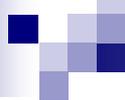


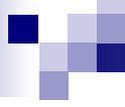
# Bioremediation of Pesticides

Lynnea Golding



# Bioremediation

- Mineralization, transformation, alteration
- George Robinson
- Objectives:
  - Oxidation
  - Biotransformation
  - Reduction



# Pesticides

- EPA: any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest
- Classified by structure

# Pesticide Concerns

- Stimulation of nervous system
- Biomagnification

Pesticide: DDD  
Water 0.02 ppm  
↓  
Plankton 5.3 ppm; x265  
↓  
Small fish 10.0 ppm; x500  
↓  
Predator fish 1,700 ppm; x85,000



Pesticide: Toxaphene  
Water 0.2 ppm



↓  
Planktonic crustaceans 73 ppm; x365



↓  
Goldfish 200 ppm; x1,000



↓  
Pelican 1,700 ppm; x8,500



# Pesticide Bioremediation Methods

- Intrinsic bioremediation
- Ex-situ and in-situ treatment

Environmental Factor	Optimum Conditions
Available soil moisture	25-85% water holding capacity
Oxygen	>0.2 mg/L DO, >10% air-filled pore space for aerobic degradation
Redox potential	Eh > 50 millivolts
Nutrients	C:N:P = 120:10:1 molar ratio
pH	5.5 to 8.5
Temperature	15 - 45°C



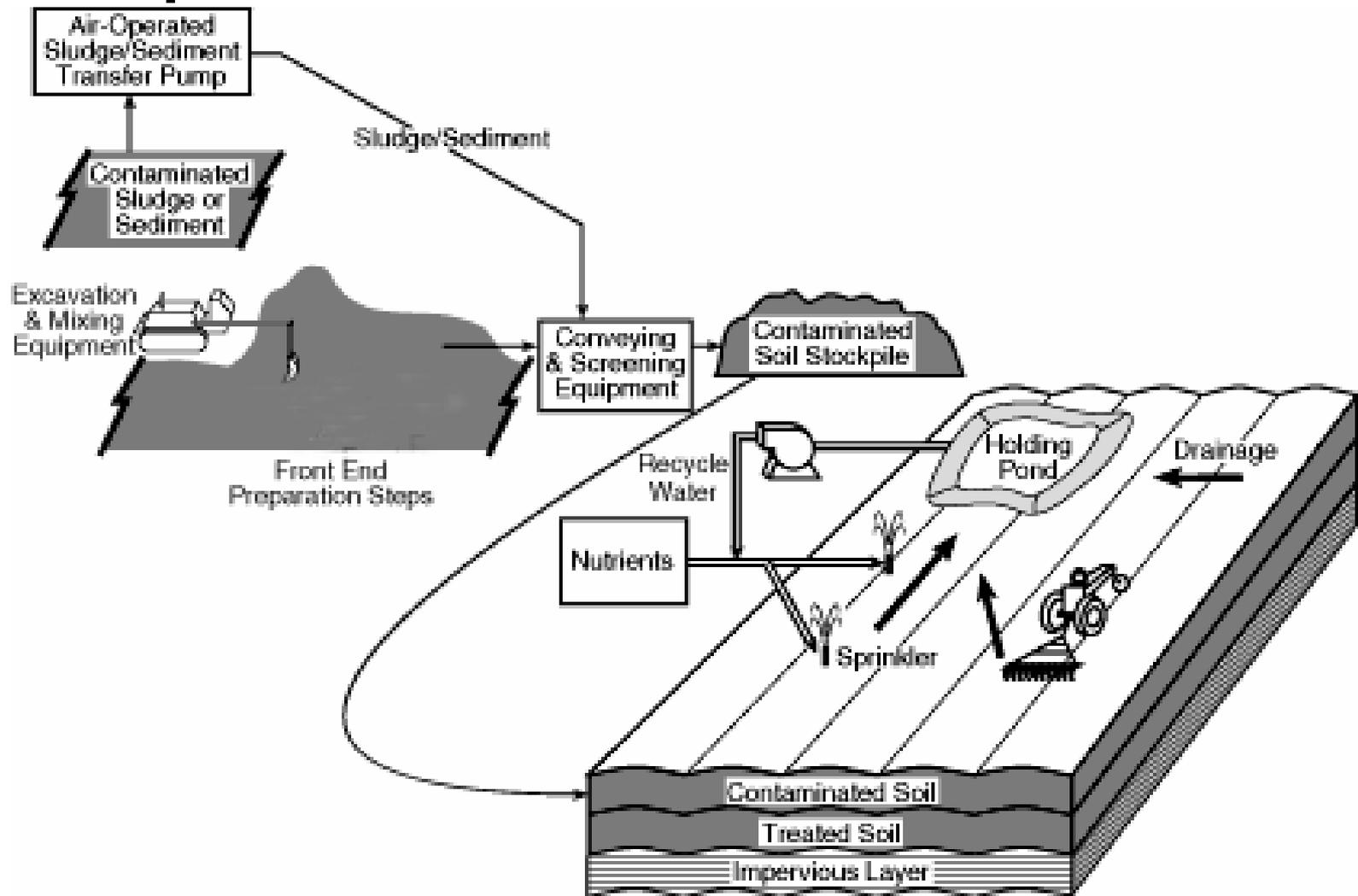
# Ex-Situ Bioremediation

- Pump-and-treat
- Biopile treatment
- Landfarming

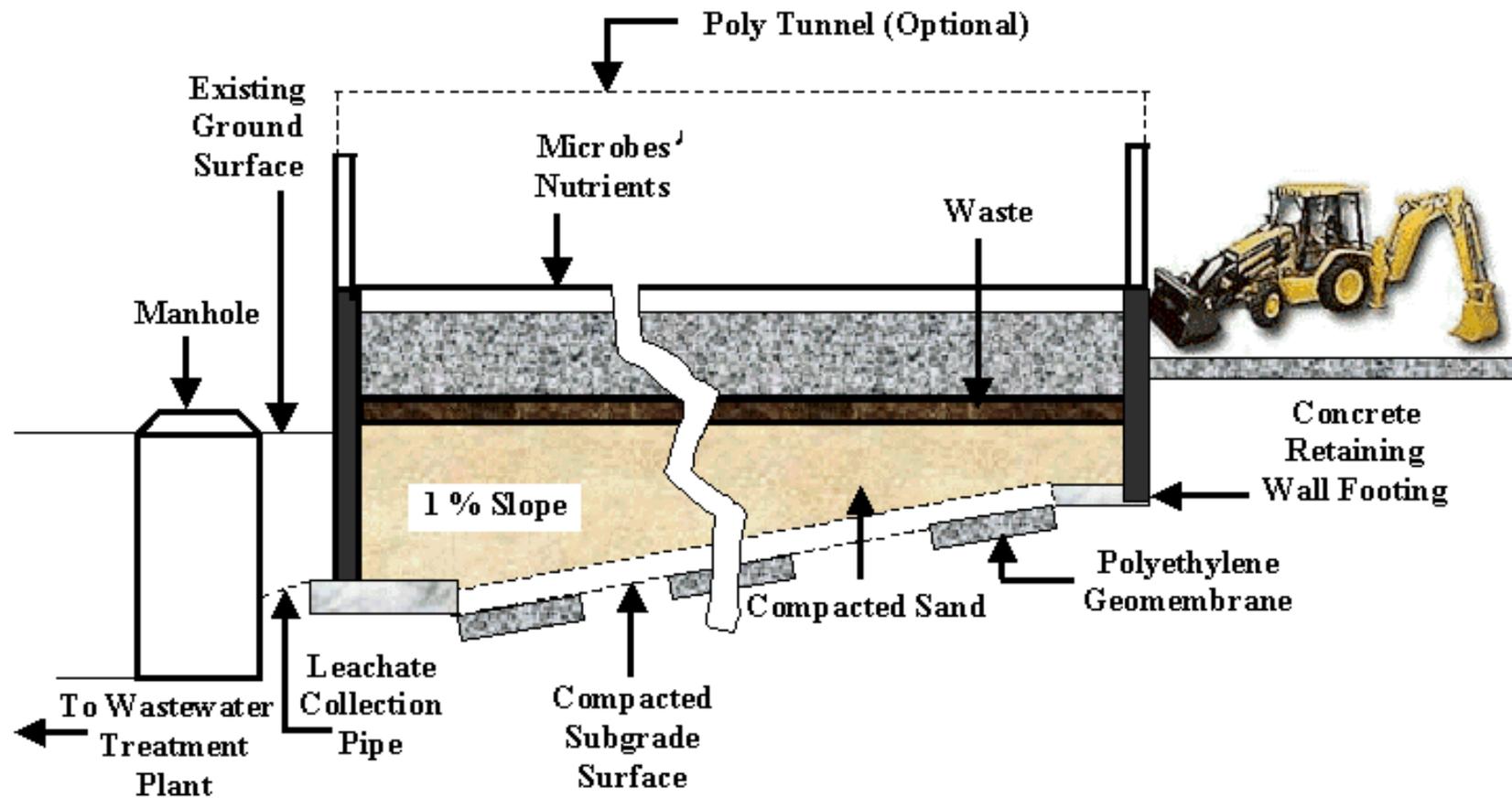
# Pump-and-treat

- Contaminated groundwater
- Treatment via engineered systems
  - Activated sludge
  - Trickling filter
  - Rotating Biological Contactors
  - Ion Exchange

# Biopile Treatment



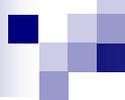
# Landfarming Treatment





# In-Situ Bioremediation

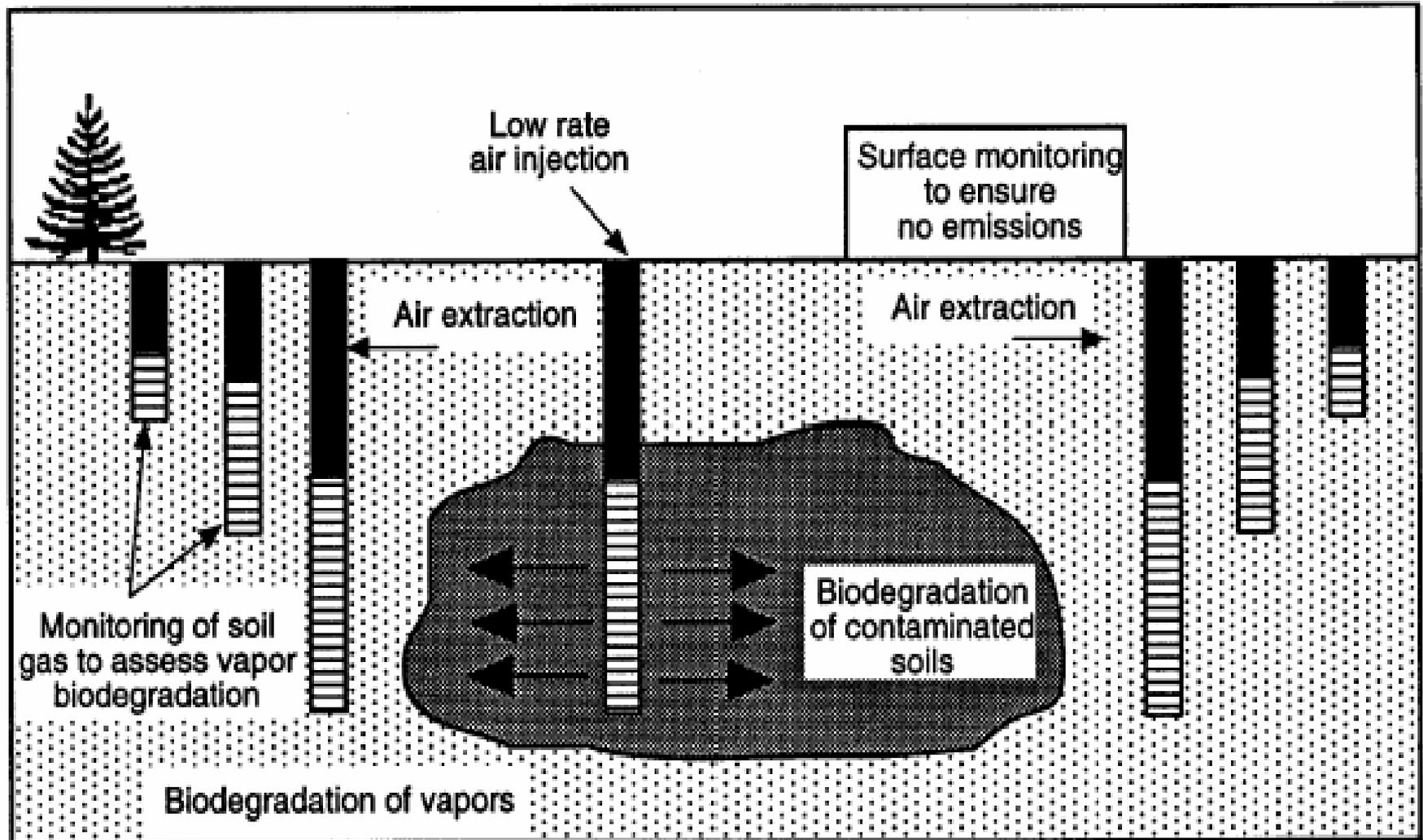
- Fungi
- Bioventing

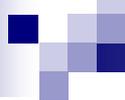


# Fungi Treatment

- White rot fungi
- Natural degrader of recalcitrant compounds

# Bioventing

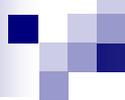




# Ex-situ vs. In-situ Treatment

## ■ Ex-situ

- Shorter amount of time
- Easier to control
- Increase in labor costs
- Large amount of space required



# Ex-situ vs. In-situ Treatment

- In-situ

- Long time frame
- Hard to control
- Intense monitoring



# Conclusion

- Pesticide remediation necessary
- Partial degradation may produce toxic compounds
- Further research needed



Questions?