

# Engaging Students With Long Term Data: Studying Nitrogen Fixation in Switchgrass to Build Science and Engineering Practices

Connie High<sup>1</sup>, Carmella Vizza<sup>4</sup>, Sarah Roley<sup>5</sup>, G. Phil Robertson<sup>2,3</sup>, Kara Haas<sup>2,3</sup>, Elizabeth Schultheis<sup>2,3</sup>

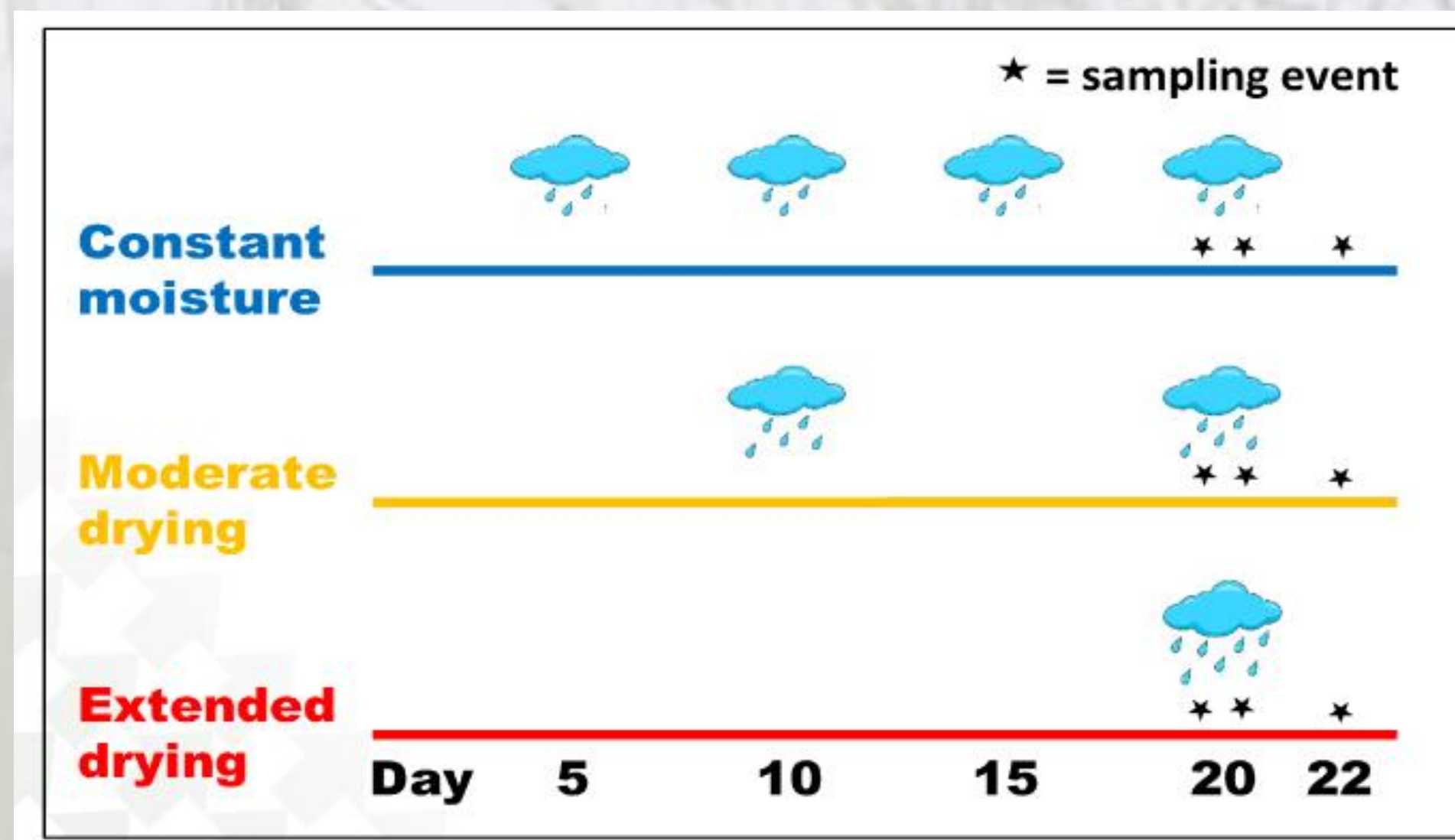
<sup>1</sup>Delton Kellogg Schools, <sup>2</sup>Michigan State University, <sup>3</sup>Kellogg Biological Station LTER, <sup>4</sup>Hawai'i Pacific University, <sup>5</sup>Washington State University

## Project Goal of the Research Experience for Teachers

As a science educator, I want to show students how to use data collected from the long term ecological research site to answer science questions. Specifically, we can work on the **science and engineering practices** analyzing and interpreting data and engaging in argument from evidence.

## Narrating the Research Story

Teachers giving the first hand account of the research experience that they have had allows students to experience research through the eyes of their teacher.



## Science Practices

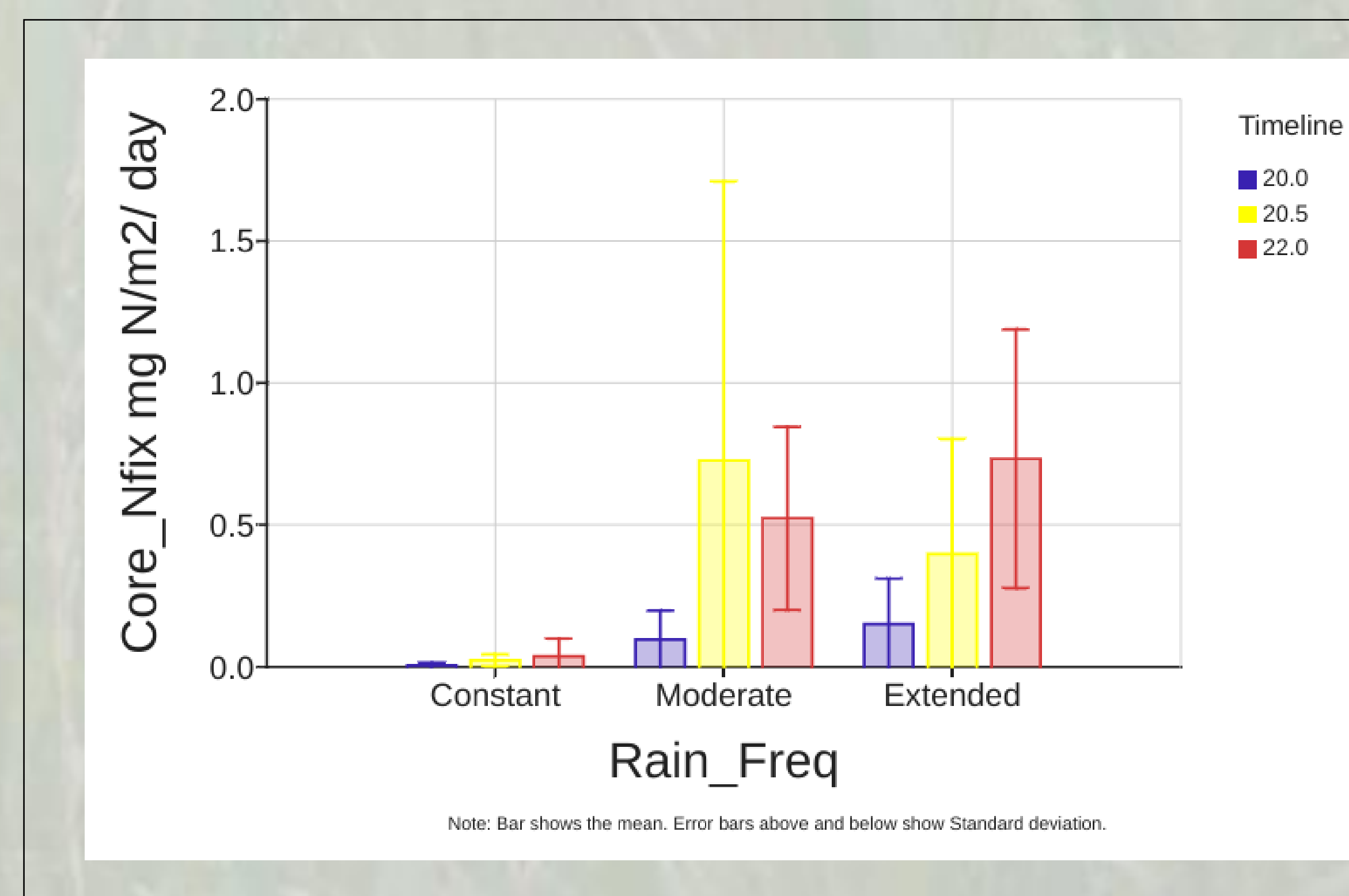
Students need to identify the **variables** of data they can compare to answer a scientific question. Example: **What amount of rainfall induced the largest amount of nitrogen fixation in the switchgrass?**

Educators help students learn to data sets that can help them answer their scientific questions from a large spreadsheet of data.

## Big Data → Tidy Data

Teaching students to effectively use large data sets that are available to the general public is an important skill to have when answering scientific questions. Students can obtain large data sets at [ter.kbs.msu.edu/data](http://ter.kbs.msu.edu/data). Helping students learn to use data in a spreadsheet where the variables are in **columns** ↓ and **observations** in → rows will help students set up data in a format where they can use technology to tell the story of the data when they graph the data set.

## ⇒ Using BIG Data from the LTER to Answer Scientific Questions ⇐



## Data Nugget Created From Research Experience - CER

An abbreviated version of the background of the scientific topic, the research methods, and data can be used with students to help them answer scientific questions. [datanuggets.org](http://datanuggets.org)



**Acknowledgements:** Carmella Vizza, Sarah Roley, G. Phil Robertson, Kevin Kahmark, Jorge Vázquez Custodio, Veronica Pargulski, Maggie Jones, Liz Schultheis, Kara Haas, and Aaron Reedy.

