Developing Collaborative Environment for U2U Project

HUBbub

September 30, 2014

U2U Hub Team

Purdue University Research Computing

Scientific Solutions Group

Larry Biehl – Presenter

Carol Song, Lan Zhao, Chris Panza, Brian Raub, Luke Policinski

U2U Collaboration Portal built on HUBzero Platform

DECISION DASHBOARD | MEDIA CENTER | NEWSLETTER | ABOUT US

U2U Decision Support Tools

AgClimate View DST
Historical climate and yield data for the Corn Belt

Corn GDD DST
30-years of GDD data plus trend projections

Climate Patterns Viewer DST
Connect global climate conditions to local climate impacts

Helping producers make better long-term plans

Weather and climate patterns are a driving force behind the success or failure of Corn Belt cropping systems. Useful to Usable (U2U) is an integrated research and extension project working to improve farm resilience and profitability in the North Central U.S. by transforming existing climate data into usable products for the agricultural community. Our goal is to help producers make better long-term plans on what, when and where to plant, and also how to manage crops for maximum yields and minimum environmental damage.

AgriClimate Connection

NWS Outlook – Wet October for Northern Corn Belt (9/19/2014)

Much of the northern Corn Belt has an increased chance of above-average precipitation...Read More.

Corn belt heat into early September (8/28/2014)

U2U TEAM

State climatologists, Crop modelers, Agronomists, Economists, Social scientists, Regional Climate Center staff, IT

PURDUE UNIVERSITY

IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY

MICHIGAN STATE UNIVERSITY

ILLINOIS

SDSU

MICHIGAN

MU

University of Nebraska Lincoln

UW Extension Cooperative Extension

High Plains Regional Climate Center

MRCC Midwestern Regional Climate Center

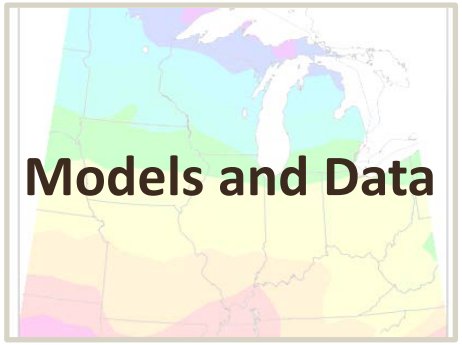
National Drought Mitigation Center

U2U VISION

- Transform existing climate information into usable knowledge for agricultural decision making
- Give farmers resources and training to more effectively manage variable climate conditions
- Increase Extension capacity to address agro-climate issues

Transforming Climate Variability and Change Information for Cereal Crop Producers

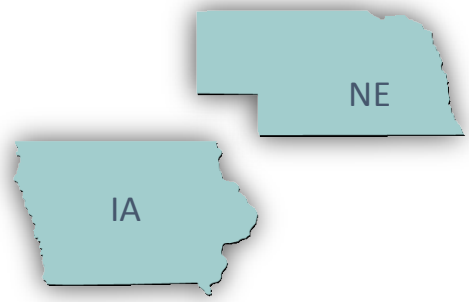
Project Objectives



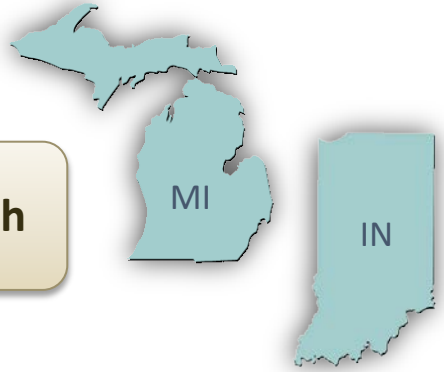
Models and Data

Decision Support Tools

Stakeholder Input



Pilot test tools, methods, and outreach



Disseminate across 12 state region

Internal Site for Collaboration Tools

Useful to Usable (U2U) ▶ Overview

Group Manager

- Overview
  - Home Page
  - Quick Links
  - HRLDAS Example Input Images
  - HRLDAS Example Output Images
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  - U2U Gridded GDD Examples
- Collections
- Members 48
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- Blog 1
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- Announcements

ABOUT THE GROUP

Show Public Description (+)

What's New?

* NEW!! Our latest internal evaluation report in now available. Thank you to everyone who participated in sharing their feedback about the U2U project.

* NEW!! The 2013-14 U2U Annual Report is now available.

* The U2U Planned Publications – Master List is always available and up-to date. Everyone is encouraged to contribute to this list. Send details to Melissa.

About the U2U Collaboration Site

Across this site you will find full group and subgroup collaboration space, data and models under development, meeting notes and documentation, discussions, and other relevant information for the Useful to Usable (U2U) research team. This site is only visible to approved, internal collaborators at this time.

Most static documents that are applicable to the full group (proposal, meeting notes, presentations, etc.) can be found under **Resources**. Objective 1 and 2 collaboration spaces are located in the **Wiki** along with tips for using this site and links to other project information. Feel free to start a **Discussion** at any time, announce news and current events in the Blog, and share your ideas by making a **Wish**.

Please contact Melissa Widhalm (mwidhalm@purdue.edu) if you need any help or have any questions. And keep checking back regularly for updates and new information!

GROUP MEMBERS

View All Members →

Cody Knutson

Jean Marie McGuire

HUBzero Components

- Data Sharing
  - iData
- Decision Support Tools

  (mygeohub.org/groups/u2u/...
  - AgClimate View (...acv)
  - Corn Growing Degree Day (GDD) (...gdd)
  - Climate Patterns Viewer (...cpv)
  - Split Nitrogen Application (in evaluation) (...splitn)

U2U Team uses iData to Share Data Files

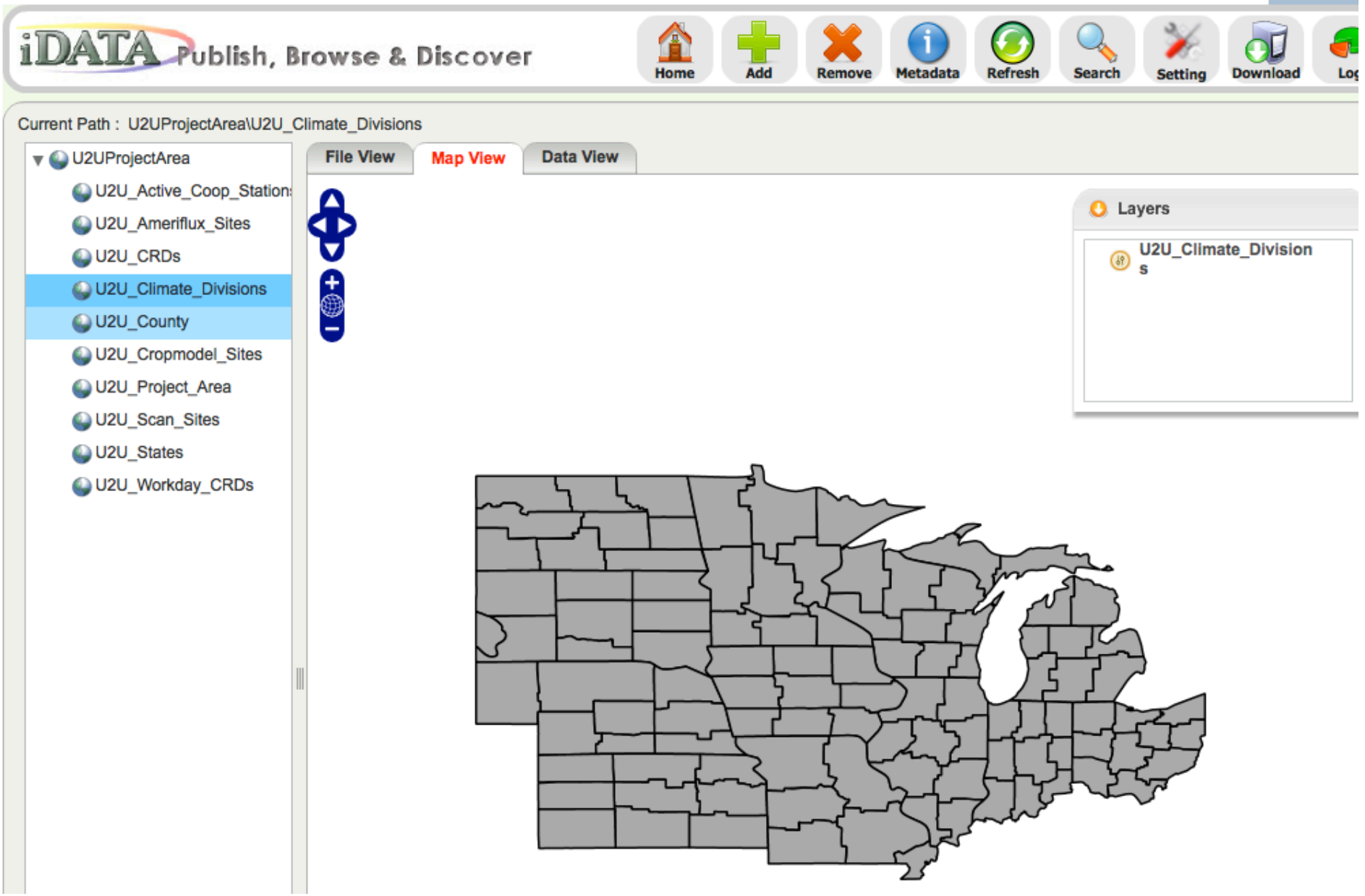
iDATA Publish, Browse & Discover

Home | Add | Remove | Metadata | Refresh | Search | Setting | Log

My Collections | Shared Collections

Name	Description	Date created	Share	Delete
drinet_conference_presentations	pdf versions of the presentations made at the driNET conference on June 21 and 22, 2011.	2011/07/14		
Crop Data Layer	NASS Crop Data layers that have been grouped.	2011/05/31		
HRLDAS Gridded Daily Data Sets	Daily gridded HRLDAS data for min temp (degrees C), max temp (degrees C), shortwave ra	2012/11/29		
HRLDAS Data Sets	Examples of the HRLDAS output data sets. One can use a tool like MultiSpec (https://engin	2012/02/29		
Sample_NLDAS2_Data	This folder contains sample forcing a, forcing b, mosaic and noah NLDAS2 data in both grit	2012/04/05		
Landuse_for_Lan	Indiana land use file for Lan.	2012/04/09		
County Yield History	NASS County Yield Files	2012/10/26		
U2U Shape Files	Zipped shape files for U2U Project Area, States, CRDs and Workday CRDs.	2012/12/03		
U2UProjectArea	Shape files for U2U project	2012/12/03		
HRLDAS Gridded Yearly Data Sets	Yearly rainfall data sets for 2001 to 2010. Units are mm.	2012/12/17		
GDD Data	For Growing Degree Day tool. These files contail accumulated gdds starting from January 1	2013/05/21		
SCAN AMERIFLUX Data	Contains data for site validations. Information on SCAN data can be found at: http://www.w	2013/09/27		

iData Provides Capability for Quick Views of Some Data



U2U Decision Support Tools - Corn GDD

Welcome to the Corn Growing Degree Day (GDD) decision support tool.

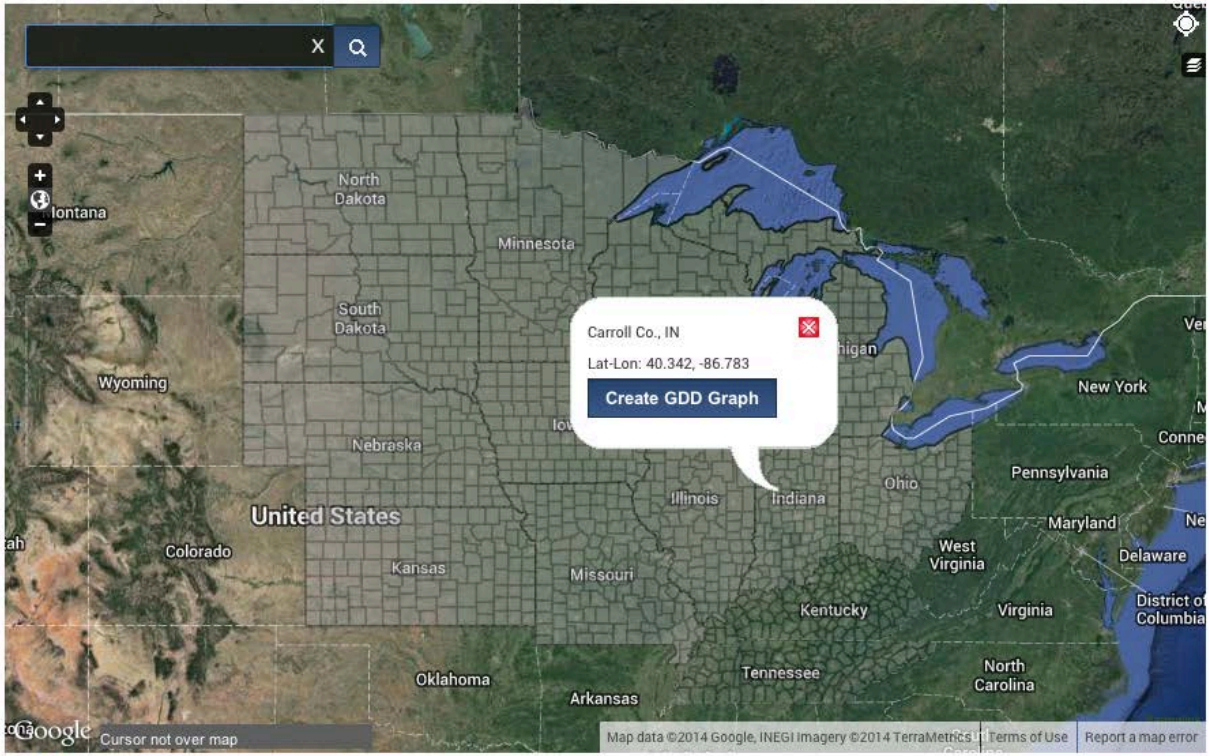
This tool puts current conditions into a 30-year historical perspective and offers trend projections (based on climatology) through the end of the calendar year. GDD projections, combined with analysis of historical analog data, can help you make decisions about:

- Climate Risks– Identify the likelihood of early and late frosts/freezes.
- Activity Planning – Consider corn hybrid estimated physiological maturity requirements, along with GDD projections when making seed purchasing and other growing season decisions.
- Marketing – Look at historical and projected GDD when considering forward pricing and crop insurance purchases.

While this tool is not meant to be a crystal ball, data and information derived from the tool can be used to make helpful inferences about current conditions, especially when combined with personal experience and localized knowledge. Please note that data is currently limited to states within the U2U project area plus Kentucky & Tennessee.

Map | Animations

To get started, click on any location within the gray area of the map. Use the zoom function for a more accurate selection.



Tool Tips:

- **Use white user location icon in upper right hand corner of map to zoom to current location of computer being used.**
- **Use the layer icon in the upper right hand corner of the map to control your viewing options.**
- **Tested with browsers: Internet Explorer 11 & later; FireFox 27.0 & later; Chrome 33.0 & later; Safari 5.1.10 & later.**

About GDD

Map | Graph | Data | Animations

This tab allows you to put corn (86/50) GDD progress into a 30-year historical perspective. Customize your data:

- **Choose your GDD start date, freeze temperature threshold and corn maturity rating**
- **Add any year between 1981-2013 for comparison**
- **Adjust the spread of historical GDD and temperature data visible on the graph**
- **Add or remove silking, black layer and freeze dates for a comprehensive growing cycle snapshot**

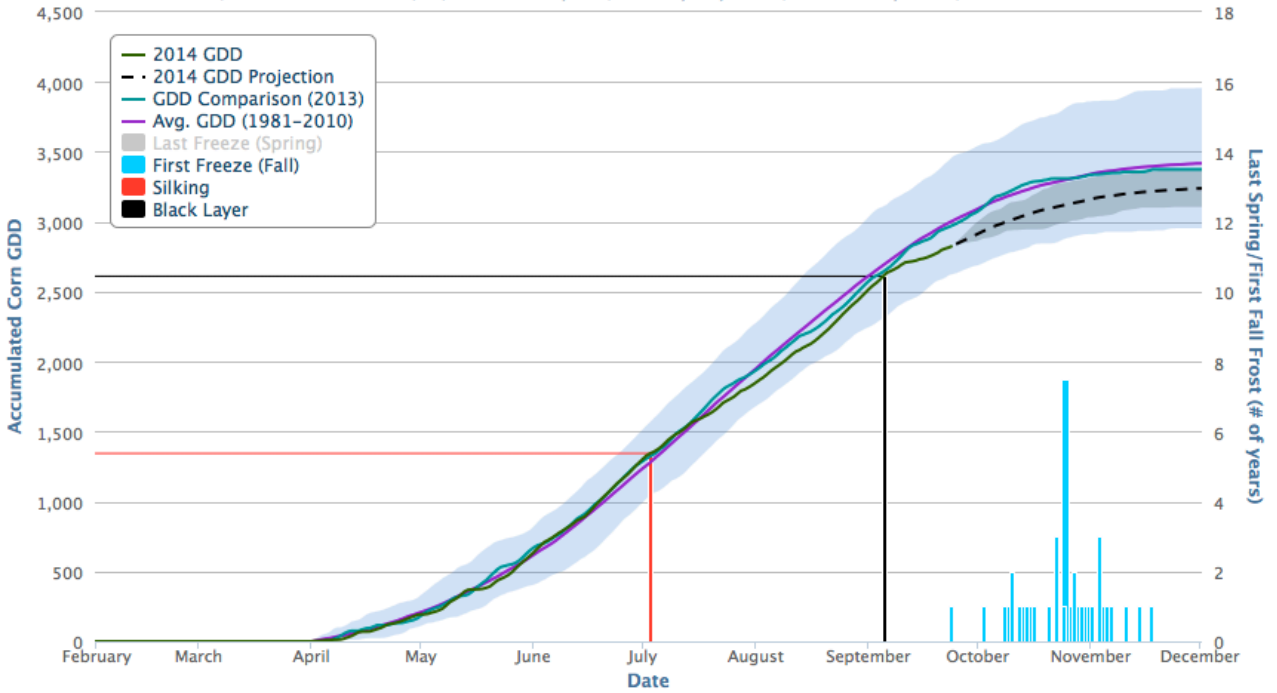
GDD Start: April 1 | GDD Comparison Year: 2013 | Corn Maturity Days: 108 | Silking GDDs: 1,338

Freeze Temperature (°F): 28 | Variation: All Years | Current Day: Today | Black Layer GDDs: 2,594

Corn Growing Degree Day Tool

Chart Options

Location: 40.34, -86.78 in Carroll Co., IN, Start Date: April 1, Maturity Days: 108, Freeze Temp: 28°F, Variation: All Years



GDD Base 50/86 (degrees F); Created: 09/25/2014

Tool Tips:

- **Select the blue question mark icon in the top right corner of the tab section for instructions and other information.**
- **Print this chart or export it in a variety of formats using the Chart Options feature.**
- **Add or remove visual elements by clicking on their corresponding legend icons.**
- **Zoom in by clicking above or below the plotted data and dragging your cursor to the right or left. Use "Reset zoom" button in upper right of graph to zoom out.**

Download Data | About GDD

U2U Decision Support Tools - AgClimate View

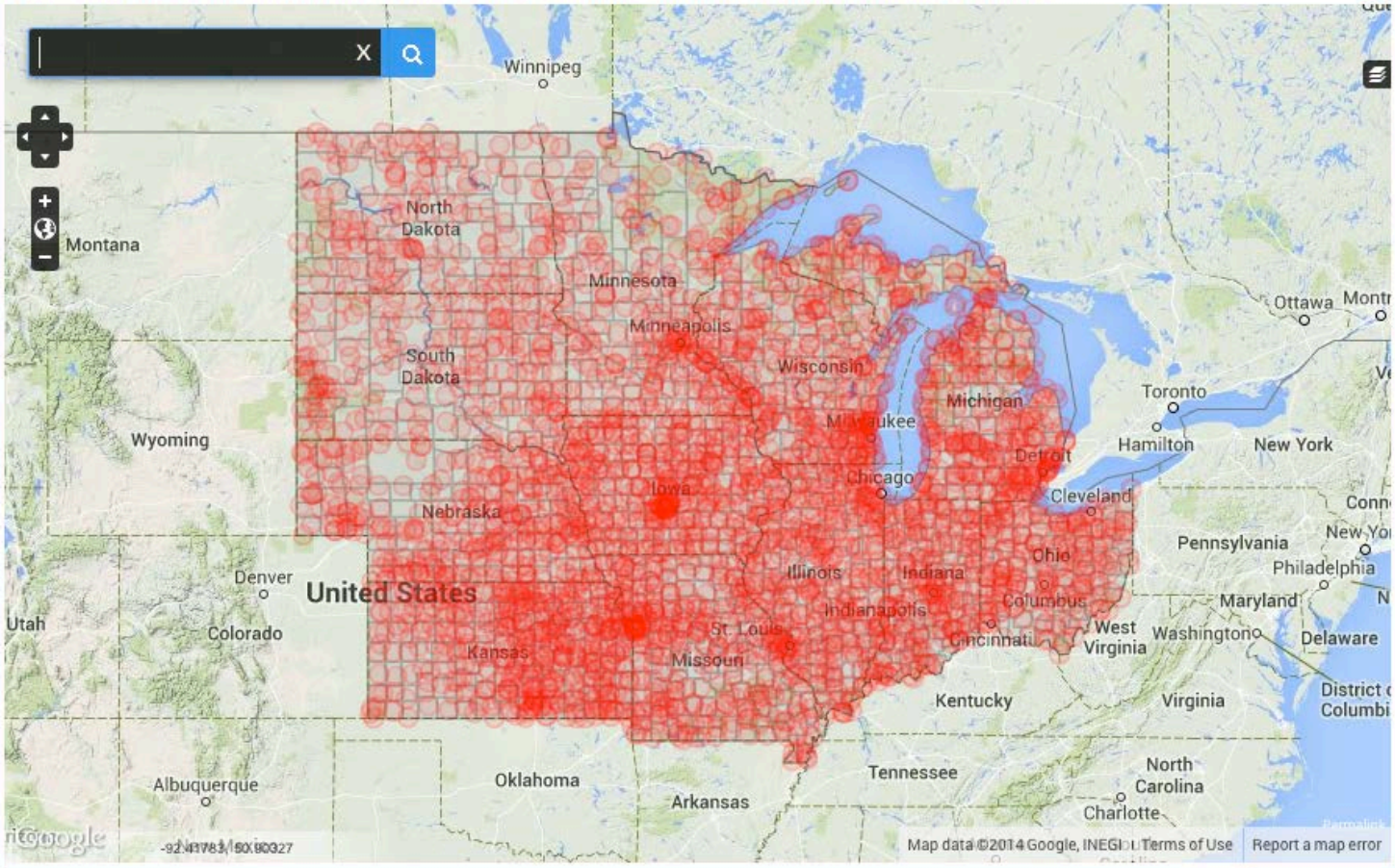
Welcome to AgClimate View – your source for historical climate and crop yield data in the Corn Belt.

- Plot local monthly temperature and precipitation variation back to 1980
- Track county crop yields and trends (where data is available)
- Consider crop yields in the context of monthly temperature, precipitation and growing degree day (GDD50) data

Used in tandem with other decision resources, this product can help you find long-term correlations between climate trends and yields and help put your recent growing cycles into historical context.

Select a Station

To get started, select a station near you. Do this by clicking on the map or using the search feature.

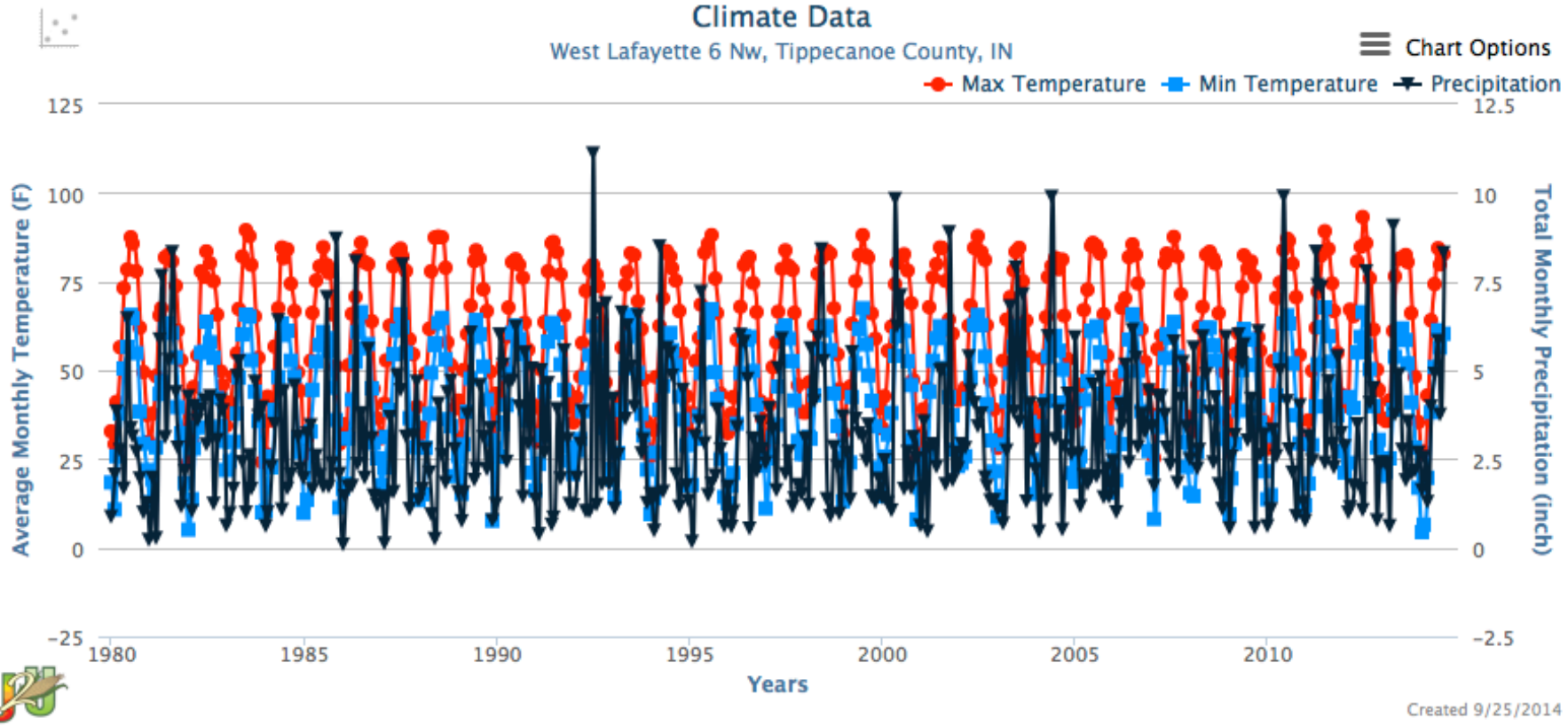


Climate Data are retrieved from http://rcc-acis.unl.edu

About ACV

Select a Station | Climate Data | Climate Average | Yield Trend | Comparison | Custom Chart

This tab allows you to plot maximum and minimum temperatures and precipitation data for a specified date range.



- Add or remove lines on the chart by clicking on the corresponding items in the legend
- Print this graphic in a variety of formats using Chart Options
- Download all climate and crop data for this location using Download Data button below the chart
- Zoom in by clicking above or below the plotted data and dragging your cursor to the right or left. Use "Reset zoom" button in upper right of graph to zoom out.

Climate Data are retrieved from http://rcc-acis.unl.edu

Download Data | About ACV

U2U Decision Support Tools - Climate Patterns Viewer

Welcome to Climate Patterns Viewer – connecting global climate conditions to local climate impacts.

This product provides a historical look at how the El Niño Southern Oscillation (ENSO) and Arctic Oscillation (AO) can influence local climate conditions and corn yield across the Corn Belt. You can use these simple maps and charts to show when and where specific phases of ENSO or AO have influenced:

- average monthly temperatures and precipitation,
- deviations of temperature and precipitation from 1981-2010 climate normals, and
- deviations of yield (in percent) from the de-trended 1981-2010 average yields.

CURRENT CLIMATE PHASE
ENSO: Neutral
AO: Neutral

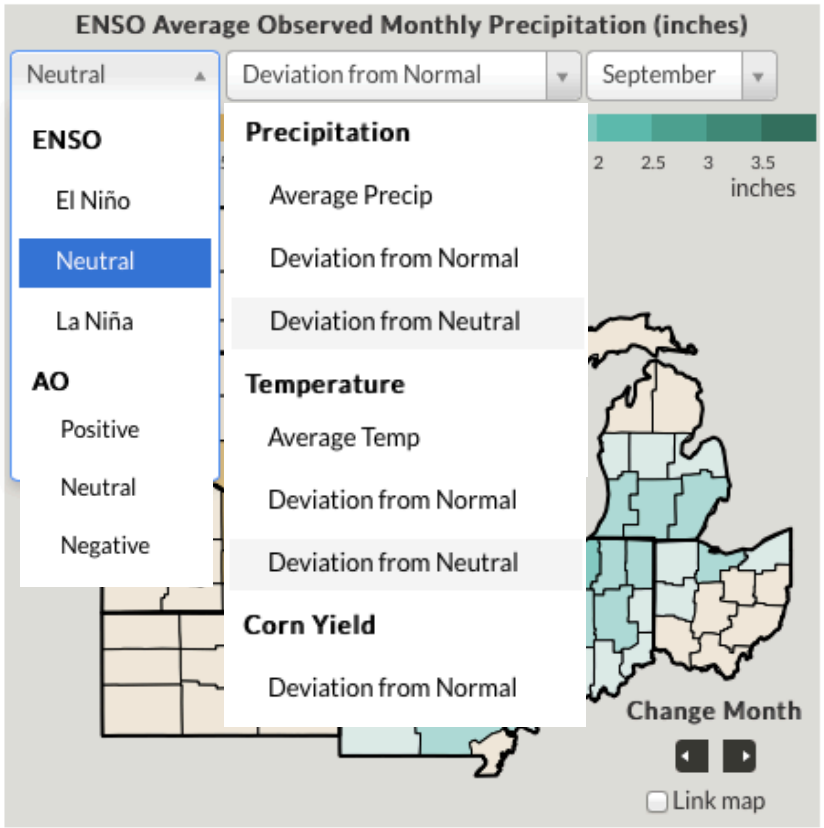
ENSO ALERT STATUS
El Niño Watch

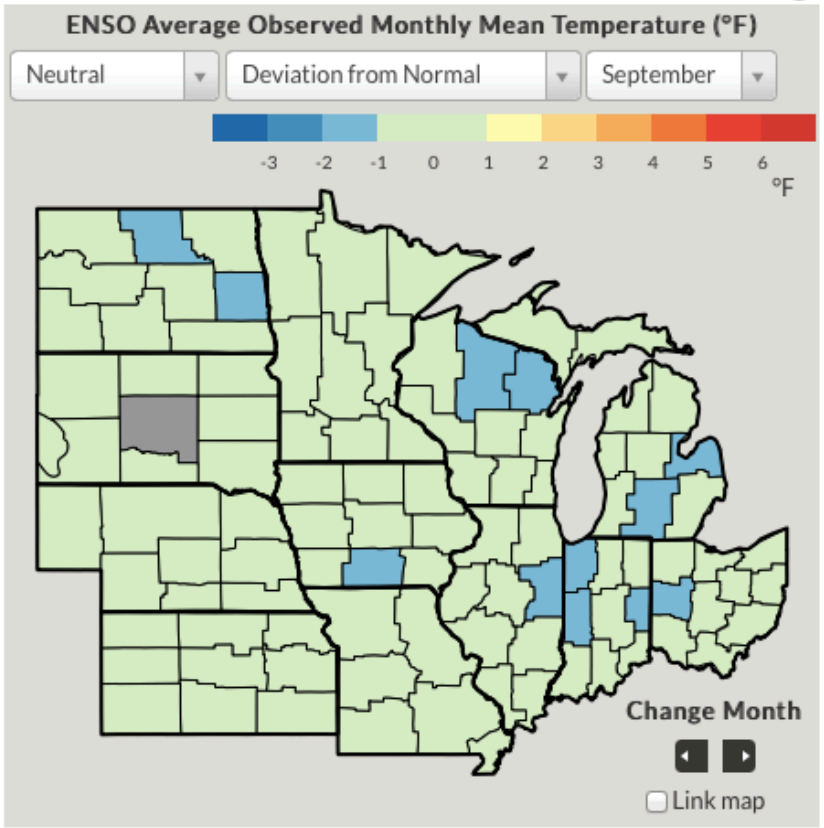
This tool is not intended to be a forecast. Rather, this tool uses historical data (1981-2010) to highlight locations where ENSO and AO can potentially impact climate conditions over the course of the year, which can help you make more informed farm management decisions.

About CPV

Click on the map to view a chart of the data for that location; chart will appear below the maps.

Four Maps





About CPV

Click on the map to view a chart of the data for that location; chart will appear below the maps.

Four Maps

ENSO Average Observed Monthly Precipitation (inches)

Neutral | Deviation from Normal | September

-2.5 -2 -1.5 -1 -0.5 0 0.5 1 1.5 2 2.5 3 3.5 inches

Indiana - Climate Division 1

Average Precip (September): 4.9"
Departure from Average Precip: 1.7"

Additional data for this location is below maps

Change Month

Link map

ENSO Average Observed Monthly Mean Temperature (°F)

Neutral | Deviation from Normal | September

-3 -2 -1 0 1 2 3 4 5 6 °F

Change Month

Link map

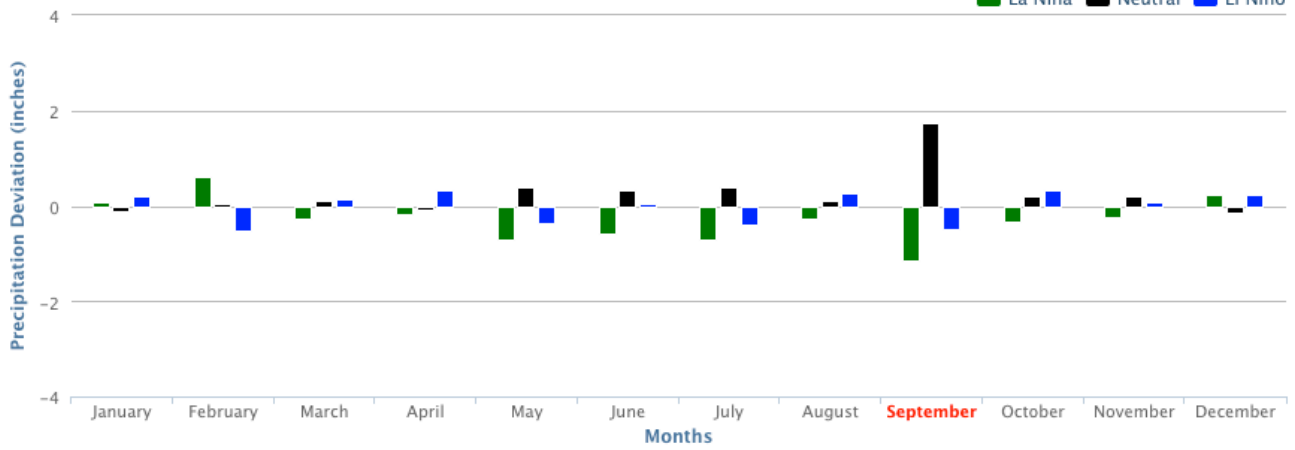
ENSO | Precipitation Deviation from Normal

Average Monthly Precipitation Deviation from Normal (1981-2010)

Indiana Climate Division 1

Chart Options

La Nina Neutral El Nino



(names in red indicate the phases are significantly different at 90% confidence interval)

Created 9/25/2014

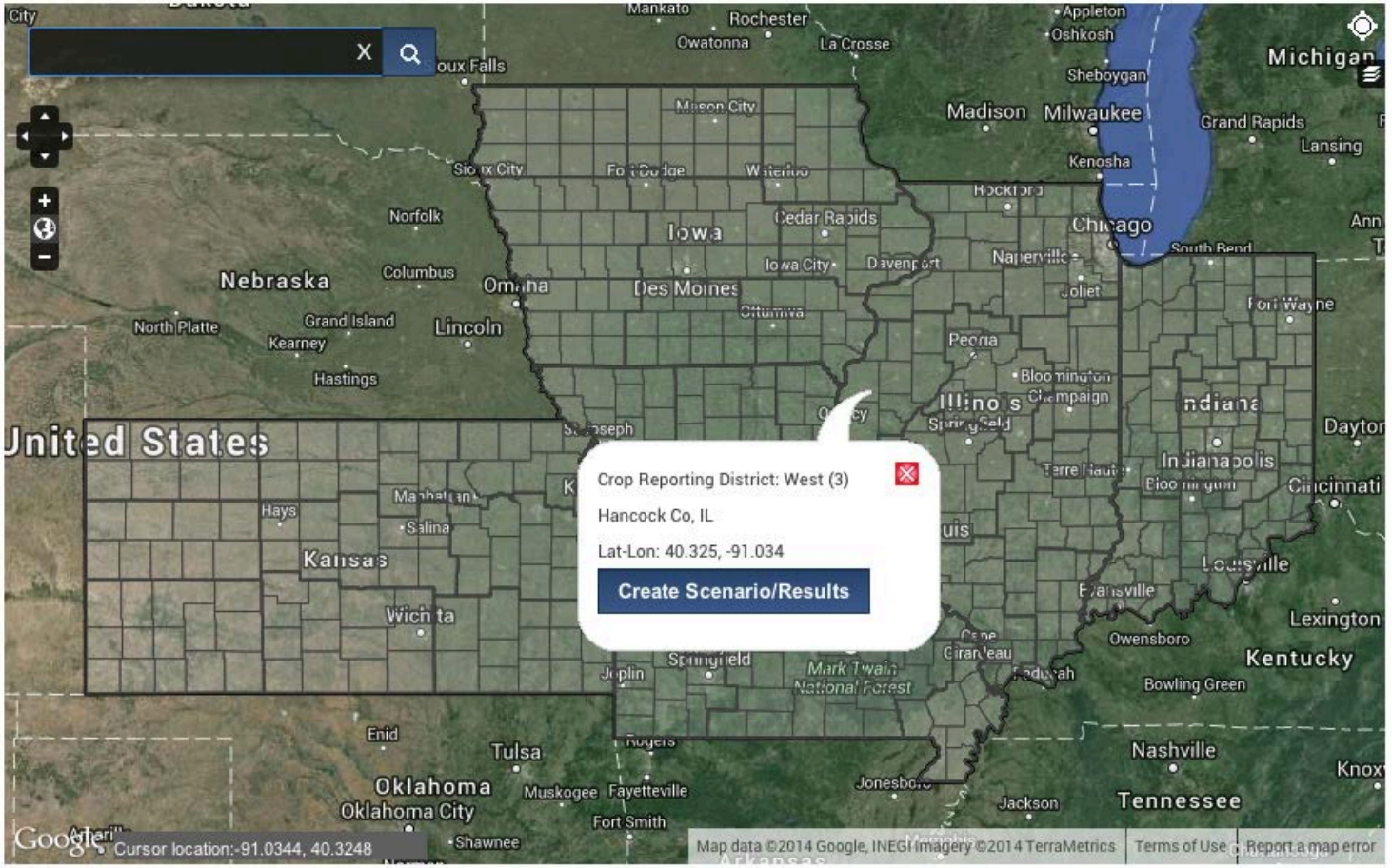
U2U Decision Support Tools - Split Nitrogen Application

Welcome to the Corn Split N decision support tool.

This product can be used to determine the feasibility and profitability of using post-planting nitrogen applications for corn production. The Split N tool combines historical data on crop growth (estimated using corn growing degree days) and fieldwork conditions (from USDA NASS) with economic considerations to determine best/worst/average scenarios for successfully completing nitrogen applications within a user-specified time period.

Map | About SplitN

To get started, click on any location within the gray area of the map. Use the zoom function for a more accurate selection.



Tool Tips:

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- **Use the layer icon in the upper right hand corner of the map to control your viewing options.**
- **Tested with browsers: Internet Explorer 11 & later; FireFox 27.0 & later; Chrome 33.0 & later; Safari 5.1.10 & later.**

Map | Scenario/Results | About SplitN

This tab allows you to customize inputs for your farm and view summarized results.

Location: Hancock Co, Illinois; Crop Reporting District: West (3)

Planting Date: May 15

Apply N by what stage?: V8

Yield penalty for not getting post-planting N applied:	25	bu/acre
Yield benefit from post-planting N application:	5	bu/acre
Reduced N applied due to post-planting N application:	30	lbs/acre
Nitrogen Price ($/lb):	$ 0.55	/lb
Corn Price ($/bu):	$ 4.5	/bu
Sidedress Cost ($/acre):	$ 15	/acre

Start Date to Apply Nitrogen: June 10

End Date to Apply Nitrogen: June 23

V8 expected by Jun 23

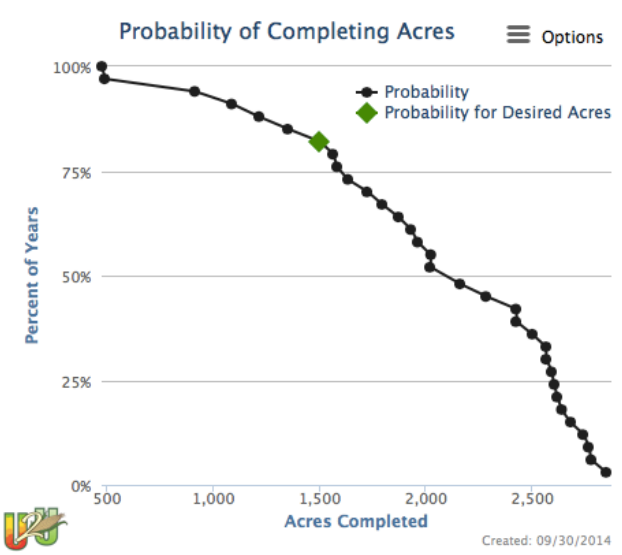
Implement width (ft):	36
Implement speed (mph):	5
Field efficiency:	0.75
Acres worked per hour:	16
Acres:	1,500
Calculated hours needed:	92
Hours in field per day:	
(•) All daylight hours	15.0
( ) Custom hours	
Days worked in 7:	6
Days in selected period:	14
Average days suitable in period:	8.2
Average hours suitable in period:	123

Economic Analysis | Acres Completed Summary | Crop Calendar Summary

Summary of Acres Completed using 33 years of Field Work Days History

Acres Completed if Start on Jun 10 and End on These Dates

Completion Percentile	Jun 16	Jun 23	Jun 30	Jul 07
50	925	2,091	3,323	4,522
60	811	1,936	3,189	4,341
70	791	1,717	2,965	3,777
80	673	1,539	2,100	3,124
82	665	1,500	2,084	3,093
85	547	1,346	1,967	3,025
90	466	1,126	1,824	2,583
95	390	766	1,442	2,167



Behind the Scene for AgClimate View

- Accesses:
  - geoserver for shape files: Coop station list, state & county boundaries
  - csv file for yield information (~4 MB)
  - Over 3000 active coop weather stations available for user to select in 12-state U2U area
  - Data accessed from NOAA's Applied Climate Information System (ACIS) using curl calls

Behind the Scene for Corn GDD

- Accesses:
  - geoserver for state & county boundaries
  - Data file with 30+ year history of accumulated gdds
    - 5 GB GeoTIFF bip file
    - ~3.5 km spatial resolution gridded data file
  - NOAA's Applied Climate Information System (ACIS) for gridded daily min & max temps using cron job each night to update accumulated gdd values for current year

Behind the Scene for Climate Patterns Viewer

- Accesses:
  - csv data files for climate pattern history & yield residuals
  - geojson files for crop reporting district (crd), climate division and state boundaries

Behind the Scene for Post-Planting Nitrogen Application

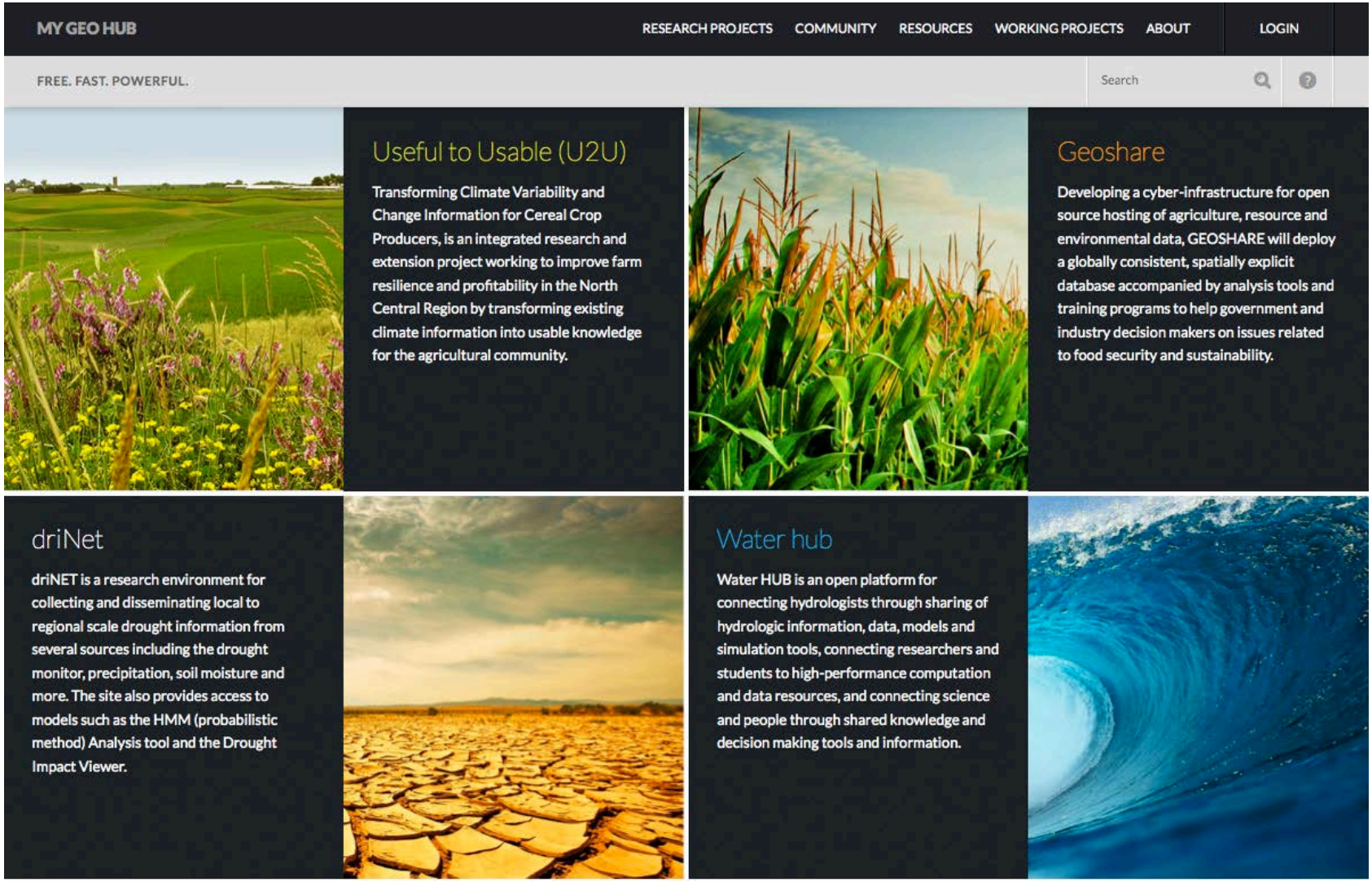
- Accesses:
  - TIF data files for field workday 36-year history
    - Field workable days per week during growing season (USDA)
    - 300 KB file
  - GeoTIFF file for 30-year average accumulated gdds & current year accumulated gdds
    - 150 MB files
  - geojson files for crop reporting district (crd), county and state boundaries

Libraries U2U DS Tools (components) Use

- Openlayers for mapping
- Highcharts for graphs
- Introjs for inline help
- GDAL for accessing tiff/geotiff files
  - Geospatial Data Abstraction Library

mygeohub.org

U2U is a “supergroup” on mygeohub



Questions