Ground ULV and Equipment Calibrations

David Sykes
AllPro Vector Group
GMCA 2009

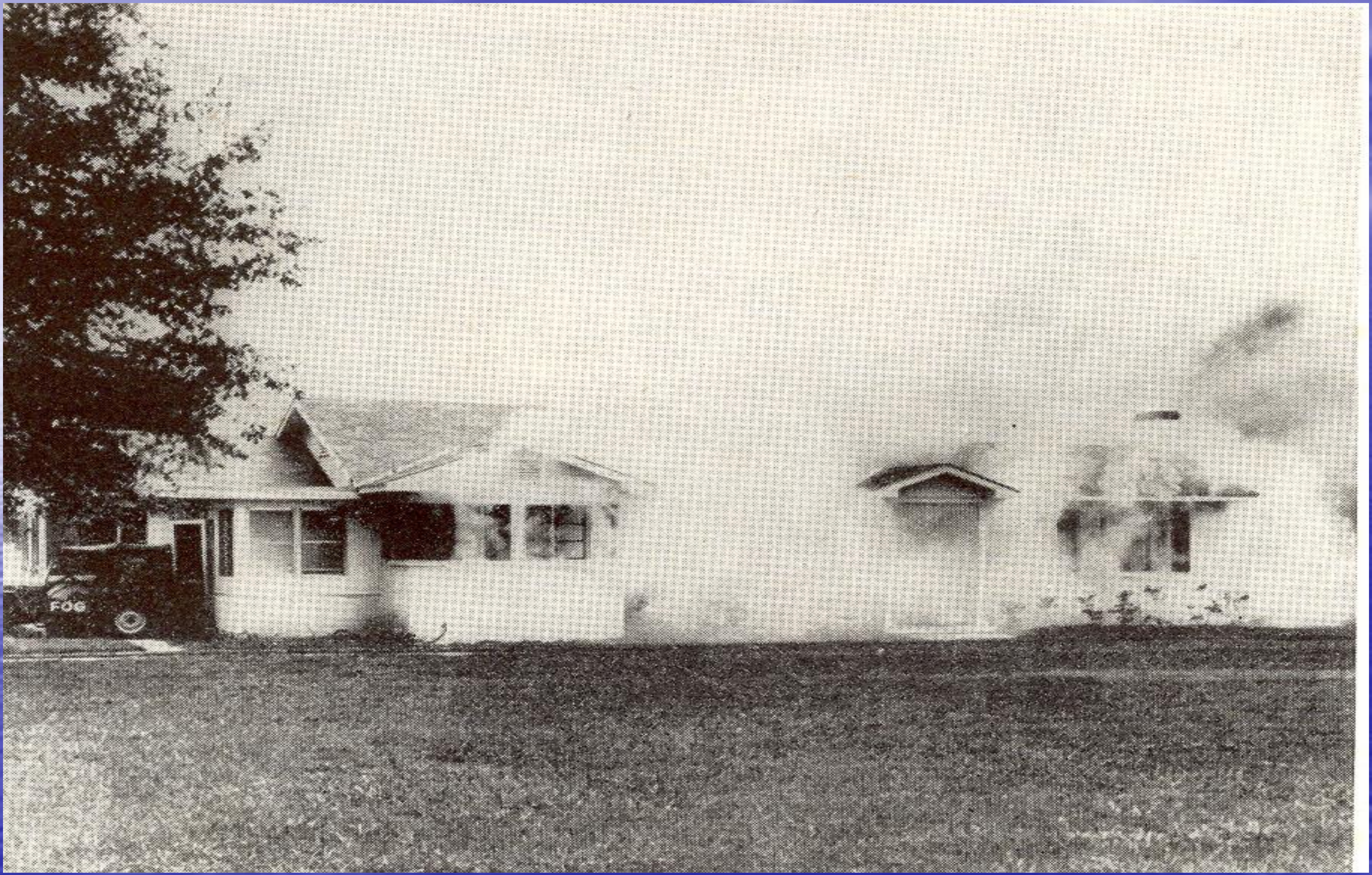
History of Thermal Fogging

- WWII Technology (Smoke Screen Generators)
- First tests by Latta and LaMer, ca 1945
- Mix of Insecticide and Carrying Agent (usually diesel or kerosene)
- Good Control in Heavy Vegetation
- Creates Traffic Hazards
- Environmental Considerations: 42 gal/hr of oil/diesel

1946

Todd Shipyard made the first thermal mosquito fogger by down sizing a smoke generator that the Navy used to hide ships during World War II. DDT was the first adulticide used and was mixed with Kerosene.


SOUTH CAROLINA STATE BOARD HEALTH
17
3100 Chevrolet


FOG

Don't forget to turn off the pilot light!

Thermal: Truck-Mounted

History of ULV Aerosols

- Developed during the 1960's
- During 1970's, ULV Papers presented by Dr. Gary Mount at state and national meetings
- Comparable Efficacy with Thermal Fogging
- Use approximately 1-4 gal/hr

1966

The first ULV machine was developed as a joint project between the U.S. Navy Jacksonville, Florida and the U.S. Department of Agriculture.

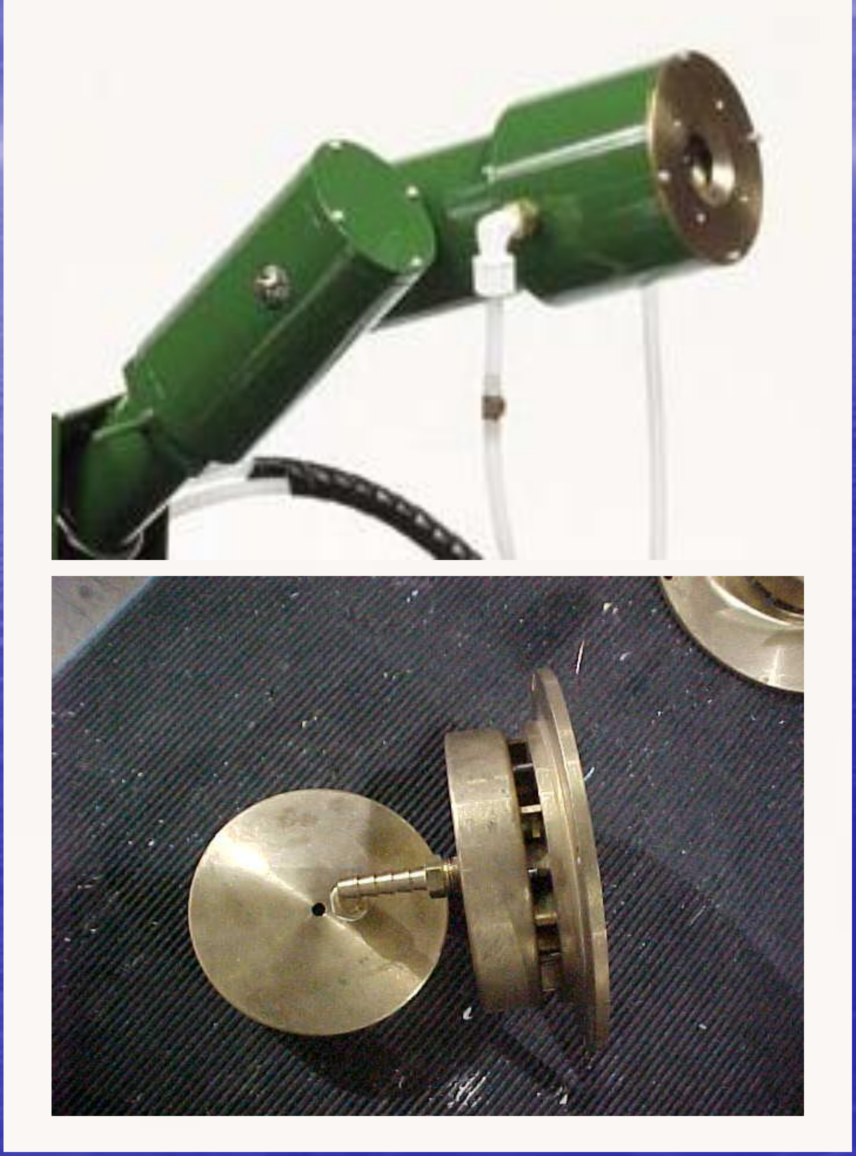
Thermal vs. ULV

- Comparable Efficacy
- Thermal can provide good penetration
- ULV is Less Offensive and Less hazardous
- Most products and application methods used today were developed using ULV
- ULV uses much less total volume

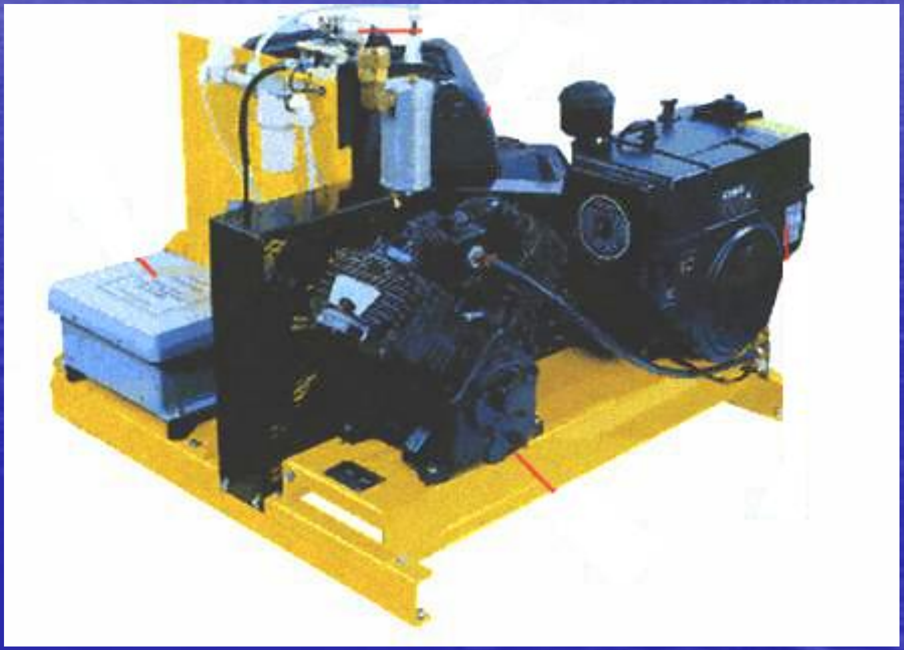
Thermal Fogging

ULV: Truck-Mounted

Basic ULV Types: Low Pressure



Basic ULV Types: High Pressure



Basic ULV Types: Rotary Atomizers

ULV: Gas Handheld

ULV: Backpack

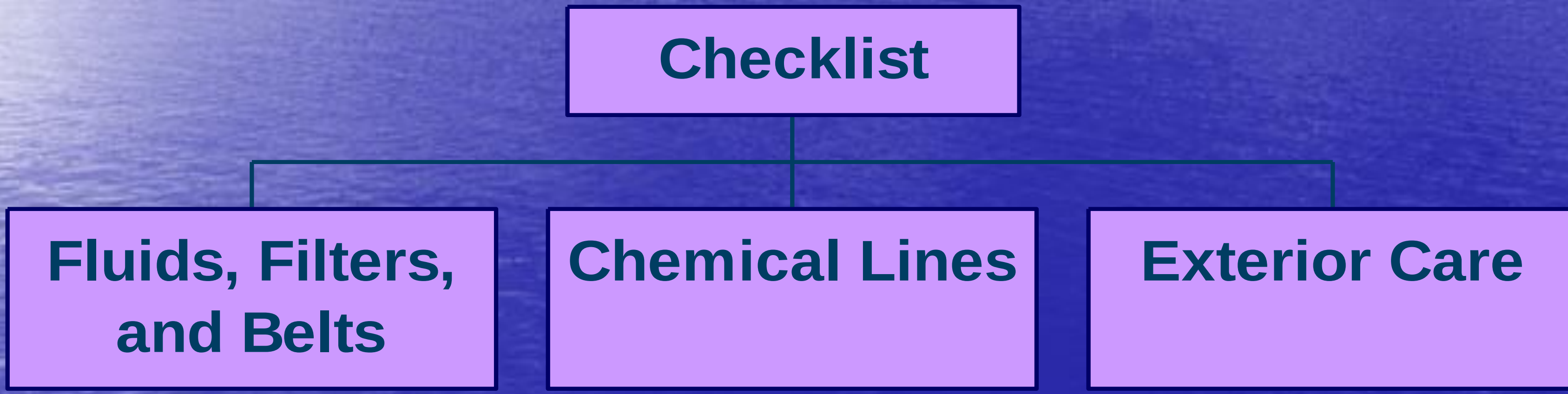
ULV: Multi-Purpose Sprayers

ULV: Truck-Mounted

ULV: Electric Foggers

ULV: Aerial

Ground Units, Maintenance



Fluids, Filters, and Belts

- Fluids: engine oil, blower oil, grease fittings
- Filters: oil filter, chemical filter, air filter
- Belts: check tension and wear

Chemical Lines

- Check all lines and fittings regularly for leaks
- Watch for dry or brittle lines
- Replace lines as needed

Exterior Care

- Wash and degrease occasionally
- Repaint surfaces as necessary
- Replace worn or damaged parts

Components of a Calibration

1. Determine desired chemical application rate from product label
2. Verify correct chemical flow rate and calibrate equipment
3. Verify droplet size (VMD or MMD) and range

Calculations- label information

- Labels usually provide lbs of active per gallon
- Provide maximum rates of application
- Provide types of applications that may be done, i.e. ULV, thermal, barrier
- Provide max application limits, i.e. pyrethroids are usually 0.007 per acre
- Aerial directions may contain some limitations

Why Calibrate?

- You must meet legal requirements for application of any pesticide
- Verify actual amount of chemical applied to comply with product labeling
- Get best results from chemical applied

Verifying Flow Rate: Materials

- Personal Protective Equipment: gloves and goggles
- Graduated cylinder (preferably in ml)
- Extra collection container
- Stopwatch
- Any special tools required: i.e. screwdriver, wrench, allen wrench, etc.

Verifying Flow Rate: Chemical Measurement Method

- Push vs. Pull systems: does your flow control system have a pump or does it rely on orifices?

- This determines whether you can measure the output at the nozzle (amount collected) or you must measure the intake (amount used).

Verifying Flow Rate: General Rules

- When possible, always take the final measurement with the engine running, as system voltage may affect pump output. Calibration of orifice systems *must* be done with the engine running.
- Measure output for at least 1 minute.
- Make sure all air is removed from the lines and filters before you start.

Pumping Systems

- Flow Meters
- SCAMP
- Leco VF and CV
- ELF
- Monitors 1,2, 3, and 4 Accuflow, GeoFlow
- SmartFlow
- Sentinel GIS

It is now possible to:

- Generate reports of spraying operations
- Can track vehicles using GPS
- regulate chemical applications, using GPS
- Have download capability
- Real-time tracking of vehicles
- Can now use mobile devices, PDA's to collect data from chemical applications, Sentinel GIS

Droplet Sizing: Why Droplet Size?

- Maintain maximum level of efficacy
- Meet label/legal requirements
- Recent labeling of mosquito control products requires a specified range of droplet sizes in microns

Label Droplet Statement

- *"Spray equipment must be adjusted so the volume median diameter or mass median diameter is less than 30 microns (Dv0.5<30µm) and that 90% of the spray is contained in droplets smaller than 48 microns (Dv0.9<48µm)."*
- The best way to check this is with a DCIII !!!!

Dv0.1

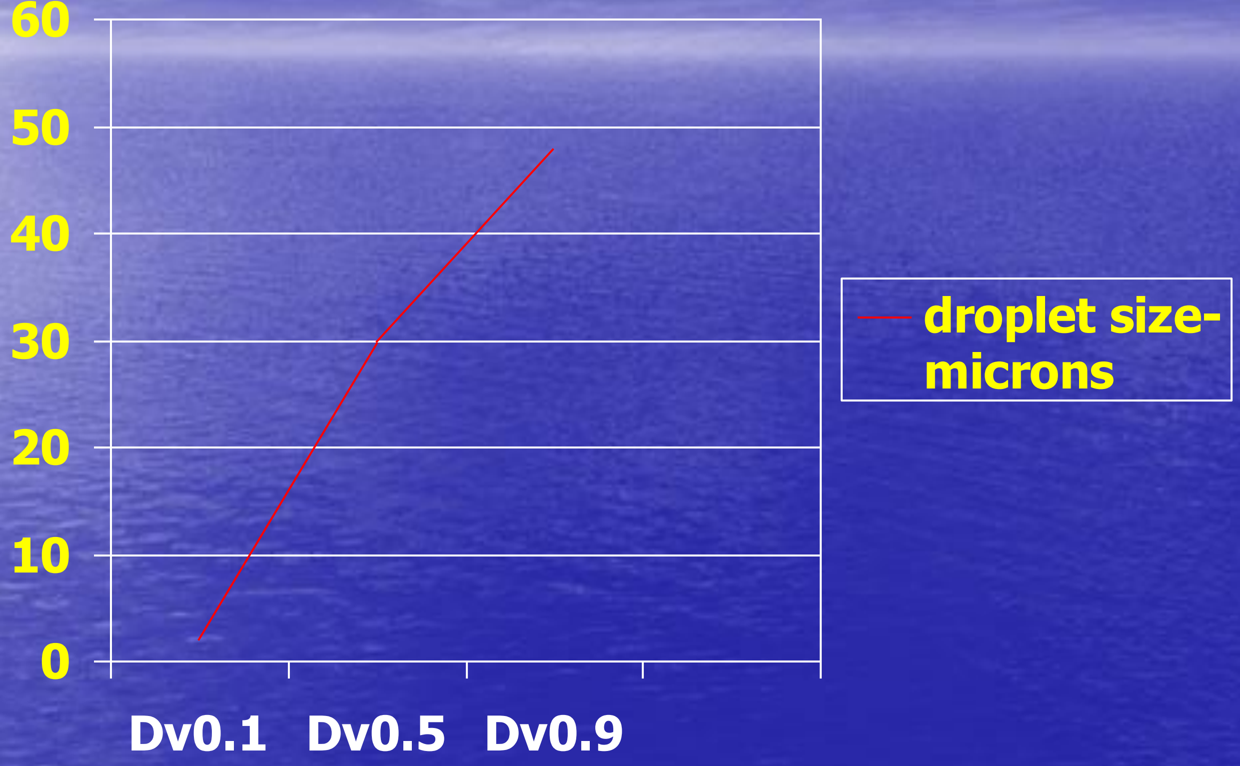
A calculated droplet size in microns that represents a droplet diameter where 10% of the total volume or mass of droplets are smaller

Dv0.5

A calculated droplet size in microns that represents a droplet diameter where 50% of the total volume or mass of droplets are smaller

Dv0.9

A calculated droplet size in microns that represents a droplet diameter where 90% of the total volume or mass of droplets are smaller


60
50
40
30
20
10
0
Dv0.1
Dv0.5
Dv0.9
droplet size-microns

Droplet Sizing: “Hotwire” DCIII

- Very easy to use
- Can be done very quickly
- Best suited for performing multiple tests
- Moderately expensive
- Probes are very delicate and can be broken easily
- Most accurate way of “in the field” sizing

Droplet Sizing: Waved Teflon-coated Slides

- Still used for aerial applications
- Least expensive method
- Very time consuming
- Complex calculations
- Not very accurate!
- Accuracy depends on person reading slide

Rotated Slides

Droplet Sizing: Laser

- Most Accurate
- Very, Very Expensive
- Not Practical for drop sizing vehicle mounted ULV sprayers
- Lasers are normally set up in a laboratory
- Newer ones are more portable, i.e. those used for Agricultural tests

Droplet Sizing: Laser

Adulticiding Basics

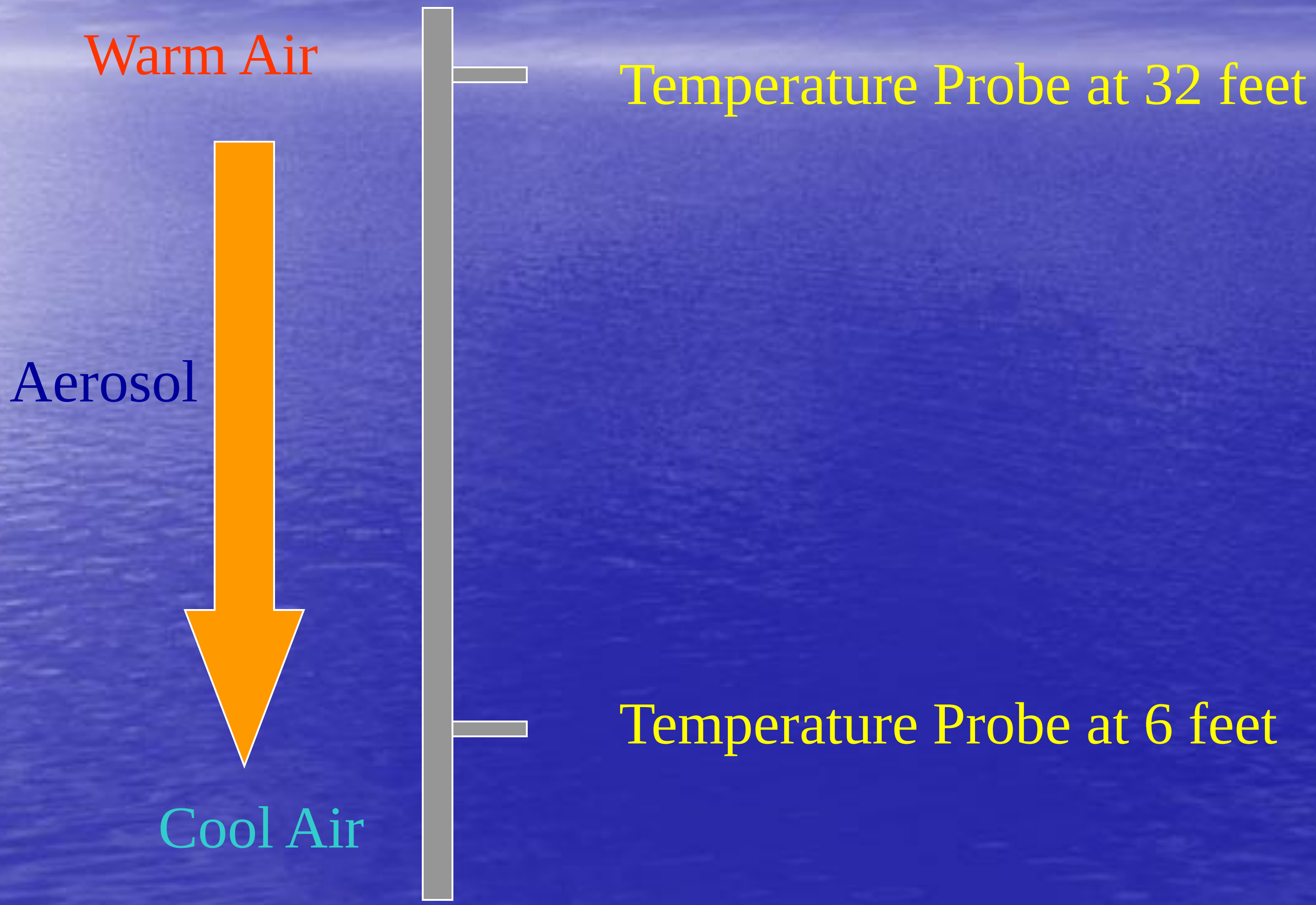
- insecticide is moved by air currents
- Droplets must impinge on adult mosquitoes
- Droplets must be small enough to provide adequate drift
- Droplets must contain enough active to kill an adult mosquito

The Weather

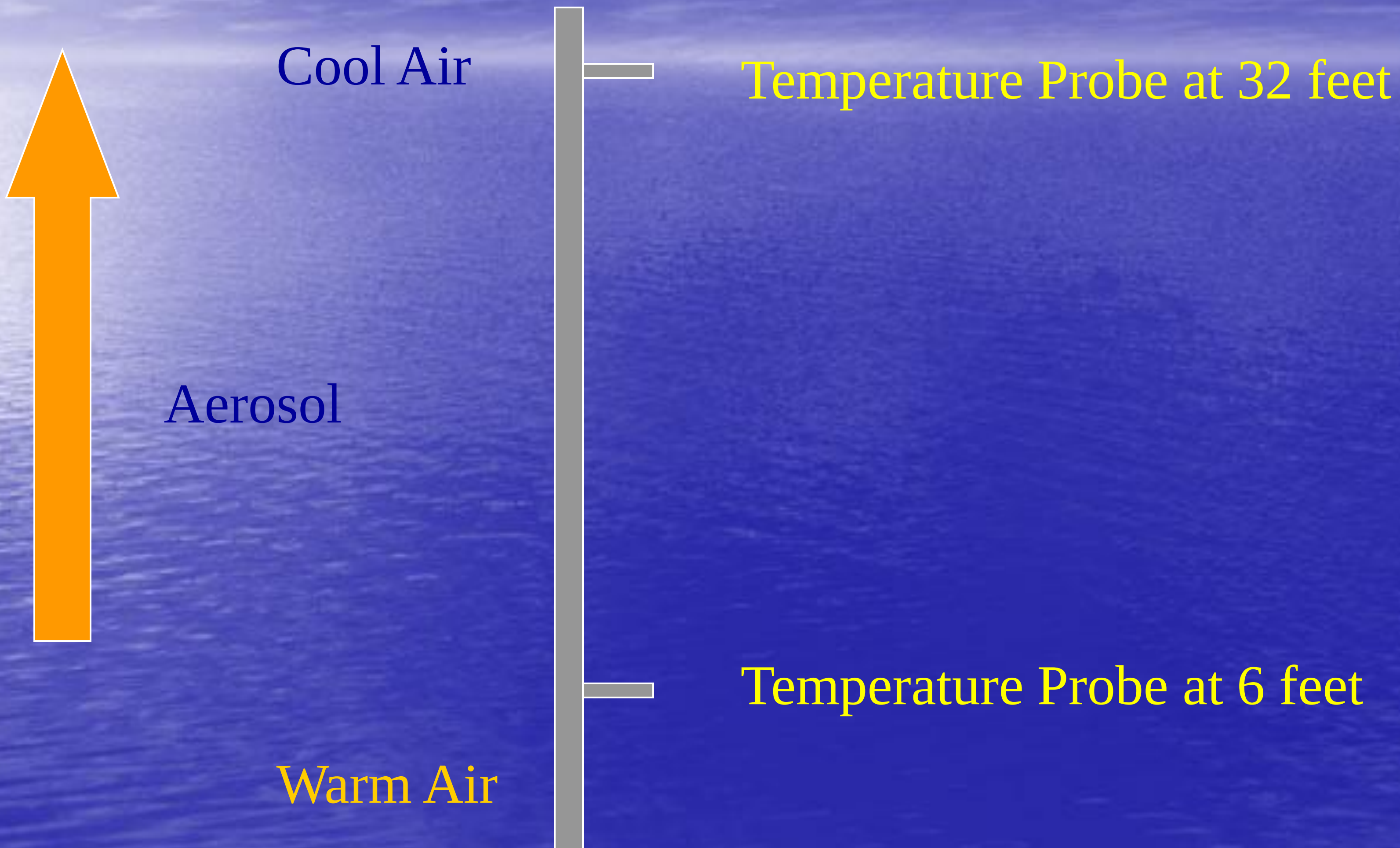
What type of weather do we want?

An inversion with low wind speed!

Inversion Conditions



Lapse Conditions



California Department of Health Services
Vector-Borne Disease Section

Adulticiding: Factors to Consider

Timing

- Peak Activity Period of Mosquitoes (consider Ae. ab.)
- Consider Thermal Updrafts

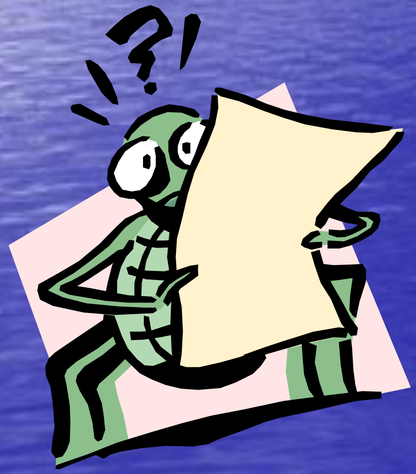
Environmental Factors

- Rain/Wind are limiting factors
- Barriers to treatment

Areas/Maps/Record Keeping

Evaluation

- Outcome of the Application
- Efficacy of the Material



- Did the Material get there?
- Did the Material kill the bugs?

Questions?

Goal: Amount per Given Area

Adulticiding: Why is it Necessary?

- Part of an IPM Approach
- Complements Source Reduction and Larviciding
- Large Scale Larviciding May Not Always be Possible
- Presence of Disease and/or Vectors