



Name _____

Lilac Festival

Inquiry Overview

Lilacs are an iconic plant that flower in the spring in many parts of the United States. Using data from Project Budburst, a citizen science project in which volunteers monitor the timing of plant life cycle events, you will predict the best date to host a lilac blossom festival so that lilacs are in full bloom.

Step 1: Plant throughout the year.

Reflect on your own or share with a family member:

- What changes where you live tell you that spring or fall is here?
- What events do you celebrate at a specific time of year that you associate with a plant?

Step 2: Consider an interesting phenomenon.

People often host festivals to celebrate specific plants. One celebrated plant is the common lilac. In Rochester, New York, as well as other parts of the country, people host festivals when the lilacs are in full bloom.

Watch this [news clip](#) of the Rochester Lilac Festival that was posted in September 2018. The festival took place in May 2019.

Reflect:

- How could they know when the lilacs will be in bloom 8 months in advance?



Step 3: Learn about lilacs.

Read about the common lilac below. (from www.budburst.org/plants/common-lilac)



(Image from www.budburst.org/plants/common-lilac)

Scientific name: *Syringa vulgaris*

Plant family: [Oleaceae](#)

Leaves

The leaves are simple, smooth, and heart-shaped. They are 2 to 5 in (5 to 12.5 cm) long and dark green in color.

Flowers

Common lilacs have very conspicuous flowers. The small, fragrant, showy flowers grow in clusters 4 to 8 in (10 to 20 cm) long. Generally, they are purple, lilac, or white in color.

Fruits

The fruiting capsules are 0.39 to 0.59 in (1 to 1.5 cm) long with flat, winged seeds.

Habitat

As a nonnative garden shrub, common lilac bushes grow only where they have been planted, such as in parks and gardens. They thrive in the eastern, midwestern, and northern parts of the United States as they prefer areas with colder winters.

Did you know?

Homesick settlers from Europe introduced the common lilac. Bushes still can be seen thriving near abandoned pioneer homesteads. Ethnobotanical uses for the plant have been fever reducer, malaria treatment, perfume, tonic, and homeopathy.

Bloom Time

The greatest bloom is usually observed in the late spring, with fruit and seed production starting in the summer. In the middle of winter, common lilac buds are desiccated (dried out) and appear somewhat “shriveled.” In late winter, after conditions begin to warm, the buds hydrate (swell due to becoming moist) and the tips open slightly. Watching for these two events is the best way to know when to start daily observations looking for first leaf. Once the buds have swelled and bud ends are slightly open and a bit green, the next round of warm weather can force the first leaf event.



Step 4: Watch the lilac life cycle.

In Rochester, they host the festival when the lilacs will be in full bloom. Here's a video from January through May showing changes in one lilac plant throughout half of the year.

Watch this [Time-lapse video](#) to see the lilac life cycle in action.

Scientists call these changes in life cycle **phenology**. Phenology is the study of the timing of the biological events in plants and animals such as flowering, leafing, hibernation, reproduction, and migration. Specific plant and animal life cycle stages, such as leafing, flowering, or fruiting are called **phenophases**.

Step 5: Focus question.

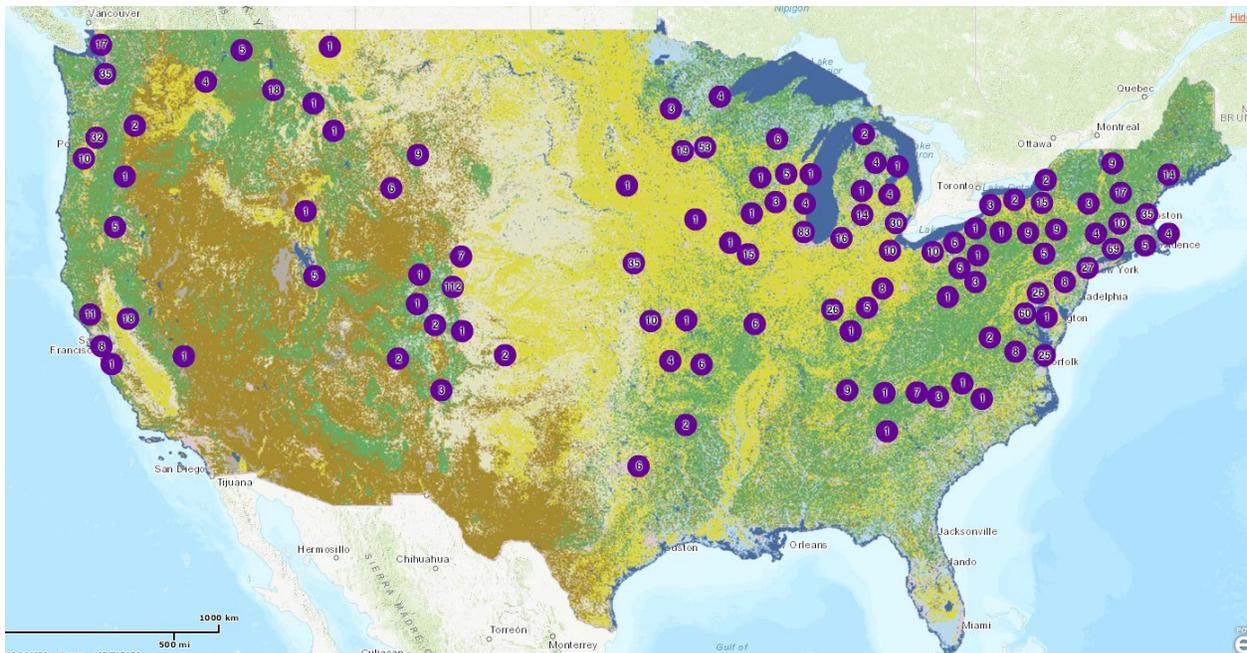
In this inquiry, we'll investigate this question:

When should our city host a lilac blossom festival so lilacs would be in full bloom?

Look at the Figure 1 below and see if lilacs grow in your area.

- If lilacs grow near you, use your city for this inquiry.
- If you don't see a purple circle where you live, select another city in the United States that you'd like to use to investigate this instead. Record the city you will focus on here.

Figure 1. Map of lilac observations produced by volunteers as part of Project Budburst.





Step 6: Learn about Project Budburst data collection.

We can predict when lilacs will be in full bloom in our area by looking at when they bloomed in the past. Read the information below about [Project Budburst](#).

Throughout the year, volunteers across the United States monitor individual plants and record the timing of plant life cycle events including leafing, flowering, fruiting, as well as changes in leaf color. Anyone can decide to monitor a plant and can observe and report one plant on one day or the same plant over many years. People started collecting data in 2007, and since then, almost 10,000 people from 50 states have participated.

Budburst data are freely available, and anyone (including scientists, educators, horticulturalists, and students) can use them to answer specific and important research questions.

Here is an example of the data collection sheet that volunteers use to record data.

Life-cycle Reports
Observation Year
Deciduous Trees & Shrubs

About my Plant

Common Plant Name* _____

Scientific Name (if known) _____

Location Name (a unique name of your choosing) _____

Latitude*: _____

Longitude*: - _____

City*: _____

State*: _____

Zip Code: _____

* Required fields ▲

Is this site within 100' of a building or concrete or asphalt?

Yes

No

Describe the irrigation at this site:

Irrigated regularly

Not irrigated

Share at budburst.org

Yes! I added my data online at budburst.org

My Plant Observations: same plant, multiple events

 **Bud Burst**
Date when the protective scale coating is shed from the bud exposing tender new growth tissues of one or more flower buds or leaves

 **First Ripe Fruit**
Date when the **first fruits** become fully ripe or seeds drop naturally from the plant on 3 or more branches. Ripening is often indicated by a change to the mature color or by drying and splitting open.

 **First Leaf**
Date the **first leaves** are completely unfolded from the bud on at least 3 branches. Leaves need to be opened completely (flattened) and the leaf stem or base must be visible (you might need to bend the leaf backwards to see those).

 **Full Fruiting**
Date when **half or more** branches have fully ripe fruit or the seeds are dropping naturally from the plant. If fruits are in clusters or stalks, then record when at least one fruit is ripe on at least half of the branches.

 **All Leaves Unfolded**
Date when **at least 90%** of the growing leaf buds have reached the first leaf stage.

 **50% Color**
Date when **half or more** of the branches have leaves which have started to change color.

 **First Flower**
Date the **first flowers** are fully open (stamens are visible) on at least 3 branches. When open, flowers on wind pollinated plants will release yellow pollen dust when touched.

 **50% Leaf Fall**
Date when **at least half** of the leaves have fallen off the tree or shrub.

 **Full Flower**
Date when **half or more** of the flowers are fully open or releasing pollen on 3 or more branches.

Note: Once you create a new Life-cycle report, add additional observations by editing the original report. Report directly from the field by using the Budburst.org website on your digital device.

budburst
a project of Chicago Botanic Garden
Budburst Data Collection Protocols
CC BY-NC-SA 4.0



Review the information above and the data collection sheet. When participants enter data, in addition to submitting information from this sheet, they also enter the observation date. Consider the following questions.

- **Who** collected the data?
- **When** did they collect the data?
- **What** data were collected? What was measured? How was it sampled?
- What data from this data collection sheet might help us predict when to host a lilac festival so lilacs are in full bloom?

Step 7: Investigate lilac full-flower data from around the United States

We will use a mapping and graphing software called FieldScope to investigate Project Budburst lilac full-flower data from around the United States.

Technology Note: The FieldScope tool used in this activity requires Adobe Flash. Flash is compatible with Chromebooks, and popular browsers like Google Chrome, Firefox, and Safari used on laptops and desktop computers. Flash is not normally compatible with iPads or other tablets and mobile devices.



a. When accessing Flash on web browsers like Chrome, Firefox, or Safari, the browser may tell you that the Flash Player is not installed (*see image*). Most times it is already installed, and by clicking on the link to download it (*see the red circle highlighting this text*) the browser will then initiate loading the Flash Player.

b. If you have an iPad or other tablet device, you can download the [Puffin browser](#), which is compatible with Adobe Flash; FieldScope should load normally when using the Puffin browser on iPads or other similar-sized tablet devices.



- Watch this short [video](#) to learn how to navigate FieldScope.
- Go to [this histogram](#) in FieldScope.
- Analyze and interpret the data in the histogram.
 - First, make observations with the online histogram:
 - Write “What I see” (or WIS), then write your observation in a complete sentence in the chart below.
 - Do this for each observation.
 - Second, interpret what these observations mean:
 - Think about what each observation means.
 - Write “What it means” (or WIM) and then add your explanation next to the observation in the chart below.
 - As you explore the graph online, you can make WIS and WIM statements about the graph, the data table, and the map.

What I see	What it means
<i>Example: The shape of the graph is like a mountain.</i>	<i>Example: Some lilacs flower really early and others flower later. But most flower in the middle.</i>





Step 8: What did we figure out?

As you observed, lilacs flower at many different times throughout the spring. Why is there so much variability in the timing of lilac flowering?

Record your initial ideas to the questions below:

- Why does the timing of when lilacs flower vary so much?
 - What might influence when a lilac will flower?
-
- Watch this video - [How Do Trees Know When It's Spring video](#) - to gather more information.

The length of the night and day is what triggers trees and flowers to bloom. Project Budburst doesn't collect data on length of day. At right are the variables they do record.

Could we substitute any of the Budburst variables instead of day length? Which one could we use and why? Record your thinking here.

Variable
Latitude
Longitude
Observation Date
Day of Year
Month
Phenophase
Common Name
Scientific Name
Plant Group

Step 9: Further investigation.

If day length influences when lilacs flower, instead of using day length, we can use latitude as a substitute. We can investigate: **Is there a relationship between latitude and when lilacs are in full bloom?**

We will use a scatter plot graph to look at the relationship between these two variables:

- latitude
- date of full lilac flower

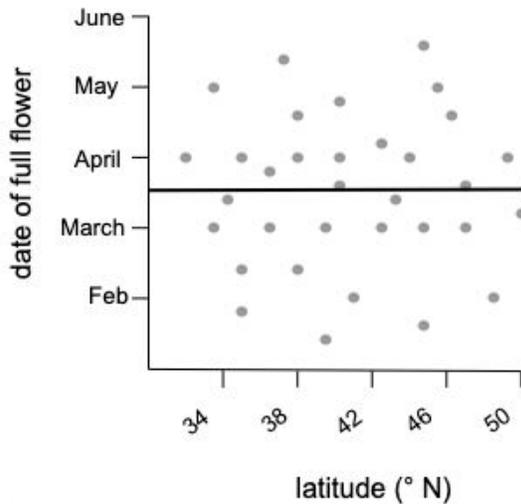
Latitude will be the independent variable and date of full lilac flower will be the dependent variable. On our scatterplot, we will see latitude on the x axis and date of full lilac flower on the y axis.



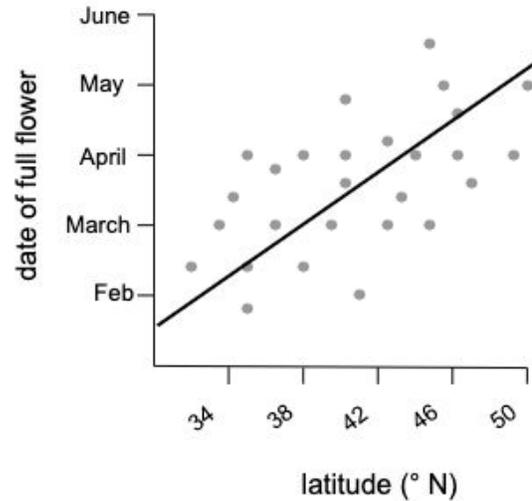
Step 10: Anticipate what we would expect to see and what it would mean.

Examine Graphs A-D below. These are examples of what we might expect to see. Record your ideas about what each graph would mean below each graph.

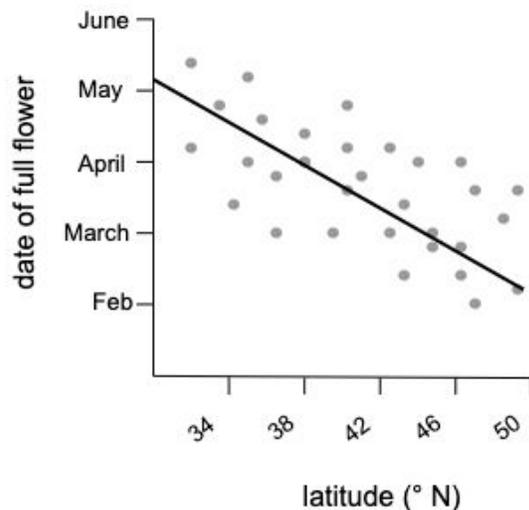
Graph A



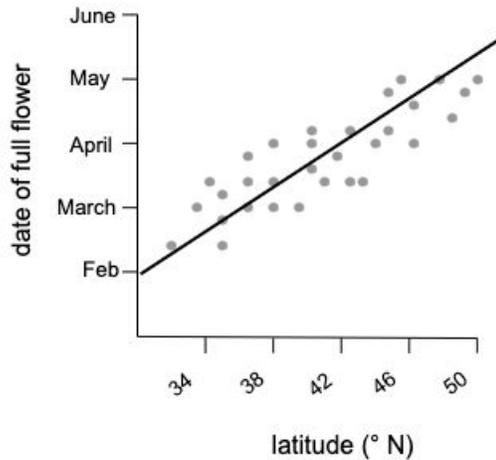
Graph B



Graph C



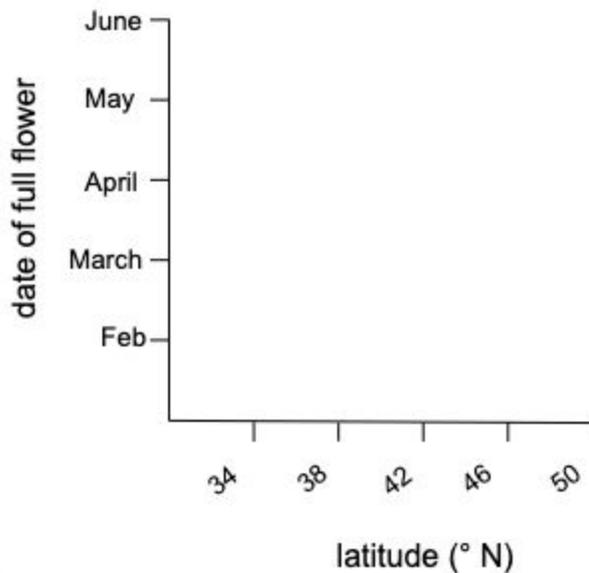
Graph D





Step 11: Make a prediction.

Draw your prediction about what you think the actual relationship is between date of full flower and latitude on the graph.



Step 12: Investigate the relationship between latitude and lilac full-flower date.

We will use FieldScope to investigate the relationship between latitude and lilac full-flower date.

- Watch this short [video](#) to learn how to navigate this scatterplot graph.
- Go to [this scatter plot](#) in FieldScope.
- Analyze and interpret the data in the scatterplot.
 - First, make observations with the online scatterplot.
 - Write your observation about the High, Low, Pattern, and Anomalies you observe in a complete sentence, using the chart below. Do this for each observation.
 - High - What is the highest value?
 - Low - What is the lowest value?
 - Pattern - What patterns do you notice in the data?
 - Anomaly - Are there any data points that don't follow the trend? Any



outliers?

- Second, interpret what these observations mean:
 - Think about what each HLP A observation means.
 - Write “What it means” (or WIM) and then add your explanation next to the observation in the chart below.
- As you explore the graph online, you can also make HLP A and WIM statements about the graph, the data table, and the map views.

HLP A: High, Low, Pattern, Anomaly	What it means
<i>Example: High: The highest y value was day 178.</i>	<i>Example: The 178th day of the year was the latest day that lilacs flowered. This happened in Colorado.</i>

Step 13: Make sense of the data.

We are trying to figure out: Is there a relationship between latitude and when lilacs are in full bloom? Record your reflections about the following questions:

- What did you notice?
- What does it mean?
- How certain are you?



Step 14: Use the model to make a prediction.

Our guiding question is: When should our city host a lilac blossom festival so lilacs would be in full bloom? The best-fit line equation is $y = 3.97x - 42.3$. In this equation, x = latitude and y = day of year. Use the line to predict when lilacs would be in full bloom in our city.

1. Look up the latitude of your city at <https://www.latlong.net/> and record it here.
2. Plug that latitude value into the best-fit line equation $y = 3.97x - 42.3$ and solve for y .
 - a. x = latitude
 - b. y = date of full flower
3. Use a day of year converter (on this [website](#)) to convert your y value to the actual day of the year that the model predicts flowers to be in full bloom.

Here are some example latitudes, days of year, and actual dates in 2020.

Latitude (x value)	Day of year (y value)	Actual date of 2020
36	100	April 9
38	108	April 17
40	117	April 26
42	124	May 3
44	132	May 11
46	140	May 19
48	148	May 27



Step 15: Next steps.

When should our city host a lilac blossom festival so lilacs would be in full bloom? Record your ideas about the following questions:

- How certain are you about hosting a lilac festival on the predicted date from the model?
- What else would you want to investigate to hone the window for the lilac festival date with greater certainty?

Step 16: Record a written argument.

Should our city host a lilac blossom festival on the day predicted by the model?

Write your argument below and make sure to include the following key points.

- Make a **claim** that answers this question.
- What **evidence** did you use that supports your claim?
- Explain your **reasoning** and how the evidence supports your claim.

BECOME A CITIZEN SCIENTIST (OPTIONAL EXTENSION)

You are invited to become a citizen scientist by participating in a project where volunteers contribute important environmental data about our world. Below you can read about how to get started with Budburst.

Budburst

Trained individuals record key life events of plants throughout the year and submit these observations to the Chicago Botanical Garden. For more information, [visit Budburst online](#).

Who can participate: Anyone with



- An interest in plants;
- A plant that you can observe either one time (One-time observation) or multiple times (Life-cycle observation)

Where do you need to collect data: A plant you can observe

When: Any time of day

