SUMMARY OF WELL-KNOWN CASE STUDIES IN ENVIRONMENTAL SCIENCE

There are several case studies in environmental science that have had a significant impact on public perception about the environment, and have influenced policy decisions and/or legislation. While it is important to also be familiar with your local or regional case studies, because the APES exam will be taken by students from all over the world, it will only include case studies that have had national or international significance. The following are brief synopses of several case studies to jog your memory; you may consult your textbook for more details.

Aral Sea, Uzbekistan/Kazakhstan (former Soviet Union) and Mono Lake, California: a large inland sea that is drying up; its salinity is rising as a result of water diversion for irrigating crops.

Ogallala Aquifer: the world's largest aquifer; under parts of Wyoming, South Dakota, Nebraska, Kansas, Colorado, Oklahoma, New Mexico, and Texas (the Midwestern United States). It holds enough water to cover the United States with 1.5 feet of water. It is being depleted for agricultural and urban use.

Minamata, Japan: mental impairments, birth defects, and deaths caused by mercury dumped in Minamata Bay by a factory. The mercury was converted to methylmercury, bioaccumulated in fish, and biomagnified through food chains. Mercury entered humans who ate a traditional fish-based diet.

Aswan High Dam, Egypt: the silt that made the Nile region fertile fills the reservoir. Lack of irrigation controls causes waterlogging and salinization. The parasitic disease schistosomiasis thrives in the stagnant water of the reservoir.

Chesapeake Bay, Maryland/Virginia: the largest estuary in the United States; lies off the Atlantic Ocean between Maryland and Virginia, and was declared a dead zone in the 1970s due to hypoxic conditions created from nutrient loading by fertilizers, which caused cultural eutrophication.

Love Canal Housing Development, Niagara Falls, New York: hazardous chemicals buried in an old canal leaked into homes and school yards. Led to the passage of the Comprehensive Environment Response, Compensation, and Liability Act (CERCLA), also known as the Superfund Act.

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Three-Mile Island, Pennsylvania: on March 29, 1979, the emergency cooling system of a nuclear reactor was shut down erroneously by an operator. This led to a partial core meltdown. The containment structure worked well to retain all radioactive materials, but eventually some radioactive gas was purposely released to reduce pressure in the containment structure and avoid a more serious accident.

Bhopal, India: on December 2,1984, poisonous methyl isocyanate gas was released accidentally by a Union Carbide pesticide plant killing about 5,000 people and causing serious health effects for 50,000–60,000.

Chernobyl, Ukraine: on April 26, 1986, an unauthorized safety test led to a fire and explosion at a nuclear power plant—as a result, millions of people in Europe are exposed to unsafe levels of radiation.

Valdez, Alaska: on March 24, 1989, the oil tanker Exxon Valdez hit a reef in Prince William Sound spilling 260,000 barrels of oil. It was the largest oil spill ever in U.S. waters.

Yucca Mountain, Nevada: the proposed site for permanent storage of high-level nuclear waste, 70 miles northwest of Las Vegas. Critics are concerned about the safety of transporting high-level radioactive waste to the site and the proximity of the site to a volcano and earthquake faults.

Three Gorges Dam, China: the world's largest dam on Yangtze River submerged ecosystems, cities, archeological sites, displaced two million people, and fragmented the river habitat.

Clinch River, Tennessee: the Tennessee Valley Authority's power plant near Knoxville had a wall breached in a retention pond holding sludge from the coal burning power plant. This released up to 1 billion gallons of mercury- and arsenic-containing sludge into the nearby Clinch River watershed.

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Exxon Valdez
- Single-hulled oil tanker ran aground in 1989
- Spilled 10.9 mil gallons of crude oil within 6 hrs; lrgest spill in US waters

Effects:
- Mass mortality of benthic invertebrates, seabirds, seals, otters
- Long-term effects from chronic exposure to oil: compromised health, growth, & reproduction of species & trophic cascades
- Oil Protection Act of 1990 - legislation that gives the Environmental Protection Agency greater powers to prevent and respond to oil spills

Three Mile Island, PA
Worst commercial nuclear reactor incident in US
Nuclear reactor was loosing coolant, and reduced coolant available to reactor, which led nuclear fuel to overheat, including melting of tubes that hold fuel pellets & pellets themselves

Effects:
- Add to mood of uneasiness & fear in terms of safety of nuclear energy
- Nuclear Regulatory Commission became much more involved in oversight of nuclear power plants
- Management issues, fledgling tech, and outdated safety standard all improved

Chernobyl
Most serious disaster in nuclear history
Operators violated safety guidelines & turned off control systems during experimental test of electrical system, and surge caused steam explosion, releasing radioactive materials (iodine-131, cesium-134, cesium-137) into atmosphere

Love Canal, New York
- Dates: 1930s to 1960s for chemical dumping; 1960s to 1980s for investigation
- Toxins: benzene, PCBs, and 80 other toxins
- Acute effects: burns, burning eyes and throat
- Chronic effects: miscarriages, birth defects, other chromosomal damage
- Outcome: Community was relocated. As a result of activities at this place and Times Beach, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) was passed.