



Smithsonian

Inka Terraces

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In the Land of the Inka

The steep Andes (AN-deez) Mountains of South America are dotted with what look like giant steps. The steps are actually terraces. They stretch across the sides of hills and mountains. People built them many years ago during the Inka Empire. Terraces gave Inka farmers flat, **fertile** land on which to grow their crops.

Terraces also helped the Inka control water. Rushing down a mountain during a storm, water can sweep away soil and even cause mudslides. Inka terraces slowed water so that soil could absorb it.

The Inka combined terraces with other ways to manage water. In many locations, they built **canals** to deliver water to fields. Canals even brought fresh water to the doors of Inka royalty.

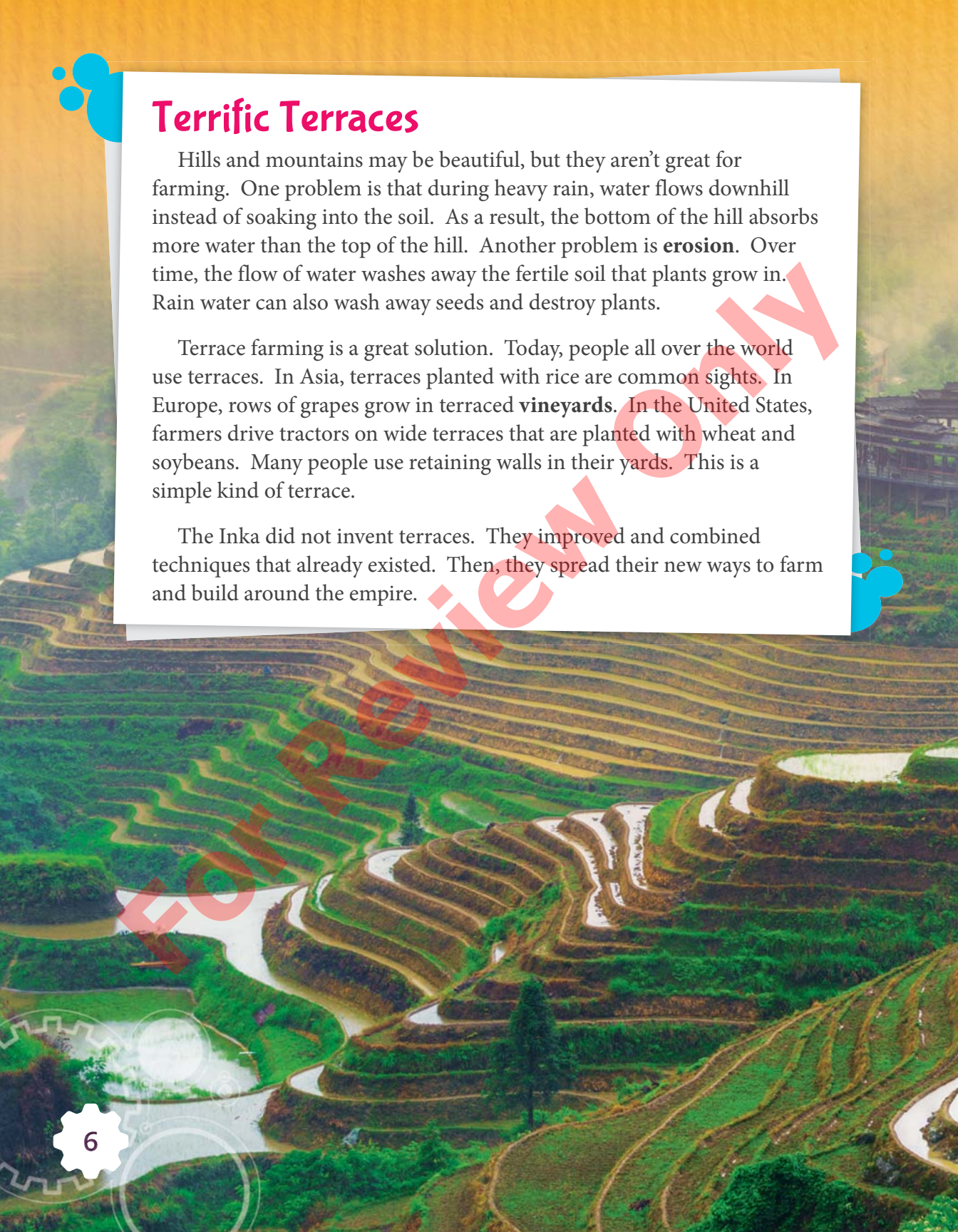
Almost five hundred years ago, people from Spain invaded the Inka Empire. The Spanish introduced new crops and new ways to farm. Some people stopped using terraces and forgot how to build them. Inka canals became choked with rocks, dirt, and plants.

Today, **archaeologists** (ahr-kee-AH-luh-jists) and local farmers work together to preserve what the Inka built. They are restoring terraces and clearing **debris** from canals. Farmers are planting ancient crops. In the land of the Inka, people are reminded that old ways to farm may still be the best.



The Andes are the longest mountain chain in the world. They are almost three times as long as the Appalachian Mountains in the United States.



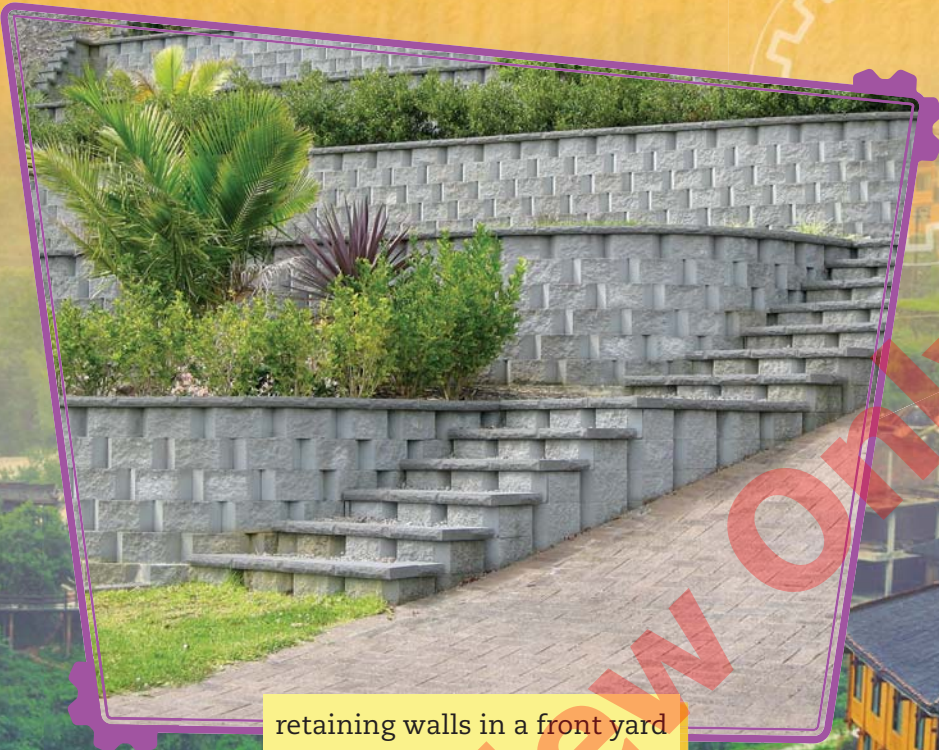


Terrific Terraces

Hills and mountains may be beautiful, but they aren't great for farming. One problem is that during heavy rain, water flows downhill instead of soaking into the soil. As a result, the bottom of the hill absorbs more water than the top of the hill. Another problem is **erosion**. Over time, the flow of water washes away the fertile soil that plants grow in. Rain water can also wash away seeds and destroy plants.

Terrace farming is a great solution. Today, people all over the world use terraces. In Asia, terraces planted with rice are common sights. In Europe, rows of grapes grow in terraced **vineyards**. In the United States, farmers drive tractors on wide terraces that are planted with wheat and soybeans. Many people use retaining walls in their yards. This is a simple kind of terrace.

The Inka did not invent terraces. They improved and combined techniques that already existed. Then, they spread their new ways to farm and build around the empire.



retaining walls in a front yard



terraced rice fields
in Yangshuo, China

In the Inka Empire, people did not pay money for taxes. Instead, they had to spend some time each year working for the state. This is how the Inka were able to create a vast number of terraces, as well as canals, roads, buildings, and other structures.

Terraces start with strong stone walls. The Inka pushed or carried each heavy stone to the right location, cut it with simple tools, and lifted it into place.

The Inka typically did not use mortar, the thick glue that holds stone or bricks together in modern houses. Instead, the Inka mastered the art of fitting stones together so that gravity alone locked them into place.

The walls of Inka terraces are strong enough that some even include floating staircases. Long stones stick out of walls to form steps. These floating steps do not look very sturdy, but they have survived centuries of use.

The Inka also built drainage into the terrace walls. When the soil behind the wall is very wet, some of the moisture can escape through the wall and continue down the hill.

The Inka were skillful builders. They built things with care so that they would last a long time.



The Inka used white stones to build this llama in a terrace wall in Peru.

This man uses
a chakitaqlla.



TECHNOLOGY

Foot Power

Inka tools had to be lightweight and portable so they could be carried up and down terraces. Instead of using a heavy plow dragged behind an ox or a horse, the Inka used a *chakitaqlla* to break up hard ground before planting. Inka farmers drove these long, pointed sticks into the ground by pressing down on a bar with their feet. This simple tool is so well suited to the Andes that it is still used.

Inka floating staircase



STEAM CHALLENGE

Define the Problem

Rainfall on mountain slopes moves downward and may cause mudslides and erosion. The Inka built terraces to decrease the force and to control the flow of water. Your task is to design and build a model of a layered terrace system that can hold 1 liter (about 1 quart) of water without spilling over the bottom terrace.



Constraints: Your model must include four terrace layers, and it must be able to hold 1 L (about 1 qt.) of water.



Criteria: A successful model will allow 1 L (about 1 qt.) of water to flow from the top to the bottom terrace layers. The water should not spill or overflow once it reaches the bottom terrace.





Research and Brainstorm

How did the Inka benefit from building terraces? What other techniques did Inka engineers use to manage water?



Design and Build

Sketch your terrace system. What purpose will each part serve? What materials will work best? Build the model.



Test and Improve

Pour 1 L (about 1 qt.) of water into the top of the system. Does the water flow in a controlled manner? Does your terrace system absorb all the water? Did it spill over once it reached the bottom layer? How can you improve it? Modify your design and try again.



Reflect and Share

What other materials can you use to build the model? Can you add more layers to your design? How can you modify your design to make water move more quickly or more slowly through the system?

