Stayin' Alive! How Plants and Animals Adapt to Air Pollution
Grade 4, Science

Georgia Performance Standards:
S4L2. Students will identify factors that affect the survival or extinction of organisms such as adaptation, variation of behaviors (hibernation), and external features (camouflage and protection).

a. Identify external features of organisms that allow them to survive or reproduce better than organisms that do not have these features (for example: camouflage, use of hibernation, protection, etc.).
b. Identify factors that may have led to the extinction of some organisms.

Total Duration: 3 ½ - 4 ½ hours

Focus: In this life science lesson from The Clean Air Campaign, fourth grade students will learn that air pollution is an environmental change that can affect the survival or extinction of plants and animals. Students will explore interactive Web sites and conduct guided Internet research to learn about plant and animal adaptations, including those that provide protection from pollution. They will also discover that in the life-or-death world of nature, organisms either adapt to environmental change or they die. Case studies of animal and plant extinction and reasons for saving endangered species will be investigated. Students will share the results of their individual research by combining notes to create a game. Then the class will engage in several rousing outdoor activities to simulate adaptations that help people survive particle air pollution. Finally, students will invent an imaginary animal or plant adapted to a polluted environment, to demonstrate knowledge of key concepts in this lesson.

Materials:
For the class:

- 150+ wadded up newsprint balls, to represent particle pollution in the Cilia game
- Masking tape, to circle around the newsprint balls and hold them in shape
  (Note: ping pong balls or dry 2" water balls may be substituted for newsprint balls)
- Orange soccer or traffic cones, to delineate outdoor activity area for Cilia game
- 15 – 20 ft rope, to delineate space for Cilia game

- One minute timer for adaptations game

For each student:

- Internet-connected computer
- 12+ index cards (with marker, pen or pencil)
- Student Handout
- Scoring Rubric
- Wide assortment of art supplies if critter project is to be an in-class activity. (e.g. paint, markers, construction paper, clay, paper maché, pipe cleaners, toothpicks, feathers, fabric scraps - any and all colors including camouflage prints, eyeballs, rope, balls, wheels, etc.)

Procedures:

Step 1: Teacher Preparation

Prior to the lesson, acquire supplies shown on the Materials list. Wad newspapers into balls and wrap a piece of masking tape around each to hold it loosely in shape, so they can serve as "particle pollutants" for the Cilly Cilia game (or substitute ping pong balls). Make at least one copy of each article linked at Step 7. For each student, make a copy of the Student Handout and the Scoring Rubric. Prepare to lead class discussions by previewing the Web resources provided in Trackstar Track #377649 and on The Clean Air Campaign's Web site.

Arrange for student access to Internet-connected computers (recommended: one child per computer), in order to take advantage of excellent simulation games and learning activities in the Internet Scavenger Hunt at Step 4. Also determine the best way to show the entire class the Web resources linked at Step 3, including a PowerPoint presentation: (i.e. an interactive whiteboard; an Internet-connected computer with scan converter, LCD projector and screen or TV monitor hook-up; or slides copied as transparencies and shown on an overhead projector).

Step 2: Introduction to Adaptation

Duration: 5 minutes

Start a discussion about adaptation by asking students what would happen to plants and animals if there were major changes in the environment, such as air pollution or global warming? Expand on student responses to cover these key points: Vulnerable organisms may sicken or even die. But if given enough time, those individuals who are a little different~ and whose differences help them survive~ would live long enough to pass those characteristics on to their offspring. From generation to generation, the population would begin to look more like the best survivors in its group, and

less like those who did not live long enough to reproduce. Explain to students that in the life-or-death world of nature, living things either adapt to changes in the environment or die.

Clarify that adaptations are not decisions individual organisms make or strategies they choose. An adaptation is an inherited characteristic that comes from a combination of the parents' genes or a genetic fluke called a "mutation." When such a characteristic gives an organism an advantage that helps it stay alive, it is considered an adaptation.
Tell the class they will explore the infinite and inventive variety of adaptations that enable organisms to respond to environmental change and stay alive long enough to reproduce. Ask students to see if they can think of any plant or animal adaptations and accept all responses. (Students may mention physical characteristics such as webbed feet, wings, or camouflage coloring; activities such as migration, hibernation, or living in herds or flocks; or growth and development patterns such as complete metamorphosis or shade tolerance).

Step 3: Introduction to Air Pollution
Duration: 10 minutes
Characterize air pollution as one type of change in the environment that forces plants and animals to adapt or die. Take a few minutes to provide background information on air pollution, including types and sources of pollutants, health effects of pollution, characteristics of particle pollution, how to tell if the air is polluted near one's home, and how to interpret the color-coded Air Quality Index (AQI). The attached "Kids' Guide to Air Pollution" reviews all of these topics and can be shown to students by whatever method is most convenient (printed on transparencies and shown on an overhead projector; on an interactive whiteboard; or on a television monitor with LCD projector, scanner and Internet-connected computer).

When the "Air Quality Index (AQI) for Kids" chart is shown, help students remember the significance of the colors by practicing this "call and response:"

Teacher calls:	***Students respond:***
• When the AQI is green	the air outside is fresh and clean.
• When the AQI is yellow	kids with asthma keep it mellow.
• When the AQI's an orange hue	all kids should limit what they do (outside).
• When the AQI is red	kids have fun inside instead.
• When AQI's a purple hue	keep your parents inside too!
• When the AQI's maroon	play inside all afternoon.

Step 4: Internet Scavenger Hunt: Guided Research on Adaptations and Pollution
Duration: 2 hours

Distribute a dozen index cards to each student and make sure everyone has a pencil. Direct students to put their own names on each of the index cards before starting the guided research. Situate students at Internet-connected computers and direct them to the Trackstar Web site, where they should enter 377649 in the box labeled: "View track number" and click "Go." Tell students they should then click "View in Frames" and *read the notes at the top of each page for directions* (scrolling down as necessary) before viewing Web page content.

In the first frame of this Trackstar Track, students will visit the Lincoln Park Zoo's "Zebra Online" to learn about adaptations through engaging interactive activities and simulation games. Allow time for students to complete all three levels of Form and Function activities. In the next two Trackstar frames, students will conduct an Internet Scavenger Hunt by visiting the Utah Education Network and Oakland Zoo Web sites for information on specific animal adaptations and their functions. Students will use each index card to write an animal name on the front and an adaptation ~ along with its purpose ~ on the back. Cards will be later collected for a game.

The next two frames, from U.S. Fish and Wildlife Service, teach students about extinction and endangerment, which occur when organisms do not have enough time to adapt to changes in their environment. Air pollution is one such change. The following Web page, from the Oxford University Museum of Natural History, teaches students about animals that are already extinct.

Students will read about pollution's effects on plants and animals at the wonderful Windows to the Universe web site, which offers three reading

levels. Next, students will consider how natural pollution, such as that from volcanic eruptions, can change the environment and have a devastating impact on living organisms. Then, students will read about two plants that have adapted to volcanic pollution in very different ways.

Windows to the Universe provides succinct information about human-made pollution ~ again at three different reading levels. Students will view a film from EPA about particle pollution. At the Vanishing Frogs Web site, students will investigate six possible reasons why certain frog species are in decline and decide whether air pollution or some other factor is to blame. A Texas A&M Web page provides insight into the role of asthma and allergies in protecting the respiratory system from pollutants. Finally, students learn about the classic case of pepper moths adapting to air pollution during the Industrial Revolution. Craig Tevis' Web site includes a great slide show on Pollution and Pepper Moths (factory icon) as well as a fantastic interactive game (bird icon) in which students act as birds looking for camouflaged pepper moths to eat, with the results of each round graphed and explained. Remind students to play the game twice ~ once in a light forest with clean air and once in a darkened forest with polluted air; and to print out both "Changes in the Forest" results pages for reference during a discussion later.

After students have completed the Internet-based research, consolidate new learning by asking each student to briefly tell their favorite new information. Discuss how pepper moths adapted to pollution and then back to clean air, asking students to refer to their "Changed in the Forest" result pages to characterize these changes.

Step 5: Adaptations Game
Duration: 20 minutes

Collect the index cards students completed during the Internet Scavenger Hunt (Step 3) and shuffle them. Each child should have contributed twelve. Divide the class into two teams. Establish the order in which members of a team will play (alphabetical? by seating arrangement?) Let an individual from one team pull a card and illustrate it on the board. Members of their own team must guess the animal, the adaptation and its purpose, in order to score a point. Set a time limit of one minute, starting when the illustration is complete. Alternate between teams until every student has had an opportunity to illustrate. The winner is the first team to reach 25 points or highest score when the time available for this activity has ended. If additional time and cards remain, play a grudge match to give the losing

team another chance to win. (Note: For large classes, it may be more engaging to divide students into four teams and have two games going simultaneously, in different parts of the room).

Step 6: The Cilly Cilia Game
Duration: 25 minutes

Take the class outside, along with supplies for the Cilly Cilia game (newspaper or ping pong balls, orange soccer cones, rope) as well as copies of articles for Step 7. In an open space, designate a large triangular playing area (at least 15 ft. on each side) with cones. Mark the base of the triangle with a 15 – 20 ft. rope. Explain that the area inside the triangle (delineated by soccer cones) represents a person's nose and respiratory system. Assign two students to be the Lungs and station them at the angle (point) of the triangle opposite the base. Designate half the remaining students as Cilia (singular: cilium) and position them anywhere inside the triangle. The rest of the students will play the part of Particle Pollution Sources and will line up along the base of the triangle, facing the Lungs and Cilia.

Clarify that cilia stick out like microscopic hairs from cells that make mucus, all along the nose, throat, windpipe (trachea) and lungs. Cilia are adaptations to keep pollution out of the lungs by waving and batting particles out the nostrils or into the stomach. In this game, students playing Cilia can stretch and wave their arms to push the particles away, but they must stand still with their feet together. Have Cilia practice stretching and waving their arms without moving their feet.

Place six to ten newspaper balls (or ping pong balls) representing Particle Pollutants, next to each of the students playing a Pollution Source. (In Georgia, the main sources of particle pollution in rural areas are road dust and fires; in urban areas, they are road and quarry dust, electrical power generation, cars and trucks, so double up in those sectors when assigning roles to students, as needed). Introduce the students portraying Pollution Sources to the class:

- Power Stations (generating electricity by burning fossil fuels),
- Fires,
- Waste Incineration,
- Manufacturers,
- Oil and Gas Refineries,
- Chemical Producers,
- Smelters (metal processing operations),
- Heavy Diesel Vehicles,

- Cars and Trucks,
- Off-Road Vehicles,
- Home Fireplaces,
- Volcanoes,
- Dust (from gravel roads and rock quarries), and
- Dirt (from erosion and land clearing).

Explain that the Pollution Sources should listen for you to announce the Air Quality Index color for the day, and then determine whether to throw Particle Pollutants (newspaper or ping pong balls) toward the Lungs or hold their fire. Good (green) and moderate (yellow) AQI levels mean no particles will be thrown. When students hear a Code Orange AQI announced, each Pollution Source will throw one Particle. Code Red AQI means two Particles; Code Purple AQI means three particles; and Code Maroon means each Pollution Source will throw four particles. Caution students not to hit Cilia or Lungs in the face. If necessary, recall the AQI level colors again with the Air Quality Index (AQI) for Kids, and add a refrain about how many particles to throw at each level:

Teacher calls:	***Students respond:***
• When the AQI is green (No particles thrown.)	the air outside is fresh and clean.
• When the AQI is yellow (No particles thrown.)	kids with asthma keep it mellow.
• When the AQI's an orange hue (One particle thrown.)	all kids should limit what they do (outside).
• When the AQI is red (Two particles thrown.)	kids have fun inside instead.
• When AQI's a purple hue (Three particles thrown.)	keep your parents inside too!
• When the AQI's maroon (Four particles thrown.)	play inside all afternoon.

Begin the game by announcing that the AQI is Code: Green. (No particles should be thrown). Then announce a Code: Orange day. (Each Pollution Source-student should throw one ball towards the lung, to represent light particle pollution). The Cilia should try to bat the balls (particle pollution) away from the Lungs. After the particles (balls) have been thrown, ask the Lungs whether any particles got through to them. If so, how many? Return all balls to the vicinity of the Pollution Sources. Declare a Code: Red day for the next round. Repeat the procedure of asking the lungs to count the

particles that reach them and returning particles to Pollution Sources. Let students switch roles and replay the game, switching the Air Quality Index color for each round.

Seat the class and debrief the activity by discussing the results. Encourage students to describe what happened. (Cilia kept some particle pollution from reaching the lungs). Ask what would likely be the result if the pollution particles were smaller? (More particles would probably get through). How effective were cilia as an adaptation that helps keep pollution out of the body? (When there is a lot of particle pollution in the air, cilia are not able to keep the lungs completely safe). Ask the class if they can think of any other adaptations that protect people from particle pollution. (Accepts all responses but do not add information). Tell the class that they will be acting out some of those other adaptations in the next activity.

Step 7: Air Pollution Adaptations
Duration: 20 minutes

Divide students into small groups of approximately four and assign each group one human adaptation to air pollution which they will demonstrate for the rest of the class with a game or skit. After each presentation, the class will try to guess the adaptation. Provide each group with background information on their assigned adaptation, by printing out these articles from the Nemours Kids' Health Web site:

- Boogers,
- Sneezes,
- Eyelids and Eyelashes,
- Watering Eyes,
- Earwax,
- Skin,
- Allergies, (page 2)
- Bronchitis (page 2)

Allow ten minutes for the groups to read about their adaptations and to plan and practice the skits. After each group presents, the rest of the class will try to guess the adaptation and tell how it protects a person from particle pollution. The presenting group will then teach the class a little more about the adaptation.

Step 8: Create a Critter / Design a Plant
Duration: Homework (or 1 hour class time)

Distribute the assignment sheet contained in the attached Student Handout. Each student will design a plant or animal with adaptations that help it survive in a polluted world. Explain to students that they will….

- Invent an imaginary plant or animal, draw it, and name it. Optional: make 3-D model.
- On the drawing, show / portray and label at least two adaptations (physical features or instinctive actions) that enable it to survive.
- On the back of the drawing, write about how this species avoids predators, gets food and water, and survives (or avoids) the effects of air pollution.

Here is some information about the island to which the invented species must adapt:

- Particle pollution has drifted from the mainland and covered every surface on the island with grey soot,
- A volcano erupts once a month. After a short warning rumble, lava races down the mountain burning everything in its path until it hits the ocean and cools into a hard black shell,
- A thin pollution cloud hovers over the island. It extends from 4 ft above ground to 7 ft above ground. Above and below the cloud, the air is clear,
- Beneath a pollution cloud, it stays dark all day long,
- Pollution has caused global cooling, so places that used to be warm and tropical are covered in ice. The island's climate is cold.
- The freshwater lake on the island is filled with acid rain, and
- The island's dreaded woglump would love to eat your guy for dinner.
- Students may add other specific information about the island or their species.

Optional for teacher: After students have completed the assignment, ask them to present their creations to the class orally and/or assemble the invented menagerie into a wall mural of the island.

Step 9: Debriefing
Duration: 10 minutes

Review the big ideas that were covered in this lesson by asking students what they learned. Record responses on the board, organizing them into two categories: 1) factors that could lead to extinction and 2) adaptations that could lead to survival. Expand on student input to make sure all of the following concepts are including:

- Adaptations are inherited characteristics that help an organism survive.
- Not all the individuals of a species are exactly alike. Because there are differences (due to mixing of both parents' genes and to genetic mutation) some individuals are better at staying alive than others.
- Only the organisms that stay alive long enough to reproduce (have babies) can pass on their characteristics to the next generation.
- Students should be able to cite various examples of adaptations……
- If a species cannot adapt fast enough to changes in the environment, it could become threatened, endangered, or extinct.
- Extinction is forever. Once a species is extinct, it is gone from the world.
- Having a wide variety of plants and animals in the world makes ecosystems more stable and allows people to benefit from other species in ways we may not even have discovered yet.
- Some species become extinct naturally due to factors out of our control. Other species become extinct because of human actions.
- If human actions have threatened or endangered a species, people may be able to save it from extinction.
- Air pollution is a change in the environment that can harm plants, animals, and habitats. Air pollution can cause death of individuals or extinction of a species.
- Some air pollution is natural (i.e. particles erupted by volcanoes; pollen or vapors released by trees) but some is caused by humans.
- Primary source pollution may be natural or human-made. It is toxic from the moment it comes out of a smokestack, chimney, tailpipe or volcano.
- Secondary-source air pollution is formed when substances in the air undergo chemical reactions. These air pollutant gases often hold heat next to the earth.
- The greatest source of human-caused air pollution is the burning of fossil fuels such as oil, gas, and coal, which produces both particles and gases.
- Humans, as well as some animals and plants, have adapted in amazing ways to survive certain levels of air pollution.
- As air pollution continues to be produced, plant and animal species have to continue to adapt or else they will become threatened, endangered or extinct.
- The most important adaptation humans have developed is a brain that can figure out what we need to do to reduce the amount of air pollution we make, and how to take care of our world!

Assessment
A Scoring Rubric is provided. Student participation in lesson activities, including Internet research and simulation games about adaptations and extinction, is assessed. In addition, students are expected to demonstrate knowledge of key concepts from this lesson in the culminating activity, "Create a Critter or Design a Plant."

Follow-Up:
After you have taught this lesson plan, please tell the Clean Air Schools program about your efforts in a brief, 60-second online survey at CleanAirCampaign.org. The information you provide is invaluable in helping this non-profit education program direct its resources to improving these lesson plans and creating new materials for your students. Thanks!

Trackstar Track #377649

Stayin' Alive: How Plants and Animals Adapt to Air Pollution or Die

What would happen to plants and animals if there were major changes in the environment, such as air pollution or global warming? Vulnerable organisms may sicken or even die. But if given enough time, those individuals who were a little different~ and whose differences helped them survive~ would have a better chance of living long enough to pass those characteristics on to their offspring. From generation to generation, a population begins to look more like the best survivors in its group, and less like those who did not live long enough to reproduce.

Explore the wild and wacky, infinite and inventive variety of adaptations that enable organisms to respond to environmental change and stay alive. For the lesson which accompanies this Trackstar Track, including students handouts and assessment rubric, go to The Clean Air Campaign Web site (http://www.cleanaircampaign.com/Kids-Schools/Lesson-Plans) and click on "Stayin' Alive!"

1. Zebra Online
http://www.lpzoo.org/education/zebra/student/a.html
Every plant and animal looks and acts the way it does because it wants to stay alive! In the life-or-death world of nature, every single characteristic either contributes to an organism's ability to survive or makes it vulnerable to death. Enter this coolest of Web sites and click on "Form and Function" to explore animal adaptations. Be sure to play all the games at all three levels.

2. Internet Scavenger Hunt for Adaptations
http://www.uen.org/utahlink/activities/view_activity.cgi?activity_id=4750
Choose five of the animals on this list. For each animal, read the question(s) about its special adaptations before clicking on the animal name. When the Web page opens, look for the answer to the question. Make an index card about each animal with the animal name on the front and a description of its special adaptation on the back of the card- INCLUDING THE PURPOSE OF THE ADAPTATION.

3. More Scavenger Hunting for Adaptations
http://www.oaklandzoo.org/animals/
Select two mammals, one bird, one reptile, one arthropod, one amphibian and one other animal of your choice (seven total). Open each animal's Web page and scroll down to the Adaptations paragraph. Make an index card about each animal with the animal's name on the front and a description of its special adaptation on the back of the card- INCLUDING THE PURPOSE OF THE ADAPTATION.

4. Extinction is Forever
http://www.fws.gov/endangered/pdfs/Why_Save_End_Species_July_2005.pdf
(Note: If this web page does not display immediately, click on link. Adobe Acrobat Reader required.)
Why should we try to keep species from becoming extinct, if extinction is a natural part of life? View this slide show to find out.

5. Endangered Means there is Still Time
http://www.fws.gov/endangered/kids/pdf/html_presentation/html/001.htm
When a species is endangered, there are still some individuals living. That means there is hope. Read for information about how people can help save endangered species.

6. Going, Going, GONE!
http://www.oum.ox.ac.uk/thezone/animals/extinct/index.htm
Find out more about animals that are already extinct. Read to discover what they were like and why they were not able to adapt fast enough to survive. Are they extinct because of natural processes? Did human actions play a role?

7. Air Pollution's Effects on Plants and Animals
http://www.windows.ucar.edu/tour/link=/earth/Atmosphere/pollution_effects_overview.html&edu=elem
Find out more about the effects of air pollution on living organisms. As you read, imagine characteristics or powers that could help plants or animals survive! (Note: You can set the reading level at the top of this Web page. Feel free to click on links in the text. To return to this Web page, just click Frame #7 on the left).

8. Killer Volcanoes - A Natural Source of Air Pollution
http://airnow.gov/index.cfm?action=static.volcano_events
Air pollution is an environmental change that certain organisms may not be able to survive. Thousands of years ago, scientists think meteors crashed into earth, sending up huge dust clouds that floated in the air and made it seem as dark as night, all day long. Plants were unable to make food without light, so a lot of species became extinct. Without those plants to eat, many animals starved. The result was mass extinction. Volcanoes can also produce so much particle pollution that they harm or kill plants and animals.

9. Case Study: Volcanic Pollution
http://www.geog.uu.nl/fg/volcanoes.html
Look at the photos of trees before and after a volcanic eruption. What happened to the trees? How would air pollution from a volcano affect animals? Animals can sometimes escape an erupting volcano, but trees cannot run away. When animals come back, how would they be affected if the trees were all dead?

10. Survival Story: How 2 Plants Adapted to Pollution from Volcanoes
http://hvo.wr.usgs.gov/volcanowatch/2005/05_03_31.html
Check out this Web site to discover how two plants adapted in different ways to bad air from volcanic eruptions. How do the 'ohi'a lehua and the a'ali'i trees survive volcanic air pollution ("vog")?

11. Sources of Human-Made Pollution
http://www.windows.ucar.edu/tour/link=/milagro/air/airpollution_intro.html
Human-made air pollution can be as destructive as a volcano. Find out which is the biggest source of air pollution today. (Note: You can set the reading level at the top of this Web page. Feel free to click on links in the text. To return to this Web page, just click Frame #7 on the left).

12. Particle Pollution
http://www.epa.gov/airnow/pm/pm.html
Watch this film to find out more about particle pollution.

13. Case Study: Vanishing Frogs
http://www.clutyk.freeservers.com/page02.htm
In recent years, many species of frogs have become extinct and more species are in decline. Read this Web page and then click on the links at the bottom to consider possible reasons why frogs are vanishing. What do you think happened?

14. Survival Story: Asthma and Allergies Protect People from Air Pollution
http://peer.tamu.edu/curriculum_modules/OrganSystems/module_4/hazards4.htm
How can coughing, sneezing, runny eyes and a runny nose be good things?!? Read this page to find out some ways our bodies protect us from natural and human-made pollutants.
http://peer.tamu.edu/curriculum_modules/OrganSystems/module_4/hazards4.htm

15. Survival Story: Pepper Moths Adapted to Air Pollution
http://www.techapps.net/interactives/pepperMoths.swf

Click on the factory symbol at the bottom of the Web page to learn about "Pollution and Pepper Moths." Control the slide show with the arrow on the right side of the page. Next, click on the bird to play a game called "Bird's Eye View." Print out the "Change in Your Forest" results page after each game. Play once in a light forest (with clean air) and then click Site #14 "Survival Story: Pepper Moths" on the far left side of the screen to return to the menu and play the game in a darkened forest (with polluted air). For best results, position bird head over moth and click to eat. Happy moth-crunching!

Stayin' Alive! Create a Critter or Design a Plant

Name of this species: _____

Directions:

Use imagination to design an animal or plant adapted to live on a polluted island.

1. Draw your plant or animal and name it.
2. On your drawing, label and explain at least two adaptations (physical features or instinctive actions) that enable it to survive on the island.
3. On the back of this paper, tell how it…
   a. Avoids predators (keeps from being eaten),
   b. Gets food, water and shelter,
   c. Survives (or escapes) the effects of air pollution.
4. Tell one way this species could go extinct.

Here is what the island is like:

- Particle pollution has drifted from the mainland and covered everything on the island with grey soot.
- A volcano erupts once a month. After a short warning rumble, lava races down the mountain burning everything in its path until it hits the ocean and cools into a hard black shell.
- A thin pollution cloud hovers over the island. It extends from 4 ft above ground to 7 ft above ground. Above and below the cloud, the air is clear.
- Beneath the pollution cloud, it's dark all day.
- Pollution has caused global cooling, so places that used to be warm are now covered in ice. The island's climate is cold.
- The lake on the island is full of acid rain.
- The island's dreaded woglump would love to eat your guy for dinner.
- Add specifics about the plant or animal and the place, from your imagination.

Stayin' Alive Scoring Rubric

Proficiency Level and Activities	4 **Caped Crusader**	3 **Earth Saver**	2 **Pollution Buster**	1 **Only Human**
				
Conducted Internet-based research on adaptations, extinction, and the effects of air pollution as environmental change	☐ **Exceeds standard** Completed 11- 13 Trackstar frames AND made 12 cards for game	☐ **Meets standard** Completed 6-10 Trackstar frames AND made some cards for game	☐ **Partially meets standard** Completed activities in 1-5 frames AND made some cards	☐ **Does not meet Standard** Completed no Trackstar frames AND made no cards
Demonstrated an adaptation to air pollution by playing the Cilly Cilia Game	☐ Participated	☐	☐	☐ Did not participate
Taught the class about another of the body's air pollution adaptations, with a skit or game	☐ Participated	☐	☐	☐ Did not participate
Helped create and played the Adaptations Game	☐ Participated	☐	☐	☐ Did not participate
Invented a plant or creature adapted to live in a polluted world. Described its adaptations and the purpose of each. Imagined ways the organism could become extinct.	☐ Made a pollution adapted organism AND wrote about its adapt-ations and their purposes AND imagined its extinction	☐ Made a pollution adapted organism	☐ Attempted part	☐ No attempt

The Clean Air Schools program is helping educate future leaders about air quality and transportation.
Learn more at CleanAirCampaign.org.

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