

# CLEANER AIR

## *tree by tree*

NAME \_\_\_\_\_

SCHOOL \_\_\_\_\_

CLASS \_\_\_\_\_



WANGARI MAATHAI  
04/01/1940 - 09/25/2011

# WELCOME TO CLEANER AIR, TREE BY TREE

Cleaner Air, Tree by Tree is a set of four investigations that examines human impacts on the environment.

## OVERALL OBJECTIVE OF CLEANER AIR, TREE BY TREE:

Students will be able to describe how planting trees contributes to helping restore humans' impact on the environment.



## WANGARI MAATHAI

*The Woman Who Planted Millions Of Trees*

Wangari says "A tree is worth more than its wood."  
Why was planting trees so important to Wangari?



# HUMAN IMPACT AT YOUR SCHOOL

**OBJECTIVE** Using the picture below, students identify the geosphere, atmosphere, biosphere, and hydrosphere.

PLACE IMAGE HERE



NATURALIZED FOREST



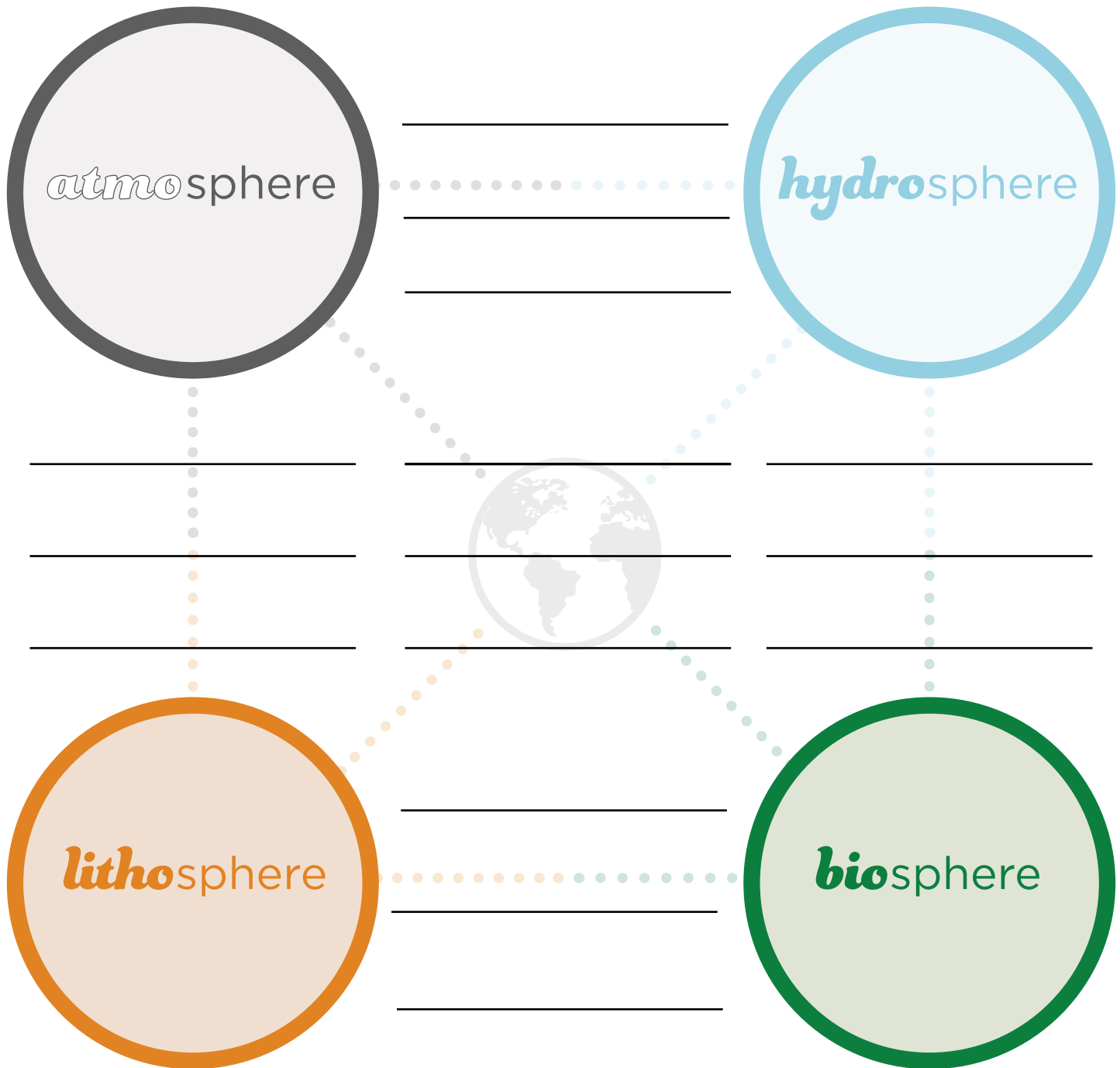
PLANNED GREEN SPACE

Does your schoolyard's trees look more like one photo or the other?  
How have humans interacted with each of these spaces?



# THE FOUR SPHERES

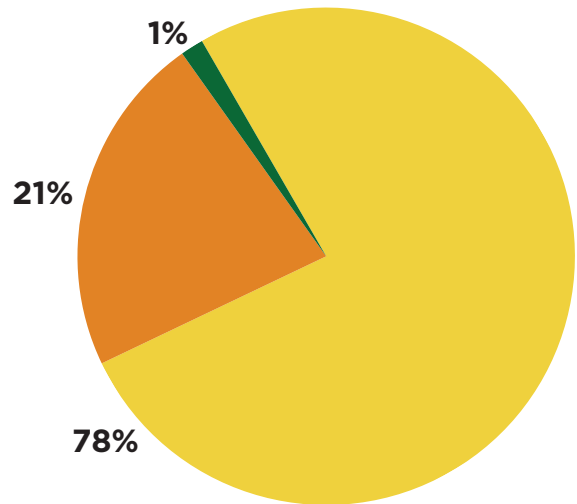
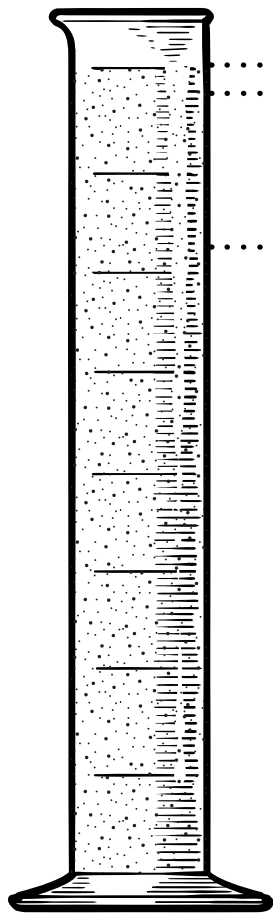
**OBJECTIVE** Students identify and describe relationships (interactions) within and between the parts of the Earth systems.



**IDEA STARTER** Precipitation, Evaporation, Erosion, Respiration...

# WHAT IS AIR?

**OBJECTIVE** Students describe the composition and properties of air.

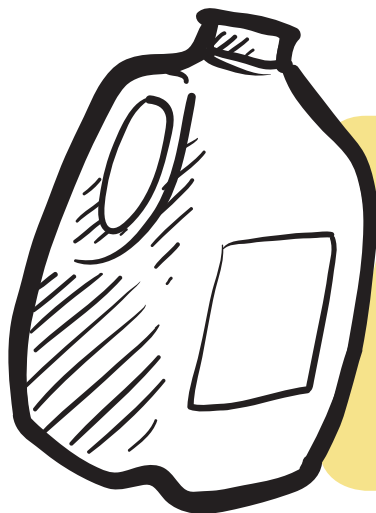


Air is a mixture of:

78% \_\_\_\_\_

21% \_\_\_\_\_

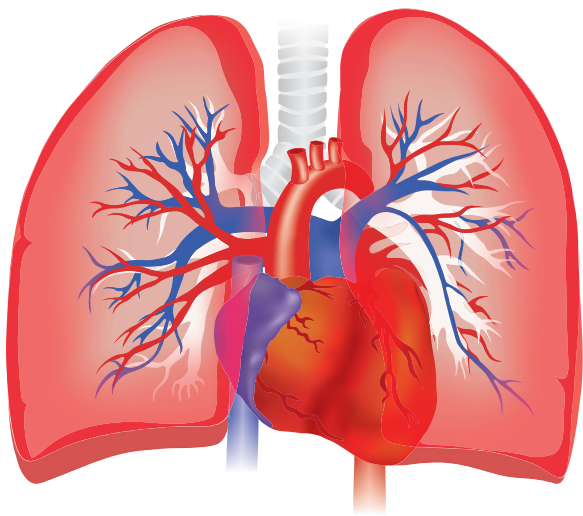
1% \_\_\_\_\_



We breathe  
\_\_\_\_\_ ***gallons***  
of air each day!

# AIR QUALITY

**OBJECTIVE** Students identify the structures and functions of different parts of the respiratory system, in order to understand how they are affected by air pollution.



Why does the quality of the air matter to human health?

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**OBJECTIVE** Students describe and identify some sources of human made and natural air pollution. Students define air pollution.

What are some **an-thro-po-gen-ic** (human made) sources of air pollution in your neighborhood?

What are some **natural** sources of air pollution?

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What can you do to improve air quality in your neighborhood?

## *Did you know?*

Exposure to air pollution may cause a wide range of health effects, including irritation of your eyes, nose and throat, lungs (respiratory) and heart (cardiovascular) disease.

# TESTING AIR QUALITY

**OBJECTIVE** Student will be able to collect data using scientific equipment to measure air pollution.

**Particulate Matter (PM)** are microscopic solid particles or liquid droplets that are suspended in the air. PM is an air pollutant that negatively impact human health, It is measured in  $\mu\text{g}/\text{m}^3$  (micrograms per cubic meter).

**Ground Level Ozone ( $\text{O}_3$ )** is formed by a reaction of pollutants, heat, and sunlight.

**Carbon Dioxide ( $\text{CO}_2$ )** is an important, heat-trapping (greenhouse) gas released naturally through the process of respiration, and human activities such as burning fossil fuels.

## Did you know?

High concentrations of fine particulate matter causes a lot of different health problems in people, from asthma attacks to heart attacks!



An **AIRBEAM** is an instrument that measures:

- PM 1.0, 2.5 and  $10.0 \mu\text{g}/\text{m}^3$
- Relative Humidity (RH%)
- Temperature ( $^{\circ}\text{F}$ )



An **AIR QUALITY EGG** is an instrument that measures:

- Ozone (PPM)
- Carbon Dioxide (PPM)

## GUIDE TO AIR QUALITY INDEX (AQI) CATEGORIES

0-50	51-100	101-150	151-200	201-300
GOOD	MODERATE	UNHEALTHY FOR SENSITIVE GROUPS	UNHEALTHY	VERY UNHEALTHY

The **Air Quality Index (AQI)** is an index for reporting daily air quality. It tells you how clean or polluted the air is, and the associated health effects. The AQI is measured using the following air pollutants ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide.

# CAMPUS DATA COLLECTION

**OBJECTIVE** Students will use the airbeams to collect air quality data. Students will record the data using accurate units.

	Particulate Matter 1.0 µg/m³	Particulate Matter 2.5 µg/m³	Particulate Matter 10 µg/m³	Ozone PPB	Carbon Dioxide PPM
Classroom Test					
Site 1					
Site 2					
Site 3					

What is the reading for ground level ozone and particulate matter in Washington, D.C. today?

Temperature: \_\_\_\_\_ °F      Relative Humidity \_\_\_\_\_ %

Ground level ozone pollution-O3 \_\_\_\_\_ PPM

Particulate Matter-PM \_\_\_\_\_ µg/m<sub>3</sub>

## Did you know?

Air pollutant concentrations are measured in Parts per Million and Billion (PPM, PPB) or in mass per volume (µg/m³, micrograms per cubic meter). This is how scientists measure Carbon Dioxide, Ozone, and Particulate Matter.

One Million = 1,000,000

One Billion = 1,000,000,000

### GUIDE TO AIR QUALITY INDEX CATEGORIES

- 0-50

GOOD
- 51-100

MODERATE
- 101-150

UNHEALTHY  
FOR SENSITIVE  
GROUPS
- 151-200

UNHEALTHY
- 201-300

VERY  
UNHEALTHY



PLACE SCHOOL MAP HERE

# THINK LIKE AN URBAN FORESTER

**OBJECTIVE** Students will observe the patterns, similarities, and diversities of trees on their campus.

## LEAVES

Scavenge fallen leaves on the ground from different trees.

Do you notice any **patterns** between the leaves?

Describe the leaves' shape and texture. Are the edges smooth? Toothed? Lobed?

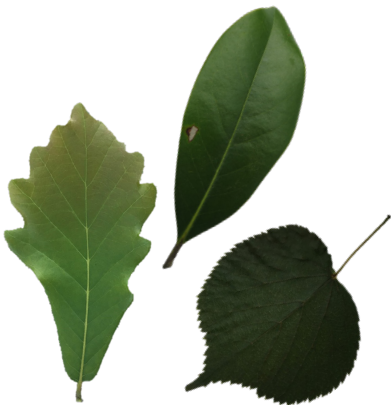
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## BARK

Come in close and gently touch the tree's bark.

The bark of these trees have a lot of **diverse** textures. What is unique about this tree's bark? What is **similar** with other trees' bark?

**How** does the bark feel to you?

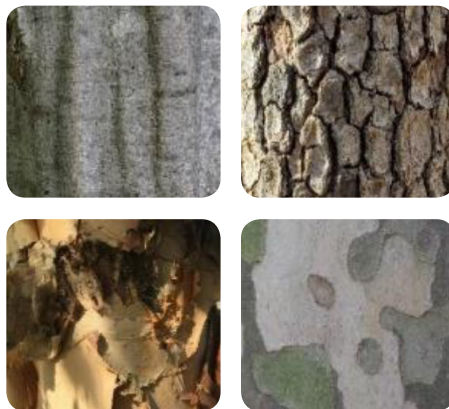
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## FLOWERS, FRUITS AND SEEDS

Look up, look down!

What difference do you notice in the **structure and function** of the fruits and flowers?

Remember, fruit holds a tree's seed. Flowers may be big and showy or small!

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**What** tree species are you observing? \_\_\_\_\_

# TREE OBSERVATION

**OBJECTIVE** Students collect data to estimate the benefits provided by this tree.

HEIGHT (feet)

DBH/TRUNK DIAMETER (inches)

TREE HEALTH (circle one)

EXCELLENT


GOOD

FAIR

POOR

DYING

TREE EXPOSURE TO SUNLIGHT (circle one)

FULL SUN 

PARTIAL SUN 

FULL SHADE 

**Is this tree healthy? Provide evidence to support your claim.**

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# DRAW A TREE

**OBJECTIVE** Students understand the benefits that their tree provides to their school's campus.

List the ways trees benefit your schools campus.

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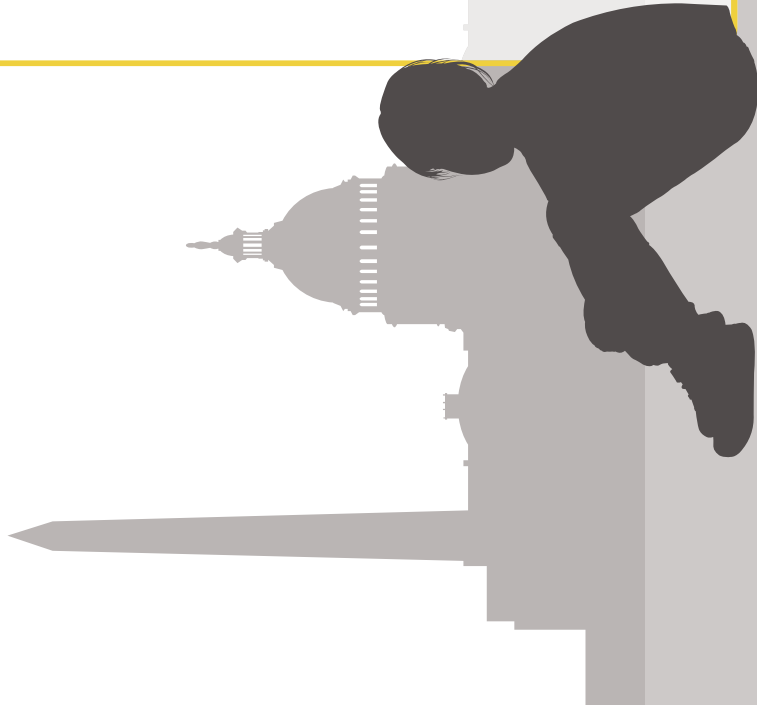
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## Did you know?

The larger and healthier a tree grows, the more these benefits add up! Young trees need 25 gallons of water EVERY WEEK to stay alive and reach this potential. You can help them by watering thirsty trees in the hot summer months!



# TREE BENEFITS WITH iTREE

**OBJECTIVE** Using iTree Design, students quantify the benefits of their school's tree.

## TREE MEASUREMENTS

Tree Species	
DBH	
Tree Health	

## Did you know?

Trees provide ecosystem services for humans and the environment. An ecosystem is a community of living and nonliving things, think all 4 spheres working together! Ecosystem services are the important benefits that come from healthy ecosystems.

BREAKDOWN	ENVIRONMENTAL BENEFIT
Storm Water Interception	_____ gallons
CO <sub>2</sub> Capture	_____ pounds
Air Pollutant Absorbtion	\$_____ saved

1. This year, these trees will remove \_\_\_\_\_ PM<sub>2.5</sub>.
2. In ten years, these trees will remove \_\_\_\_\_ PM<sub>2.5</sub>.
3. In D.C. we currently have \_\_\_\_\_ trees.
4. Based on the number of trees in DC, how much money does D.C. save?

$$\frac{\text{Number of trees in DC}}{\text{Number of trees in DC}} \times \frac{\text{Dollars Saved Per Tree}}{\text{Dollars Saved Per Tree}} = \frac{\text{\$ Total}}{\text{\$ Total}}$$

**Wangari stated, "A tree is worth more than its wood."**

What other benefits or ecosystem services does a tree provide?



# YOUR ROLE IN RESTORING THE ENVIRONMENT

Support your claim with evidence that planting trees will contribute to restoring humans' impact on the environment.



**Wangari Maathai** won a Nobel Peace Prize in 2004.

Photo source: *The New York Times*

# NATURE JOURNAL



Use this space as your nature observation journal. You can take a leaf rubbing. Design your house with new trees. Write your Air Quality Improvement Campaign.

# WHO WE ARE



## **D.C. Environmental Education Consortium**

is a nonprofit organization 501(c)3 that provides opportunities for collaborating, networking, event coordination and program partnering among its members.



**Casey Trees** is a Washington, D.C.-based nonprofit established in 2002 committed to restoring, enhancing and protecting the tree canopy of the nation's capital.



**Clean Air Partners** is a nonprofit partnership chartered by the MWCOG and the BMC. We strive to improve public health and the environment by working with businesses, organizations and individuals throughout the region to raise awareness and reduce air pollution through voluntary actions.



*Funding provided by D.C. Office of the State Superintendent*