Genomes to Fields

IOWA CORN™

NCGA

Weather Data Collection, Management, and Availability

IOWA STATE UNIVERSITY
Plant Sciences Institute

maizeGDB
MAIZE GENETICS AND GENOMICS DATABASE

USDA ARS

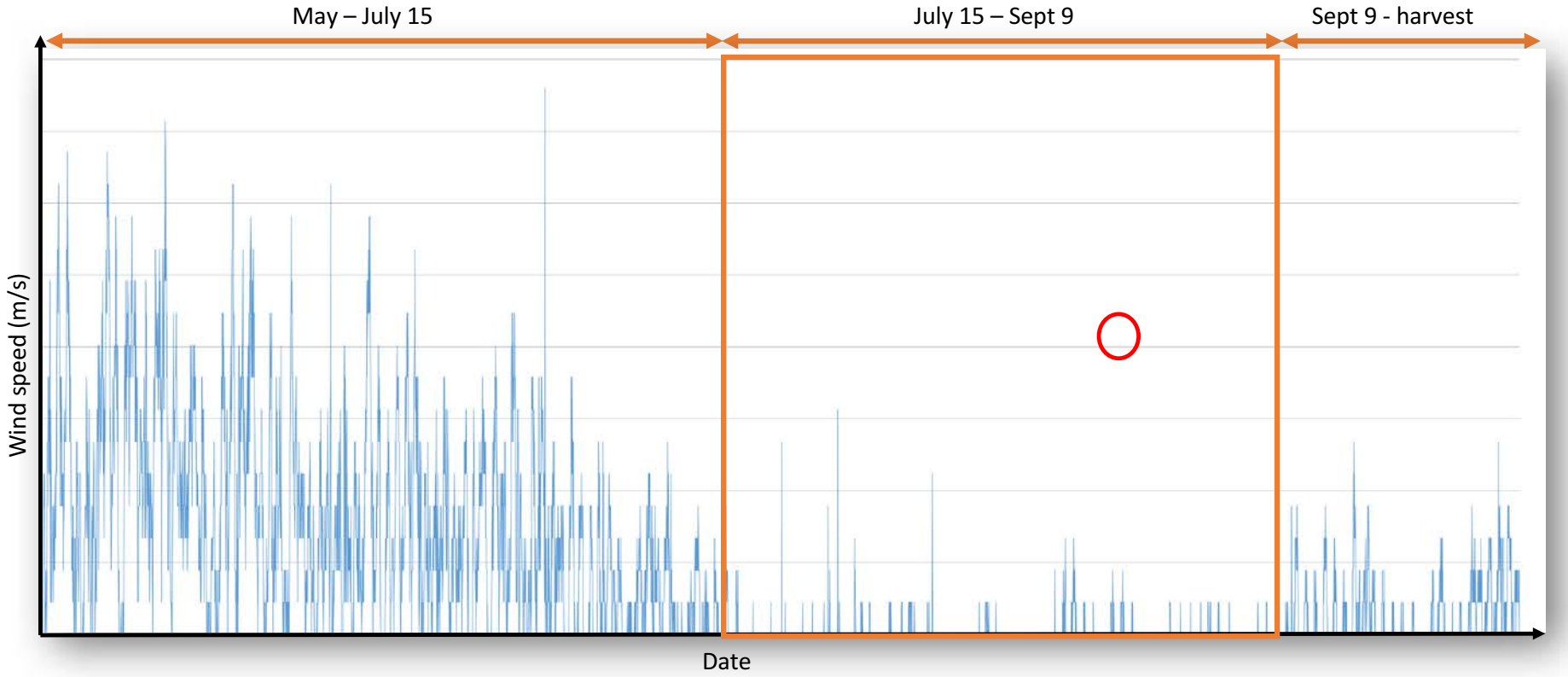
Renee Walton

- Earned Bachelor's and Master's of Science in Meteorology at ISU (2010 – 2015)
- Worked as development meteorologist at the Aviation Weather Center in Kansas City (2015 – 2016)
- Currently improving weather data collection and handling for G2F (July 2016 – present)
  - Implemented standards for weather station use
  - Developed system for weather data collection and curation

Outline

- Weather data collection:
  - Station placement and setup
  - Station maintenance
- Data management
- Data availability

In the field… or near the field?



Compromise

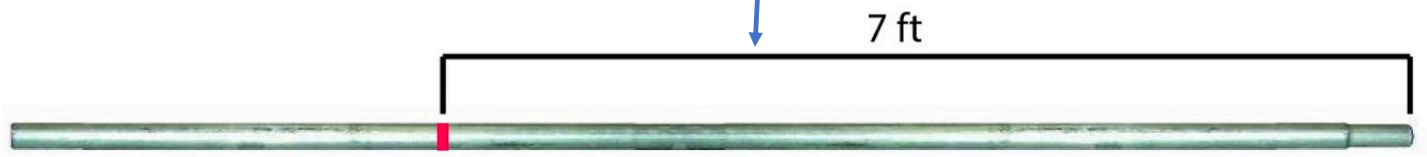
- All weather stations should be placed outside the field
- Test the use of two stations: one outside the field and one in-field
- Data will be analyzed to see if there is a significant difference

2017 Standard Operating Procedure

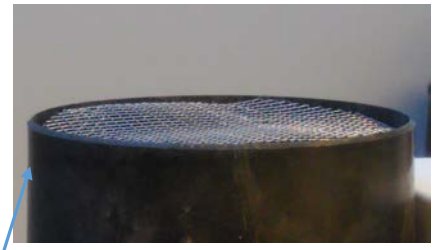
IV. WatchDog 2700 Weather Station Configuration

a. For investigators with multiple GxE trial fields, weather stations should be located within ¼ mile of all trial fields. For trials > ¼ mile apart, or for trials with varying water treatments, consider a second micro weather station to measure soil moisture differences.

b. In order to maintain consistency and adhere to meteorological measurement standards, the weather station should be placed at a height of 2 meters (~6 ft). Purchase a 1 ⅜" wide x 10' 6" long top rail fence post similar to one found here: https://goo.gl/40KoTW. This will replace the post that comes with the tripod. Cut the post at the non-tapered end so you're left with 7 ft.



2017 Standard Operating Procedure



b. WatchDog 2700 Field Setup

Use the following checklist to complete setup of the weather station

Station Placement:

_____ Place the weather station at the edge of GxE field trial on level ground no closer than a distance 5 times the height of the nearest obstruction (see 1)

_____ Drive the tapered end of the 7 ft post 1 ft into the ground

_____ Secure the tripod around the post

_____ Secure the feet of the tripod

_____ Secure the weather station on top of the tripod with the front facing south

_____ Point the wind vane and anemometer away from the rest of the station

_____ Use a compass to point the nose of the wind vane to North. Hit Display > Set > Set North > Set > Set to calibrate.

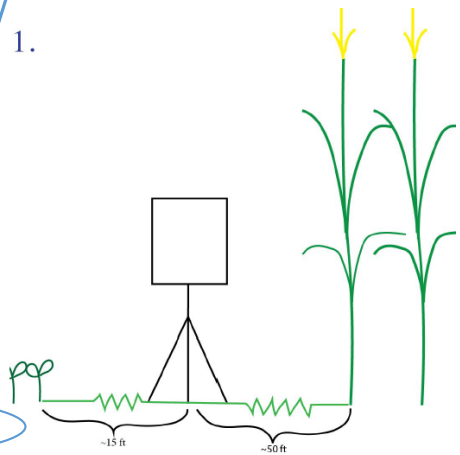
_____ Install rain bucket cover by bending legs of hardware cloth and inserting into bucket

_____ Check the date and time

_____ Set the logging interval to 30 minutes

_____ Clearly mark weather station location for passing farm equipment

1.



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Annual maintenance

- Improve longevity of the station
- Increase measurement accuracy
- Maintain consistency

a. Annual Watchdog 2700 Pre-Season Tasks

i. Check that all sensors are reading correctly on LCD screen. See item (g) for specific instructions regarding the calibration/troubleshooting of individual instruments.

ii. Rearrange the external instruments to the following ports:

1. Soil moisture - Port A
2. Soil temperature - Port B
3. Solar radiation - Port C

iii. Using the SpecWare software with the station connected, delete the data from the logger (Logger > WatchDog Manager > Advanced > Clear > OK)

In-season checklist

- Increase longevity of the station
- Increase measurement accuracy
- Catch sensor failure before end of season

c. In-Field WatchDog 2700 Maintenance

Weather station checks should take place at each field visit. Note the date and time of station check in metadata sheet to allow proper data cleaning.

Anemometer:

_____ Clean dirt/debris from the wind cups
_____ Check display values to ensure the sensor is still working (Display > Current > Current > Up Arrow)
_____ Ensure the cups still spin freely

Wind vane:

_____ Clean dirt/debris from the wind vane
_____ Check display values to ensure the sensor is still working (Display > Current > Current > Up Arrow)

Rain bucket:

_____ Remove debris from the top of the bucket, both on and beneath hardware cloth cover
_____ Unscrew the top and lift lid
_____ Remove dirt/debris from inside the bucket
_____ Set the display to view rain values (Display > Current > Current > Up Arrow > Down Arrow) and tip the bucket to ensure the sensor is still working
_____ Replace the lid and cover for rain bucket

Radiation shield:

_____ Use an air can duster to remove debris from within the radiation shield
_____ Check display values to ensure the temperature and humidity sensors are still working (Display > Current > Current > Up Arrow (x2 for temperature, x4 for humidity))

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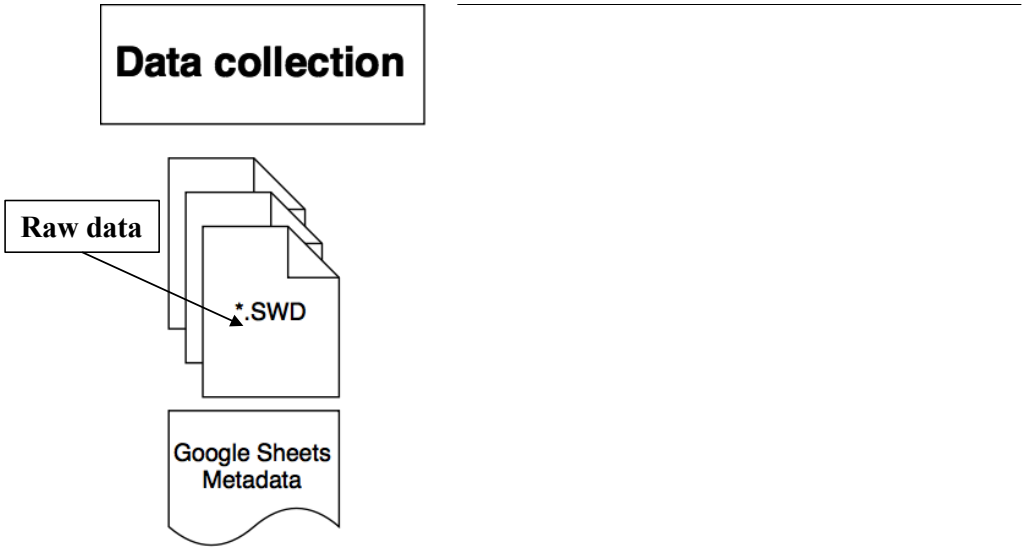
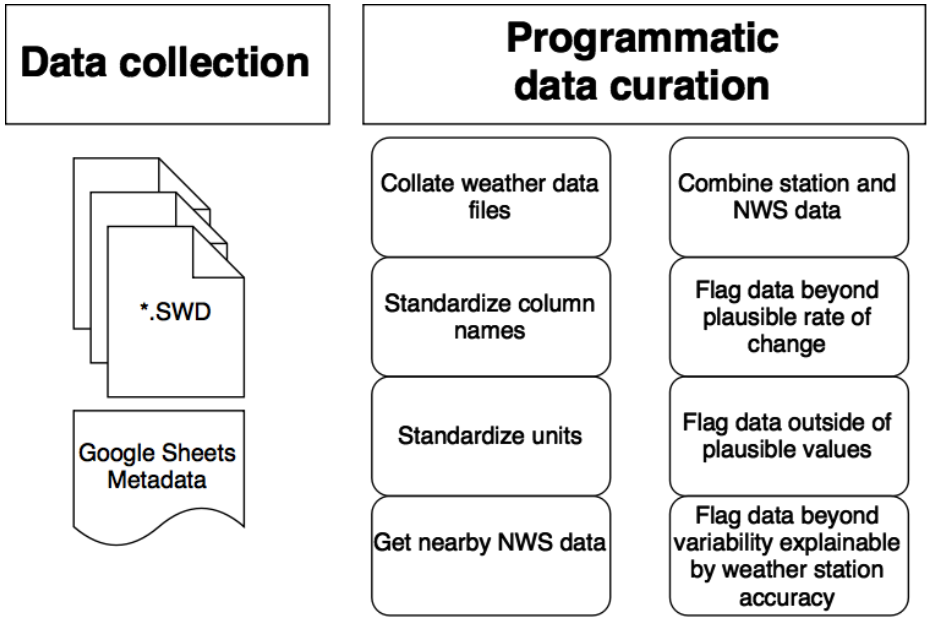
Curation methods



- Developed script to identify and remove errant data points
  - Consult World Meteorological Organization (WMO) guidelines for quality control[1]
  - Compare to nearby, reliable weather stations

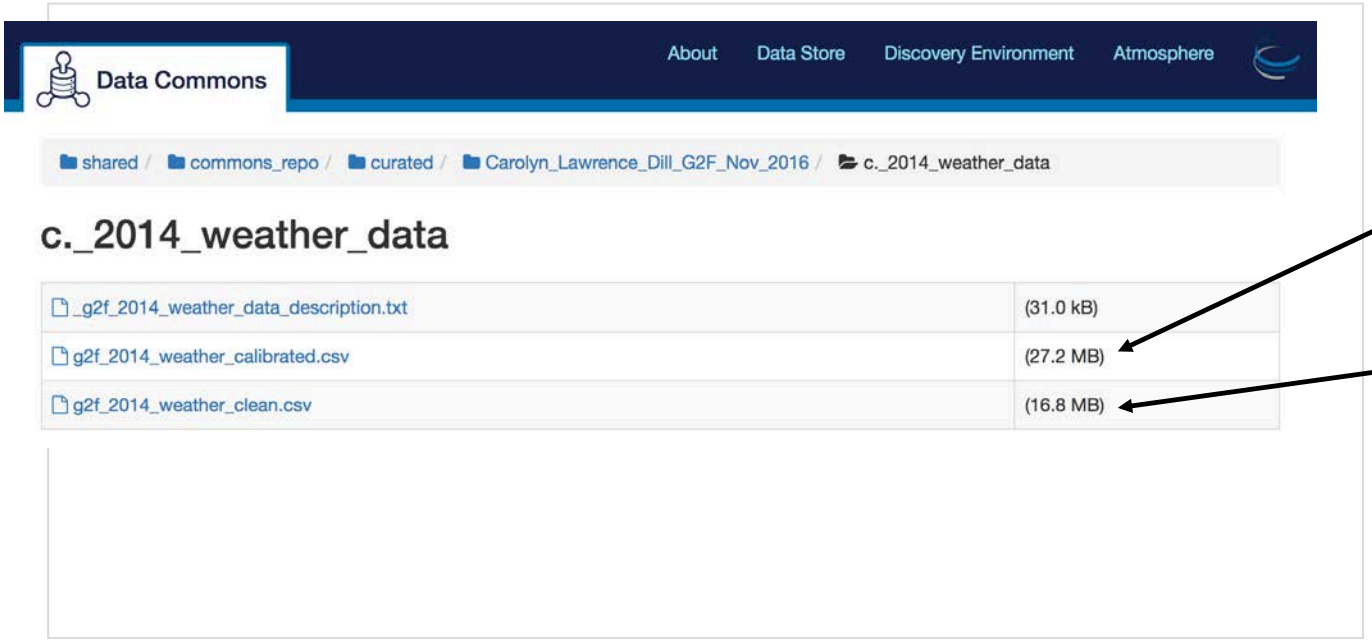
1. World Meteorological Organization, 2004: Guidelines on Quality Control Procedures for Data from Automatic Weather Stations.

Curation methods



- Visually inspect data to determine if flagged observations should be removed
- Calibrate wind direction as necessary

Curation methods



- Compile two different data sets for release
  - Calibrated data – includes nearby quality control data and calibrated wind direction as necessary
  - Clean data – no data altered, only eliminated

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Weather data progress

- 2014 weather data – http://dx.doi.org/10.7946/P2201Q
- 2015 weather data – DOI in progress
- 2016 weather data – curation of received data is complete

- REMINDER: Read the 2017 Standard Operating Procedure and contact us at g2f_help@cyverse.org with any questions

G X E Cooperators

Principal Investigators who grew GxE trials in 2014-2016

- Martin Bohn (UIUC)
- Ed Buckler (ARS - Cornell)
- Ignacio Ciampitti (KSU)
- Jode Edwards (ARS - ISU)
- Sherry Flint-Garcia (ARS)
- Christopher Graham (SDSU)
- Mike Gore (Cornell)
- Candy Hirsch (UMN)
- Jim Holland (ARS - NCSU)
- Elizabeth Hood (AR-State)
- David Hooker (Guelph)
- Fiona Goggin (Univ AR)
- Shawn Kaeppler (UW)
- Joe Knoll (ARS - UGA)
- Judith Kolkman (Cornell)
- Greg Kruger (UNL)
- Nick Lauter (ARS - ISU)
- Liz Lee (Guelph)
- Natalia de Leon (UW)
- Sanzhen Liu (KSU)
- Argelia Lorence (AR-State)
- Aaron Lorenz (UMN)
- Jonathan Lynch (PSU)
- Steve Moose (UIUC)
- Seth Murray (TAMU)
- Rebecca Nelson (Cornell)
- Torbert Rocheford (Purdue)
- Oscar Rodriguez (UNL)
- Cinta Romay (Cornell)
- James Schnable (UNL)
- Pat Schnable (ISU)
- Brian Scully (ARS)
- Rajandeep Sekhon (Clemson)
- Margaret Smith (Cornell)
- Nathan Springer (UMN)
- Kurt Thelen (MSU)
- Peter Thomison (OSU)
- Mitch Tuinstra (Purdue)
- Jason Wallace (UGA)
- Randy Wisser (UDel)
- Wenwei Xu (TAMU)

Genomes To Fields Collaborators

† G2F Executive Committee members *GxE Coordinating Groups ˜G2F co-lead

- Naser Alkhalifah (ISU)
- Martin Bohn (UIUC)*
- Ed Buckler (ARS)†
- Darwin Campbell (ISU)*
- Ignacio Ciampitti (KSU)
- James Clohessy (Cornell)
- Liang Dong (ISU)
- Jode Edwards (ARS)*
- David Ertl (IA Corn)*†
- Sherry Flint-Garcia (ARS)*
- Joseph Gage (UW)
- Jack Gardiner (ISU)*
- Fiona Goggin (Univ AR)
- Byron Good (Guelph)
- Mike Gore (Cornell)
- Christopher Graham (SDSU)
- Patricio Grassini (UNL)
- Jerry Hatfield (ARS)
- Candy Hirsch (UMN)
- Jim Holland (ARS)
- Elizabeth Hood (AR-State)
- David Hooker (Guelph)
- Diego Jarquin (UNL)*
- Shawn Kaeppler (UW)†
- Joe Knoll (ARS)
- Judith Kolkman (Cornell)
- Greg Kruger (UNL)
- Nick Lauter (ARS)
- Carolyn Lawrence-Dill (ISU)*
- Liz Lee (Guelph)*
- Zhizhai Liu (TAMU)
- Natalia de Leon (UW)*†˜
- Alex Lipka (UIUC)
- Argelia Lorence (AR-State)
- Aaron Lorenz (UMN)*
- Jonathan Lynch (PSU)†
- Nathan Miller (UW)
- Steve Moose (UIUC)
- Seth Murray (TAMU)*
- Rebecca Nelson (Cornell)
- Torbert Rocheford (Purdue)
- Oscar Rodriguez (UNL)
- Cinta Romay (Cornell)*
- Emily Rothfusz (UW)*
- James Schnable (UNL)
- Pat Schnable (ISU)†˜
- Brian Scully (ARS)
- Rajandeep Sekhon (Clemson)
- Kevin Silverstein (UMN)
- Margaret Smith (Cornell)
- Edgar Spalding (UW)
- Nathan Springer (UMN)†
- Srikant Srinivasan (ISU)*
- Yiwei Sun (ISU)*
- Kurt Thelen (MSU)
- Peter Thomison (OSU)
- Kelly Thorp (ARS)
- Mitch Tuinstra (Purdue)
- Jason Wallace (UGA)
- Renee Walton (ISU)
- Rod Williamson (IA Corn)
- Randy Wisser (UDel)*
- Wenwei Xu (TAMU)
- Cheng-Ting Yeh (ISU)
- Jianming Yu (ISU)

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