

Lesson #5 WebQuest Scavenger Hunt (Teacher Copy)

1. The Water Cycle

a) Go to the following diagram and complete the questions below: <https://water.usgs.gov/edu/watercycle-kids-adv.html>

i) Define each of the following terms and explain why each of these is an important factor to consider for your action project

Runoff: Water running over the land surface downhill due to gravity. This runoff reaches creeks, rivers, lakes and the ocean. Answers will vary for the explanation.

Seepage: Seepage occurs when precipitation falls on the landscape and starts to soak into the ground. Seepage does not just happen downward but happens upwards and sideways too, from the ground into the bottom of rivers, lakes and the oceans. Answers will vary for the explanation.

Infiltration: Water that soaks into the ground to recharge groundwater. Answers will vary for the explanation.

2. Point and Non-point Source Contamination

a) Go to the image at the following link: <https://www.e-education.psu.edu/earth103/node/899>

i) Describe what is happening in the image titled "Potential sources of contamination in drinking water" in a short paragraph

Answers will vary but the key points are that there are a number of different potential sources of contamination for groundwater. These sources include urban developments, industrial sites, agricultural operations, and waste facilities. Specific potential sources of contamination include leaking sewers, runoff and infiltration from landfills, agriculture, gas stations, the application of fertilizers and pesticides, road salt, manure, and waste water treatment. Industrial sites are potentially harmful as well due to the possibility of seepage and runoff affecting groundwater.

b) Go to the following website: <http://www.aadnc-aandc.gc.ca/eng/1398369474357/1398369572276#chp2>

i) Define and give five examples of point source contamination.

“Point Source Contamination”: pollution that can be traced to a fixed point such as an effluent pipe, a smokestack, or a leaking fuel tank. Point source pollution enters the environment at a specific place from an identifiable source.” Examples: industrial point discharges, as well as spills and leaks of industrial chemicals; municipal wastewater effluents; landfill site leachate; wastes from existing and abandoned mining sites; on-site septic systems; and leaking underground oil and gas storage tanks.”

ii) Define and give five examples of non-point source contamination.

“Non-point source pollution. Non-point source pollution is pollution that cannot be traced to a fixed point such as recreation activity, roads, and urban runoff. Examples: urban runoff from buildings, streets and sidewalks that carry sediment, nutrients, bacteria, oil, metals, chemicals, pesticides, road salts, pet droppings and litter; bacterial and petroleum products from recreational boating; and acid precipitation and other forms of air pollution that fall into surface waters and onto the land.”

3. Agricultural Development

c) Use [this link](#) to find an example of how agriculture can contaminate water.

“In agriculture, large tracts of land are typically plowed to grow crops. Plowing the land exposes and disturbs the soil, making it more vulnerable to erosion during rainstorms. This increases the runoff that carries fertilizers and pesticides away from the farm and into nearby waters.”

b) Go to the following page http://wwf.panda.org/what_we_do/footprint/agriculture/impacts/pollution/ and answer the next questions:

i) According to the [World Wildlife Fund](#), what are two of the ways that farming can contribute to water pollution?

Widespread Contamination through the increased use of pesticides, fertilizers, and other agrochemicals applied to fields and adjacent waterways; pesticides killing soil microorganisms, excess nutrients caused by the application of fertilizers

ii) What percentage of the world's planted crops does cotton represent?

2.4%

iii) What percentage of the world's insecticide use does cotton account for?

24%

a. What percentage of the world's pesticide use does cotton account for?

11%

4. Energy Projects

a) Watch [this video](#) by ConocoPhillips on their approach to water and answer the following:

i) According to ConocoPhillips, why are horizontal drilling and hydraulic fracturing better for the environment? (0:30)

More production with fewer wells reduces the environmental footprint of drilling operations relative to traditional drilling.

ii) How are drill sites selected? (1:00)

Well planning and geological studies are used to determine the best sites based on topography.

iii) How are the aquifers protected from contamination through upward migration? (2:10)

Wells are located thousands of feet below groundwater. Multiple layers of impermeable rocks separate the wells from the groundwater, protecting the aquifers.

- iv) How long is the life of a hydraulic fracturing well compared to a conventional well?
(3:24)

2-3 months, compared to 20-30 years of typical well.

- v) What happens to the waste water from drilling sites? (3:40)

Water is transferred to holding tanks and then transported to either safe disposal sites or reused in other company processes

- b) Look at [this diagram](#) and explain how hydraulic fracking reduces the number of wells required to access natural gas in shale beds.

Answers will vary. Key points: it is possible to use the best spot topographically (ie the best soil, most insulated from contamination, safest for the operation and the community) to access the gas deposits from the surface and then drill horizontally to get at the gas from far below with one long concrete lined well. Conventional drilling would require multiple wells to access the same deposits and would require that these were accessed from directly above the deposits, on less geographically desirable land.

- c) Using [this article](#) from the Canadian Press, name five concerns that the government of Newfoundland and Labrador believed needed to be addressed before shale gas sites can be approved.

Social licence, groundwater contamination, air pollution and increased earthquakes, sustainable tourism

5. Urban and Suburban Development

- a) Read the short article

here: <http://oceanservice.noaa.gov/education/kits/pollution/05areas.html> and answer the following:

- ii) Why is runoff in urban and suburban areas a problem for water quality?

These areas are largely impervious, which makes it easier for stormwater to pick up, absorb and carry pollutants.

ii) What problem do construction sites cause for water systems?

Uncontained soil can erode and discarded materials can be carried away from the site by runoff waters

iii) What threat does lawn care in suburban environment pose for water systems?

The chemicals used in lawn care and pet wastes flow untreated into storm drains and then into nearby waterbodies.