

Forests & Air



Section 1 FOREST ACTIVITIES

Grade: K-12

State Standards:

S B-1, S B-5, S C-2

NGSS: 5-LS1-1, 5-LS2-1, 5-ESS3-1, -
ESS2-1, MS-LS1-6, MS-ESS2-4,
HS-LS2-5

Subjects: Science, social studies

Skills: Observing, measuring,
predicting, comparing,
contrasting, inferring

Duration: 2 days, 30 minutes
classroom, 60 minutes outdoors
each day

Group Size: 2

Setting: Outdoors/indoors

Vocabulary: Broadleaf, carbon
dioxide, conifer, ground cover,
hypothesize, oxygen, shrub,
transpiration

Objectives:

Students will conduct an identical set of air quality and moisture experiments and compare the results to learn how forests effect air quality.

Teaching Strategy:

Students conduct identical experiments in two different ecosystems, compare results and draw conclusions.

Complementary Activities:

OUTDOOR: "Forests and Sunlight" and "Forests and Soils," both in Section 4, Succession, compare forested and non-forested sites. *INDOOR:* "Breath of Life" and "Rain-Making Partners," both in this section.

Materials:

Small plastic bags, rubber bands, petroleum jelly, index cards, string, pinwheels or wind gauges, and hand lenses for each site. Clipboards and writing paper or field note books, pencils or pens for each student. "Science Cards" for both forested and non-forested sites (*following pages*).

Background:

See **INSIGHTS Section 1, Elements that Create Forests.**

Procedure:

IN ADVANCE, locate two sites for taking measurements, one forested and one non-forested.

DAY ONE

1. Brainstorm potential differences between forested and non-forested sites. Lead the discussion to the differences in wind, dust, and water vapor.
2. Introduce the experiment by asking for ideas on how to measure the differences.
3. Introduce the tools that will be used: wind gauge, petroleum-jelly-smear cards, and plastic bags. Explain that the students will use these to conduct identical experiments at forested and non-forested sites.
4. Introduce the Science Cards.
5. Have students prepare their observation notebooks by writing the heading "Forests and the Air" across the top of a page. Tell them to draw a line down the center of the page, and put the heading "Forested Site" at the top of the left side and "Non-Forested Site" at the top of the right side.



6. Go OUTDOORS. Each team will set up their experiments at the sites and take initial wind measurements.

7. *At the forested site*, each team places plastic bags around leafy branches of a **conifer**, a **broadleaf**, and a dead stick. Tightly seal each bag around each branch with a rubber band. *This experiment will work well only if the ground is thawed.*

8. Each team ties an index card to a branch of a tree or shrub, and then spread petroleum jelly over it. This will trap dust in the air.

9. Using the pinwheels or a wind gauge, measure the wind at the site. Students record in their notebooks (*under the appropriate column*) whether they observe any wind at this site and whether the wind caused the gauge or pinwheel to turn: (1) not at all, (2) very slowly, (3) slowly, (4) fairly quickly, or (5) very quickly.

10. *At the non-forested site*, each team places plastic bags around a leafy branch of a **shrub**, **ground cover** such as grasses, and a dead stick. Tightly seal each bag around each branch with a rubber band. *This experiment will work well only if the ground is thawed.*

11. Each team ties an index card to a branch of a shrub, and then spread petroleum jelly over it. This will trap dust in the air.

12. Using the pinwheels or a wind gauge, measure the wind at the site. Ask students to record in their notebooks (*under the appropriate column*) whether they observe any wind at this site and whether the wind caused the gauge or pinwheel to turn: (1) not at all, (2) very slowly, (3) slowly, (4) fairly quickly, or (5) very quickly.

DAY TWO

Go OUTDOORS. Using the Science Cards as format, students observe, collect, and record data from both sites.

Classroom Follow-Up:

Compare the two sites. Discussion questions include:

(a) Did one site have stronger wind? Which one? Why do students think there was a difference? If students did not observe a difference, do they think they would have found a difference on a windy day? Which do students **hypothesize** would be more windy? Why do they hypothesize this?

(b) Which site had the least dust? Why do students think this difference occurred? Did the leaves of conifers or broadleaves trap dust? How might this affect the air quality?

(c) Based on the bags sealed on branches, did students conclude that the plants were putting moisture into the air (**transpiration**)? *If they did, their answer is correct. A tree may pump 80 gallons of water into the air in a single day.* Which of the two sites do they think is most likely to have moist air?

*Students should find less wind and less dust in the forested site, and predict the forested site would have the most moisture in the air. Students should conclude that forests break the wind, remove dust from the air, and add moisture. They should remember that trees and other plants, and therefore forests, add **oxygen** and remove **carbon dioxide** from the air.*

Evaluation:

Based on their observations, students name three ways that forests affect the air. (*Hint: remember **photosynthesis***)

Curriculum Connections:

(See appendix for full citations)

Books:

America's Forests (Staub)

Biomes of the World (v.1) (Allaby) 7-12

Forests and Woodlands (Pipes) K-6

Taiga (Kaplan)

Taiga (Sayre)

U-X-L Encyclopedia of Biomes (v.3) (Wigel) 7-12

Website:

Alaska Science Forum

<www.gi.alaska.edu/AlaskaScienceForum>

Teacher Resources:

(See appendix)



SCIENCE CARD

Forests & Air: Forested Site

1. Record the data under the column “Forested Site” on the page “Forests and the Air.”
2. Measure the wind on this day also. Hold the pinwheel or wind gauge over your head and slowly turn around. If there is any wind, the gauge or wheel will turn. Record whether you observe any wind at this site and whether the wind caused the gauge or pinwheel to turn: (1) not at all, (2) very slowly, (3) slowly, (4) fairly quickly, or (5) very quickly.
3. The card tied on the tree is a trap for dust in the air. Use a hand lens to look at it closely. Record the amount of dust it has collected: (1) none, (2) a few specks, (3) 10-20 specks, (4) 20- 50 specks, (5) over 50 specks.
4. Look at a branch of a conifer tree using a hand lens. Record the number of dust specks on it using the same scale as above.
5. Look at the leaf of a broadleaf tree for dust specks. Record the number of dust specks on the leaf using the same scale.
6. The plastic bags that are tied around the branches of a conifer, a broadleaf, and a dead branch were all dry when tied to these trees. Record which, if any, bags now contain water. How do you think this water got into the bag?

SCIENCE CARD

Forests & Air: Non-Forested Site

1. Record the data under the column “Non-Forested Site” on the page “Forests and the Air.”
2. Measure the wind on this day also. Hold the pinwheel or wind gauge over your head and slowly turn around. If there is any wind, the gauge or wheel will turn. Record whether you observe any wind at this site and whether the wind caused the gauge or pinwheel to turn: (1) not at all, (2) very slowly, (3) slowly, (4) fairly quickly, or (5) very quickly.
3. The card tied on the tree is a trap for dust in the air. Use a hand lens to look at it closely. Record the amount of dust it has collected: (1) none, (2) a few specks, (3) 10-20 specks, (4) 20- 50 specks, (5) over 50 specks.
4. Look at a branch of a shrub using a hand lens. Record the number of dust specks on it using the same scale as above.
5. Look at the leaf of a shrub or grass blades for dust specks. Record the number of dust specks using the same scale.
6. The plastic bags that are tied around a shrub branch, ground cover plant, and a dead stick were all dry when tied. Record which, if any, bags now contain water. How do you think this water got into the bag?

