by junior appropriators. The applications are being held in abeyance pending further data collection and analysis so an informed determination can be made assuring that the statutory criteria will be met. In the Elk Valley and Inkster aquifers, where the water resource is heavily developed and competition exists for the resource, an extensive record of climatic, geologic, water level and water use data and the development of hydrologic models are needed to assist in the analysis of the potential effects of new appropriations.



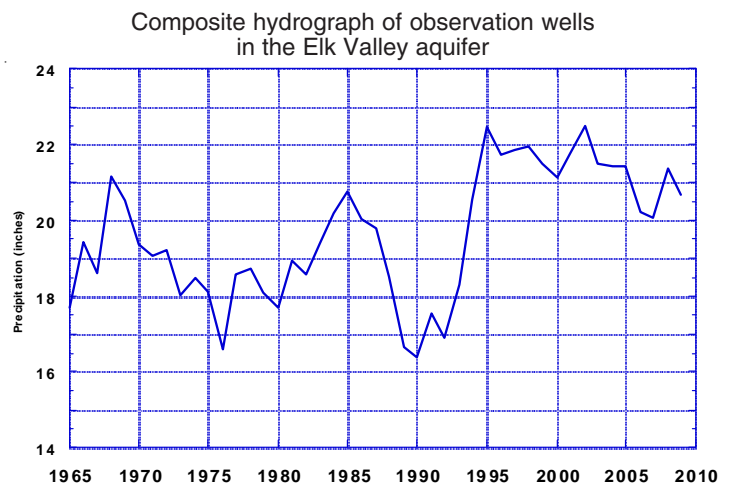
Monitoring of water levels in the aquifer in response to stresses placed on the aquifer through pumping of high-capacity wells is important to ensure that the long-term sustained yield capability of the aquifer in the vicinity of the prior appropriators is not exceeded.

Ongoing data collection activities include monthly water level monitoring of 140 observation wells placed throughout the aquifers. A hydrograph that incorporates all of the water level measurements collected from wells in the Elk Valley aquifer is shown below. Water quality samples are collected from monitoring, irrigation and municipal/rural water wells on a regular basis. These samples are analyzed for common ions as well as nitrate (NO₃).

The five-year moving average of the annual precipitation totals measured at the Grand Forks airport is presented in the following graph. The drought of 1988-90 is evident as well as the abnormally wet period through most of the 1990s. Comparison of the ground-water level trend with the precipitation trend shows the strong correlation between climate and the aquifer water levels.



Water use from the Elk Valley and Inkster aquifers is represented by the following bar chart. The largest amount of water use occurred in 1998 and 2006 because of the increased irrigation withdrawals due to the drought conditions. Concern about the potential effect of over-appropriation on the aquifer during an extended drought period (three to 10 years) has caused a "proceed with caution" approach on future water appropriation from these aquifers.



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Production of Perennial Grasses for Biofuel Production in Central and Western N.D.

A 10-year field study was initiated in 2006 to evaluate 10 perennial grasses and mixtures in two harvest scenarios (annual and biennial). The plots were seeded at NDSU's Williston, North Central (Minot), Carrington, Hettinger and Central Grasslands (Streeter) Research Extension Centers. Long-term growing season precipitation varies from 12.5 inches at Williston to 17 inches at Carrington. At Williston, the plots are managed under both dryland and irrigated conditions.

One of the objectives of the study is to determine the economic viability of raising perennial grasses for biofuel production. Switchgrass has been noted as a grass that yields very well in the southern states, and part of the study is to determine if switchgrass is adaptable to our region and if yields are comparable to the other local perennial grasses.

Annual Production

The dryland plots at the Williston Nesson Valley site, which are on a sandy loam soil, were harvested for the third year in 2009 (Table 1). Intermediate wheatgrass produced a top yield of 1.27 tons/acre, followed closely by the Conservation Reserve Program grass mix and Alkar tall wheatgrass alone at 1.05 tons/acre. Intermediate wheatgrass has been the top yielding species each of the three years of the study, with a three-year average of 1.09 tons/acre. Under these dryland conditions, switchgrass had poor stands.

In 2009, the irrigated plots at Williston (Table 1) produced the highest yields in statewide trials, with Sunburst switchgrass yielding a high of 5.76 tons/acre. This was followed closely by a Sunburst switchgrass/Altai wildrye mix at 5.72 tons/acre and Sunburst switchgrass/big bluestem mix with 5.02 tons/acre. Sunburst switchgrass produced the highest three-year average, with 6.29 tons/acre, followed closely by Sunburst switchgrass/Altai wildrye mix at 5.75 tons/acre. In 2008, the highest yields for this biomass study were obtained at Nesson Valley under irrigated conditions. For the Sunburst switchgrass, a yield of 7.28 tons/acres was harvested.

Table 1. Summary of the Williston biomass study yields.

	Annual Harvest			Biennial Harvest	
	2007	2008	2009	2007	2009
Williston Dryland					
Alkar Tall Wheatgrass	0.96	0.70	1.05	1.03	1.16
CRP Mix (Intermediate and Tall Wheatgrass)	1.04	0.72	1.05	1.10	1.40
CRP Mix (Wheatgrasses+Alfalfa+Sweetclover)	0.87	0.62	0.78	0.83	0.95
Dakota Switchgrass	0.35	0.60	0.84	0.33	1.16
Haymaker Intermediate Wheatgrass	1.23	0.79	1.27	1.10	1.22
Magnar Basin+Mustang Altai Wildrye	0.27	0.61	0.90	0.28	1.22
Sunburst Switchgrass	0.27	0.50	0.93	0.00	1.35
Sunburst Switchgrass+Mustang Altai Wildrye	0.31	0.75	0.85	0.38	1.31
Sunburst Switchgrass+Sunnyview Big Bluestem	0.35	0.69	1.00	0.31	1.15
Sunburst Switchgrass+Tall Wheatgrass	1.06	0.68	0.93	0.89	1.24
LSD 0.05	0.67	NS	0.26	0.63	NS
Williston Irrigated					
Alkar Tall Wheatgrass	4.98	3.16	3.84	5.06	5.48
CRP Mix (Intermediate and Tall Wheatgrass)	4.50	3.24	2.80	4.55	4.18
CRP Mix (Wheatgrasses+Alfalfa+Sweetclover)	3.72	2.80	3.48	4.16	3.82
Dakota Switchgrass	4.31	4.91	4.75	4.33	5.43
Haymaker Intermediate Wheatgrass	4.20	3.35	3.72	4.02	3.93
Magnar Basin+Mustang Altai Wildrye	4.19	3.06	3.31	3.82	6.57
Sunburst Switchgrass	5.83	7.28	5.76	5.68	6.96
Sunburst Switchgrass+Mustang Altai Wildrye	5.85	5.69	5.72	6.92	7.09
Sunburst Switchgrass+Sunnyview Big Bluestem	4.92	5.87	5.02	5.01	8.23
Sunburst Switchgrass+Tall Wheatgrass	5.61	4.27	3.92	5.85	6.12
LSD 0.05	1.03	0.59	1.04	1.84	1.62

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Biennial Production

The biomass study has two sets of plots planted with each species and species mix. One set of plots is harvested annually while the other set is harvested every other year (biennial harvest). The biennial plots were not harvested in 2008, so the harvest in 2009 contained the remaining production from 2008 as well as that of 2009.

With the exception of the Sunburst switchgrass plots at Minot, all biennial plots yielded less during the three years than did the annual plots. The lower yields of the biennial harvest varied considerably by location. The Carrington biennial plots yielded 30.3 percent less than the annual harvest, with all the plots showing significantly less production, while the plots at Minot saw a 15.4 percent lower yield. The other sites had 19 to 20 percent less production on the biennial plots versus the annually harvested plots.

The variability in the amount of yield on the biennial plots is hard to explain. Both Basin and Altai wildrye are known to stand erect during the winter, and the sites at Minot and Williston irrigated did have higher production than other sites where the plots contained a poor stand of the wildrye.

The question that bears further investigation is what the economic advantage is of a biennial harvest versus an annual one. The obvious answer would be the harvest

cost savings, but would this offset the loss in total yield? In a large field situation, the standing crop in the year with no harvest might trap enough snow to aid in the production the following year. A biennial harvest certainly would be an advantage to upland nesting game birds, and it might provide some economic returns from hunting, etc.

The harvest method might have some impact on these numbers. A machine similar to a swather was used to harvest the standing crop. Using a mower and rake might have captured more of the litter from the ground, increasing the yield of the biennial plots. This study will continue through 2016.

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