<u>Aerial Adulticiding in *MOSQUITO* Control Versus *VECTOR* Control:</u>

A Discussion of our Current Understanding Including Considerations of Practicality and Applicability

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What is Adulticiding?

- Adulticiding is the term used to describe control operations aimed at adult mosquitoes.
- Although the most visible (to the public), it is but one aspect of an IPM program
- Integrated Pest Management is a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks. (FIFRA).

Two types of Adulticiding.

- "Barrier Spraying":
The application of a relatively coarse (DEPOSIT) spray to the foliage/surfaces of areas where mosquitoes may rest or cause annoyance to the public. Often acts both as a contact insecticide and a repellant. Requires much higher application rates of the active ingredient. Has a "residual" effect.
- "Space Spraying":
The application of a cloud of small droplets to the environment in which the mosquito is active. The mosquito must come in contact with the "drifting" droplets in order for it to be effective. Once droplets deposit out on the ground or other surfaces they are no longer active. (No "residual" effect.)
This is the type of spraying we are usually referring to when we talk about "Adulticiding" for mosquitoes

Why Use Adulticiding?

- Assuming Mosquito Control is warranted for reasons of arbovirus disease transmission or significant nuisance problems, then:
- Adulticiding is generally considered the "method of last resort"
- It requires the use of "broad spectrum" pesticides
- Biological Control, Source Reduction and Larviciding with mosquito specific biorational pesticides should be the "methods of choice"
- However, the aforementioned methods may not be practical or effective…
- …Or an integrated approach using multiple strategies INCLUDING adulticiding may be necessary to provide the required level of control

Why Use Aerial Adulticiding Over Ground (Truck) Adulticiding?

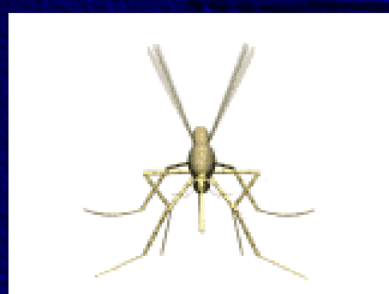
- Truck-mounted adulticiding equipment is good at placing an effective-sized spray cloud (VMD of 12-20 microns) into the environment near the ground (<30 feet) where mosquitoes are most active
- However its' effectiveness is limited by:
- Need for a tight (urban) street network
- Activity (traffic, people, commerce) on those streets
- Physical barriers (large buildings, walls, vegetation)
- Limited coverage (1-3 square miles/truck/night*)

- Aerial Adulticiding can cover much larger areas (25-50 square miles/aircraft/night*) without the need for street networks, but it's a complex process…

How complex is the aerial adulticiding process?

- Consider:

Toxic
Dose



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Looks simple enough…

<u>But now consider……</u>

Variables and Interactions to Consider:

Topics Related to Aerial Adulticiding

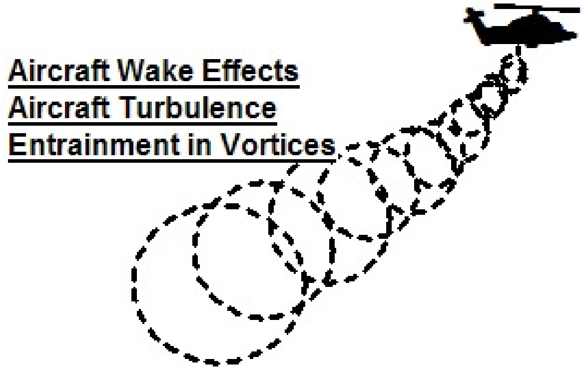
- In the next 30 minutes I hope to touch on:
- Spray droplet movement from aircraft to ground
- Importance of Meteorology
- Importance of Droplet Size
- Modeling block size
- Species specific issues

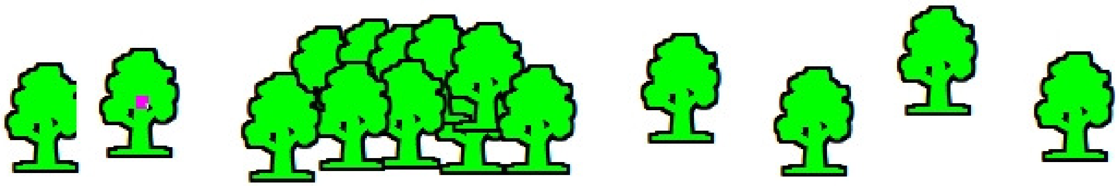
Utilizing Technology in Aerial Adulticiding

- **Technologies are always improving and we in Florida pride ourselves on trying to keep up and incorporate them into our operations…**
- **But it is difficult to get our employees to accept and use them**
- **However we have managed to develop a new "Palm Pilot" system that they seem quite happy with…**

Three Distinct "Phases" in Particle Movement from Aircraft to Ground

1) Aircraft Wake Effects:
Droplets emitted from the nozzles are quickly caught up ("entrained") in vortices created by the aircraft. These vortices "sink" towards the ground until their energy decays. (Vortices strength, sink rate and life related to aircraft size, weight, speed and wing/rotor loading.)

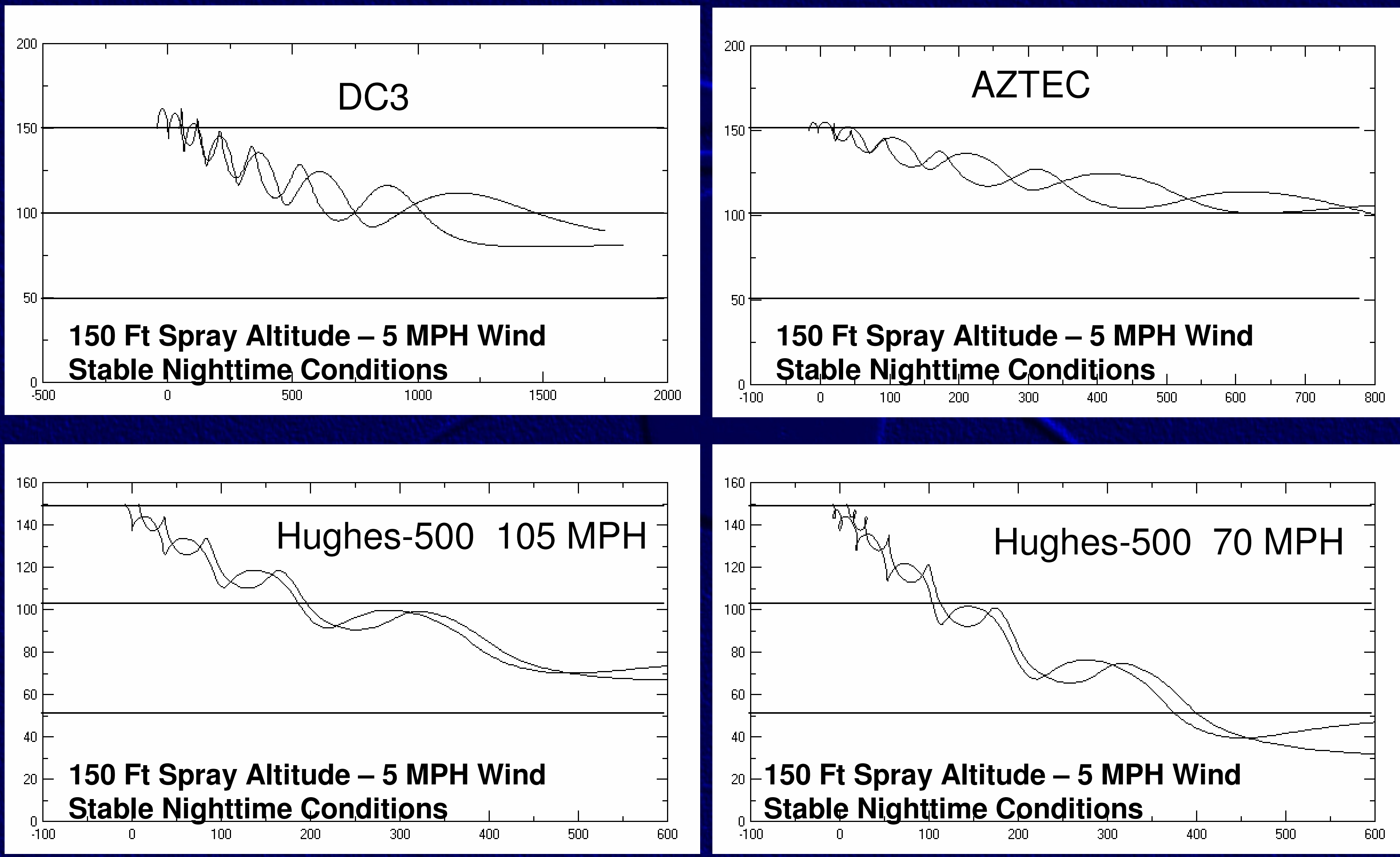




$$\text{Vortex Sink (ft/s)} = \frac{14.56 * \text{Weight (lb)}}{\text{Semi-Span}^2 \text{ (ft)} * \text{Speed (mph)}}$$

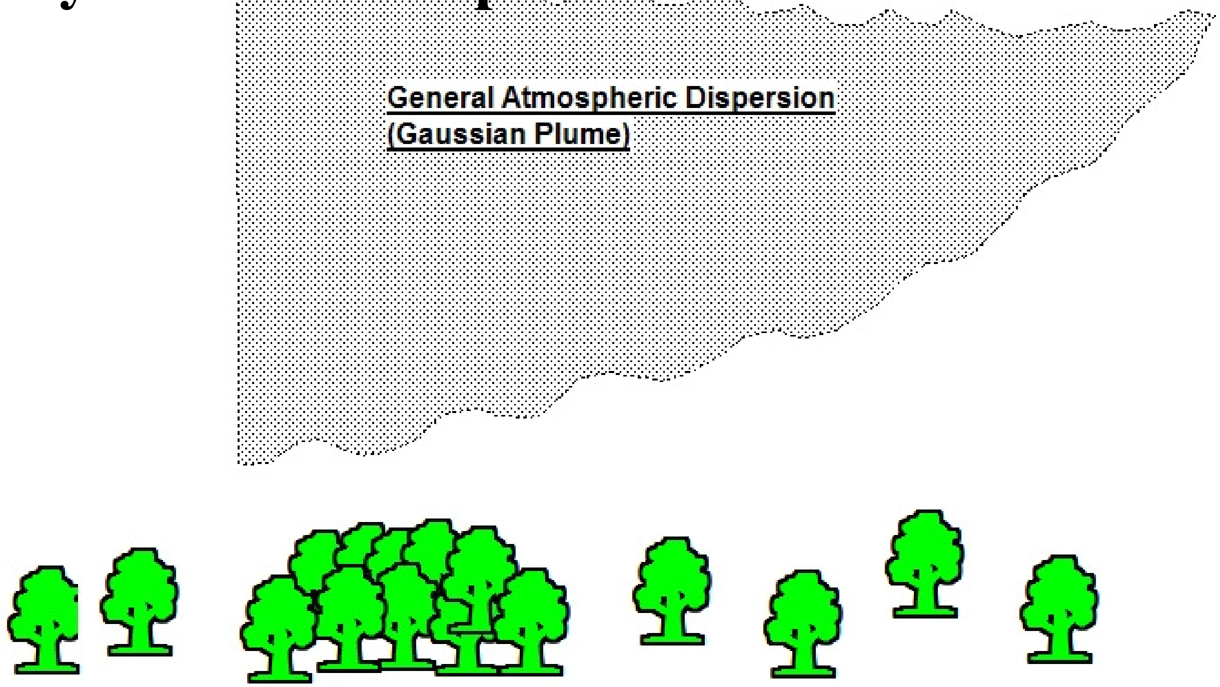
Aircraft	Weight (lb)	Speed (mph)	Semi-Span (ft)	Vortex Sink Velocity (ft/s)
DC3	21397	150	47.3	0.93
Twin Beech	7267	160	23.8	1.17
Piper Aztec	4217	150	18.6	1.18
Lockeed C-130	120000	250	66.3	1.59
Hughes 500	3000	105	13.16	2.40
Hughes 500	3000	70	13.16	3.60

25 Micron Droplet Trajectories Modeled Using AGDISP

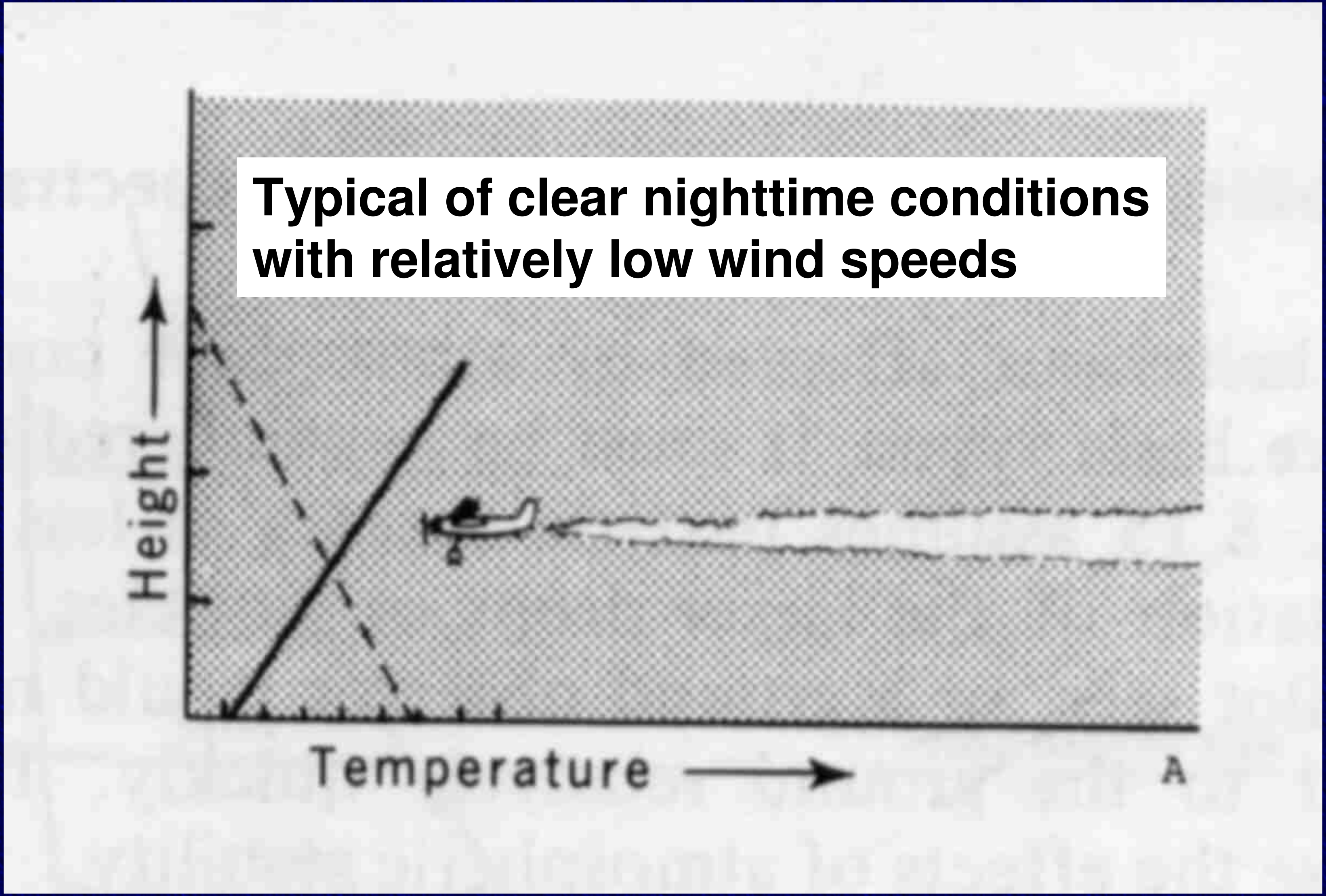


Three Distinct "Phases" in Particle Movement from Aircraft to Ground

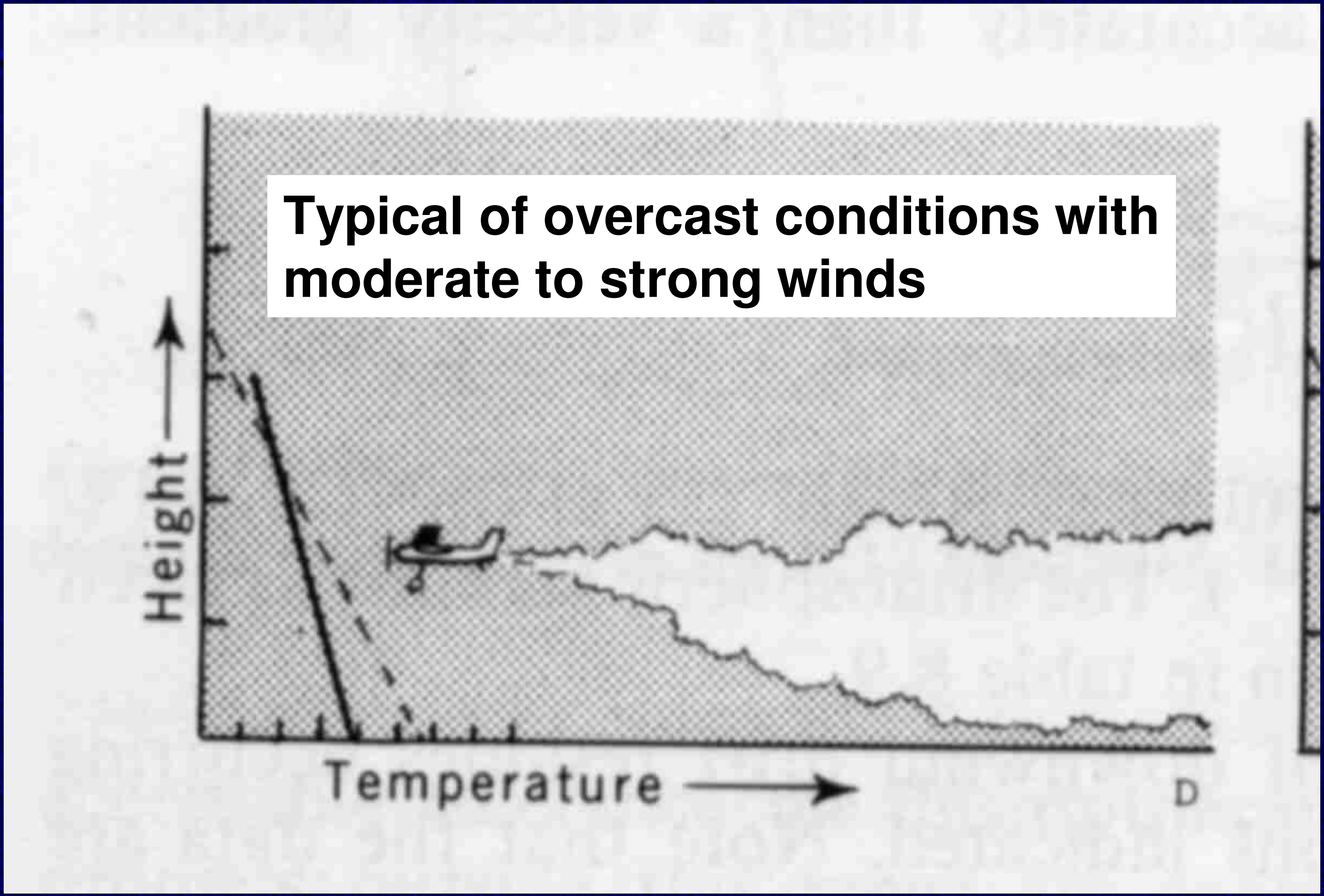
2) General Atmospheric Dispersion:
Once released from the vortices, the drops are then subject to the general movement of the air within the air mass. The vertical spread is dictated by the "Stability" of the atmosphere.



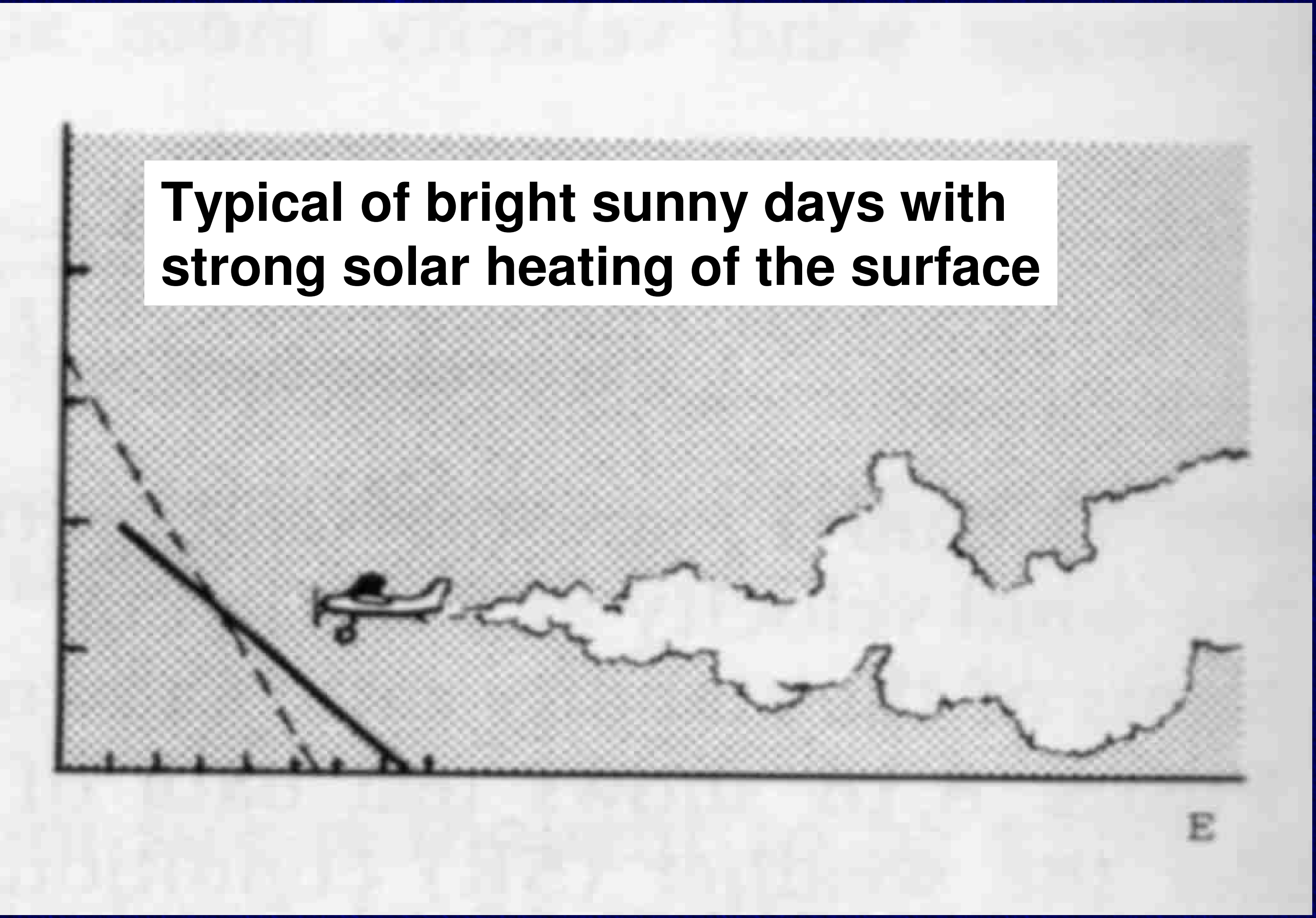
Stable – Significant increase in temperature with altitude (inversion conditions), low to negligible vertical air movement.



Neutral – No change or slight decrease in temperature with altitude (weak lapse conditions), moderate vertical air movement.



Unstable – Rapid decrease in temperature with altitude (strong lapse conditions), strong eddies moving blocks of air up and down.



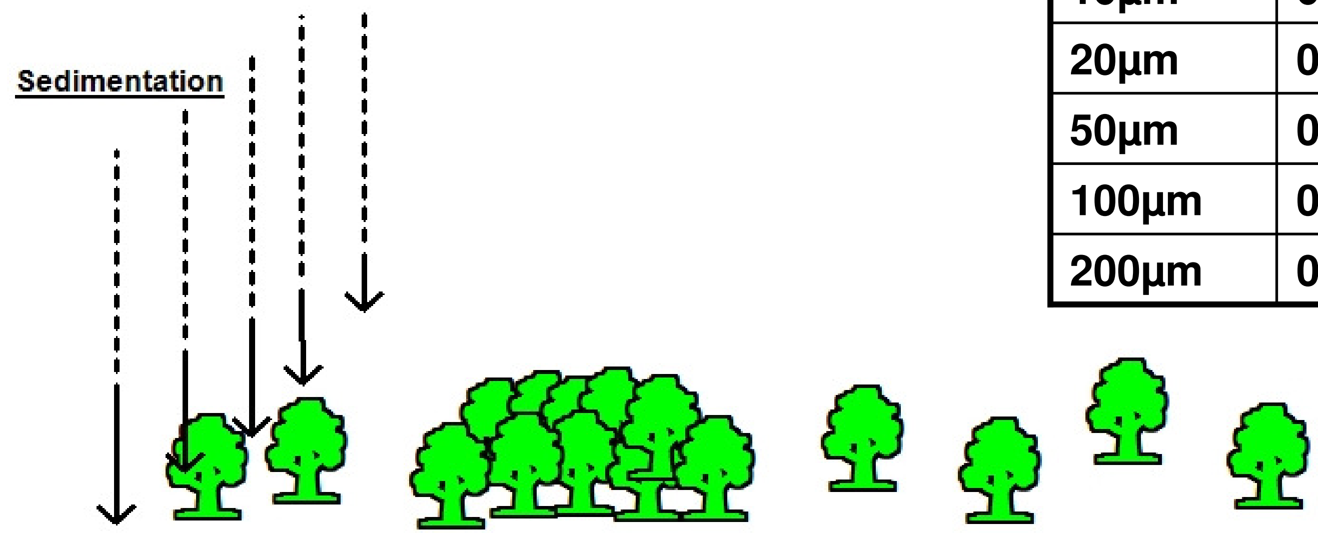
Typical of bright sunny days with strong solar heating of the surface

Three Distinct "Phases" in Particle Movement from Aircraft to Ground

3) Sedimentation:

During their descent the droplets are subject to the forces of gravity. The sedimentation velocity of small drops is very low but may be a significant factor in very still (stable) air masses.

Drop Diameter	Terminal Velocity m/s	Fall time from 30m (SG=1)
1µm	0.00003	11.7 days
10µm	0.003	2.8 hrs
20µm	0.012	42 min
50µm	0.075	6.7 min
100µm	0.279	109 sec
200µm	0.721	42 sec



Movement of Aerial Adulticides

- Three phases of movement from emission at aircraft nozzle to depositing on the ground:
  1) Entrainment and transport by aircraft vortices
  2) General atmospheric (turbulent) dispersal
  3) Sedimentation
- As mosquito adulticides are very small drops with a long airborne life, each of these three phases plays an important role in the ultimate dispersion of the spray
- In short, you MUST understand these phases in order to manage drift and dispersal from aerial adulticiding

Movement of Aerial Adulticides

- Assuming aircraft type, speed, weight and boom position remain constant, 4 primary factors govern the relative effects of these 3 phases of movement:
- Droplet Size
- Spray Altitude
- Horizontal Wind Speed
- Atmospheric Stability
- (The effects of these 4 primary factors are not isolated but intertwined, each being influenced to a degree by the others)

Droplet Size

- Droplet size influences how long the droplet stays entrained by the diminishing energy of the aircraft vortex
- Large drops (>100 microns) exit the vortex early, whereas small drops (the "ideal" adulticide drops) stay entrained for the life of the vortex
- Droplet size and its corresponding sedimentation velocity influence the dispersal effects of general atmospheric turbulence
- Very small drops (<30 microns) are greatly influenced by even the weakest turbulence associated with strongly stable conditions, remaining airborne for long periods of time

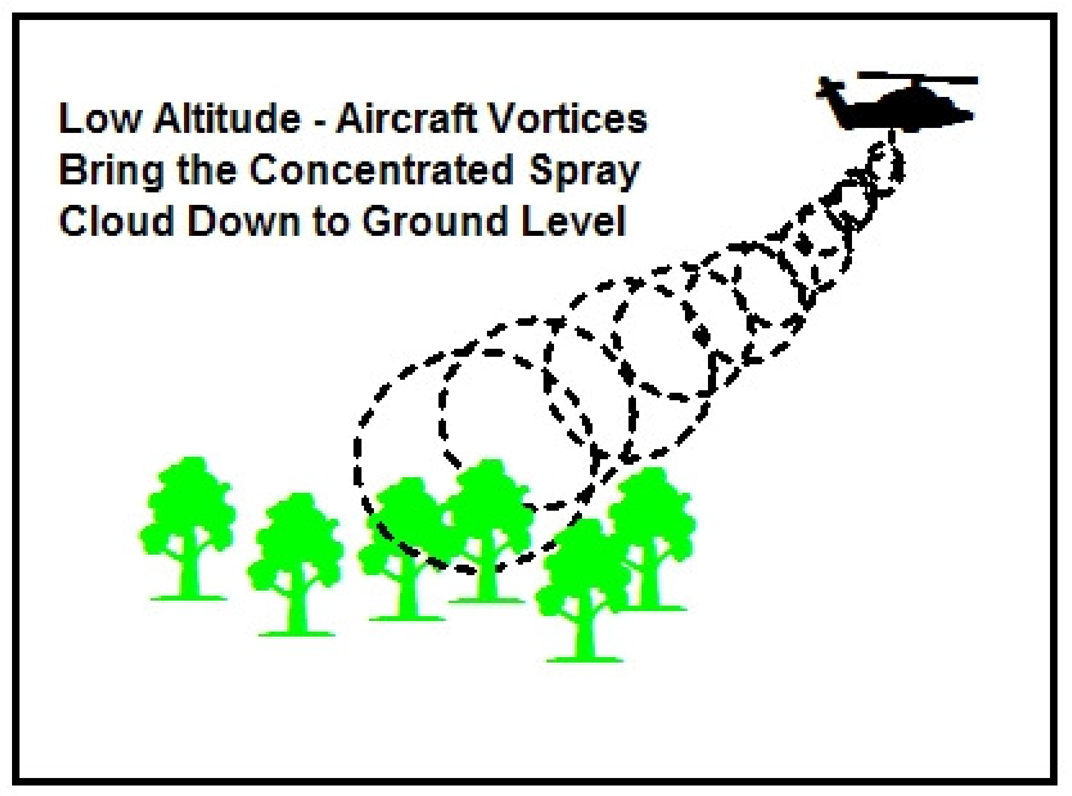
Droplet Size

- Larger drops (>60 microns) may deposit out close to the flight line in the strongly stable (=weak turbulence), low wind speed conditions typical on a (Florida) summer night due to their higher sedimentation velocities
  (Sedimentation velocity of a 60 micron drop is approximately 20 feet per minute versus 2 feet per minute for a 20 micron drop)
- It must be remembered that “conventional” spray systems produce “inefficient” sprays with a VMD of 60 to 100 microns
- The deposit from the larger drops may be significant enough to cause non-target impacts (Dukes, Zhong et al 2004)

Spray Altitude

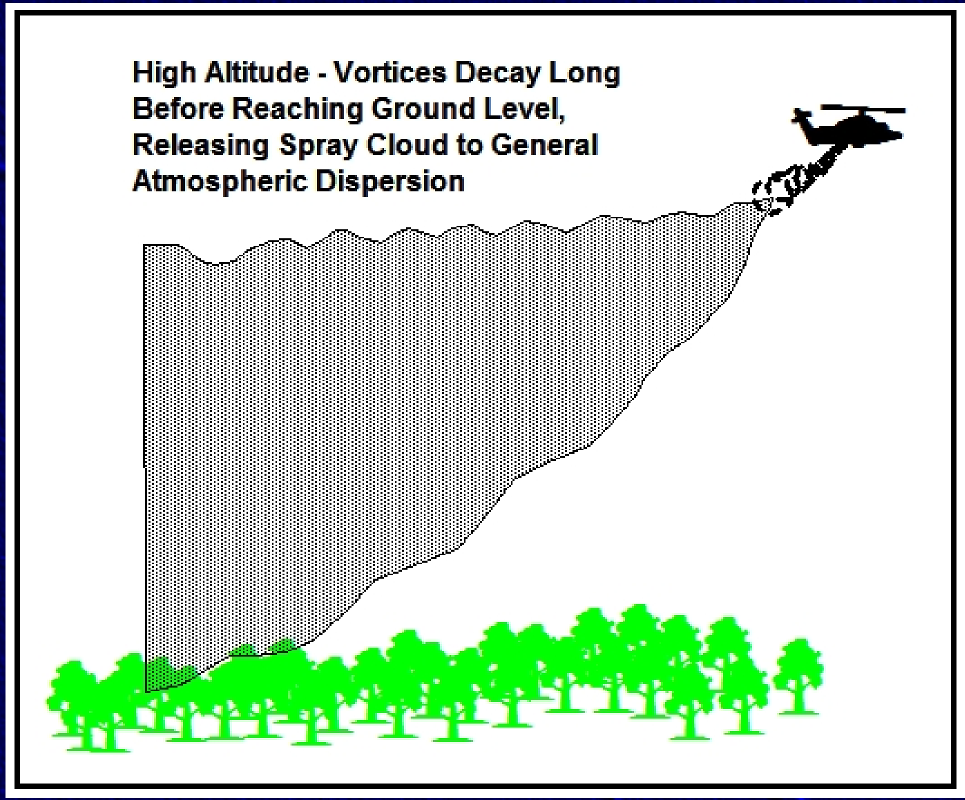
- For a given aircraft setup and meteorology regime, the vortex life and descent distance should be relatively constant (out of ground effect)
- Once the vortices encounter ground effect (within one wingspan/rotor diameter of the ground/canopy) they decay at 4 times the rate out of ground effect (1.25 mph IGE, 0.34 mph OGE - in a neutral atmosphere)
- Typical vortices descent distances for mosquito control aircraft are between 40 and 80 feet, with a life to decay of 100 to 300 seconds (neutral stability)
- Larger aircraft tend towards longer-lived vortices whereas helicopters tend to generate the greatest downward "push", some in excess of 150 feet
- Once decayed, the vortex phase "hands-off" to the general atmospheric dispersion phase

Low Altitude Spray (<100 feet)



- Low spray altitudes may bring the cloud quickly to the ground and limit off-target drift but could result in deposit peaks potentially damaging to non-target organisms and non-uniform dispersal of the spray

High Altitude Spray (>200 feet)

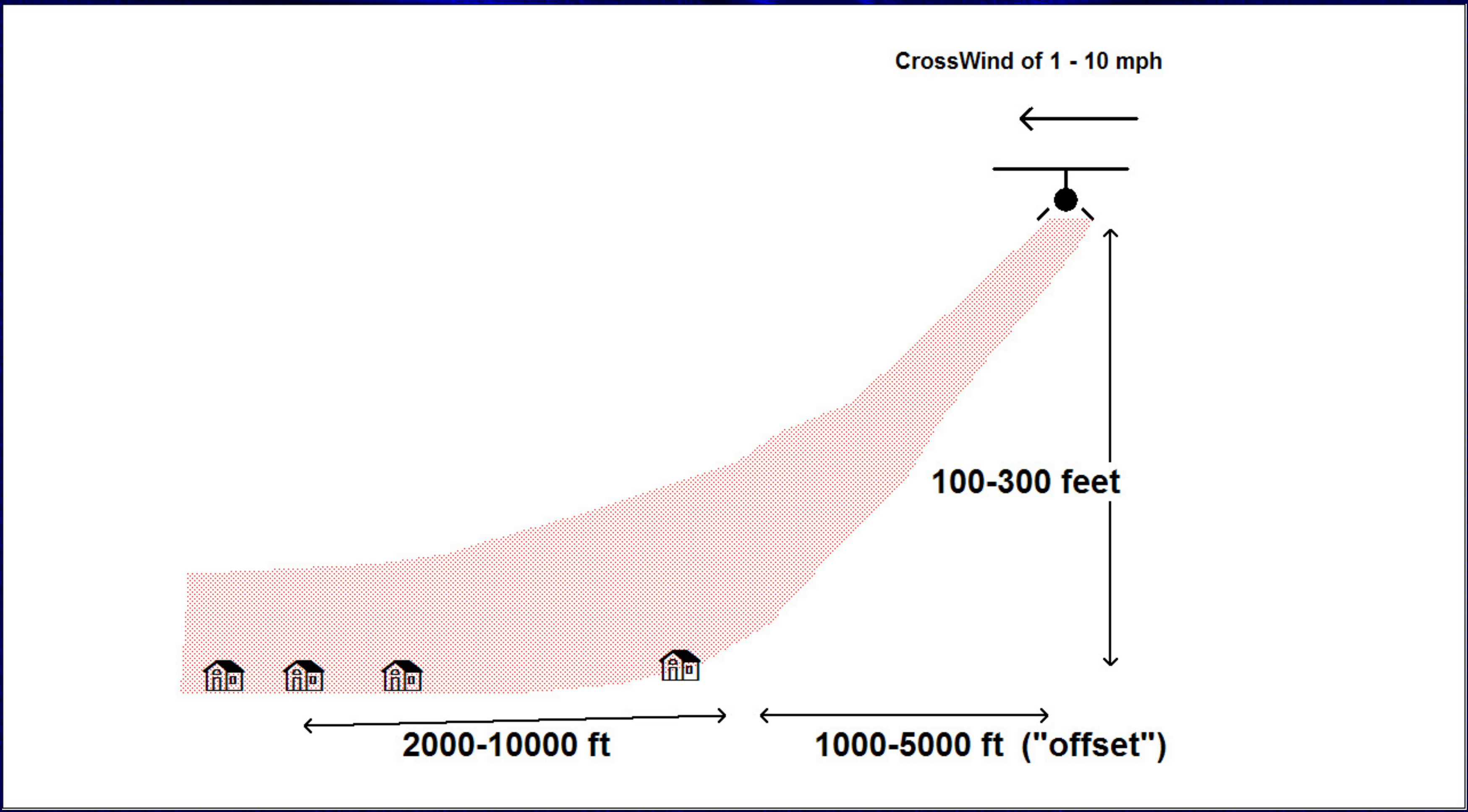


- High altitude sprays result in significant atmospheric dispersion (and dilution) with little control of off-target drift
- But potentially damaging deposit levels are minimized and off-target drift may not be “biologically significant”

Horizontal Wind Speed

- Most significant effect is on downwind dispersion and dilution of the spray cloud

Diagrammatic Representation of Downwind Movement of Spray Cloud from Aircraft Spray Line

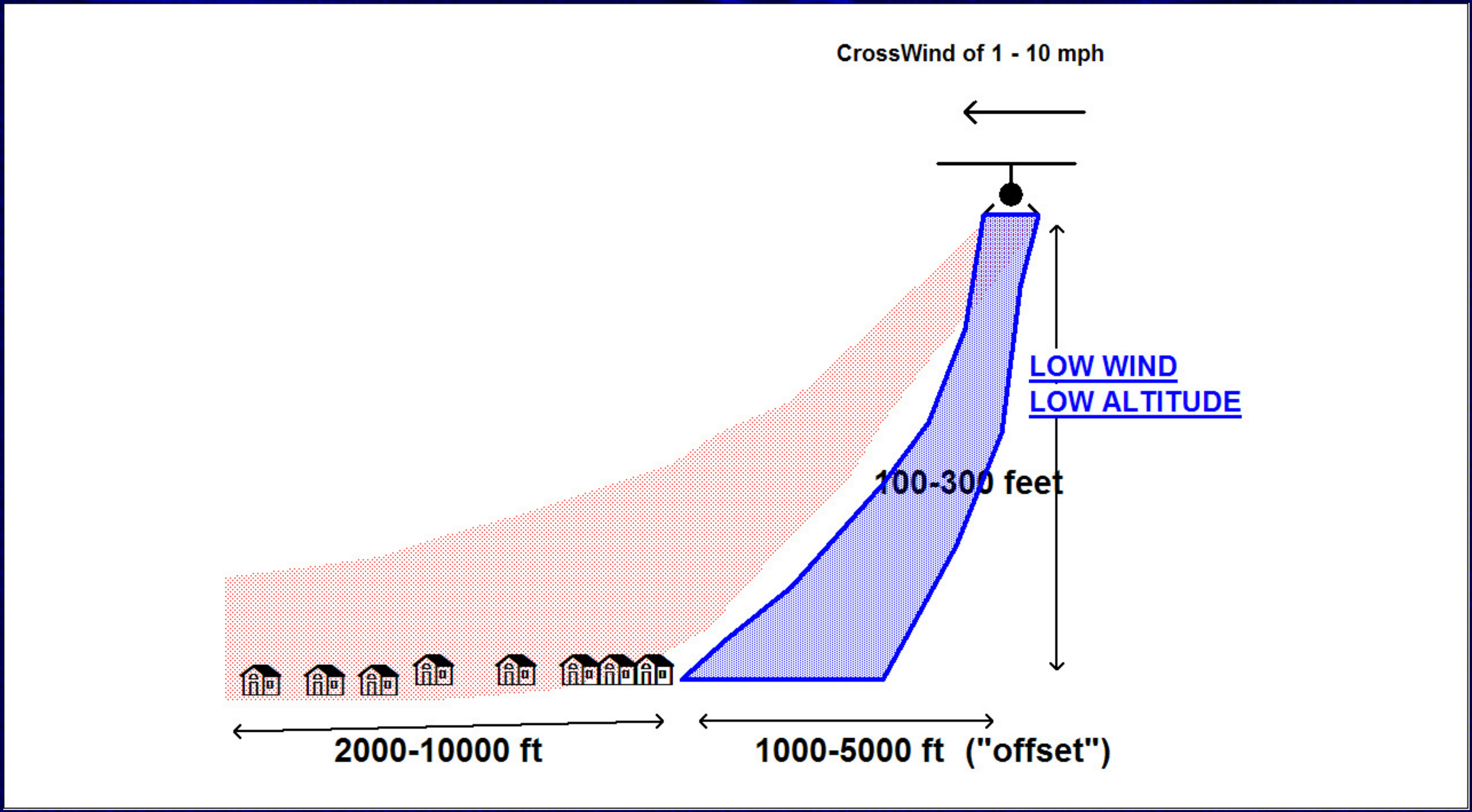


Horizontal Wind Speed

- Most significant effect is on downwind dispersion and dilution of the spray cloud
- Light winds – potential for high deposit levels close to the aircraft flight line because:

1. Spray cloud may not disperse horizontally very far before reaching ground level
2. High Stability associated with light wind conditions may allow vortices to bring concentrated spray close to the ground through reduced decay rates

Diagrammatic Representation of Downwind Movement of Spray Cloud from Aircraft Spray Line

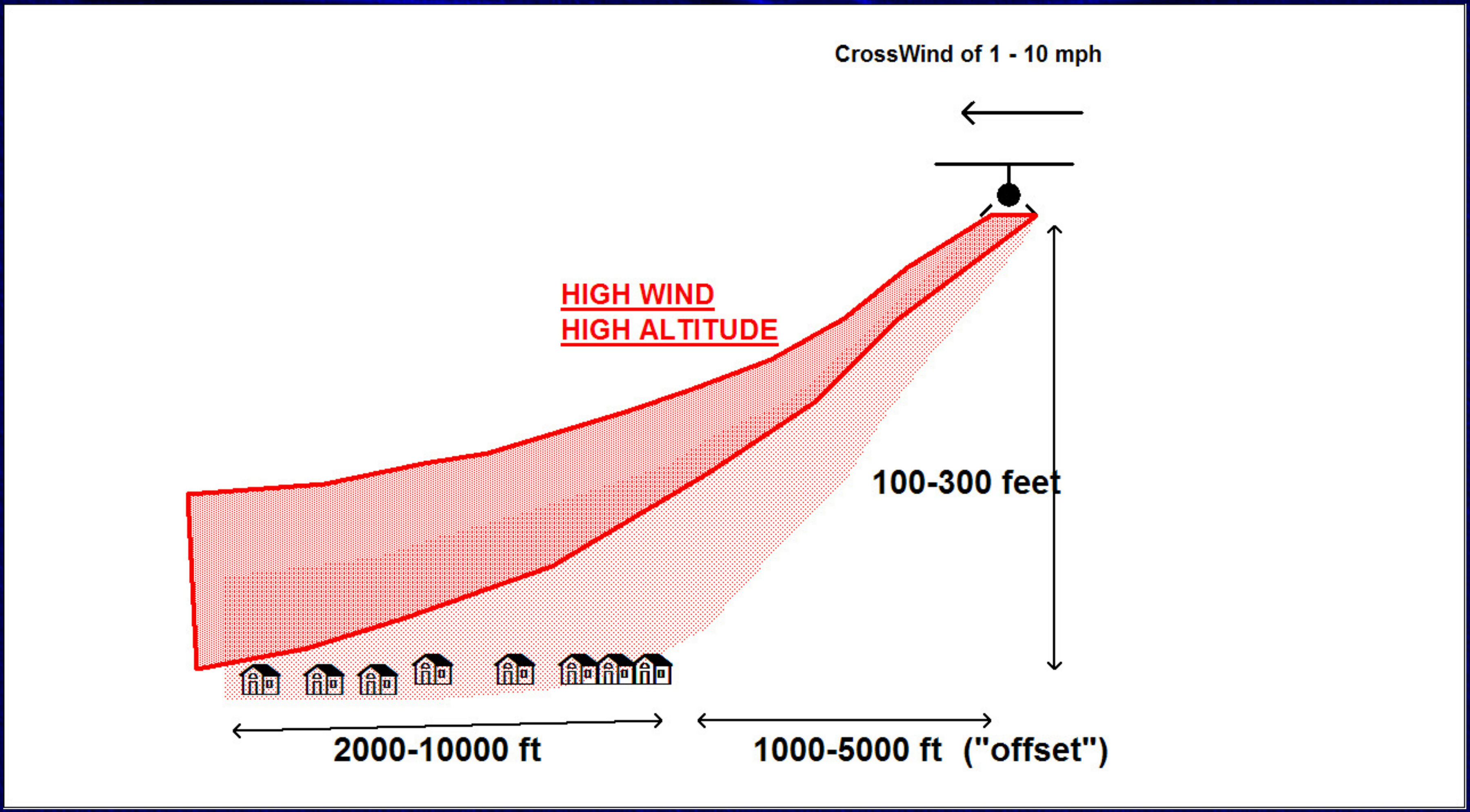


Horizontal Wind Speed

- Most significant effect is on downwind dispersion and dilution of the spray cloud
- <u>High Winds</u> – potential for off-target drift because:

1. Long distance horizontal dispersion before spray cloud reaches ground
2. Wind shear may increase decay of vortices, limiting their potential descent distances

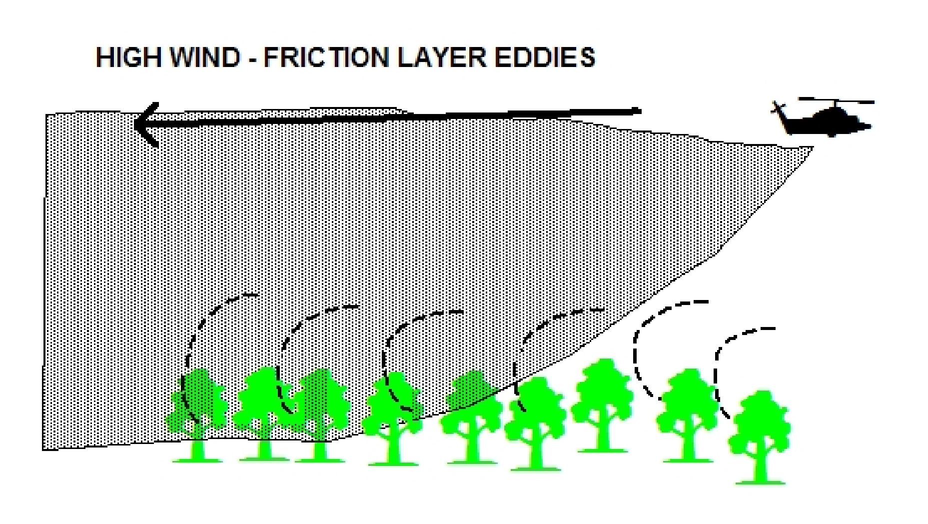
Diagrammatic Representation of Downwind Movement of Spray Cloud from Aircraft Spray Line

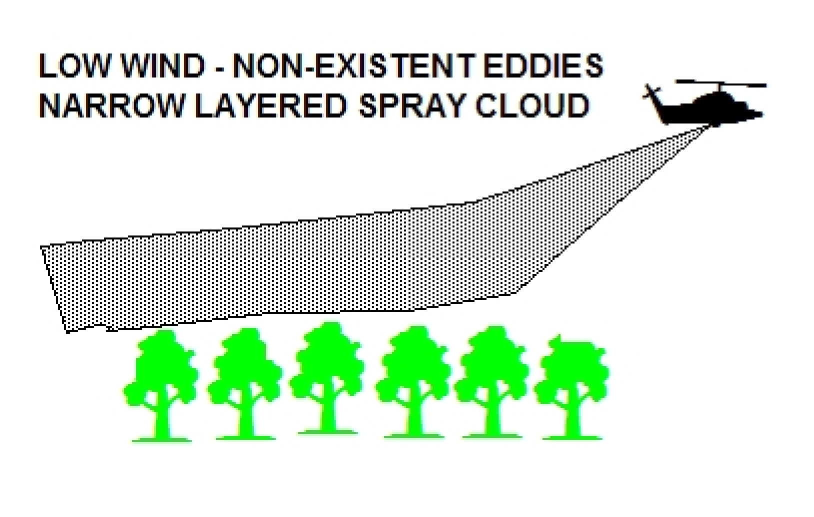


Horizontal Wind Speed and Habitat Penetration

- Horizontal winds encountering forest canopies (rough layer) creates friction turbulence which results in "eddies":

High Wind – Large eddies brings spray cloud down through the canopy

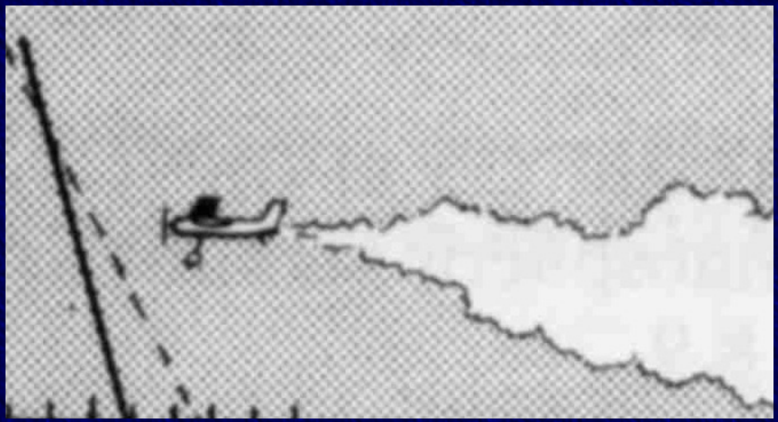


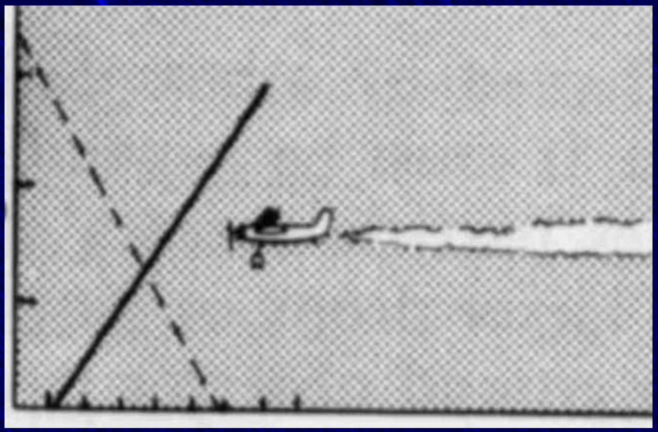


Low Wind – Weak to no eddies so spray cloud drifts in thin layer above canopy

Atmospheric Stability

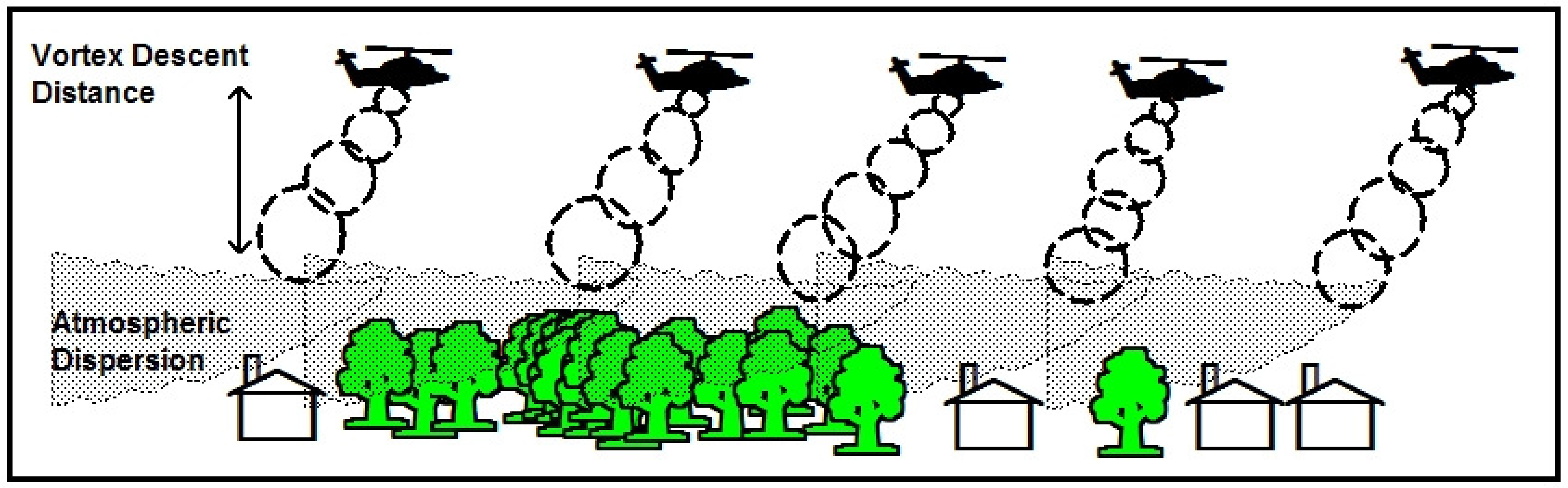
- Once the vortices have decayed, general atmospheric dispersion takes place
- In neutral to unstable atmospheres rapid vertical dispersion of the spray cloud occurs resulting in significant dilution throughout the atmosphere
- In strongly stable atmospheres turbulence is minimal and vertical dispersion is limited resulting in a narrower more concentrated spray cloud layer





Ideal Aerial Adulticiding Scenario

- Vortices bring spray cloud down to below 100 feet above ground level
- Atmospheric dispersion then distributes spray cloud evenly throughout target zone



- Off-target drift is minimized as spray cloud is "placed" into the target zone
- High deposit levels avoided as vortices decay and release spray well above ground level

“Real World” Aerial Adulticiding

- We do not have a full understanding of all the factors:
- Aircraft characteristics, vortex strength and descent distances, prevailing atmospheric stability measures, “de-coupled” atmospheric layers
- We do not have access to equipment that could help measure these factors such as LIDAR, SODAR, etc
- Anecdotal reports indicate some missions where spray cloud did not reach target zone in sufficient concentrations and others where concentrated cloud impacted residents in a recreational area under similar operational parameters
- Safety plays a critical role in spray altitude determination – may have to spray at altitudes higher than ideal

"Real world" Aerial Adulticiding

- Droplet size issue still unresolved
- Many, if not most operators still using "conventional" spray systems producing sprays with a VMD of 60 to 100 microns, only 15-25% efficient at producing theoretically ideal drop sizes (15-40 microns)
- Few commercially available systems (rotary atomizers) capable of producing sprays close to optimum size – other systems (high pressure nozzles, two-fluid nozzles) are built in house for public aircraft
- Actual optimum droplet size for aerial adulticiding may not be "one size fits all" but may be dependent on operational parameters (primarily altitude – higher altitudes require larger droplet sizes)

Optimum Droplet Size

- Relationship between drop size and impingement velocity recognized early (Latta, 1947)
- Product of droplet diameter (in microns) squared and velocity (mph) relative to the mosquito should exceed 300 to ensure high probability of impingement
- Optimum drop sizes demonstrated to be 12 to 20 microns in 2 to 8 mph wind (relative to mosquito)
- Drop size (diameter) containing a lethal dose determined for 3 organophosphate adulticides (Weidhaas, 1970)
  Fenthion – 17.5 microns
  Naled – 20 microns
  Malathion – 25 microns
  Droplets larger than these contain in excess of a lethal dose and as such could be considered inefficient

Optimum Droplet Size

- **Dose/Mortality response for mono-sized malathion sprays demonstrated lowest LC50's obtained for droplets between 7 and 22 microns (Haile, 1982)**

"Effect of Droplet Size of Malathion Aerosols on Kill of Caged Adult Mosquitoes"

"The trend of the curve.., indicates that the optimum uniform droplet diameter is between 10 and 15um; however, little difference in efficiency is shown for sizes from ca. 7 to 22um."

Haile, D.G., G.A.Mount and N.W.Pierce - Mosq News 42:576-583 (Dec. 1982)

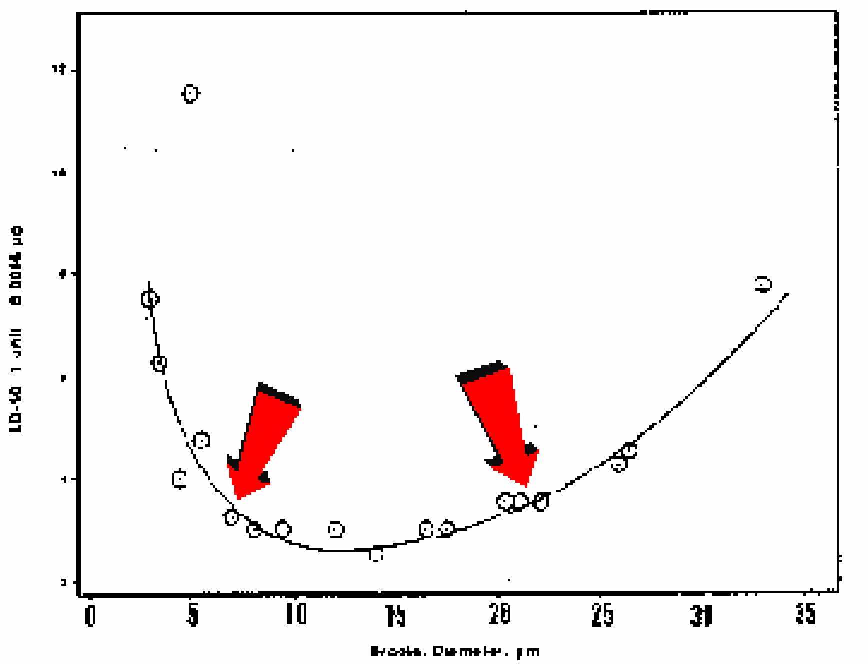


Fig. 2. Relationship between LD-50 and droplet diameter from wind tunnel tests exposing caged *Ae. taeniorhynchus* mosquitoes to monodisperse aerosols of malathion.

Optimum Droplet Size

- Suggestion is that optimum droplet size is one that:
1) Has a high impact efficiency on mosquitoes
2) Remains airborne for a significant period of time
3) Does not contain much more than a single toxic dose
- But current "conventional" spray systems are based on agricultural spray technology utilizing small orifice flat fan nozzles, oriented at 90 to 135 degrees (for shear) and pressures of 30 to 70 psi
- These typically produce a spray cloud with a VMD of 60 to 100 microns, well above the "optimum" range
- Some of the newer rotary atomizers are capable of sprays with a VMD in the 20 to 40 micron range
- A few novel systems built in house utilize high pressure (1000-3000 psi) or two fluid nozzles to produce sprays with a VMD of 10 to 40 microns

Effectiveness of Adulticides

1) Should be of optimum droplet size
2) Should be applied at times mosquitoes are active within the target zone
3) Should be applied to the target zone
4) Should be applied when meteorology favors transport to, and through, the target zone

- But many mosquito species are active after sundown, during periods of high humidity, low wind speeds and a strongly stable atmosphere…
- …conditions that do not necessarily favor good spray transport to and dispersion through the target zone from aerial applications

Effectiveness of Adulticides

- Haile and Mount's studies showed the most efficient droplet sizes to be 7-22 microns
- But their work was primarily laboratory wind tunnel work with caged mosquitoes backed up by simple ground ULV adulticiding field trials
- They were effectively "placing" the spray droplets directly to the target mosquitoes
- As has been discussed in this presentation, Aerial adulticiding is heavily reliant on many other factors to facilitate the movement of the spray drops from altitude to the target zone
- Operational evaluations indicate optimum droplet size for aerial adulticiding is more likely 15-40 microns rather than the 7-22 microns suggested by Haile and Mount

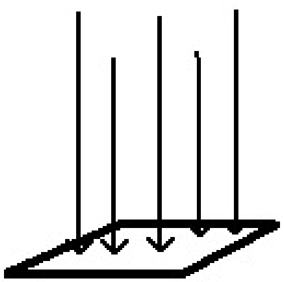
Importance of Spray Block Size (Demonstrated by AGDISP Model)

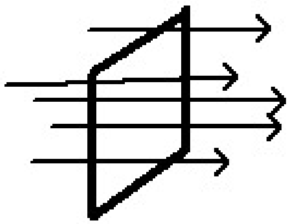
- High altitude (>200 feet) sprays become dispersed or diluted on their movement to the ground
- This can be demonstrated through the use of computer modeling (AGDISP) and 3D graphing of spray cloud concentrations
- A single pass may not be sufficient to produce an "effective cloud" or mosquito "kill zone" in the target area
- When viewing the following contour plots, one must understand the difference between "deposit" measurements and "flux" (or transport) measurements (horizontal movement of spray drops)

“Deposit” Vs “Flux” (or “Transport”)

Flux or Transport: Material passing through a "Window".
The material can continue to contribute to flux at other "Windows" further downwind.

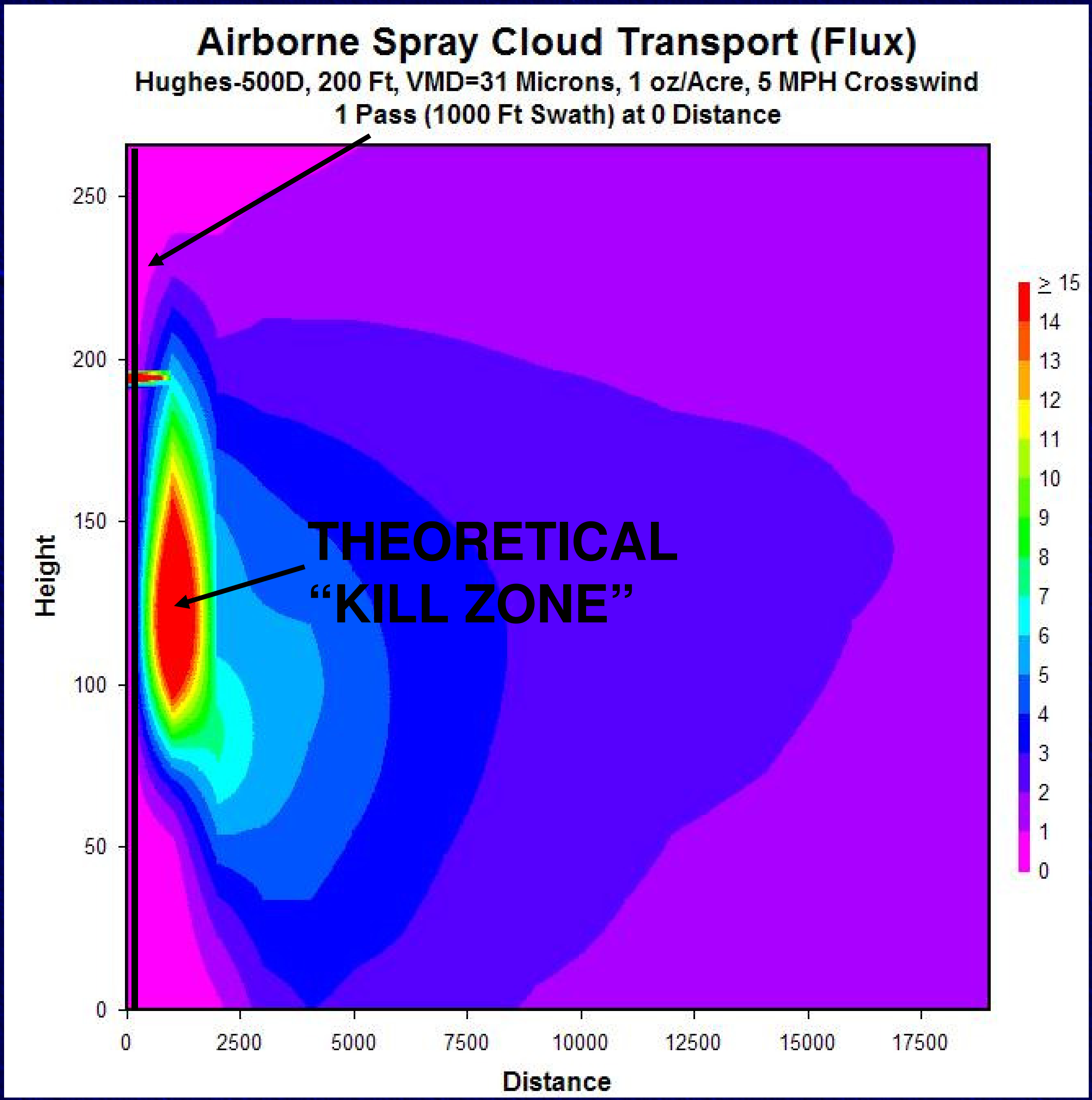
Deposit: Material landing upon a solid surface.
Once deposited the material cannot contribute to deposit on another surface.





“Deposit” should never exceed “intended application rate”, but “Flux” of an effective spray should be significantly larger than the “intended application rate”

1 PASS



Airborne Spray Cloud Transport (Flux)
Hughes-500D, 200 Ft, VMD=31 Microns, 1 oz/Acre, 5 MPH Crosswind
1 Pass (1000 Ft Swath) at 0 Distance
THEORETICAL
“KILL ZONE”
Height
Distance
0
50
100
150
200
250
0
2500
5000
7500
10000
12500
15000
17500
≥ 15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0

Importance of Spray Block Size

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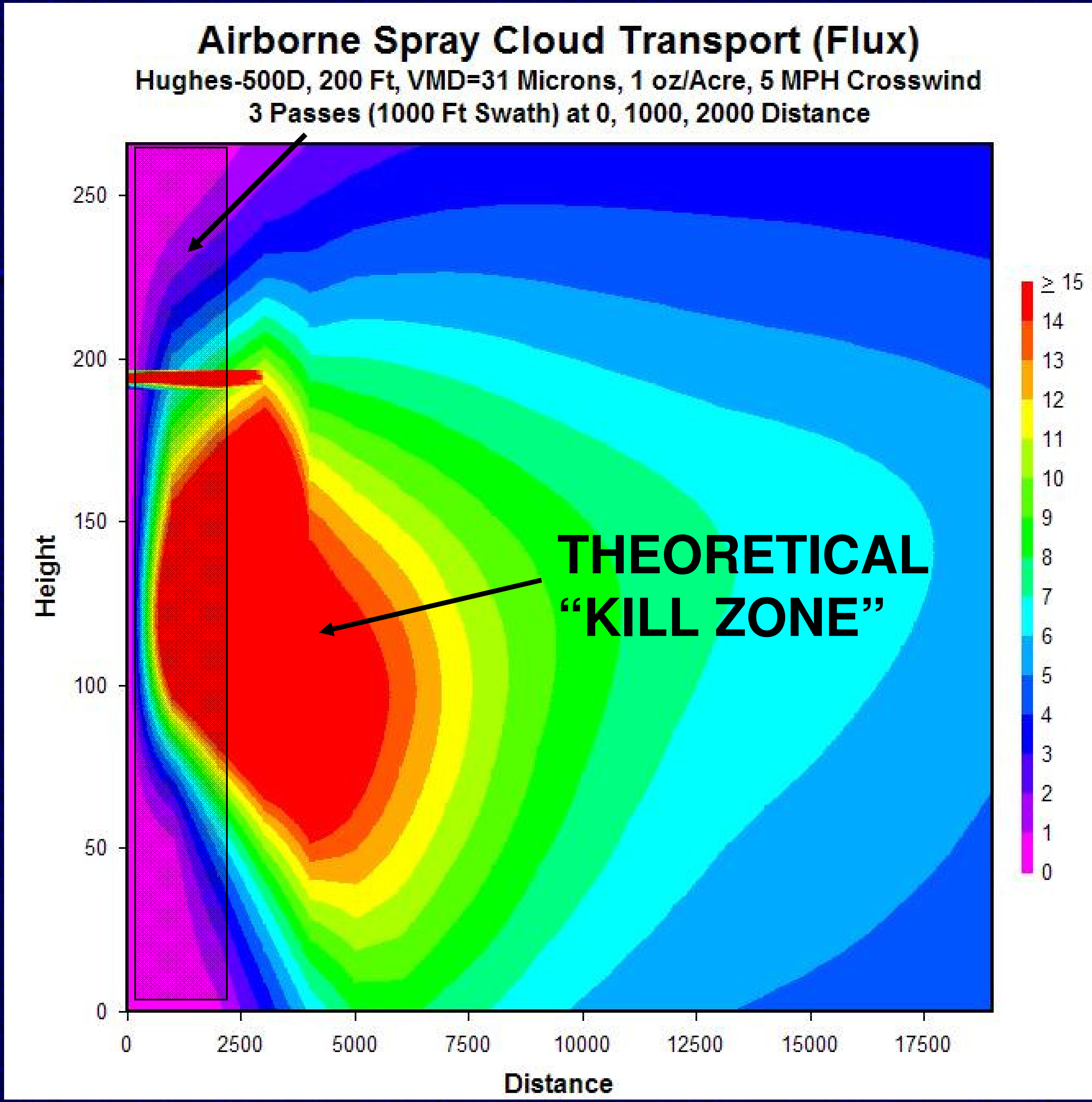
- **But multiple passes have an “additive” effect downwind**

3 PASSES



Airborne Spray Cloud Transport (Flux)
Hughes-500D, 200 Ft, VMD=31 Microns, 1 oz/Acre, 5 MPH Crosswind
3 Passes (1000 Ft Swath) at 0, 1000, 2000 Distance
Height
250
200
150
100
50
0
0
2500
5000
7500
10000
12500
15000
17500
Distance
≥ 15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
THEORETICAL
“KILL ZONE”

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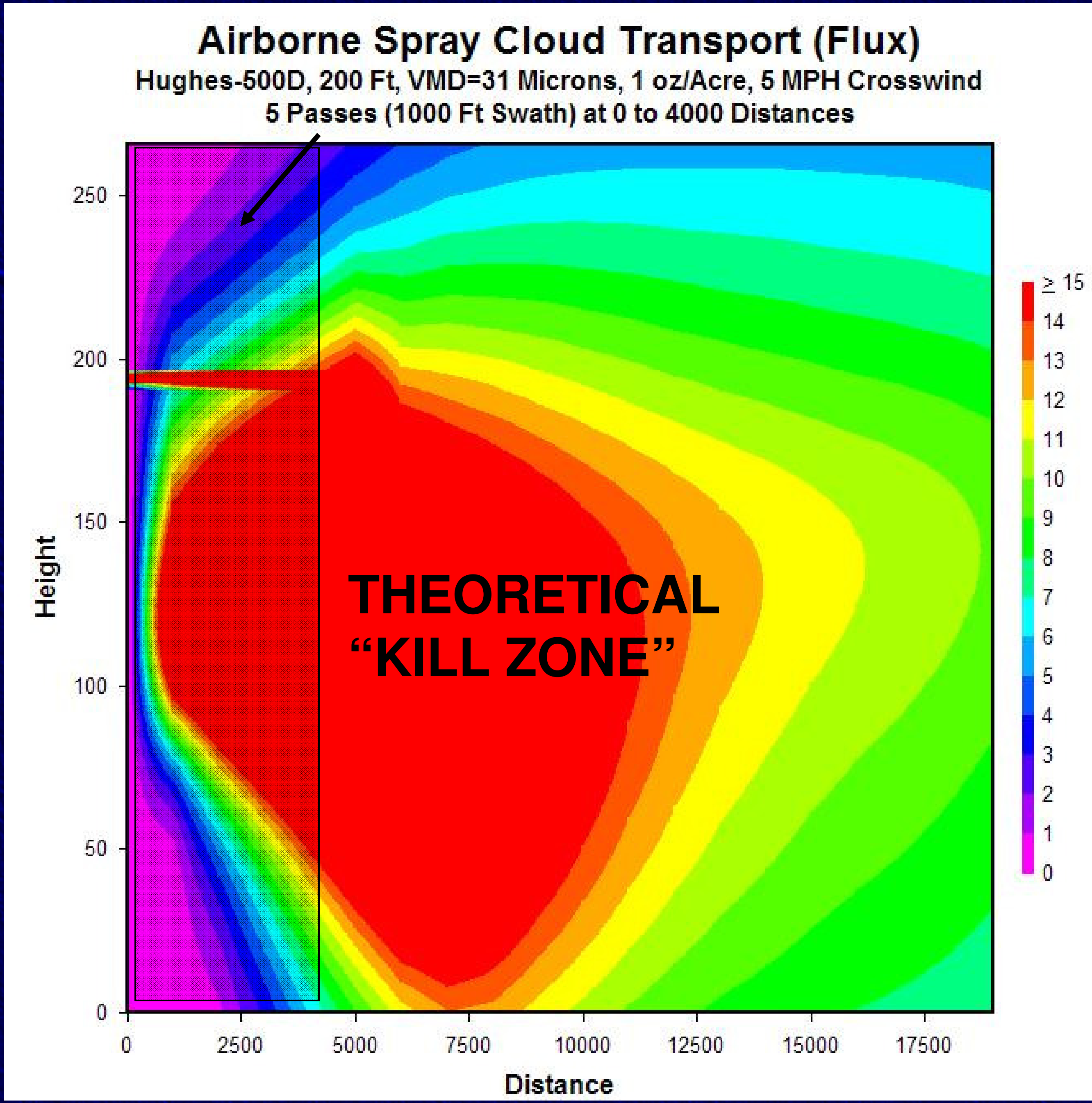
- **There may be a minimum number of passes necessary to produce an effective spray cloud**

5 PASSES


Airborne Spray Cloud Transport (Flux)
Hughes-500D, 200 Ft, VMD=31 Microns, 1 oz/Acre, 5 MPH Crosswind
5 Passes (1000 Ft Swath) at 0 to 4000 Distances
Height
250
200
150
100
50
0
0
2500
5000
7500
10000
12500
15000
17500
Distance
≥ 15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
THEORETICAL
"KILL ZONE"

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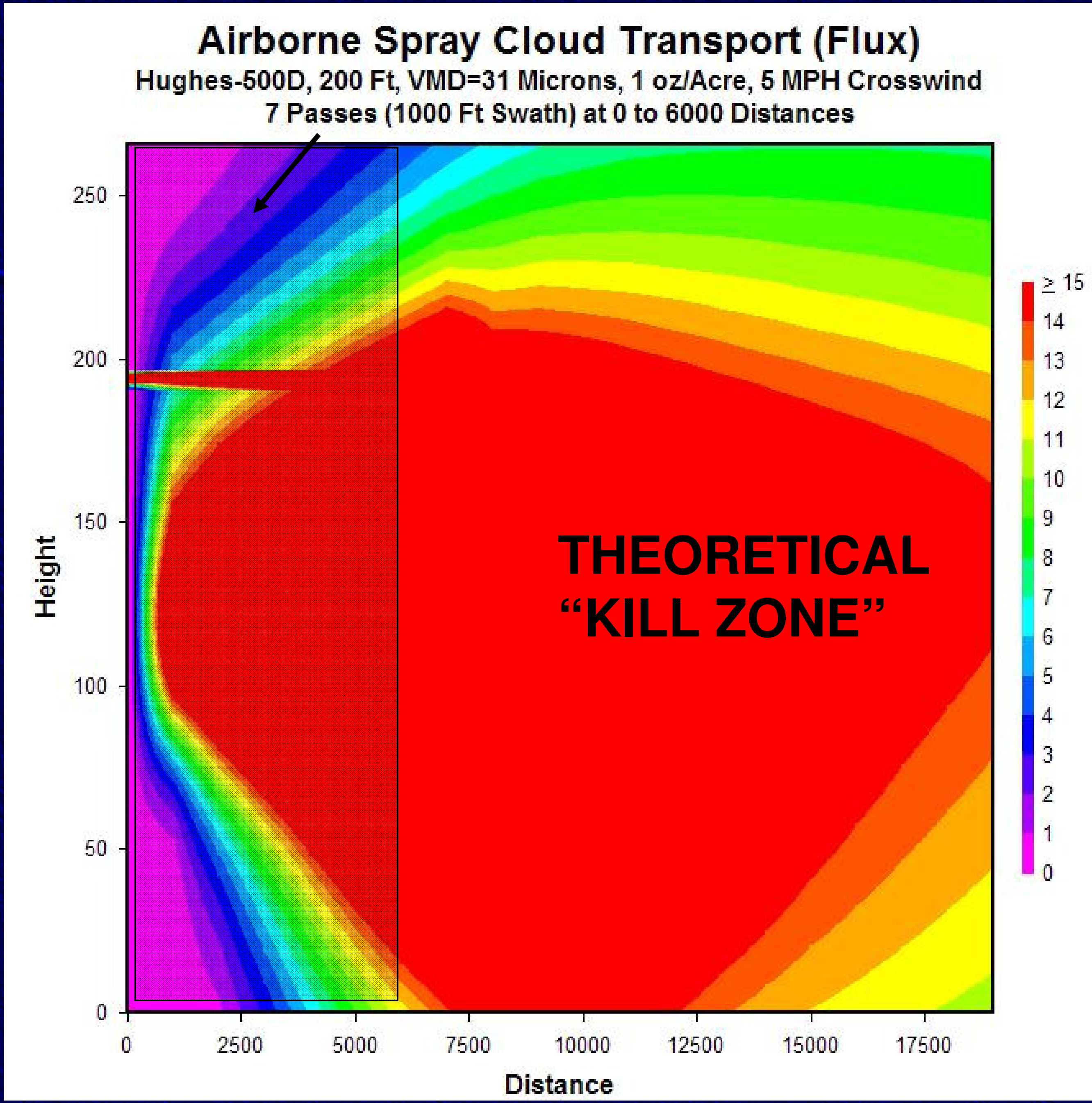
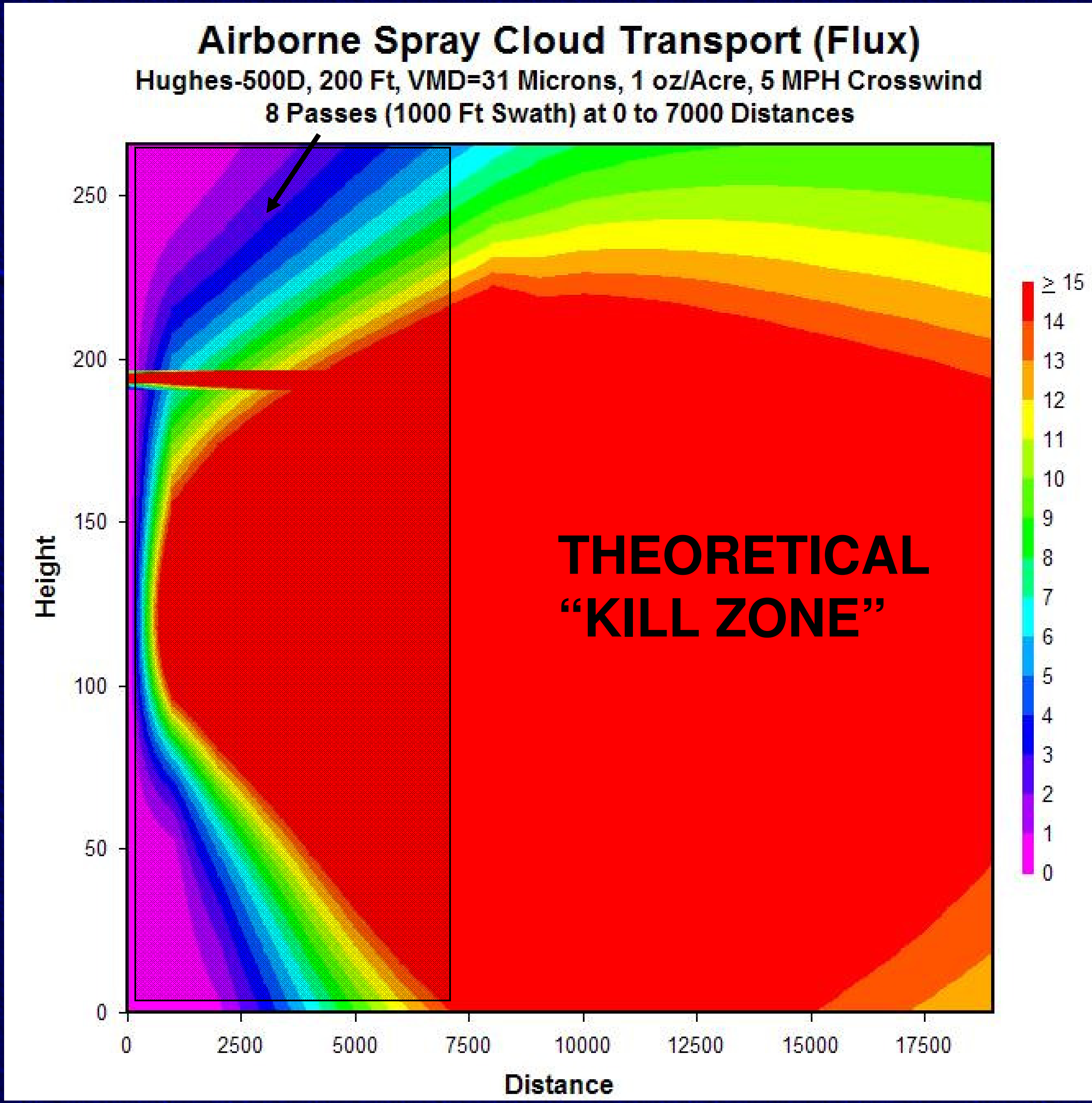
- A single pass may not be sufficient to produce an "effective cloud" or mosquito "kill zone" in the target area
- But multiple passes have an "additive" effect downwind
- There may be a minimum number of passes necessary to produce an effective spray cloud
- Each successive pass (swath) of the aircraft DOES NOT increase the concentration of the spray cloud at a single point in time because each pass is several minutes behind and 1000 ft upwind of the previous
- But it does increase the amount of time spray drops are present and the total volume passing through a given "window" over the life of the spray

7 PASSES



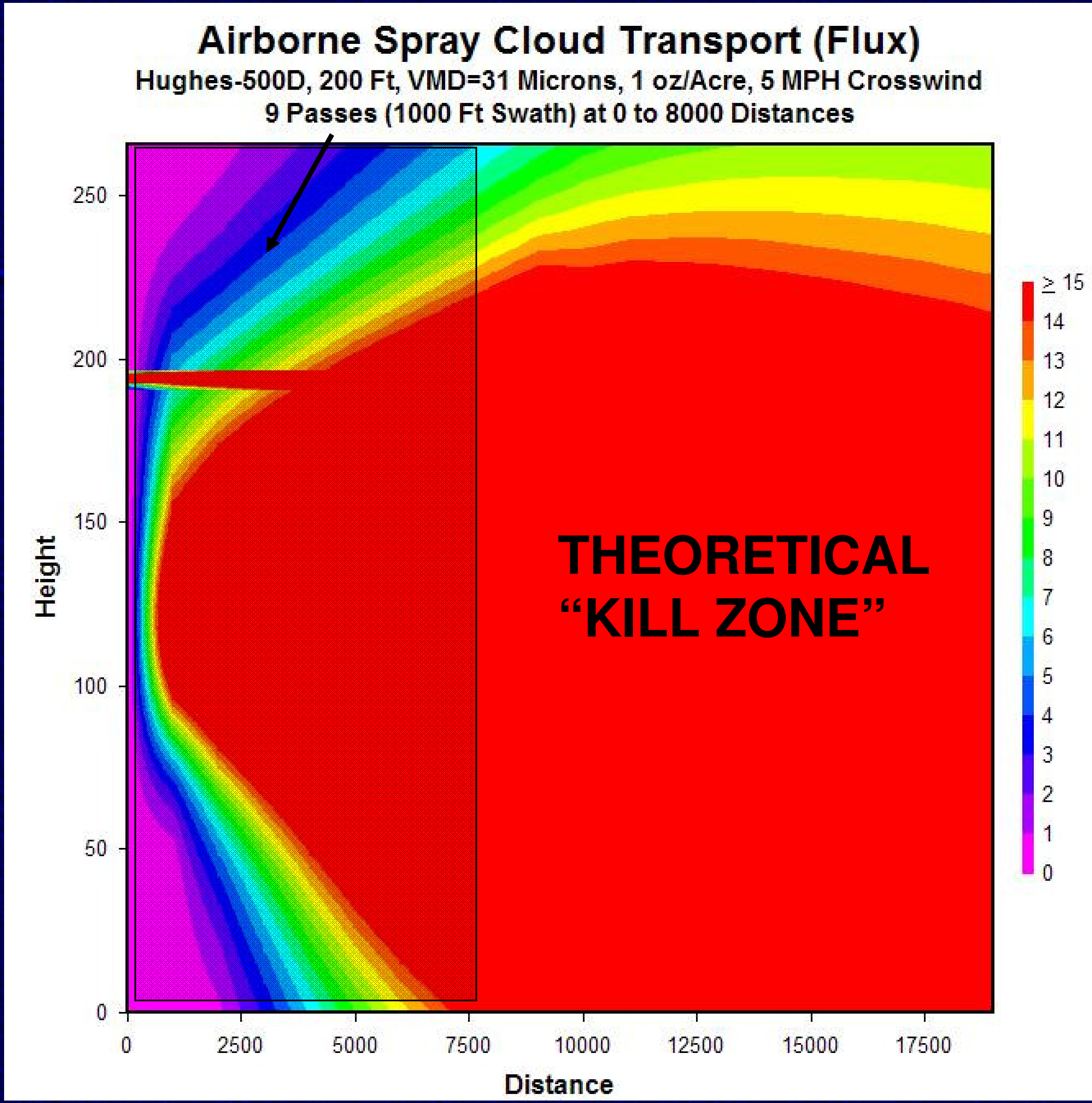
Airborne Spray Cloud Transport (Flux)
Hughes-500D, 200 Ft, VMD=31 Microns, 1 oz/Acre, 5 MPH Crosswind
7 Passes (1000 Ft Swath) at 0 to 6000 Distances
Height
Distance
THEORETICAL
"KILL ZONE"
0
50
100
150
200
250
2500
5000
7500
10000
12500
15000
17500
≥ 15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0

8 PASSES



Airborne Spray Cloud Transport (Flux)
Hughes-500D, 200 Ft, VMD=31 Microns, 1 oz/Acre, 5 MPH Crosswind
8 Passes (1000 Ft Swath) at 0 to 7000 Distances
Height
Distance
0
50
100
150
200
250
0
2500
5000
7500
10000
12500
15000
17500
≥ 15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
THEORETICAL
"KILL ZONE"

9 PASSES

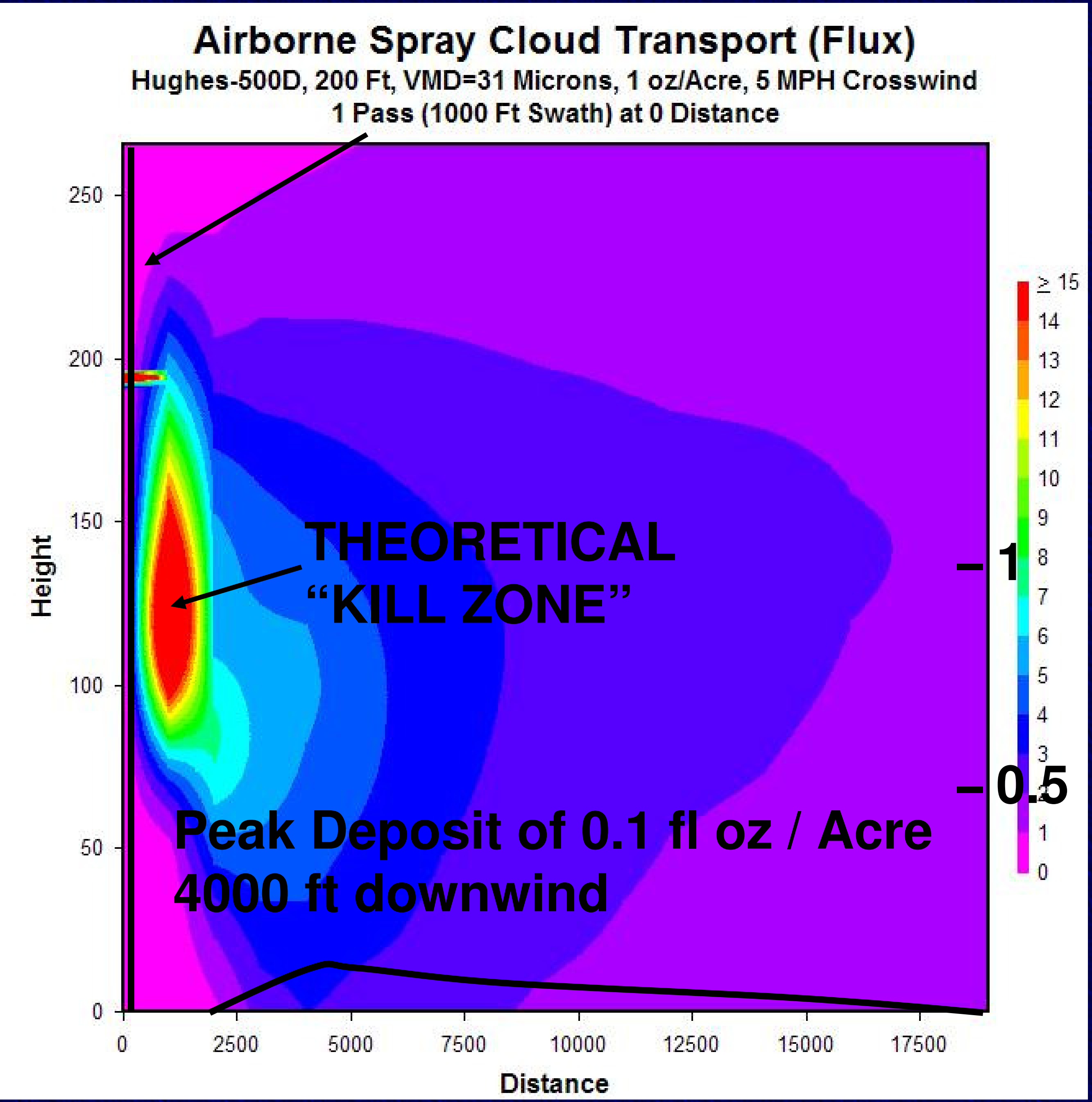

Airborne Spray Cloud Transport (Flux)
Hughes-500D, 200 Ft, VMD=31 Microns, 1 oz/Acre, 5 MPH Crosswind
9 Passes (1000 Ft Swath) at 0 to 8000 Distances
Height
250
200
150
100
50
0
0
2500
5000
7500
10000
12500
15000
17500
Distance
THEORETICAL
"KILL ZONE"
≥ 15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0

Deposition from Multiple Spray Lines

- One of the major concerns from aerial sprays is the level of deposition that may occur and the potential for non-target impacts
- Dukes, Zhong et al (2004) showed significant fiddler crab mortality (80%) from deposits of aerial sprays of Fenthion using "conventional" spray systems (low pressure flat fan) with a VMD of approximately 80 microns.
- They also demonstrated that reducing the VMD to approximately 25 microns significantly reduced the level of deposit (to 10%, 4% and 1% in 3 different zones) and eliminated the non-target impacts.
- The caged mosquito mortality was similar under the 8 spray lines and out to 1.5 miles downwind but beyond that the 25 micron VMD spray (high pressure system) continued with significantly higher mosquito mortality compared to the flat-fan spray

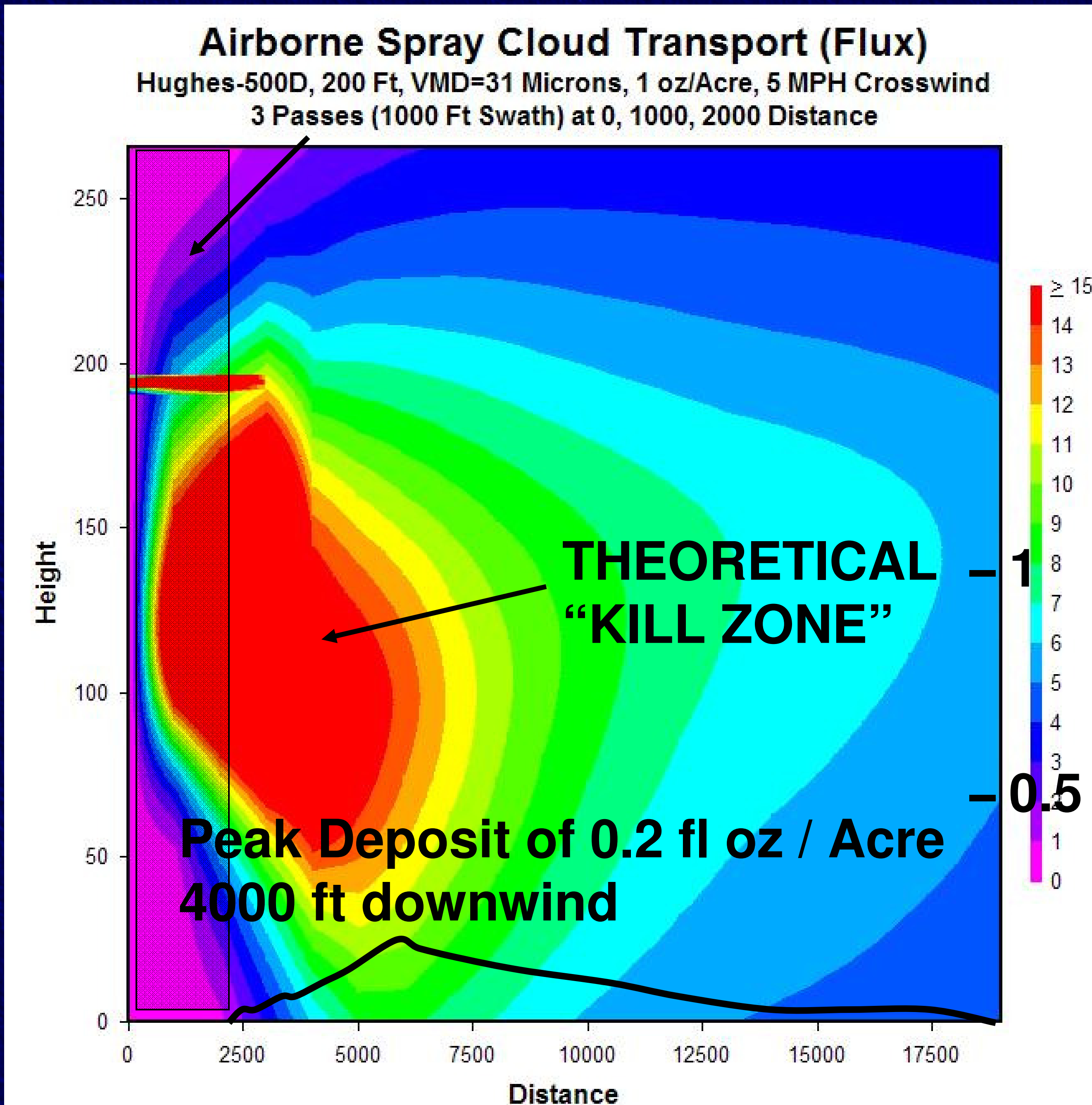
1 PASS

Peak Deposit 1/10 of applied



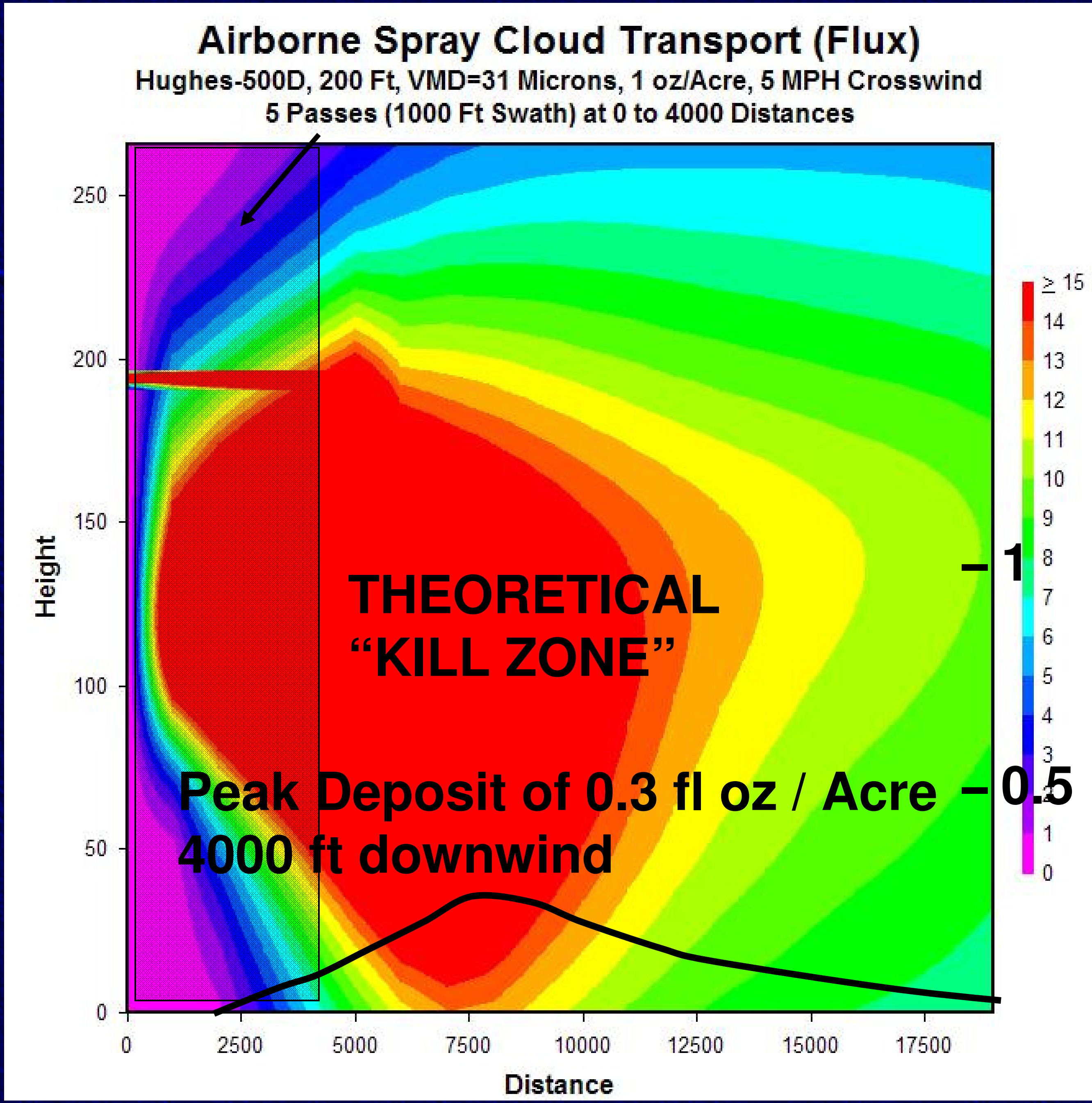
3 PASSES

Peak Deposit 2/10 of applied



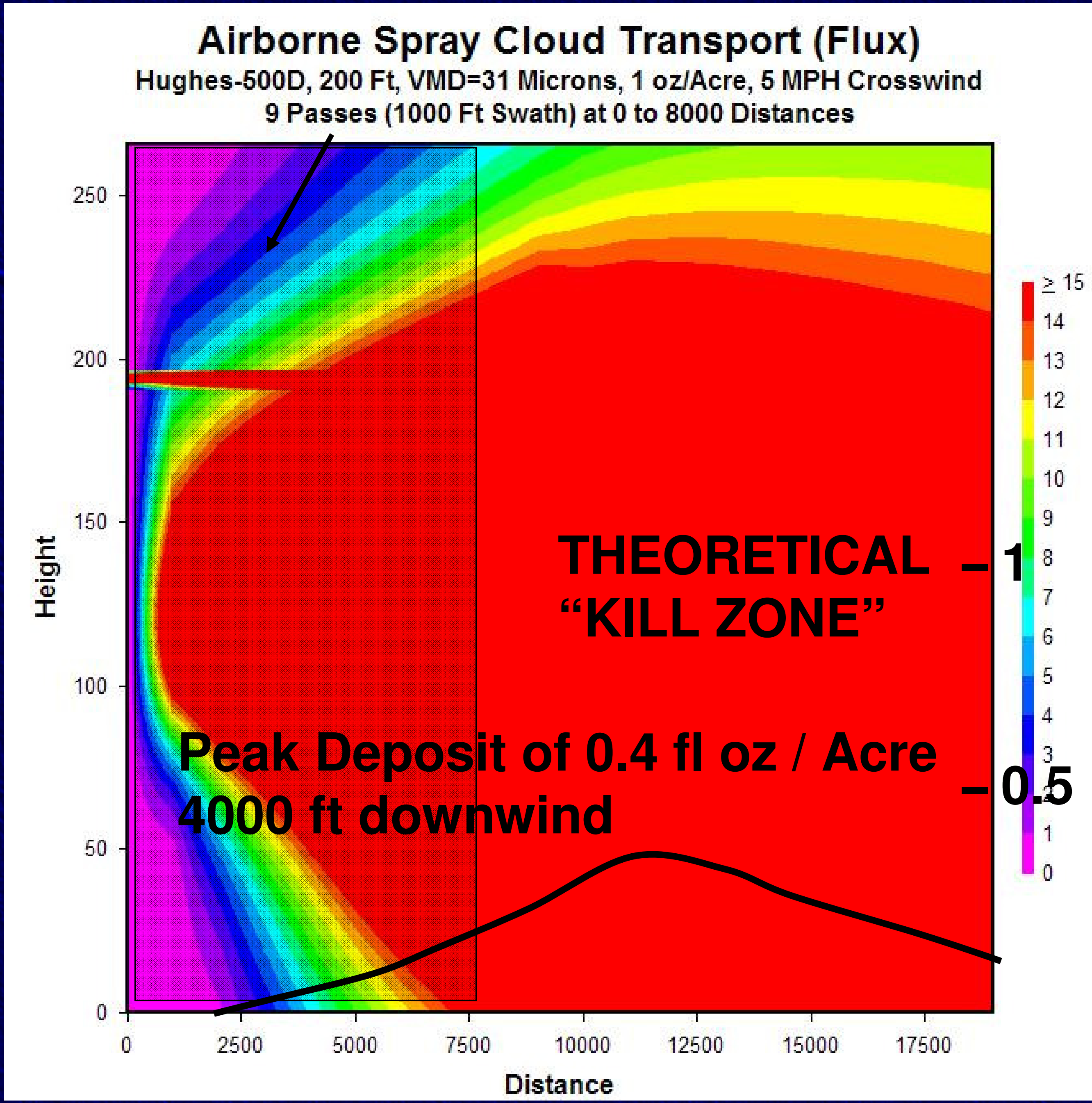
5 PASSES

Peak deposit 3/10 of applied



9 PASSES

Peak deposit 4/10 of applied



Deposition from Multiple Spray Lines

- Increasing the number of swaths does not increase the peak deposit at the same rate.
- 1 swath gives a peak deposit of 10% of applied, 3 swaths 20%, 5 swaths 30%, 9 swaths 40% and 20 swaths a little over 50% (for this given scenario)
- These numbers are from AGDISP modeling in an "open" environment.
- In reality the deposit numbers are actually significantly lower, as are the spray cloud "flux" or "transport" numbers shown in the previous contour plots.
- This is due to the significant environmental filtering of the spray cloud by small elements, mainly vegetation and the minute leaflets and hairs the droplets encounter / impinge upon.

Other Considerations

- **All the previous discussions have revolved around the physics of an "effective spray", from droplet size, to meteorology, from operational (aircraft) parameters to spray block size and placement**
- **One major factor not discussed is mosquito behavior and activity, and the extreme variations between species**
- **For example, *Aedes* (or is it *Stegomyia*?) *aegypti* and *Aedes albopictus* are daytime active… they are not effectively controlled by wide area adulticiding, primarily by reason of prevailing meteorology at that time**
- **The control of these species during dengue outbreaks relies on effective source reduction measures through premise sanitation**

Mosquito Behavior and Habitat

- Two major pest species in Florida are ***Psorophora columbiae*** and ***Psorophora ferox***
- ***Psorophora columbiae*** is a species occurring in open pastures in huge numbers after flooding rains
- The adults rest in the open, usually on clumps of grasses
- Wide area adulticiding is extremely effective as even resting adults are exposed to spray drops being moved by prevailing winds in the open fields
- However ***Psorophora ferox***, also a floodwater species, is a woodland species rarely venturing out of densely vegetated habitats
- Wide area adulticiding is often ineffective as only a small portion of the spray cloud penetrates into the habitat and the winds within the canopy are so low as to not effectively impinge the drops upon the resting mosquitoes

Mosquito Behavior and Timing

- **Many mosquito species are crepuscular in their activity, having peaks of activity during dusk and (to a lesser degree) dawn, with lower activity throughout the night.**
- ***Ochlerotatus taeniorhynchus*** **(the predominant pest species in coastal Florida) and** ***Culex nigripalpus*** **(believed to be the primary vector of WN and SLE viruses in peninsular Florida) are two such species**
- **However aerial adulticiding conducted during the crepuscular activity hours is usually (although not always) a lot more effective against the former rather than the latter**
- **The reason for this can be attributed to a number of factors…**

Mosquito Behavior and Timing

- ***Ochlerotatus taeniorhynchus*** **is active in a wide range of conditions, as long as temperatures are greater than 65F**
- **Also, a large proportion of the adult population is active on most nights (being a floodwater species, adult populations tend to be synchronous)**
- ***Culex nigripalpus*** **on the other hand is rarely active unless the humidity exceeds 80% (and it is asynchronous)**
- **Also, a much smaller proportion of the population is active on any given night… gravid females may "hold on" to their eggs and remain inactive (rest deep in heavily vegetated areas) for days, even weeks until conditions are just right for oviposition (such as following a major rainfall event)**
- **As such a single aerial application, unless timed perfectly, may only impact the 20-40% of the population that may be active at that time**
- **The fact that Culex nigripalpus spends a significant portion of it's flight activity within woodlands also protects this species**

Good Spray Timing!

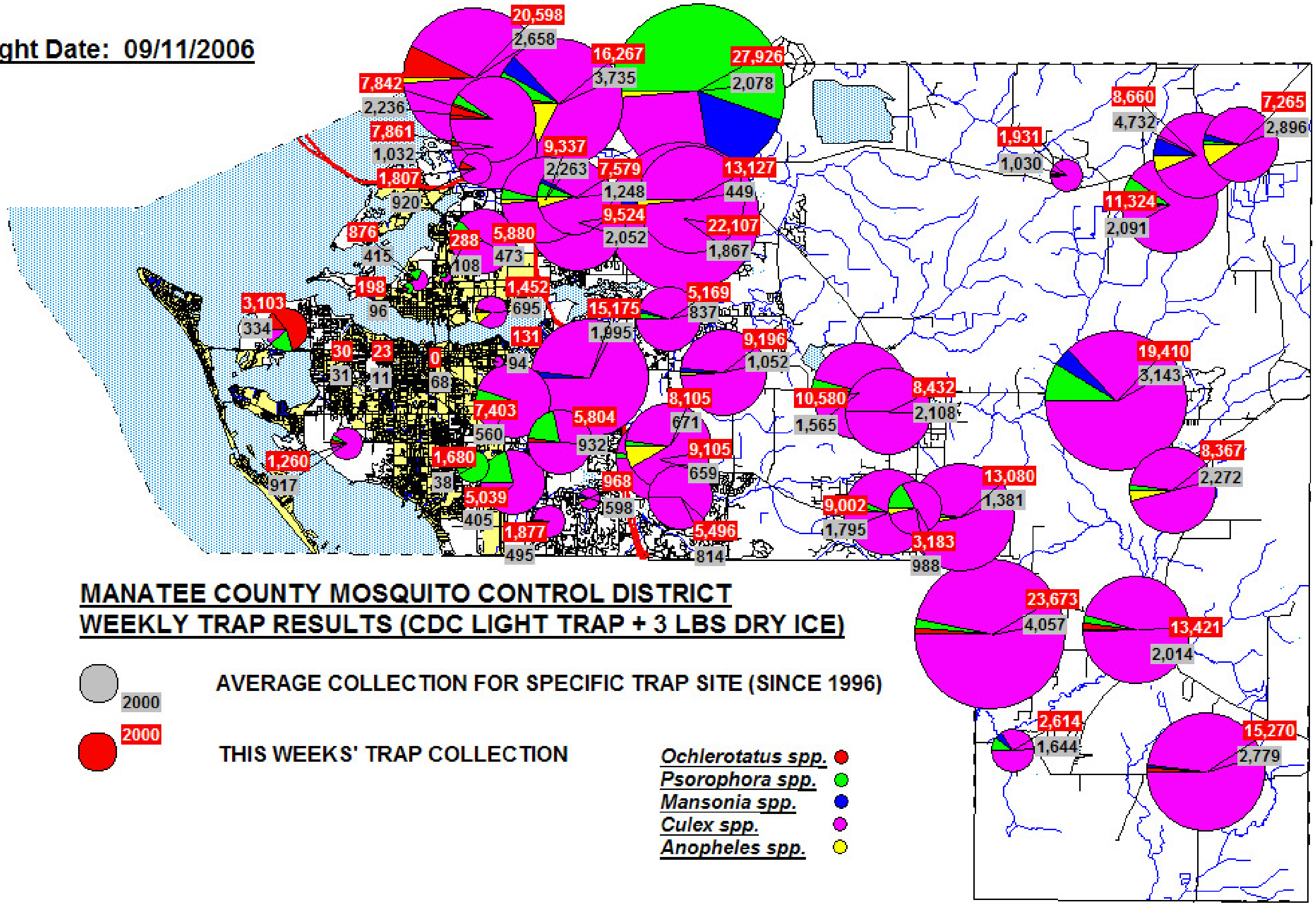
Mosquito Behavior and Timing

- The *Culex pipiens* complex has been incriminated as one of the major WN virus vectors in urban areas
- It is a species that tends to be found and breeds in cryptic "protected" habitats.
- It has many of the features discussed for *Culex nigripalpus* that make it difficult to control through a single wide area adulticiding application.
- In order to have a significant impact on the population, and hence a significant impact on the population's vectorial capacity, multiple applications over successive nights are required.
- This was demonstrated in the "controversial" aerial spraying of Sacramento during the 2005 WN epidemic.
- Control of nuisance species (the primary reason for aerial adulticiding in Florida) rarely if ever uses the multiple successive night application technique as excellent control (>90%) can be achieved through a single, well timed application.

Other Observations for Discussion

- Why such "low" numbers of human cases of WN in Florida with such high populations of the principal vector (?), ***Culex nigripalpus*** and high conversion rates in sentinel chicken flocks (Manatee County: 49/66 in 2002, 61/72 in 2003, 41/78 in 2005 – low numbers, 8/72, in 2004 "Hurricane Year", and only 1/78 this year)

Trap Night Date: 09/11/2006

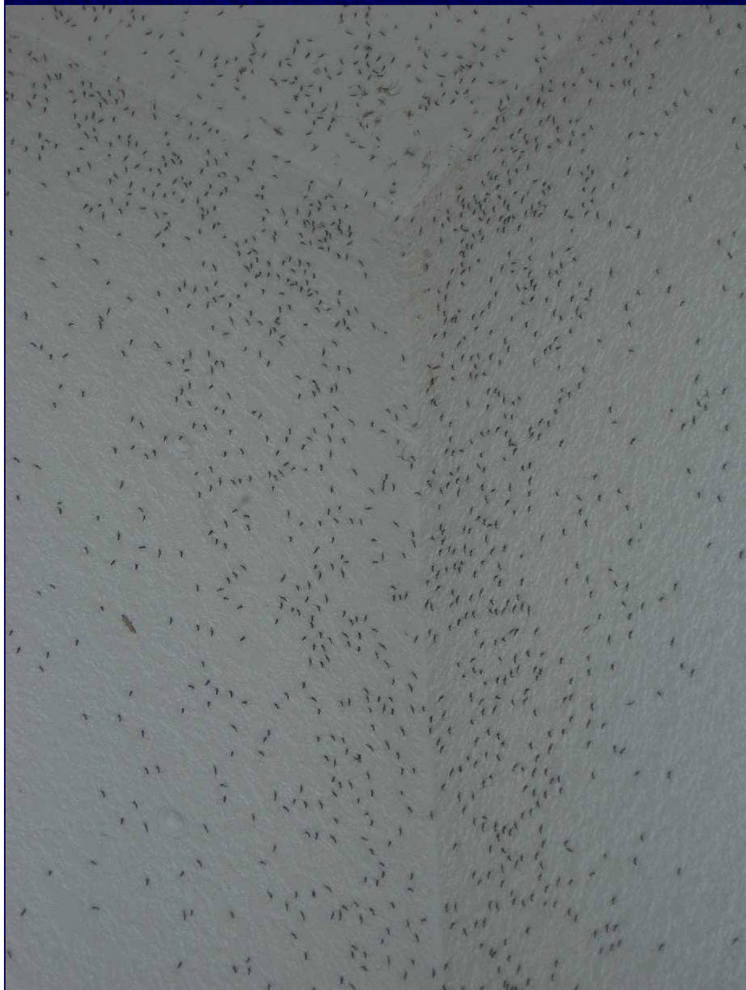


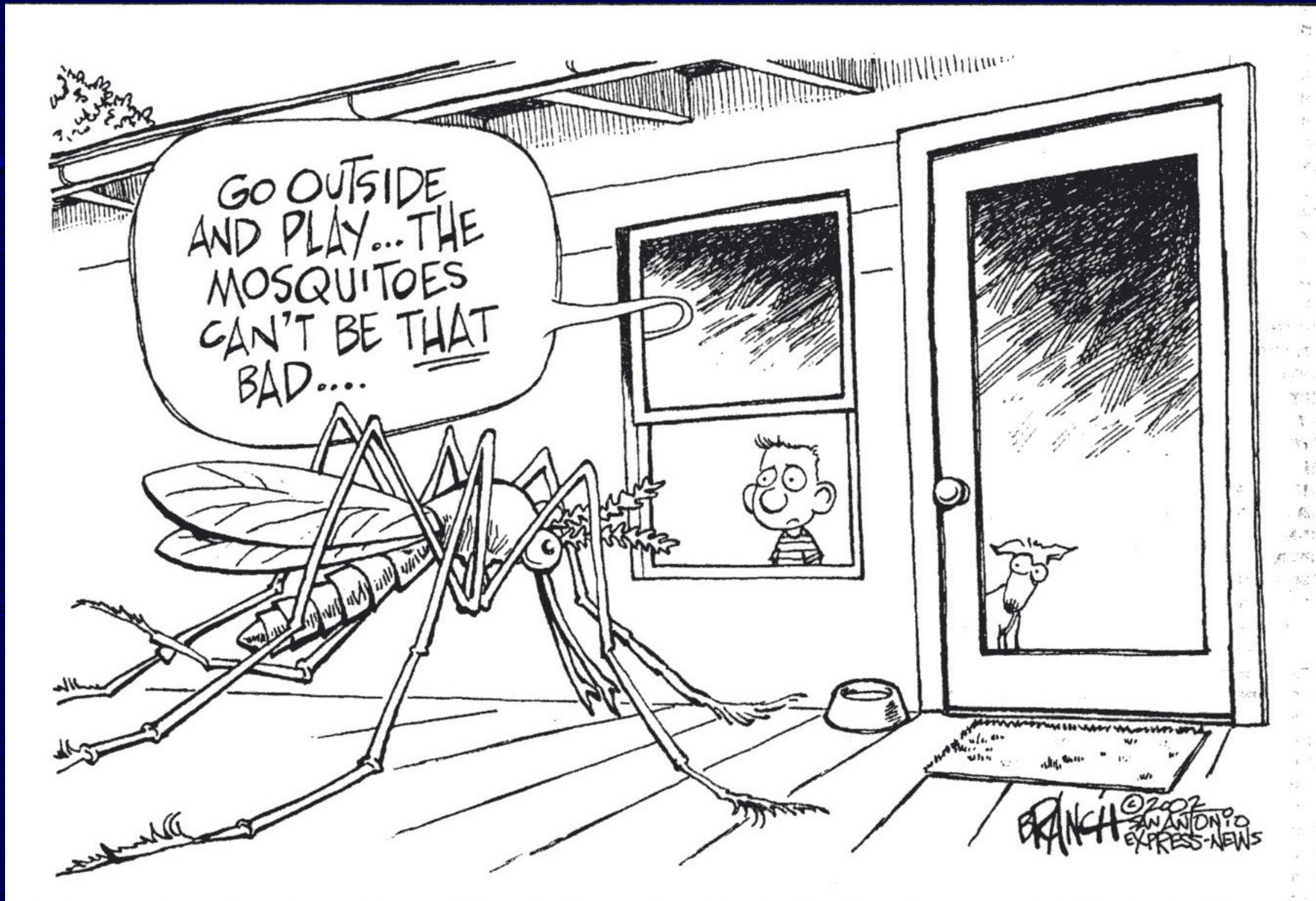
MANATEE COUNTY MOSQUITO CONTROL DISTRICT
WEEKLY TRAP RESULTS (CDC LIGHT TRAP + 3 LBS DRY ICE)

AVERAGE COLLECTION FOR SPECIFIC TRAP SITE (SINCE 1996)

THIS WEEKS' TRAP COLLECTION

Ochlerotatus spp.
Psorophora spp.
Mansonia spp.
Culex spp.
Anopheles spp.




GO OUTSIDE AND PLAY... THE MOSQUITOES CAN'T BE THAT BAD....
BRANCH ©2002 SAN ANTONIO EXPRESS-NEWS

Other Observations for Discussion

- **Why such "low" numbers of human cases of WN in Florida with such high populations of the principal vector (?), *Culex nigripalpus* and high conversion rates in sentinel chicken flocks (Manatee County: 49/66 in 2002, 61/72 in 2003, 41/78 in 2005 – low numbers, 8/72, in 2004 "Hurricane Year", and only 1/78 this year)**
- **Relatively "poor" vector**
- **Low MIR**
- **"Sneaky" nighttime biter, usually not that aggressive (although behavior changes late in summer)**
- **Would like to boast that our control measures are also a major reason**
- **More likely preponderance of nuisance species keep humans indoors during high risk periods**

Proactive versus Reactive Sprays

- Health Department's response plans based on human cases
- But delaying response until first confirmed human case usually too late to prevent further human cases
- Response should be based on "earliest warning" (be it dead birds, +ve mosquito pools, sentinel chickens, veterinary cases, etc)
- But mosquito populations (based on standard surveillance techniques for nuisance species) may be very low… (Ask Louisiana!)
- Are we willing to conduct aggressive control measures to include wide area adulticiding…
- And is are constituent public willing to accept our reasoning?


ANY QUESTIONS?