Environmental Disruptions and Plant-Based Solutions

GOAL: Students will explore the connections between natural habitats and urban stability.

TIME REQUIRED: 30 minutes

MATERIALS:
- The Surprising World of Horticulture poster
- Disruptive Scenarios activity sheet and/or Create Community Solutions activity sheet

❶ Hook students with this striking fact: A hurricane can expend as much energy as 10,000 nuclear bombs. A well-vegetated wetland system can absorb the impact, protecting humans and wildlife.

❷ Tell students that cities and nature are connected in countless ways. Ask for volunteers to give a few examples of how city dwellers interact with nature on a daily basis and how they depend on nature for their well-being. To expand on the topic, offer these facts:

WATER: Most cities do not have their own water supply, so they must depend on clean water that comes from other places. Often this source is a river or a distant reservoir. If that river or lake becomes heavily polluted or begins to run low, the city is in trouble. Cities rely on healthy, natural ecosystems upstream to provide them with clean water.

AIR: The atmosphere is a shared resource, and air pollution produced in one location can spread to other places. Without pollution controls and natural systems, such as healthy forests, air quality can decline.

LAND: Cities need trees and plants for many reasons. They moderate temperatures and can help prevent the "heat island" effect. They also improve air quality and mental health.

Reinforce and supplement this content by showing and discussing **The Surprising World of Horticulture poster**.

❸ Explain that when natural systems are disrupted, there are wide-ranging effects. Deforestation, wetland destruction, and pollution can cause damage both to physical infrastructure—through flooding, for example—and to public health. The rise of carbon dioxide in the atmosphere is causing disruptions as well, and promises to create many problems in the future, including rising temperatures, extreme storms, and coastal flooding. In all of these cases, working to maintain a healthy plant world will help prevent or mitigate many of these problems.

▶ **FOR EXAMPLE:** Many plants can remove carbon dioxide from the air. Researchers have found that trees can also remove up to 97 percent of volatile organic compounds (chemicals that have high vapor pressure).

❹ Distribute one of the activity sheets.

▶ To decrease the challenge: Use the **Disruptive Scenarios activity sheet**.

▶ To increase the challenge: Use the **Create Community Solutions activity sheet**.

Guide students through the activity. Discuss where some of these problems are currently happening in your region. Have students complete the activity with online research to find out how humans are affected.

EXTENSION: Work together as a class to consider solutions to the problems listed on the activity sheet and brainstorm ideas about what you may be able to do at your school. Have students use their scientific knowledge and technological creativity.

DIGITAL GAME

Students will pair plants with the community challenge they can solve at **scholastic.com/bloom/plantpower**.

SCHOLASTIC

THE SURPRISING WORLD of HORTICULTURE

How plants power our lives in innovative ways

DRONES & ROBOTS *help us* **GROW PLANTS**

to feed a growing world

Technology

People only eat roughly **2.5%** of the edible plants in the world

If we cultivated the others, maybe we could solve world hunger

Beauty

Plant-based cosmetics are one of the fastest-growing segments of the beauty industry

Environment

More Trees — Less Pollution!

1 Tree Can Scrub **48 lbs.** of **CO₂** from the air each year

Simply looking at flowers and nature can improve your **MOOD**

Art & Design

Ornamental **Horticulture** has been proven to:

REDUCE STRESS

IMPROVE MEMORY & CONCENTRATION

and **SPEED HEALING**

Food

Fashion

More PLANTS — more comfort

39% of the World's Clothing is made from cotton plant fibers

MORE NATURAL SUSTAINABLE ♻ COMFORTABLE

than chemical-based synthetics

PLANT MORE GRASS!
Grass fields increase oxygen & improve performance

Sports

Athletes are **20%** more likely to sustain injuries on artificial turf **VS.** natural grass

Health & Wellness

½ of the top **100 MOST PRESCRIBED MEDICINES** come from **PLANTS!**

Science

Spinach is being used in experiments to re-engineer **HUMAN TISSUE**

Plant Scientists are working to solve some of the world's most challenging issues

Goodbye drought, starvation and cancer!

Jobs

39% of the annual horticulture job openings are unfilled due to lack of qualified applicants

Want to solve unemployment? Show more people all the awesome jobs working with plants

Economy

Horticulture contributes **$196b** to the **U.S. ECONOMY** *(annually)*

BLOOM!

SOURCES: Clockwise: **Beauty:** "What's Driving the Billion-Dollar Natural Beauty Movement," Fast Company; "Natural Segment Continues to Outpace the Overall Beauty Market," Global Cosmetic Industry (Cosmetics). **Environment:** "Carbon & Tree Facts," Arbor Environmental Alliance (Carbon Dioxide); "A Review of the Benefits of Nature Experiences," US National Library of Medicine National Institutes of Health (Mood). **Art & Design:** "Literature Review of Documented Health and Environmental Benefits Derived from Ornamental Horticulture," Landscape Ontario. **Health & Wellness:** "Facts and Figures on Biodiversity," ICUN. **Economy:** "Enriching Lives, Creating Jobs, Building Wealth, Saving Money," National Initiative for Consumer Horticulture. **Jobs:** "Join Our Movement," Seed Your Future; "Employment Opportunities for College Graduates," United States Department of Agriculture. **Science:** "Using Decellularized Plants as Perfusable Tissue Engineering Scaffolds," ScienceDirect. **Sports:** "NFL Leg Injuries More Common on FieldTurf than Grass," Reuters (Athletes); "Maintenance Safety," Sports Field Management Magazine (Plant More Grass). **Fashion:** "How Much of the World is Made From Cotton," Live Strong (Cotton); "Plants Used for Clothing," Leaf TV (Plants). **Food:** "Plant Facts," Science Kids. **Technology:** "10 Ways Technology is Changing Our Food," TechRepublic; "6 Ways Drones Are Revolutionizing Agriculture," MIT Technology Review; "Unleashing A Decade of Innovation in Plant Science," Plant Summit.

NAME:_____

Disruptive Scenarios

Disruptions to our natural habitats can have widespread effects. Not only can they destroy natural and human environments, but they can cause social instability as well. In this activity, you will think about several real-life situations where disruptions are causing major problems around the world—sometimes closer than you think.

Instructions: Draw a line matching the disruptions on the left with the corresponding effects on the right.

DISRUPTION

Invasive beetles—thriving in a warming climate—kill a huge forest.

Coastal wetlands are slowly destroyed by oil drilling operations.

Chemicals from agricultural fields drain into a river lacking vegetation on its banks.

Carbon dioxide from human activity causes rising temperatures.

Visitors destroy grasses and dunes on a beach, which is a vital habitat for endangered species.

EFFECTS

Species dependent on this ecosystem—birds, mammals, insects, and other plants—are forced to move or die.

Low-lying cities along the coast suffer massive flooding due to the lack of a buffer from the sea.

A "dead zone" is caused when a chemical imbalance causes an algal bloom, depriving fish species of oxygen.

Sea levels rise, causing coastal flooding. Plants and animals struggle to adapt to new temperatures.

Shorebird populations plummet, some of which are driven to the brink of extinction.

WHAT IS THE IMPACT? For each of the scenarios above, identify a state where the disruption is happening and describe how it impacts human life.

SCENARIO	STATE	IMPACT ON HUMANS
Invasive beetles		
Destruction of wetlands		
Chemicals in rivers		
Excess of carbon dioxide		
Destruction of dunes		

Create Community Solutions

Evaluate the real-world challenges and solutions below. Then identify issues in your own community and propose solutions that use plants and plant experts.

COMMUNITY ISSUE	IMPACT	PLANT-BASED SOLUTION	PLANT PROFESSIONAL
Large amounts of rainfall within a short period of time cause flooding in low-lying communities.	▸Disrupts drainage systems in cities. ▸Overwhelms sewer systems. ▸Stagnant pools of water become a breeding ground for insects.	▸Plant trees, bushes, and **propagules** around vulnerable areas so the roots dig deep into the soil and act as a barrier to floodwater. ▸Support healthy wetland systems to purify water, regulate water flow, and stabilize bank streams.	**NATURAL LANDS MANAGER** ▸Specializes in maintenance and upkeep of land such as wetlands. ▸Determines optimal conditions for dry and flooded soil to support propagation.
Suburbia is "carpeted" with grassy lawns. These landscapes create a grass **monoculture** due to an aesthetic preference for green, well-kept lawns.	▸Chemical runoff from lawn fertilizer is a major source of water pollution. ▸Monoculture creates fewer opportunities for biodiversity. ▸Keeping lawns watered can put pressure on our freshwater reserves.	▸Add trees and shrubs to slow rainfall, create shade, and provide animal habitats. ▸Plant wildflowers to attract pollinators, frogs, and worms and other invertebrates. ▸Choose plants that will survive in climate and soil conditions without the need for additional watering and fertilization.	**LANDSCAPE DESIGNER** ▸Designs a beautiful and functional outdoor space incorporating a variety of plants. ▸Uses knowledge of horticulture to recommend plants suited to climate, amount of sunlight, and soil type.
Vacant lots in urban centers attract illegal dumping, are unsightly, and detract from the pride residents feel about their communities.	▸Dumping contaminates land with hazardous waste. ▸Abandoned lots create an impression that a neighborhood is unsafe or not cared for. ▸Untended lots can become breeding grounds for pests that carry bacteria and disease.	▸Reclaim the land and clear it of debris and hazards. ▸Create an urban garden and green market with plants, flowers, and vegetables.	**URBAN FARMER** ▸Helps to lessen food insecurity by growing fresh and healthy food choices in urban centers. ▸Increases access to locally grown plants and foods that have been produced in environmentally sustainable ways.

PROPAGULES are plant structures capable of growing a new plant, such as a seed, spore, or plant cutting.

MONOCULTURE is the practice of growing a single type of crop or plant.

FOOD INSECURITY is being without reliable or consistent access to affordable and nutritious food.