Herbicide Drift and Avoidance

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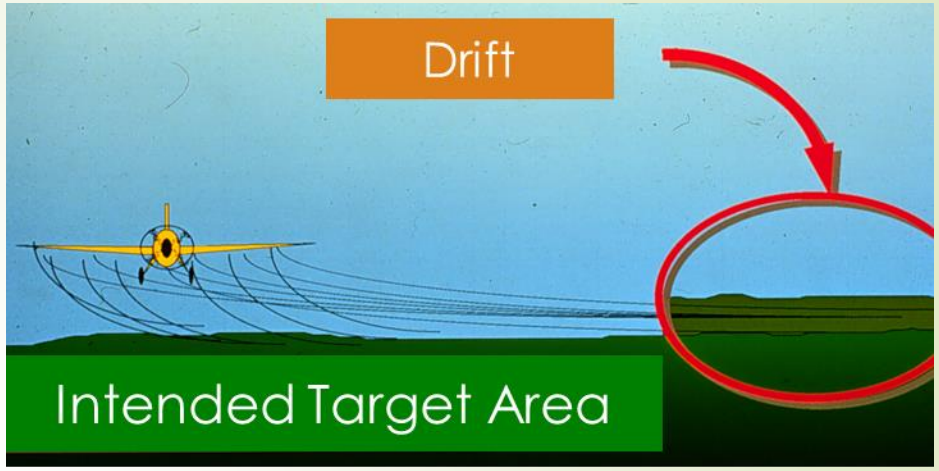
UC IPM Program

Definition of Drift:

Movement of spray particles and vapors off target causing less effective control and possible injury to susceptible vegetation, wildlife, and people*.



The physical movement of a pesticide through the air at the time of application or soon thereafter, to any site other than that intended for application"

*Adapted from National Coalition on Drift Minimization 1997 as adopted from the AAPCO Pesticide Drift Enforcement Policy - March 1991

Should YOU be concerned about spray drift?

- Are there drift-susceptible, or organic, crops nearby?
- Are you using highly active or nonselective herbicides?
- Are there sensitive areas (rural homes, schools, honeybee colonies, surface streams, etc.) close by that you should protect from drift?
- Are you trying to avoid litigation?

Problems Caused by Pesticide Drift

- Plants: can result in the contamination or destruction of agricultural crops, home gardens and ornamental plants by pesticide residues
- Structures and Surfaces: can result in structural or surface damage to buildings and other property via corrosion, visible residues from pesticides

Scott Bauer

Problems Caused by Pesticide Drift

- Human Health: can result in pesticide exposure to farm workers, children and adults in nearby areas (i.e., homes, schools, day care centers, retirement centers, hospitals, parks, etc.)
- Environment: can result in pesticide exposure to wildlife and their habitats

Ken Hammond

Factors Affecting Drift:

Spray Characteristics

- chemical
- formulation
- drop size
- evaporation

Equipment & Application

- nozzle type
- nozzle size
- nozzle pressure
- height of release

Weather

- air movement (direction and velocity)
- temperature and humidity
- air stability/inversions
- topography

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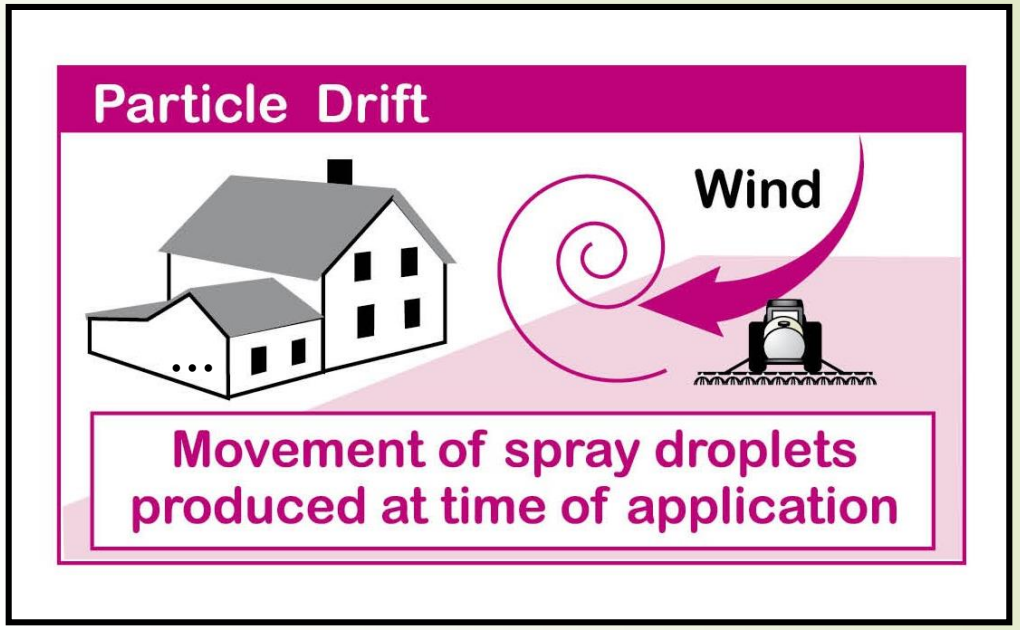
Cecil Tharp, Montana State Univ.

There are Two Types of Drift

1.



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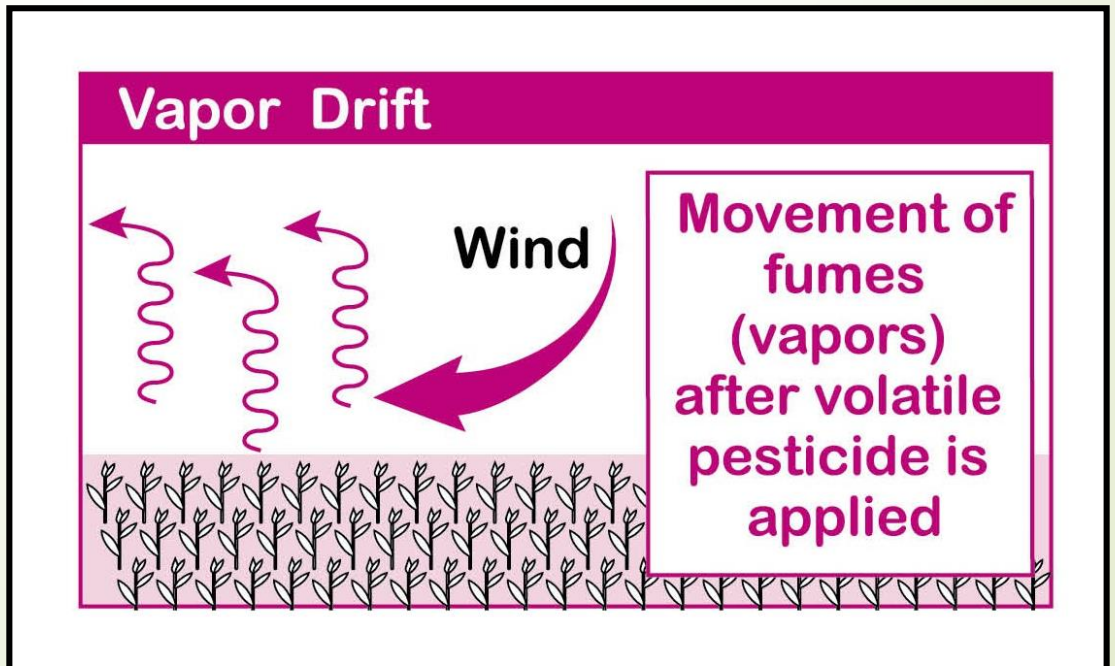
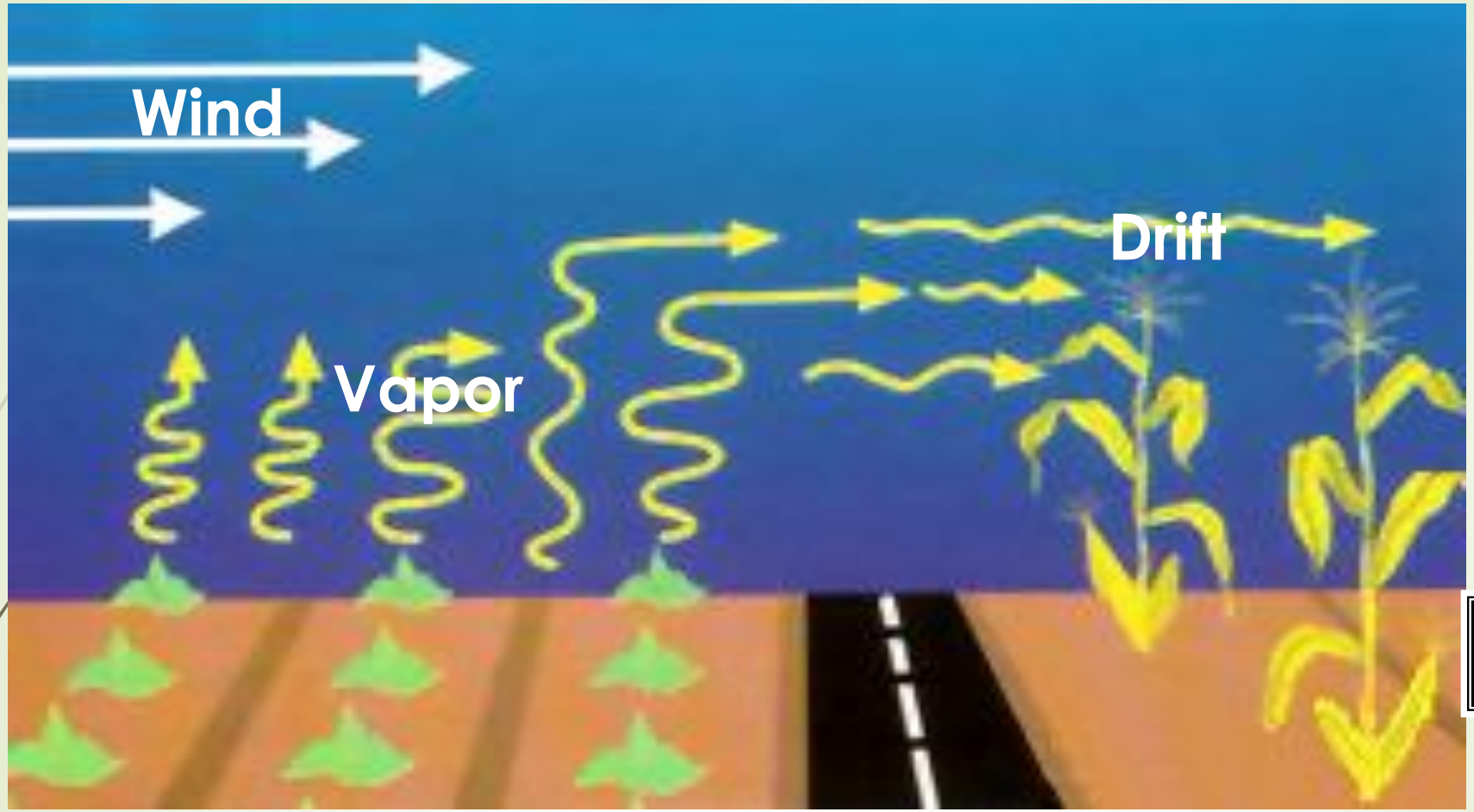


Vapor drift can occur even days after the application



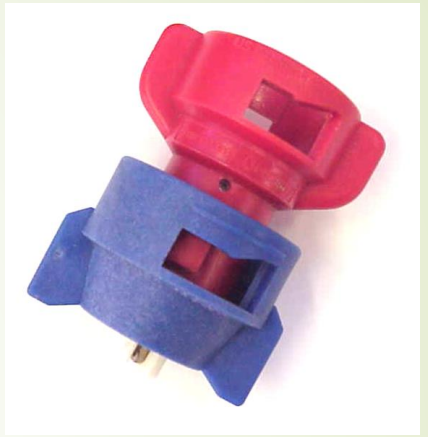
Temperature ↑

Humidity ↓

= Higher Volatility

Nozzles

- Nozzles designed to reduce drift
- Improved drop size control
- Emphasis on 'Spray Quality'



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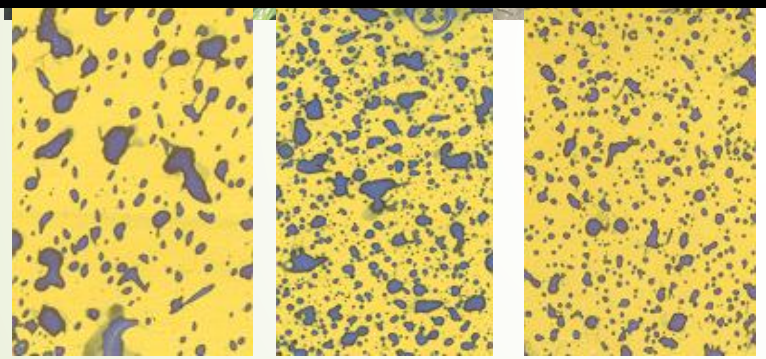
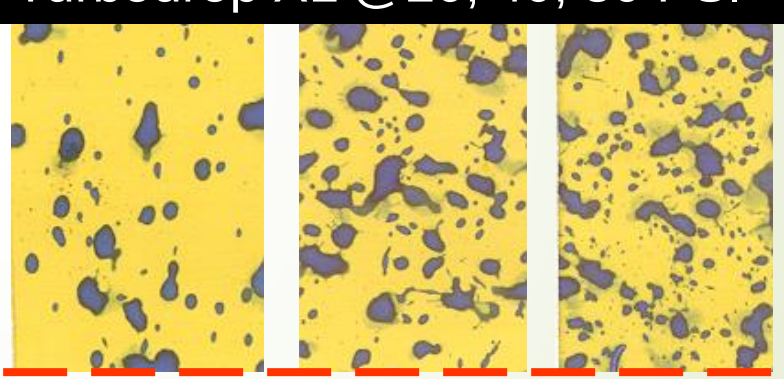
XR Flat-fan @20, 40, 80 PSI

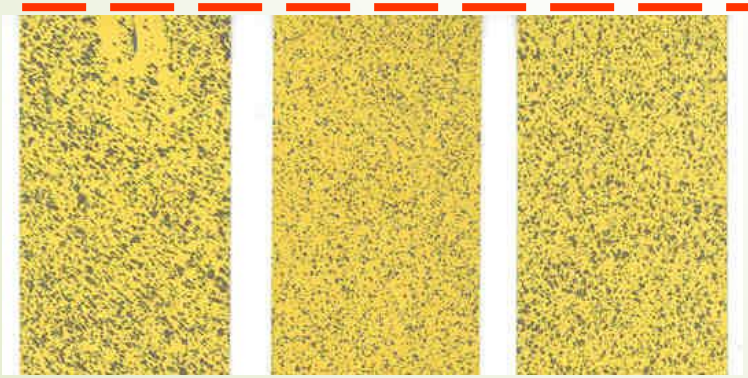
Turbodrop XL @20, 40, 80 PSI

Boom





Drift



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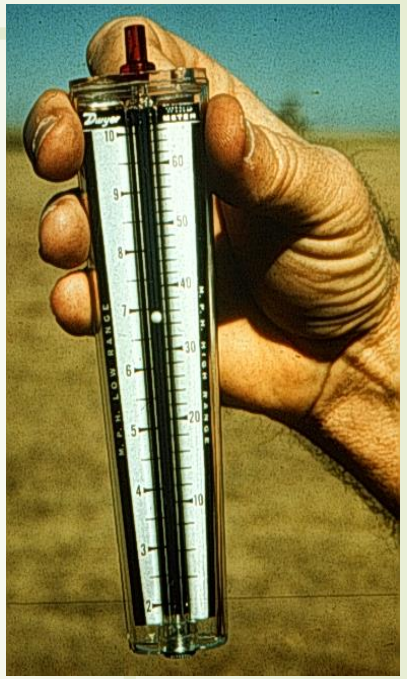
More Drift Potential at 10mph or 1mph Wind Speeds??

- **LOW SPEEDS** Because:
  - Light winds tend to be unpredictable and variable in direction.
  - Calm and low wind conditions may indicate presence of a temperature inversion.
- **Drift potential is lowest at wind speeds between 3 and 10 mph** (gentle but steady breeze) blowing in a safe direction.



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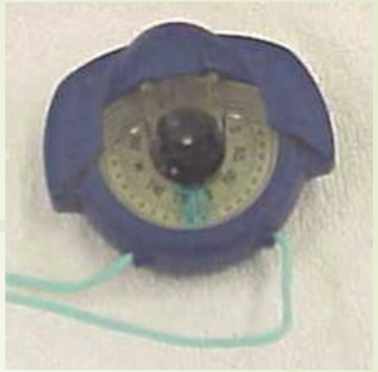
Wind Direction:



- Wind direction is very important
  - Know the location of sensitive areas - consider safe buffer zones.
  - Do not spray at any wind speed if it is blowing towards sensitive areas - all nozzles can drift.
  - Spray when breeze is gentle, steady, and blowing away from sensitive areas.
  - "Dead calm" conditions are never recommended.

Factors Affecting Pesticide Drift

- Pesticide Applicator: the good judgment, skill, experience, and planning of the applicator is a very important factor in preventing pesticide drift

Do not fall into the trap of needing to spray RIGHT NOW!

North Carolina Pesticide Applicator Training Program

Factors Affecting Particle Drift

- Equipment and Application
  - Nozzle Type
  - Nozzle Size
  - Nozzle Pressure
  - Boom Height

Droplets: Large vs. Small

- Large Droplets: less potential to drift
  - Fall more quickly
  - Evaporate more slowly
  - Are less affected by wind
- Small Droplets result from:
  - High spray pressure
  - Small nozzle tips
  - Wind shear across the nozzles (aerial)

The bigger they are the faster they fall…

Droplet	Width (in μm)	Time to fall 10 feet	Travel distance in 3 mph wind
Fog	5	66 min	3 miles
Very fine	20	4 min	1100 ft
Fine	100	10 sec	44 ft
Medium	240	6 sec	28 ft
Coarse	400	2 sec	8.5 ft
Xtra Coarse	1,000	1 sec	4.7 ft

Source: *Akesson and Yates, 1964, Annual Rev. Ent.*

Boom Height

- "Lower the boom"
  - Shorter the distance a droplet has to travel, the less chance for drift
  - Be careful to stay within manufacturer's guidelines

No room for guessing

- Difficult to “guess” wind speed
- Use a wind meter for most accurate results
- Local weather station (or radio station) is a guide, but conditions can vary in a short distance

- A wind meter is a sound investment for <u>good recordkeeping</u>

Which way is the Wind Blowing?

- Wind **direction** is very important
- Drift potential is lowest at wind speeds between 3 and 10 mph (gentle but steady breeze) blowing in a safe direction **away** from sensitive areas.
- "Dead calm" (0-3 mph winds) conditions are **never** recommended.

Fall Rate of Various Size Droplets

The "Nozzle Compromise": Using nozzles and pressure to produce the largest droplet size possible (> 150 microns) while achieving good target coverage sometimes involves a tradeoff.

Droplet Diameter (microns)	Time to Fall 10'
20	4 mins.
100	11 secs.
240	5 secs.
400	2 secs.

Relationship of Particle Size to Drift

Drop Diameter (microns)	Particle Type	Drift Distance
400	Course	8.5
150	Medium	22.0
100	Fine	48.0

Based upon 10' fall in 3 MPH winds

Be Aware of Temperature Inversions

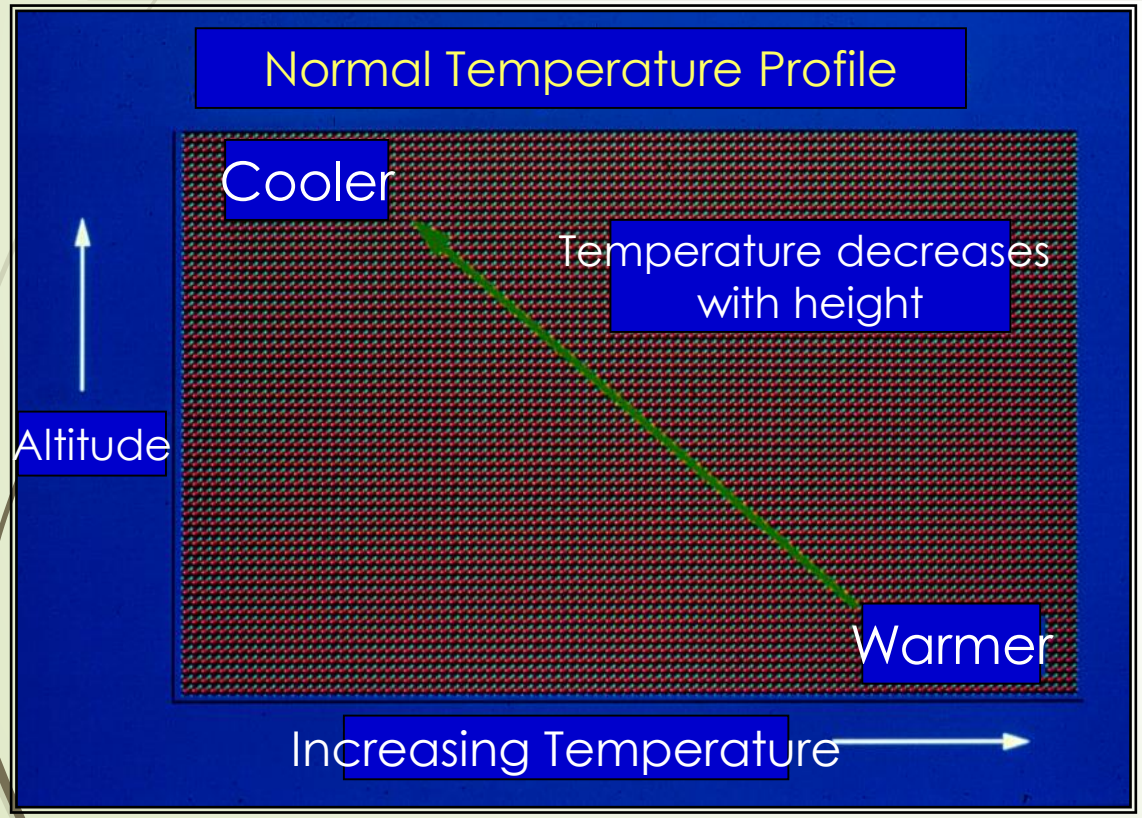
- Occurs when air is STABLE
  - air at ground has cooled (heavier air)
  - warm air has risen (lighter air)

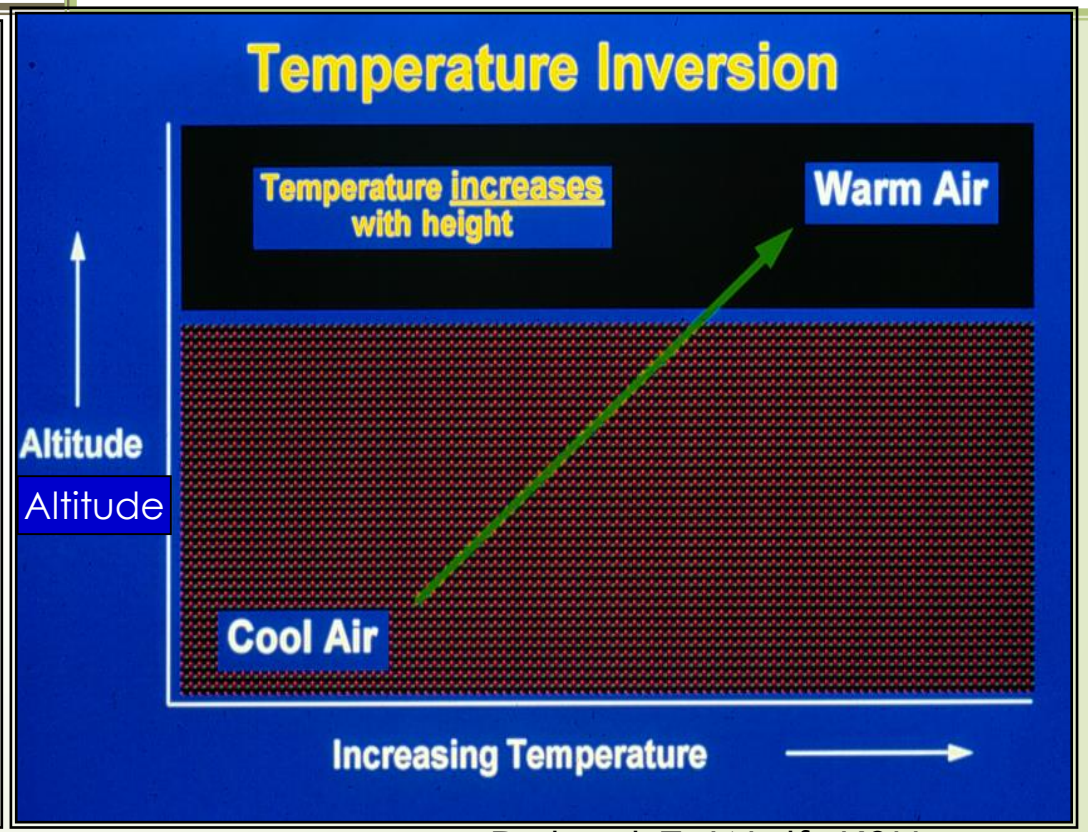
- result is stagnant, stable air = inversion
- long distance drift can result from applications made during inversions

Inversions:

Under normal conditions air tends to rise and mix with the air above. Droplets will disperse and will usually not cause problems.

Under these conditions
the temperature increases as you move upward. This prevents air from mixing with the air above it. This causes small suspended droplets to form a concentrated cloud which can move in unpredictable directions.





Physical Drift
Temperature Inversions

Normal

Inversion

Drift Control Agents

- Increase droplet size of pesticide/water mixes
- Will not eliminate drift
- Nozzles can accomplish similar effect

Tips to Reduce Pesticide Drift

- nozzle selection
- reduce pressure
- lower boom height
- increase nozzle size
- Know the wind speed and direction before applying a pesticide (do not spray when the wind speed is too high, a temperature inversion exists, or wind direction is toward a sensitive area)
- avoid spraying when winds exceed 10 MPH or less than 3 MPH

- Survey the area to be sprayed and the surroundings to become aware of environmentally-sensitive sites, and make pesticide application decisions with these sites in mind
- look out for inversions
- use additives
- calibrate sprayer
- use common sense Deciding **not to spray** or **stopping** in the midst of poor spraying conditions is the best way to prevent drift!

For Weed Management in Natural Areas

- Establish appropriate streamside management zone (SMZ) along perennial & intermittent streams & flowing bodies of water

- Consider weather conditions (temperature, wind speed & precipitation) equipment capabilities & pesticide formulations to avoid pesticide drift into the SMZ or other sensitive areas


Dave Moorhead, U GA