QUICK GUIDE

Wisconsin Irrigation Scheduler (WIS)

Version 6.3.11

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For the
WI Irrigation Scheduler (WIS)

The WI Irrigation Scheduler (WIS) applies the checkbook method to track soil moisture on a daily basis within a user defined managed root zone depth. Soil moisture losses through evapotranspiration (soil evaporation and plant transpiration) and deep drainage (water passing through the managed root zone) are considered along with moisture inputs that include daily rainfall and irrigation. Colored fonts indicate when excess water inputs results in deep drainage or when additional water input is needed to prevent plant stress. The WIS program supports decisions on soil moisture management and should be used in combination with other information such as soil moisture monitoring and field observations when making irrigation decisions.

The non-input cells in WIS have been protected to reduce accidental deletion or overwriting, but they are **not** password protected. If additional days (rows) are needed, simply unprotect the sheet by selecting *Tools – Unprotect Sheet* and copy the columns down. The model allows up to eight different soil types or fields to be managed using the five separate spreadsheets. The five spreadsheets can represent either five different soils on a single field or five separate fields. Soils data are copied from the Soils Input Sheet (Sheet 1). *Daily r*ainfall and irrigation data must be entered into each sheet individually. Daily reference ET data from the UW-AWON site can be entered into Sheet No. 1 and will be automatically copied to subsequent sheets. The ET data for any individual sheet can also be entered manually into that sheet and will simply overwrite the ET data copied from Sheet No. 1.

Model Inputs

Parameter	Comments / Explanation
Start date	Use the crop emergence date for perennials or the start of growth date for annual crops. When the start date is entered, WIS will add the next 162 successive days into the lower portion of the sheet. If needed, additional days can be added to the end of the list as previously discussed.
Managed root zone depth	Crop root depth assuming no obstructing soil layer. See attached Table 1 for typical root zone depths and the recommended installation depths for soil moisture sensors. Root zone depth is impacted by many things (i.e. local soil conditions, crop type, plant hybrid type), therefore the root zone depth is best determined in the field by exposing the roots at full canopy and measuring the depth.
Soils data	Enter the field capacity (Fc) and permanent wilt point (PWP) values for your soils from the USDA soil survey into the soils data input table. This need only be done once during setup. Soils data for each sheet are automatically copied from Sheet 1

to all subsequent sheets and are referenced based on the number in the Field / Soil No. column in the table. Sheet 1 data can be overwritten as previously explained.

The WEB Soil Survey (WSS) is the recommended method to obtain soils data. The steps to use the WSS are as follows:

1. Start the WSS using the hyperlink on the soils input screen.

2. Locate your fields using the methods available in the WSS (address, state and county, map, etc.).

3. Select VIEW each time to retrieve the requested data.

4. Zoom into your location using the magnifying glass with the + symbol.

5. Use the Area of Interest (AOI) tool to select the specific field of interest.

6. Select the SOIL DATA EXPLORER tab and soil series identifications will appear.

7. Select the SOIL PROPERTIES AND QAULITIES tab and under that the SOIL PHYSICAL PROPERTIES sub menu.

8. One at a time select WATER CONTENT, 15 BAR (PWP) and WATER CONTENT, One-Third bar (Fc) as shown on WSS input screen.

9. Under Aggregation Method be sure to select WEIGHTED AVERGE and select the correct depth units and enter your managed root zone depth (inches).

10. The WSS will provide a depth weighted summary of Fc and PWP along with the area and % area of each within the AOI. At this point you can select number of individual soil groups you want to use for your field. If Fc and PWP values are within 10% of each other, you may choose to average values and lump spoil groups.

Note that WSS data are a starting point for the Fc values. Site specific monitored soil moisture data should be used when available. Field capacity (Fc) is the stable soil moisture level after sufficient water has been applied to saturate the soil. This can be determined after a large rain fall event or after sufficient water has been manually applied to the soil, typically within one to two hours.

MAD value	The **M**aximum **A**llowable **D**epletion (MAD) is the fraction of the total available water (TAW) that is plant extractable without limiting growth. The default value of 0.50 is the recommended value for most crops. A smaller value could be used for crops that are more susceptible to water stress; however it is recommended that this input not be changed.

AWON ET (in/day)

AWON ET is the site-specific reference evapotranspiration (ET), available from the UW AWON site www.soils.wisc.edu/wimnext/et/wimnet.html. The AWON reference ET is multiplied by a crop coefficient to get the daily crop ET (column G). The ET values entered on Sheet 1 are automatically copied to all subsequent sheets. If individual reference ET values are needed, they can be manually entered and the ET values from Sheet 1 overwritten.

Rainfall (in/day)

Rainfall volume should be measured daily and entered into the model. Rainfall data should be collected from a location as close to the irrigated field as practical.

Irrigation (in/day)

Irrigation volume should be measured daily and entered into the model. If an irrigation event is greater than a day the total irrigation volume should be divided by the number of days and entered on a daily basis.

Observed Soil
Moisture (%)

The root zone soil moisture should be measured on a regular basis (i.e. weekly) using a soil moisture sensor(s) and entered. WIS 6.3.11 will automatically readjust the model's predicted soil water content to the observed value and use that value in subsequent calculations. CELLS WITHOUT DATA MUST REMAIN BLANK. USE THE **DELETE KEY** TO REMOVE UNWANTED CELL VALUES FROM THIS COLUMN.

Model Outputs

<u>Parameter</u>   <u>Comments / Explanation</u>

Change in soil
  storage (in/day)

The daily change in soil moisture is displayed in column H and is calculated as Rainfall + Irrigation – ET.

Plant available
  water (in/day)

The plant available water balance for a given day is calculated as the balance from the previous day plus or minus any change in storage. All fields are assumed to start the growing season with the root zone at water holding capacity (field capacity). The initial monitored soil moisture should be entered if it is available.

The plant available water should be monitored closely and used to determine when irrigation is necessary. A negative value

indicates depletion of readily available water (RAW) and the onset of plant stress. A **BLUE** font alerts the user to this condition.

Deep drainage
 volume (in/day)   Deep drainage occurs when water is added to saturated soil thus, forcing water deeper into the soil profile. This condition should be avoided or minimized to the greatest extent practical.

Deep drainage transports nutrients and pesticides deeper into the soil profile where it has a greater potential to enter groundwater or tile drains, if present. In addition, saturated soils create conditions favorable for disease and limits aeration, both of which can adversely impact crop health and yields. A **RED** font alerts the user to this condition.

Also note that the default name on each tab (ex. Soil or Field 1) can be changed to your field name or ID. To edit the sheet tab name simply double click on the tab with the left mouse button, the tab will turn black and you can enter the name of you choice.

Table 1. Root zone / irrigation management range and sensor placement depths by crop type.

Crop Type	Irrigation Mgmt. Depth (in)	Shallow Sensor Depth (in) @ 25%	Deep Sensor Depth (in) @ 75%
Broccoli & Cauliflower	12 -18	3 - 4	9 - 13
Blueberry & Strawberry	12 -18	3 - 4	9 - 13
Potato *	16	4	12
Tomato & Cantaloupe	12 - 24	3 - 6	9 -18
Dry, Snap and Green Bean	18 - 24	4 - 6	13 - 18
Soy Bean	30 - 36	7 - 9	22 - 27
Small Grains	30 - 36	7 - 9	22 - 27
Sweet Corn & Asparagus	24 - 30	6 - 7	18 - 22
Field Corn	30 - 36	7 - 9	22 - 27
Established Alfalfa	36 - 48	9 - 12	27 - 36

* Measured from the top of the hill.