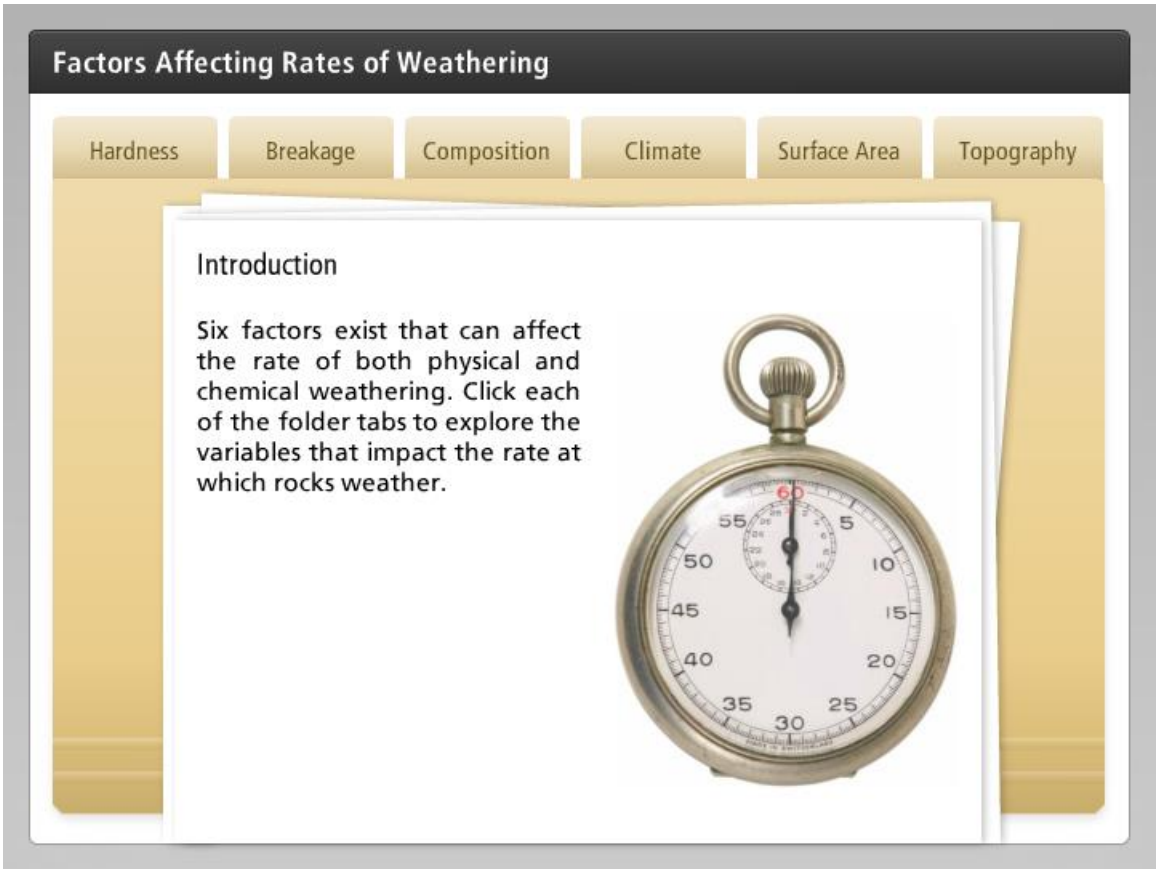
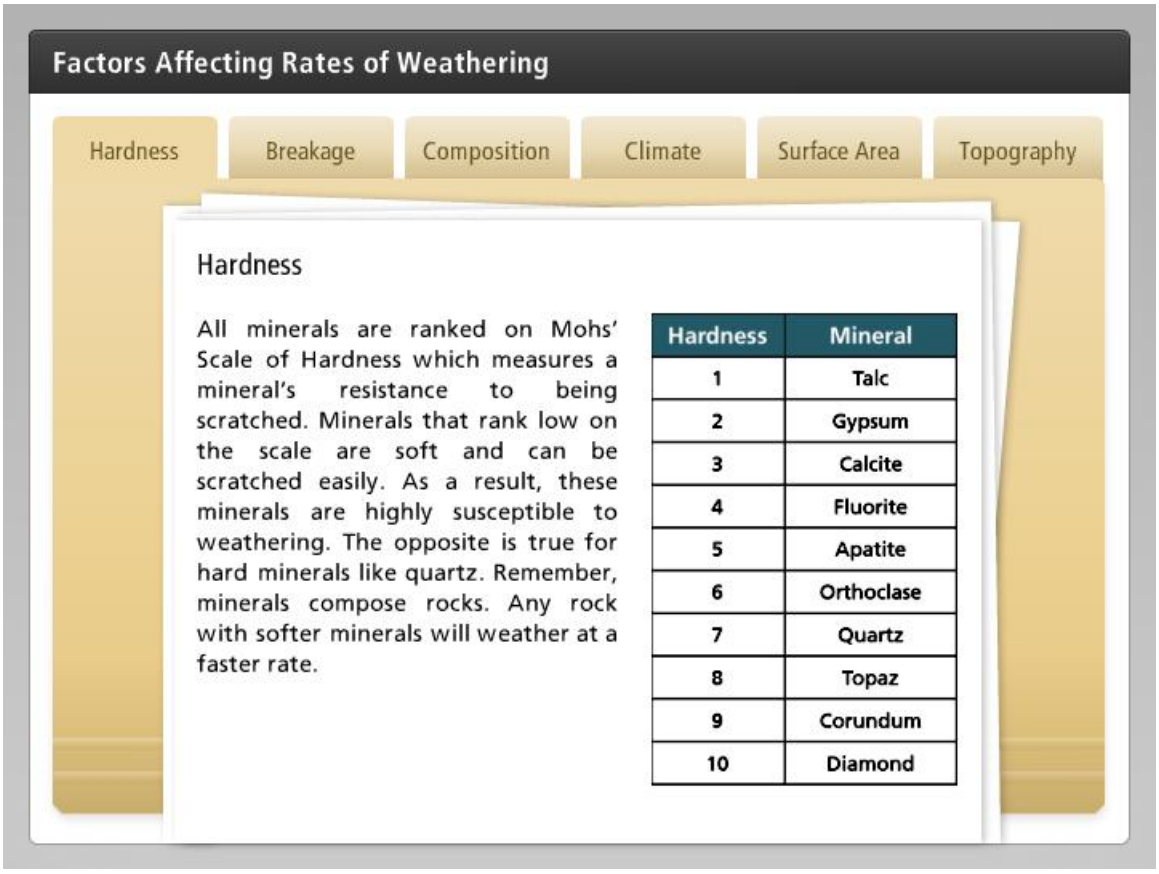
Module 8: Weathering, Erosion, and Groundwater
Topic 1 Content: Factors Affecting Rates of Weathering Notes

Introduction



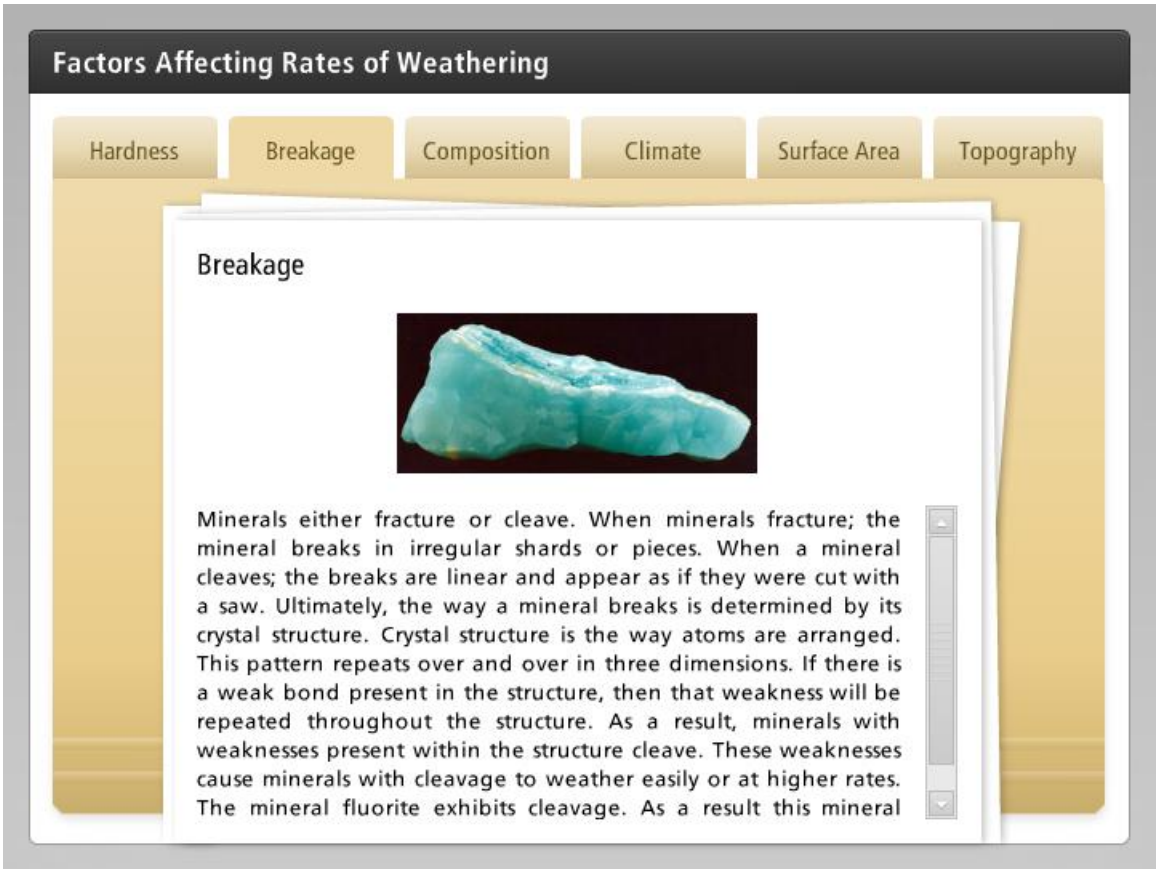
Six factors exist that can affect the rate of both physical and chemical weathering. Click each of the folder tabs to explore the variables that impact the rate at which rocks weather.

Hardness



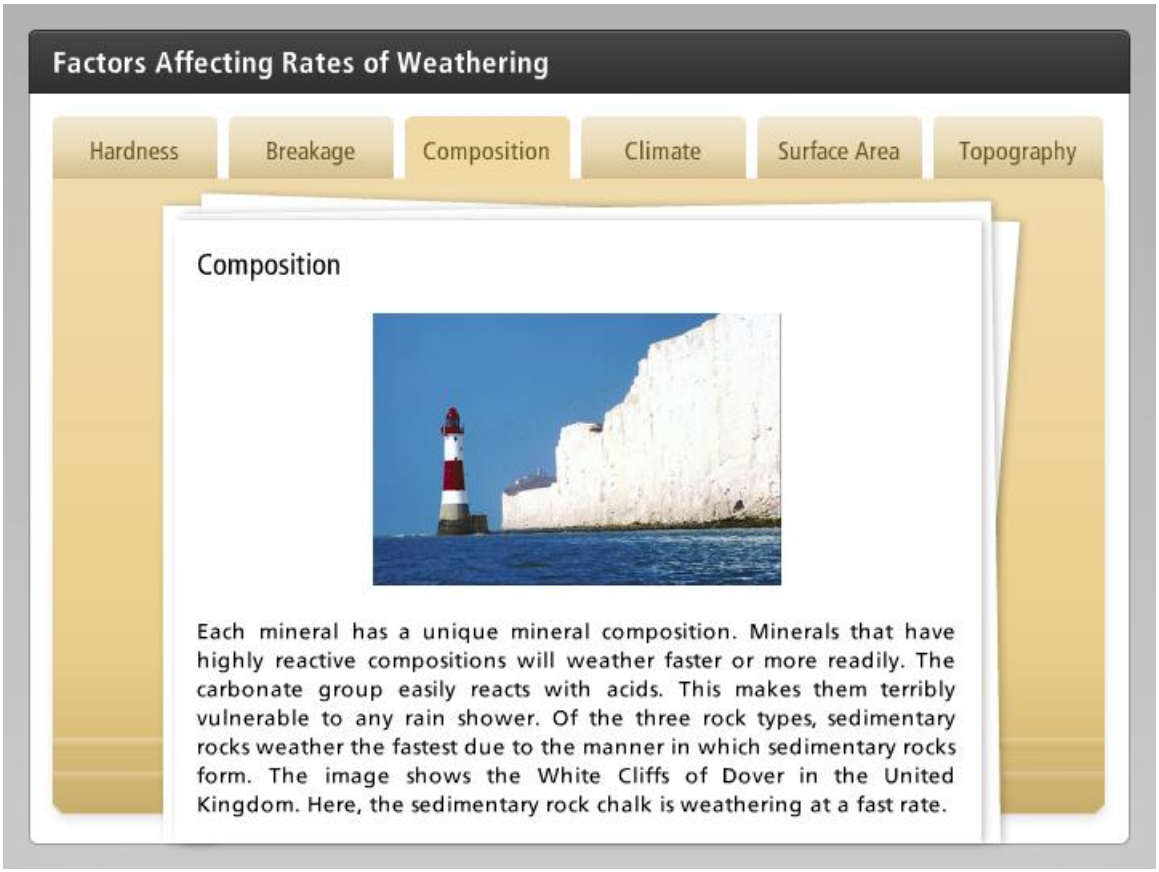
All minerals are ranked on Mohs' Scale of Hardness which measures a mineral's resistance to being scratched. Minerals that rank low on the scale are soft and can be scratched easily. As a result, these minerals are highly susceptible to weathering. The opposite is true for hard minerals like quartz. Remember, minerals compose rocks. Any rock with softer minerals will weather at a faster rate.

Breakage



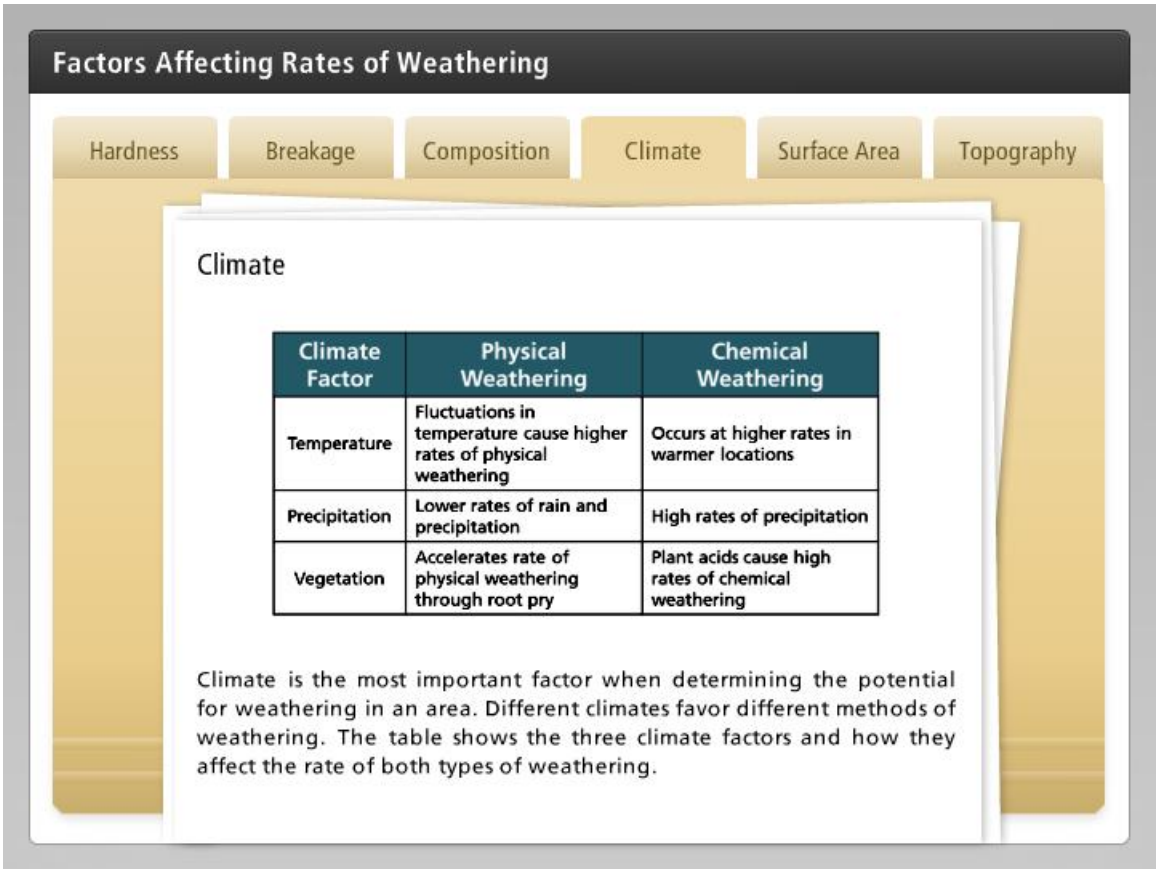
Minerals either fracture or cleave. When minerals fracture; the mineral breaks in irregular shards or pieces. When a mineral cleaves; the breaks are linear and appear as if they were cut with a saw. Ultimately, the way a mineral breaks is determined by its crystal structure. Crystal structure is the way atoms are arranged. This pattern repeats over and over in three dimensions. If there is a weak bond present in the structure, then that weakness will be repeated throughout the structure. As a result, minerals with weaknesses present within the structure cleave. These weaknesses cause minerals with cleavage to weather easily or at higher rates. The mineral fluorite exhibits cleavage. As a result this mineral could weather quickly in the correct environment.

Composition



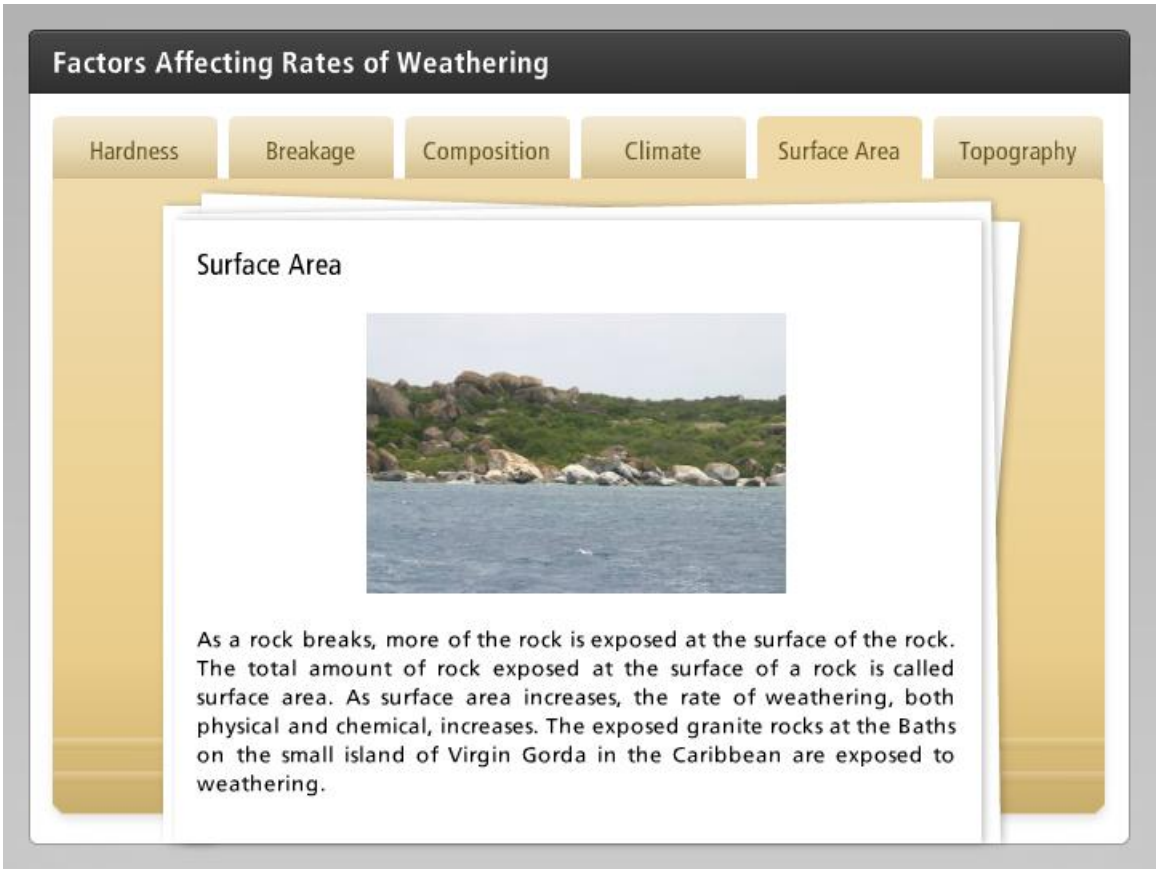
Each mineral has a unique mineral composition. Minerals that have highly reactive compositions will weather faster or more readily. The carbonate group easily reacts with acids. This makes them terribly vulnerable to any rain shower. Of the three rock types, sedimentary rocks weather the fastest due to the manner in which sedimentary rocks form. The image shows the White Cliffs of Dover in the United Kingdom. Here, the sedimentary rock chalk is weathering at a fast rate.

Climate



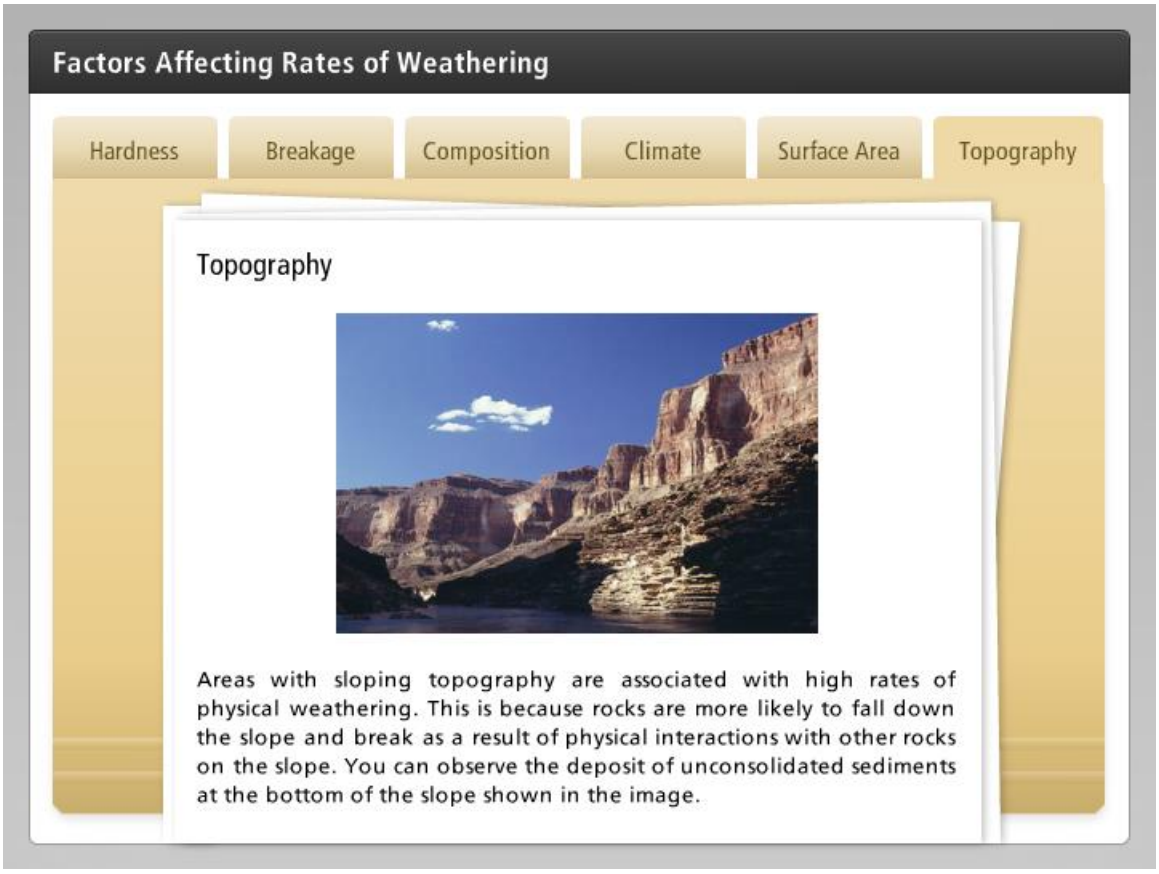
Climate is the most important factor when determining the potential for weathering in an area. Different climates favor different methods of weathering. The table shows the three climate factors and how they affect the rate of both types of weathering.

Surface Area



As a rock breaks, more of the rock is exposed at the surface of the rock. The total amount of rock exposed at the surface of a rock is called surface area. As surface area increases, the rate of weathering, both physical and chemical, increases. The exposed granite rocks at the Baths on the small island of Virgin Gorda in the Caribbean are exposed to weathering.

Topography



Areas with sloping topography are associated with high rates of physical weathering. This is because rocks are more likely to fall down the slope and break as a result of physical interactions with other rocks on the slope. You can observe the deposit of unconsolidated sediments at the bottom of the slope shown in the image.