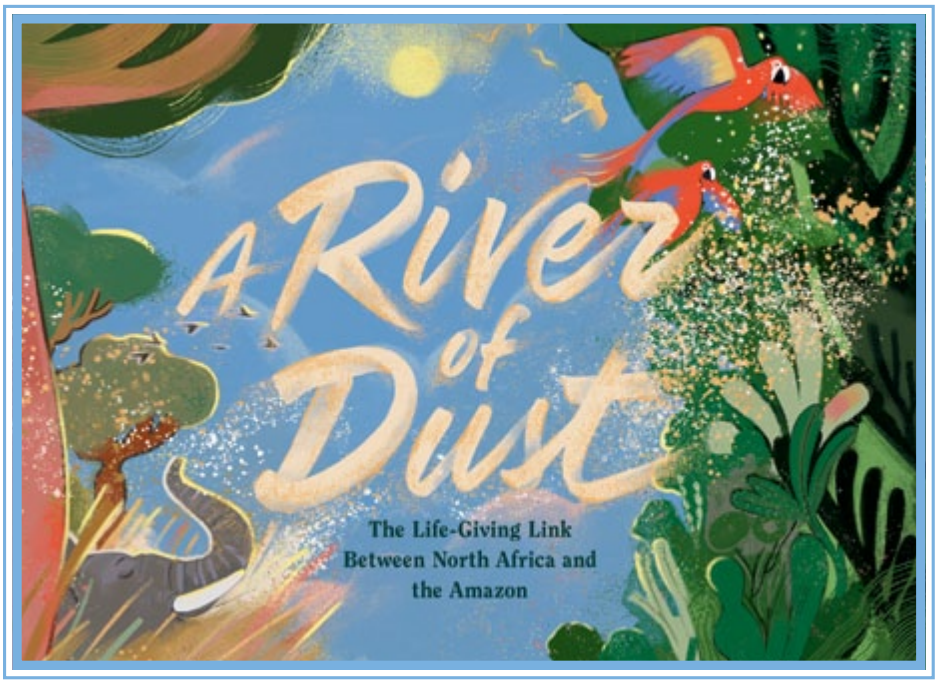
A RIVER OF DUST EDUCATOR'S GUIDE

This guide was developed for the use of educators while reading
A River of Dust by Jilanne Hoffmann and Eugenia Mello.
All lessons may be adapted as you see fit.



About the Book

A River of Dust, a lyrical ode to global interconnectedness, takes readers on a journey across thousands of miles of vibrant landscapes, celebrating the power and wonder of Earth's ecosystems, and showing how dust's tiny particles are, in fact, key to the health of our planet.

About the Author

Jilanne Hoffmann is a children's book author with a BS in Engineering and an MFA in Creative Writing. She has traveled to the Amazon rainforest highlands in Peru, collected the dust of six continents in her shoes, and plans to see the dust swirl in Africa's Sahel and Sahara Desert herself before she turns to dust. Jilanne lives with her family in San Francisco, where dust from China's Gobi Desert flies on the wind, on its way to feeding the trees of the High Sierra.

About the Illustrator

Eugenia Mello is an illustrator and graphic designer from Buenos Aires. When she was seven years old, she moved to Costa Rica, where she was surrounded by the most incredible nature. She was deeply impacted by the majestic scenery she saw: enormous leaves, infinite greens, the rainbow colors of the animals, and the myriad of small creatures. All of that showed her how everything on this planet is connected, bound together by invisible ties we might not see, but that are there, keeping everything alive in a delicate but ever-so-strong balance. She has an MFA in Illustration and lives in New York City.

The Common Core Anchor Standards in English Language Arts, Next Generation Science Standards, National Core Art Standards Anchors, and National PE Standards that can be addressed using the discussion questions and activities in this guide are:

ENGLISH LANGUAGE ARTS

CCSS.ELA-LITERACY.RL.1.2
Retell stories, including key details, and demonstrate understanding of their central message or lesson.
CCSS.ELA-LITERACY.RL.2.1
Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
CCSS.ELA-LITERACY.RL.3.7
Explain how specific aspects of a text's illustrations contribute to what is conveyed by the words in a story (e.g., create mood, emphasize aspects of a character or setting)
CCSS.ELA-LITERACY.RL.4.1
Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
CCSS.ELA-LITERACY.RL.5.6
Describe how a narrator's or speaker's point of view influences how events are described.
CCSS.ELA-LITERACY.RL.6.1
Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

MATHEMATICS

5.NBT.B.5
Fluently multiply multi-digit whole numbers using the standard algorithm.
6. 5.NBT.B.6
Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
6. 5.NF.B.6
Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
6.RP. A.3
Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

NEXT GENERATION SCIENCE STANDARDS

3-LS2-1 Ecosystems: Interactions, Energy, and Dynamics
Construct an argument that some animals form groups that help members survive.

3-LS4-1 Biological Evolution: Unity and Diversity
Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
4-ESS2-1 Earth's Systems
Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
4-ESS2-2 Earth's Systems
Analyze and interpret data from maps to describe patterns of Earth's features.
5-ESS3-1 Earth and Human Activity
Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics
Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

SOCIAL STUDIES

NSS-USH.5-12.8 ERA 8: THE GREAT DEPRESSION AND WORLD WAR II (1929-1945)
Understands the causes of the Great Depression and how it affected American society

ART

CREATING: ANCHOR STANDARD #1:
Generate and conceptualize artistic ideas and work.

HEALTH/PHYSICAL EDUCATION

STANDARD 1
The physically literate individual demonstrates competency in a variety of motor skills and movement patterns.

COMPREHENSION

Before Reading

- Look at a world map with students. Find North Africa. Next find the Amazon rainforest. Make predictions about how wind-borne nutrients might travel from one location to the other.

- Ask students how far they think dust can travel. How does it travel and how far might it go? How much dust may make the journey? How could the amount of dust that travels be affected by weather or other factors? How might we know that dust makes this journey? What evidence would we have?

- Talk with students about what nutrients are (substances that provide nourishment necessary for growth and life). What nutrients do they know? (Students may mention things like protein, vitamins, or minerals.) Where do they get nutrients? How do plants get theirs? What type of nutrients might be wind-borne?

- Look at the cover illustration together. Ask students to predict what plants or animals (including humans) might benefit from the wind-borne nutrients.

- Discuss what students know about wind and weather. Do students know other instances of wind affecting life on earth? Hurricanes? Tornadoes? Wildfires?

- Make a list of ways the wind can be helpful and/or harmful to humans. Create a list before reading, and compare to what is known after reading. The chart may look something like this to begin:

Helpful	Harmful
Cool breezes on hot days	Spreads wildfires
Spreads seeds	Dust in the air makes it harder to breathe or see

During Reading

- After reading the first lines, stop and discuss them. Who do you think is narrating this story? How do you know?

- What does "no ocean lay between us" mean? If students are not familiar with Pangaea and Continental Drift, they may not understand, and this would be a good time to introduce the concept. (See Earth Science for lesson ideas.)

- What sort of "great forces" might tear continents apart?

- Think about the word flourish. What does it mean? What are some things that help life, not just survive, but flourish?

- What do you think of when you think of dust? Do you think it's ever helpful? How?

- What do you know about the Sahara Desert? Have you heard of the Sahel? What about other parts of Africa? Discuss students' knowledge of African geography.

- What might be the "precious cargo" carried by the dust? What makes it precious?

- What do you picture as the dust travels across Africa? Ask students to close their eyes and imagine the dust moving. Describe what they see. You may also ask students to sketch what they picture.

- Think about the line "shroud the sun." What does it mean to shroud something? Can you think of other examples of things that shroud (like fog or a curtain) or are shrouded (like Halloween ghosts or tables under tablecloths)?

- What other ingredients do you think might be included in "the ocean's soup"? How do those ingredients reach the ocean?

After Reading

- Ask students to retell the dust's journey from beginning to end. Where does it start? Where does it complete its journey? Does all of the dust make the entire journey?

- Describe the end of the dust's journey. What has it accomplished?

- Why do you think dust from North Africa would be so important to the Amazon rainforest?

POINT OF VIEW

A River of Dust is informational fiction. The content is factual, but it's told by a fictional voice (the dust).

- Why do you think the author chose to personify dust? What are some advantages to this narrator? What are the disadvantages?

- Compare the narrator to the narrators of other informational fiction picture books. How are the books and narrators similar and different?
    - The ghost of Noah Webster in *Noah Webster's Fighting Words* by Tracy Nelson Maurer and Mircea Catusanu
    - The octopus in *Love, Agnes* by Irene Latham and Thea Baker
    - The smoke in *I Am Smoke* by Henry Herz and Mercè López
    - The avocado in *Avocado Asks* by Momoko Abe

VOCABULARY

Ideas to incorporate vocabulary into your lessons:

- Discuss words as they come up in the story.
- Ask students to look up each unfamiliar word and its definition. Students may record their work in a notebook or on flashcards.
- Play Memory by matching words to their definitions.
- Play vocabulary charades/Pictionary for practice. Challenge one student to act out/draw a word. The rest of the student's team must guess the word in a certain amount of time.
- Challenge students to use a new vocabulary word in their own writing. Alternately, choose a word of the day and ask everyone to use that word throughout the day. Celebrate when a new vocabulary word is used correctly.

Bountiful: large in quantity, abundant
Bulbous: fat, round, or bulging
Canopy: the uppermost spreading branchy layer of a forest
Cargo: goods carried, usually on a ship, aircraft, or motor vehicle
Flourish: to grow or develop in a healthy, vigorous way
Grime: dirt ingrained on the surface of something, especially clothing, a building, or skin
Harmattan: a very dry, dusty trade wind that blows from east to west across North Africa, occurring late November through mid-March
LIDAR: (Laser Imaging, Detection, and Ranging) a tool on the CALIPSO satellite that uses light pulses to detect and measure the size and quantity of objects moving through Earth's atmosphere or ocean. [word used in back matter]
Oasis: a fertile spot in a desert where water is found
Plateau: a flat stretch of land that is higher than the areas of land around it
Shroud: something that envelopes or covers something else
Sift: put a fine, loose, or powdery substance through a sieve to remove lumps or large particles
Trade Wind: winds that reliably blow east to west just north and south of the equator, helping ships travel west, and steering storms such as hurricanes [word in back matter]
Tufts: a group of threads, grass, hair, etc., held or growing together at the base
Vast: of very great extent or quantity, immense
Vital: required or essential

Challenge: The word "sustain" is a contranym, a word with two opposing meanings. Sustain can mean to strengthen or support as in "The farmer's grain storage will help sustain him through the winter." It can also mean to undergo an injury as in "The centerfielder sustained a knee injury while making a diving catch." Have students determine which definition of sustain is used in the book. Can they come up with a sentence about the dust migration using the opposite meaning?

WRITING

Invite students to present the journey of dust in a different way. Try one of the following:

- Newspaper/magazine article—In 500 words or fewer, tell the who, what, where, when, why, and how of nutrient-rich dust traveling from Africa to South America.
- Newscast—Be news reporters and put on a program that shares the news of how African dust nourishes the Amazon rainforest.
- Game show—Pretend the Amazon rainforest is on a game show and has a chance to win the big prize—Dust from North Africa! Write a script for this game show. Will the Amazon win big or lose it all?
- Infomercial—Pretend you are "selling" African dust to someone in South America. Why should they "buy" your dust? What will it do for them?
- Graphic novel/comic—Blend panels of pictures and words to tell how the dust moves from one continent to the other.
- Diary—Pretend you are Dust writing in your diary as you make the journey. Record your experiences as well as your feelings.

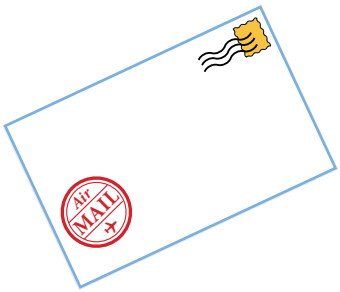
- The author uses personification (giving human qualities and voice to a nonhuman object) to tell the story. Have students tell another nature-inspired story using personification. Some ideas might include:
    - A butterfly as it metamorphosizes
    - A hurricane wreaking havoc
    - A flower blooming
    - A snowflake falling
    - An endangered animal facing extinction

- Ask students to make a list of things that help them flourish. Have them write a poem describing one of the items on their list and how it helps them flourish.

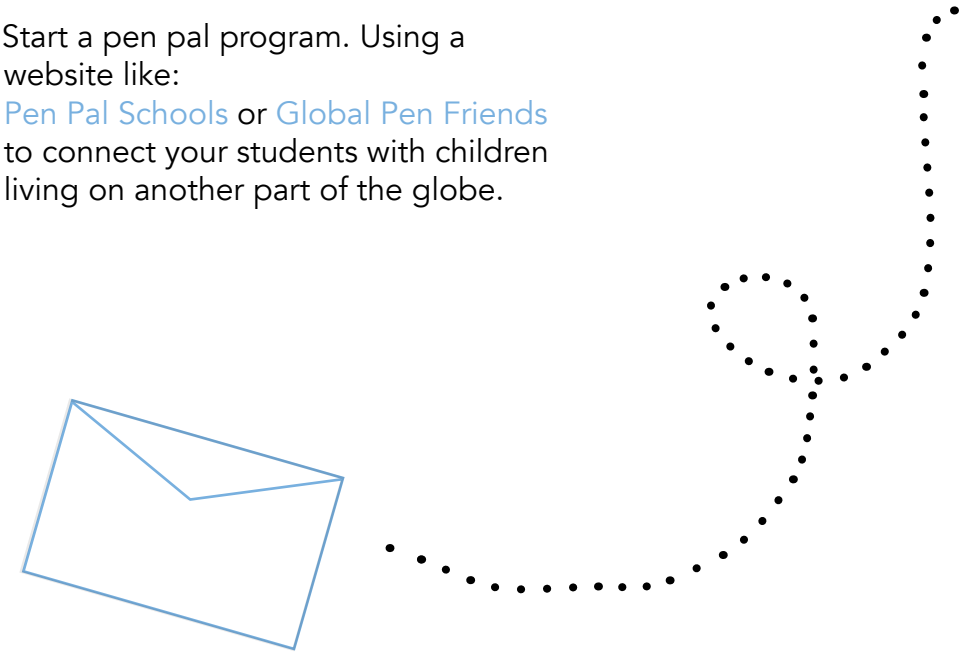
- Have students write a recipe for "Ocean's Soup." What ingredients would they include (and in what quantities)? How long does it take to prepare? How do they serve it?

- *A River of Dust* is a story about a journey from Africa to South America. Assign students to write a story about a journey they've taken (or one they'd like to take). What did they lose and gain along the trip?

- Have students write letters to someone far away. In the letters, tell the things you miss about them and what you're sending along with your letter. You might choose to send a picture, stickers, a page of riddles or a small care package. What do you hope to accomplish with your mail? How will this help sustain your relationship or friendship?

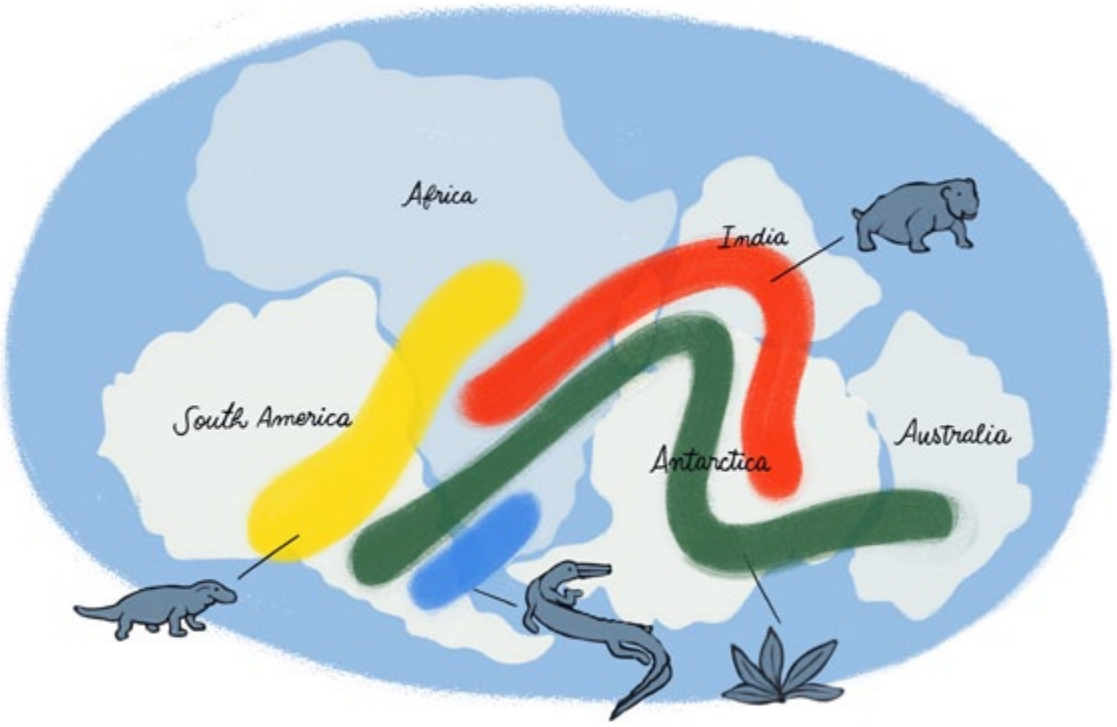


- Start a pen pal program. Using a website like:
  Pen Pal Schools or Global Pen Friends
  to connect your students with children living on another part of the globe.



EARTH SCIENCE

Pangaea
When the dust falls on South America, it "renews the connection" between the two continents. That is because Africa and South America were once joined together. In fact, all continents were once one. This supercontinent is called Pangaea. Have students notice how South America and Africa were once connected. Here is a good source for pictures and more information on Pangaea: Live Science.



Continental Drift
Fossils and rock formations provide evidence for continental drift. Scientists know the continents moved because they found similar fossils in seemingly very different places. Watch this video which helps explain why continental drift occurs: Proof of Drift.

Below is a chart of fossils and where they've been found. Ask students to label the locations of each species on a current map as well as one of Pangaea. What do they notice?

Species	Locations Found
Lystrosaurus (small reptile)	India, Africa, Antarctica
Glossopteris (woody shrub)	Australia, S. Africa, S. America, India, Antarctica
Mesosaurs (reptile similar to crocodiles)	S. Africa, Eastern S. America
Cynognathus (mammal-like reptile, dog sized)	S. Africa, S. America

Plate Tectonics
Explain that the earth's crust is not solid, but made up of shifting plates and explore how these plates move. For more information on plate tectonics, visit: The Earth's Layers.

- Give each student a plate holding a thick dollop of Cool Whip. The Cool Whip represents the earth's mantle, solid but not stable. (For fun you can add red food dye to the Cool Whip so it looks more like the mantle.) Place two graham crackers on top. These represent different plates of the earth's surface. Have students try the following experiments:
    - Rub two plates together as you move them back and forth in opposite directions to form a transform boundary. Students should feel a bit of friction as the plates grind together. Plates along a transform fault rub and often lock together until the pressure increases so much they fracture. The sudden release of energy when they slip is what we feel during an earthquake. Big earthquakes happen when lots of pressure builds up before a slip. The San Andreas Fault in California is an example of a transform boundary.
    - Pull the plates apart from each other to form a divergent boundary. Students should see Cool Whip magma ooze up in the space between. Africa's Great Rift Valley is an example of a divergent boundary. (You can also explain that when the mantle comes through the crust, it cools and forms igneous rocks).
    - Push the plates directly into each other to form a convergent boundary. (This works best when crackers are a bit soggy.) The overlapping plates are forming mountains. The Himalayan Mountain Range was formed this way.
    - Thrust one plate under another to make a subduction zone. The plates should overlap with magma oozing between them. This happens when a denser oceanic plate meets up with a less dense continental plate. Volcanic mountains like Mt. St. Helens in the Cascade Range in Washington State were formed by subduction.
- Visit The Geological Society's education resource page for puzzles, games and online quizzes related to plate tectonics.

Dust Particles
Dust particles travel more than a thousand miles between Africa and South America.

- Set up an experiment to see how far particles can travel in your classroom. Using small paper holes (from a three-hole punch), test how far the particles travel in each of the following scenarios:
    - Blowing the particles with your mouth.
    - Using a paper fan to move the particles.
    - Setting up an electric fan near the particles. (You can also experiment with the fan's settings or location.)

Students can also experiment with particle size. Do smaller or larger particles travel farther? Does the shape or quantity of the particles matter? What happens if you use a lighter material (tissue paper) or a heavier one (cardboard)?

CALIPSO
Scientists have been able to verify the movement and estimate the changing quantity of dust from Africa to South America by using satellite images and LIDAR data provided by the CALIPSO satellite.

- Using a variety of materials make a model of the CALIPSO satellite.

Air Quality
Learn to track air quality.

- As a class, visit Air Now. This is the U.S. government's air quality control website, where you can check the air quality of any location in the United States. Check your city's air quality and discuss what goes into the rating. If your city has a poor rating, read why.

- What factors contribute to a poor rating? (Students may mention high pollens, fires, dust, etc). What do these things do to the air? How do they harm people?

- Discuss why this site is helpful and what to do when the air quality is poor (stay inside, etc).

- Why do we need a site like this (or scientists monitoring the air quality)? Can we always see bad air?

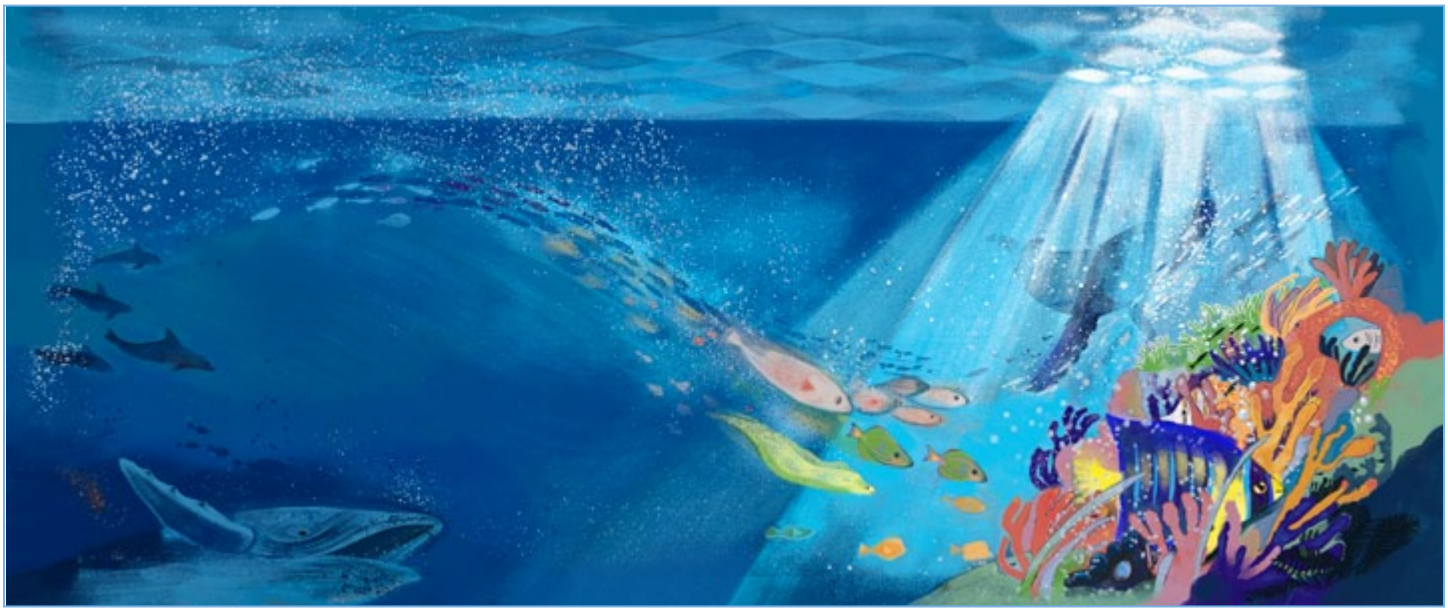
- If you have a class calendar, add air quality status to it. One student can check the air quality each morning and color the calendar square with the corresponding color. Students can share their knowledge with others (perhaps report during morning announcements or by posting an update in a communal spot).

BIOLOGY

Phytoplankton
Phytoplankton living in the Atlantic Ocean benefit from the African dust and are a vital ingredient in building up "the ocean's soup." As noted in the back matter, the iron from the dust is essential for phytoplankton life. During sunlight hours, phytoplankton absorb carbon dioxide and produce more oxygen than the rainforest!

- Research what types of animals consume phytoplankton. Make food web maps that show how essential phytoplankton are to life on earth. To make a food web, list all the food producers and consumers in a habitat. Use arrows to show how they are connected to (and dependent upon) each other. Visit Food Webs for examples.

- Make public service posters that celebrate the unsung accomplishments of phytoplankton. Or have students make a series of phytoplankton fun facts trading cards.



Phosphorus
Phosphorus and Iron are two of the essential elements carried by the dust. Phosphorus is an element essential to life and found in many foods we consume including chicken, seafood, nuts, seeds, and whole grains. It is the second most abundant mineral in the human body, after calcium. It's important for healthy bones, teeth, and all of the cells of living creatures.

However, phosphorus comes from rocks (and dust)! The phosphorus in the dust from the ancient Lake Mega-Chad is fossilized diatoms (a type of phytoplankton) that lived in the lake thousands of years ago. So how does it transfer from rocks and dust to our foods? Water (from rain, streams, and oceans) and wind cause rocks to erode over time. When rocks erode, they break down into smaller elements, becoming part of Earth's soil. Plants growing in that soil absorb the phosphorus. The phosphorus is then absorbed by animals (including humans) when they eat plants and other living creatures.

- Have students draw a diagram of how phosphorus is transferred from rocks to humans. (Make sure to include wind.)

- Put white flowers (carnations work well) in a vase of colored water. Observe how the colored water affects the flower. Explain how this demonstration shows how plants absorb water and nutrients.

- Put dry sponges in shallow bowls of water of no more than an inch high. Watch and record what happens to the sponge (including the parts not touching the water). What changes? How is this like the leaves of plants in the Amazon rainforest absorbing phosphorus?

- Ask students to imagine that phosphorus is a superhero. Have them draw a picture of what the superhero might look like and explain (or write) what their superpowers might be.

- Too much phosphorus is NOT a good thing. Just as too little phosphorus can cause plants and animals to die, too much phosphorus can do the same. Have students research phosphates, chemicals that are made from phosphorus and the damage they can cause when they're found in ecosystems. What products still contain phosphates? How does farm/ lawn fertilizer runoff affect water ecosystems?

Iron

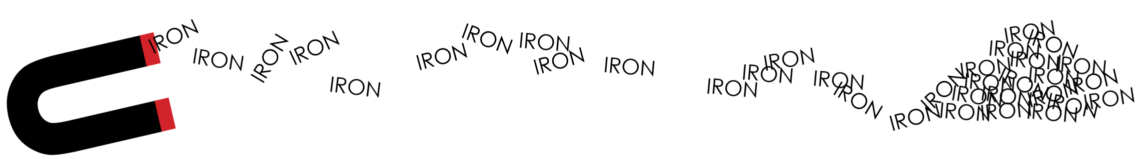
Iron is both a metal and an important nutrient in our body. It is an essential component in human blood. Iron is found in meats, beans, and leafy vegetables.

- Show students a cast iron pan. Explain to them that iron, the same material used to make the pan, is essential to human life. (You can even tell students that if they cook something acidic like tomato sauce in a cast iron pan, they will add iron to the food.)

In A River of Dust, iron is one of the nutrients carried by dust in the wind. How does something seemingly as heavy as an iron pan travel with the wind? Iron, like all elements, can be broken down into much smaller parts. So small, in fact, they can hide in your cereal.

- Give students a small Ziploc bag of Total cereal. Cereals are fortified with iron to make them more nutritious. Have students break up the cereal with their hands until it's crumbly. Add warm water until it has a mushy consistency. Wait at least an hour then mix the cereal again. Using magnets (on the outside of the bag), extract the iron from the cereal. The small black flecks attracted to your magnet are iron, the most magnetic of all metals.

- As before, ask students to imagine that Iron is a superhero. Draw what this superhero might look like and list their superpowers.



Nutrition

Nutrients are essential for growth and life—not just for rainforest plants—but for human life, too. Scientists have identified six key nutrients that humans need to survive: proteins, carbohydrates, fats, vitamins, minerals, and water. Divide students into six groups and have each group research and report on their nutrient.

- From what sources do humans get this nutrient?
- Why do we need it?
- How much do we need?
- How does it benefit us?
- What happens if we don't get enough?
- What happens if we consume too much?

Migration

- Compare the journey in A River of Dust to animal migrations. Ask students to investigate one and report on it. Below is a list of ideas, but students are welcome to generate their own.

- Who or what is migrating?
- When does it happen?
- Why?
- How does this migration affect other life on earth?
- Why is it important?
- What might happen if this migration stopped occurring?

Ideas for migration:

- Zebras
- Gazelles
- Wildebeests
- Humpback whales
- Killer whales
- Monarch butterflies
- Salmon
- Sea Turtles
- Bats
- Dragonflies
- Seals
- Arctic Terns / birds

Operations, Ratio + Proportion, Visual Model
Lake Mega-Chad is an ancient lake in North Africa that was once the size of California! Scientists believe its nutrient-dense, now-dry lakebed is one of the origins of the dust in A River of Dust.

Create visual representations of Lake Mega-Chad.

Give students Worksheet 1 found on page 21. Worksheet 1 contains a grid, divided equally into 100 squares.

Tell students that this chart represents Lake Mega-Chad, as it was about 7,000 years ago. Lake Mega-Chad once covered an area of 400,000 km^2. At that time, it was the world's largest freshwater lake!

On this grid, how many square kilometers does each square represent?
(400,000 km^2/100 squares = X) Ans: X = 4,000 km^2 per square, or almost one million football fields per square, larger than the state of Rhode Island.

Today, Lake Chad covers an average area of just 1,350 km^2 (depending on annual rainfall). It has shrunk 90% since the 1960s, due to decreased rainfall resulting from climate change, irrigation use, and other human demands for fresh water.

Ask students to find Lake Chad's current size as a percentage of its original size.

(1,350 km^2/400,000 km^2 = X/100.) Answer: X= .3%

What is the percentage change in Lake Chad's size over the past 7,000 years?
(original size as a percentage minus the current size as a percentage) 100% - 0.3% = 99.7%
Ans: The lake has decreased in size by 99.7%.

To show this, have students color in just 1/3 of one square to represent the current size of Lake Chad vs. its original size of 100 squares.

- What does this say about how much water was lost between 7,000 years ago and the 1960s, and between the 1960s to now?
- Has the rate at which the water is disappearing increased?
- Why do you think that is?

Students could make similar visual representations of Lake Mega-Chad vs. the total area of Africa (30.37 million km^2).

GEOGRAPHY

Amazon Rainforest

- Read other rainforest-related picture books, such as Fourteen Monkeys: A Rain Forest Rhyme by Melissa Stewart and Steve Jenkins, and watch videos about the rainforest. This National Geographic YouTube link offers great background information.

Discuss the differences between the four layers of the rainforest (Emergent, Canopy, Understory, and Forest Floor). Then choose one or more of the following activities:

- Divide students into four groups. Assign a layer to each group. Students should research their layer and discover what makes it special. Students can share their knowledge by making a poster, PowerPoint presentation, or report on their section.

- Create a class mural of the rainforest. Assign each student to draw or find images of one plant or animal that might be found in each layer to create a bountiful mural. Students may write a short description or fact about their plant/animal to add to the mural.

- Assign students to research specific plants found in the rainforest. Ask each student to explain how North African dust helps their plants.

- Create your own rainforest using this worksheet from the National Zoo.

- Humans have inhabited the Amazon rainforest for 10,000 years! Make an interactive timeline to understand cultivation and how humans have changed the size or other characteristics of food crops over the years. For example, a wild peach palm's fruit in the Amazon weighs only about one gram (the weight of a paper clip). The domesticated peach palm's fruit can weigh as much as 200 grams (ave. weight of a large Golden Delicious apple). Assign students to research different aspects of human's impact. The work can be combined to form a timeline (digitally or on a large wall). You may want students to look at things such as:

    - Groups of people who've lived and still live in the Amazon rainforest
    - Countries/governments that have controlled the Amazon rainforest, and how their policies are protecting or speeding its destruction
    - Crop growth and size. (See below for more on this)
    - Deforestation and pollution

This Atlantic Magazine article may be a helpful starting point.

- Ask students to investigate the changes in produce or grain sizes by comparing wild vs farmed crops. Use the collected data to make a class bar graph. What trends do students notice? (Students should note that farmed crops are usually bigger than their wild counterparts.) Are there any other differences? Here's a list of potential crops to investigate:

    - Wild berries
    - Pumpkins
    - Potatoes
    - Tomatoes
    - Beans
    - Corn
    - Wild onions
    - Mushrooms
    - Peppers

North Africa

Much of the book focuses on North Africa as the dust travels over the continent. Make a map to heighten students' knowledge of the area.

- Make a Salt Dough Map of North Africa.

    Directions:
    - In a bowl, mix the following ingredients (4 cups flour, 2 cups salt, 2 cups water, 2 tablespoons cream of tartar)
    - Printout a map of North Africa. (The size you choose will be the size of your map.)
    - Cut out your map and carefully trace it onto heavy cardboard.
    - Add the salt dough to your map and carefully fill in the borders.
    - Consult a topographic map to determine where you should have flat parts and where the land rises.
    - When finished, allow your map to dry and harden.
    - Paint the map. (If you have multiple groups making maps, you may assign each group, a different type of map—political, physical, etc.)

Depression Era Dust Bowl
The Dust Bowl was a period when the southern Great Plains and the Midwestern United States were affected by severe drought as well as terrible dust storms.

Discuss the Dust Bowl of the 1930s and its effects on the Great Plains ecosystem.

- Read A Child of the Dust Bowl.
- Review photographs of the Dust Bowl.
- The Dust Bowl happened during the Great Depression. How did an already crippled economy make the situation worse? Make a timeline of events of the Great Depression to see where the Dust Bowl falls.
- The Dust Bowl was caused by many factors, including poor government policies related to farming, poor farming practices, extended drought, unusually high temperatures, and wind erosion.
- To demonstrate how farming and drought changed the prairie, prepare two pie tins. In one, place dry soil. This represents the dry, tilled land of the Dust Bowl region. In the next, place a small piece of sod (or soil with plants that act as ground cover). Put newspapers under the pie tins, then turn a hair dryer on low and aim it at each pie tin. What happens when wind (simulated by the hair dryer) hits the dry soil? What is different when the wind hits the sod or groundcover?
- What happens if the soil is wet compared to dry? How are the soil cover, dryness, and wind related in ways that make the air more or less dust-filled?
- Research the Homestead Act of 1862. How did this change the Great Plains in the U.S.?
- Use a Venn diagram to compare and contrast the dust in A River of Dust versus the dust in the Dust Bowl. How are they the same? How are they different?

- Check out these links to see images of the dust storms:
  - Tracking a Massive Dust Cloud From Africa to America.
  - CALIPSO Observes Saharan Dust Crossing the Atlantic Ocean.

Give students a picture of the Earth's surface (it can be a photograph or an illustrated image). Have them add dust storms to the Earth's surface through any medium of choice (paper collage, oil pastels and acrylic paints work well)

- Paint with dust. Collect dust (from the playground or some other accessible place) and mix it with paints. Allow students to experiment with the quantity that is mixed to form different consistencies and then create original artwork. Perhaps students can paint a dust storm with their dust paint.

Physical Education

Play Dust Storms

- Divide students into two teams. One team represents the continent of Africa. Place this team in the center of your play space. Make sure the team has a clear border of their region—tape on the ground works well. (Bonus points if the border is in the shape of Africa.)

- The other team will spread out to the north (Europe/Mediterranean) and west (S. America). Use tape to mark these boundaries as well.

- Give the African team a basket of soft balls or bean bags. These soft balls represent dust particles traveling from Africa and beyond. They are carried west (to South America) by Harmattan trade winds in winter/spring and north (Europe) by Sirocco winds (anytime of the year). The goal of Team Africa is to get the dust particles into the other two regions. The goal of the other team is to stop the dust from arriving (students might pretend to be animals, man-made obstacles, or other barriers).

- Call out a wind (Harmattan or Sirocco). Team Africa should throw balls in that direction. Make sure to vary the winds so students must change where they are throwing. Team Africa gets a point for each ball that lands inside the continent boundaries during a round. The opposite team may catch a ball and throw it out, but once it lands, it counts for Africa. Balls that land between the boundaries are in the ocean and do not count.

- Switch sides so the other students can have a turn being Africa. (You can either time the teams or limit the number of soft balls that can be thrown during a turn.) The team with the most points wins.

This guide was prepared by Candy Wellins and Jessica Cotsonas with a CLOSER Read.

 Name:_____

Lake Mega-Chad