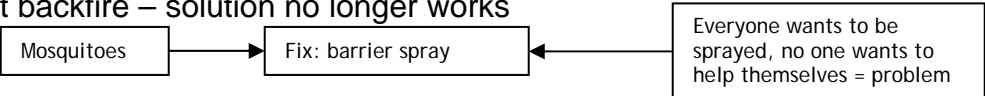


MAMCA 2007 – Feb 20-22

DAY 1:

- 1) Keynote – Mosquitoes, Survivors, and a Lot of Luck, L A Williams
 - a) History of Arthropod-Borne Diseases in North America
 - i) Impacts of disease on the state of South Carolina
 - ii) Mosquito control has been essential to development
 - b) Mosquito-borne diseases still a threat today
 - c) Failures do occur
 - i) Bad management
 - ii) Poor practices
 - iii) Insufficient science
 - d) Federal Programs
 - i) 1960s – *Aedes aegypti* eradication program
 - ii) Malaria eradication
 - (1) Started with the military
 - (2) Expanded to CDC
 - e) Military training for mosquito control
 - f) Prevention is the key!
 - g) Need to keep an eye on public policy
 - h) Army Corp of Engineers – 1970s
 - i) Dredge disposal sites breed salt-marsh mosquitoes
 - ii) Army Corp took no responsibility to mosquito problems caused by this practice
 - iii) Change in policy needed – lots of hard work by many agencies and people
 - iv) Army Corp now
 - (1) Accepts some responsibility to mosquito control in disposal sites
 - (2) Are more careful when disposing of dredged material
 - i) *Aedes albopictus* – 1980s
 - i) Tire breeder
 - ii) Increased mosquito problems in areas where no mosquito problems had existed
 - iii) Big tire problem in state
 - iv) Created legislation to deal with problem
 - (1) SC Tire Dealers Association
 - (2) County associations
 - (3) Environmental activists
 - (4) Public Health
 - (5) Environmental Health
 - (6) Mosquito control
 - v) Took legislation to the politicians
 - (1) \$2 fee
 - (2) Got introduced a year later with a larger bill & passed
 - (3) Mosquito control got no funds from the bill
 - (4) Tire problem was reduced
 - j) Hurricanes – 1989 (Hugo)

- i) A lot of damage
- ii) CDC & FEMA involvement
- iii) Aerial application required
 - (1) Linemen could not fix lines
 - (2) People could not live and work in area
 - (3) Worry for possibility of disease
- iv) Policy change occurred
- v) Issues with special interest groups
- vi) Issues in dealing with people who are in both official and unofficial capacities
- vii) Health & well-being of citizens of primary importance
- viii) BE PREPARED in advance
- k) Mosquito control has shaped, and continues to shape, South Carolina
- 2) The AMCA in 2006 – 2007, Joe Sanzone
 - a) Volunteers are the backbone of the AMCA
 - b) Mission – leadership, education, information
 - i) Leadership – impact policy at a national level
 - (1) Clean Water Act/NPDES permits
 - (a) Application of pesticides consistent with FIFRA requirements do not require NPDES permits to control larvae or adults as long as control is being applied according to the label
 - (b) May still be changes down-the-line
 - (2) FEMA
 - (a) Simplified expense recovery
 - (b) Somewhat restrictive
 - (c) Still needs work
 - (3) Re-registration eligibility decisions
 - (a) Need application of appropriate modeling
 - (b) Assessment of impact to health and environment
 - (4) Fish & Wildlife Service policy
 - (5) DDT for Indoor Residual Spraying
 - (a) International concerns
 - (b) Supported by AMCA & CDC
 - (c) USAID and WHO have revised malaria control programs
 - (d) Controversial, but people are dying of malaria who have no other options
 - (6) Misting systems
 - (a) NO NO NO
 - (b) No support as the systems are currently configured
 - (c) EPA website addressing these systems is being developed
 - (7) EPA Pesticide Program Dialogue Committee (PPDC)
 - (a) Joe Conlon, technical advisor
 - (b) Creation of White Papers to drive policy
 - (8) Risk Assessments
 - (9) Intellectual Property Protection – registering name
 - (10) Legislative & Regulatory Affairs
 - (a) AMCA Day

- (b) Joe Conlon attends meetings
 - (c) Monthly e-newsletter
 - ii) Education & Information
 - (1) AMCA web page www.mosquito.org
 - (2) WingBeats
 - (3) Journal
 - (4) Annual Conference
 - (a) 2007 – Orlando
 - (b) April 1-5
 - (5) Various committees
 - c) Highest standards in mosquito control
 - i) Good science
 - ii) Best practices
 - iii) IPM approach
 - d) Participant in EPA PESP program
- 3) Systems Thinking in Mosquito-Borne Disease Prevention, Patricia Ferrao
 - a) Definition
 - i) Understand reality
 - ii) Emphasize relationships
 - b) Tools
 - i) Causal loop diagrams
 - (1) Visualize basic mechanisms
 - (2) Mosquito-borne disease system
 - (3) Helps to determine limiting forces
 - ii) Archetypes
 - (1) Behaviors
 - (2) Relationships between program and influencing forces
 - (3) Types
 - (a) Fixes that backfire – solution no longer works
 - (b) Example:
 

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graph LR
    A[Mosquitoes] --> B[Fix: barrier spray]
    B --> C[Everyone wants to be sprayed, no one wants to help themselves = problem]
    C --> A
          
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 - (c) Shifting the burden
 - (d) Limited resources
 - (e) Accidental adversaries
 - i) Points to a need for education and cooperation
 - c) Computer modeling
 - i) Mapping and modeling forces of change
 - ii) Overcome policy resistance
 - iii) Look for triggers
 - iv) Software - iThink
 - d) Need to understand systems and interrelationships
- 4) Catch Basin Treatment in Savannah Georgia, Heather Ferguson
 - a) Initiated stormwater/catch basin treatments in 2003
 - b) WNV hot zone
 - i) 23.5 square miles in downtown Savannah
 - ii) 8500 stormwater drains

- c) Mosquito activity
 - i) 39 species
 - ii) 2 species found in storm drains
 - (1) *Aedes albopictus*
 - (2) *Cx quinquefasciatus*
 - iii) Very active breeding sites
- d) Treatment strategies
 - i) >30 days to finish treatment by hand
 - ii) 2004 – mozzies
 - (1) 250 days
 - (2) 2 employees
 - (3) 100-150 basins treated per team per day
 - iii) Scooters
 - (1) TGB Adventure 101S
 - (2) ~30 MPH
 - (3) ~70 miles per gallon
 - (4) No license needed
 - (5) Did training and practice before buying
 - (6) Motorcycle Safety Training program
 - iv) 2005 – first used scooters
 - (1) Altosid pellets using funnel & hose
 - (2) Switched to WSP
 - (3) Could treat 300-350 stormdrains per operator per day
 - v) 2006
 - (1) Switched to *B sphaericus* WSP
 - (2) Resistance deterrent
 - (3) Will switch each year
- e) Work in pairs
 - i) 5 scooters
 - ii) 2 teams per day
 - iii) 4 operators
- f) Treat high traffic areas very early morning
- g) Goal – reduce ground adulticiding
- 5) Arboviruses of Public Health Importance, Roger Nasci
 - a) There are a lot of arboviruses in the US
 - i) Many families
 - ii) Many viruses within the families
 - iii) Some common, some rare
 - iv) Very few cause public health problems
 - b) 1793-1905, YF
 - i) Lots of yellow fever
 - ii) Many deaths
 - iii) Now rarely seen
 - c) Dengue
 - i) Distributed worldwide
 - ii) Sporadic cases seen in US

- d) Primary viruses affecting US today
 - i) EEE
 - (1) ~50% symptomatic people die
 - (2) survivors generally have severe sequelae
 - (3) potential for epidemic transmission
 - (4) 1964-2005
 - (a) Human cases reported from 20 states
 - (b) Primarily coastal
 - (c) Alphavirus
 - (d) Restricted to freshwater hardwood swamps
 - (e) Epizootic vector – *Cs melanura*
 - (f) Variety of bridge vectors – depends on overlap
 - (g) Average 5 cases per year
 - (h) Range: 0-21
 - ii) WNV
 - (1) Since 1999
 - (a) WNF: 13,921 cases
 - (b) WNND: 9786
 - (c) Total: 23707
 - (d) Deaths: 928
 - (e) Epidemiologically,
 - (i) 205,506 symptomatic cases in US
 - (ii) 1.46 million cases projected
 - (f) WNF cases are not insignificant
 - (2) Human cases reported from 46 states
 - (3) Birds
 - (a) > 300 species killed
 - (b) ecological impact
 - (4) Various vectors involved depending on location
 - (a) 175 species total in US
 - (b) 61 found carrying WNV
 - (c) evidence of pervasiveness of virus
 - (5) 2003 – largest US arboviral epidemic to date
 - (6) Average ~3000 cases per year
 - (a) Neuroinvasive disease averages ~1200 cases per year
 - (b) Only capture neuroinvasive disease in other viruses
 - (c) Latent infections with recrudescence????
 - (d) Immunity – probably immune for life, includes asymptomatic cases
 - iii) WEE
 - (1) *Cx tarsalis* involved
 - (2) # cases has dropped to zero
 - iv) SLE
 - (1) 111 cases per year
 - (2) range: 2-1967 (1975)
 - v) LAC
 - (1) Hardwood forests

- (2) mosquitoes
 - (a) *Oc triseriatus*
 - (b) *Oc canadensis*
 - (c) *Ae albopictus*
- (3) ~80 cases per year
- (4) range: 29-167
- (5) CFR low ~1%
- (6) Short-term sequelae
 - (a) Will resolve
 - (b) Can lead to learning difficulties
- (7) Repeat infections
- (8) Need to define areas
- e) Differences between these and past outbreaks
 - i) Arboviral zoonoses
 - ii) Many vectors can be involved
- f) What about the money
 - i) Joint resolution FY07 – restored budget to FY06 levels
 - ii) Did not come with mark-up language
 - iii) Money has come in a lump and is subject to reprogramming
 - iv) WNV funding is still apt for cutting
 - v) May still see the 50% cut at state level
- g) WNV risk reduction
 - i) Surveillance
 - ii) IPM mosquito control
 - iii) Personal protection
- 6) Vendor presentations
 - a) AMVAC
 - i) Dibrom and Trumpet labels submitted to EPA
 - (1) Changes
 - (a) Record keeping
 - (b) Droplet range
 - (2) Retreatment issues
 - (3) Hurricane stipulations
 - (4) Disease stipulations
 - ii) Testing a new valve on returnable drums
 - b) Dynamic Aviation
 - i) Own 140 aircraft
 - (1) 10 outfitted for aerial application
 - (2) Twin-turbine Beechcraft King Air 90
 - (3) FAA dump exception
 - ii) Headquarters – Bridgewater VA
 - iii) 10,000-20,000 acres per hour per aircraft
 - iv) Partner with Clarke Mosquito Control
 - v) Use Flight Master system
 - c) Valent BioScience
 - d) Univar USA

- i) Adulticides
 - (1) Natural & synthetic pyrethroids –
 - (2) ULV & thermal fogging
- ii) Larvicides
 - (1) Bti (Valent)
 - (2) Altosid
- iii) Equipment
 - (1) London Fog
 - (2) Curtis DynaFog
- e) B2E Biotech
 - i) New to mosquito control market
 - (1) 10 year project
 - (2) Shipping this April
 - ii) S-Methoprene
 - iii) Product name: Aquaprene
 - iv) 8 formulations, including pre-hatch formulations
 - v) Single brood and residual formulations
- f) Adapco
 - i) New backing
 - ii) Some reorganization occurring
- g) Summit Chemical
 - i) Complete line of pest control products
 - ii) Mosquito control
 - (1) Mosquito dunks
 - (2) Bti briquettes
 - (3) Many others
- h) Williamsburg Air Service
 - i) Aerial application
 - ii) Both adulticiding and larviciding
- i) True North Mapping
 - i) Custom PDA field applications
 - ii) Optimizes record keeping
 - iii) Customized for specific need
- j) Clarke Mosquito Control
- k) Bayer Environmental Science
 - i) 30 years ago – AquaReslin
 - ii) Water-based products
 - iii) Will be introducing new technology in the next couple of years
 - iv) Work with Adapco
- l) Central Life Sciences (Wellmark Zoecon) - altosid
- m) B&G Chemicals & Equipment (bgchem.com)
 - i) New product – Universal Mobile Computing PDA
 - (1) Works with GIS & PC
 - (2) Customizable
 - ii) Various new control products
 - iii) Changes to equipment - ~200 models

iv) All-terrain vehicle (LandTamer)

DAY 2:

1) Larviciding Techniques in Dare County NC – Tim McGonegal

- a) Intensive, but well worth it
 - i) Concentrated kill
 - ii) Residuals cut down on labor
 - iii) Better for environment
 - iv) Can be done no matter the weather
 - v) Usually cheaper, but manpower needed
- b) Need a larval survey
 - i) Where the problem lies
 - ii) What species
 - iii) When is hatch off
 - iv) Better coordination with spray trucks
- c) Dare County
 - i) 383 total square miles
 - ii) 96 sq miles to treat
 - iii) 34000 permanent residents – 200000+ in summer
 - iv) all types of habitat
- d) No larviciding program previously
- e) How to start
 - i) Survey in early spring
 - ii) Developed maps
 - (1) Paper
 - (2) GIS
 - iii) Put out a call to the public
 - (1) Newspaper
 - (2) Radio
 - (3) TV
 - iv) ID breeding sites
- f) Carry a variety of products
 - i) Area
 - ii) Species
- g) Timing is important – wait 24 hrs
 - i) Emergence
 - ii) Evaporation
 - iii) Upcoming weather
- h) Occasionally double-check
 - i) Take baby steps – start small and work up
- j) Budget - ~\$500,000
- k) Chemical - ~\$200,000
- l) Employees
 - i) 2 full-time
 - ii) 2-4 seasonal
 - iii) Ditch crew

- iv) Yard, woodland, pool, etc crew
 - m) Need the right equipment
 - n) Winter projects – source reduction
 - i) Ditch cleaning
 - ii) Property container searches
 - o) timm@darenc.com
- 2) Hurricanes, Floods, and Mosquitoes: Public Health Risks and Responses – Roger Nasci
- a) Normal control
 - i) IPM
 - ii) Source reduction
 - iii) Larvicides
 - iv) Adulticides
 - b) Emergency control
 - i) Need immediate relief
 - ii) Adulticiding generally needed
 - c) Arboviruses of public health importance
 - i) EEE
 - ii) WNV
 - iii) WEE
 - iv) LAC
 - v) SLE
 - d) Need to understand systems in order to make the correct control decisions
 - i) Aging mosquitoes provide highest risk of disease
 - ii) Timing of control is crucial
 - e) Problems after a disaster
 - i) Substandard housing
 - ii) Many people working outdoors
 - f) Disaster scenarios
 - i) Epidemic arbovirus transmission in area preceding disaster – disease increase
 - ii) Enzootic arbovirus transmission in disaster area – epidemic occurs
 - iii) Mosquito density increases following disaster
 - g) What happens
 - i) # Breeding sites increase
 - ii) Mosquito populations explode
 - (1) Many are nuisance species
 - (2) Virus transmission usually decreases or disappears
 - iii) Zoonotic arbovirus outbreaks are relatively rare and usually focal
 - iv) Disaster events are ecologically disruptive
 - v) Disaster area not conducive to arboviral transmission
 - vi) No evidence of disease increase following a disaster in the disaster area
 - vii) Surrounding areas may be different – needs to be determined
 - viii) Surveillance/control
 - (1) No disease risk seen
 - (2) Mosquito densities very high

- (3) Control needed to keep mosquito population from aging
 - (a) Control resulted in as much as 92% reduction
 - (b) Landing rates dropped from >200/minute to <1
 - (c) Took about 2 weeks to achieve pre-spray mosquito densities
 - h) Summary
 - i) Natural disasters increase mosquito densities
 - ii) Long-term impacts may occur
 - iii) National response capacity is able to quickly reduce mosquito population
 - iv) Disease potential not realized
 - (1) People left area
 - (2) Good control
 - (3) Other reasons
 - i) Preparedness
 - i) Need good surveillance
 - ii) Need to maintain an awareness of mosquitoes and vector-borne diseases
 - iii) PRE-EMERGENCY PLANNING IS VITAL
 - (1) Define nature of problem
 - (2) Continuity of operations plan
 - (a) Command and control
 - (b) Security of assets
 - (c) Emergency resources
 - (d) Emergency funding
 - (3) Communications
 - (a) Important contacts
 - (b) Mechanics – how can it be achieved
 - (4) Training and practice – interface with Incident Command System
 - j) Nasci & Moore, Emerging Infectious Diseases 4:333-34, 1998
- 3) Public Education Program in Brunswick County – Jeff Brown
 - a) 19 municipalities
 - i) 11 have programs
 - ii) 8 do not
 - b) Interagency cooperation is vital
 - c) Brochure template
 - i) Get brochure from state
 - ii) Add agency info
 - iii) Also have a mailing insert
 - d) Need continuity of message
 - e) Municipalities are responsible for copying and distributing
 - f) Placement
 - i) Libraries
 - ii) Carry brochures in truck
 - iii) Government Complex
 - g) Use service requests as an educational opportunity
 - h) Need mosquito population data
 - i) Individual complaint investigations
 - i) Typical – 200 citizen requests per year

- ii) Can more than quadruple during a hurricane year
 - j) Bti donuts provided to municipalities, property owner associations, and the general public for home use
 - i) Provide use education
 - ii) Also carry in trucks
 - iii) Crew larvicide spoil sites, etc
 - k) Take all public education opportunities – tailor to need/group
 - i) Meeting
 - ii) County activities
 - iii) Fairs
 - iv) Property owner associations
 - v) Civic groups
 - vi) Media – know their characteristics and spin
 - (1) Newspapers
 - (2) Radio
 - (3) TV
 - vii) Internet –
 - www.brunswickcountync.gov/Departments/MosquitoControl/tabid/423/Default.aspx
 - (1) Access to real-time data useful
 - (a) Mosquito info
 - (b) Yearly/weekly distribution (column-area graph)
 - (i) Tab for each year
 - (ii) Update data every week
 - (iii) New Jersey traps
 - (2) Lots of educational opportunity
 - (3) Contact info
 - (4) Management programs
 - viii) Schools programs
 - ix) Inter-municipal training programs
- 4) Vertical Obstructions: A Challenge for Mosquito Control Pilots – Greg Hunt
 - a) History
 - i) 1956-1986: contracted pilots for adult control
 - ii) 1986-present: BCMC – Beaufort County helicopters and pilots
 - b) Current program
 - i) Fixed wing
 - (1) Larviciding
 - (2) Adulticiding
 - ii) Helicopter
 - (1) Survey
 - (2) Larviciding
 - (3) will use for urban adulticiding
 - c) Too many aerial towers and guidewires
 - i) Many go up overnight
 - ii) Permits were not required
 - iii) Many are dark in color

- iv) Many are unlit
- v) Many are located in wooded areas
- d) Did a comprehensive survey
 - i) VOs >100 ft
 - (1) Total 199
 - (2) Not including military installations
 - ii) VOs 150-200 ft
 - (1) 5 municipalities - 25
 - (2) Unincorporated areas - 26
- e) Lighted Tower Ordinance
 - i) Meetings (all invited)
 - ii) Planning Commission (11 members)
 - iii) Land Management Committee
 - iv) County Council (3 readings)
- f) Lots of misinformation
- g) Several other counties and parishes have these ordinances
- h) Ordinance is supported by Verizon
- i) Support from military
- j) Compromises
 - i) No strobe lights – use reflective tape
 - (1) Need to fly at night
 - (2) Need lights on plane
 - ii) Raise minimal height from 100 ft to 150 ft
 - iii) Exempt old/existing towers
- k) Approved Jan 8, 2007 (took 2.5 years)
 - i) Must justify putting up tower
 - ii) Strobe lights on all structures over 150 ft
 - iii) All new towers must have strobes
 - iv) Abandoned structures must be removed after 60 days
- l) Media were helpful
- m) Have the facts and use only the facts
- 5) The Coming Storm – Rosmarie Kelly
- 6) Entomological and Small Mammal Studies Following a LaCrosse Outbreak in North Carolina in 2005 – Brian Byrd
 - a) Economic and social impacts
 - i) Lifelong sequelae - >\$3 million over a lifetime
 - ii) Medical costs – average \$33,000
 - iii) Definite social and family impact
 - b) Primary vector – *Ochlerotatus triseriatus*
 - i) Treeholes
 - ii) Artificial containers
 - iii) Tires
 - c) Implicated vectors
 - i) *Aedes albopictus*
 - ii) *Oc japonicus*
 - d) Transmission strategies

- i) Zoonotic: normal host – small mammals
 - ii) Transovarial transmission (*Oc triseriatus*)
- e) Hughes et al. Comparative potential... J Med Entomol. 2006. 43(4): 757-61
- f) Number of reported LAC cases is on the rise
 - i) Under-reported
 - ii) More people living in endemic areas
- g) Study
 - i) Mosquito collection
 - (1) 4 methods used
 - (2) Landing-mouth aspiration (LMA) worked well for all three species
 - (3) Collected over 10 days
 - (4) 89% collected were *Oc japonicus* and *Ae albopictus*
 - (5) Low numbers of *Oc triseriatus* collected
 - (6) LMA collected mosquitoes all day
 - (7) All tested
 - ii) Small mammal collection
 - (1) Focused at three residence
 - (2) Needed special considerations due to white squirrel populations
 - (3) Sciurid collection
 - (a) 6 chipmunks – 1 LAC+
 - (b) 13 eastern gray squirrels – 3 LAC+
 - iii) Family data
 - (1) Lack of information
 - (2) Lack of medical follow-up
 - (3) Lack of county/state response
 - iv) Deliver the Dream Retreat, March 2006
 - (1) For families of ill children
 - (2) Asked for education about problem
- h) Question – do all 3 mosquito species feed on small mammals
 - i) *Oc japonicus* will feed on hamsters in the lab
 - ii) All typed bloodmeals from *Oc japonicus* have been from large mammals
 - iii) Other two species do feed on small mammals
- i) Question – mosquito competition from invasive species
- 7) STARI: Southern Tick-Associated Rash Illness – Dr William Simpson
 - a) Lyme Disease
 - i) Leading vector-borne disease in US
 - (1) Caused by *Borrelia burgdorferi*
 - (2) ~12,000 cases per years
 - (3) First described in 1975
 - ii) Carried by *Ixodes scapularis* – primarily the nymphal stage, also adults
 - iii) Distribution heaviest in New England, Middle Atlantic, and Midwest
 - iv) Peak season – spring, summer
 - v) Incubation period 3-10 days
 - vi) Illness
 - (1) Fatality rate low (if ever)
 - (2) Asymptomatic cases common

- (3) Chronic infection controversial
- (4) Targeted organs
 - (a) CNS
 - (b) Cardiac
 - (c) Synovial
- (5) Diagnosis
 - (a) History and physical
 - (b) ELISA
 - (c) Western blot
- (6) Erythema migrans
 - (a) 60-70% cases have this
 - (b) >5 cm
 - (c) At site of bite
 - (d) May be multiple
 - (e) "bull's eye" with clear center usual
 - (f) Expands
 - (g) Can be confused with allergic reaction to tick bite
- (7) Therapy
 - (a) Prophylaxis not indicated except in NE and MI
 - (b) Doxycycline 100mg PO BID x 21-30 days
 - (c) Alternatives available
- b) STARI
 - (1) Also has an erythema migrans rash
 - (2) Deer tick feed on reptiles in the south, not on deer or mice
 - (3) Many tick bites in the south are associated with *Amblyomma americanum*
 - (4) Vector likely to be *A americanum* (adult)
 - (5) Etiologic agent – might be *B lonestari*
 - (6) Differences
 - (a) STARI happens earlier in year
 - (b) More likely to recall a tick bite (bigger tick)
 - (c) Bite to lesion time shorter (6 vs 10 days)
 - (d) Less likely to be symptomatic
 - (i) Less likely to be chronic
 - (ii) Fewer CNS symptoms
 - (iii) Less likely to have arthritis
 - (e) Less likely to have multiple EM lesions
 - (f) EM lesions smaller
 - (g) More likely to have central clearing
 - (h) Treatment
 - (i) Same as Lyme
 - (ii) No reported chronic illness
 - (i) CDC STARI study
- c) Other tick-borne diseases
 - i) Babesiosis – does not respond to tetracycline
 - ii) Anaplasmosis
- d) Prevention

- i) Use permethrin on clothing
 - ii) Use DEET-based repellent
 - iii) Wear protective clothing
- e) Attached tick
 - i) Remove correctly
 - ii) Monitor site for 30 days
 - iii) Send the tick for ID/testing if available
- f) Agromedicine Program
 - i) MEDULINE 800-922-5250
 - ii) www.musc.oem.edu
- 8) Barrier Treatments: An Alternate Adulticiding Option – Joe Andrews
 - a) Harborage
 - i) Shade
 - ii) Disperse to after emergence
 - iii) Plant nectars
 - b) Habitat
 - i) “breeding” sites
 - ii) Varied
 - iii) Numerous
 - iv) Species-specific
 - v) Habitats of peak concern
 - (1) Woodland pools/floodplains
 - (2) Catch basins/storm drains
 - (3) Roadside ditches
 - (4) Residences
 - (a) Containers
 - (b) Drainpipes
 - (5) Agriculture
 - c) Types of control
 - i) ULV
 - (1) Micron droplets
 - (2) Small amount of product
 - (3) Work best in:
 - (a) Specific sites
 - (i) Subdivisions
 - (ii) Neighborhoods
 - (iii) Cities/towns
 - (b) Open areas where drift works to advantage
 - (c) No residual
 - (d) Work only when in the air
 - ii) Thermal fogging
 - (1) Old technology put to new use
 - (2) Work best in:
 - (a) Densely vegetated areas
 - (b) Storm water systems
 - (c) Specific sites:

- (i) Woods around ball parks
 - (ii) Natural trails
 - (iii) Camping areas
 - iii) Barrier Treatments
 - (1) Uses products with high residuals
 - (2) Usually applied to foliage and harborage
 - (3) Similar to perimeter control for other insects
 - (4) Proven effective
 - (5) Targets resting areas
 - (6) Works best in:
 - (a) Borders of woods
 - (i) Where people gather
 - (ii) Group homes
 - (iii) Retirement centers
 - (iv) Schools
 - (b) Product applied to:
 - (i) Vegetation
 - (ii) Fence lines
 - (iii) Shaded areas
 - (7) Needs
 - (a) Readily available
 - (b) Inexpensive to apply
 - (c) Long residual
 - (d) Low to no odor
 - (e) Limited skin irritation
 - (f) Limited phytotoxicity
 - (g) Limited staining
 - (8) More label intensive
 - (9) Equipment – backpack sprayer
 - (10) Droplet size larger than for ULV (80-100 μ)
 - (11) Mist leaf surface – coat both sides
 - (12) Apply throughout whole harborage area
- 9) Summary of Arboviral Activity in VA – David Gaines
 - a) Background
 - i) 30+ years of data (1975-2006)
 - ii) Diseases reported
 - (1) EEE – 5 cases
 - (2) LAC – 27 cases
 - (3) SLE – 8 cases
 - (4) WNV – 66 cases (2000–2006)
 - iii) Locations
 - (1) WNV – primarily urban
 - (2) SLE – primarily urban
 - (3) LAC – originally mountain areas but spreading
 - (4) EEE – around Great Dismal Swamp
 - b) WNV

- i) 66 clinical cases
- ii) 7 blood donors
- iii) 4 fatalities
- iv) Many indicators
 - (1) Wild birds
 - (2) Sentinel chickens
 - (3) Equine
 - (4) Mosquito pools
- v) Bird data much less useful since 2003
- vi) Equine data has also dropped off
- vii) Sentinel chickens more useful for EEE
- viii) Mosquito surveillance best indicator
 - (1) Positives are not the best indicator
 - (2) Populations more indicative of a problem
 - (3) *Culex pipiens + restuans*
 - (a) account for the majority of positive pools
 - (b) MIR 2.65
 - (c) MIR in human case areas 3.61
- ix) Using MIRs
 - (1) Look at the first positives
 - (a) Early peaks – earlier the peak the higher the risk
 - (b) Height of early peak
 - (2) MIR for season
- x) Bridge vectors
 - (1) Indicates a lot of transmission is occurring
 - (2) Indicative of high human risk
- c) EEE
 - i) Equine cases are a good indicator of a high risk year
 - ii) May not be predictive of human cases locally
 - iii) Sentinel chickens useful for EEE surveillance
 - iv) Mosquito pools
 - (1) Important to monitor *Cs melanura* populations
 - (2) Seasonality is important
 - (3) High MIRs may not be predictive
- d) Mosquito surveillance is vital to protecting public health!
- 10) State Reports
 - a) PA – Mike Hutchinson
 - i) DEP, Dept of Health, Dept of Ag, counties
 - ii) Testing done at DEP
 - iii) All counties have had WNV detected
 - iv) Mosquitoes
 - (1) Counties and regional biologists
 - (2) Web-based database
 - (3) Bar-coded samples
 - (4) DEP identifies and tests
 - (5) *Cx pipiens* – highest MIRs, then *Cx restuans*

- (6) Targeted species
- (7) Will test other species from positive counties
- v) Dead birds
 - (1) Have been testing just corvids & raptors
 - (2) Not really predictive anymore
 - (3) Opened up to all species in 2006
 - (a) 69 species
 - (b) Most positives were corvids
- vi) Sentinel chickens
 - (1) 16 flocks – 6 birds each
 - (2) Dept of Ag
 - (3) Will cut back to 4 flocks only in urban areas
- vii) Complaints & control
- viii) Black Fly Program (larviciding)
- b) DE – Chris Lesser
 - i) Mosquito control is state-based within Fish and Wildlife
 - ii) Disease
 - (1) No longer do mosquito testing
 - (2) EEE
 - (a) No cases
 - (b) No positives
 - (3) WNV
 - (a) First seen in 2001 – wild birds
 - (b) 2003 – 17 human cases (2 deaths)
 - (c) Declined to zero human and veterinary cases
 - (d) Maintain sentinel chicken flocks
 - iii) Policy
 - (1) Fish & Wildlife Service lands (NWR)
 - (a) Working on handbook for mosquito control
 - (b) Should also work for NPS lands
 - (2) Stormwater management structures
 - (a) Best Practices lead to high mosquito numbers
 - (b) Worked for policy change
 - (c) Water not held for more than 4 days
 - (d) Steep sides
 - (e) No vegetation
 - (3) EPA pesticide models
 - (a) Not realistic to mosquito control
 - (b) Need change
 - iv) Operational
 - (1) Active (successful) open marsh water management program
 - (2) Control
 - (a) 2005 – very dry until June
 - (b) Nor'easter dropped a lot of rain in late June/early July
 - (c) Could not larvicide due to dense canopy
 - (d) Adulticided large areas

- (e) Remained dry until Ernesto came through
- (f) Mostly controlled by larvicide
- (g) Products used:
 - (i) Naled
 - (ii) Bti
 - (iii) Methoprene
 - (iv) Aqualure (permethrin)
- c) MD – Zach Cohen
 - i) Dept of Ag program
 - ii) Community-driven approach
 - iii) 50 years
 - iv) Number of counties/cities involved varies
 - (1) Geography varies
 - (2) Control areas follow topography
 - v) Dry spring in 2006
 - vi) Heavy rain in June – flooding
 - vii) 2006 – mosquito populations lower than normal
 - viii) Risk of mosquito-borne diseases considered reduced
 - (1) Reduced control
 - (2) More complaints
 - (3) 10 human cases on WNV (100% increase from 2005)
 - (4) Continued to test mosquitoes
 - ix) Aerial spray does occur
 - (1) After sunset
 - (2) Jurisdiction must pay
 - (3) Effectiveness often exceeds 95%
 - x) IPM program – includes education
 - xi) Inter-agency cooperation
 - xii) 2007 – mosquito control satisfaction survey
- d) WV – Anita Ray
 - i) 47-49 local health departments
 - ii) State health department
 - iii) Town Hall meetings in communities with human cases
 - iv) Tire removal drives
 - v) 2006
 - (1) Dead bird sampling –
 - (a) Corvids primarily
 - (b) Will test all species
 - (c) Almost all counties submitted at least one bird
 - (2) Equine surveillance
 - (3) Mosquito surveillance
 - (4) Human surveillance
 - (a) 16 cases of LAC
 - (b) 2 cases pending (LAC)
 - (c) 1 WNV case
- e) VA – George Wojcik

- i) 60th anniversary for the VA Mosquito Control Association
 - (1) ~140 attendees
 - (2) ~182 total members
 - (3) Student papers
- ii) See David Gaines talk for arboviral info
- f) NC – Walker Rayburn
 - i) Control work done by counties and towns
 - ii) LAC
 - (1) 16 cases
 - (2) 9 counties
 - iii) EEE
 - (1) 14 chickens
 - (2) 6 counties
 - (3) No human cases
 - (4) 5 positive pools – 4 counties
 - (5) One positive horse
 - iv) WNV
 - (1) 2 flocks positive
 - (2) One human case
 - (3) No positive pools
 - (4) One positive alpaca
 - v) Tick-borne diseases
- g) SC – Todd Gwinn
 - i) SCMCA - >120 participants (www.SCMCA.net)
 - ii) Vector specialist team (~15 people)
 - iii) 35 WNV+ pools
 - iv) 15 WNV+ birds
 - v) Human case
 - (1) 1 LAC
 - (2) 1 WNV
- h) GA – Rosmarie Kelly
- 11) Santee Cooper Mosquito Operations along Lake Marion & Lake Moultrie – John Grant
 - a) Electric utility established in 1938
 - b) Mosquito control a priority for the company in 1938
 - i) Malaria was an issue
 - ii) Mosquito-proofed houses in area
 - iii) Provided medication to local people
 - c) Continue to provide IPM mosquito control
 - d) Species needing control:
 - i) Permanent water species
 - (1) *Anopheles spp*
 - (2) *Cq perturbans*
 - (3) *Cs melanura*
 - ii) Temporary water species
 - (1) *Ps columbiae*

- (2) *Ps ferox*
 - (3) *Ae albopictus*
 - (4) *Culex spp*
 - e) Surveillance
 - i) Larval dips
 - ii) Landing rates
 - iii) New Jersey light traps
 - iv) Resting boxes
 - f) Arbovirus surveillance
 - i) Use both gravid and CDC light traps
 - ii) Ship and test
 - iii) Some VecTest and RAMP testing done in-house
 - g) Source reduction
 - i) Cut access points
 - ii) Mow high grass
 - iii) Herbicide use – limited use
 - iv) Ditch maintenance
 - v) Burning of organic material in dry ditches in winter
 - h) Control
 - i) Larviciding – pre and post-treatments
 - (1) Backpack Bti
 - (2) Truck-mounted Bti/Altosid
 - (3) Granular Bti – spreader attached to ATV
 - (4) Fixed-wing Altosid - rare
 - (5) Boat-mounted blower
 - (6) Gambusia
 - ii) Adulticide
 - (1) Aerial applications - rare
 - (2) Truck-mounted aquareslin
 - (3) Backpack treatment
 - (4) ATV-mounted ULV and fogger
- 12) Habits of Crows & Blue Jays – Melissa Wiggins
- a) Corvids
 - i) Jays
 - ii) Crows
 - iii) Rooks
 - iv) Magpies
 - v) Jackdaws
 - vi) Ravens
 - vii) Blackbirds or various types
 - b) World-wide ~218 species
 - c) US ~20 species
 - d) Local crows species – similar behavior
 - i) American
 - ii) Fish
 - e) Amplify WNV with high mortality

- f) Behaviors
 - i) Mimic
 - ii) Highly intelligent
 - iii) Engage in play
 - iv) Forest alarm systems
 - v) Jays cache food
 - vi) Omnivorous
 - vii) Females tend to disperse
 - viii) Nest predators – eggs and young
 - ix) Cooperative breeding – American crows
 - (1) Rare among animals
 - (2) Very clan-like
 - (3) Use older offspring to help raise young-of-year
- g) Movement into cities
 - i) Trees cut down in forested areas
 - ii) Green spaces in cities
- h) Winter roosts can hold huge numbers of corvids
- 13) Mosquito misting Systems: Quo Vadis? – Joe Conlon
 - a) Historically used on farms
 - b) Typical consumer system
 - i) Pesticide drum
 - ii) Weather sensor
 - iii) Nozzle systems
 - iv) Automatic timer
 - v) Manual over-ride
 - c) Issues
 - i) Drift
 - ii) Timing
 - iii) Improper installation
 - d) Products used
 - i) Minimum risk 25b products
 - (1) Garlic
 - (2) Cedar oil
 - (3) other
 - ii) Pyrethroids
 - e) What are the issues?
 - i) AMCA/Pest Management Concerns
 - (1) Public health protection claims
 - (2) Efficacy
 - (3) Incompatibility with IPM
 - (4) Installation
 - (5) Human exposure risk issues
 - (6) Lack of maintenance
 - (7) Non-target impacts
 - (8) Resistance issues
 - (a) Cause – probably not

- (b) Contribute to – yes
 - (c) Sublethal dosing
 - (d) No monitoring
 - (e) No rotation of chemicals
 - (f) May kill natural predators
 - ii) EPA response
 - (1) Specific labeling – new label language
 - (2) Risk assessments
 - (3) Web page with info for consumers
 - iii) National Pest Management Association
 - (1) Stakeholder forum in 2005 and 2006
 - (2) Included AMCA
 - (3) Drafting Best Management Practices (BMP) for industry
 - (4) Setting up advertising guidelines
 - (5) Addressing efficacy issues
 - iv) AMCA Position Paper
 - (1) Available on www.mosquito.org
 - (2) Biggest issue is unnecessary insecticide use
 - v) Now what?
 - (1) AMCA may ameliorate position somewhat, but probably will never endorse them
 - (2) Lawsuits
 - (3) CWA issues
 - (4) Efficacy
 - (5) Surveillance
- 14) Charleston County's Response to WNV – Martin Hyatt
- a) Long, narrow county
 - b) Stats
 - i) 1353 square miles, about 1000 are 'high ground'
 - ii) 330,000 pop
 - iii) 6-8 million tourists per year
 - c) Mosquito control
 - i) Ground crews
 - ii) Surveillance
 - iii) Larvicide
 - iv) Adulticide
 - v) Contract airplanes
 - vi) Provide extra control at assisted living and nursing home sites
 - d) WNV
 - i) 2002 – WNV+ horse late in season
 - ii) 2003 – 2 hot spots at opposite ends of county
 - (1) Horses and birds
 - (2) Rural areas
 - iii) 2004 – nothing
 - iv) 2005
 - (1) Positive birds and mosquitoes

- (2) Gravid trap – rabbit pellet infusion
- (3) Door-to-door in target area to provide education
- (4) Aerial spray
- (5) Human case late in season
- v) 2006
 - (1) Older neighborhoods
 - (2) Used Altosid in catch basins
 - (3) Bti or agnique in ditches
 - (4) Used thermofoggers in yards
 - (5) Truck-mounted ULV
 - (6) Some barrier spraying
 - (7) Aerial spray
 - (8) Used gravid traps – wheat straw pellet infusion
- vi) Mosquitoes
 - (1) *Culex* spp
 - (2) No positives seen after mid to late Oct
- vii) 2007
 - (1) Will use an ATV to put out larvicide
 - (2) Put out ingots earlier in season
- viii) Used the news to inform people
- ix) Have continued going door-to-door in high risk areas
- e) Also deal with EEE
- 15) 3-D Mosquito ID Project – Alice Anderson
 - a) 20 interactive mosquito models
 - b) Teaching issues
 - c) Computer-aided learning
 - i) Z-stack technology provides focus through all levels of picture
 - ii) Need both integrated and objective learning for understanding
 - iii) Animated sequences good for learning complex biological systems
 - iv) Balance needed between animation, interactivity, and fidelity
 - d) Modeling process
 - i) Reared mosquitoes from larvae
 - ii) Photographs using z-stack method
 - iii) Sent to art student for wireframe construction (8-10 hour rendering process)
 - iv) Used 3-D StudioMax on a Macintosh
 - v) Editing Editing Editing for taxonomic correctness
 - vi) Converted files to flash format – too many details lost
 - vii) On-going process
- 16) Competition Between the Two Invasive Mosquitoes, *Aedes albopictus* and *Aedes japonicus*, in VA – Jennifer Johnson
 - a) Introduction
 - i) 1985 – *Ae albopictus*
 - ii) 1998 – *Oc japonicus*
 - b) Significance
 - i) Vector potential (WNV & LAC)
 - ii) Container breeder – competition with native species

c) Study

i) Broad-based survey of container habitats

- (1) Ecological niche
- (2) Competitive predictions
- (3) May-Oct 2006 in Fairfax County
 - (a) Removed larvae
 - (b) Water volume
 - (c) Sun exposure
 - (d) Container type
- (4) Results
 - (a) *Ae albopictus* more frequent, especially later in season
 - (b) Coefficient of association was zero
 - (c) Preferred habitats
 - (i) Rock pools – japonicus
 - (ii) Tires & artificial containers - albopictus
 - (d) Seasonality
 - (i) June & July – japonicus
 - (ii) August - albopictus
 - (e) Different instar distributions
 - (i) Older japonicus
 - (ii) Later in season
 - (iii) Data suggest that japonicus larvae might overwinter
 - (f) Interspecific crowding
 - (i) May – japonicus seem to have an edge
 - (ii) Less than albopictus later
 - (g) Metamorphic success
 - (i) Early season – japonicus
 - (ii) Later – albopictus
 - (iii) Not significantly different
 - (h) Summary
 - (i) Some overlap
 - (ii) Temporal and spatial partitioning
 - (iii) Distinct seasonality

ii) Field Competition experiment

- (1) Hatched larvae – all 24 hrs old
- (2) Placed in shaded area
- (3) Sufficient food
- (4) Randomized complete block design
 - (a) 5 replicates
 - (b) High density
 - (c) Low density
 - (d) Intraspecific
- (5) Parameters
 - (a) Survivorship
 - (b) Development time
 - (c) Body size (wing length)

- (d) Rate of population increase
- (6) Results
 - (a) Survivorship
 - (i) Not affected by treatment
 - (ii) Better for albopictus
 - (b) Development time
 - (i) No effect for japonicus
 - (ii) More important for albopictus
 - (c) No wing length affect
 - (d) Rate of population increase
 - (i) No affect for japonicus
 - (ii) Higher for albopictus with competition
- (7) Summary
 - (a) *Ae albopictus* seems to compete better
 - (b) *Oc japonicus* has different habitat preferences and comes off earlier
- (8) More research needed
- (9) What about *Oc atropalpus*?

17) Field Comparison of Novel and Gold Standard Traps for Collecting *Aedes albopictus* in Northern Virginia – Wilhelmine Meeraus

- a) Aims
 - i) Compare CDC light trap with ISCA CMT-20 and BG Sentinel traps
 - ii) Assess effectiveness of these traps for *Ae albopictus*
- b) Why do this
 - i) Potential bridge vector
 - ii) Not easily trapped
 - iii) Info about species abundance is limited
 - iv) MIRs for WNV are imprecise
 - v) Extent of involvement in WNV not well understood
- c) Traps
 - i) ISCA CMT-20 trap
 - (1) Prototype
 - (2) Visual stimuli
 - (a) Black and green color
 - (b) Expandable skirt
 - (3) Chemical stimuli
 - (a) Skinlure
 - (b) CO₂
 - (4) Collapsible
 - (5) Portable
 - (6) Powered by a 6-volt battery
 - ii) BG Sentinel
 - (1) BioQuip
 - (2) Chemical stimuli
 - (a) BG-lure
 - (b) CO₂
 - (3) Black and white color

- (4) Pop-up design
- (5) Portable
- (6) 12-volt battery
- iii) CDC miniature light trap
 - (1) Visual stimuli – light
 - (2) Chemical stimuli – CO₂
 - (3) 6-volt battery
 - (4) Rain shield
 - (5) Gold standard
- d) Latin square design
 - i) 5 replicas
 - ii) 25 trap nights (24 hr periods)
- e) Trapping stations
 - i) Tarps for rain shields
 - ii) ~30 m apart
 - iii) Marked stations with red & yellow flags
- f) Results
 - i) Looked at:
 - (1) Species composition
 - (2) Trap performance
 - ii) CMT
 - (1) With lure (L)
 - (a) 2.65 mosquitoes per 24-hr trapping period
 - (b) 9 species collected
 - (c) 1.1 albopictus on average
 - (2) With lure and CO₂ (CL)
 - (a) Increased number of species
 - (b) Collected fewer albopictus
 - (c) 4.1 albopictus on average
 - iii) BG
 - (1) With lure (L)
 - (a) 8 species collected
 - (b) Fewer species per trap night
 - (c) 12.2 albopictus on average
 - (d) Better than CDC light trap
 - iv) With lure and CO₂ (CL)
 - (1) 9 species
 - (2) Most mosquitoes per trapping period
 - (3) 16 albopictus on average
 - (4) Better than CDC light trap
 - v) Summary
 - (1) Collected between 8-11 different species of mosquitoes
 - (2) Got more species with CO₂
 - (3) Range: 1.52 to 5.24 mosquitoes per trapping period
 - (4) BG –CL worked best for albopictus