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Harvard LTER Schoolyard Program

Teacher Developed Lessons and Documents that integrate Harvard Forest Schoolyard Ecology Themes into curriculum.

- **Presentation Title:** Peak Autumn Leaf Color in Thoreau's Time and Today
- **Description of Presentation:** Connects Harvard Forest Phenology study with work done by Richard Primack and Abe Miller-Rushing, using phenology notes from Thoreau's journals.
- **Teacher/Author:** Maria Blewitt
- **School:** Austin Preparatory School
- **Level:** 7th Grade- Life Science
- **Date:** April 13, 2011

Peak Autumn Leaf Color in Thoreau's Time and Today

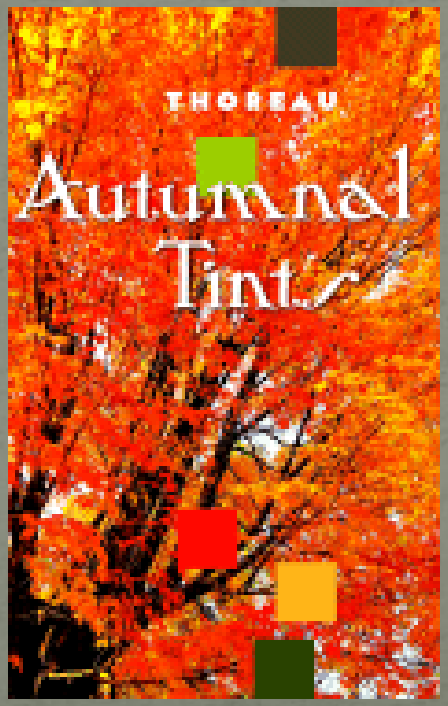
By Maria Blewitt

Background

- In late 2000, I read an article in science news for kids about work done by Richard Primack and Abe Miller-Rushing in which they had taken Thoreau's journals, wrote down when he said certain flowers started blooming at Walden Pond, and then did field work to compare when the same flowers currently bloom.
- They found that on average, flowers are blooming a week earlier than they were in Thoreau's time.
- http://www.sciencenewsforkids.org/articles/20090415/Feature1.asp

Background

- Last summer, I took a week long course at Walden Pond.
- During that time, I read an article by Thoreau called “Autumnal Tints”.



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Background

- I discovered that Thoreau gave dates of peak fall color for some of the same trees my students and I were using in our tree studies.

Tree type	Date
red maple	25-Sep
sugar maple	2-Oct
scarlet oak	26-Oct
quaking aspen	26-Oct

Lesson Plan

- I decided to use this information to set up a new lesson plan.
- First, I had the students read the science news for kids article and answer some questions on the article.
- ..\Autumn data analysis.docx

Lesson Plan

- Next, I decided to create an operational definition of "peak color" as the week when our tree observations turned from a "3" to a "4".
- After our fall observations were completed, I had the students look through their data and determine when their peak color was for the trees that Thoreau had discussed in "Autumnal Tints".

Lesson Plan

- Here is the data and analysis worksheet that I provided the students with.
- ..\Autumn data analysis.docx

Lesson Plan

- Here is the filled in data chart as determined by the students using the definition that “peak color” occurred the week when the trees turned from a “3” to a “4”.

- img001.jpg

Lesson Plan

- Here are some of the student's graphs:
- graph1.jpg
- graph2.jpg

Lesson Plan

- Here are some sample answers to the analysis questions:
- img004.jpg
- img005.jpg
- img006.jpg
- img008.jpg
- img009.jpg

Ideas for Adaptations

- You could either use Thoreau's dates and trees if they correspond to your dates and trees.
- You could check for other local resources, such as the library, to see if anyone in your local area kept fall or spring naturalist journals.
- Who knows? Maybe someday your student's data might be used by someone in the future making a graph about trees!

1. Gather up your data sheets for your tree. Find when you tree reached peak fall color – when 100% of the leaves had changed color. Write down that date here. 2 points

Date: October 28

2. Now let's compare to when Thoreau said the trees were at peak color. As a class, we will record all of the dates for our trees, and fill in this entire chart. 2 points

Tree	Thoreau Peak Fall Color Data - 1862	Austin Peak Fall Color Data - 2010
Red Maple	Sept. 25	October 20
Sugar Maple	Oct. 2	October 28
Scarlet Oak – Thoreau Black Oak – Austin	Oct. 26	October 19 | October 27 | November 16
Quaking Aspen	Oct. 26	November 16

3. On the back of this paper, graph Thoreau's dates with Austin's dates. 10 points

See back.

4. In the space below, using your graph, write a comparison about the similarities and differences in the results. 2 points

In 2010-with Austin-the dates for leaf change got later. Sometimes just a week, other times as much as a month. In both, most color change occurs in October. The oak was especially close.

5. Does there appear to be any evidence that global climate change is affecting our fall foliage? Support your answer with evidence. 2 points

Global change is definetly affecting fall foliage. In 1862, it was getting cooler sooner, around early October. It may have even been snowing by early November. Nowadays, we don't usually see snow or bare trees until early December

1862, and when we see peak colors now.

1. Gather up your data sheets for your tree. Find when you tree reached peak fall color – when 100% of the leaves had changed color. Write down that date here. 2 points

Date: October 20th

2. Now let's compare to when Thoreau said the trees were at peak color. As a class, we will record all of the dates for our trees, and fill in this entire chart. 2 points

Tree	Thoreau Peak Fall Color Data - 1862	Austin Peak Fall Color Data - 2010
Red Maple	Sept. 25	October 20th
Sugar Maple	Oct. 2	October 28th
Scarlet Oak – Thoreau Black Oak – Austin	Oct. 26	October 19th | October 27th | November 16th
Quaking Aspen	Oct. 26	November 16th

3. On the back of this paper, graph Thoreau's dates with Austin's dates. 10 points ✓

4. In the space below, using your graph, write a comparison about the similarities and differences in the results. 2 points The results are similar because Thoreau's scarlet oak's peak of color is very close to Austin's Black Oak on October 27th (this is on the 26th.) They are different because Thoreau's trees' ~~color~~ Peak of color are a much earlier time than our peak color. His trees must have lost their leaves much earlier than Austin's trees' leaves

Finish super

5. Does there appear to be any evidence that global climate change is affecting our fall foliage? Support your answer with evidence. 2 points To me, it seems our climate is staying warmer later because of what time our trees change! In Thoreau's experiment his latest date is October 26th. Austin's is November 16th. In Thoreau's time his trees reached their peak of color much earlier than ours. I can conclude that ~~in~~ our time the world is becoming warmer for a longer time. This climate change affects

our fall foliage.

1. Gather up your data sheets for your tree. Find when you tree reached peak fall color – when 100% of the leaves had changed color. Write down that date here. 2 points

Date: 11/16/2010

2. Now let's compare to when Thoreau said the trees were at peak color. As a class, we will record all of the dates for our trees, and fill in this entire chart. 2 points

Tree	Thoreau Peak Fall Color Data - 1862	Austin Peak Fall Color Data - 2010
Red Maple	Sept. 25	10/20/10
Sugar Maple	Oct. 2	10/26/10
Scarlet Oak – Thoreau Black Oak – Austin	Oct. 26	10/27 | 11/16 | 10/19
Quaking Aspen	Oct. 26	11/16

3. On the back of this paper, graph Thoreau's dates with Austin's dates. 10 points

4. In the space below, using your graph, write a comparison about the similarities and differences in the results. 2 points On the Black Oak and Scarlet Oak So
of Austin's dates (2 of them) are pretty close t
Thoreau's date of Oct. 26. However, most of Austin's
are far after Thoreau's dates

5. Does there appear to be any evidence that global climate change is affecting our fall foliage? Support your answer with evidence. 2 points The is evidence the global c
Change is affecting our fall foliage. In Thoreau's t
when there wasn't much pollution, the dates were m
in early fall. However our dates are middle or late fall
significant difference.

1862, and when we see peak colors now.

1. Gather up your data sheets for your tree. Find when you tree reached peak fall color – when 100% of the leaves had changed color. Write down that date here. 2 points

Date: 11/17

2. Now let's compare to when Thoreau said the trees were at peak color. As a class, we will record all of the dates for our trees, and fill in this entire chart. 2 points

Tree	Thoreau Peak Fall Color Data - 1862	Austin Peak Fall Color Data - 2010
Red Maple	Sept. 25	Oct. 20
Sugar Maple	Oct. 2	Oct. 28
Scarlet Oak – Thoreau Black Oak – Austin	Oct. 26	Oct. 19 | Oct. 27 | Nov. 16
Quaking Aspen	Oct. 26	Nov. 16

3. On the back of this paper, graph Thoreau's dates with Austin's dates. 10 points

4. In the space below, using your graph, write a comparison about the similarities and differences in the results. 2 points In the Red Maple, Sugar Maple, and Quaking Aspen the Austin trees changed colors a lot earlier than Thoreau's trees. The Black Oak, however, changed colors about when Thoreau's tree did 2 out of 3 of the times.

5. Does there appear to be any evidence that global climate change is affecting our fall foliage? Support your answer with evidence. 2 points The leafs are changing colors later so that means that winter is getting shorter. This is probably because of climate change. It doesn't get cold until later so the leafs change later

kind of research as Drs. Primack and Miller-Rushing, and compare when Thoreau said peak color was in 1862, and when we see peak colors now.

1. Gather up your data sheets for your tree. Find when you tree reached peak fall color – when 100% of the leaves had changed color. Write down that date here. 2 points

Date: 12-6-10

2. Now let's compare to when Thoreau said the trees were at peak color. As a class, we will record all of the dates for our trees, and fill in this entire chart. 2 points

Tree	Thoreau Peak Fall Color Data - 1862	Austin Peak Fall Color Data - 2010
Red Maple	Sept. 25	Oct. 20
Sugar Maple	Oct. 2	Oct. 28
Scarlet Oak – Thoreau Black Oak – Austin	Oct. 26	Oct. 19 | Oct. 27 | Nov. 16
Quaking Aspen	Oct. 26	Nov. 16

3. On the back of this paper, graph Thoreau's dates with Austin's dates. 10 points

4. In the space below, using your graph, write a comparison about the similarities and differences in the results. 2 points The differences are that the expirements we did our tree ~~wasn't~~ didn't became 76-100 o\o as quick as Thoreau's. The similarities are The Black on Thoreau's Black oak 76-100o\o is 1 day off from our statistics.

5. Does there appear to be any evidence that global climate change is affecting our fall foliage? Support your answer with evidence. 2 points yes there is evidence. on the data almost all of the leaves became 76-100o\o a lot later than Thoreau dates. They are all about 26 days from thoreau's 76-100o\o from ours.

were blooming earlier in the year due to climate change.
In 1862, Thoreau wrote an article for a magazine. The title of the article was *Autumnal Tints*, and Thoreau recorded his observations on when trees reached peak color in the fall. We can do the same kind of research as Drs. Primack and Miller-Rushing, and compare when Thoreau said peak color was in 1862, and when we see peak colors now.

1. Gather up your data sheets for your tree. Find when you tree reached peak fall color – when 100% of the leaves had changed color. Write down that date here. 2 points

Date: 10/19/10

2. Now let's compare to when Thoreau said the trees were at peak color. As a class, we will record all of the dates for our trees, and fill in this entire chart. 2 points

Tree	Thoreau Peak Fall Color Data - 1862	Austin Peak Fall Color Data - 2010
Red Maple	Sept. 25	10/20
Sugar Maple	Oct. 2	10/28
Scarlet Oak – Thoreau Black Oak – Austin	Oct. 26	10/19 | 10/27 | 11/16
Quaking Aspen	Oct. 26	11/16

3. On the back of this paper, graph Thoreau's dates with Austin's dates. 10 points

4. In the space below, using your graph, write a comparison about the similarities and differences in the results. 2 points On my graph all of Thoreau's results were earlier than ours. Our bar graphs are a lot taller than his. The similarities are that the Scarlet and Black Oak trees are around the same dates.

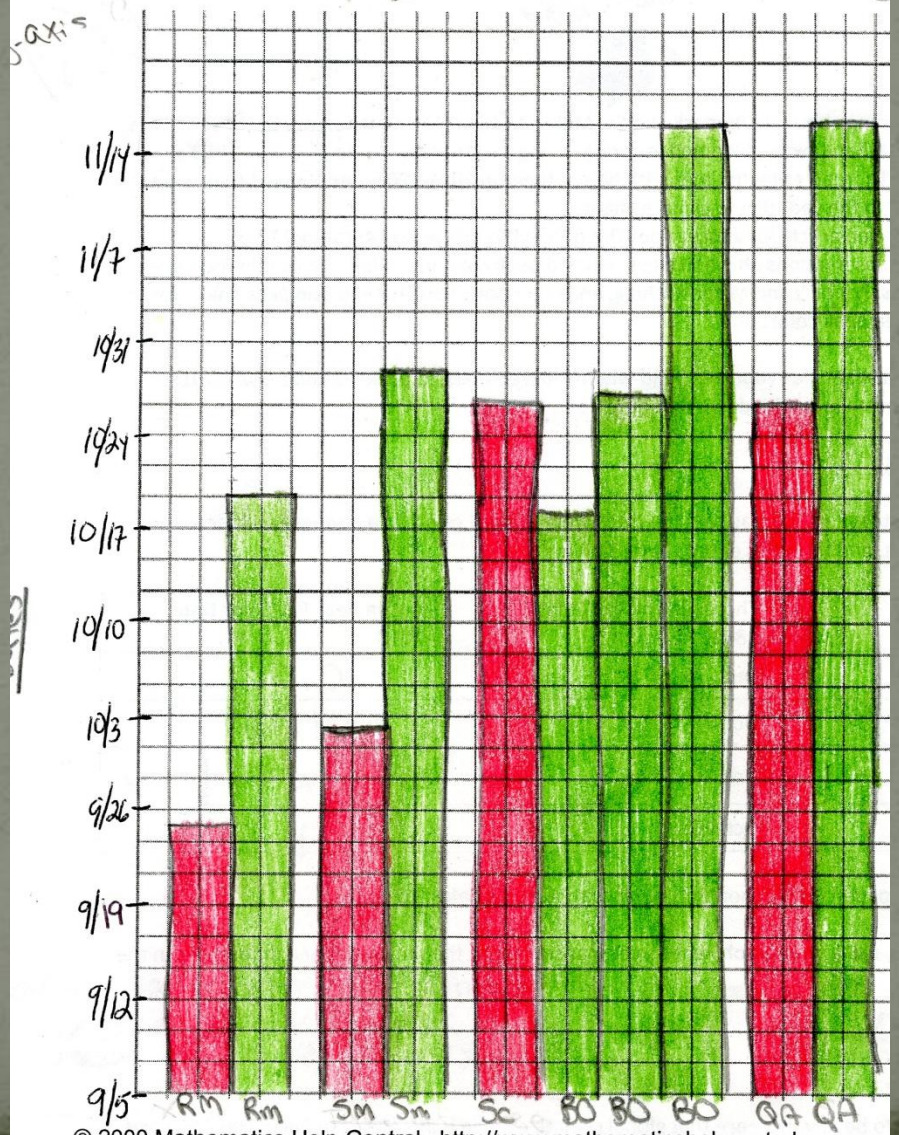
5. Does there appear to be any evidence that global climate change is affecting our fall foliage? Support your answer with evidence. 2 points

Yes, I think the winter is getting shorter because in 1862 the Red Maple peaked on Sept. 25, now it didn't Peak until Oct. 20. All of the trees are changing later.

Your graph should include

- A good long science title – 2 points
- X and Y axis labels – 2 points
- Key to indicate which are Thoreau's results, and which are Austin's results – 2 p
- Bars drawn to the correct height – 2 points
- Neatness and accuracy – 2 points
- TOTAL = 10 points

Title: Thoreau's vs. Austin's Peak Fall C



Title: Austins Prep Thoreau Leaf Peak Project