PhenologyMMS 2.0

Overview - **DRAFT**

**THE OVERVIEW SHOULD CONTAIN CONCEPTS, CREATION, SCIENCE AND HISTORY OF PHENOLOGYMMS 2.0. COPIED THE FOLLOWING TO THE QUICK START GUIDE:**

**Model Description**

The PhenologyMMS 2.0 Model is a Windows-based, decision support tool which simulates the phenology of ten different crops for varying levels of soil water. In PhenologyMMS, soil moisture conditions are selected from four descriptive selections including Optimum, Medium, Dry and Planted in Dust. Growth stages such as seedling emergence, floral initiation, beginning of stem elongation, anthesis (flowering) and physiological maturity are predicted based upon the accumulation of thermal time which is commonly referred to as Growing Degree-Days (GDD). The number of leaves to a growth stage is also an estimate of thermal time and both are included in the model. Time to each growth stage is simulated under No Stress and Stress conditions. No Stress refers to the non-limiting conditions of an environmental factor which is assumed to be soil moisture. This option is appropriate for irrigated or high rainfall environments. The Stress option refers to the most limiting environmental factor which does not lead to death of the plant such as in rainfed conditions where soil water is very limiting but is not lethal.

Required input includes weather, management and environmental information. Weather includes maximum daily air temperature (Tmax), minimum daily air temperature (Tmin), and daily precipitation (Precip). The included weather files also contain daily solar radiation and daily soil temperature at 5 cm however; they are not currently used in the model. Input is needed for crop and management information such as the planting date, rate and seed depth. The current soil moisture condition and maximum canopy height for the crop are additional pieces of information needed to run the simulation. The number of GDD’s for each growth stage of the selected crop is needed under Stress and No Stress conditions as well as the Number of Leaves under both conditions for each developmental stage. Defaults are provided but the user can adjust these values if they know that their environment would require different amounts of GDD’s or Number of Leaves for a particular stage.

Output from the model is displayed in two files. The phenol.out file displays the number of leaves by Day of Year (DOY) and the respective developmental stages with the date, DOY and Days After Planting (DAP), Days after Emergence(DAE), Days After Vernalization (DAV) where appropriate, GDD After Planting (GDD AP), GDD After Emergence (GDD AE), GDD After Vernalization (GDD AV) where appropriate, and Number of Leaves (NOLVS). The results.info file which is contained with the folder for the named run shows the Input values, the Number of Leaves by Day of Year (DOY) and the Developmental Stages table also found in the phenol.out file.

**Input Screen**

When the model is begun, the first screen is the Input screen showing the ‘Crop Type, Location, & Planting Information’ tab. In this tab, you will enter basic information relating to the location of the crop to be simulated, the weather file and planting information. The ‘Additional Info’ tab opens a window showing Temperature settings, Photoperiod settings, GDD method and Vernalization data. These should not be changed unless you are sure you need to do so. You should always check the Growth Stages information in the ‘Growth Stages’ tab and then enter a name for this scenario. If you know you do not need to adjust the settings in the ‘Growth Stage’ tab, you can enter a name on the ‘Crop Type, Location, & Planting Information’ tab and press enter to bypass the ‘Growth Stages screen’.

**Run Mode Screen**

On this screen, you can Run Setups in Batch Mode. In the bottom half of the screen you can setup how the Runs will be performed by choosing ‘Simulation Options’. Under the ‘Simulation Options’ section there are two tabs including ‘Planting Conditions’ and ‘Plant Information’.

**View Screen**

In this screen you can view the two files resulting from the model run. In the Input View located in the top section, the results.info file is displayed. It contains the inputs to the model, the leaf number table and the output table of the model run. To view this file, press the View button just below the viewing section. In the bottom section, the phenol.out file is displayed when the bottom View button is pressed. This file shows the same as the results.info file but without the Inputs information.