



**Descriptive Field Investigation**



# **Fall Color Change**

**Third Grade**



**PEI** PACIFIC  
EDUCATION  
INSTITUTE



## **Descriptive Field Investigation**

### **Fall Color Change**

#### **Overview**

#### **Phenomenon** –Leaves Changing Color in the Fall

These lessons are specific to the fall season. Students are introduced to the phenomenon of leaves changing color in the fall. In these three lessons students, 1) observe leaves and sort them by their characteristic to explore the concept that trees' leaves have unique characteristics that help identify the tree and are inherited from their parent tree(s); 2) identify deciduous and evergreen trees, 3) conduct an investigation to observe the hidden pigments in leaves. Students read and/or listen to videos to obtain information about how leaves change color. There are several optional investigations including submitting leaf color and leaf drop data to [www.budburst.org](http://www.budburst.org).

#### **Project Learning Tree Lessons**

These lessons are adaptations of Project Learning Tree activities: *Looking at Leaves #64, Name that Tree #68, Signs of Fall #78*.

**Descriptive Field Investigation** - fall color change in leaves

**Next Generation Science Standards-3-Dimensions**

Dimensions from the Framework	What Students are Doing
<p><u>Science and Engineering Practices</u></p> <ul style="list-style-type: none"> <li>Asking questions</li> <li>Planning and carrying out investigations</li> <li>Constructing explanations</li> <li>Obtaining, evaluating, and communicating information</li> </ul>	<p>Students ask questions when observing trees and leaves for fall color. They carry out investigations categorizing leaves by characteristics, observing trees for fall color, and exploring hidden colors in green leaves. Students construct explanations when they describe that different leaves/trees have different characteristics and why leaves change color. Students obtain and communicate information when they read books and watch videos about why leaves change color and then explain in their own words.</p>
<p><u>Disciplinary Core Ideas</u></p> <p><b>LS3.A: Inheritance of Traits</b></p> <ul style="list-style-type: none"> <li>Many characteristics of organisms are inherited from their parents. (3-LS3-1)</li> <li>Other characteristics result from individuals’ interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2)</li> </ul> <p><b>LS3.B Variation of Traits</b></p> <ul style="list-style-type: none"> <li>Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1)</li> <li>The environment also affects the traits that an organism develops. (3-LS3-2)</li> </ul>	<p>LS3.A When students observe leaves, they discover that leaves have unique characteristics that identify the tree/shrub and are inherited from the “parents”. The characteristic of changing leaf color in the fall is both inherited and environmental as students explore how and why deciduous trees change color.</p> <p>LS3.B When students observe leaves, they discover leaves have unique characteristics that identify the tree and are inherited from the “parents”. Evergreen trees do not change color in the fall and are green all year long. The characteristic of changing leaf color in the fall is both inherited and environmental as students explore how and why deciduous trees change color.</p>
<p><u>Cross Cutting Concepts</u></p> <ul style="list-style-type: none"> <li>Patterns</li> <li>Cause and Effect</li> <li>Stability and Change</li> </ul>	<ul style="list-style-type: none"> <li>Students look for patterns as they sort leaves by characteristics. They also look for color patterns on deciduous trees when they observe where different colors are on the trees and the leaves.</li> <li>Students explain cause and effect of temperature and day length on tree color and cause and effect of sunlight and green chlorophyll in trees.</li> <li>Students explore how and why leaves change color and trees change overtime.</li> </ul>

**English Language Proficiency Standard:**

ELP.2-3.2 participate in grade appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.

## Optional Citizen Science Opportunity for this Mini Unit

The website [www.budburst.org](http://www.budburst.org) collects data from all over the United States on leaf color change and leaf drop. They are looking for geographical information as well as long term trends and cause and effect relationships. The submission of data is simple and goes well with student observations of fall color change. See lesson 3 for more information. Below is from their website:

### Fall into Phenology from [www.budburst.org](http://www.budburst.org)

What autumn changes do you notice in the plants in your neighborhood, schoolyard, or community? At Budburst, we are interested in what plants are doing throughout the year so we can understand how plants respond to changes in their environment. *Fall into Phenology* is a fun way for everyone to get outside to observe fall phenological changes around the country. Join us, observe a plant near you, and learn more about the stories plants are telling this fall!

No need to limit your *Fall into Phenology* observations to leaf color and drop. Watch for fall flowers, such as asters, and record first flower, or full flower. Seeds and fruiting abound in the fall months. Report all your phenology observations to your [Budburst Account](#).

### Why Fall into Phenology?

One of the most frequent requests we get from scientists is for enhanced geographic coverage of observations. The more people we have participating across the country, the better geographic coverage we have, and the more useful the data is to scientists and researchers. Your data can and will be used to look for general trends, or they might be used to double-check and better understand remotely sensed data such as that taken by satellites, or they might be used by high school students tracking relationships between leaf color change and precipitation.

# Lesson 1: Preparing for Descriptive Investigation Fall Color Change

## Looking at Leaves

### Objectives

Students:

- Collect leaves and sort them into groups according to characteristics.
- Explore the concept that there are many types of trees and each type of tree has unique characteristics including leaf shape, size and margins that help identify the type of tree.

**Materials:** *Looking at Leaves*, Project Learning Tree Activity, journals/science notebooks, brightly colored fall leaf or photos, a variety of leaves for students to sort including evergreens. Books (optional) *Look What I Did With a Leaf!* by Morteza E. Sohi and/or *Leaf Man* by Lois Ehlert; *My Favorite Tree: Terrific Trees of North America* by Diane Iverson or *Meeting Trees* by Scott Russell.

### Learning Experience

Students go outside and collect leaves at home and/or in the schoolyard. Students sort leaves by characteristics and then graph the characteristics they observed in the leaves.

**Teacher Note:** If there are not trees to collect in the schoolyard, and to add to the collection of different types of leaves, have students bring leaves from home or collect yourself and bring them in. Leaves can also be laminated after pressing them flat. In the Puget Sound region, we have both evergreen trees that have needles (conifers) and broad-leafed evergreens such as Madrone. In other areas of the state we have tamarack or larch that are deciduous conifers.

### Engage

1. Ask students what they like best about fall. Have them turn and talk and then share. When they cite "leaves on trees turning color and falling", share with them a beautiful colored leaf or a photo of amazing fall color and let them know that they are going to study the phenomenon of color changing in trees and shrubs in the fall.
2. Tell them that first they need to look at different types of leaves. Remind them that every leaf has a unique shape and characteristics that identify what type of tree it comes from. Trees and shrubs inherit or get their unique shape and other characteristics from their "parent" trees.

## Explore

1. Have students go outside and collect leaves 3-5 different types and 2 leaves of each type per student. Have students collect leaves from as many different trees as possible. Perhaps limit groups to assigned areas to create better distribution of leaf types.
2. Place all the leaves on a table according to type and keep schoolyard leaves separate from those brought in from off campus.
3. Have students count how many different types of leaves they found both in the schoolyard and leaves that were brought from home (diversity).
4. Now have students in pairs or small teams take 8-10 different types of leaves (including evergreens) and sort them into 2-3 groups according to characteristic they choose.
5. Have students share out how they sorted their leaves and make a class record.

## Explain

1. Students now construct graphs using a variety of the leaf characteristics identified. Students could do this in teams or as a class using all of the types of leaves brought in and collected. Because students will be observing and investigating color, this should be one of the characteristic students graph.

Graphing leaf characteristic options:

- a. How many leaves are different colors-yellow, red, orange, brown, green?
  - b. How many leaves have different shapes- oval, round, heart, needle, hand?
  - c. How many leaves are different sizes-smaller than or greater than 3 inches, or other size classes?
  - d. How many leaves have smooth edges vs jagged edges?
2. Debrief the characteristic of color, by giving students information about the terms deciduous and evergreen. Have students write in their journals/notebooks the definition of deciduous and evergreen.
  3. Have the class discuss using think, pair, share strategy how leaf characteristics help us identify trees and shrubs.

## Elaborate

1. Have each student find the name of the tree of one of the leaves using tree ID books or the internet. Leafsnap is an app for tree and shrub ID. The website <https://www.pltwa.com/forest-resources.html> provides a bibliography of books.
2. Have students create leaf pictures after pressing the leaves. *Look What I Did With a Leaf!* by Morteza E. Sohi and *Leaf Man* by Lois Ehlert are great for inspiration.
3. Optional: Read *My Favorite Tree: Terrific Trees of North America* by Diane Iverson or *Meeting Trees* by Scott Russell.

## Evaluate

1. Give each student 2 different leaves to compare and contrast using a Venn diagram or a box and T chart (see student pages: **Comparing and Contrasting 2 Types of Leaves**). Ask them to answer the question, “How are these leaves alike and different?”
2. Give students the **3,2,1 Reflection** page from the reflection and assessment section. Have students write three ideas they have learned, two ideas they are wondering about and one question that they have. You could use these reflections to check for understanding and inquiries the students have to connection to lesson 2 and 3.

## Lesson 2- Descriptive Investigation- Fall Color Change

### Objectives

Students:

- Observe color changes on trees and shrubs and record observations using drawings.
- Obtain information about how leaves change color through reading and a video.

**Materials:** compass, markers or crayons in greens, yellow, oranges, reds; paint chips (optional); journals/science notebooks. Reading material: *Why Do Leaves Change Color?* by Betsy Maestro; *How Leaves Change* by Sylvia Johnson, *Sky Tree* by Thomas Locker.

### Background

Read *How Leaves Change* by Sylvia Johnson or background information in the Project Learning Tree “Signs of Fall” activity to gain knowledge about how and why leaves change color.

### Engage

1. Remind students of the characteristic of color.
2. Bring in some evergreens both with needles and broadleaves, if available, to demonstrate for students. Review the terms deciduous and evergreen.
3. Have student draw what they think a deciduous tree looks like in the fall using the student page **What do deciduous trees look like in the fall? (tree)**. **You will use this page twice, once before the students go outside and once after and use the pictures for a comparison.**
4. Inform students they are going outside to observe a deciduous trees that have fall color to answer the question: *What do deciduous trees look like in fall?*

### Explore

1. Take students outside to observe a tree that is changing color. Ask the questions:
  - Is the tree all one color?
  - If not, where are the different colors on the tree?
  - If there is still green on the tree is it all the same shade of green? (darker-light areas)
2. Have students observe another tree if possible and answer the same questions.
3. Ask students to draw either of the trees accurately capturing where the color is found on the student page **What do deciduous trees look like in the fall? (tree)**. Optional: have students draw and label the colors to fill in back in the classroom. Students could also use paint chips to match colors they observe.
4. Have students collect a colorful leaf, if possible, and ask these questions:
  - Is the leaf all one color?
  - If not, where does the color change on the leaf?
  - Is the leaf the same color top and bottom?
5. Ask students to draw, color and label their leaf on the student page **What do deciduous trees look like in the fall? (Leaf)**

## Explain

1. Have students place their tree drawings around the room or share in groups. Ask students to discuss the following questions doing a pair - share:
  - a. Is the tree all one color?
  - b. If not where are the different colors on the tree?
  - c. If there is still green on the tree is it all the same shade of green? (darker-light areas)
2. Have students brainstorm reasons they think the tree is not all one color and have them record their ideas in their journals/notebooks.
3. Read *Why Do Leaves Change Color?* by Betsy Maestro or have students read it themselves if there are enough copies.
4. Have students watch a video about why leaves change color. Here are some suggestions:
 

[https://www.youtube.com/watch?v=cyj7kyYX\\_gQ](https://www.youtube.com/watch?v=cyj7kyYX_gQ)

<https://www.youtube.com/watch?v=Xk4-6II8I5Q>

<https://www.youtube.com/watch?v=UuTrDnzmMxY>

<https://www.scientificamerican.com/video/why-do-autumn-leaves-change-color-2013-10-03/>
5. Ask the following questions again with a think - pair - share strategy:
  - a. What environmental changes occur in the fall to signal changes in deciduous trees' leaves? The change in light tells deciduous trees to get ready for winter.
  - b. Some types of trees (inherited by their parents) develop red color in their leaves in the fall. What caused the bright red/purple to form in leaves? (The red/purple in leaves is brighter when days are sunny, and nights are cool).
  - c. Thinking about the tree you observed and drew ask students, *“do you think different parts of the tree get different amounts of light?”*

- d. Were some leaves shaded by other leaves? Are some parts of trees shaded by other trees or buildings?
6. Ask students to describe, in their own words, the changes that cause leaf color in the fall? (page 23 of *Why do Leaves Change Color?*).

## Elaborate

- Have students compare their first tree to the second tree they drew outside.
- Have students write a poem using the words describing the tree.
- Have students press leaves or do other leaf art.
- Read *Sky Tree* by Thomas Locker

## Evaluate

- Evaluate student drawings for details and accuracy.
- Evaluate student answers to questions particularly to what causes leaf changes to occur using the student page **Questions to Evaluate**.

## Lesson 3-Fall Color Change Investigations

### Objectives

Students:

- Investigate the hidden color of leaves.
- Optional: conduct a comparative investigation counting deciduous and evergreen trees in the schoolyard or in a local park.
- Optional: observe fall color and/or leaf drop <http://budburst.org/projects/fall-phenology> and submit data to site.

**Materials:** Painter's tape; journals/notebooks; optional - potted plants such as chrysanthemums; and aluminum foil if you do "hidden colors" in classroom instead of outdoors.

**Teacher Notes:** Find low-hanging leaves in the schoolyard where students can place their tape. This investigation works best when choosing leaves that are deciduous and in the sun.

For the comparison of deciduous vs. evergreen trees in the schoolyard plan a route so your class can view the entire campus.

There is an opportunity here for citizen science by submitting leaf color and/or leaf drop data to <http://budburst.org/projects/fall-phenology>.

## Background

During Lesson 2 the class explored why and how leaves change color in deciduous trees/shrubs. Now students do an investigation to see the hidden colors in leaves. Students have an opportunity to do a simple comparative investigation of types of trees in the schoolyard. The other opportunity is for students to observe leaf color and leaf drop and submit their data to a national data bank demonstrating the importance of data when collected over time.

## Engage

1. Review with students what they have just learned about how leaves turn color and tell them they are now going to do an investigation looking for the hidden colors in leaves.
2. If conducting the optional investigation, read the *Fall into Phenology* article and explain to students how this data is collected all over the United States, and over time, so scientists can explore trends of changes happening in the environment.

## Explore

### First Investigation: Hidden Colors

1. Inform students they are going to put tape on green leaves to see what happens over the next few days. They are answering the question, “*What happens to the color of a leaf when it doesn’t get light?*”.
2. Take students outside to the previously identified, low-hanging leaves and have teams or the class put painter’s tape on the them.
3. Have students draw and record in their journals/notebooks what they did along with the date, time and weather.
4. After 5-7 days remove the tape and observe and record what has happened to the color.
5. **Optional** investigation of hidden leaf color in the classroom.
  - a. Students record the color of leaves, using paint chips works well for this.
  - b. Students place aluminum on 3-5 leaves of a chrysanthemum, waits a week and makes observations to record in their journal/notebooks.

### Second Investigation: Comparing the number of Deciduous vs Evergreen Trees in the Schoolyard or Park

1. Explain to students they are going to answer the question, “*Are there more deciduous trees or evergreen trees in the schoolyard (or local park)?*”.
2. Take a walk around the schoolyard and have students count the deciduous and evergreen trees (or shrubs) in the schoolyard and record. If the class is visiting a local park, explain to students that because they can’t count all the trees in the park you are going to sample the

trees in the park. Stop 2-3 times in the park and have students count the deciduous and evergreen trees along the trail.

**Comparative Question:** *Are there more deciduous or evergreen trees in the schoolyard (or local park)?*

# Evergreen Trees	# Deciduous Trees

### Third Investigation: Citizen Science - Observations of Tree Color and/or Leaf Drop for Budburst.org

**Teacher Note:** Collect one-time data to submit to [www.budburst.org](http://www.budburst.org). You will need to know the name of the tree and its location (latitude and longitude from your phone). These questions will need to be answered online. You might want to choose several trees.

<http://budburst.org/index.php/educators/four-steps-using-budburst-your-classroom> and <http://budburst.org/projects/fall-phenology>. See teacher resources for more information.

#### Leaves changing color:

- No** leaves have changed color
- Early:** Only a few leaves have changed color (less than 5%)
- Middle:** Many leaves have changed color
- Late:** Most leaves have changed color (over 95%)

#### Leaves dropping:

- No** leaves have dropped
- Early:** Only a few leaves have dropped (less than 5%)
- Middle:** Many leaves have dropped
- Late:** Most leaves have dropped (over 95%) fallen

## Explain

### First Investigation: Hidden Colors

1. Back in the classroom have student draw one of the leaves that has changes color.
2. With either the outdoor or indoor investigation, have students answer the investigative question, “*What happens to leaf color or when the leaf doesn’t get light?*” making a claim with evidence and reasoning using the assessment and reflection page [Leaf Color Change CER](#). This will assess progress towards standard 3-LS3-1. See rubric for scoring

### Second Investigation: Comparing number of Deciduous vs Evergreen Trees in the Schoolyard or Park

1. Have students discuss in small groups the question, “*are there more deciduous trees or evergreen trees in the schoolyard (or local park)?*”
2. Ask students to write an answer to the question; “*are there more deciduous trees or evergreen trees in the schoolyard (or local park)?*” supporting that answer with the data they collected. (claim and evidence) **Example:** *There were more evergreen trees in the schoolyard than deciduous trees. We counted 10 evergreens and only 5 deciduous trees.*

### Optional: Third Investigation-Observations of Tree Color and/or Leaf Drop for Budburst.org

1. Have students discuss why they think scientists want and use this “citizen science” data. Use think, pair, share strategy or other. Students write their ideas in the journals/notebooks.
2. Have students analyze data from the budburst website.

## Elaborate

Students could do pigment chromatography of leaves to see the color inside them. Project Learning Tree, *Signs of Fall* activity.

## Evaluate

### First Investigation: Hidden Colors

1. Evaluate students’ drawings/descriptions of the color changes after removing the tape.
2. Evaluate students’ constructed explanations answering the question, “*What happened to the leaf’s color when the leaf doesn’t get light?*”

### Second Investigation: Comparing number of Deciduous vs Evergreen Trees in the Schoolyard or Park

Evaluate the claim and evidence statements from the question: “*Are there more deciduous trees or evergreen trees in the schoolyard (or local park)?*”



# Fall Color

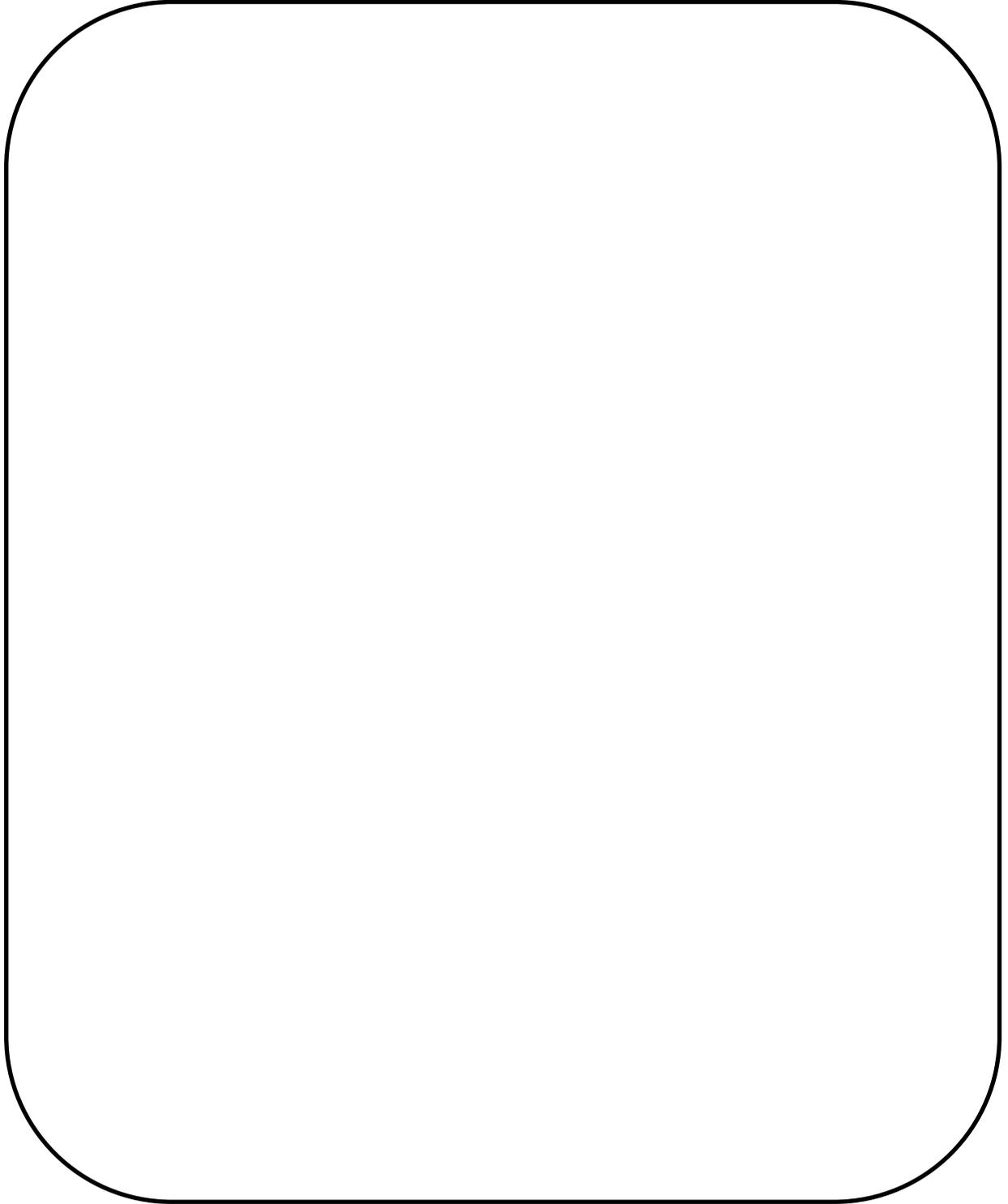
## Student Pages

Name: \_\_\_\_\_



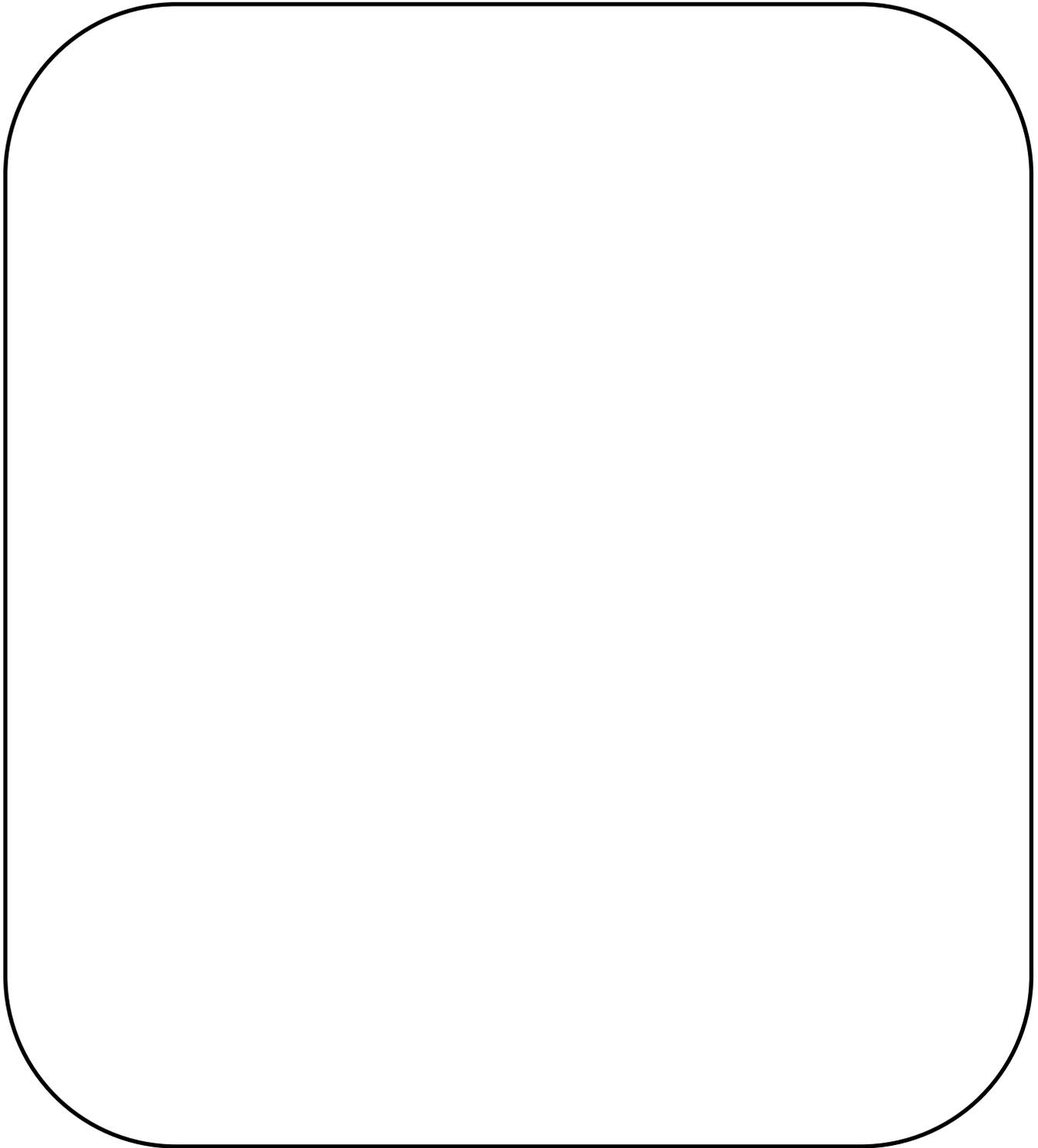
***What do deciduous trees look like in fall?***

**Draw and Color your tree**



**What do deciduous tree look like in the fall?**

**Draw and color your Leaf**





# **Reflection and Assessment**

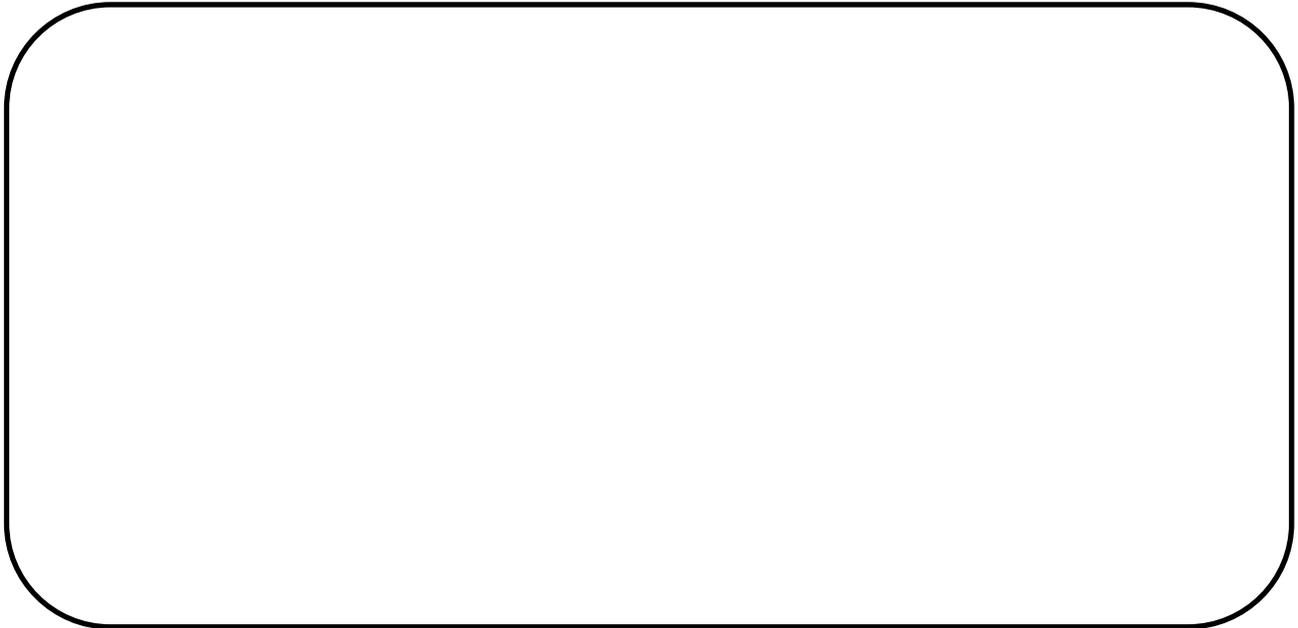
Lesson 1

3, 2, 1 Reflection

- Write three ideas you have learned
- Write two ideas you are still wondering about
- Write one question you still have


***What happens to the color of a leaf when it doesn't get light?***

**Draw or describe leaf color change:**

A large, empty rounded rectangular box with a black border, intended for a student to draw or describe the leaf color change.

***Claim:***

***Evidence:***

***Reasoning:***

## Rubric for Color of a Leaf Claim, Evidence, Reasoning (CER)

Standard: 3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.

\*This assessment is working towards meeting the full standard.

\*At the third-grade level, some students may struggle with scientific reasoning. Students are not expected to fully explain using scientific reasoning until 4<sup>th</sup> grade.

Score of 4	Score of 3	Score of 2	Score of 1
Student was able to write a claim, evidence and reasoning that shows understanding of environmental changes that effect plants.	Student was able to write a claim and add evidence but <b>the reasoning was missing some details but generally correct.</b>	Student was able to write a claim and add evidence to support their claim but <b>did not attempt or had an incorrect reasoning.</b>	Student was <b>missing several components</b> of a CER.

# Teacher Resources

## Fall into Phenology from [www.budburst.org](http://www.budburst.org)

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### How to Report your *Fall into Phenology* Observations

*Fall into Phenology* was developed with your busy schedule in mind. It takes about ten minutes to report an observation. This campaign welcomes both types of observation reports:

- A one-time report, or status-based observation -- For example: early, middle, or late stage of leaf color or leaf drop for a Sweet gum tree you see while driving through a state park.
- A life-cycle report, or event-based observation -- For example: for 50% leaf color *and* 50% leaf drop of the red maple in your backyard.

To make your observation report follow these simple steps:

- Log into your [Budburst Account](#) - submit your [One-time or Life-cycle Report](#) using your handheld device or record your observations on a field report form (downloadable from your plant's webpage) and post your findings later.
- Track your data - check your Sugar Maple data from previous years in your [Budburst Account](#), or view data from other observers using the [Data menu](#). Is this year's leaf color or leaf drop earlier or later than previous years?

All observation reports - whether Life-cycle or One-time - are helpful in understanding how plants respond to changes in climate and atmosphere over time.

The goal of this campaign is to collect at least 500 observations from around the country (that's only 10 per state!). Watch for updates and track observations as they are reported.

