

ENVIRONMENTAL & COMPLIANCE DEPARTMENT

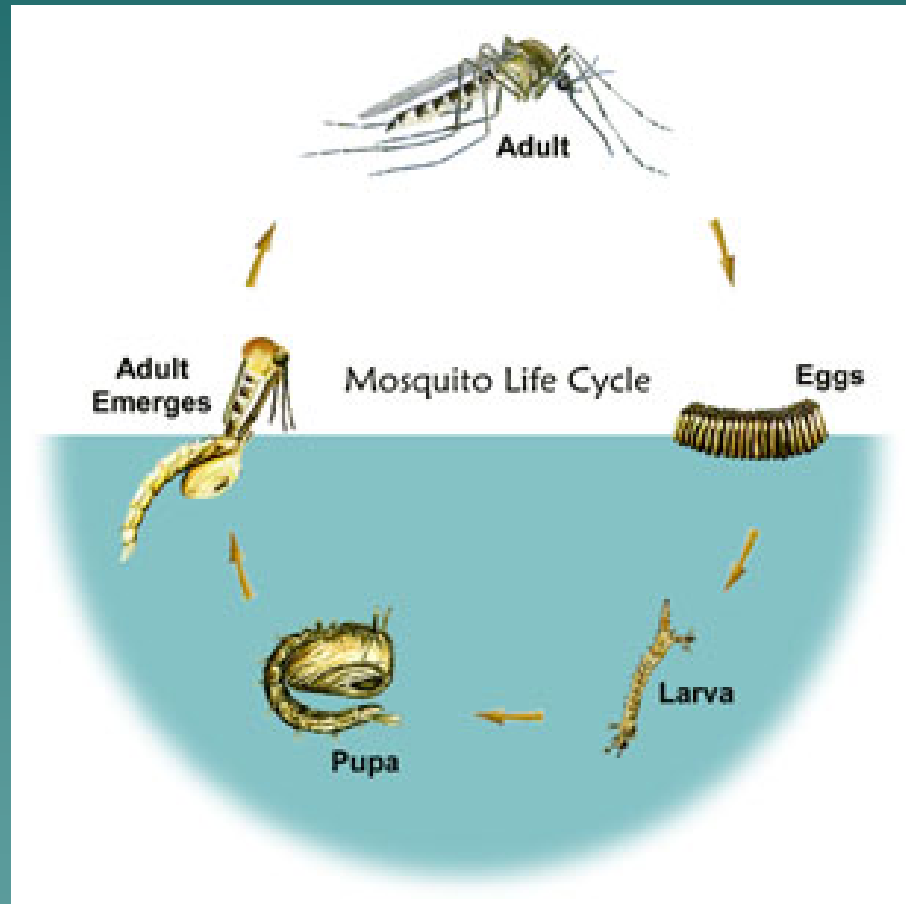


Mosquito Control Division

Richard Smith, Superintendent

Larviciding Techniques for Underground Storm Drains

Mosquito metamorphosis



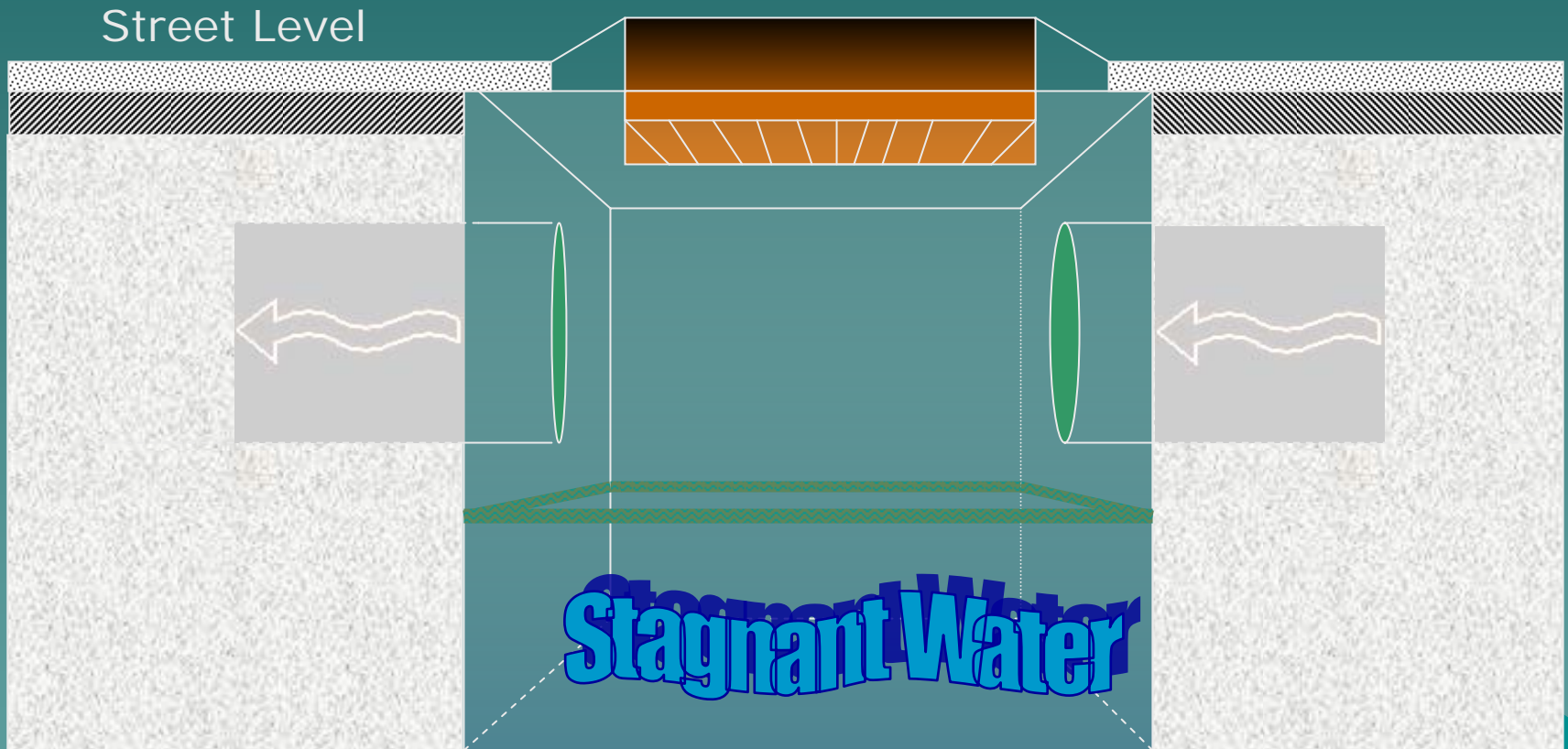
Storm drains provide safe solution to roadside drainage



A Mosquito Fortress

- ◆ Permanent structure
- ◆ Insulated from temperature extremes
- ◆ Access is limited
- ◆ Humid
- ◆ Resting place for adults
- ◆ Water for ovipositing adults
- ◆ Few predators
- ◆ No wind or wave action

Catch Basin Design



Inflows: Rain...



Heat Pump Discharge...



Irrigation Runoff...



Organic Debris...



Nutrients



Aerobic Decomposition

- ◆ Vegetation enters through grates & pipes
- ◆ Septic inflow
- ◆ Fertilizer runoff
- ◆ Grass clippings
- ◆ Domestic activities
- ◆ Organic digestion

Nutrient Soup



Stable Temperature

- ◆ Underground
- ◆ Cool during day
- ◆ Warm during winter
- ◆ Humid

Isolation = Safety

- ◆ Absence of predators
 - No minnows,
 - Tadpoles, or
 - Copepods
- ◆ Drought-resistant permanent water habitat
- ◆ Perfect soup for *Culex spp.* mosquitoes

Ubiquitous

- ◆ They're everywhere
 - Urban
 - Suburban
 - Established neighborhoods
 - New developments
 - Open ditch intersections
 - Industrial yards
 - Parking lots



Filter Systems



Drain Guard Filter



FloGard Filtration
Basket

VacStar Vacuum Truck



Larvicide Products

- ◆ Oils and Surface Films
 - Arosurf, Agnique, GB1111, Bonide, etc.
- ◆ BTI
- ◆ *B. sphaericus*
- ◆ IGRs (Methoprene, S-meth.)
- ◆ Temephos (Abate, Provect)
- ◆ Ultrasound (LarvaSonic)



Delivery Systems

- ◆ Sprayer
- ◆ Pre-packaged doses
- ◆ Hand application
- ◆ Granule dispenser



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Jeep Wrangler

- ◆ RHD conversion by Leisure Equipment Inc., Parker Ford, PA
- ◆ Options available
- ◆ Chrysler warranties Jeep
- ◆ 3-yr. warranty on Leisure equipment
- ◆ "Factory" RHD
- ◆ Added bumper cradle
- ◆ Safari door for driver comfort

Dry Larviciding by Hand



Curbside Larviciding w/ Oil



Mammoth Task

- ◆ More than 60,000 basins cataloged
- ◆ 20-volume library of route sheets
- ◆ Simple step-by-step instructions
- ◆ Use mechanical counters to tally
- ◆ Inspect first, then treat
- ◆ 45,000+ treated in 2007

Considerations to Leverage Capability

- ◆ Larvicide at night
- ◆ Temperature slightly cooler after sunset
- ◆ Less traffic on the roads
- ◆ Provides alternative work for the night shift during drought and low service requests

Downlighting



Downlighting



Downlighting



Comments from Staff

Benefits

- ◆ Driver can see upcoming basins
- ◆ Lighting illuminates basins well
- ◆ Driver sees adult mosquitoes inside basins
- ◆ Jeep is highly visible to traffic

Concerns

- ◆ Too bright, interferes w/ night vision
- ◆ Left turns at night into blind side
- ◆ Tx. restricted to curbside basins at night (no off-set basins)
- ◆ Driver could not read route sheet
- ◆ Parked cars

Conclusion

- ◆ Overall, we're happy with Jeeps
- ◆ Nimble, rugged vehicle for a specialized task
- ◆ As outfitted, the Jeeps satisfy most traffic safety concerns and larvicides
- ◆ Continue experimenting w/ night larviciding
- ◆ Will address concerns raised by staff

Thank You!



Miscellaneous Photos



Debris clogged basins



Open chute basin w/ manway



Grate Lifter



A Basin “Catch”



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Bottle Bioassay Experiment

Testing Laboratory Resistance of
Culex quinquefasciatus to Dibrom

Objective

- Dibrom has been applied by aircraft for 30+ years in Duval Co.
- *Culex quinq.* is a vector species
- Evidence suggests that aerial adulticiding is not efficacious in controlling *Culex* in Jacksonville
- Is there any significant resistance by wild *Culex quinquefasciatus* to Dibrom?
- Perform a Bottle Bioassay to test for resistance

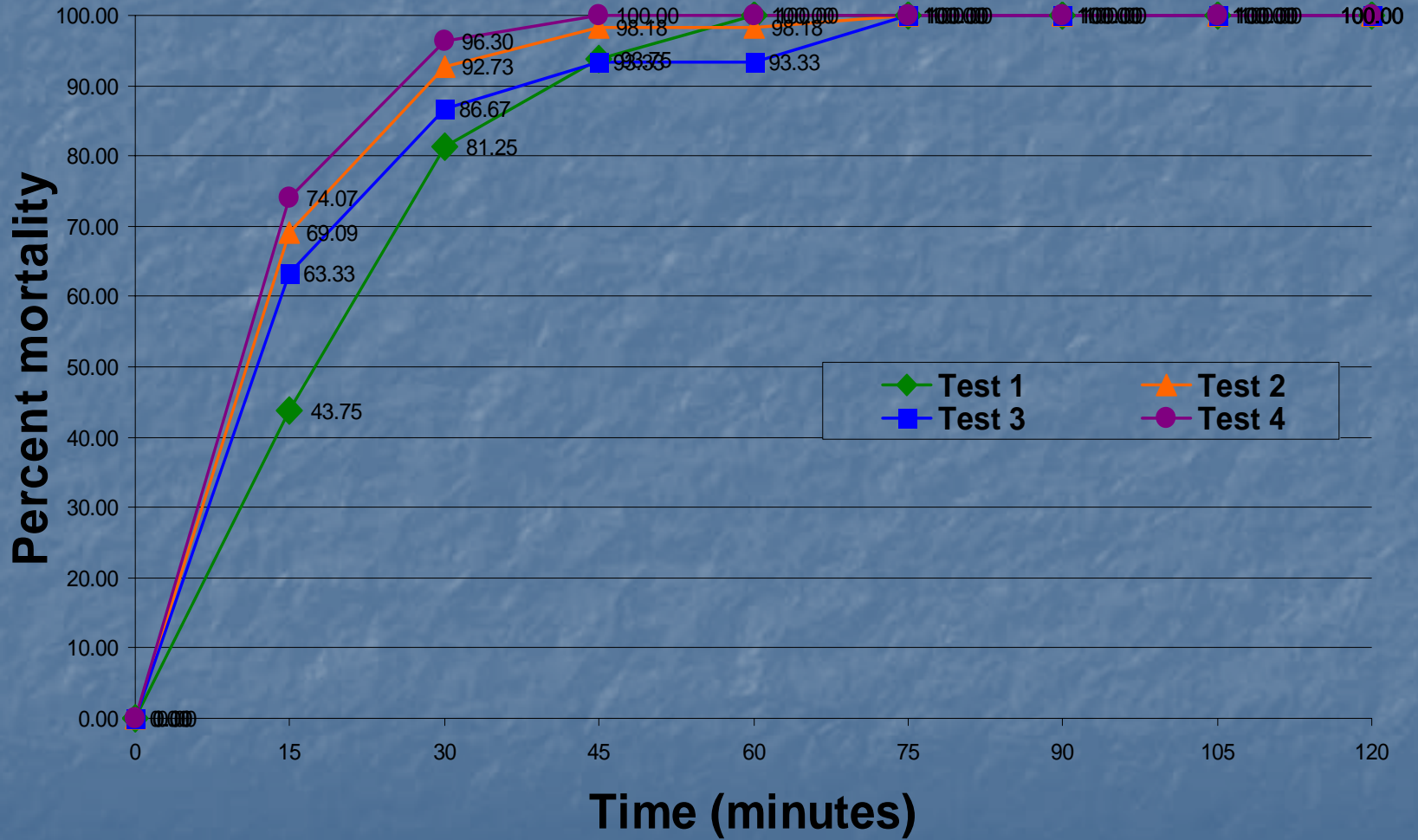
Procedure

- Review Dr. Petersen's protocol
 - www.pherec.org/memoranda/procedure/html
- Obtain supplies, prepare workspace
- Collect and rear *Cx. quinq.* larvae
- Proceed with experiment (four replicates)
- Record observations on data sheets
- Clean up
- Analyze results

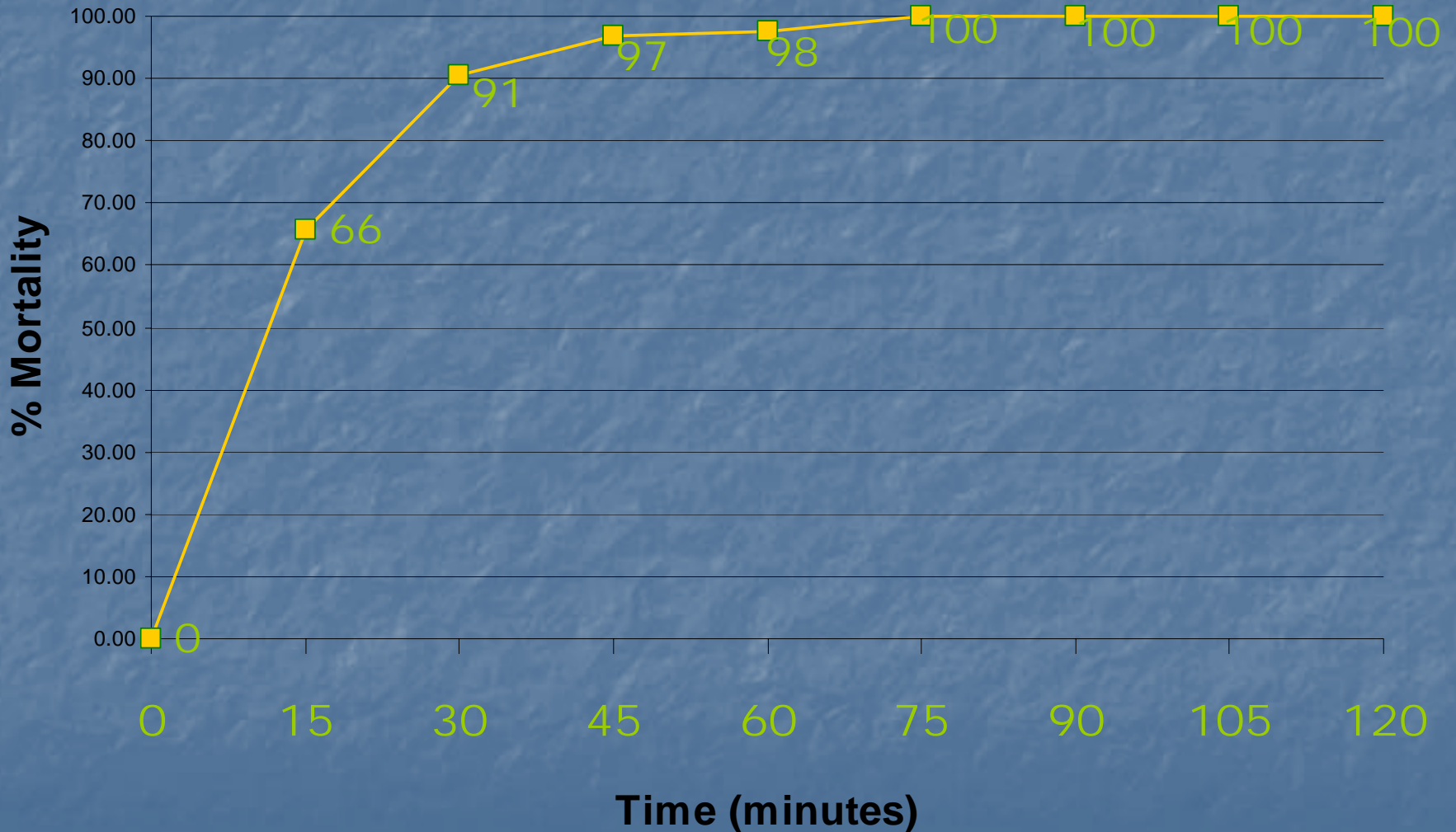
Results

- Good response curve
- Little variation
- > 60% mortality in 15 minutes on average
- >90% mortality in 30 minutes
- 100% mortality in 75 minutes

Mortality Curves of *Cx pip quinque* to Dibrom Jacksonville, FL, May 9, 2007



Average Mortality Curve of *Cx pip quinque* to 25 μ g Dibrom, Jacksonville, FL



Conclusion

- *Culex quinquefasciatus* displayed uniform susceptibility to Dibrom concentrate.

Note

- Resistance test results do not correlate with label dosage (200x normal dose)
- Results indicate resistance only
- Lethal Dose Probit developed from serial dosage concentrates is necessary to infer dosage response

Discussion

- These results are the first in a series of in-house tests planned for Jacksonville
- Tests of other species and insecticides may follow, for example *Ae. albopictus* and permethrin.

Next Question

- Bottle Bioassay answers the question of resistance
- What causes subpar results from aerial applications in Jacksonville?
 - Mosquito behavior minimizes vulnerability
 - Weather (humidity, wind, temp., etc.)
 - Mission timing
 - Aerosol equipment, technique, dosage

Epilogue

Bottle Bioassay is a useful scientific tool for management to evaluate mosquito control quality

Highly recommended to assess mosquito resistance in your area

Thank you!

