

**Student Handout #1:  
LAND USE AND POLLUTANTS: CAUSES AND EFFECTS**



| LAND USE                     | Yard care/<br>Landscape<br>chemicals | Automobile<br>fluids | Animal<br>waste | Paint,<br>cleaners, &<br>detergents | Trash | Sediment | Pool<br>chemicals | Toxic runoff/<br>petrochemicals | Heavy<br>metals | Industry &<br>power plant<br>discharge | PAHs* | Golf course<br>runoff | Thermal<br>pollution |
|------------------------------|--------------------------------------|----------------------|-----------------|-------------------------------------|-------|----------|-------------------|---------------------------------|-----------------|--|-------|-----------------------|----------------------|
| Houses                       | ?                                    | ?                    | ?               | ?                                   | ?     | ?        | ?                 | ?                               | ?               |  | ?     |                       |                      |
| Mobile Homes                 | ?                                    | ?                    | ?               | ?                                   | ?     | ?        | ?                 | ?                               | ?               |  | ?     |                       |                      |
| Apartments                   | ?                                    | ?                    | ?               | ?                                   | ?     | ?        | ?                 | ?                               | ?               |  |       |                       |                      |
| Commercial                   | ?                                    | ?                    |                 | ?                                   | ?     | ?        |                   | ?                               | ?               |  | ?     |                       |                      |
| Office                       | ?                                    | ?                    |                 |                                     | ?     | ?        |                   | ?                               | ?               |  |       |                       |                      |
| Industry                     |                                      |                      | ?               |                                     | ?     | ?        |                   | ?                               | ?               | ?                                      | ?     |                       | ?                    |
| Civic                        | ?                                    | ?                    | ?               | ?                                   | ?     | ?        | ?                 | ?                               | ?               |  | ?     |                       |                      |
| Open Space                   |                                      | ?                    | ?               |                                     | ?     |          | ?                 |                                 |                 |  |       | ?                     |                      |
| Transportation/<br>Utilities | ?                                    | ?                    |                 |                                     | ?     |          |                   | ?                               | ?               | ?                                      | ?     |                       | ?                    |
| Undeveloped/<br>Rural        | ?                                    |                      | ?               |                                     |       | ?        |                   |                                 |                 |  |       |                       |                      |

\*PAHs (Polycyclic aromatic hydrocarbons) are a group of over 100 different chemicals that are formed during incomplete burning of coal, oil and gas, or other organic substances found in coal tar, crude oil, and roofing tar.

**How land uses are categorized**

| LAND USE                 | Type of Building or Service  |
|--------------------------|--|
| Commercial buildings     | Retail stores, Grocery and food sales, Auto related, Entertainment, Personal services, Lodgings, Building services   |
| Office                   | Administrative offices, Banks, Medical offices, Research and Development   |
| Industry                 | Manufacturing, Warehouses, Equipment sales and service, Recycling and scrap, Animal handling   |
| Civic                    | Schools, Hospitals, Government services, Meeting and assembly facilities (churches), Cemeteries, Day cares   |
| Open Space               | Parks, Recreational facilities, Golf courses, Preserves and protected areas, Water drainage areas and detention ponds  |
| Transportation/Utilities | Roads, Highways, Bridges, Railroads, Transportation terminal, Aviation, Parking facilities, Utility services, Radio towers, Communication service facilities, Water/Wastewater |
| Undeveloped/Rural        | Rural uses, Vacant land, Land under construction   |

| Types of<br>Pollutants | Pollution sources   | What are the Effects?  |
|------------------------|---|--|
| Yard care/             | <ul style="list-style-type: none"> <li>Fertilizers, weed killer, insecticide, fungicides, and grass, tree and shrub clippings wash</li> </ul> | <ul style="list-style-type: none"> <li>Phosphorus and nitrogen from fertilizers cause algal blooms, which depletes water of oxygen,</li> </ul> |

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| Landscape pollutants  | to stormdrains or soak into groundwater when it rains   | <p>killing fish and aquatic life</p> <ul style="list-style-type: none"> <li>• Pesticides and herbicides can be harmful to humans and aquatic organisms (some are carcinogenic or attack the nervous system)</li> <li>• Loose grass clippings and leaves clog drainage systems and/or cause algal blooms in water</li> </ul>   |
| Automobile pollutants                                       | <ul style="list-style-type: none"> <li>• Oil, antifreeze, brake fluid, grease and metals on streets and driveways run off pavement to stormdrains or soak into groundwater</li> <li>• Nitrogen and other contaminants emitted from automobiles settle in water</li> <li>• Oil, grease, transmission fluids, etc. spilled from automobiles, trucks, buses, planes, etc. wash to stormdrain or creek</li> </ul>   | <ul style="list-style-type: none"> <li>• Oil, petroleum products and other toxins from automobiles kill fish, plants, aquatic life and even people (contaminate drinking water). Used oil from a single oil change can ruin a million gallons of water-a year's supply for 50 people.</li> <li>• Some of these toxins and metals are absorbed in various aquatic life and can cause medical problems to humans when contaminated fish and shellfish are consumed.</li> <li>• Pollutants such as heavy metals and automobile fluids are toxic to aquatic life (interferes with photosynthesis, respiration, growth and reproduction).</li> </ul> |
| Organic waste- once part of a living animal (feces or food) | <ul style="list-style-type: none"> <li>• Failing sewer systems spilling out raw sewage after a heavy rain</li> <li>• Leaking or failing septic systems</li> <li>• Pet wastes not collected and disposed of appropriately</li> <li>• Pathogens from rotting food or dead animals</li> <li>• Discharge from food-processing plants, meat-packing houses, dairies and other industrial sources</li> <li>• Organic waste from fibers originating from textile and plant processing plants</li> <li>• Wastewater treatment plants</li> </ul> | <ul style="list-style-type: none"> <li>• Fecal coliform bacteria in pet droppings and septic tank overflows can cause infections and diseases by getting into drinking water and recreation areas</li> <li>• Pathogens from food and dead animals may also cause infections and diseases if they enter water sources</li> <li>• Phosphorus and nitrogen from organic material cause algal blooms, which depletes water of oxygen, killing fish and aquatic life</li> </ul>  |
| Household chemicals   | <ul style="list-style-type: none"> <li>• Improperly disposed paint, solvents and other chemicals runoff or soak into the ground</li> <li>• Household and commercial cleaning agents wash into water and stormdrains</li> <li>• Washing car</li> </ul>   | <ul style="list-style-type: none"> <li>• Paint, cleaning supplies and other toxic materials contaminate drinking water and kill fish, animals and plants</li> <li>• Detergents cause explosive plant and algae growth, which depletes water of oxygen, killing fish and animals as well as creating a terrible smell</li> </ul>   |
| Trash   | <ul style="list-style-type: none"> <li>• Litter washed into stormdrains, creeks, and groundwater</li> </ul>   | <ul style="list-style-type: none"> <li>• Looks and smells unpleasant; can harm wildlife</li> </ul>  |
| Sediment  | <ul style="list-style-type: none"> <li>• Soil and sediment absorb toxins and transport them to creek beds and groundwater</li> <li>• Construction of new buildings, homes and streets causes excessive erosion</li> <li>• Paved roads cannot absorb chemicals, soil and suspended particles in runoff</li> </ul>  | <ul style="list-style-type: none"> <li>• Sediment settles to the bottom of a creek or lake and prevents sunlight from reaching plants, clogs fish gills, chokes other organisms and can smother fish spawning and nursery areas</li> </ul>  |
| Pool chemicals  | <ul style="list-style-type: none"> <li>• Swimming pool water illegally discharged to a creek</li> </ul>   | <ul style="list-style-type: none"> <li>• Chlorine kills aquatic life</li> </ul>   |
| Toxic runoff/ petrochemicals                                | <ul style="list-style-type: none"> <li>• Grease and other toxins from restaurants, vehicles, machinery, cleaning products, garbage and toxic waste not disposed of properly</li> <li>• Fuel and oil spilled on the pavement washes to storm drains and/or bodies of water</li> <li>• Chemical spills or medical waste improperly managed</li> </ul>   | <ul style="list-style-type: none"> <li>• Oil, petroleum products and other toxins from automobiles kill fish, plants, aquatic life and even people. One quart of oil will contaminate thousands of gallons of water because it doesn't dissolve</li> <li>• These toxins as well as trace metals and degreasing agents used on automobiles contaminate drinking water and can cause major illness</li> <li>• Some of these toxins and metals absorbed in various aquatic life cause medical problems in people when contaminated fish and shellfish are eaten.</li> </ul>  |
| <b>Types of Pollutants</b>                                  | <b>Pollution sources</b>  | <b>What are the Effects?</b>  |
| Heavy metals  | <ul style="list-style-type: none"> <li>• Car and truck exhaust, worn tires and engine parts, brake linings, weathered paint, and</li> </ul>   | <ul style="list-style-type: none"> <li>• Toxic to aquatic life and can potentially contaminate groundwater</li> </ul>   |

|   |  |  |
|---|--|--|
|   | rust   |  |
| Industry and power plant discharge      | <ul style="list-style-type: none"> <li>Litter washed into stormdrains and creeks</li> <li>Chemicals</li> </ul>   | <ul style="list-style-type: none"> <li>Looks and smells unpleasant; harms wildlife</li> <li>Toxins and metals absorbed in various aquatic life cause medical problems in humans when they consume contaminated fish and shellfish.</li> </ul>            |
| Runoff from golf courses                | <ul style="list-style-type: none"> <li>Fertilizer and pesticide runoff from golf courses, sidewalks, playgrounds, and landscaped areas entering a body of water as runoff</li> </ul> | <ul style="list-style-type: none"> <li>Phosphorus and nitrogen from fertilizers cause algal blooms, which depletes water of oxygen, killing fish and aquatic life</li> <li>Pesticides and herbicides can be harmful to human and aquatic life</li> </ul> |
| PAHs (Polycyclic aromatic hydrocarbons) | <ul style="list-style-type: none"> <li>PAHs enter water through discharges and decomposed asphalt</li> </ul>   | <ul style="list-style-type: none"> <li>PAHs are carcinogenic-surprisingly low concentrations (parts -per-trillion range) can cause adverse effects in both fish and zooplankton</li> </ul>   |
| Thermal pollution                       | <ul style="list-style-type: none"> <li>Discharge of heated water from power plants</li> <li>Removal of shade trees along creek banks</li> </ul>                                      | <ul style="list-style-type: none"> <li>Inhibits fish growth and reproduction and can be fatal to aquatic life</li> <li>Increases evaporation thus decreasing flow rate of river</li> </ul>   |