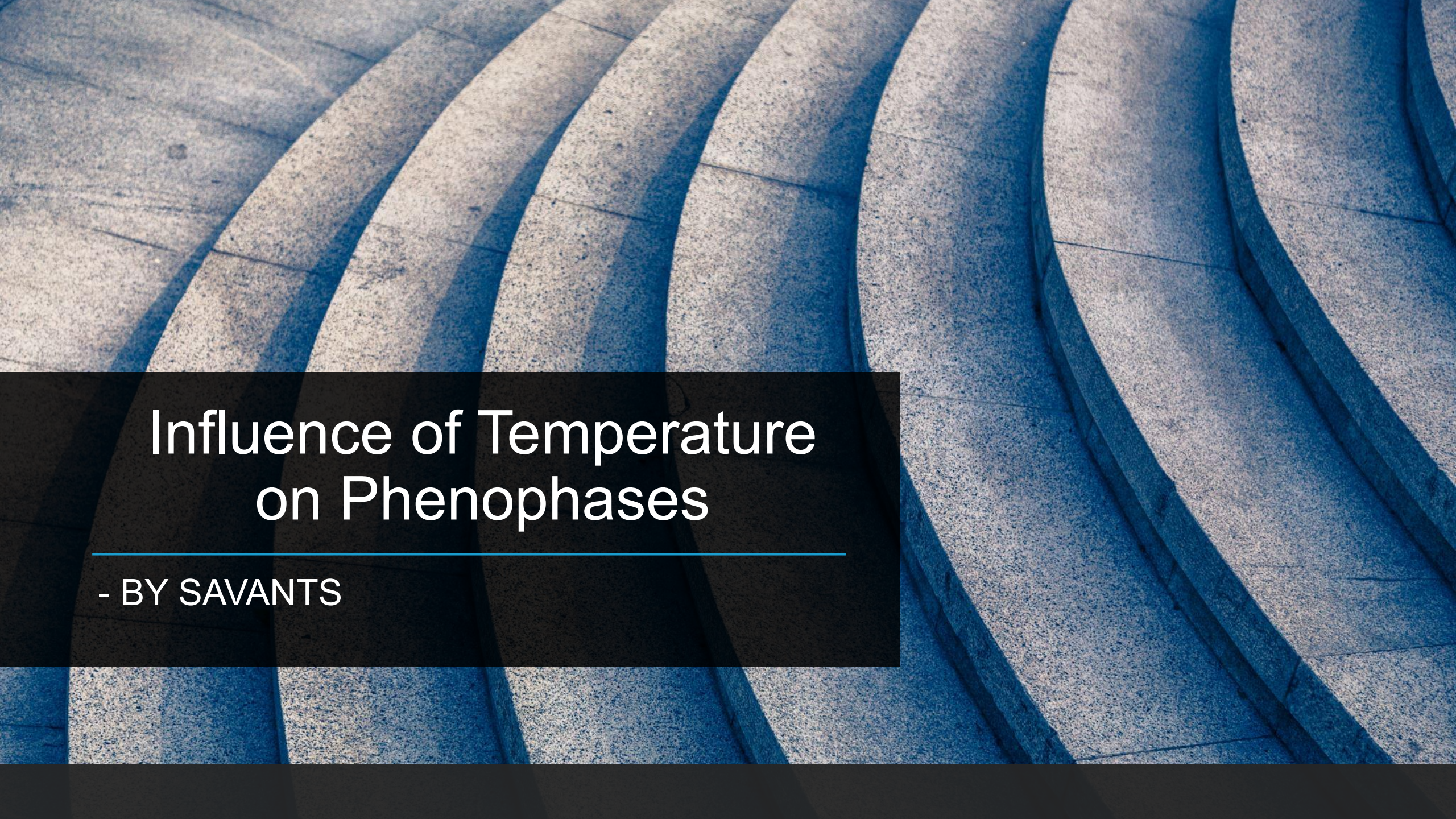


# Influence of Temperature on Phenophases

- BY SAVANTS

# Table of Contents

# Background Introduction

- Founded in 1957
- Mission: “the Linda Loring Nature Foundation is dedicated to preserving and protecting Nantucket's biologically diverse ecosystems. The Foundation's property, a living laboratory for research and education, advances broad community support and environmental understanding to respect the fragile habitats surrounding us”
- Needs:
  - educate communities with environment and habitats.
  - Enhance Community understanding on Phenology

# Research Questions

- What is the change pattern of both air temperature and soil temperature?
- Is there a time in a year that the most shrubs break their leaf buds? If so, when is that?
- How does the elevation variances among the 8 sites affect their temperature? Does the variance have a significant influence on the temperature?
- Are the number of breaking buds functionally dependent on the air temperature and soil temperature? If yes, what will that be?

# Importance of the Research Questions

- Prediction of temperature change
- Enhancement of Understanding of the Growth Patterns
- Identifying the influence of temperature on growth patterns
- Identifying the Influence of temperature on bradking leave buds
- Helping Sustain Diversity on the Island

# Stakeholders

- **Linda Loring Nature Foundation**

  **Officers, Trustees and Lifetime Trustees**

- **Community**
- **Business Partners**

  **Educational Institution, Sponsorship etc**

# Data Resources

- Dataset provided by Linda Lorin Foundation
  - Data collected since 2014 for 13 different months on daily and hourly basis.
  - 8 different sites
  - Soil temperature recorded for throughout the year of 2017.
- Nature's Notebook program
  - Recorded time at the breaking of buds.

# Data Usage

- Linda Loring Foundation (Given by Dr. Sarah T. Bois)

1. Date & Time
2. Temperature

- Nature's Notebook (downloaded from mom's nature notebook site)

1. Phenophase - Breaking of Bud
2. Intensity Data

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | Plot Title: Site A | | | | | | |
| 2 | # | Date Time | Temp, °C | Intensity | | | |
| 3 | 1 | 2/7/2018 11:00 | 7.782 | 10677.8 | | | |
| 4 | 2 | 2/7/2018 12:00 | 5.552 | 3272.2 | | | |
| 5 | 3 | 2/7/2018 13:00 | 4.727 | 1894.5 | | | |
| 6 | 4 | 2/7/2018 14:00 | 4.623 | 635.1 | | | |
| 7 | 5 | 2/7/2018 15:00 | 6.37 | 2238.9 | | | |
| 8 | 6 | 2/7/2018 16:00 | 7.28 | 129.2 | | | |
| 9 | 7 | 2/7/2018 17:00 | 9.472 | 0 | | | |
| 10 | 8 | 2/7/2018 18:00 | 9.669 | 0 | | | |
| 11 | 9 | 2/7/2018 19:00 | 9.077 | 0 | | | |
| 12 | 10 | 2/7/2018 20:00 | 7.582 | 0 | | | |
| 13 | 11 | 2/7/2018 21:00 | 8.082 | 0 | | | |
| 14 | 12 | 2/7/2018 22:00 | 8.581 | 0 | | | |
| 15 | 13 | 2/7/2018 23:00 | 6.471 | 0 | | | |
| 16 | 14 | 2/8/2018 0:00 | 4.934 | 0 | | | |
| 17 | 15 | 2/8/2018 1:00 | 2.41 | 0 | | | |
| 18 | 16 | 2/8/2018 2:00 | 1.656 | 0 | | | |
| 19 | 17 | 2/8/2018 3:00 | 0.563 | 0 | | | |
| 20 | 18 | 2/8/2018 4:00 | -0.325 | 0 | | | |
| 21 | 19 | 2/8/2018 5:00 | -1.341 | 0 | | | |
| 22 | 20 | 2/8/2018 6:00 | -1.57 | 0 | | | |
| 23 | 21 | 2/8/2018 7:00 | -1.799 | 204.5 | | | |
| 24 | 22 | 2/8/2018 8:00 | -1.341 | 4305.6 | | | |
| 25 | 23 | 2/8/2018 9:00 | 1.33 | 13089 | | | |
| 26 | 24 | 2/8/2018 10:00 | 9.965 | 27555.7 | | | |
| 27 | 25 | 2/8/2018 11:00 | 6.166 | 33066.9 | | | |
| 28 | 26 | 2/8/2018 12:00 | 4.519 | 26178 | | | |
| 29 | 27 | 2/8/2018 13:00 | 3.683 | 23422.4 | | | |

Site_A

This is how data for one site looks like

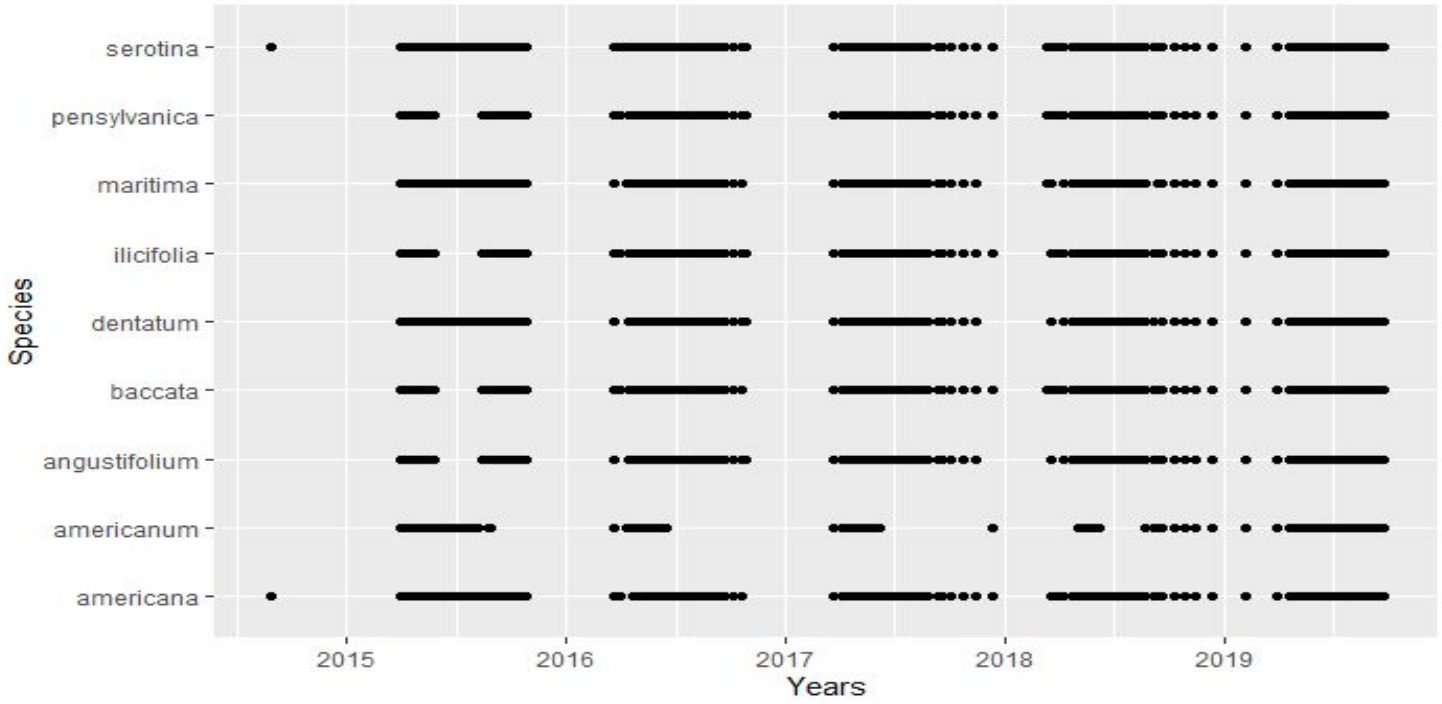
# Improvements in Data Set

- Elimination of rows
- Merging of two different data sets.

# Interpretation of Data

We have created some Plots so that it will be easy for us, for client, for audience to understand the data and can easily interpret it.

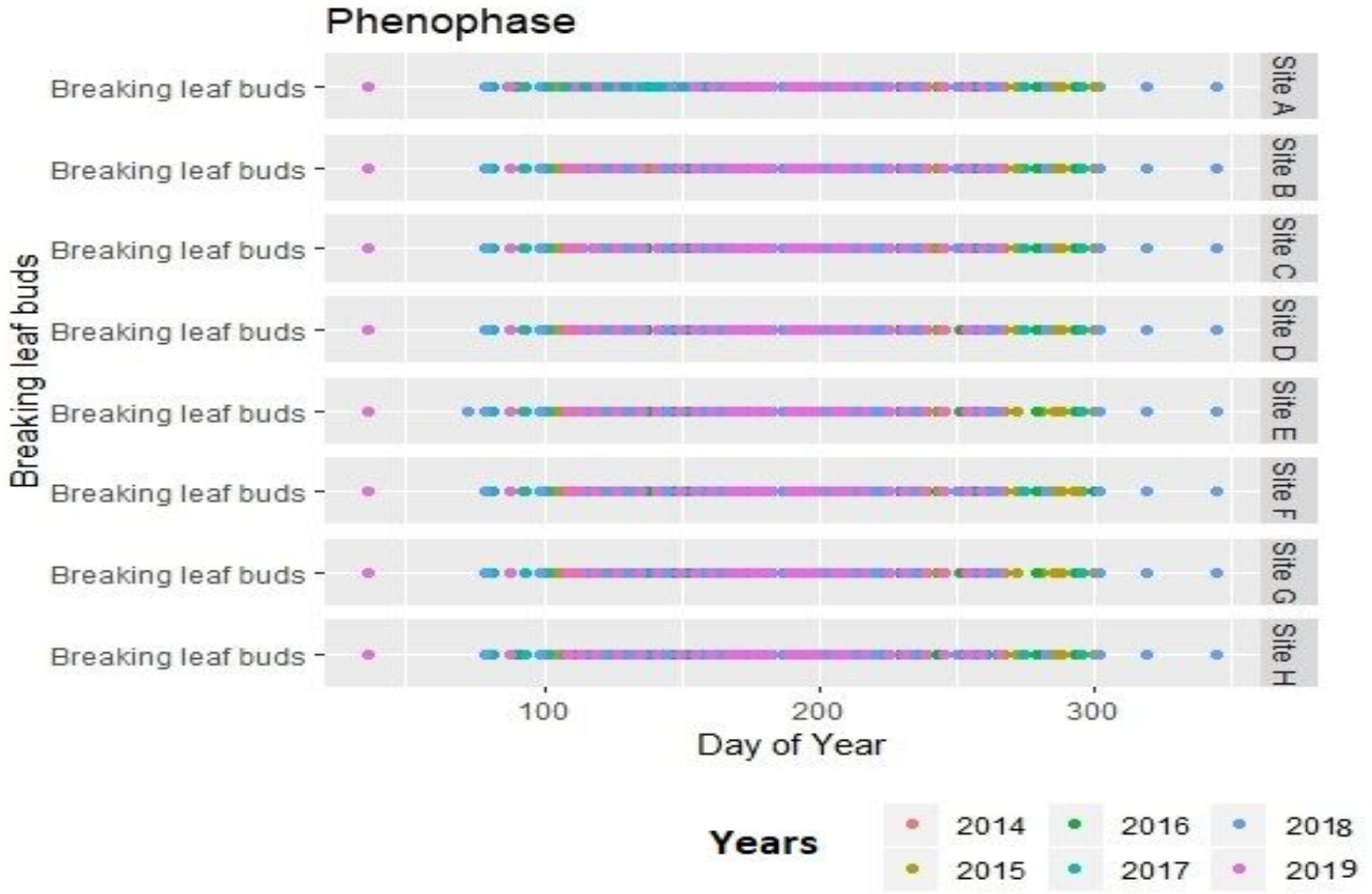
**Plot 1: Presence of Species over the Years**



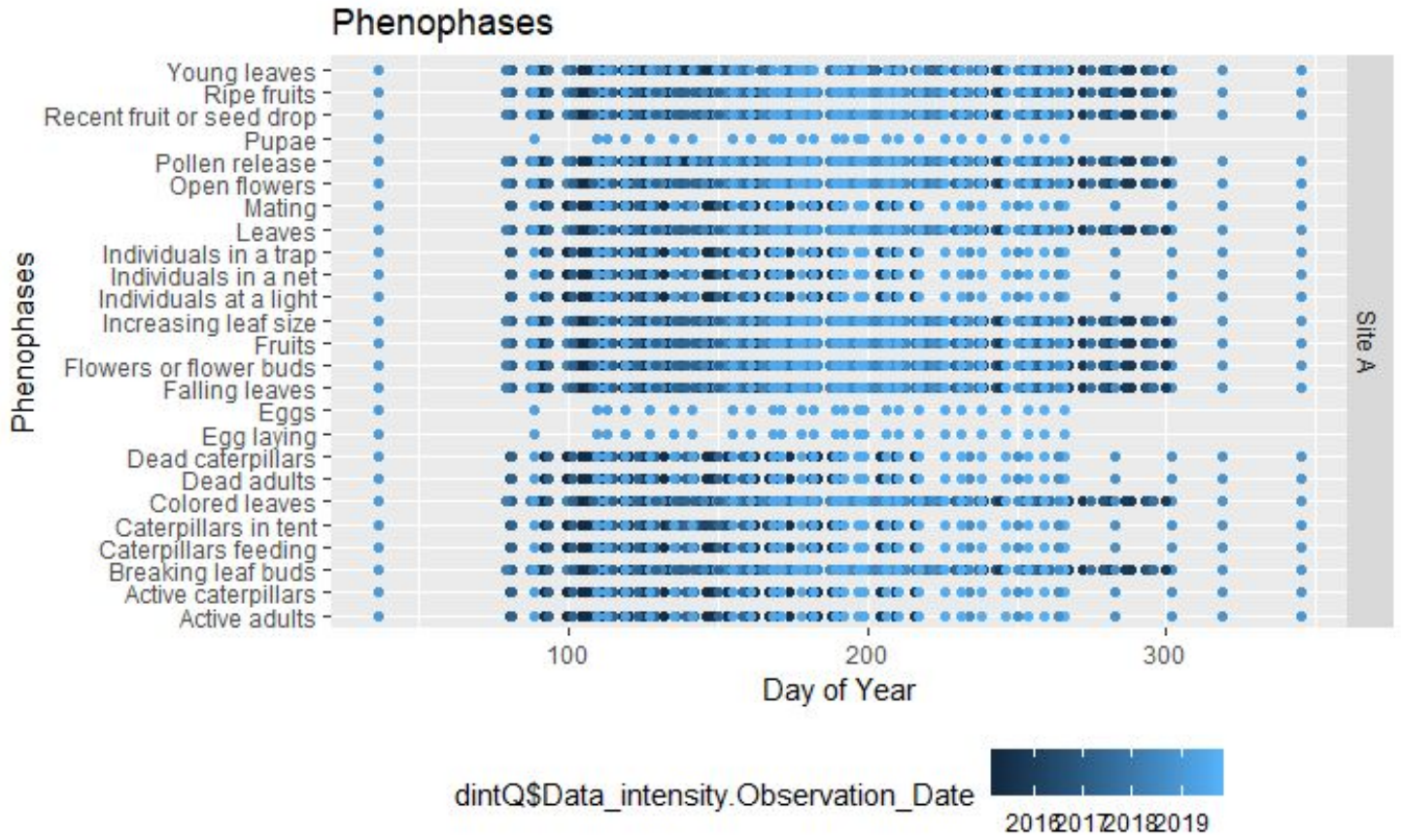

This graph represents the Phenophase "Breaking bud leaf" for each species across the years on the Site A. We can plot for another sites with the same script. From above graph we can conclude that Breaking bud leaf happened after April and stops around october

# Plot 2: Breaking leaf Buds with Day of the Year

This graph represents the presence of Breaking leaf bud phenophase over the years on the each site. From this graph we can conclude that Breaking Leaf Bud phenophase started around 90th day of the year that is March Ending and occured till 300th day that is around october ending

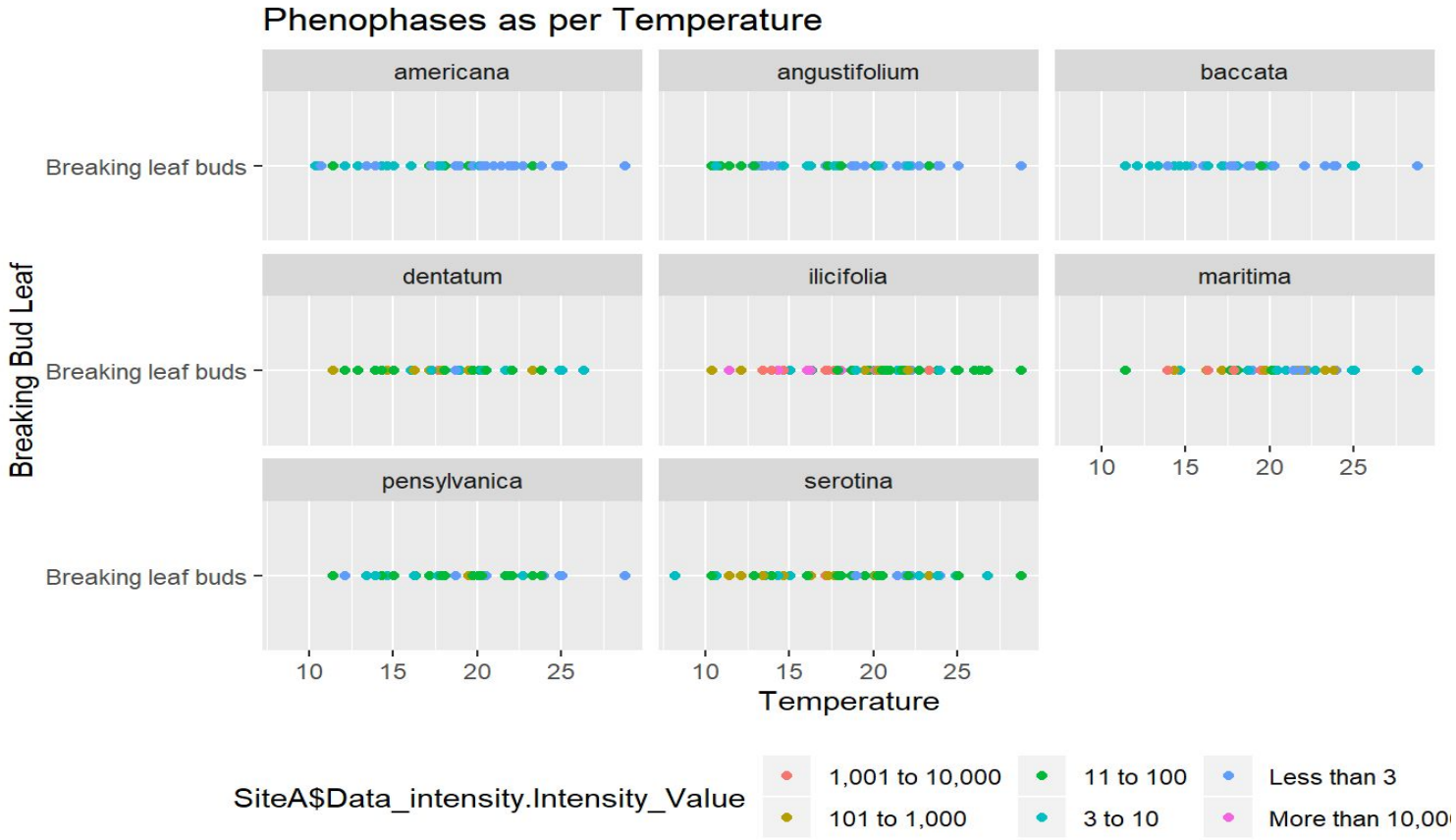


# Plot 3: All Phenophases on the Site A



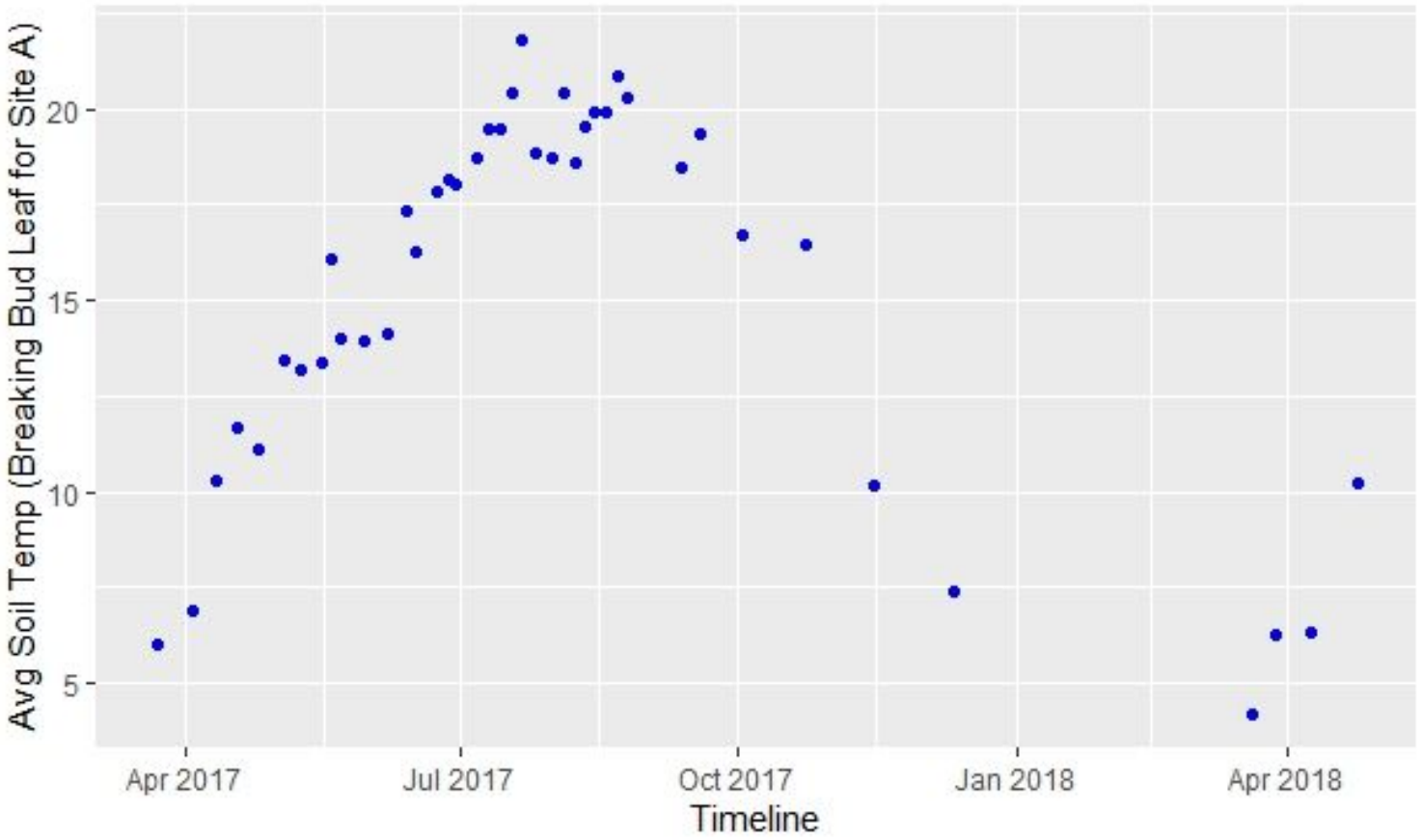

This plot shows the All Phenophase for each species on the Site A over the years from 2015 to 2019. Let's take an example of "Egg" Phenophase this happened between day of the year 100-280.

# Plot 4: Breaking leaf bud Phenophase for each species and relation with Average Temperature and their Intensities




This graph represents the intensity of Breaking Bud leaf for every species on Each site and on what temperature Breaking Bud Phenophase occurred. From this graph we conclude that breaking bud leaf event occurs when temperature range is from 10 to 25 degree celsius.

# Plot 5: Effects of Soil Temperature on Breaking bud leaf




This graph represents the ow Soil Temperature affects the Breaking bud phenophase. As we can conclude from this graph that Breaking bud happened around Apr to July and Average Temperature is above 5 degree celsius.

# Recommandation

**Before Plotting the data, we have cleaned it so that it will be easy to interpret. Below are the some recommandations**

- Try to keep the name of the columns short and understandable.
- During cleaning the data, we noticed that many Intensity values are -9999 which doesn't make any sense.
- There are some missing values so instead of keep them as it is, try to replace with "NA".
- Dataset we have used for phenophases and intensity values, it doesn't have Temperature data, it should be more convenient to plot the data if Temperature values are there of everyday.