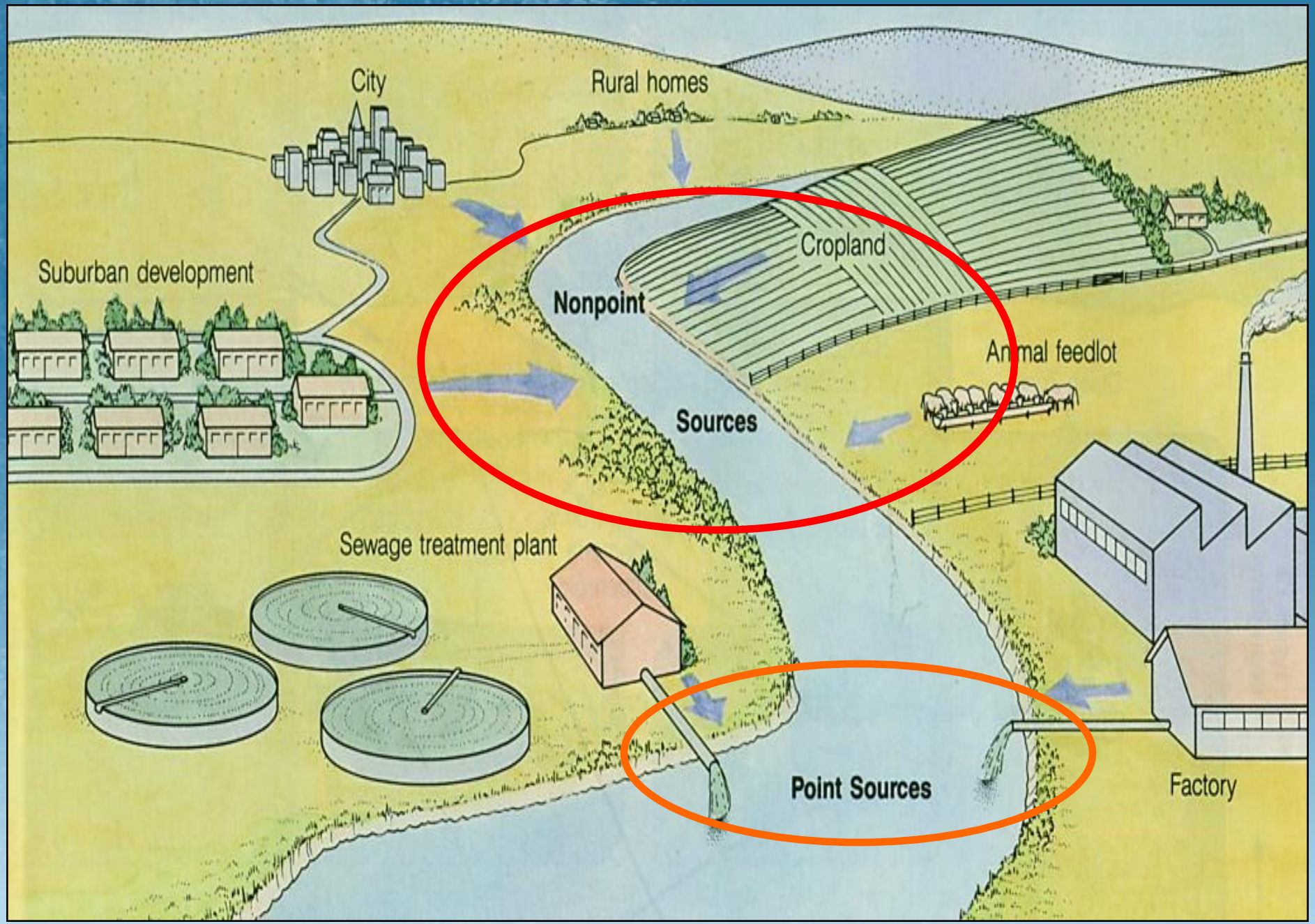
SKAA 3913 – ENVIRONMENTAL MANAGEMENT

WATER POLLUTION – SOURCES & EFFECT

WATER POLLUTION SOURCES

- **Point sources**
  - Wastewater that are discharge from known sources at an identifiable point
  - Can be reduced or eliminated through proper wastewater treatment prior to discharge

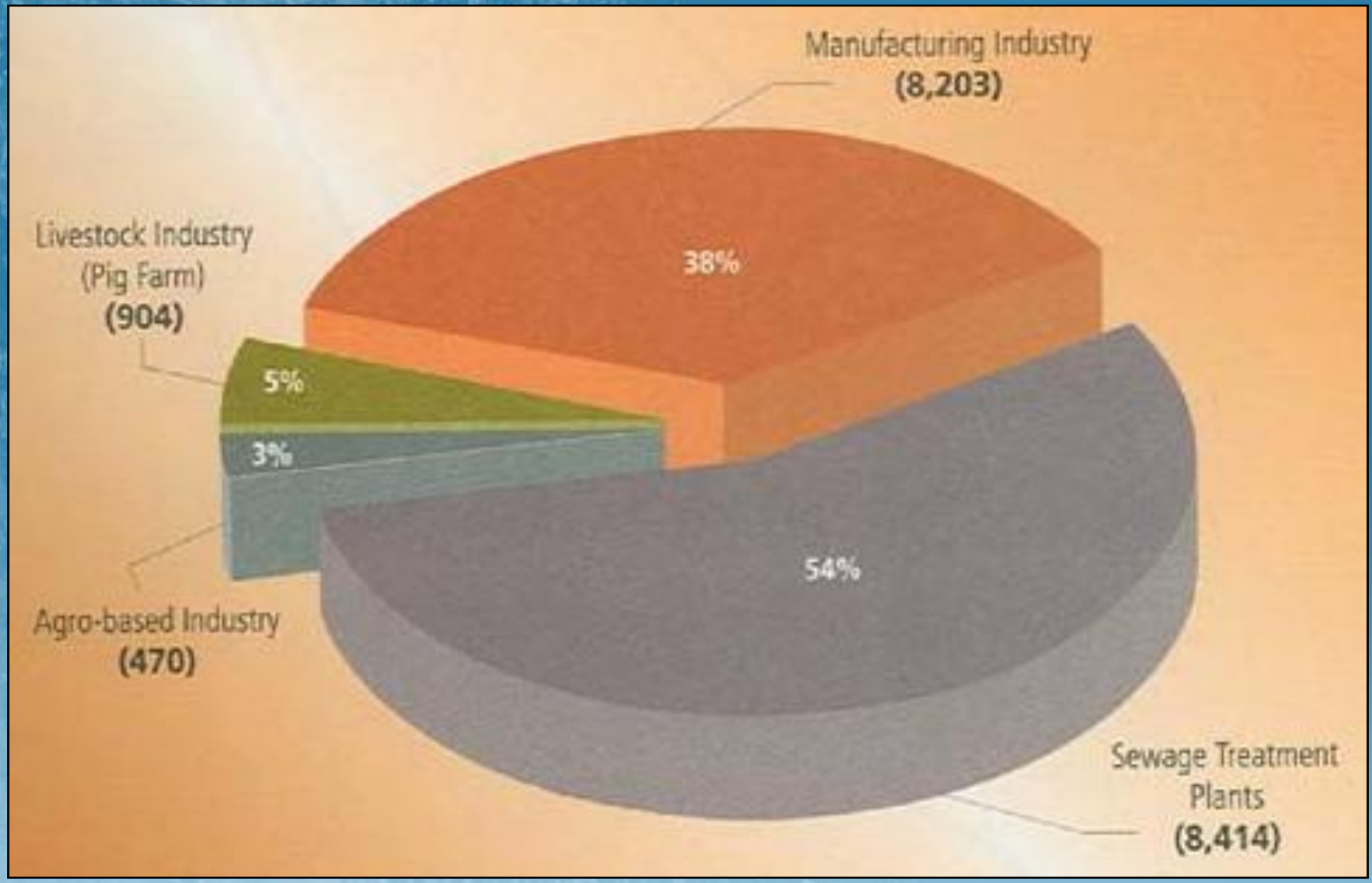
- **Non-point sources**
  - Characterized by multiple discharge points (eg: urban and agricultural runoff)
  - Much of non-point sources pollution occurs during rain storms.
  - Reduction generally requires changes in land use practices


City
Rural homes
Suburban development
Cropland
Nonpoint
Sources
Animal feedlot
Sewage treatment plant
Point Sources
Factory

POINT SOURCE

- Also defined as stationary locations or fixed facilities from which pollutants are actually discharged.

Industrial/Commercial	Agricultural	Municipal
• Manufacturing and maintenance's operation • Solvents, petroleum products or heavy metals.	• Animal feeding, animal waste treatment lagoons, storage, handling, mixing, cleaning operations • Pesticides, fertilizers, petroleum	• Wastewater treatment plants, landfills, utility stations, motor pools and fleet maintenance facilities

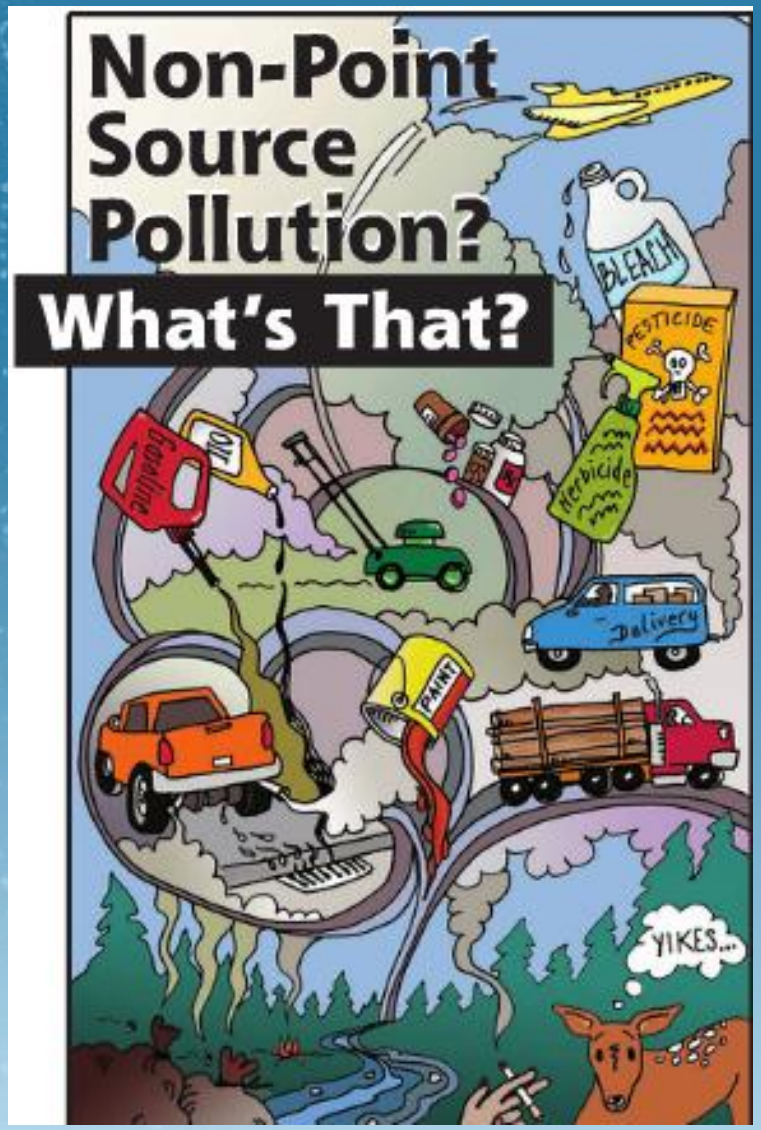


In Malaysia: DOE has recorded 17,991 water pollution point sources in 2004


16 4 2003

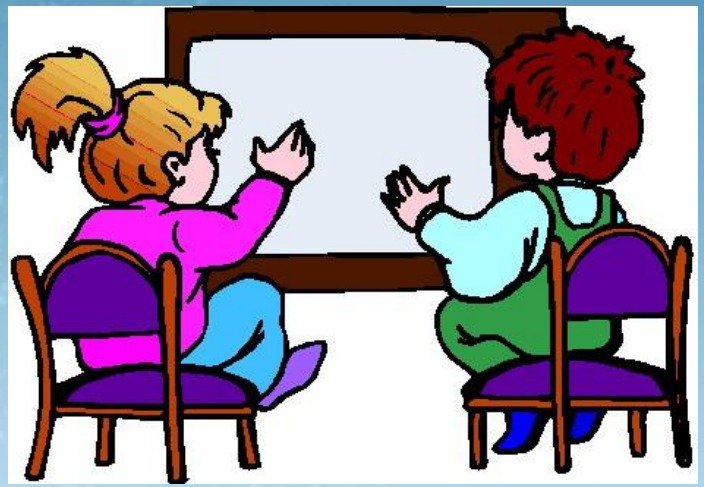
NON-POINT SOURCE

- Deposition of contaminated rain falling from the sky
- Polluted melting snow
- Runoff (water flow on land) of polluted water
- Impure water draining down into the groundwater from many different sites on the surface.



Source: google.com

VIDEO ON SURFACE RUN-OFF (NPS)



TYPE OF NON-SOURCE POLLUTANT

Sediment	Nutrient	Heavy metals
• From field, construction sites, mining or logging operations	• From cropland, nurseries, orchard, livestock and poultry farms, lawns and landfills	• Fluids that leak out of vehicles, runoff from mine sites, roads and parking lots

Toxic chemical	Pathogens
• From farmland, nurseries, orchards, construction sites, lawns and landfill	• From sewage, farms, fluid leaking from landfill

NON-POINT SOURCE

- It is often difficult to trace the exact origin of these pollutants
- Result from a wide variety of human activities on the land as well as natural characteristics of the soil, and topography .

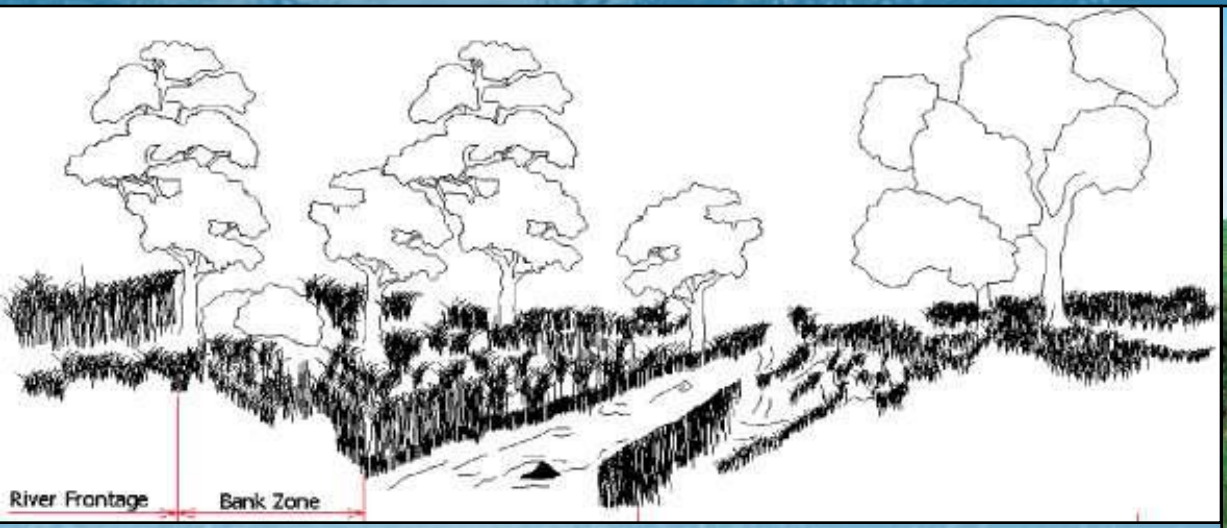
NPS: CONTROL SURFACE WATER POLLUTION

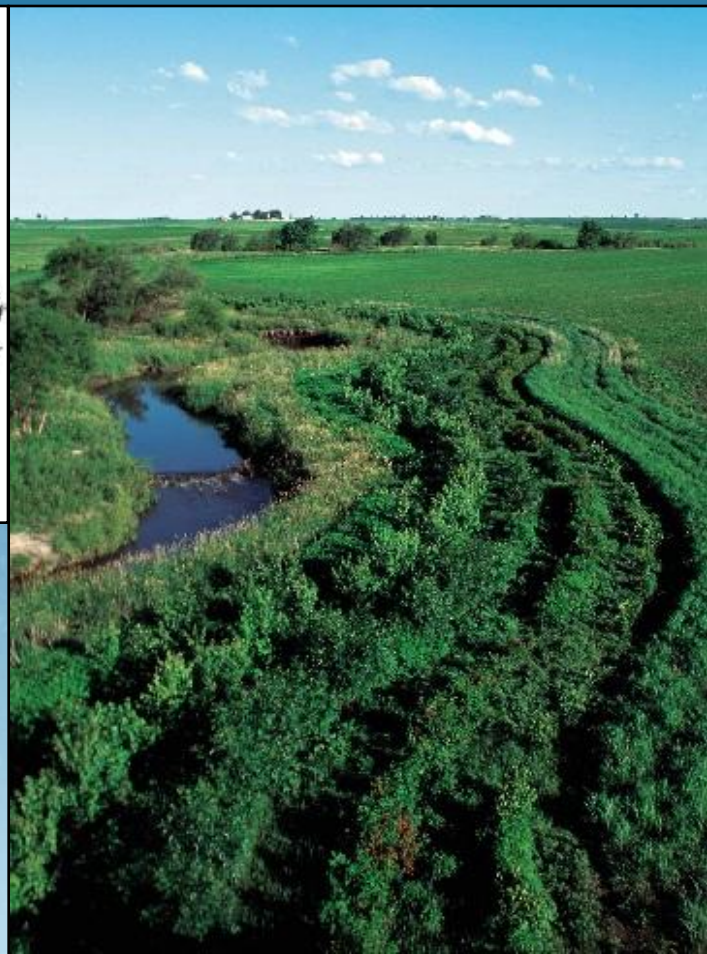
- Reduce fertilizer runoff
  - not using excessive amount
  - using none on steeply sloped land
  - applypesticides only when needed
  - reducing the usage of fertilizers and pesticides on golf courses and public parks

Source: google.com

NPS: CONTROL SURFACE WATER POLLUTION

- Planting of permanent vegetation as **buffer zone** between farmland and rivers/lakes.





NPS: CONTROL SURFACE WATER POLLUTION

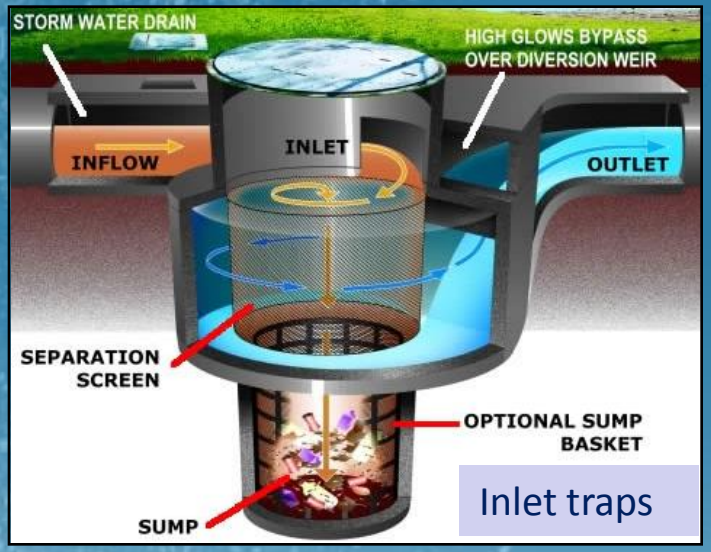
- Reforestation of logged forest to control soil erosion

Source: CIFOR

Source: thestar.com

NPS: CONTROL SURFACE WATER POLLUTION

Silt fence



Inlet traps

- Use of sedimentation basins or **silt traps** at construction sites

Silt trap in Berinchang

Straw Bales

Source: google.com

NPS: CONTROL SURFACE WATER POLLUTION

- **Road cleaning** practices

Source: google.com

NPS: CONTROL SURFACE WATER POLLUTION

- Efficient solid waste management
- Installation of waste traps at drainage system and rivers

Sungai Juru

Sungai in Selangor

Source: google.com

WATER QUALITY PARAMETERS

- Dissolved Oxygen
  - Significant in protection of aesthetic qualities, a well as for the maintenance of aquatic life.
  - Concentration of 2 mg/L is the minimum to support normal aquatic life in the tropics.
  - A criteria level of above 5 mg/L is needed for the propagation of fish and aquatic wildlife.
  - A criteria level of above 4 mg/L is desirable in drinking water.

WATER QUALITY PARAMETERS

- Lead
  - Toxic to human, animals & plants
  - It is recommended that concentration in domestic water supplies should not exceed 0.05 mg/L.
- Mercury
  - High toxic potential
  - A level of 0.05 µg/L is recommended as a safe concentration for freshwater aquatic organisms.
  - For domestic water supply mercury levels should be less than 0.002 mg/L.

WATER QUALITY PARAMETERS

- Cadmium
  - High toxic potential
  - Factors such as pH affect the toxicity of Cd.
  - Cd in domestic water supply should not exceed 0.01 mg/L.
  - Certain fishes can tolerate a limit of 0.02 mg/L.

- Iron
  - Essential trace element required by plants and animals, however, can become toxic when present in high levels.
  - Recommended iron concentration in water supply is 0.3 mg/L with a minimum limit of 0.05 and maximum limit of 1.0 mg/L

WATER QUALITY PARAMETERS

- Manganese
  - Although high concentration of manganese can be toxic, it is a vital nutrient for plants & animals.
  - Desirable concentration in drinking water: 0.01 to 0.05 mg/L.
  - Manganese caused brownish color to water and washed cloth.
  - High concentration of manganese in drinking water produces undesirable taste.

WATER QUALITY ASSESSMENT AND MONITORING

BIOLOGICAL ASSESSMENT

- Most aquatic organism are sensitive to changes in their environment whether natural caused or human caused.
- Different organism response in different ways may include:

Death

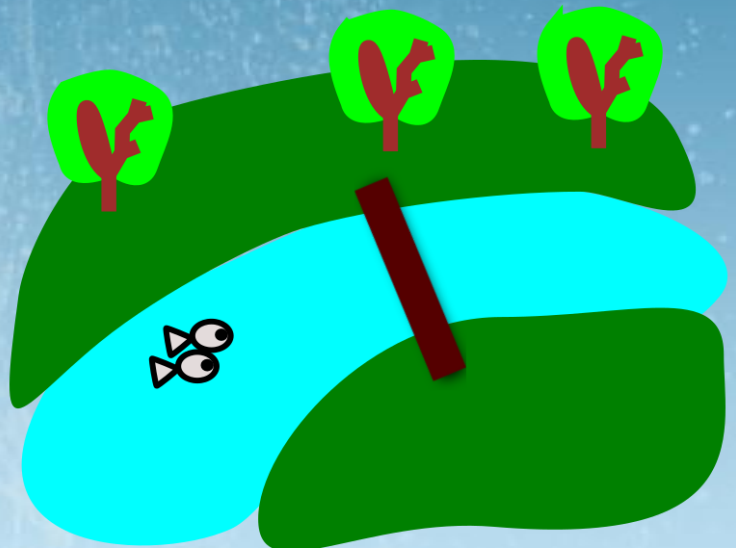
Inhibition certain physiological process

TYPES OF BIOLOGICAL ASSESSMENT

1. Ecological methods

- Analysis of communities in the water body
- Presence or absence of specific species
- An indicator organism will be selected for its sensitivity or tolerance to various kinds of pollution or its effects
  - Example: typical effects on water quality and the associated biota which may be observed downstream of a sewage outlet

VIDEO ON STREAM ECOLOGICAL ASSESSMENT



Ecological methods

Source: http://www.glwi.uwm.edu

CLADOPHORA

- Research in 1960's and 70's linked *Cladophora* blooms to high phosphorus levels in the water.
- Due to tighter restrictions, phosphorus levels declined during the 1970's and *Cladophora* blooms were largely absent in the 1980's and 90's.

Ecological methods

TUBIFICIDAE

Aquatic sludge worms of family Tubificidae are most tolerant to pollution and occurred in the most polluted areas.

Source: google.com

CHIRONOMUS

Due to its short life cycle, small size and high density, different species of chironomids have been used in acute toxicity tests

TYPES OF BIOLOGICAL ASSESSMENT

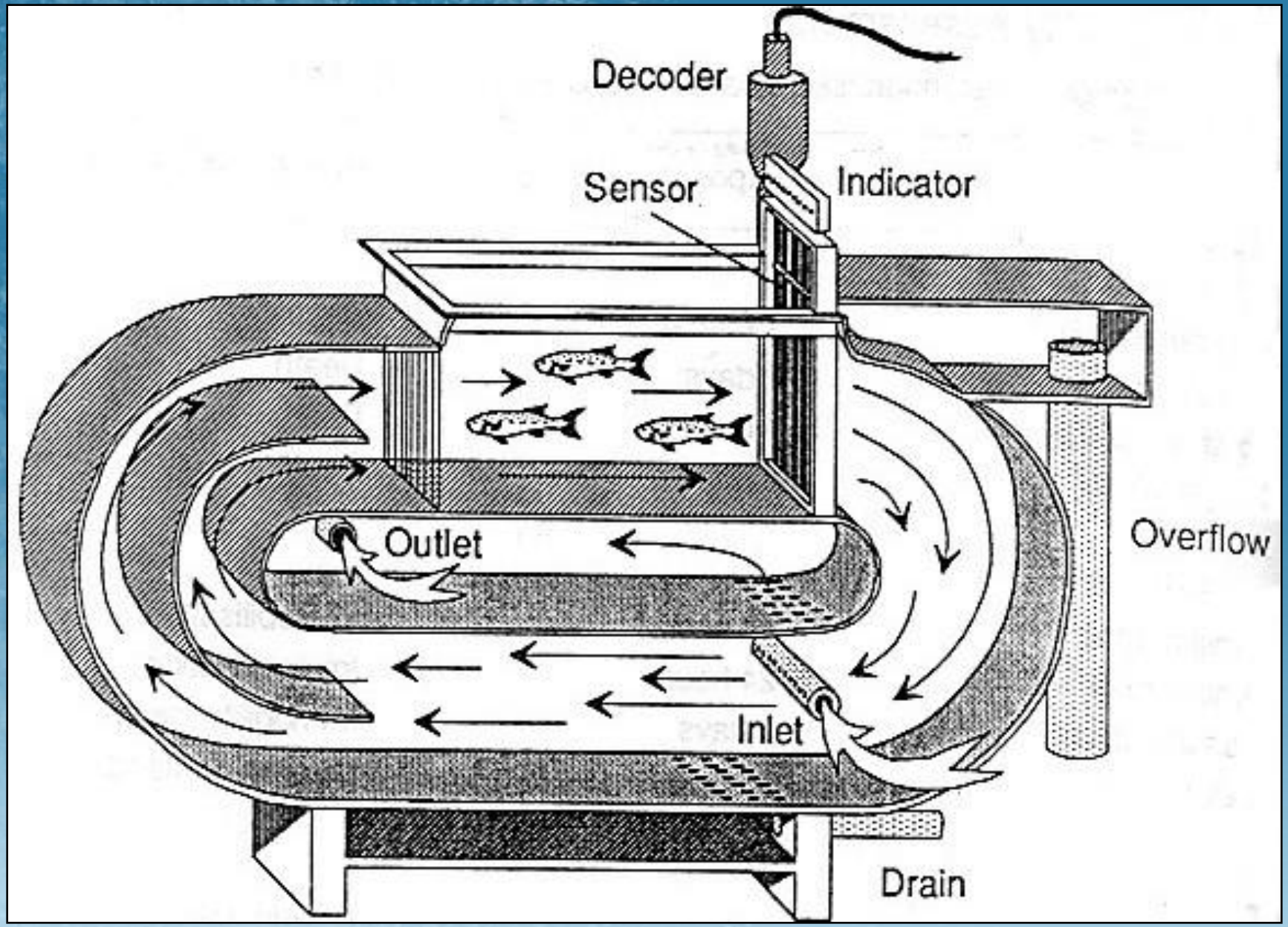
2. Physiological & biochemical methods

- Respiration and growth of organism suspended in water
  - to determine the quantity of biodegradable organic compounds and the tendency for eutrophication
- Oxygen production and consumption, stimulation and inhibition.
  - example: measurement of Oxygen Production Potential (OPP) that can be carried out in the lab or on-site

TYPES OF BIOLOGICAL ASSESSMENT

3. The use of organism in control environment

- Assessment of the toxic effects on organism under defined laboratory conditions (bioassays)
- Biological assessment results are used to answer the question of whether waterbodies support survival and reproduction of desirable fish, shellfish, and other aquatic species


Decoder
Sensor
Indicator
Outlet
Overflow
Inlet
Drain

EXAMPLE OF WATER QUALITY MONITORING