

LESSON IDEA

# The Carbon Cycle

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SCIENCE



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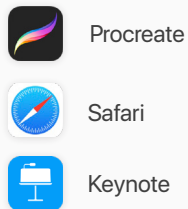
# Lesson ideas

Use these Lesson Ideas to spark your imagination for using Procreate in the classroom. Feel free to take them further and make them your own.

# The Carbon Cycle

In this lesson we'll be exploring how carbon moves around our planet. We'll do this by looking at the natural process of life and death in plants and animals, and the impact of human-led processes.

All you need is an iPad and the following apps:



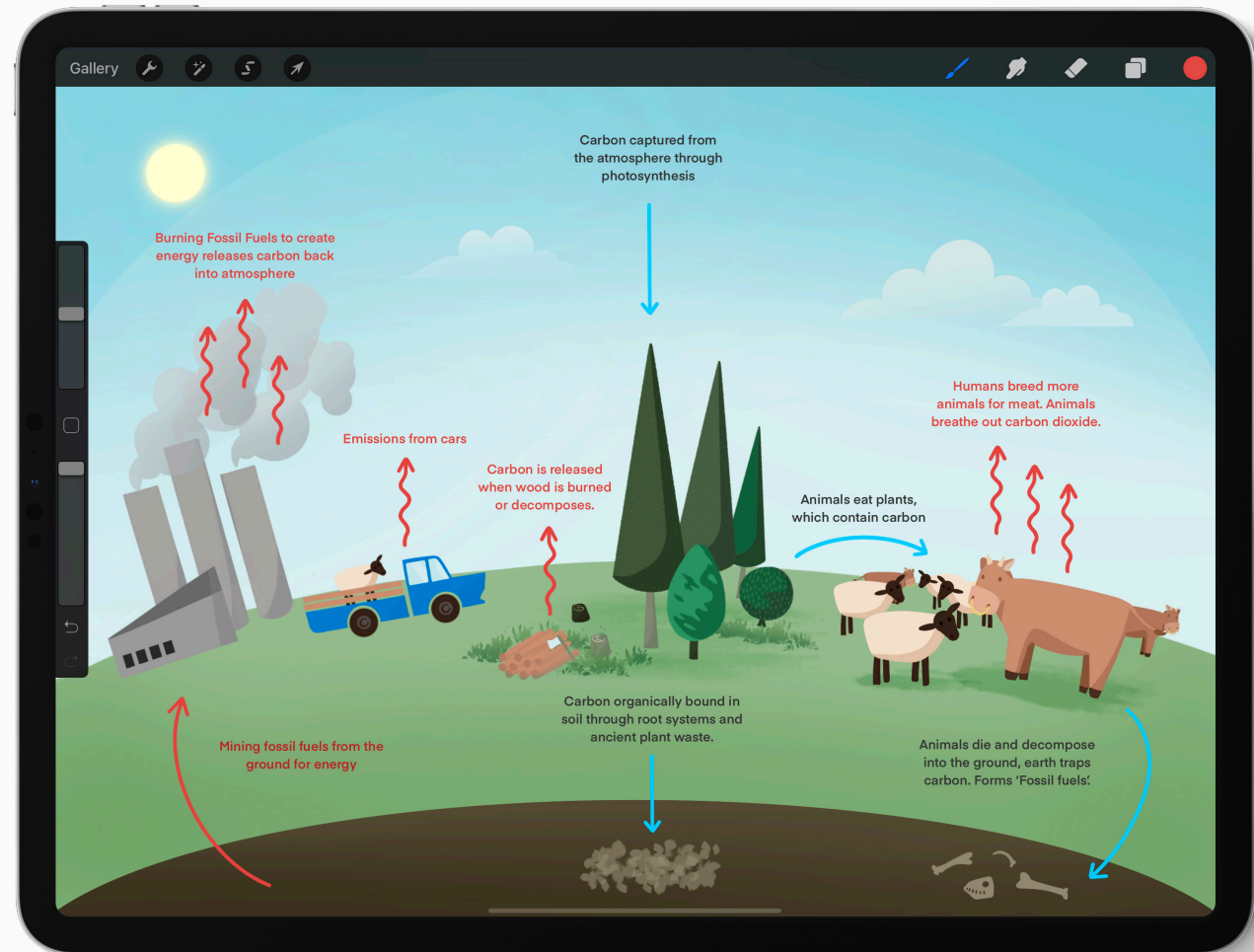
Procreate

Safari

Keynote

## Educational Value

- ✓ Students demonstrate understanding of the carbon cycle and identify the role of human influence.
- ✓ Students think critically about existing processes and imagine solutions to big picture climate change problems.
- ✓ Students use digital technologies and creative processes to summarize their knowledge and communicate ideas.



# In this guide

1	What is Carbon?
2	Set the scene
3	Carbon cycle of plants
6	Adding in animals
7	Human impact
9	Disrupt the cycle
10	Be a change maker
11	Take it further



# What is Carbon?

1.

## Chemical element

Have you ever heard the term 'Carbon' before?

Carbon is the 4th most abundant element in our universe, and is an essential building block of life – it's found in our bodies, in our food, in plants and animals. Naturally occurring carbon in our atmosphere makes Earth unique among all the planets we know and understand, as it's one of the Greenhouse gasses that absorbs heat from the sun to keep us warm in the cold void of space.

The screenshot shows the Wikipedia page for Carbon (C). The page is titled "Carbon" and includes a summary of the element's properties and its role in the universe. The article is written in English and is part of the Wikipedia encyclopedia.

**Carbon** (from Latin: *carbo* "coal") is a chemical element with the symbol **C** and atomic number 6. It is nonmetallic and tetravalent—making four electrons available to form covalent chemical bonds. It belongs to group 14 of the periodic table.<sup>[1][3]</sup> Carbon makes up only about 0.025 percent of Earth's crust.<sup>[1][4]</sup> Three isotopes occur naturally, <sup>12</sup>C and <sup>13</sup>C being stable, while <sup>14</sup>C is a radionuclide, decaying with a half-life of about 5,730 years.<sup>[1][5]</sup> Carbon is one of the few elements known since antiquity.<sup>[1][6]</sup>

Carbon is the 15th most abundant element in the Earth's crust, and the fourth most abundant element in the universe by mass after hydrogen, helium, and oxygen. Carbon's abundance, its unique diversity of organic compounds, and its unusual ability to form polymers at the temperatures commonly encountered on Earth enables this element to serve as a common element of all known life. It is the second most abundant element in the human body by mass (about 18.5%) after oxygen.<sup>[1][7]</sup>

The atoms of carbon can bond together in diverse ways, resulting in various allotropes of carbon. Well-known allotropes include graphite, diamond, amorphous carbon and fullerenes. The physical properties of carbon vary widely with the allotropic form. For example, graphite is opaque and black while diamond is highly transparent. Graphite is soft enough to form a streak on paper (hence its name, from the Greek verb "γράφειν" which means "to write"), while diamond is the hardest naturally occurring material known. Graphite is a good electrical conductor while diamond has a low electrical conductivity. Under normal conditions, diamond, carbon nanotubes, and graphene have the highest thermal conductivities of all known materials. All carbon allotropes are solids under normal conditions, with graphite being the most thermodynamically stable form at standard temperature and pressure. They are chemically resistant and require high temperature to react even with oxygen.

The most common oxidation state of carbon in inorganic compounds is +4, while +2 is found in carbon monoxide and transition metal carbonyl complexes. The largest sources of inorganic carbon are limestones, dolomites and carbon dioxide, but significant quantities occur in organic deposits of coal, peat, oil, and methane clathrates. Carbon forms a vast number of compounds, more than any other element, with almost ten million compounds described to date.<sup>[1][8]</sup> and yet that number is but a fraction of the number of theoretically possible compounds under standard conditions. For this reason, carbon has often been referred to as the "king of the elements".<sup>[1][9]</sup>

**Contents** [hide]

- Characteristics
  - Allotropes
  - Occurrence
  - Isotopes
  - Formation in stars
  - Carbon cycle
- Compounds
  - Organic compounds

**Carbon, <sup>6</sup>C**

Graphite (left) and diamond (right), two allotropes of carbon

**Allotropes** graphite, diamond, others

**Appearance** graphite: black, metallic-looking  
diamond: clear

**Standard atomic weight *A*<sub>r</sub>, std(C)** [12.0096, 12.0116]  
conventional: 12.011

**Carbon in the periodic table**

boron ← carbon → nitrogen

**Atomic number (*Z*)** 6

**Group** group 14 (carbon group)

**Period** period 2

**Block** p-block

**Electron configuration** [He] 2s<sup>2</sup> 2p<sup>2</sup>

**Electrons per shell** 2, 4

**Physical properties**

**Phase at STP** solid

Safari



# Set the scene

2.

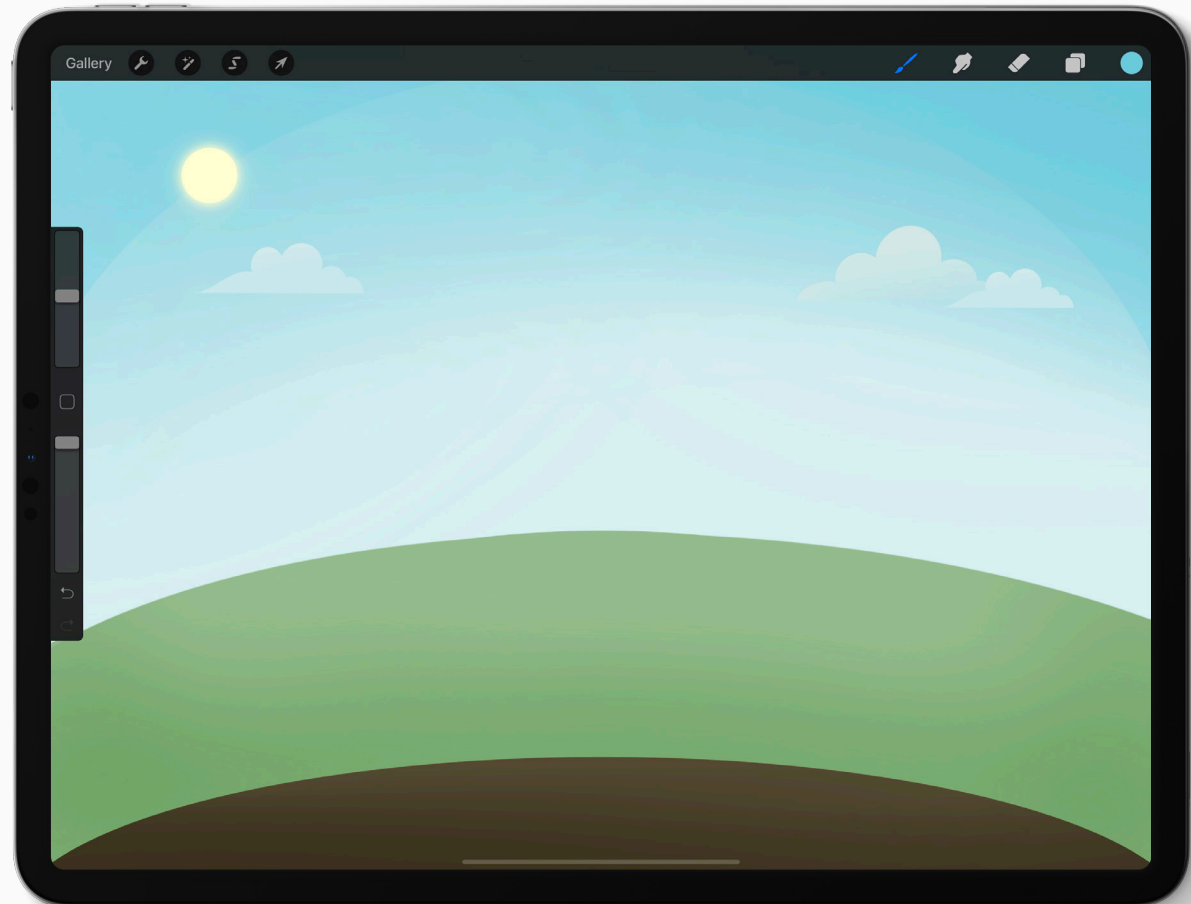
## A dream environment

In your Gallery tap the + icon to create a screen-sized canvas.

In any artistic style you'd like, draw an empty landscape, this will be the background for all of your other elements, so keep it simple.

Be sure to include:

- \* Land that we walk on (the Earth's surface)
- \* Soil below the surface (the Earth's crust)
- \* Sky and the sun
- \* The Earth's Atmosphere

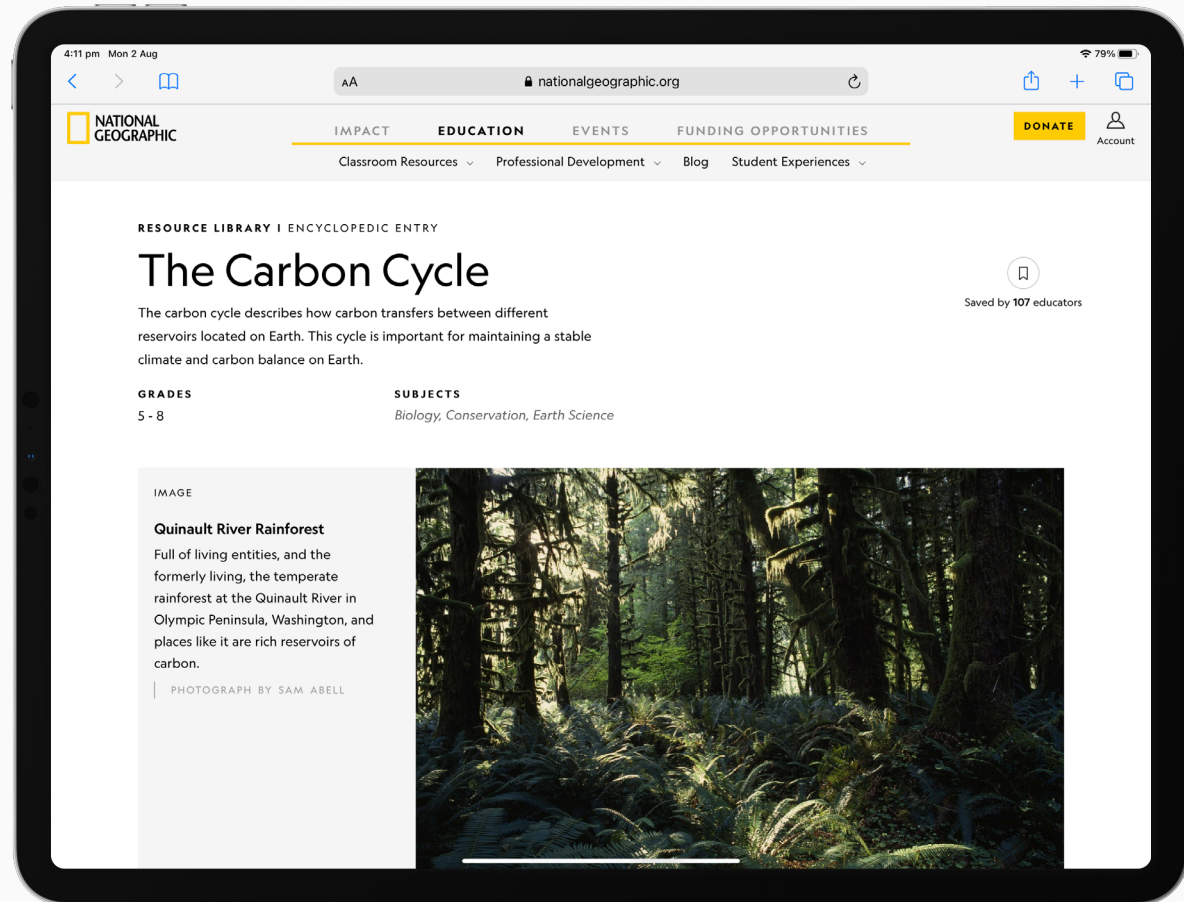


# Carbon cycle of plants

## Research

In *Safari*, research the carbon cycle of plants.

Start by trying to find out how plants capture carbon through photosynthesis, and see where your research takes you.



# Illustrate

- 1 Tap the two squares in the top-right menu to open the *Layers Panel*. Tap the + icon to create a new layer.
- 2 Select a brush from the *Brush Library* and illustrate the different elements that participate in the Plant-Carbon cycle.

## DRAWING TIP

Draw each of your elements on their own separate layer. This will make adding and editing your diagram easier later on.



## Annotate

- 1 Tap the + icon in the *Layers Panel* to create another new layer.
- 2 Draw arrows that demonstrate the direction carbon is moving through the atmosphere. If a process is trapping carbon, draw your arrows in one color. If a process is releasing carbon into the atmosphere, use another.
- 3 Tap the *wrench* icon to open the *Actions menu*, tap *Add*, and *Add Text* to open the *Text tool*. Use the *Text tool* to add short annotations about the process.
- 4 When you're done, swipe right on all your plant layers to select them, and then tap *Group*. Tap the group to open *Layer Options* and rename 'Plants'.



# Adding in animals

6.

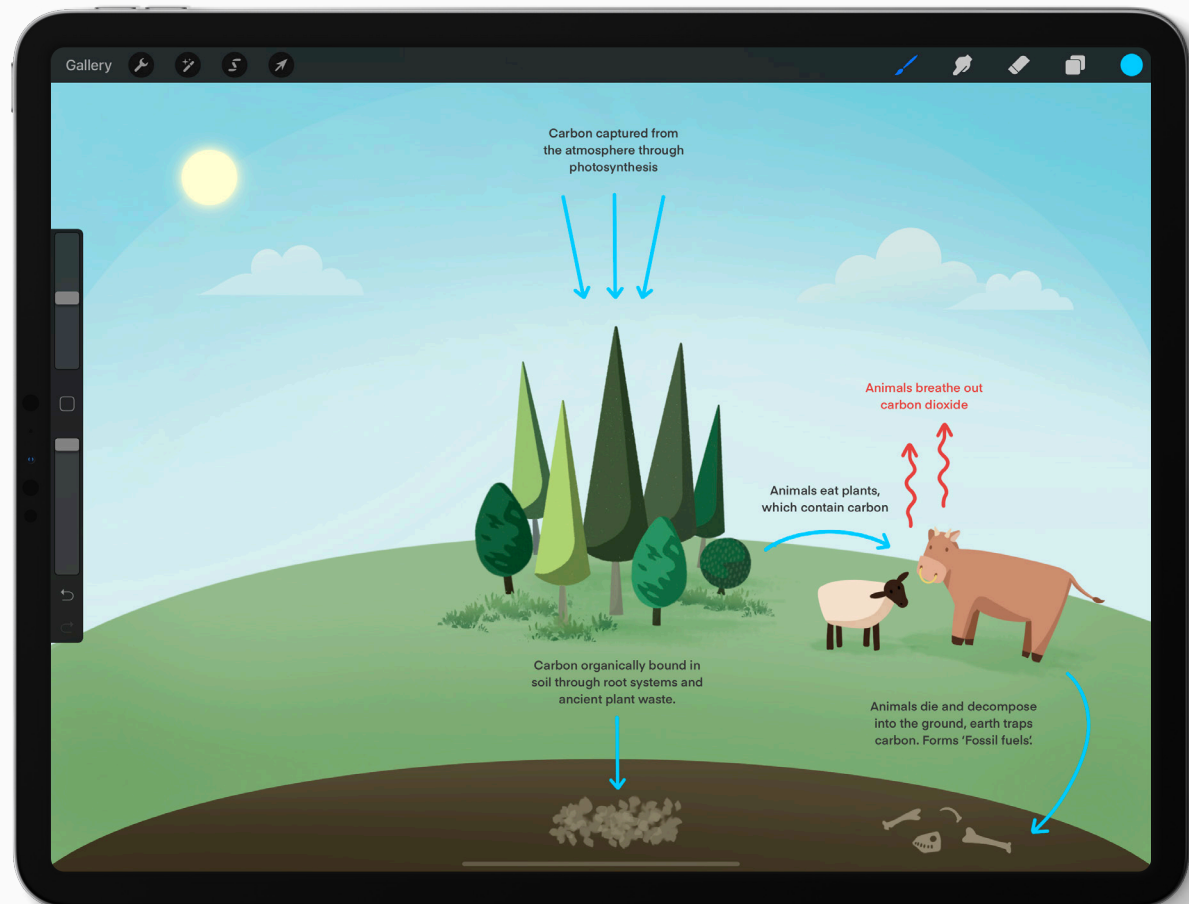
## Repeat

Repeat the previous three steps of researching, illustrating and annotating, this time investigating the impact that animals have on the carbon cycle.

When you've finished your annotations, group your animal layers together and rename.

### LOTS OF LAYERS

Just as with your plant layer, draw each of your animals on their own layer so you can easily duplicate and transform them later on.



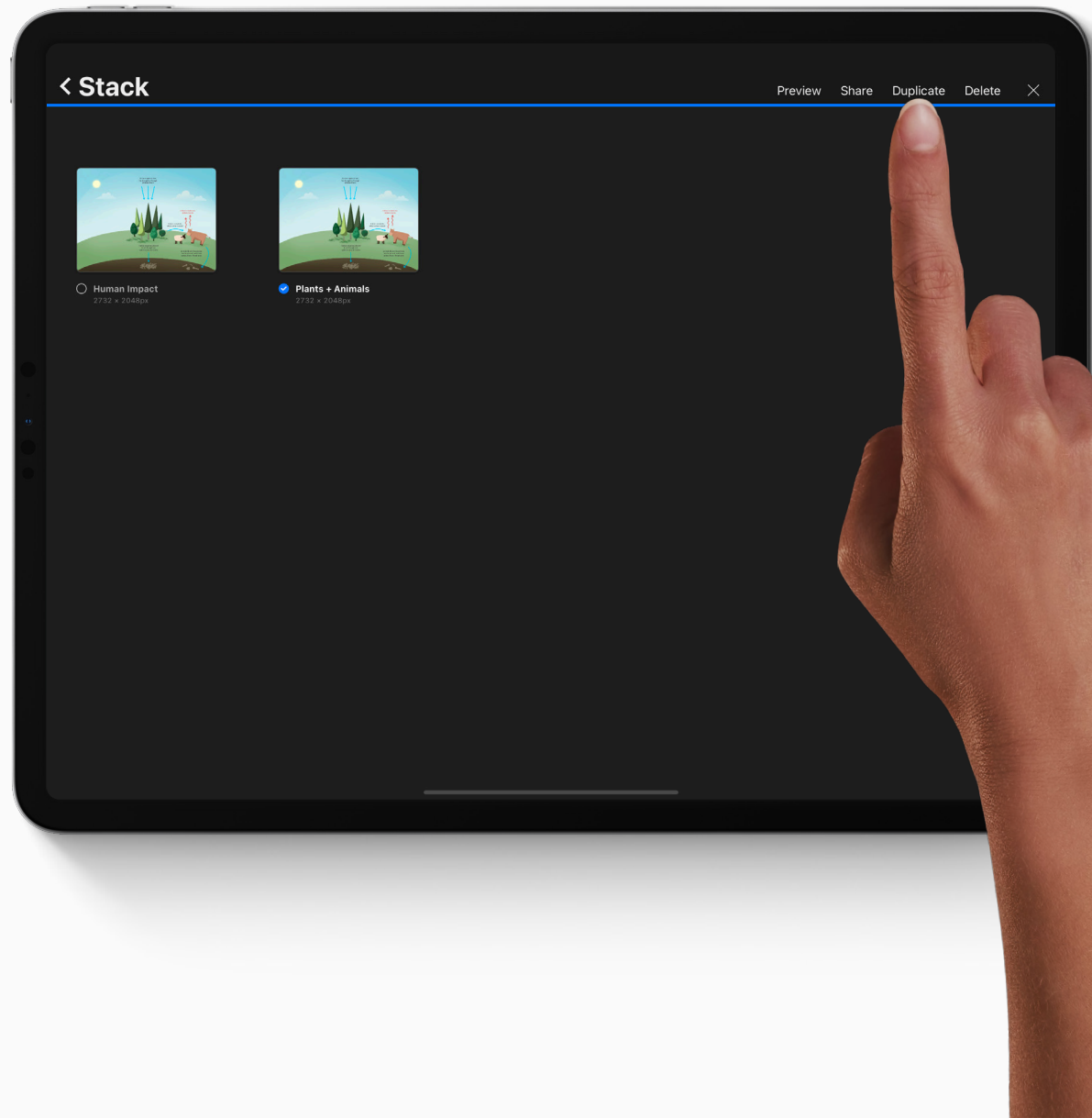


# Human impact

7.

## Duplicate your file

Make a copy of your file, so that you have a clean version of it saved before disrupting the process with human activity.

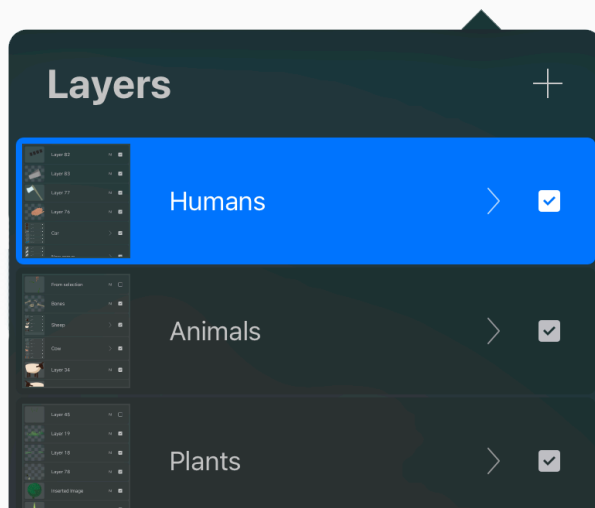


## The role we play

Repeat the process of researching, illustrating and annotating a third and final time, investigating the impact that humans have on the carbon cycle, and how this interacts with:

- \* The carbon cycle of plants
- \* The carbon cycle of animals

When you've finished making annotations, group the human layers together and rename the group.





# Disrupt the cycle

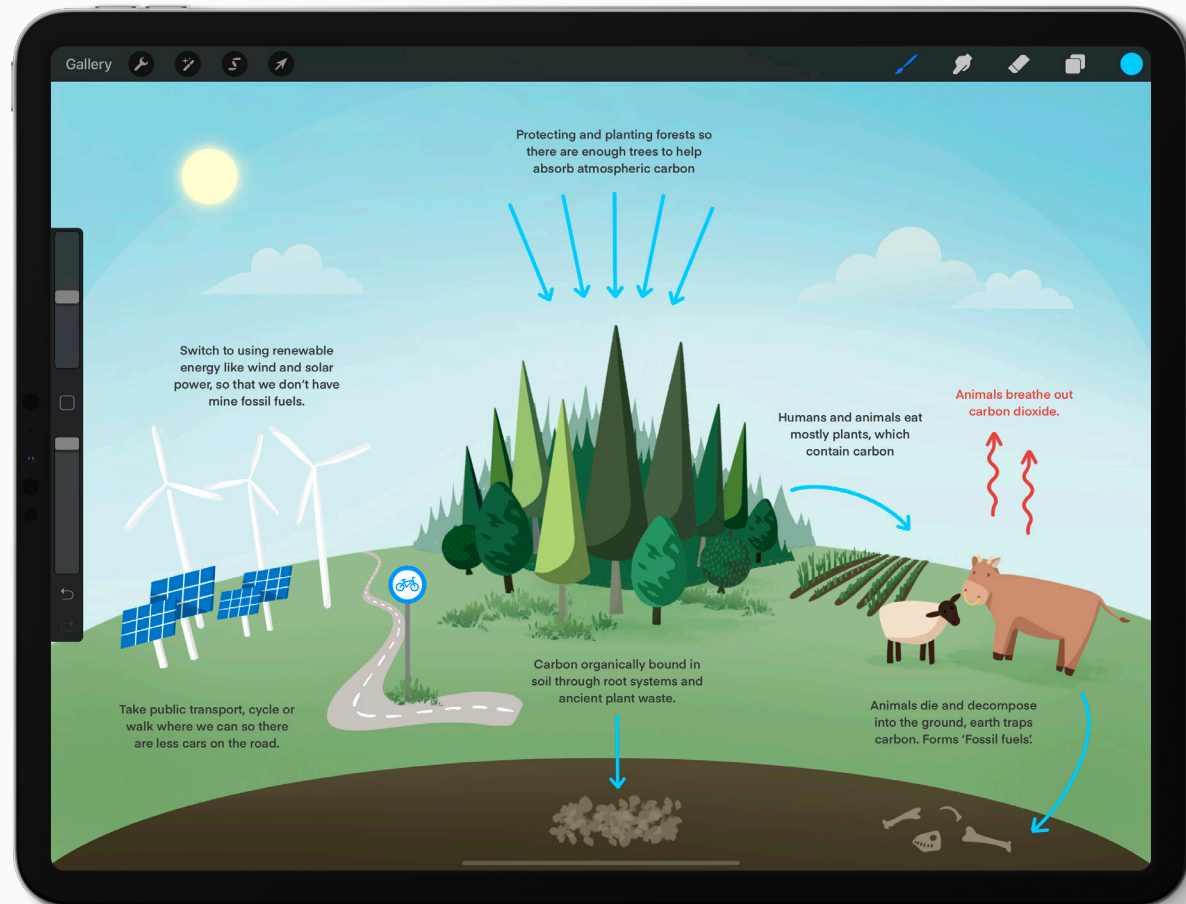
9.

## Reimagining

In the Layers Panel, use the Visibility checkbox to turn the human layer off and on, and notice the impact that human beings have on the Carbon Cycle.

Human-led processes are releasing more carbon into the atmosphere than natural processes can absorb. Carbon and other greenhouse gases trap heat, so if there are too many in our atmosphere, the earth overheats. This is the process behind global warming.

- \* Create another copy of your canvas, and redraw the human-led interactions so that less carbon is released back into the atmosphere.
- \* What creative replacements can you think of for our Carbon emissions-heavy ways of life?



# Be a change maker

## What is in your control?

Some of these changes require action from people who own big corporations or make laws, but there are many ways that you can disrupt the carbon cycle as an individual too.

Spend some time brainstorming as a class ways that you can have a positive impact on the carbon cycle, and commit to action.

# Take it further

11.

## Other gasses

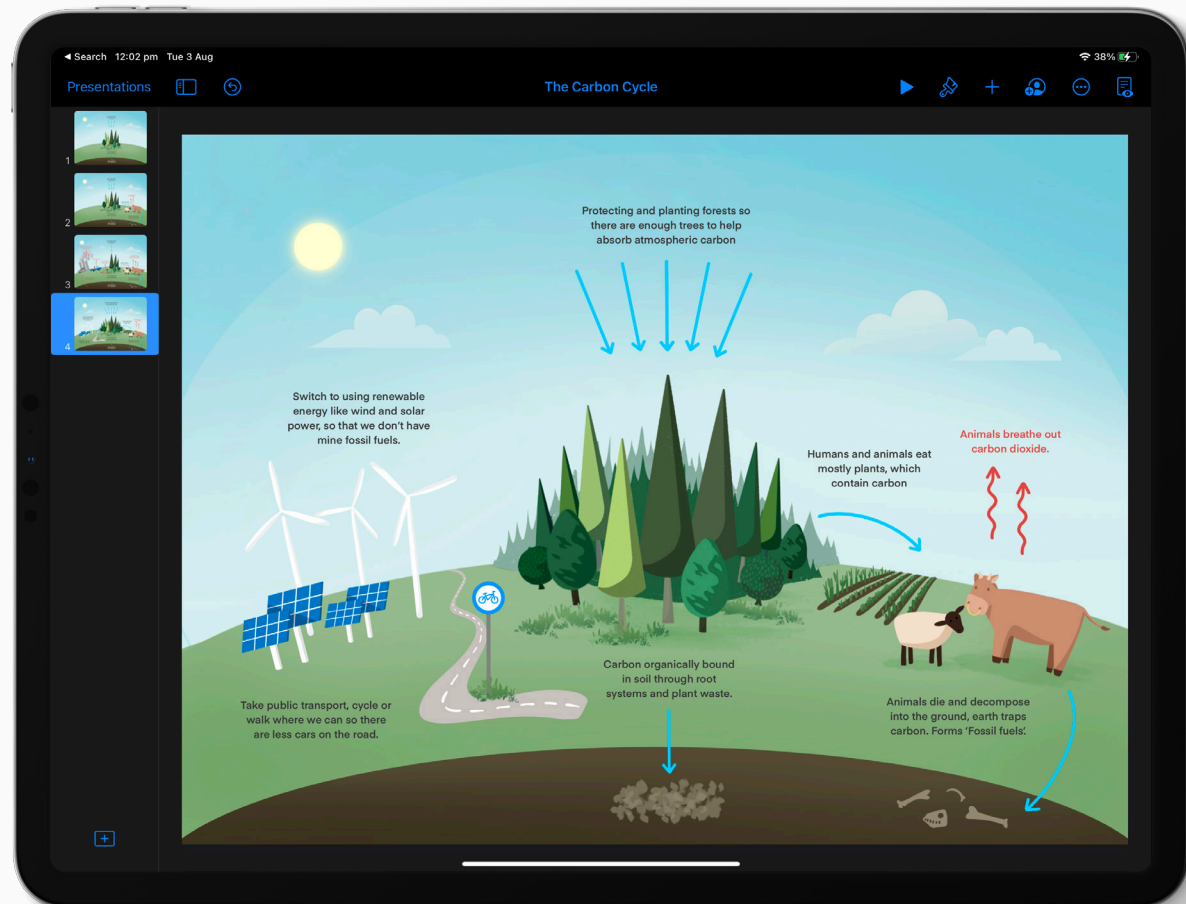
Carbon is one of many essential gasses that plays a key role in life on earth. Investigate other gasses and see how their process interacts with what you have discovered about the carbon cycle.

## Educate an adult

Export your different carbon cycle illustrations as PNGs, and import into a *Keynote* presentation to share with your caregivers at home. You might know something they don't.

As you're preparing your presentation, consider:

- ✳ What is the key information you want them to remember when you're finished?
- ✳ How can you explain the process as simply as possible?



Keynote



# Create

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