

The Alaskan National Wildlife Refuge (ANWR) on Alaska's North Slope is frequently in the news because petroleum geologists estimate that there are billions of barrels of economically recoverable oil beneath the surface of its frozen tundra. According to a 1998 United States Geological Survey (USGS) estimate, ANWR could contain up to 10 billion barrels of technically recoverable oil. Oil company officials advocate opening the refuge to oil exploration and the subsequent development of its petroleum resources. Environmentalists argue that oil exploration and development will damage this fragile ecosystem and urge Congress to protect ANWR by designating it as a wilderness area.

- (a) The United States consumes approximately 20 million barrels of oil per day. According to the USGS estimate, for how many days would the technically recoverable oil resource in ANWR supply the total United States demand for oil?
- (b) Describe TWO characteristics of arctic tundra that make it fragile and explain how these two characteristics make the tundra particularly susceptible to damage from human impacts.
- (c) Identify TWO activities that would be associated with the development of ANWR petroleum resources and describe a substantial environmental impact of each in ANWR.
- (d) Identify and describe TWO major end uses of the 20 million barrels of oil that the United States consumes each day and for each use describe a conservation measure that would substantially reduce United States consumption.

Most of the coal mined in the United States today comes from surface (strip) mines. In surface mining, the vegetation, soil, and rock covering the coal (referred to as overburden) are removed and set aside. After the coal has been hauled away, good conservation practices require that the overburden be replaced and the surface be restored to its original condition. Land restoration may be difficult in some regions, due to factors such as the local climate, the thickness of the coal seam, the extent of the overburden, and the sulfur content of the coal.

- (a) Describe the steps that should be taken to restore the land after the overburden has been replaced.
- (b) Explain why the restoration of the land would likely be more difficult in an arid climate (less than ten inches of precipitation per year).
- (c) Describe one environmental impact that the sulfur content of the remaining coal and the tailings would have on the reclamation process and suggest a possible remedy.
- (d) Other than mining and reclamation, describe TWO environmental impacts of using coal for energy.
- (e) Explain why per capita coal consumption in the United States is likely to increase.