After the Application…

…What Happens?

The Fate of Pesticides in the Environment

modified/updated by
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Virginia Cooperative Extension
2022-2023

Public Perception?

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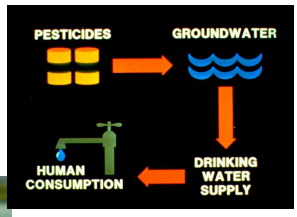
Pesticide Fate?



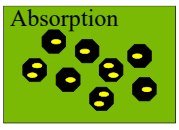
?????

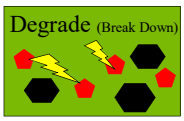
…Manage **Pests**…

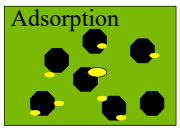
…Manage **Pesticides**…

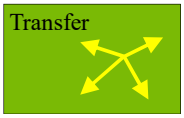
…Protect **Environment**…

Fate Processes









Ideal Situation

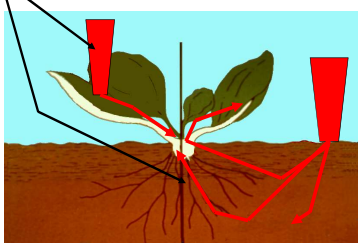
- Direct the pesticide to the target.

- Choose a pesticide -- and apply it in such a way -- that it lasts long enough to do the job…but no longer!

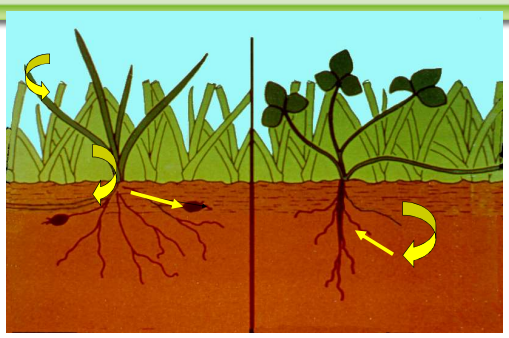
Pesticide Fate Process
1. Absorption

Absorption / Uptake

- "Hitting the Target":



Systemic Herbicides

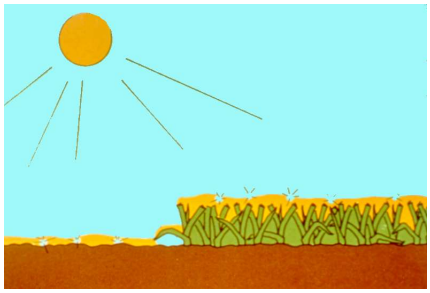


Pesticide Fate Process
2. Degradation

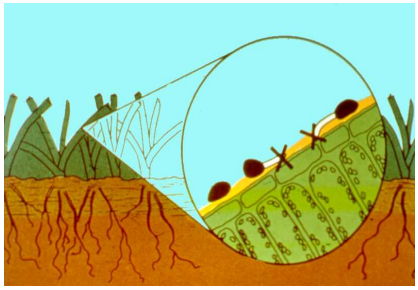
What Missed the Target:

- **Degrades** (breaks down):
  - Photo
  - Chemical
  - Microbial

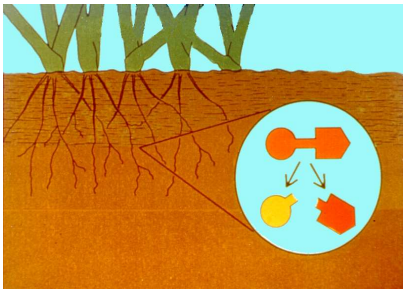
Photodecomposition



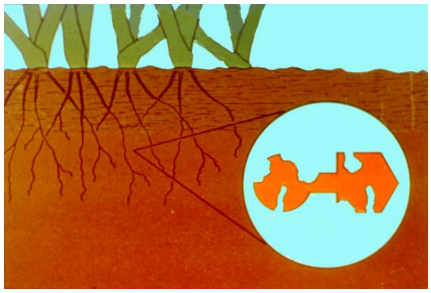
Photodecomposition



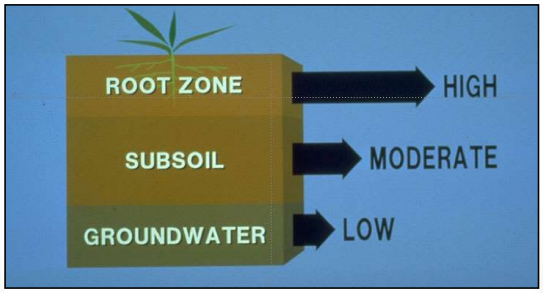
Chemical Decomposition



Microbial Breakdown



Microbial Activity

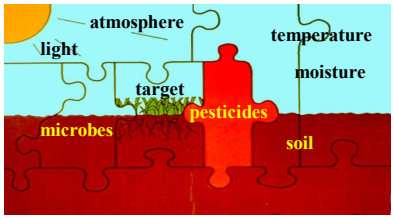


Soil Factors for Microbial Activity

- Moisture
- Temperature
- pH
- Aeration
- Organic matter

Interactions

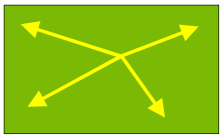
Pesticide Properties -- Environmental Conditions



Pesticide Fate Process
3. Transfer

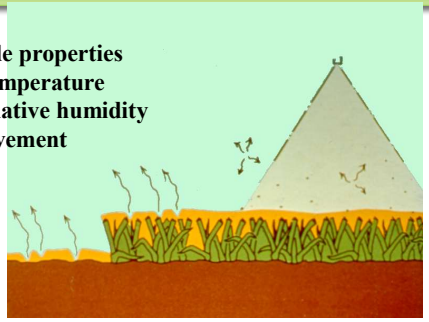
What Missed the Target:

- What doesn't/hasn't yet degraded can **Transfer:**
  - Drift…
  - Leaching…



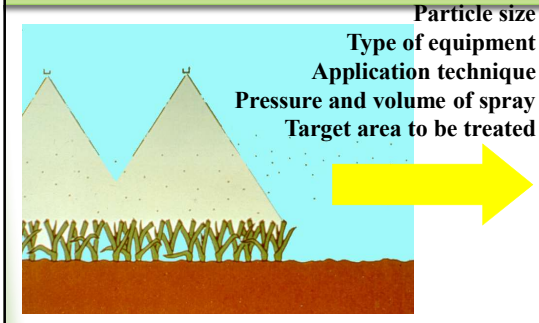
Volatilization / Vapor Drift

Pesticide properties
High temperature
Low relative humidity
Air movement



Particle Drift

Particle size
Type of equipment
Application technique
Pressure and volume of spray
Target area to be treated



Drift Potential

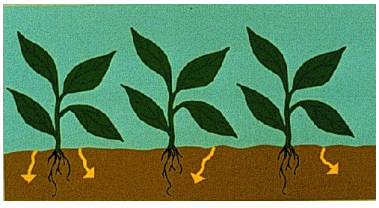
High

Low

Granular Products

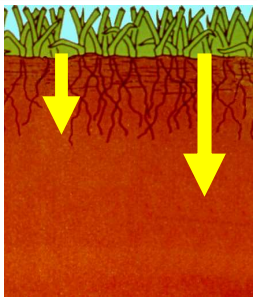
Drift Plant Damage

Leaching



Movement of pesticides in water through soil

Leaching Potential



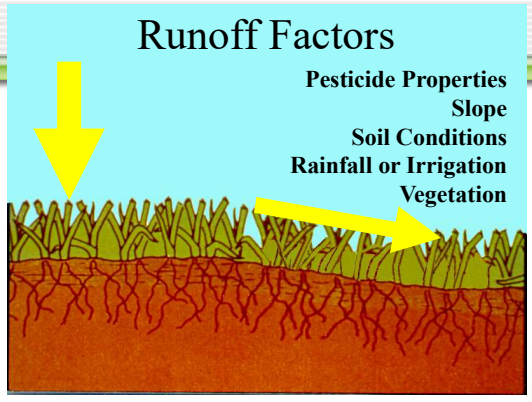
Pesticide Properties
adsorptivity
solubility
persistence

Soil Characteristics
texture/structure
organic matter
moisture

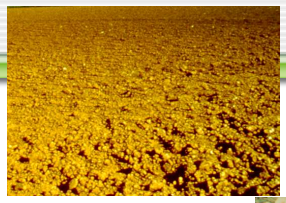
Leaching to Groundwater

- **Pesticides:** low adsorptivity, high solubility, high persistence
- **Soils:** sandy, low organic matter, high water content (rainfall or irrigation)
- **Site:** high water table, direct access to ground or surface water, slope, geology, etc.

Runoff Factors



Pesticide Properties
Slope
Soil Conditions
Rainfall or Irrigation
Vegetation



Bare Soil vs. Turf

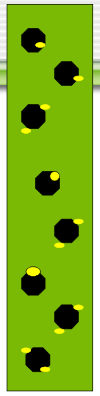
Healthy Turf Protects Water Quality

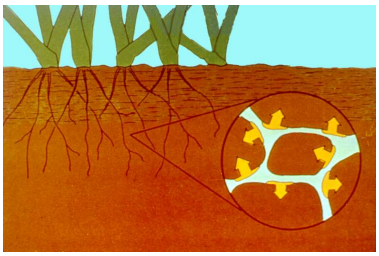
Runoff Consequences

Pesticide Fate Process

4. Adsorption

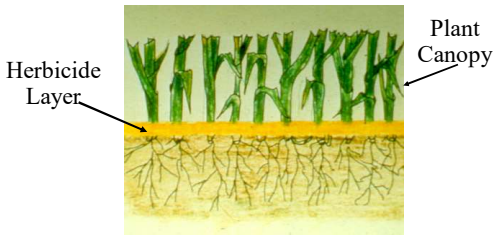
Adsorption





Mode of Action and Adsorption

Preemergent Herbicides



Mode of Action and Adsorption

Soil Insecticides

Environmental Fate

- **Depends on:**
  - Pesticide properties
  - Soil characteristics
  - Application Site conditions
  - Applicator practices

Pesticide Properties

- **Important Factors Affecting Environmental Fate:**
  - *Water solubility*
    - Dissolve in water?
  - *Adsorption*
    - "Stick" to soil?"
  - *Volatility*
    - Vaporize readily?
  - *Mode of Action*
    - Contact vs. Systemic?

Pesticide Properties

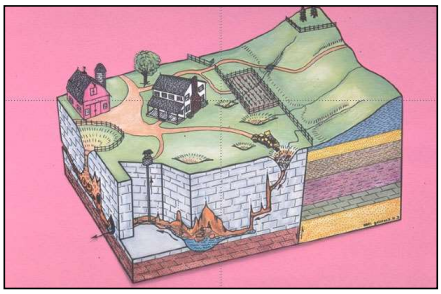
- **Know the properties of products you use:**
  - **How?**
    - Label/SDS
    - VCE references/resources
    - ExToxNet
      - http://extoxnet.orst.edu/

Soil Characteristics

- **Important Factors**:
  - Texture / structure
  - Moisture
  - Temperature
  - pH
  - Aeration / Oxygen
  - Organic matter

Site Conditions

- **Important Factors - Sensitive Areas:**
  - Surface Features
    - Ex. slope, surface water
  - Geologic Features
    - Ex. depth to water table, fractures, porous rock, limestone / karst topography



Environmental Factors

- **Important Factors:**
  - Warm-Cool
  - Wet-Dry

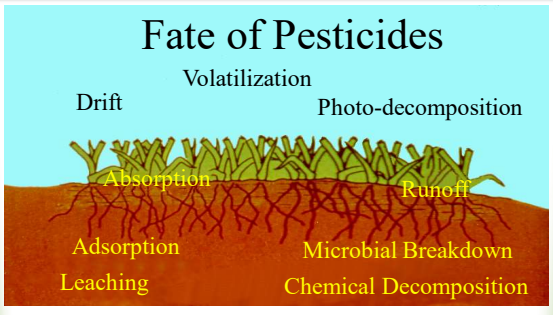
Applicator Practices

- **Important Factors:**
  - Product choice
  - Handling / mix-load procedures
  - Application method
  - Application timing
  - Target
- **Consider Environmental Fate!**

Putting it all Together

- The role of the applicator = pest management **and** pesticide management!

Summary = Possibilities…



Pesticide Management

Read and Follow the Label!

Adapted from

"The Fate of Pesticides in the Urban Environment"

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modified/updated by

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Pat Hipkins / VT Pesticide Programs

Virginia Cooperative Extension

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