Iowa Drainage Water Management

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INTRODUCTION

Drainage water management (DWM) is intended to reduce the total amount of water leaving a system via subsurface tile drainage. These systems have been implemented around the country with drainage volume reductions between 10% and 40% (Gilliam and Skaggs 1986; Fouss et al. 1987; Evans et al. 1995; Skaggs et al. 1995a, 1995b; Drury et al. 1997; Amatya et al. 1998; Tan et al. 1998; Drury et al. 2001). As part of this CAP project we are investigating undrained, conventionally drained, shallow drained, and controlled drainage plots in an attempt to determine the potential impact on crop yields and nitrate loss with varying weather patterns during the growing season.

SITE LOCATION/HISTORY

The DWM site in Crawfordsville, Iowa (41° 11' 38" N, 91° 28' 58" W) is hosted by the Iowa State University Southeast Research and Demonstration Farm (SERF) (Figure 1). The site was established in 2007 to address the interest in alternative drainage systems on crop production and nitrate-nitrogen loss. There are four treatments at this location each with two replicates for a total of 8 plots.

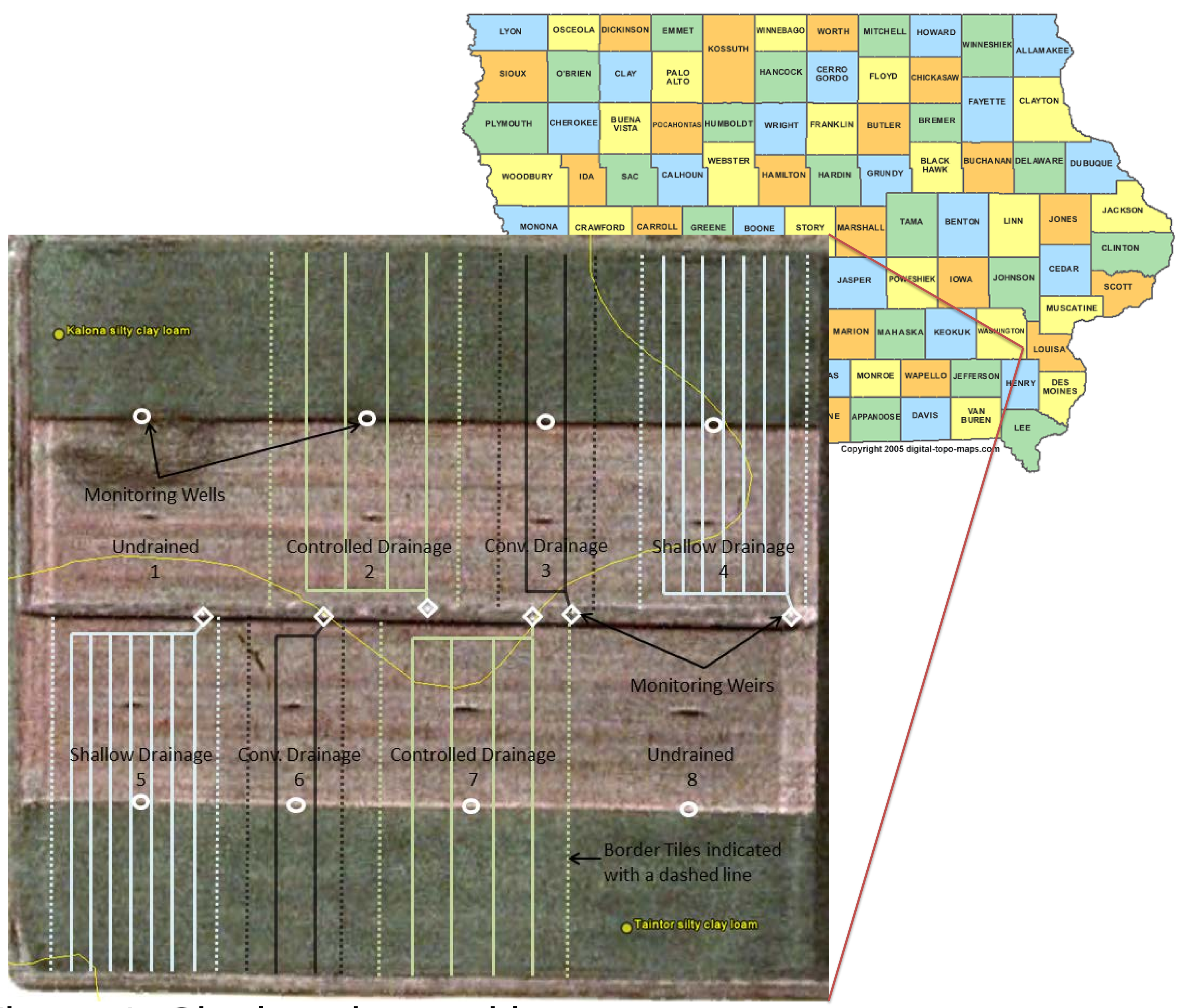

Figure 1. Site location and layout.

IMPLEMENTATION

During implementation, tile lines were run in a north-south orientation and setup so that the center tiles would flow through a 45° v-notch weir sized to handle flow from the plots. Border tile lines were installed at the edges of the plots to hydraulically isolate each plot. Drain spacing for both the conventional drainage and controlled drainage systems as set to 18 m (at a depth of 1.2 m) with the shallow drainage system having a spacing of 12.2 m (at a depth of 0.76 m). Additionally, water table monitoring wells were added to the northern plots in 2007 and the southern plots in 2009 midway between tile lines to measure potential impacts of high water tables on crop performance.

CROPPING AND SOILS

Cropping is conducted in an east-west manner with half the plot in corn and half in soybeans every year to replicate a typical corn-soybean rotation. There are two primary soil types at this location Taintor (silty clay loam, fine, smectitic, mesic Vertic Argiaquolls) and Kalona (silty clay loam, fine, smectitic, mesic Vertic Endoaquolls). These soils split the site nearly in half with Taintor in the south and Kalona in the north.

WEATHER TRENDS

The wettest months relative to precipitation at this site are in May and June during crop establishment. Temperatures rise in July and August as precipitation starts to decline (Figure 2).

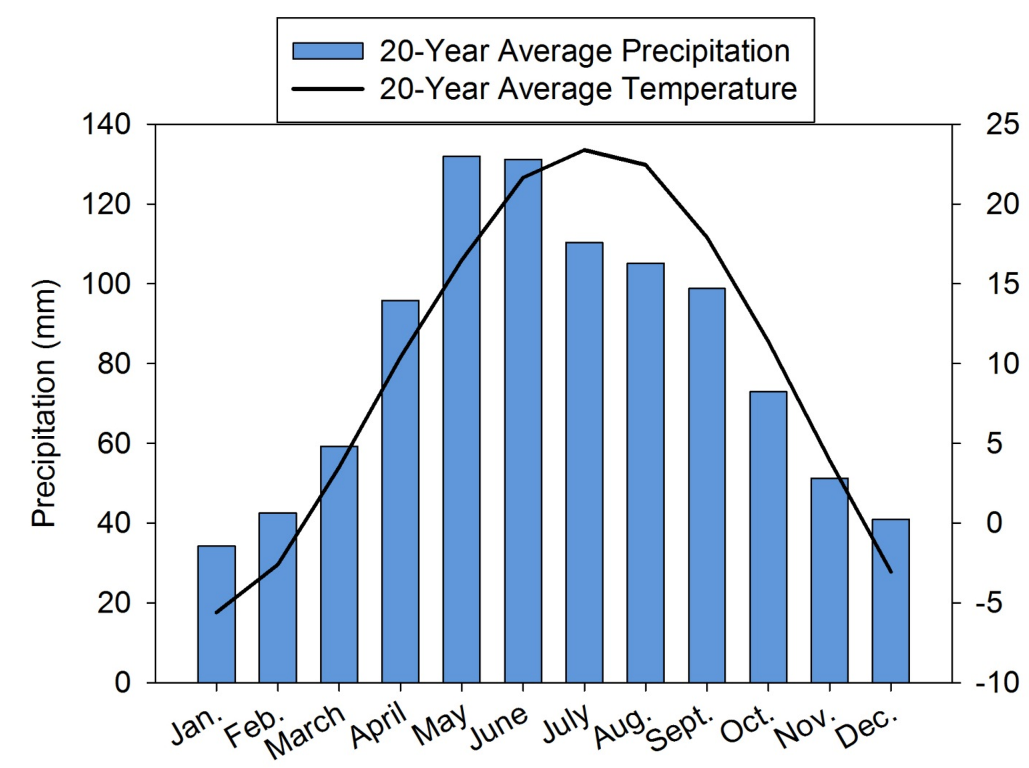

Figure 2. 20-year average precipitation and temperature patterns (1991 to 2010).

CURRENT MEASUREMENTS

Starting in 2011 the following measurements will be done:

Measurements
Crop: Plant population, plant biomass, total C and N, grain yield and moisture, and grain total C and N
Soil: Bulk density, water retention, soil moisture (samples and sensors), soil texture, GHG, pH, CEC, SOC, total N, soil nitrate, SOM, and standard fertility
IPM: Field log and soil insect population
Climate and Weather: Onsite rain gauge with nearby weather network
Water: Tile drainage volume and water quality

PRELIMINARY INFORMATION FOR 2011

Past measurements of parameters such as drainage and water table depth are driven by precipitation. As seen over the previous 4 years of data at this study site (Figure 3), water table depths and drainage are relatively predictable given the precipitation amount and time of year (crop demand).

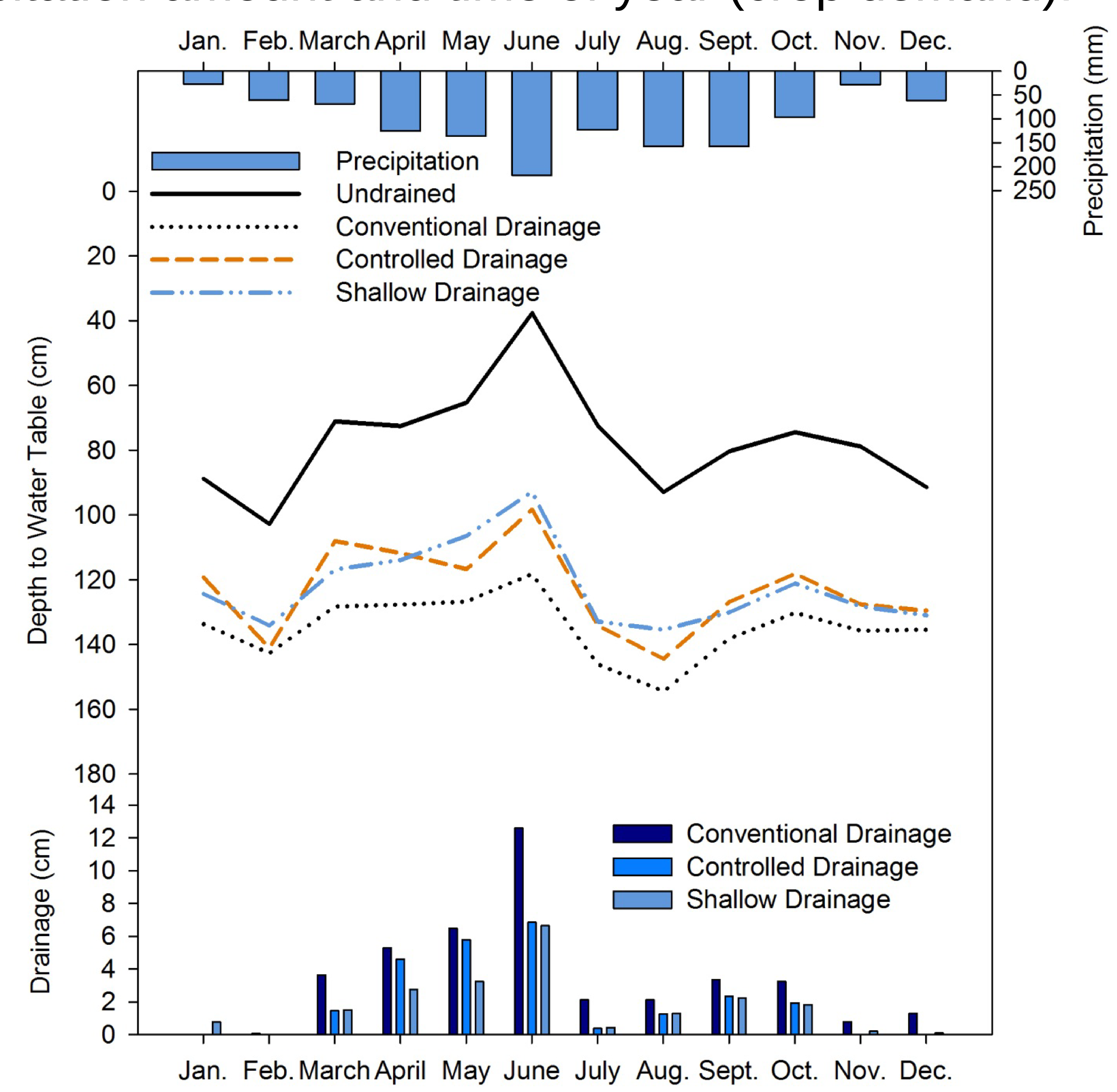

Figure 3. Four-year average drainage and water table response to precipitation (2007 to 2010).

ACKNOWLEDGEMENTS

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