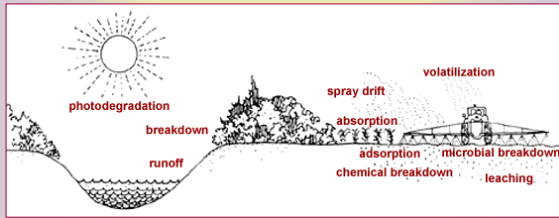


Environmental Fate of Pesticides

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Environmental Fate of Pesticides



Source: B.C. Ministry of Ag & Land

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A Significant Amount of Pesticide Is Lost at Application

- Losses are affected by:
 - Method of application
 - Rate
 - Timing
 - Number of applications
 - Placement

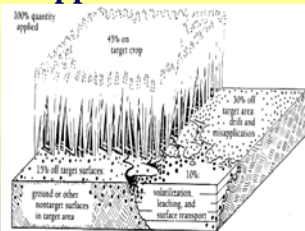


FIGURE 6A

As much as 55% of an applied pesticide may leave the application site due to spray drift, volatilization, leaching, runoff, and soil erosion.

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Pesticide Characteristics

- **Chemical characteristics of a pesticide will determine how it behaves in the environment**
 - Solubility
 - Adsorption
 - Half-life (Persistence)
 - Volatility

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Pesticide Characteristics: Solubility

- **How readily a pesticide dissolves in a solvent (water is the most common solvent)**
 - Sugar and salt are household examples
- **Pesticides that are more soluble are more likely to move with water in surface runoff or through the soil to groundwater**

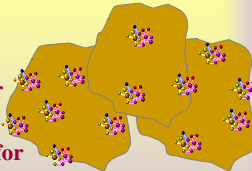


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Adsorption

- ❖ **The binding of chemicals to soil particles**
 - ❖ Higher with oil-soluble pesticides
 - ❖ Clay and organic matter increase binding
 - ❖ Decreases the potential for a pesticide to move through soil



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Knowing Soil Adsorption Characteristics

- Pull a soil sample and include a request OM levels
 - UNH soil testing program (\$5)
- Why?
 - Some herbicide labels set specific texture or OM limits
- If you have a question and need to know ASAP



Do A Jar Test

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Solubility and Adsorption

- As solubility increases; adsorption decreases
 - There is always an exception:
 - Roundup and paraquat
 - Both are highly water soluble but bind very tightly to soil.

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Persistence

- How long will a pesticide remain present and active
- More persistent pesticides provide s term pest control
 - But may harm sensitive plants and animals, and
 - May lead to illegal residues on rotational crops

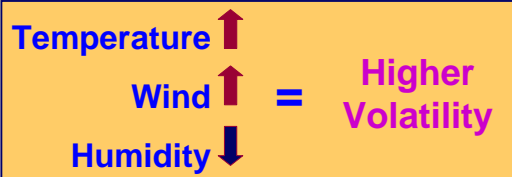
Graphic: Shogun Univ.

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Volatility

➤ The ease with which a pesticide turns into a gas or vapor



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Pesticide Characteristics: Volatility

- Fumigants volatilize and move gas through soil, structures or stored commodities
- Several herbicides are quite volatile and pose harm when the vapor moves off target
 - Labels may state cut-off temperatures for application
 - Labels may require pesticide to be incorporated into the soil

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Degradation: Microbial

- Important means for destroying pesticide in soils
- Some soil microorganisms use pesticides as food
 - bacteria and fungi



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Soil Conditions that Favor Microbial Degradation

- warm soil temperatures
- adequate soil moisture
- favorable pH
- aeration
- fertility
- adsorption



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Degradation: Chemical

Hydrolysis occurs with High pH

- Non-living processes
- Hydrolysis:
 - A chemical reaction with water, typically high in pH
 - Fungicides/spray water
- Soil properties and conditions affect the rate and type of chemical reactions

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Photo-degradation

- Breakdown of pesticide by sunlight
 - For some herbicides, incorporation is necessary to prevent photo-degradation
- May be reduced by soil incorporation




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Pesticide Movement

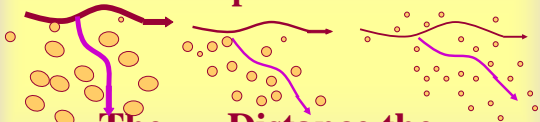
- **By air**
 - Vapor, particle, spray drift
- **By water**
 - Surface runoff
 - Movement through soil
- **By other objects**
 - Residues on plants and animals



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Equipment Set Up: Droplet Size

The Larger the Spray Droplet Size



The Less Distance the Droplet Drifts

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Spray Drift Factors

- **Equipment Set Up**
 - Nozzle size and pressure set to give an appropriate size droplet to reduce drift
 - Use nozzles that produce medium and coarse droplet sizes
 - Smaller orifice = smaller droplet
 - Use lower pressures
 - except with certain nozzles
 - Boom height - drift potential increases as distances increase



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Spray Drift Factors

- **Weather Conditions**

- **Temperature** – droplet evaporates to smaller droplets as temperatures increase
- **Humidity** – droplets do not evaporate as humidity increases

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Spray Drift Factors

- **Weather Conditions**

- **Temperature Inversion** – air is **STABLE** with minor air flow
 - air at ground has cooled (heavier air)
 - warm air as risen (lighter air)



- ❖ result is stagnant, stable air = inversion
- ❖ long distance drift can result from applications made during inversions

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Pesticide Movement: in Air Vapor Drift

- Certain products volatilize and move with airflow off-target under warm weather conditions (above 85°F)
- Check the label for precautions for cut-off temperatures
- Select low-volatile formulations



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Pesticide Movement: in Air Particle Drift

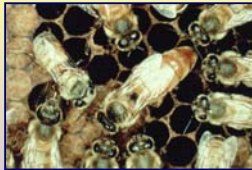
- Dust applications can drift
- Certain pesticides attach to soil particles, remain active and can blow off-target
- Check the label for soil incorporation precautions

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Protect Bees and Other Pollinators

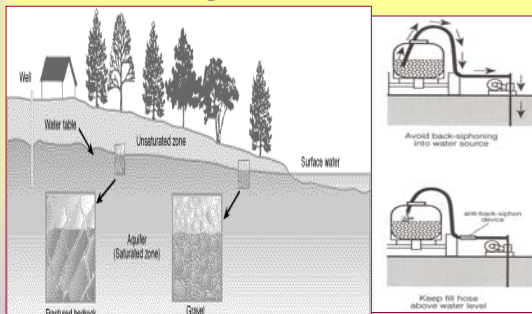
- Do not apply toxic pesticides if there is bloom in the target area or in nearby areas
- Mow cover blooming crops and weeds
- Reduce drift
- Apply early or late when they are not foraging



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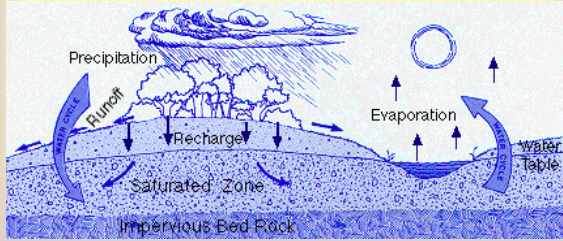
Protecting Water Resources



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The Water Cycle



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Pesticide Movement: in Water

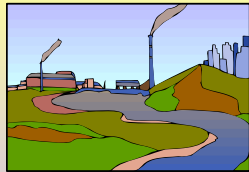
- Pesticides can move into water from a identifiable occurrence or from general contamination

- Point Source

- identifiable source

- Non-point Source

- wide area contamination



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Runoff vs. Leaching

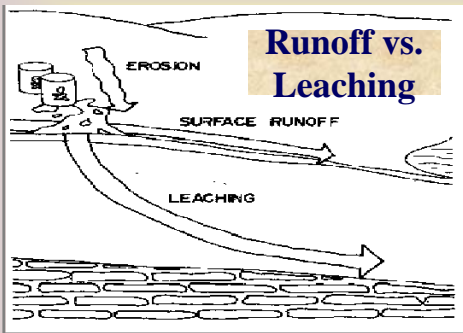


Figure 3. Pesticides can pollute water through either surface runoff or leaching.

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- **Pesticides may enter a well directly from spillage or back-siphonage, thus entering the groundwater directly**
 - This is called **point source pollution**
- **The best protection against groundwater pollution is prevention**

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- **To minimize pesticide leaching to groundwater sources, consider the following steps:**
 - Read the label
 - Ask if the application is needed
 - Use alternative pest control methods whenever possible
 - Identify and know the vulnerability of the soil and leaching potential of the pesticide

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- **Choose pesticides with the least potential for leaching into the groundwater**
- **Follow directions on the label**
- **Apply pesticides at the appropriate time**
- **Measure the pesticide properly and carefully**
- **Calibrate accurately and often**
 - During calibration, check the equipment for leaks and malfunctions

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Don't Forget What New Hampshire Requires

- No pesticide applications within 400 feet of a gravel packed well used as a public water supply
- No pesticide applications within 250 feet of other public wells
- Pesticide storage must be at least 75 feet from any drinking water well
- If you are drawing water from surface waters...you must use an anti-siphon device

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