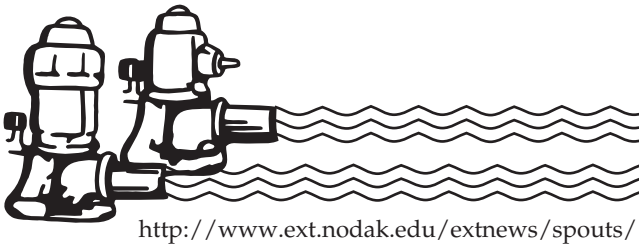

water spouts

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

No. 234 APRIL 2008

Upcoming NDSU Field Days

Streeter Central Grasslands Research Extension Center	June 26	(701) 424-3606
Hettinger Research Extension Center	July 8	(701) 567-4323
Dickinson Research Extension Center	July 9	(701) 483-2348
Williston Research Extension Center	July 10	(701) 774-4315
Casselton Agronomy Seed Farm	July 14	(701) 347-4743
Carrington Research Extension Center	July 15	(701) 652-2951
Minot North Central Research Extension Center	July 16	(701) 857-7677
Langdon Research Extension Center	July 17	(701) 256-2582

Welcome to the 2008 Irrigation Season

We are experiencing some very interesting developments in agriculture. Many agricultural commodities are at or near all-time high prices, but at the same time, input costs have risen dramatically. Competition among commodity organizations for crop acreage is unprecedented. Ethanol plants continue to be built, increasing the demand for corn. Last year, the irrigated corn acreage in the state was at 115,000 acres, almost 30,000 more than the previous year.

All these developments are increasing interest in irrigation. During the last two years, the number of irrigation permit applications has increased, compared with the previous five years. In 2006, the North Dakota State Water Commission received 25 irrigation water permit applications involving about 9,400 acres and in 2007, it received 40 irrigation water permit applications involving around 12,500 acres. In the first four months of 2008, the commission has received irrigation water permit applications involving more than 3,400 acres.

Another force driving the interest in irrigation is the drought in the western areas of the state. As of mid-April, subsoil moisture is very low in most of the western three-quarters of the state. Irrigation will need to begin early to recharge the subsoil for the coming growing season.

I always am looking for announcements of irrigation-related events, field days or other news, so if you hear of any in the region, please send me a copy of the announcement and I will include it in *Water Spouts* this summer.

Site-specific Irrigation Scheduling on the NDAWN Web Site

Now is the time to starting setting up your fields on the new Web-based irrigation scheduling tool that is part of the North Dakota Agricultural Weather (NDAWN) Web site. Using this tool makes tracking soil water content in your field easy. It works just like the old checkbook method (publication AE-792, "Irrigation Scheduling by the Checkbook Method"), but it is specific to your field, including soil textures and soil water-holding capacities. It even can be used with nonirrigated fields.

You can schedule irrigations for the following crops: alfalfa, barley, corn, dry beans, potatoes, soybeans, sugar beets, sunflowers and wheat. Alfalfa was added this winter and allows you to select the cut dates. The alfalfa water use will be adjusted to reflect the

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decrease in water use after the cut date. Using this tool will help you make better irrigation water management decisions.

The site-specific irrigation scheduler can be accessed on the NDAWN Web site *(http://ndawn.ndsu.nodak.edu/)*. To use the irrigation scheduler, you need to log in to the NDAWN Web site and create a user name and password. This is necessary for two reasons. It creates an individualized workspace for your fields and provides a certain amount of security so others cannot alter the information you have entered for each field. Click on **Login** at the bottom of the menu on the left side of the NDAWN home page and follow the instructions on the page that comes up. If you already have an account, enter the username and password. If you are new to the system, sign up for a new user account.

After you log in to the NDAWN Web site, you can access the Irrigation Scheduler through the **Applications** menu on the left side of the NDAWN homepage. When Irrigation Scheduler is selected, first-time users will see the Field Creator screen. The purpose of this screen is to allow you to select the location of your irrigated field. It contains an aerial photo map of North Dakota, two drop-down menus for selecting a county and township and a *help* link. The aerial photos were taken in 2005.

You can "zoom" to your field two ways. The first is common to GIS systems: Hold down the left button on the mouse to draw a box on the map around the area to highlight. You can draw a box around the entire county or just half of it. Each time you draw the box, it will zoom in closer to your field. The second method is to use the drop-down menus to select your county and township. You can select a county without selecting a township. Unorganized townships are not listed. If you select the county and township, an aerial photo of the township will appear and you then can use the mouse to draw a box to highlight your field. When you have found your field and put a red box around it, drawing the boundaries of the soils in the field may take some time. When this is done, at the bottom of the screen is a text box to enter a name for the field. After you enter a name, click the ***save*** button.

The Irrigation Scheduler page then will appear with a picture of the field containing yellow lines delineating the various soil types in the field. This is just a picture and no GIS operations can be done to it. Next select from the pull-down menus the year and crop, then enter planting and emergence dates. Default dates already are entered based on National Agriculture Statistic Service (NASS) crop data collected through the years. The three nearest NDAWN weather stations are shown in a pull-down menu, along with distance from your field. You can select one of the three NDAWN weather stations (the closest is shown at the top of the menu) and weather data from the selected station will be used to calculate crop water use values for your checkbook. Click the "***save changes and update table***" button and a checkbook for the three most dominant soils in the field will be created. Notice the three tabs above the crop information. The tab labeled **Soil Properties** will show you the average water-holding capacity for each soil layer.

If the checkbook is created for the 2008 growing season, the water use values for the selected crop automatically will be entered and the checkbook updated every day. You have to enter the rain and irrigation amounts. To do this, click on the date on the left side of the checkbook. A box will open that allows you to enter rain and/or irrigation amounts for the selected date. If you have selected alfalfa, you can check a box if you cut alfalfa on that day. In addition, if you go out to the field and check the soil moisture and it doesn't match what the checkbook predicts, in this box you can adjust the soil moisture value for the selected soils in the field.

You also can create a checkbook for a previous year and, in that case, the water use values for the selected crop will be entered for the whole checkbook. Once a checkbook is created, you should not have to do it again in future years.

One problem we have noticed: If you use Internet Explorer 6.0, the checkbook pages will not print properly. We have not been able to resolve this problem and recommend you use either the Firefox 2 or Opera 9 Web browsers. Both are free. You can get access to them by clicking on the buttons at the bottom of the NDAWN Web page.

If you use this method of irrigation scheduling, I welcome any feedback or suggestions, whether it is positive or negative. We want this tool to be user-friendly and useful to you.

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Why Look at Site-specific Sprinkler Irrigation?

Growing conditions across every farm field are inherently variable. That can lead to very different yields across a single field due to differences in soil types, soil chemical properties, subsurface conditions, topography, drainage, insect/weed/disease problems, soil compaction and wind distortion of sprinkler patterns, as well as external factors such as herbicide drift. In addition, while infiltration rates have long been known to vary between irrigation events, they also vary among locations within the field and may be further impacted by tillage practices and multiyear crop rotations.

Given these many variables, research has shown that varying water applications across a field to accommodate potential production differences and environmental consequences may be more economical than managing the entire field as one unit. This is known as site-specific irrigation and can be done through relatively inexpensive modifications to existing sprinkler irrigation systems.

Center-pivot and linear-move irrigation systems are particularly amenable to site-specific approaches because of their current level of automation and large area coverage with a single lateral pipe. The ability to vary water application along the main lateral of a center pivot based on position in the field allows the irrigation manager to address specific soil, plant and/or slope conditions. By aligning irrigation water application with variable water requirements in the field, total water diversions may be reduced and, almost certainly, deep percolation and surface runoff will be reduced. Energy use and other inputs also may be lowered.

In addition to reducing labor, microprocessor-controlled center pivot and linear-move irrigation systems provide a unique control and sensor platform that makes varying water and agrochemicals (e.g., water-soluble fertilizers and labeled pesticides) to meet the specific needs of a crop in each unique zone within a field relatively easy. Doing so can help optimize crop yield and quality goals and improve environmental health (reduced water, lower agro-chemical use and less leaching). Reducing excess water applications also may decrease foliar disease pressures.

Installing the variable-rate water application technology adds about $100 in U.S. dollars per acre to the initial cost of a full-sized 1,280-foot center pivot. Management costs may be higher.

Potential water savings using site-specific technologies typically run about 5 percent or less, but may be in the range of 15 percent to 30 percent if substantial noncropped area (e.g., rock outcroppings or wetland areas) is within the field being irrigated. Avoiding irrigation of areas outside irregularly shaped field boundaries also may reduce pumping costs.

If agrochemicals are applied through the system, costs can be further reduced since they, too, no longer will be applied to noncropped areas. Finally, total harvestable yields may be increased under site-specific water applications due to improved growing conditions in previously overly wet areas. However, the greatest benefits and cost savings may occur when fertilizers and other chemicals are applied through the irrigation system.

Nutrient losses in runoff or through leaching also can be reduced with site-specific irrigation. Studies across the nation have shown that a high proportion of the leaching often occurs in a relatively small amount of the total field area due to surface, as well as subsurface, lateral transport of applied water and precipitation. These studies indicate that precise management of water and agrochemicals in relatively small areas of a field can have a large impact in reducing groundwater contamination. Even greater reductions have been shown in fields with a larger percentage of coarse-textured soils.

Site-specific irrigation also can help ease some regulatory pressure faced by growers whose fields

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are near water bodies. Regulatory attention is heightened if nutrients or pesticides are injected into irrigation water or if animal waste is spread with the irrigation machine. Spraying chemicals onto water bodies also is prohibited in some areas. Unfortunately, avoidance of water bodies often is not easily programmed into the standard commercial irrigation controllers, which means producers may leave substantial cropped areas without irrigation to avoid any possibility of contaminating a nearby water body.

In conclusion, the implementation of site-specific irrigation technology that can spatially direct the amount and frequency of water (and appropriate agrochemical) applications can be a very powerful tool to increase water productivity, reduce inputs and minimize adverse water quality impacts.

The challenges and opportunities for irrigation equipment manufacturers, designers, researchers, managers and growers will be considerable, but development and employment of these new systems ultimately could prove to be quite profitable.

Additional information can be found at *www.ars.usda.gov/npa/nparl.*

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