

Suggested Supplements and Aids for Whetpebble Lessons

Scenario #1:

The “Map Reading” lesson is a very good introduction to this lesson. It is important for the students to have a basic understanding of the following topics:

Coal Mining
Fossil Fuels
Acid Rain
Air Pollution
Water Pollution

The focus of this lesson is to teach the following:

- Although the short-term benefits of coal mining are attractive, the long-term damage can be irreversible. Lifestyles in Whetpebble may improve initially, but future generations will be forced to deal with acid rain, water pollution from sulfuric acid, and the visible scar left behind from strip mining.
- Coal companies, as with any business, must make money to be successful. If their profit is threatened, supplements such as school buildings and other fringe are usually the first to go.
- The noise pollution will effect everyone in the northwest area of Whetpebble. Runoff of sulfuric acid from tailings piles will contaminate Patterson Run, Patterson River, and eventually Lake Hopper.

Scenario #2:

Before attempting this lesson, it is important for the students to have a basic understanding of the following topics:

Rocks and Minerals
Soil and Rock Permeability
Decomposition
Ground water
Drainage basins

The focus of this lesson is to teach the following:

- The placement of a landfill is critical to minimize negative impact on the environment. It is virtually impossible to eliminate all pollution runoff from landfills. However, by selecting a landfill site carefully, the natural resources damaged can be limited.
- Most igneous, metamorphic, and hard shales are best for bedrock under landfills because they have very little porosity.
- Landfills should be placed at the lowest elevation possible so that surface runoff can be traced easily and tested for pollutants. Therefore, a landfill on top of Drypebble Mountain is not acceptable because rain falling there could drain down slope to virtually any other place on the Whetpebble map.

- Landfills should NOT be placed in the floodplain of a river or lake, or in the drainage basin of a river that flows year-round. This means its water source is underground and pollutants could contaminate the entire ground water supply.
- Any area of Whetpebble underlain with shale and at least 20 feet above the nearest body of water is acceptable. However, the most convenient spot would be directly over ground water well #9. The contour intervals show that this is the flattest spot in Whetpebble. Any pollution from the landfill will drain in Cassius Creek without affecting the majority of Whetpebble citizens' drinking water and making monitoring and clean-up of the pollution confined to one body of water. The ground water well is a convenient feature, but not necessary in selecting a site. Wells are drilled at every landfill site.

Scenario#3:

This lesson may actually be the best to start with after the "Map Reading" supplement because the related topics are limited. the lesson will move along smoothly if students have a basic understanding of the following topics:

Slope
 Flooding
 Erosion

The focus of this lesson is to teach the following:

- Logging can be destructive to wildlife and natural resources if not done in moderation.
- If trees and foliage are not planted and established quickly after logging, excessive erosion of topsoil occurs. The steeper the slope, the faster erosion tends to take place. If erosion continues over time, it is difficult to reestablish foliage and wildlife to the area and the land remains barren.
- Rivers and streams in logging areas may fill up with sediment, become muddy, stream flow slows, and pH and eH levels can be altered.
- Flood levels will rise in logging areas when heavy runoff meets streams and rivers running higher than normal due to sediment intake. Homes along Lake Hopper will be flooded.
- The noise pollution from machinery will disrupt wildlife and Whetpebble residents. Visual impact is tremendous.

Scenario #4:

Students found this lesson to be the most challenging, but the most fun as well. this lesson was initially done individually, but Homeowner's groups could be utilized for initial investigations. An overview on the following topics will be helpful:

Septic Systems
 Ground water flow
 Surface water flow

The focus of this lesson is to teach the following:

- Elevation and slope are VERY important in determining sources of pollution because ground water usually models surface flow features underground. Where surface water flows, ground water tends to parallel.
- Oxygen is needed for organic waste to decompose.
- The home on the east side of downtown Whetpebble is the polluter for the following reasons:
 1. It is situated over fossiliferous limestone, a highly porous and permeable sedimentary rock. Pollution *could* leak through sandstone or shale, but it would not be detected for many years.
 2. The highest concentrations of pollution are all found in water sources that flow through the central limestone layer. The pollution is transported underground in a southeast direction from the home. The most polluted surface water source (#4) and ground water well (x8) are found in this path. The surface contours show runoff would flow in this direction (most likely underground as well).
 3. The Mills Creek home could not be the sole culprit because ground water well x11 has a lower concentration than x8, but is in between the two points. However, it is possible that BOTH homes could be polluters! (There is no way to prove otherwise with the given information). For simplicity, the given data reveals the downtown Whetpebble home as a definite polluter.