Georgia Mosquito Control Association
Oct 17-19, 2007

First Session

1) Opening Remarks – Donell Mathis
   a) Washington Day
      i) Discussed continuing federal funding for WNV
      ii) Need for mosquito surveillance
      iii) Clean Water Act info
      iv) Talked to several Representatives
      v) Favorable towards continuing funding
   b) Importance of GMCA
2) Georgia Update – Ros Kelly
3) Dougherty County Update – Donell Mathis
   a) 160,000 population
   b) Surveillance
      i) Passive – complaints
      ii) Landing counts
      iii) Active – WNV program (work with Health Department)
   c) Control
      i) Focus on larvicing
      ii) Follow up with adulticiding
   d) Mapping of "hot spots"
      i) Vases in cemeteries are a big problem for *Culex* spp
      ii) Problem with abandoned houses
      iii) Trash piles in alleyways
      iv) Tire piles – work with Code Enforcement
      v) Cypress swamps - larvicide
   e) Swimming pools
      i) Not much problem with below-ground pools
      ii) Big problem with above-ground pools
   f) Old areas - larviciding
      i) Lots of treeholes – fill with sand
      ii) Low-lying areas
      iii) Old wooded areas
      iv) Respond to complaints
      v) Catch basins
   g) Adulticiding
      i) Hand Fogger
         (1) Ball fields
         (2) Abandoned houses
         (3) Crawl spaces
      ii) Try to do all repairs in-house
      iii) Keep equipment calibrated
      iv) Spray all county every 8-10 days

v) Respond to complaints
h) Proper storage of chemicals and equipment
i) Education program
i) Mosquito control
(1) Identification
(2) Control methods
ii) Diseases
(1) WNV
(2) Dog heartworm
iii) Hand-outs & prizes
j) Complaints
i) Be fair
ii) Be consistent
iii) Be courteous
iv) Don't make promises you can't keep
v) Follow up

4) Industry Spotlight
a) ADAPCO – aerial
i) Malcom Williams – Chief Pilot (AVCS)
ii) Own, operate and maintain fleet of aircraft
iii) Can treat 30,000 – 60,000 acres in one evening
iv) Pilots do only mosquito control
v) Aircraft
(1) FAA-certified
(2) Only do mosquito control
vi) Equipment
(1) Wind-driven rotary atomizers
(2) AIMMS-20 weather monitoring system
(3) Cockpit GPS guided system (Wingman)
vii) High level of application accuracy
(1) Optimization drift technology (USA AG dispersal model)
(2) Night-time applications
viii) Contingency Contracts
(1) Many waivers and permits needed
(2) All preparations for facilities put in place
(a) Fuel
(b) Parking
(c) Chemical storage
(3) Insurance certification
(4) GIS mapping – spray blocks
(5) Congested area contracts
(6) 24-48 hour response time
(7) Help with press coverage when contract is invoked
(8) Bring all needed equipment
(9) Can do efficacy monitoring
(10) Post-application reporting within 24 hours

b) ADAPCO – ground
    i) Monitor 4 system
        (1) Variable flow control
        (2) Uses GPS for control and recording
        (3) Data recorded
            (a) Speed
            (b) Flow rate
            (c) Date/time applications
            (d) Historical data
    ii) Geotracker - Mapping
    iii) Download options
        (1) Removable compact flash
        (2) "Parking-lot" download option
        (3) "Real-time tracking" option

5) Mosquitoes & Other Pest Management Operations on Military Installations – Denny Kuhr
    a) USACHPPM - South
    b) Many casualties from vector-borne diseases during military operations
    c) Entomological Sciences Division
        i) Train pest management and preventative medicine personnel
        ii) Consultations
        iii) Identification
        iv) Vector-borne disease analysis and risk assessment
    d) Installations
        i) Army – 17
        ii) Air Force – 17
        iii) Navy -10
    e) Key Personnel
        i) Preventative medicine – public health
        ii) Pest management
        iii) Certified pest controllers
            (1) Forestry
            (2) Ornamental/turf
            (3) Aquatic
            (4) Right-of-way
            (5) Industrial
            (6) Institutional/Structural
            (7) Public Health
            (8) Nuisance/Wildlife damage control
        iv) Pest control contract inspectors
        v) Golf course manager/Greenskeeper
        vi) Natural resources
        vii) Veterinary services
        viii) Animal Control
    f) Mosquito surveillance
        i) Components

(1) Larval survey
(2) Adult survey
(3) Sentinel chickens

ii) Purpose
(1) Assess threat
(2) Identify mosquitoes
(3) Communicate problem
(4) Target problem
(5) Evaluate control

iii) Key elements
(1) Liaison with local agencies
(2) Plan of control

iv) Monitor spread of introduced species

g) Control
i) IPM based
ii) Based on surveillance data
iii) Can do all kinds of aerial applications

h) Other pest problems
i) Exotic pests
ii) Plant pests
(1) Herbicides
(a) Aerial
(b) Weedseeker system
(2) Prescribed fires
(3) Mechanical control

iii) Birds
(1) Trapping
(2) Shooting
(3) Rehabilitation/relocation

iv) Deer
v) Feral hogs
vi) Raccoons
vii) Beaver
viii) Badgers
ix) Skunks
x) Porcupines
xi) Rough fish
xii) Snakes
xiii) Fire ants
xiv) Africanized bees
xv) Flies
xvi) Cockroaches
xvii) Mites – stored food products
xviii) Rodents
(1) Pest control
(2) Hantavirus

i) Work with endangered species programs
j) Must know rules & regs for the area where the installation is located

6) After the Fire: Ware County Fires, Mosquito Surveillance, & Control – Trey English
   a) Wildfires April-June, 2007
   b) Firebreaks used to try to stop fire from spreading
   c) >600,000 acres burned
   d) Timber companies moved into the area to salvage timber
   e) Large areas of cut and replanted land – row ditched
   f) June 2007 – heavy rain
   g) Huge numbers of *Psorophora columbiae* resulted
   h) ADAPCO called to do mosquito control
      i) Surveillance using mosquito control trailer
      ii) Created spray blocks
      iii) Waited for 2nd brood to come off before doing control to get all possible benefit from adulticiding
      iv) Used dibrom – excellent control
   i) Mosquito problems directly related to fires
   j) Timber companies need to take some responsibility
   k) Working to design a larviciding program to assist with future problems
   l) Problem will continue until trees grow
7) Larviciding Techniques for Underground Storm Drains & Bottle Bioassay of *Culex quinquefasciatus* exposed to Dibrom Concentrate – Richard Smith
   a) Jacksonville, FL
   b) Larviciding underground storm drains
      i) Storm drains
         (1) BENEFIT - Storm drains provide a solution to roadside drainage problems
         (2) PROBLEM - Wonderful mosquito breeding sites
      ii) Aerobic decomposition occurs
         (1) Water enters from a variety of sources
         (2) Organic debris and nutrients also enter system
         (3) Nutrient soup results
      iii) Stable system
         (1) Minimal temp fluctuation
         (2) Humid
      iv) Mosquito control
         (1) Filter systems sometimes used to reduce nutrient loading
         (2) Public Works pumps the catch basins
         (3) Larviciding
            (a) Oils/Surfacants
            (b) Bti
            (c) Bs
            (d) Altosid
            (e) Temephos
      v) Equipment

(1) www.leisureequipmentInc.com
(2) Modified jeeps for left-hand drive
(3) Equipment cradles
(4) Lights

vi) Plan
(1) >60,000 basins cataloged
(2) Inspect first, then treat
(3) Larvicide at night
(a) Cooler
(b) Less traffic
(c) Parked cars are a problem

c) Bottle Bioassays
i) Testing resistance of quinces to Dibrom
ii) Dibrom applied by aircraft for 30+ years in Duval County
iii) Seeing poor control
iv) Procedure
(1) www.pherec.org/memoranda/procedures.html
(2) Determine if resistance to Dibrom is occurring
(3) Saw 100% mortality after 75 minutes
(4) Resistance tests do not correlate to label dosage
(5) Must do a Lethal Dose Probit to infer label rates
(6) Additional testing is planned
v) Why the subpar control?
(1) Mosquito behavior
(2) Weather
(3) Mission timing
(4) Aerosal equipment, technique, dosage
vi) Useful tool to evaluate control efficacy
vii) Technique taught at Dodd Course

8) Dept of Ag Overview, Pesticide Regulatory Update – Steve Cole
a) What's new?
i) New commercial exam process
(1) Jan 2007 – computer exam
(2) Operated by Georgia Technical Colleges
(a) 25 Colleges involved
(b) $45 exam fee
(c) www.gapestexam.com
(3) Advantages
(a) Plan your own exam date, time, & location
(b) More locations
(c) Instant exam results
(d) Quicker retakes
ii) Worker safety program
(1) EPA currently expanding pesticide worker protection programs to include all pesticide occupations
(2) Greater training requirements

(3) Greater monitoring by GDA
(4) No timeline for implementation as of yet

iii) Mosquito control issues
(1) Commercial vs private license
(2) Training certifications
(3) Licensing
(a) More individuals getting licensed in Public Health
(b) Mosquito control category being developed
(i) Elmer Gray & Doug Jones
(ii) Subcategory?? Separate category??
(iii) Will still need to take the core exam
(iv) Working on details
(4) Misting Systems regulatory issues
(a) Used for a long time in horse farms in Texas
(b) May have some use in areas with bad mosquito problems and no control programs
(c) Waiting for EPA response
(d) Need specific label language
(e) Safety issues
(f) Control efficacy
(g) Company focus is on installation, not pesticide
(i) Uncertified applicators
(ii) Application actually done by homeowner
(iii) Unsubstantiated claims
(iv) Off site drift
(v) Exposure risks
(vi) Misuse
(vii) Discourages IPM
(viii) Resistance
(ix) Calibration issues

iv) Pesticide misuse
(1) Baiting (predator control with pesticides)
(a) Illegal
(b) Dangerous
(c) Non-target impacts
(d) Risk to children and pets
(2) Careless use
(a) Usually involves poor storage practices and labeling
(b) Illegal & dangerous
(c) Need to be prepared for spills
(d) Always read the label
(e) Keep good records
(f) Don't get in a hurry
(g) Keep equipment in good repair
(h) Follow label instructions

b) www.agr.georgia.gov

Second Session

1) Richmond County Mosquito Control – Fred Koehle
    a) 3 person crew
    b) Seasonal entomologist
    c) Problem areas
        i) Pools
        ii) Tire piles
        iii) Trash dumps
    d) Surveillance
        i) Past
            (1) New Jersey light traps
            (2) Never ID or counted anything
            (3) No plan
        ii) 2007
            (1) Hired an entomologist
            (2) Had a plan
                (a) 1 gravid trap
                (b) 1 light trap
                (c) 5 sites
                (d) 4 trap nights a month (June-Aug)
                (e) 2 trap nights in Sept
            (3) ID'ed, counted and tested pools – 1 WNV+ pool
            (4) Created a reference collection
        iii) Budget
            (1) Asking for more money in 2007
            (2) Due to surveillance:
                (a) Didn't start soon enough
                (b) Need another worker
                (c) Need an entomologist
        iv) Working relationships
            (1) Augusta Cares – Mayor's office
            (2) Board of Education
                (a) School education program
                (b) Mosquito control at the schools
            (3) Parks and Recreation
            (4) Public Works
            (5) Code Enforcement
        v) Education
            (1) Civic Groups
            (2) School programs
            (3) Community Education
            (4) Computer program
2) Status of Arboviruses in North America – John Edman
    a) 7 mosquito-borne Arboviruses found in the US

b) 3 viral families
    i) Togoviridae (alphaviruses)
        (1) WEE
            (a) Serious but rare
            (b) Virus still found but very few human cases
            (c) Vector - *Cx tarsalis*
        (2) VEE
            (a) Serious equine disease
            (b) Mild human disease
            (c) Needs a bridge vector
            (d) Horses can infect mosquitoes
        (3) EEE
            (a) Major vector found in wooded swamps
            (b) Needs a bridge vector
            (c) Reservoir – birds
            (d) Primarily coastal distribution
            (e) Average # cases per year ~5
            (f) Appears to be increasing
                (i) Human encroachment into wetland areas
                (ii) More surveillance due to WNV
            (g) Surveillance is vital
    ii) Bunyaviridae – California encephalitis viruses
        (1) LAC
            (a) Wide distribution – primarily Eastern US
            (b) Vector - *Oc triseriatus*
            (c) Reservoir – chipmunks and squirrels
            (d) Average ~80 cases per year
            (e) Transovarial and venereal transmission occurs
        (2) No others of importance
    iii) Flaviviridae
        (1) WNV
            (a) Activity increasing again in 2007
            (b) Average ~2969 cases per year
            (c) Primary vectors are *Culex* spp
            (d) Migrating birds involved in spread
            (e) Bird surveillance
                (i) Numbers reported and found positive usually rose before human cases were reported
                (ii) Not so predictive any more
            (f) Old world virus introduced to US in 1999
            (g) Spread to every state except Hawaii & Alaska in 5 years
            (h) Kills many new world bird species
            (i) Overwinters in mosquitoes and birds
        (2) SLE
            (a) Closely related to WNV
            (b) Widely distributed

(c) # cases seem to be dropping
(d) Average ~111 per year
(e) Does not cause disease in equines
(f) Naturally cycles in peridomestic bird species
(g) *Culex* spp vector

(3) Dengue
(a) Most important arbovirus from a world-wide respective
(b) 4 strains
(c) Primary human vector – *Aedes aegypti*
(d) Tropical distribution
(e) Average ~1/2 million cases per year in Latin America
(f) Correlated to change in distribution of *Aedes aegypti*
(g) Hawaii outbreak tied to *Ae albopictus* (2001-2002)
(h) Dengue does not appear to become endemic in the absence of *Ae aegypti*
(i) Dengue Hemorrhagic Fever related to second infection from another strain
(j) Sylvan cycle in wild primates
(k) No vaccine

c) Generalizations
i) All zoonotic
(1) Only dengue can be maintained or cycled in humans
(2) VEE can briefly cycle in horses
ii) All cause human disease
iii) Symptoms occur within 3-10 days (usually 6-7 days)
iv) No human vaccines
v) Good surveillance and appropriate mosquito control are essential

d) External factors affecting transmission
i) Weather/climate
ii) Vector abundance
iii) Abundance of amplifying/reservoir host
iv) Presence of predators, parasites, etc

3) Insecticide Resistance in North American WNV Vectors – Bill Brogdon
a) The most practical method for proving the presence of resistance is a good bioassay
i) Field
ii) Bottle/Lab

b) Question –
i) Will this formulation of this insecticide control this vector at this location at this time?
ii) If not, now what?

c) Mosquito control based on nuisance mosquitoes
d) Need to also look at resistance in vector species
e) Resistance surveillance lets you know when something is changing
i) Need to recheck resistance after rotating chemicals
ii) Resistance reflects chemical use patterns

f) Resistance is highly focal
   i) Surveillance needs to be spatial
   ii) Surveillance needs to be ongoing
g) Molecular Assays
   i) Esterase assay – resistance enzyme
   ii) Fluorescence PCR
   iii) DNA analysis
h) Bioassay Procedures
   i) One method
      (1) Collect egg rafts
      (2) Rear and ID
      (3) Bottle Bioassay
   ii) Adult collections
      (1) Good for virus testing
      (2) Don't always know which species
   iii) Multiplex procedures will give more complete data
      (1) Not yet practical for Mosquito Control Agencies
      (2) Not a complete solution for all areas and all types of resistance
i) *Culex* spp info
   i) Species vary from North to South and from East to West
   ii) Resistance also varies
   iii) Types of resistance
      (1) Point mutations (KDR-resistance genes)
         (a) Different mutations found
         (b) Regionally specific
         (c) May be a relict of the *Ae aegypti* eradication program
         (d) Multiple mutation can be found in one mosquito
         (e) KDR-resistance to pyrethroids is very wide-spread
         (f) Misting systems will drive resistance to pyrethroids very rapidly
      (2) Unregulated (oxidases, GST)
         (a) Oxidases
            (i) Lots of polymorphism
            (ii) Oxidases metabolize at a lot of places on the pyrethroid molecule
            (iii) Don't know what assortment of resistance enzymes are out there in the mosquito populations
         (b) GST
            (i) Involved with DDT resistance
            (ii) Becoming more wide spread
            (iii) Very complicated - multisplicing
      (3) Multiple copy (esterase resistance genes)
         (a) Different genes are conferring resistance in different areas
         (b) Georgia has esterase resistance in the *Culex* populations
j) Bottom line – depend on bioassays
   i) Mechanisms for resistance are in the mosquito populations
   ii) Need to do resistance surveillance

iii) No resistance seen in the field to Dibrom – yet
(1) High vapor pressure chemical
(2) Hard for mosquito to get mechanisms in place fast enough

4) Industry Spotlight
   a) B&G
      i) Sentinel GIS
         (1) Mobile solution for all surveillance and control needs
         (2) Tracking, reporting & monitoring all in one package
      ii) Products
         (1) Aqualuer –
            (i) Permithrin/PBO product
            (ii) Oil-based
         (2) Provect –
            (a) Temephos
            (b) Various formulations
            (c) Good against all stages of mosquito larvae
            (d) Good backup pesticide
         (3) Altosid – complete line of products
      iii) Equipment
   b) Valent BioSciences
      i) Products
         (1) Vectobac – Bti
            (a) Quick acting (withing 24 hrs)
            (b) No residual
         (2) VectoLex – Bs
            (a) Slower mode of action (within 48 hrs)
            (b) Some recycling – spores germinate
      ii) Mode of action
         (1) Spores and crystals
         (2) "stomach" poison
         (3) Activated by specific gut pH
            (a) Specific to mosquitoes
            (b) Some midge control
      iii) Various formulations
      iv) Underground control
         (1) Primarily an urban problem
         (2) Pump system to disperse liquid product via ULV into catch basins
5) Georgia Tick Attach Study – Laurel Garrison
   a) Human-biting ticks in Georgia
      i) *Amblyomma americanum* (Lone Star tick)
      ii) *Dermacenter variables* – American dog tick
      iii) *Ixodes scapularis* – Blacklegged tick
      iv) Amblyomma maculatum
   b) Tickborne disease burden
      i) RMSF – higher than nationwide incidence
      ii) HME – similar to nationwide average

iii) Lyme Disease – much lower than nationwide average

c) Study
   i) One year study (April 2005-April 2006)
   ii) Patnered with NR, Georgia Poison Center, UGA
   iii) Characterize, estimate, identify
   iv) Ticks ID'ed and tested at SCWDS
   v) GDPH epidemiologist administered a questionnaire
      (1) Exposure
      (2) Symptoms
   vi) Outcome
      (1) 807 enrollees
      (2) 57% submitted tick for testing
      (3) No difference in whether someone submitted a tick or not – no selection bias
      (4) Barriers to joining study
      (5) Results
         (a) Peak corresponds to media coverage
         (b) Demographics
            (i) 50.6% male
            (ii) Median age – 50
            (iii) Predominantly non-Hispanic whites
         (c) Submissions primarily from areas above the Fall line
         (d) Most ticks were Lone Star ticks
         (e) Most were adult ticks
         (f) Disease agents found:
            (i) Rickettsia amblyommii
            (ii) Ehrlichia Chaffeensia
            (iii) Borrelia lonestari
            (iv) R montanensis
            (v) E ewingii
            (vi) Panola Mountain Ehrlichia
         (g) Symptoms
            (i) 18% reported being sick within 3 weeks after being bitten by tick
            (ii) No correlation with being bit by an infected tick
         (h) Factors affecting illness
            (i) Tick testing positive*
            (ii) Tick engorgement status
            (iii) Species of tick
            (iv) Multiple bites
            (v) Geographic area
            (vi) Length time attached
            (vii) Age
            (viii) Chronic conditions
         (i) Only the presence of disease agents in the tick correlated to the presence of symptoms

6) B&G Sentinel GIS – David Sykes
    a) Electronic Data Solutions
    b) Software packages
        i) Tracking
        ii) Mapping
        iii) Reporting
    c) Tracking
        i) Old school – highlighting roads on a paper map
        ii) A variety of mechanical/electrical monitoring devices developed
        iii) Computerized devices
    d) Mapping
        i) Old school – paper maps
        ii) GIS
    e) Reporting - Need to combine info from a variety of sources
    f) Sentinel GIS
        i) Combines all data sources and reporting capability into one package
        ii) Uses a hand-held computer any Windows mobile device)
        iii) Can record a wide-variety of tracking data
        iv) Can input data
        v) Has GPS capability
            (1) Navigate
            (2) Track
        vi) Highly customizable
        vii) Based on ESRI GIS
        viii) Uses ArcPad and Datalink
        ix) Database functions – search capacity
        x) Report generation wizards
        xi) Can output to other formats
        xii) Easy to use
    g) Software resides on the desktop computer
    h) Synchronize to transfer data

Third Session

1) Operational Midge Control – Annji Greenwood
    a) Lake Monroe
        i) Surface area ~9000 acres
        ii) Eutrophic system
        iii) Chironomids present
            (1) High density
            (2) Low diversity
        iv) Big nuisance problem
            (1) Odor
            (2) Staining
            (3) Clogging vents
            (4) Economic loss ($3-4 million)

v) Midge biology
    (1) Life cycle similar to mosquitoes
    (2) Cycle 2-3 weeks in summer
    (3) Development may be suspended in winter
    (4) Larvae difficult to see
        (a) 4 instars
        (b) 1st instar
            (i) mostly planktonic
            (ii) do not always feed
        (c) 2nd, 3rd, and 4th instars are found within sediment
        (d) Red in color – hemoglobin for low oxygen conditions
        (e) May form tubes to avoid predation
        (f) Pupae hard to find
    (5) Adults
        (a) Males form swarms
        (b) Do not feed as adults
        (c) Eggs laid at dusk or at night

b) Surveillance
    i) Use an eckman dredge to sample larvae from the lake floor
    ii) Sample within predetermined grids
    iii) Map data
    iv) Determine acreage of treatable areas
    v) Treat when larval populations are at treatable levels
    vi) Lobinske, et al 2002 – Spatially Explicit Computer Model for Larval Midge Distribution
        (1) Seche disk readings
        (2) Larval density
        (3) Temp
        (4) Water depth
        (5) Outcome – likely distribution of larvae
        (6) Only works on one or two nuisance species

c) Control
    i) Chemical
        (1) Use a spreader to put out larvicide
        (2) Large area – difficult to treat
        (3) Temephos

d) Physical – River Walk
    i) Compared NJ Light Traps and sticky traps (panel trap)
    ii) Sticky traps worked best
    iii) Using panel traps on light posts to determine midge population
    iv) Found that the River Walk lights attracted large numbers of midges
    v) Light-Shield Study
        (1) Used shields on the lights
        (2) Shielded lights did not reflect off the lake water
        (3) 75% mean light intensity reduction achieved
        (4) 42% reduction in midge attraction after shielding

vi) Light Barge Study
(1) Dr Arsha Ali & Dr Richard Lobinske (1998)
(a) Decoy light barges set in lake intercept
(b) ~50% of midges before they reach the land
(2) Both barge surface and lights attract the midges – more with lights on
(3) Light barges drawing more midges that shoreline lights
(4) Project being continued for another year
vii) Vegetation – effect of presence or absence of midge numbers
viii) Sound??

2) My Life in Film – Roxanne Connelly
a) Integrated Management Control for Mosquitoes: The Basics
b) Making an educational video
i) Funding – USDA Southern IPM Regional Grant
ii) Points
(1) Scientifically correct
(2) Explain IPM principles
(3) Meet the needs of many basic/beginner audiences
(a) Field techs
(b) Commissioners
(c) County Officials
(d) the Public
iii) Format
(1) Modules?
(2) One video?
(3) Q&A??
iv) Media
(1) Cost goes up with the different media
(2) DVD
(3) Online, eventually
c) On Location Issues
i) Traffic
ii) Extraneous noise
(1) People
(2) Wind
(3) Weather
(4) …
iii) Lighting
iv) Lack of cooperation by nature
v) Time of year
vi) Time of day
vii) Other issues
(1) Permissions
(2) Copyrights vs Public domain
(3) Brand names
(4) Regionality

viii) Need for cooperation from a lot of people

d) What's on the DVD?
   i) 10 modules
   ii) IPM mosquito control
   iii) Discussion questions
   iv) CEU opportunity
   v) Fact sheets

e) Getting a DVD
   i) One per agency
   ii) Free of charge
   iii) Can make copies

3) Industry Spotlight
   a) Curtis DynaFog
      i) Bill Phillips no longer with company
      ii) New person?
      iii) Products sold through Univar
   b) Wellmark – Central Life
      i) Altosid
         (1) Can pre-treat areas
         (2) Many formulations
      ii) Mavrik –
         (1) Perimeter control
         (2) Does not kill honeybees after it dries
         (3) Safe to use on plants
      iii) Literature packets - handouts
4) The Status of Entomology in Georgia – Ray Noblet
   a) Land Grant University
   b) UGA Entomology Department
      i) Staff
         (1) 30 tenure track
         (2) 10 research
         (3) 20 support staff
      ii) Role
         (1) Extension & outreach
         (2) Teaching
         (3) Basic & applied research
      iii) Focal areas
         (1) Urban Entomology
         (2) Insect Pathogen Interactions/Vector Biology
         (3) Insect Pest Management
         (4) Molecular Biology/Biotechnology
         (5) Ecology & Environmental Entomology
      iv) Current Issues
         (1) Budget cuts
         (2) Added back a cotton IPM faculty member – 2006
         (3) Continued funding for Formosan termite work

(4) Plant Vector Biology position being added
(5) Looking for funding for vector biology for medically important diseases

v) UGA's Entomology Dept & GMCA
(1) Need local ambassadors for entomology and mosquito control
(2) Work together to meet training needs
(3) Help support local education programs
(4) Interns

c) Problems
i) Insect control and damage costs in GA ~$1 billion per year
ii) However, almost all insects are beneficial

d) Need to work together education the public about insects and to control detrimental insects

5) Arboviral Surveillance in Alabama – Gary Mullen
a) Helpful to see what is happening in surrounding states
b) Historical notes
i) Not prepared to conduct surveillance
ii) 1959-1963
(1) Surveillance done by CDC in southern Alabama
(2) Discovered a number of viruses in Alabama
iii) Some surveillance/testing done through Mobile Health Dept

c) State Health Department
i) Coordinating agency
ii) Oversee 67 county agencies
iii) Handled through Epidemiology Division
iv) No medical entomologist at state level
v) Depend on Auburn University for entomological expertise

d) WNV – 2000
i) Pulled together a number of agencies (~20)
(1) TVA
(2) State Conservation
(3) DNR
(4) Raptor Rehab Center
(5) Auburn University
(6) Dept of Ag
(7) …
ii) Initially coordinated by State Public Health entomologist
iii) 2006 – State Dept of Health hired an entomologist
iv) 3 counties involved with mosquito surveillance
(1) Jefferson
(2) Baldwin
(3) Mobile
v) All counties involved with bird surveillance
vi) Most surveillance done through Auburn University
vii) Testing done at Vet Diagnostic Lab at Auburn

e) Current surveillance

i) Primary vector is probably *Cx quinquefasciatus*
   (1) Initially used light traps
   (2) 2004 – shifted to gravid traps
ii) Detected first cases in 2001
   (1) Very few cases late in year
   (2) No positive mosquito pools
   (3) No positive dead birds
   (4) Good baseline data
   (5) EEE epidemic in horses
iii) 2002
   (1) Dead bird data - ~52% positive
   (2) Continued collecting mosquitoes
   (3) 194 horse cases
iv) 2003
   (1) About 6% pools tested WNV+
   (2) Dead bird collecting and testing decreasing
   (3) 66 horse cases
   (4) EEE epidemic in horses
   (5) Zoo mosquito collections done
      (a) July – MIR >12%
      (b) August – MIR ~11%
      (c) Dropped to ~6%
      (d) Late season <1%
v) Subsequently
   (1) Number positive dead birds decreasing dramatically
   (2) Number of positive pools also decreasing
   (3) Very few horse cases reported
vi) Some SLE seen
vii) Seeing dengue cases, all internationally acquired
viii) 2007
   (1) No horse cases
   (2) 15 human cases
      (a) 11 from Montgomery
      (b) Rest scattered throughout state
   (3) Bird and mosquito data pending

f) What about the future
   i) Funding issues
   ii) Auburn University will probably not be involved in surveillance for much longer
   iii) Entomologist at State Health Dept – change in State program??
g) Make use of baseline and historic data

6) Dynamics of Arbovirus Transmission – Cynthia Lord
   a) What are the dynamics?
      i) Changes in time and space
      ii) Can be monitored/modeled at different scales
         (1) Single season

(2) Between years
iii) Scale used depends on questions asked

b) Viruses
i) SLE
(1) Vector – *Cx nigripalpus*
(2) Bird-mosquito cycle
ii) WNV
(1) Vector – various *Culex* spp
(2) Bird-mosquito cycle

c) MODEL: Understanding central bird-mosquito cycle
i) Model development
(1) Question – Can seasonality and variation in mosquito population explain all the variability in SLE transmission dynamics? NO
(2) Question – How does seasonality in bird populations interact with mosquito variation to affect transmission?
ii) Structure & Assumptions
(1) Seasonal dynamics
(a) Birds and mosquitoes
(b) Temperature effects
(2) Keeping it simple - Assumptions
(a) Consider one species of mosquito
(i) Populations described based on field data
(ii) Variation in seasonal patterns
(b) Consider one host species
(i) 2 age classes
(ii) Seasonal reproduction
(3) Create a flow chart for the model
(a) Recruitment
(b) Mortality
(c) Susceptibility
(d) Infectivity
(4) Need to incorporate variability
(a) Biological
(i) Spatial
(ii) Temporal
(iii) Species
(b) Gaps in knowledge
(5) Analysis
(a) Sensitivity analysis
(i) Explores parameter space
(ii) Assess consequence of variability
(b) Analysis
(i) Outcome
(ii) Statistical analysis – contribution of each parameter to outcome

d) How did the model work?

i) Virus introduced when there are a lot of mosquitoes – immediate outbreak
ii) Virus introduced when mosquito populations were low – low levels of transmission until mosquito populations increased, then an outbreak occurred
iii) Logistic Model $R^2 = 0.34$
iv) Likelihood of epidemic
(1) Timing of peak bird recruitment
(2) Time of summer peak in mosquitoes
(3) Threshold effect – mosquito population size below which an epidemic does not occur

e) What about WNV – multiple vector species
i) Tradeoffs in population abundance, vector competence, seasonality
ii) Will a less competent vector allow transmission during the "off" season
iii) Work in progress

f) Using the model – control based on vector abundance

7) Product Development Made Simple – Peter Connelly
a) Bayer Environmental Science
b) Development process is lengthy and costly
c) Mosquito control products
i) 2 classes
(1) Pyrethroids
(2) OPs
ii) About 7 active ingrediaents
d) Newsletter – What's Buzzing
e) www.bayerus.com
f) Development times
i) 1995 - 8.3 years
ii) 2000 - 9.1 years
iii) 2005 – 10 years
g) Number of compounds considered to get one marketable compound is over 1 million in 2007
h) Procedure
i) Random chemistry
(1) Consider what is needed
(2) Screen known chemicals for activity
ii) Directed screening – closer look at chemicals with desired activity
i) Costs
i) 1975-1980: $23.1 million
ii) 1990-1995: $157 million
iii) 2000: $200 million
iv) 2004: $240 million
j) Most products developed for control of crop pests
k) Crop needs directly opposite to mosquito control needs
l) Patent lengths have decreased – less chance to make a profit

m) Only about 6 companies still doing research and development for pesticides
n) Industry sponsorship ensures survival of research programs

8) AMCA SE Region Update – Roxanne Connelly
   a) AMCA founded in 1935
   b) 2006 - >1600 members
   c) Goals
      i) Support good science
      ii) Partner with EPA
      iii) Promote IPM
      iv) Education and information
   d) www.mosquito.org
   e) Committees
      i) Training & Education committee – Elmer Gray (member)
      ii) Many others
      iii) Volunteer positions
   f) Legislative & Regulatory Affairs – Washington Days
   g) NPS Mosquito Control Policies
      i) www.fws.gov/refuges/policyMakers/NWRpolicies.html
      ii) Commenting period
   h) Annual Meeting

Fourth Session

1) South Carolina Arboviral Activity – Chris Evans
   a) DHEC entomologist
   b) Surveillance
      i) Birds
         (1) All counties required to collect and ship dead birds
         (2) March 15-Nov 30
         (3) Also except birds from other sources
         (4) Testing
            (a) Corvids – oral & cloacal swabs
            (b) Others - brain
         (5) Bird samples decreasing
            (a) 2006 – 129 birds
         (6) 2007 – 50 birds
      ii) Horses
         (1) Useful sentinels I rural areas
         (2) Horses tested at Clemson University
         (3) Data collected by Clemson or entomologist
         (4) 2007 – tested 18 horses, 2 dogs
      iii) Mosquitoes
         (1) Provides earliest evidence of transmission
         (2) Programs
            (a) 4 city

(b) 3 county
(c) 1 lake impoundment
(3) Traps
(a) Reiter gravid trap – wheat straw infusion
(b) CDC light
(4) Overwinter collections done
(5) Traps set all over the state
(a) 68 sites
(b) 26 sites
(6) Entomologist does all data collection, ID's and pooling
(7) Testing
(a) Viral culturing
(b) r-PCR
(8) Species of interest
(a) Oc japonicus
(b) *Ae aegypti*

iv) Humans
(1) Useful for resource allocation
(2) Useful for tailoring educational messages
(3) Testing
(a) ELISA
(b) Some PCR
(4) Procedure
(a) Physician notifies Health Department
(b) Case investigation by regional epidemiologists
(c) Notify environmental health - trapping
(d) Notify Mosquito Control - control
(e) Education

c) Results
i) 2006
(1) Birds – 15
(2) Equines – 0
(3) Human – 1 WNV, 1 LAC
(4) Mosquito – 35 pools
ii) 2007
(1) Birds - 4
(2) Equines - 1
(3) Human – 4 cases
(4) Mosquito – 46 pools
iii) 19 cases total since 2002

d) Mapping
i) Mosquito pie charts at trap sites
ii) Black – Neg, Red - Pos

e) Bird and mosquito positives are linked

f) Aug and Sept highest months of WNV activity

g) Human cases do occur in cooler weather

h) EEE also a concern
    i) Monitor *Cx erraticus* and *Cs melanura*
    ii) 2003 was a big year
    iii) Had a EEE+ dog in 2003
2) Industry Spotlight
    a) Clarke Mosquito Control
        i) 5 new products in 2007
            (1) AquaAnvil
                (a) Water-based Anvil
                (b) Macroemulsion
                (c) Evaporation provides good particle size
            (2) AquaHalt
            (3) Duet – oil based dual active adulticide
                (a) ETOC (prallethrin) + Anvil (sumithrin)
                (b) Benign agitation –
                    (i) Moves resting mosquitoes out of harborage
                    (ii) Does not cause a biting frenzy
            (4) VCMS – data management
                (a) Acquired by Clarke in 2006
                (b) Single solution data management system
                (c) Collects data
                (d) Creates maps and reports
            (5) FlightMaster – aerial application flight line
        ii) Investing >$1 million to Research and Development of mosquito control products
    b) Pest Management Resources
        i) Larry Motes
        ii) Based in Charleston, SC
        iii) Contract mosquito control
        iv) Consulting work for startup programs
3) Using Motorized Scooters in Chatham County – Bobby Moulis
    a) Need to treat storm drains
    b) Hot zone –
        i) 203 - 23.5 mi^2 hot zone
        ii) Began to treat storm drains
        iii) 8500 storm drains in area
        iv) First method
            (1) Altosid ingots
            (2) 150 day product
            (3) Hand treatment
        v) 2004 – second method
            (1) 80% truck treatment using mozzies
            (2) 20% by hand
        vi) Ideas
            (1) Bicycles???
            (2) Scooters??

(3) Motorized scooters!!
vii) 2005 – third method
(1) Motorized scooters
(2) 10 hours of training
(3) Practiced with rentals
(4) No license needed
(5) Altosid pellets – pipe and funnel system
(6) Could treat between 100-150 storm drains per day
(7) Worked in teams – one on each side of the road
(8) Switched to Altosid WSP – 300 to 350 strom drains per day
viii) 2006 – product switching
(1) BS WSP
(2) Altosid WSP
ix) Problems
(1) Tracking – working on this
(2) Accidents – only one
(3) Traffic
(a) Lights on scooters
(b) Work in low traffic times
(4) Transport –
(a) Trailer with modifications
(b) Used in outreach programs
(c) Supply depot
x) 2007 – extension of hot zone

c) Scooters allow a 30-day cycle of treatments
i) Able to re-treat to avoid product flushing problems
ii) Minimizes ground adulticiding
iii) Allows for easy extension of area without impacting treatment schedule
iv) Much cheaper to larvicide catch basins with scooters than with trucks

4) Mosquito Parasites – Mark Blackmore
a) Form of symbiosis
i) Parasites – host not killed
ii) Parasitoids – Host dies
b) Types of parasitism
i) Endo- internal
ii) Ecto- external
iii) Obligate – must have
iv) Facultative – opportunistic
v) How many hosts
(1) Monoxenous - one
(2) Oligoxenous - few
(3) Polyxenous - many
c) Mosquito parasites (excluding viruses)
i) Bacteria
(1) Wolbachia pipientis

(2) Intercellular
(3) Pass in the female line
(4) Infect male gonads – renders them sterile
(5) Effects
(a) Cytoplasmic incompatibility
(b) Filarid nematode pathogegenicity
(6) Shortens mosquito life expectancy
(7) http://microbewiki.kenyon.edu/index.php/Wolbachia_pipientis

ii) Protozoans
(1) Apicomplexa
(a) Plasmodia spp – cause malaria
(i) Obligate endoparasites
(ii) Very host specific
(iii) GA malaria vectors – *An quadrimaculatus* sl & *An punctipennis*
(b) Ascogregarina spp
(i) Gregarines
(ii) One host species
(iii) http://www.zoology.ubc.ca/courses/bio332/sporozoa_notes.htm
(iv) Host specific
(2) Effect on host – gregarines
(a) Minimal in usual host
(b) May be pathogenic in aberrant hosts
(i) Slow growth
(ii) Mortality
(iii) Increased susceptibility to pesticides
(c) *Aedes aegypti* vs *Aedes albopictus*
(i) Parasite prevalence high
1. 70 % sites infected
2. >50% larvae with parasites
(ii) A mechanism by which albos out-compete aegypti??
Probably not.

iii) Metazoans
(1) Nematodes
(a) Mermithids
(i) Mosquito parasitoids
(ii) http://nematode.unl.edu/epn/mermit3a.htm
(iii) Life cycle
1. Enter larval instar
2. Some species emerge from larvae, some from adults
(iv) Behavioral manipulations occur
(v) Mosquitoes can have an immune response to the nematodes
1. Encapsulate nematode
2. Response modified by
3. Interspecies variation

4. Parasite load
5. Efficacy

(vi) Was marketed as a mosquito control agent – Skeeter Doom
1. Time consuming to produce
2. Not cost effective

(vii) Nematode has environmental sex determination

(viii) Adults are free-living

(b) Filarial worms

(i) Canine heartworm – *Dirofilaria immitis*
1. Obligate parasite
2. Very common in Georgia
3. Host specificity issues
4. Life cycle
   a. 3 larval stages in mosquito
   b. 3 larval stages and adult stage in dog

(ii) Human filarial diseases

(2) Mites
(a) Arrenurid mites
(b) Ectoparasites
(c) Common on *Cq perturbans* and *Anopheles* spp
(d) Red and green mites found
(e) Drop off when females goes to lay eggs

(3) Pseudoscorpions
(a) Found attached to mosquitoes
(b) Phoresy (hitching a ride) or parasitism (actually feeding)??
(c) http://www.uoguelph.ca/pdc/Factsheets/Other/Pseudoscorpians.htm

5) GIS Mosquito Surveillance and Control – Rachel Strom
a) South Georgia Regional Development Center
b) Services
i) Planning
ii) Small business loans
iii) Workforce investment
iv) IT
v) Data processing
vi) GIS
c) VALOR – Valdosta-Lowndes Regional GIS initiative
i) 4 fulltime GIS professionals
ii) ESRI products
iii) Networked to City and County governments
iv) Instant data access
d) GIS – smart maps
e) Partnership arose between VSU's mosquito program and the VALOR program
f) Process
i) Where are the traps?

ii) How much of the city/county is covered?
    (1) Added more traps for better coverage
        (a) Population-based
        (b) Needed access to sites
    (2) Goal
        (a) City - Monitor vector populations
        (b) County – Data for control
    (3) Issues - Valdosta
        (a) How much area in city is actually monitored
        (b) Based on vector species
        (c) Used a 1 mile radius buffer
        (d) What other info is needed
            (i) Mapped all schools
            (ii) Mapped Childcare Centers
            (iii) Mapped personal care homes
    (4) Using the data
        (a) Weekly trap totals in graph form
            (i) quinces
            (ii) melanura
        (b) Keeping historic database
    (5) Mapping project has evolved to include complaints
iii) Control issues – county
    (1) Focus on *Cs melanura*
    (2) Used wetlands and tree data layers to create melanura habitat maps
    (3) Added population data
    (4) Added historic data
    (5) Added schools, childcare centers, and personal care homes
    (6) Came up with risk maps
    (7) Used maps to target larviciding
iv) What's next
    (1) Expand monitoring to all types of mosquitoes
    (2) Switch to concentration on nuisance species
    (3) Wish to expand surveillance
    (4) Add retention/detention pond data
v) ArcReader documents

Business Meeting

1) 2008 meeting: Oct 17-19???
2) 2009 meeting: Oct 15-17???
3) 2010 meeting: 3rd week
4) New Officers
    a) President: Wallace Head
    b) Vice President: Mark Blackmore
    c) Secretary/Treasurer: Robert Seamans

d) Reps
    i) 1 Year: Candace Royals
    ii) 2 Year: Bobby Moulis
    iii) 3 Year: Robin English
e) Industry Rep: David Sykes
f) Education/Cooperative Extension Rep: Elmer Gray
g) Public Health Rep: Rosmarie Kelly

5) Meeting Stats
a) Registered 80 people
b) 3 were no shows
c) Had 3 walk-ins
d) 76 people at banquet
e) Only 3 registered members not present