# The Morton Arboretum

Phenology of Oaks from Around the World

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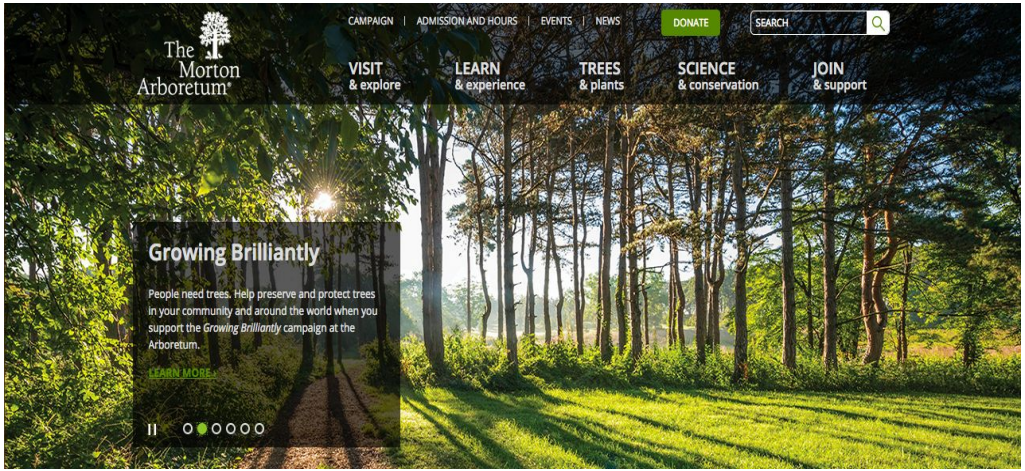
# Agenda

- About Morton Arboretum
- Interesting facts about Oak Species
- Our Research Questions
- Why the questions are important?
- Who should care?
- About Data
- Limitation/Restriction of the data
- Interpretation of the data
- Decisions based on our analysis

# Morton Arboretum

- Founded: 1922 by Joy Morton
- 1,700 acres of land that holds live plants from around the world
- Main Focus: health and improvements of the trees



# Interesting Facts about Oak Trees

- There are about 600 extant species of “oaks”
- OAK trees are widely found in Asia and North America where in North America contains the Largest number of “oak” species with an estimation of more than 90 species
- A wide variety of “oak” tree species are deciduous and most of them do not shed its leaves until spring
- Oak has been chosen as a national tree for many countries such as USA in the year 2004, Germany, England, etc.,
- Oaks are more likely struck by lightning than the other trees.

# Research Question

1. Overview of the species
2. How are the phenophases of 4 species which are from different parts of the world respond to environment at Morton Arboretum?
3. Does the number of flower and leaf budding impact the number of fruits observed?
4. Leaf Increasing Size Observed vs Leaf Increasing Size Intensity [2017 vs 2018]
5. Leaf Falling Observed [2017 vs 2018]
6. Flower Buds Observed vs Flower Buds Intensity [2017 vs 2018]

Leaf increasing size observed: are leaves increasing in size
Leaf increasing size  intensity: estimate of the what percentage of full size are most leaves

# Why the questions are important?

- Provide insight of the lifecycle of the oak from around the world
- To differentiate between the species
- To identify if there is any correlation between  leaf budding, flower budding and fruit time.

# Who should care?

- Tree in general improves environment. Oak is one of them. Improves environmental conditions in a landscape and also help stabilize soil with its root system.
- Provides habitat and food for wildlife
- Durable tree so as the tree matures it can be harvested for construction

# About data

**Where the data came from?**

- Received the data from Dr. Christy Rollinson: a Forest Ecologist at Morton Arboretum
- Data is about the phenophase of the Oak tree for year 2017 and 2018: monitors oak phenology in terms of buds, leaves, flowers, and acorns within The Morton Arboretum Oak Collection

**How we used it?**

- Used it to identify if there is any correlation between the phenophase
- Used data to differentiate species  between year 2017 and 2018

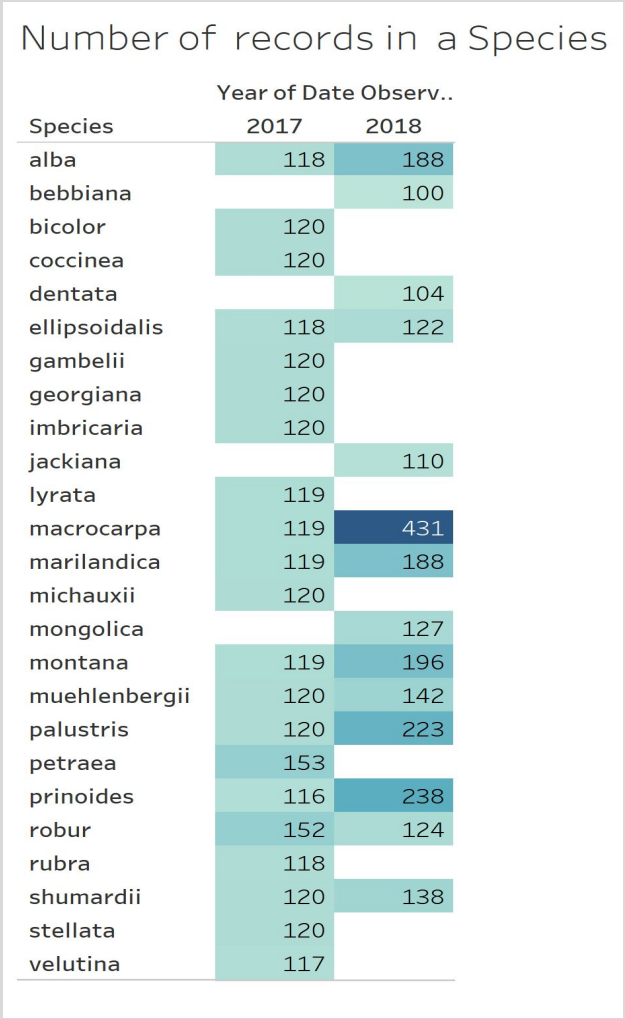
# Limitation/Restriction of the data

- **Species behaviour**: We do not have information about the behavioural nature of different species across the world
- **2018 data**set: is until the first week of August however 2017 is from March to Dec which had restricted us to analyze the trend better

# Interpretation of the data

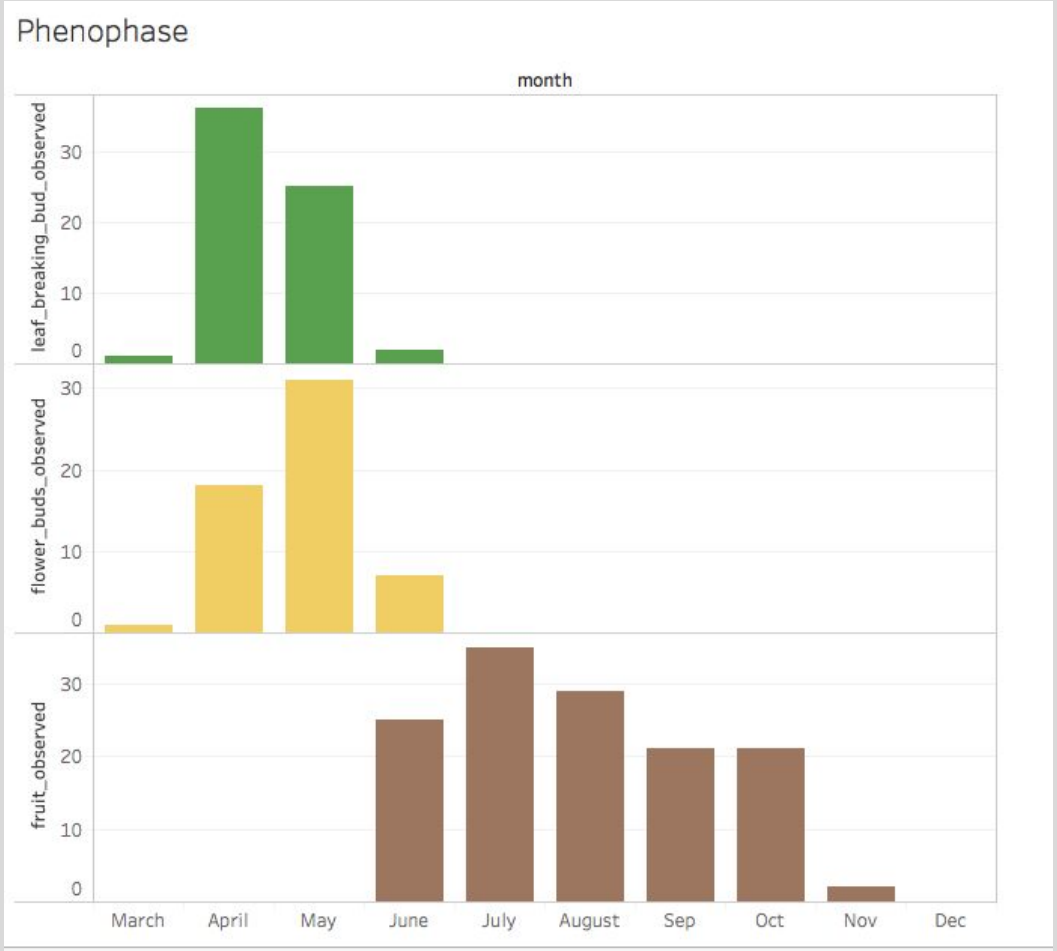
# Overview of the Species

Answers research question 1



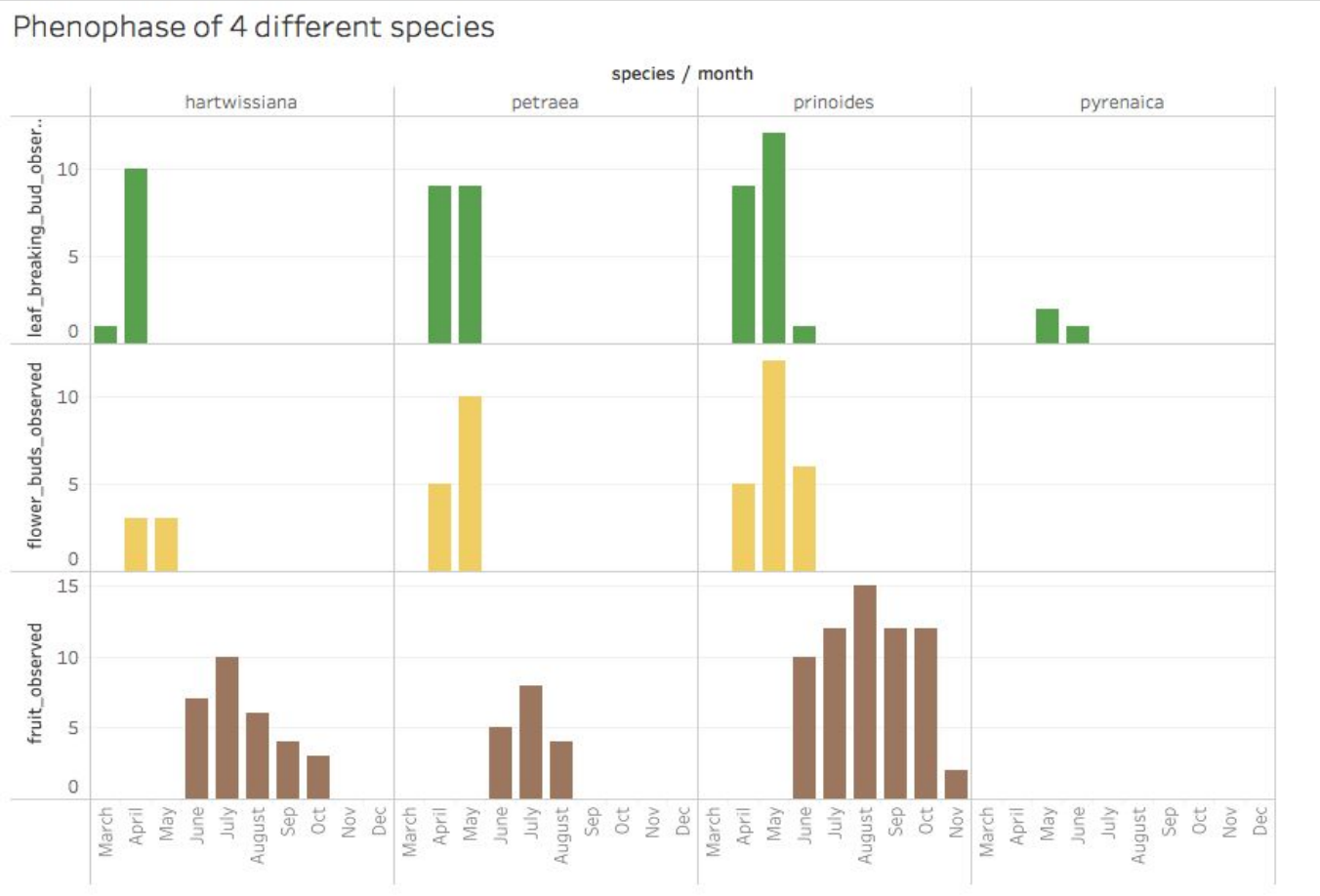

| Species | Year of Date Observ.. 2017 | 2018 |
|---|---|---|
| alba | 118 | 188 |
| bebbiana | | 100 |
| bicolor | 120 | |
| coccinea | 120 | |
| dentata | | 104 |
| ellipsoidalis | 118 | 122 |
| gambelii | 120 | |
| georgiana | 120 | |
| imbricaria | 120 | |
| jackiana | | 110 |
| lyrata | 119 | |
| macrocarpa | 119 | 431 |
| marilandica | 119 | 188 |
| michauxii | 120 | |
| mongolica | | 127 |
| montana | 119 | 196 |
| muehlenbergii | 120 | 142 |
| palustris | 120 | 223 |
| petraea | 153 | |
| prinoides | 116 | 238 |
| robur | 152 | 124 |
| rubra | 118 | |
| shumardii | 120 | 138 |
| stellata | 120 | |
| velutina | 117 | |

# Phenophase based on month for all Oak species



## Phenophase of 4 species from 4 different place

Answers research question 2 and 3



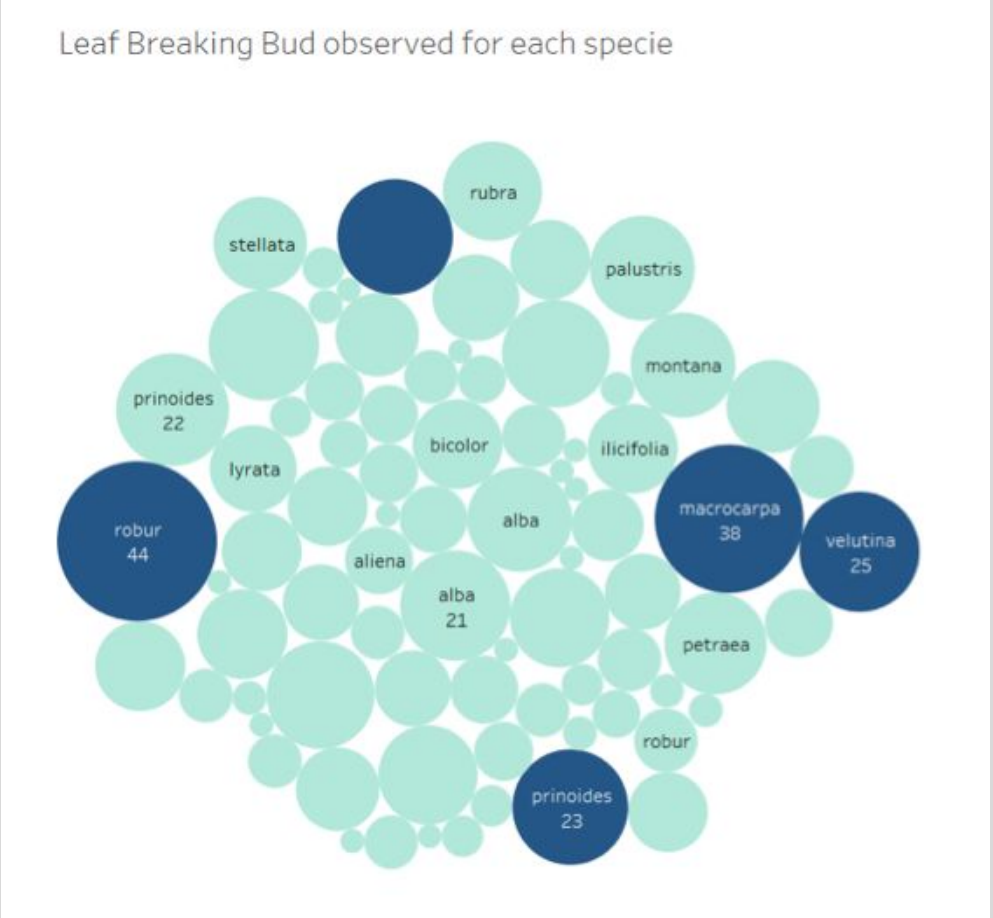

| | |
|---|---|
| Leaf | |
| Flower | |
| Fruit | |

| | |
|---|---|
| hartwissiana | Asia |
| petraea | Europe |
| prinoides | North American |
| pyrenaica | Africa |

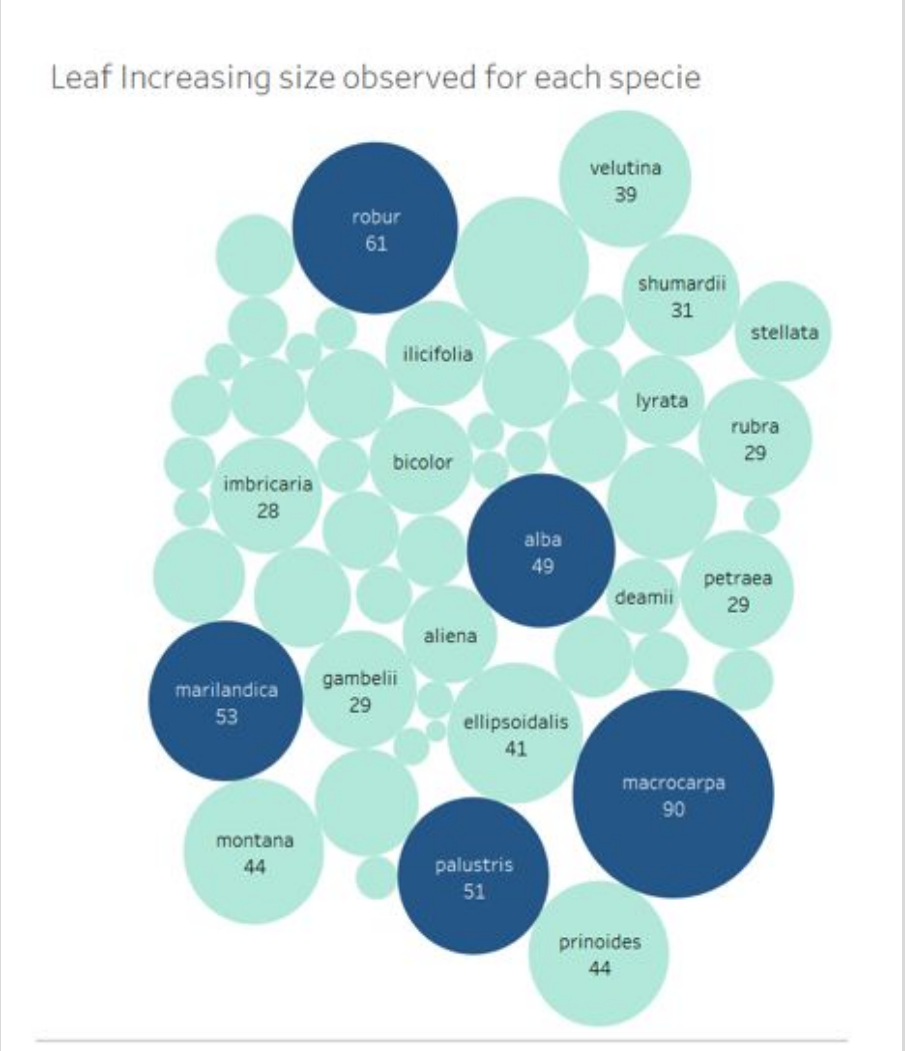
# Drill through level 1 for the following phenophases

- Leaf Breaking Buds Observed
- Leaf Increasing Size Intensity
- Flower Buds Observed
- Fruits Observed

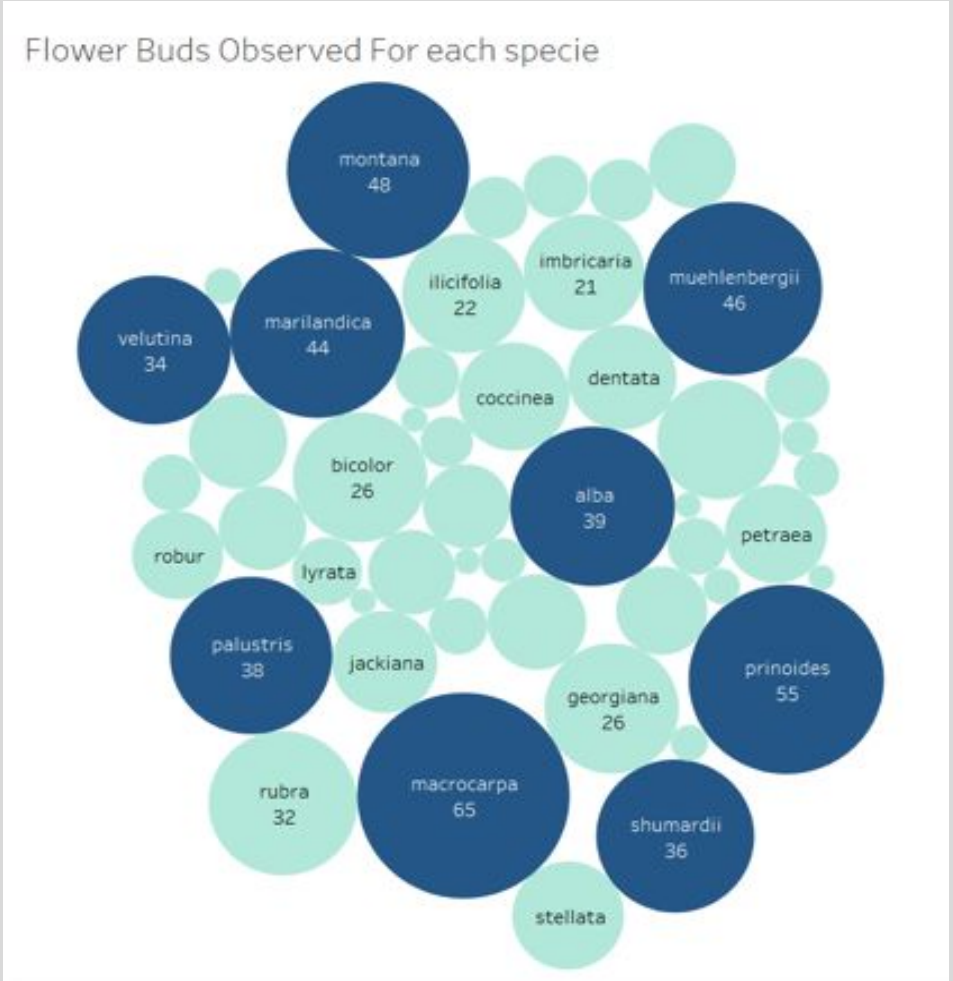
# Leaf Breaking Bud Observed



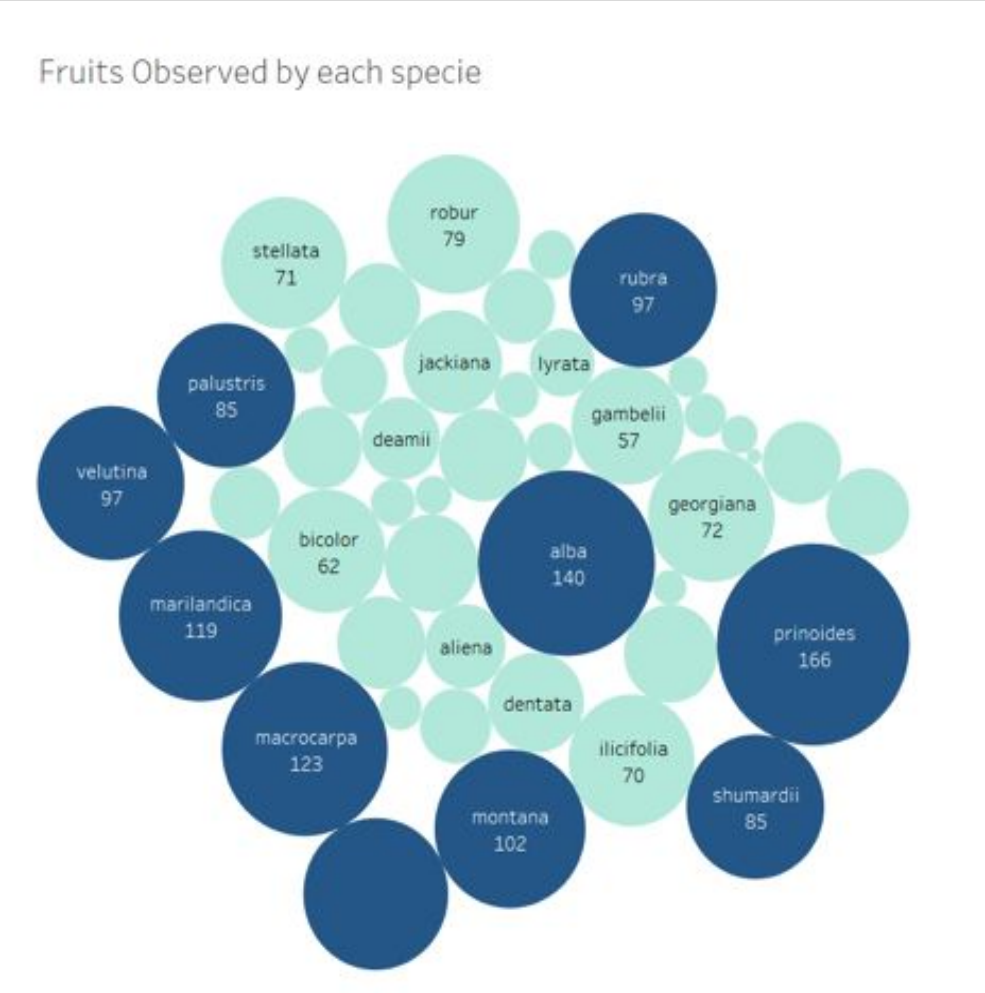
# Leaf Increasing Size Observed



# Flower Buds Observed



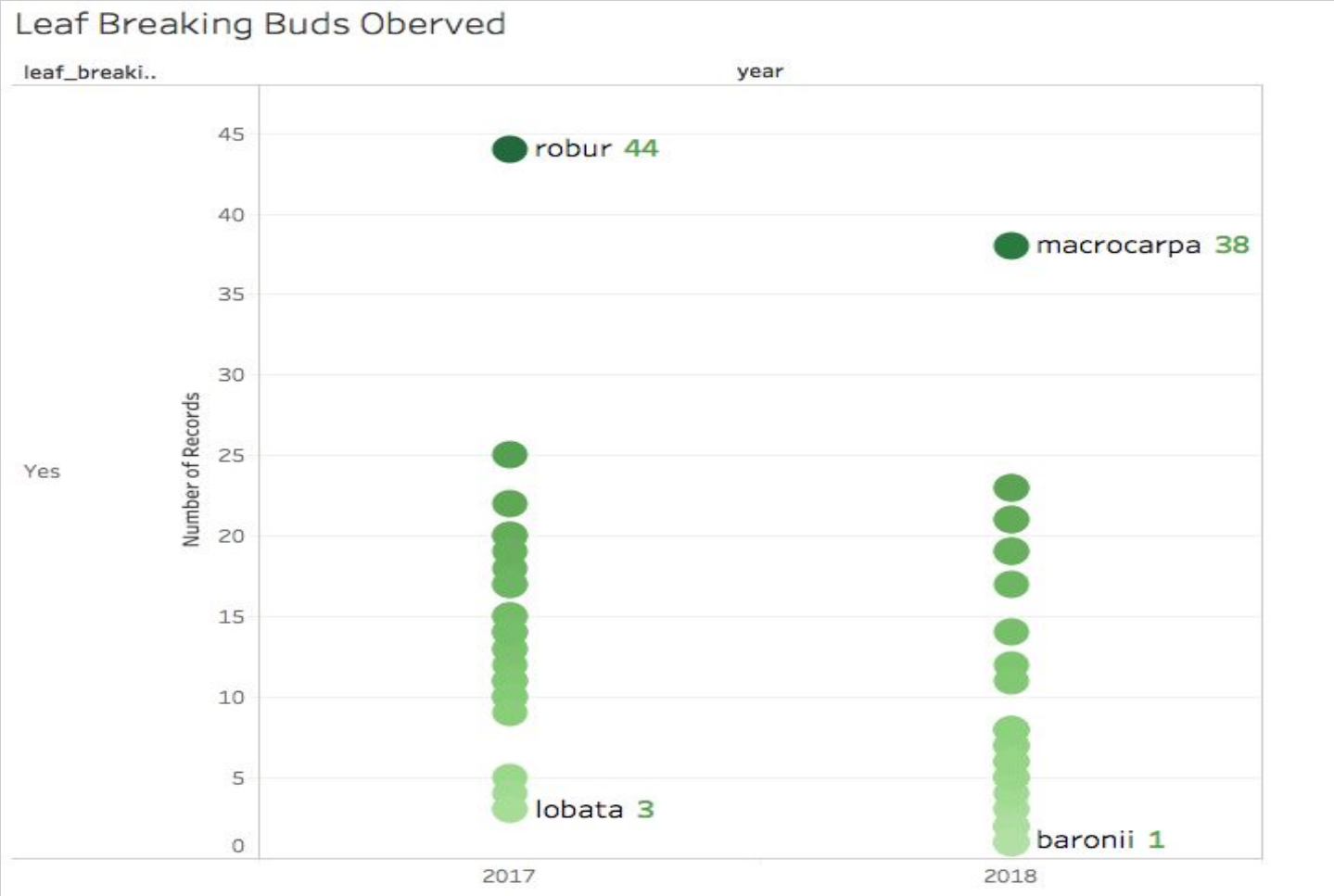
# Fruits Observed



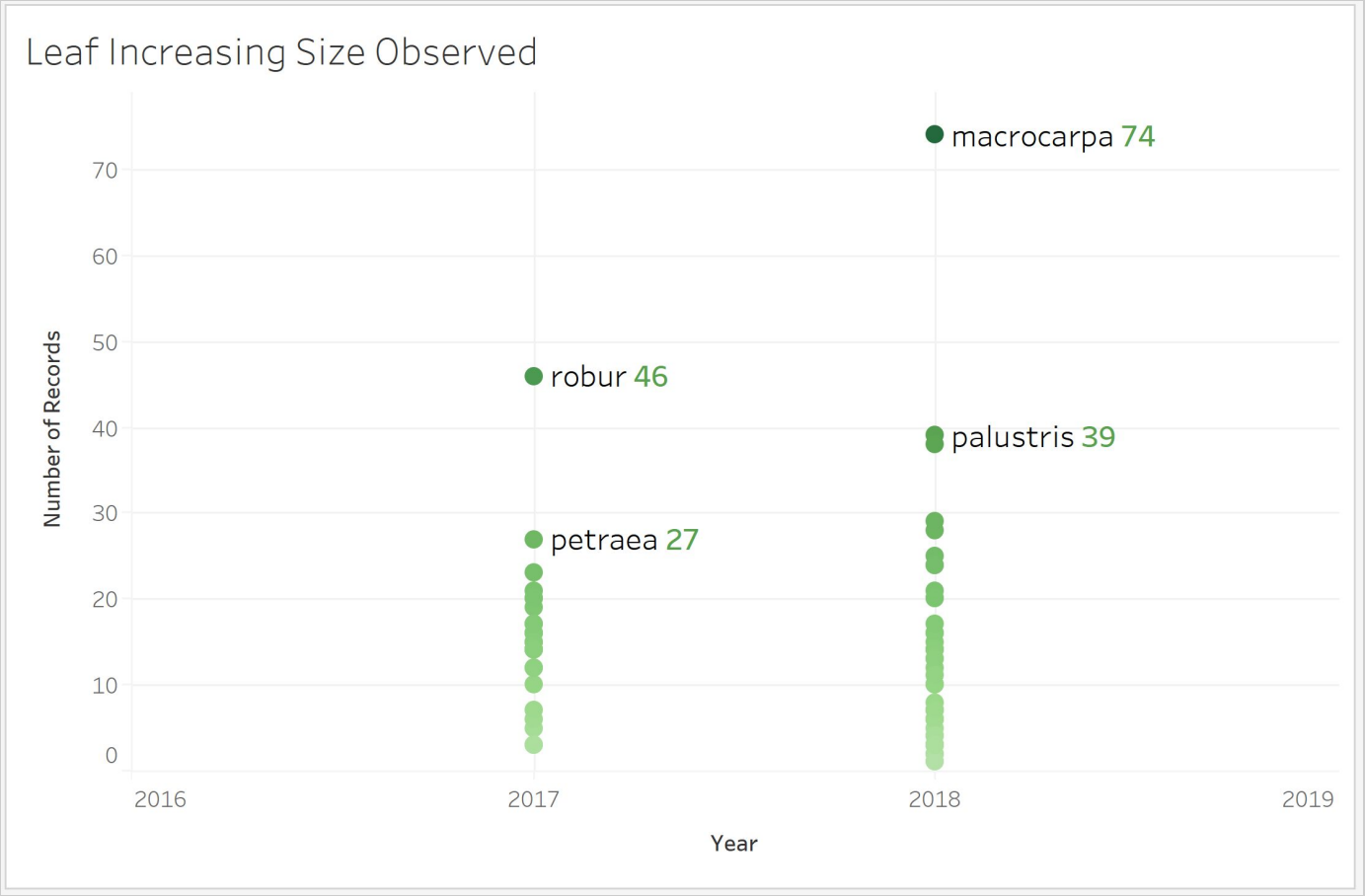
# Drill through level 2 for the following phenophases

- Leaf Breaking Buds Observed
- Leaf Increasing Size Intensity
- Flower Buds Observed
- Fruits Observed

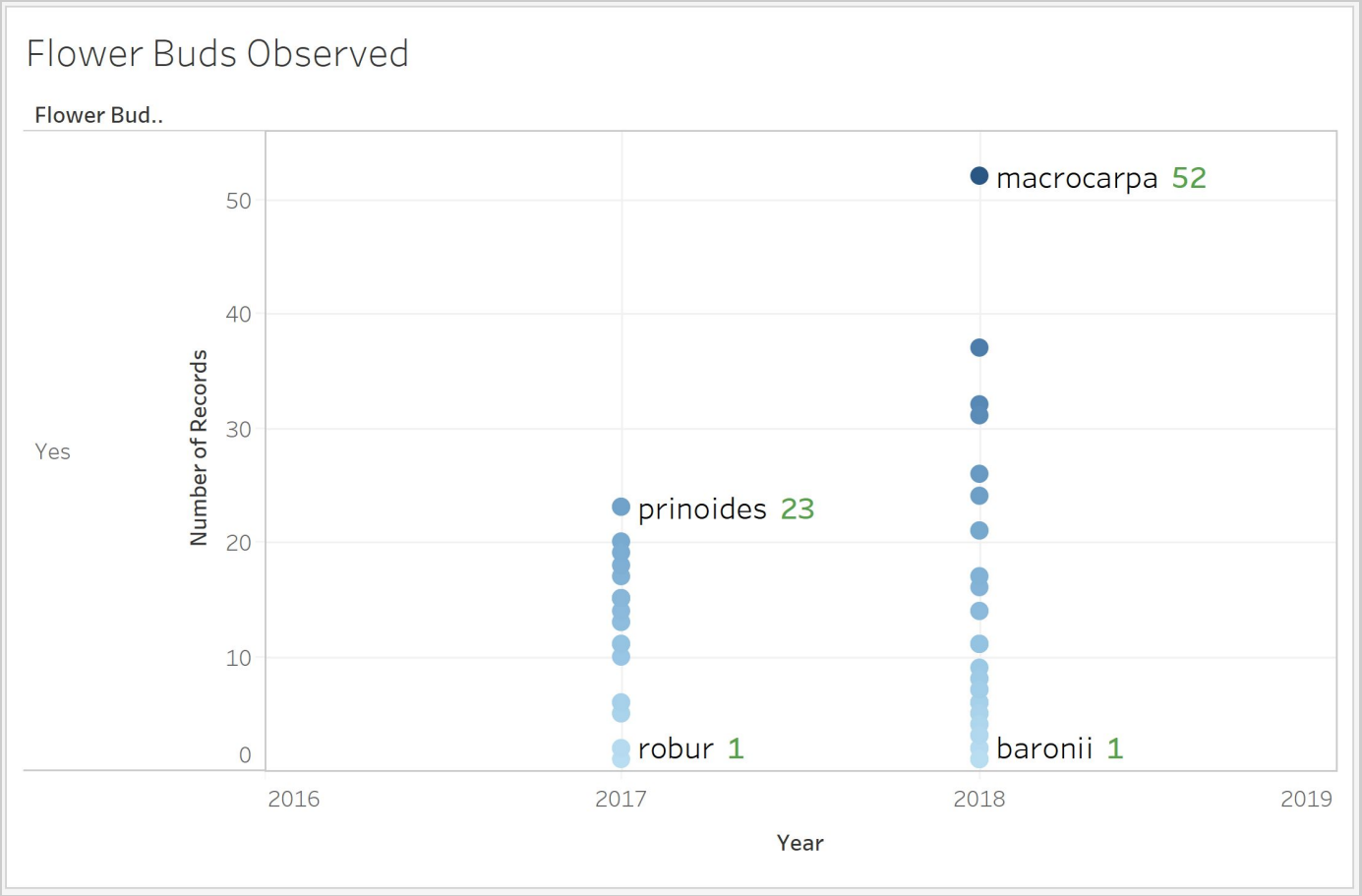
# Leaf Breaking Bud Observed



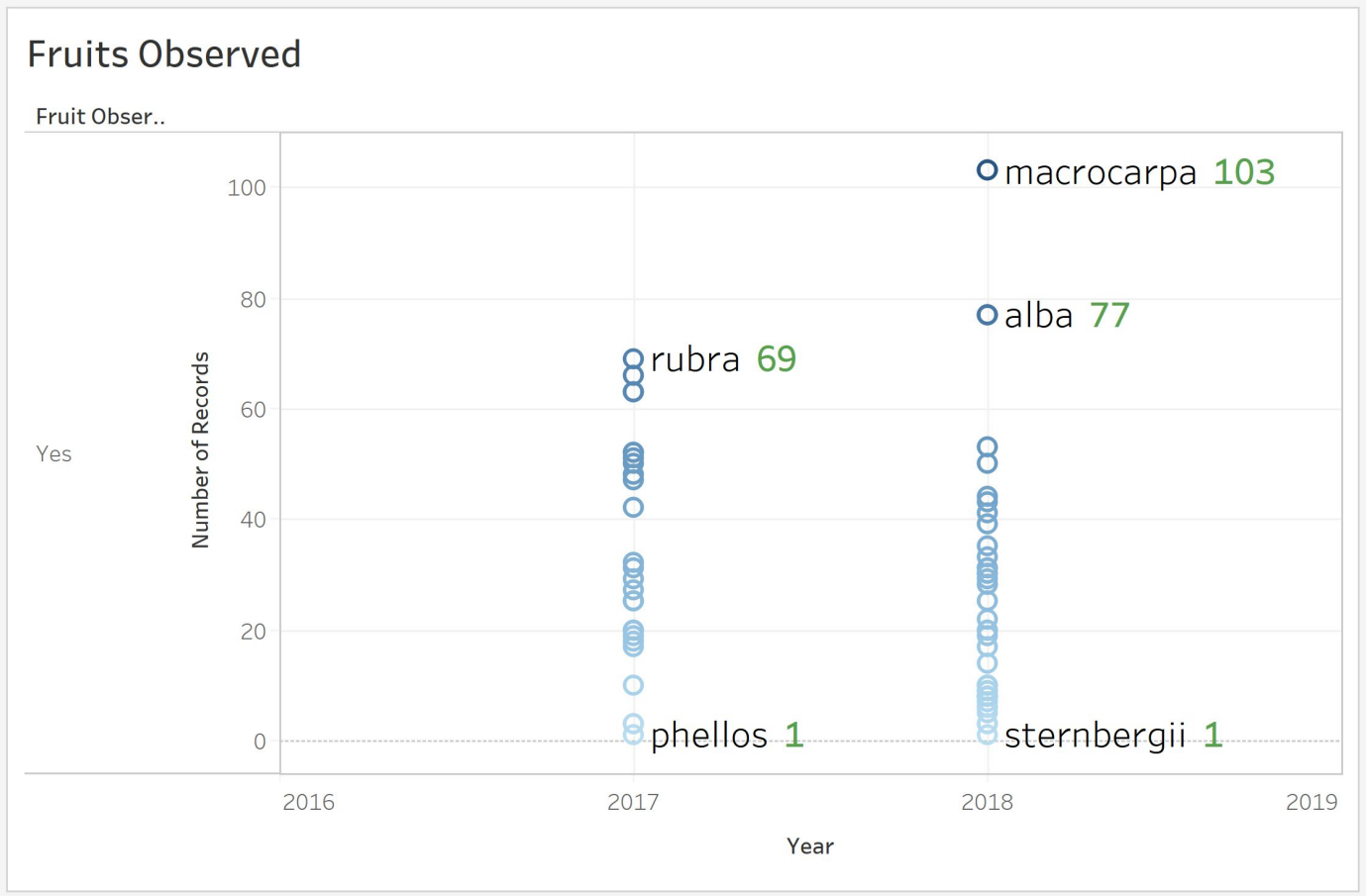
# Leaf Increasing size Observed



# Flower Buds Observed



# Fruits Observed



# Drill through level 3 for the following phenophases

Answers research question 4, 5 & 6

4. Leaf Increasing Size Observed vs Leaf Increasing Size Intensity [2017 vs 2018]

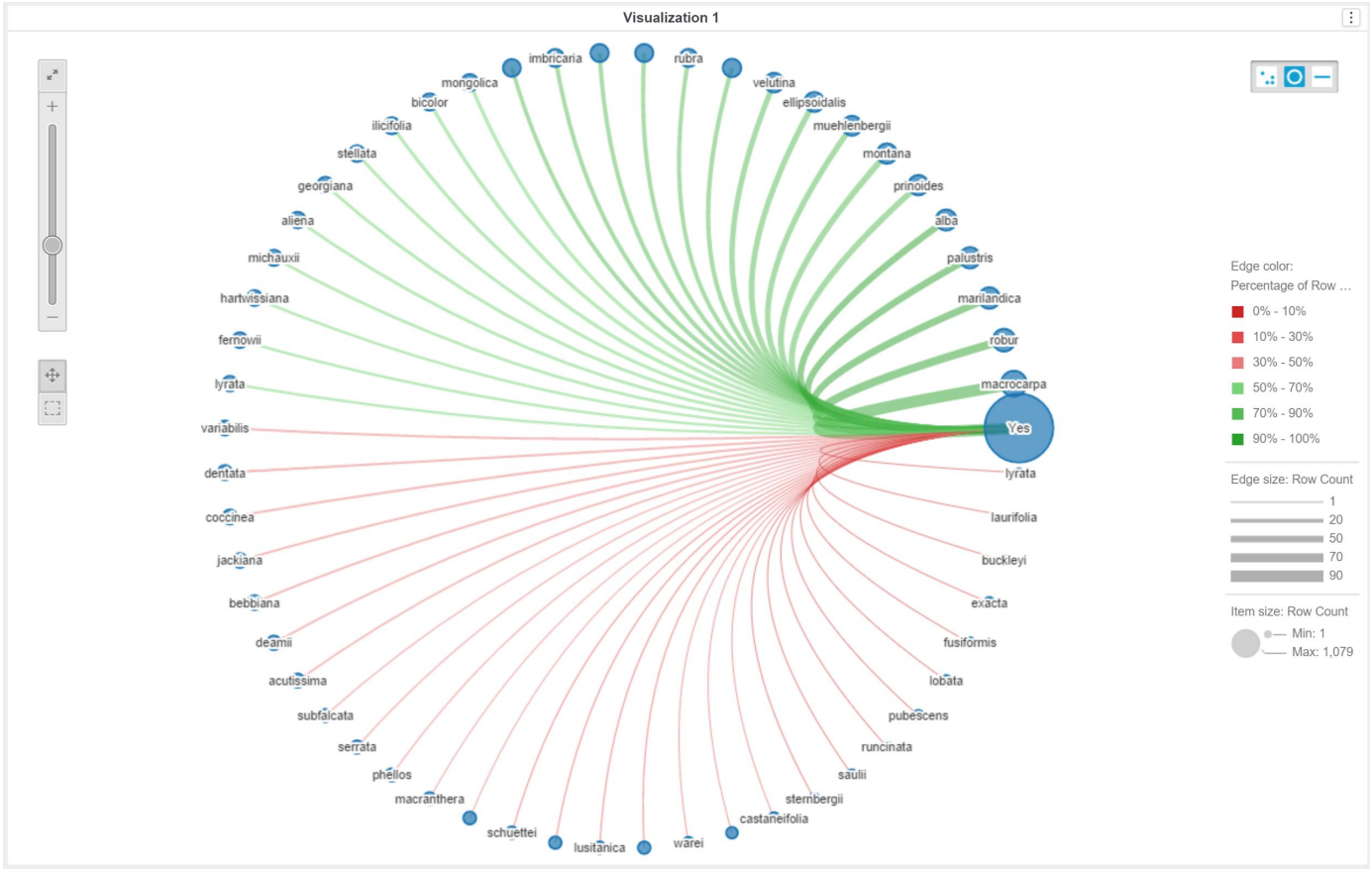
5. Leaf Falling Observed [2017 vs 2018]

6. Flower Buds Observed vs Flower Buds Intensity [2017 vs 2018]

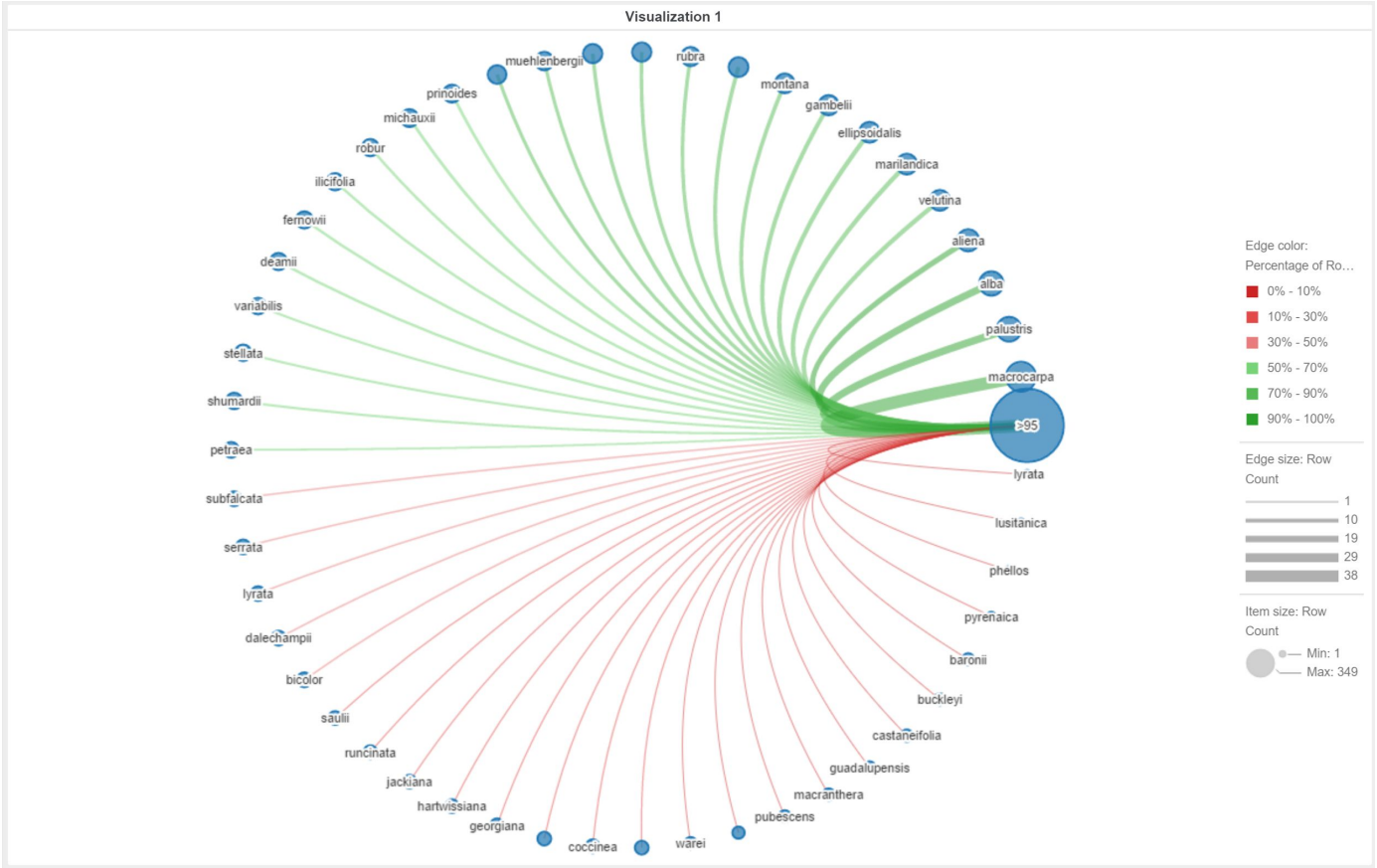
**2017 vs 2018**

- Leaf Increasing Size Observed
- Leaf Increasing Size Intensity
- Leaf Falling Observed
- Flower Buds Observed
- Flower Buds Intensity
- Leaf Breaking Buds Intensity

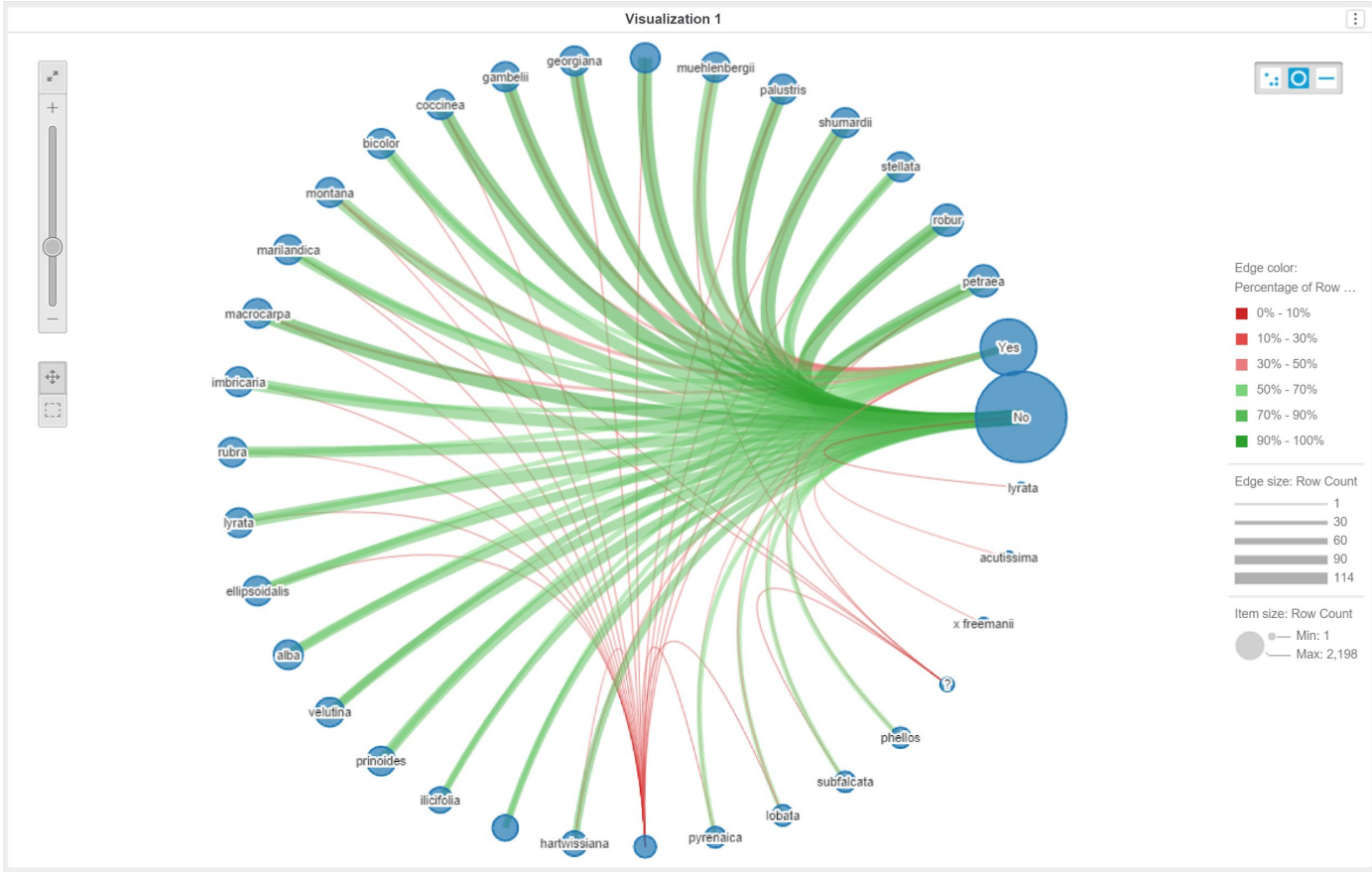
# Leaf Increasing Size Observed



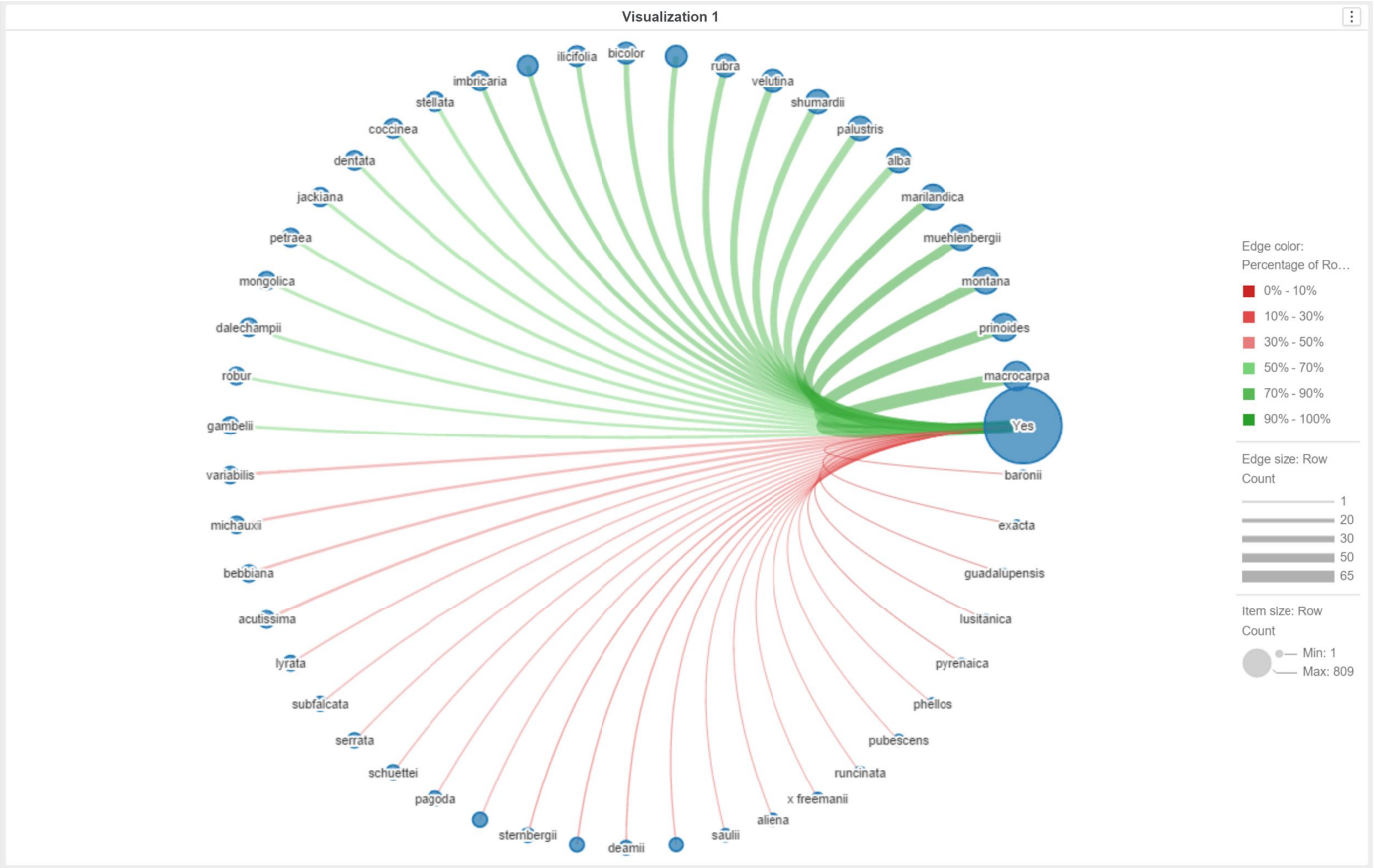
# Leaf Increasing Size Intensity



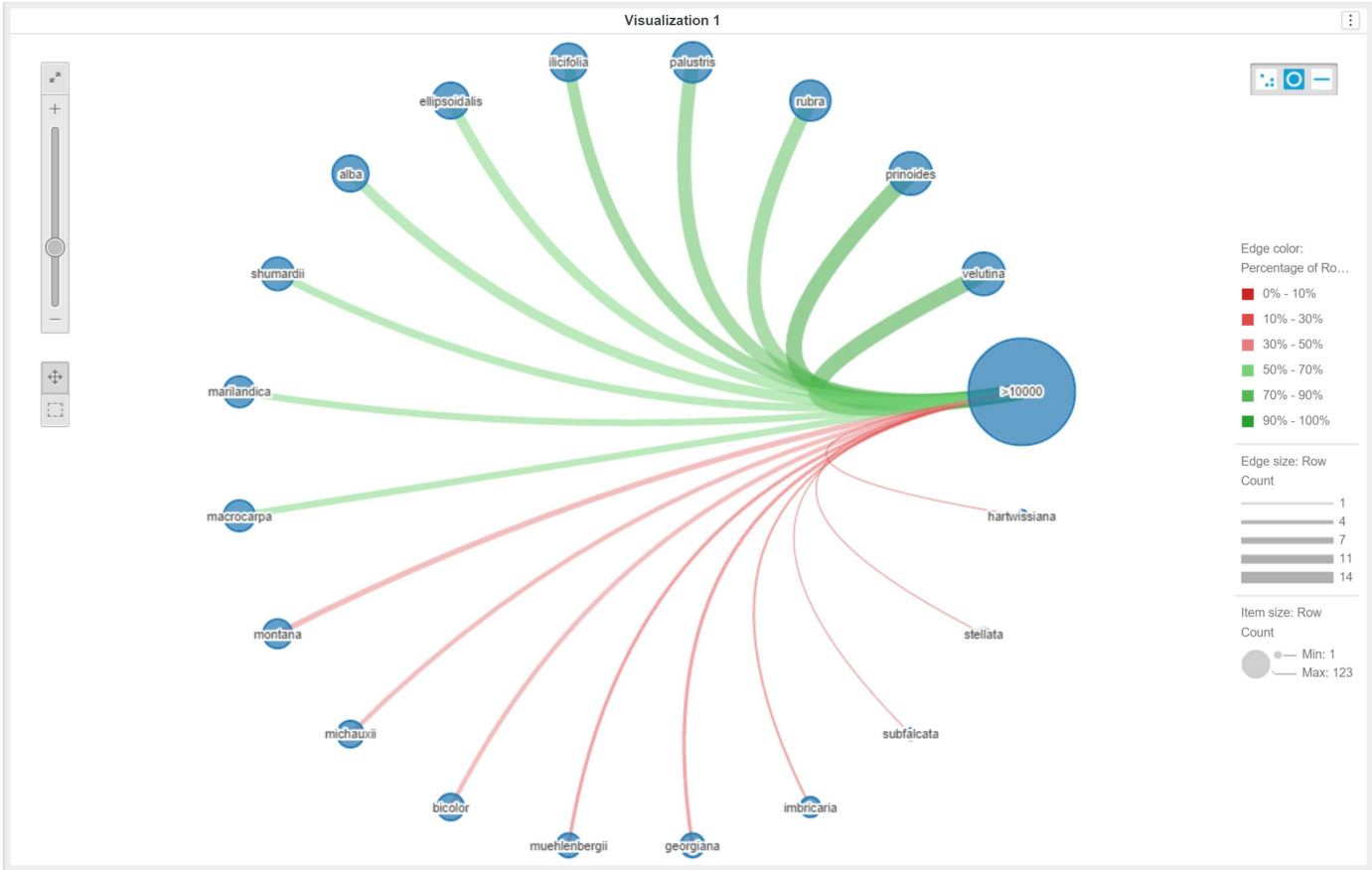
# Leaf Falling Observed



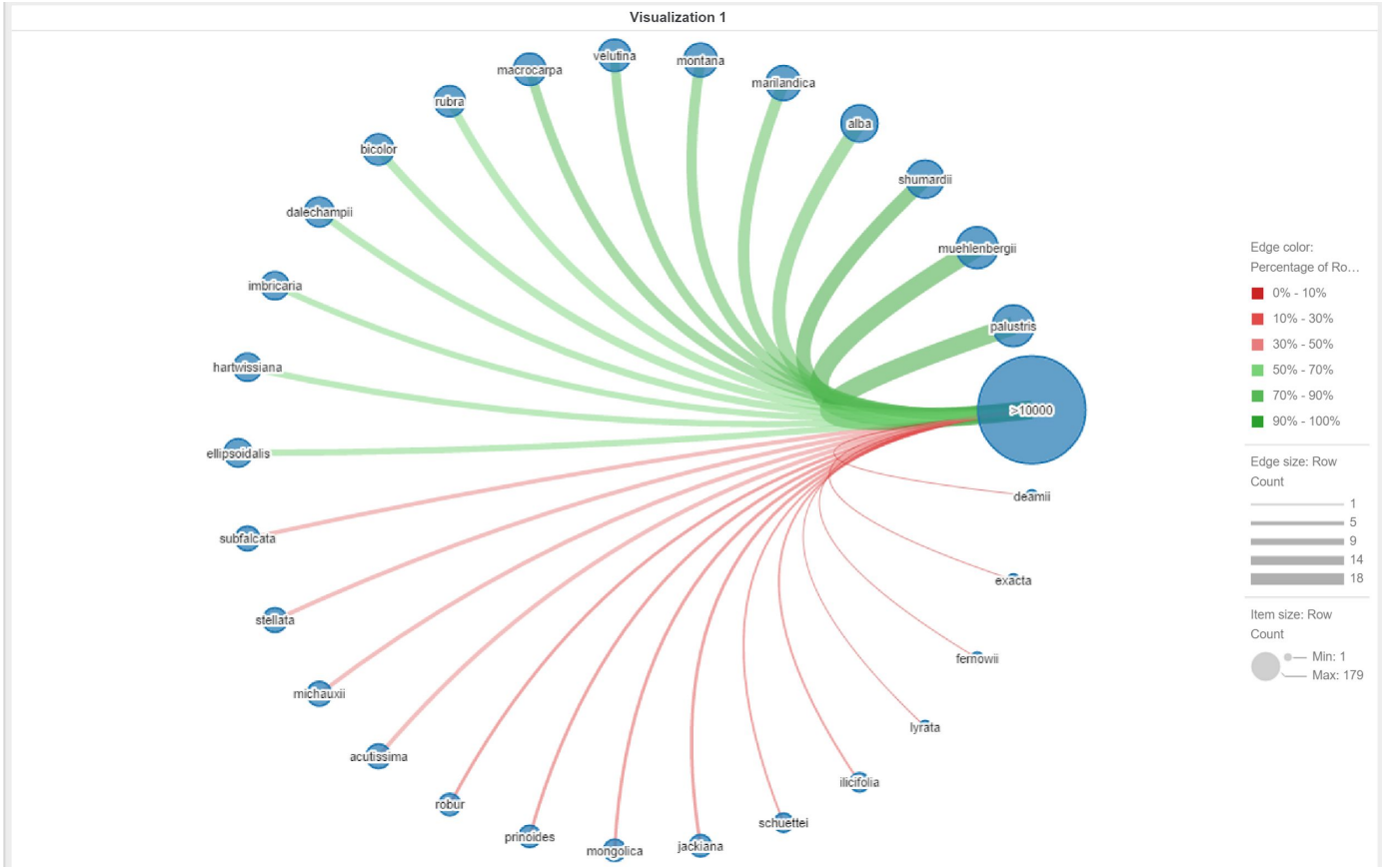
# Flower Buds Observed



# Flower Buds Intensity



# Leaf Breaking Bud Intensity



# Decisions based on our analysis

- **Species Behaviour:** The North American species **Prinoides** responded well to the environment when compared with species around the world.
- **Flower Buds Observed vs Intensity [2017 vs 2018]:** They are not the same for any species during any year
- **Leaf Increasing Size Observed vs Intensity [2017 vs 2018]:** They are the same for for both the years. It is species Macrocarpa.
- **Leaf Falling Observed [2017 vs 2018]:** Insufficient Data