MAMCA 39th Annual Meeting
March 4-6, 2014

March 4 (Tuesday)
Session 1

1) An Overview of AMCA - Dennis Salmen
    a) What is the AMCA?
        i) Non- profit professional association
        ii) Since 1935
    b) Leadership
        i) Supports sound science
        ii) Advocates IMM
        iii) PESP program partner
        iv) Advocacy
    c) Benefits
        i) Increased knowledge of mosquito control
        ii) Better protection of public health
    d) Website - www.mosquito.org
    e) Education and information
        i) Publications
        ii) Webinars
        iii) Newsletter
        iv) Annual meeting
        v) Student competition
        vi) Young professionals group
    f) Regulatory & Legislative
        i) Washington Day May 5-7
            (1) Held annually since 1999
            (2) Typically 80-90 members
        ii) Joe Conlon - technical advisor
2) How to Give a Good Presentation - Joe Conlon
    a) Components
        i) Suitable preparation
        ii) Goal - communication
        iii) Practice practice practice
    b) Presenting is marketing
    c) Know your audience
    d) Colors
        i) Cool colors as background
        ii) Warm colors for text
        iii) Don't use reds
    e) Fonts
        i) Do not capitalize text except as an emphasis
        ii) Avoid shading
        iii) Use simple fonts
        iv) Make things big enough to read at a distance

(1) Text 24-28
(2) Title larger and bold
v) Bullets
(1) Mid-size
(2) Simple
(3) Close to text
f) Use 25 words or less on slide
i) Important info at top
ii) One key message per slide
iii) 3 supporting points per message
iv) ~6 words per bullet
g) Tables
i) Keep it simple
ii) Make it self-explanatory
iii) Keep it relevant
h) Graphics
i) Keep it simple
ii) Make it self-explanatory
iii) Keep it relevant
i) Do not use animation
j) Minimize laser use
k) Proof read for spelling and grammar
l) Demeanor and attire
i) Dress appropriately
ii) Don't apologize for nervousness or mistakes
iii) Be polite but firm to hecklers
iv) Arrive early and be prepared
m) Pacing is important
n) Do not go over time
o) Time wasters
i) Testing protocols - keep it simple
ii) Get rid of extraneous info
iii) Tag teaming speakers for a presentation should be avoided
iv) Avoid lengthy acknowledgement a
p) Communicate to the audience
i) Scan the audience
ii) Speak to the audience
iii) Don't describe your slides
iv) Don't ever have to make excuses for your slides or your talk
q) In conclusion
i) Summarize
ii) Emphasize
iii) Takeaway points
3) Mid-Atlantic Mosquito Key: An Update - Bruce Harrison
a) Purpose
i) Regional key

ii) MAMCA states
iii) Will be adding a TN addendum

b) Current keys
i) Darsie and Ward 2005
ii) Slaff and Apperson 1989
iii) Reinhardt system - taxonomic review

c) The new key
i) Multi-character couplets
ii) Females and 4th instar larvae
iii) Vector-line graphics using Adobe illustrator
iv) Will be online
v) Species
(1) 16 northern species not found in the south
(2) 7 sub-tropical species not found in the north
(3) 87 taxa
(4) 3 group or hybrid categories
vi) Methods are strictly morphological
vii) New characters included
viii) Key to larval instar stage
ix) Lots of new info
x) Distribution records for 8 states
xi) Designed for field use in mosquito control
xii) Total pages ~160

d) Progress report
i) All figures and couplets are drafted
ii) Half are finished
iii) Adult key edited 5 times
iv) Larval key edited 3 times
v) Notes are half completed

e) Distribution
i) Wire bound water resistant hard copy
ii) Electronic version
(1) Dynamic
(2) Easy to update
iii) PDF available through NCMVCA/WCU
iv) Illustrations available as a searchable database
(1) Can be used with permission
(2) Useful for teaching and presenting

f) Proceeds will be used for future educational projects (Duke Fund Account)

g) The Smithsonian needs specimens - Jim Pecor

4) Socio-Ecological Approaches to Mosquito Control: Framing Mosquitoes Within a Broader Public Health Context – Dr. Paul Leisnham

a) Website - www.enst.umd.edu

b) Mosquitoes are a signature socio-ecological system
i) Require understanding of biophysical and social dynamics
ii) Managing container mosquitoes in urban landscapes

c) What is a socio-ecological system?
    i) Processes
    ii) Services
        (1) Provisioning
        (2) Servicing
        (3) Regulating
    iii) Effects
d) Resident-based mosquito management (Study 1)
    i) Dowling et al 2003. EcoHealth 10: 37-47
    ii) Study questions
        (1) Can resident source reduction reduce mosquito infestations
        (2) Effect of demographics
        (3) Source reduction and knowledge, attitudes, and practices
    iii) Various studies on mosquito KAP found mixed results on the effect of education on container source reduction
    iv) Conceptual diagram
        (1) Household demographics
        (2) Knowledge
        (3) Practices
        (4) Attitude
    v) Mosquito - number of containers
    vi) Bite tolerance??
    vii) Procedures
        (1) 240 KAP questionnaires
            (a) Different socio-economic neighborhoods
            (b) Questions to fit the conceptual diagram
        (2) Entomological survey
    viii) Background
        (1) Mosquitoes were a problem
        (2) Situation was residential
    ix) Take home messages
        (1) Knowledge was related to effective practices
        (2) Practices were related to mosquito reduction
        (3) Related to income
e) Study 2
    i) Evaluating the effectiveness of educational materials
        (1) Passive outreach
            (a) Flyer
            (b) Notepad
            (c) Magnet
            (d) Calendar
        (2) Packets handed out to households from study 1
    ii) Households resurveyed
        (1) KAP - 2010
        (2) 2011
            (a) Deployed materials (May)

(b) Questionnaire and survey
(3) 2012
(a) Deployed materials
(b) Survey
(c) KAP
iii) Linking education intervention with changes in KAP
(1) Education intervention
(2) Attitude change
(3) Knowledge improvement
(4) Practice change
iv) Measurements
(1) Knowledge improvement = intervention +income+age+baseline knowledge
(a) Higher in those with higher baseline knowledge
(b) No evidence of improvement
(2) Concern = intervention+income+gender+baseline knowledge
(a) Higher in houses not receiving info
(b) No evidence of improvement
(3) Responsibility
(4) Source reduction adoption - education intervention was effective
v) At household level
(1) Questions
(a) Is education intervention related to changes in water-holding containers?
(b) Does this decrease mosquito abundance?
(2) Results -
(a) Appears to be true for larval abundance
(b) Does not hold true for pupal abundance
vi) Types of containers
(1) Dowling et al 2013. J Med Ent 50: 764-772
(2) Socio-economic status has an effect on container type
f) Future studies
i) Urban disamentities and pests
(1) Urban decay leads to greater mosquito exposure
(2) Mosquito problems lead to reduced use, valuation, and care of outdoor environments
ii) Site - Baltimore City, MD

<u>Session 2</u>

5) Human Arboviral Disease in Maryland - Amy Bergmann
a) Arboviral types
i) Alphaviruses
(1) EEE
(2) WEE
ii) Bunyaviruses - LaCrosse
iii) Flaviviruses

(1) SLE
(2) WNV

b) Arboviral surveillance is similar to most other states
c) Assessing Barriers to WNV Prevention among Maryland Adults >= 60 yo
   i) Cross-sectional stratified telephone survey
   ii) 36 item questionnaire
   iii) Health Belief Model
   iv) Preliminary results
      (1) 96% believe WNV is serious
      (2) 70% would accept a vaccine
      (3) 83% support mosquito control

6) Mosquito Control on Federal Lands: Where Do Things Now Stand? – Dr. Bill Meredith
   a) Federal lands
      i) USFWS National Wildlife Refuges
         (1) 42 - some work occurring
         (2) 48 - control needed
      ii) NPS
         (1) National seashore - 8 problematic
         (2) Everglades
         (3) Others can be problematic as well
         (4) Many either don't have issues or are open to control
      iii) NOAA
         (1) Varies
         (2) Some problematic Estuarine Research Reserve systems
      iv) Other - fewer issues
         (1) Military bases - usually good
         (2) National forests
         (3) Army Corps sites
         (4) Etc
   b) USFWS proposed national policy for mosquito control
      i) 11 year effort
      ii) Abandoned effort on 5/7/13
      iii) Why?
         (1) Internal dissent?
         (2) Other?
      iv) History
         (1) 1997 Act
         (2) Excluded mosquito control from federal sites (passive)
         (3) AMCA intended to add 3 points
         (4) Too late to make amendments
         (5) Asked to work with service administratively after the act was passed
      v) There was suppose to be a collaborative effort to create a handbook
         (1) Service hired a coordinator
         (2) In 2002, the Service decided to create a national policy
         (3) 2005 - very problematic interim guide
         (4) 2007 - marginal better draft policy

(5) It all fell apart
(6) Decision making will continue to be decentralized

c) Problems
   i) No emphasis on source control
   ii) No recognition of quality of life impacts
   iii) Little importance on non-disease issues
   iv) Spray thresholds had to include arbovirus measures
   v) Did not want to follow BMPs and IMM
   vi) Political boundaries were an issue
   vii) Mosquito control not considered experts in public health
   viii) Mosquito control on refuge use was considered a "refuge use"
d) AMCA Guidance Document
   i) Compilation of info helpful in mosquito control decision making on-refuge
   ii) 11 page document
   iii) Not a BMP
   iv) Useful in crafting:
      (1) Comprehensive conservation plans
      (2) Mosquito management plans
      (3) Special use permits
e) Future fate of 2005 interim guidelines
   i) Flawed
   ii) Need to be drastically modified or eliminated
   iii) Service is possibly looking at integrating all pertinent regulations concerning mosquito control
   iv) There are a lot of policies, some good and some bad
   v) No way for AMCA to offer formal input
      (1) No need for a declared public health emergency in order to adulticide
      (2) Treatment thresholds should not include a measure of arboviral diseases
f) Other issues
   i) Endangered species act issues and non-target impacts
   ii) Fallout from Bandon Marsh
      (1) Service restored large wetland areas
      (2) Caused a horrible mosquito problem
      (3) No local mosquito control program
      (4) Service recognized that this mosquito did cause a problem outside of a disease issue
      (5) Service paid for aerial larviciding
g) Future
   i) AMCA will try to continue to meet with USFWS
   ii) AMCA will help with local issues if asked
   iii) AMCA wants to hear how local MCDs are faring on this issue
   iv) Hoping for some improvements
h) Federal Lands Mosquito Control Accommodation Act
   i) One page bill
   ii) Applicable to all types of federal lands
   iii) Stalled at this point due to dysfunctional state of the federal government

iv) AMCA is in a wait-and-see made at this point

7) Sustaining Member Presentations
   a) Valent BioSciences - Jim Andrews
      i) Biorationals (bacteria)
         (1) VectoBac- Bti
         (2) VectoLex - *Bacillus sphaericus*
         (3) VectoMax - both
      ii) MetaLarv - IGR
   b) Dynamic Aviation - Caleb Stitley
      i) Contingency contracts
      ii) Planning measure
      iii) No up-front cost
   c) ADAPCO - Steve Molnar
      i) New literature
      ii) Updates in application equipment and technology
   d) Curtis DynaFog - Mike Runyon
   e) AllPro - Joe Andrews
      i) Adulticides
         (1) Oil-based
            (a) Evoluer - pyrethroid
            (b) Chlorpyrifos - OP
         (2) Water-based
            (a) Envion - pyrethroid
            (b) Aqualuer - blended with orange oil
      ii) Larvicides
         (1) Provect - temephos
         (2) Sustain MBG - Bti
      iii) Dosematic proportioning system
         (1) Closed system
         (2) Measures out the correct mix
         (3) Provided free with product
      iv) Study data available on website
   f) Electronic Data Solution - Ryan Pearson
      i) Software
         (1) Sentinel GIS (desktop)
         (2) Field Seeker GIS (web-based)
      ii) Partnered with Clarke
   g) Advanced Microbial Solutions - Larry Couch

March 5 (Wednesday)
<u>Session 3</u>

8) The Bridge on the River Kwai: The Man, The Bridge - Joe Conlon
   a) Movie is a must-see
      i) Made in 1957
      ii) It is a fictionalized account of what really happened
   b) Book was written by Pierre Boulle in 1952

i) Lived in the area
ii) Train saboteur
iii) Also wrote Planet of the Apes

c) The reality
i) Railway built by Japanese in Thailand and Burma
ii) Bridge built in Tamarkan
iii) Used primarily British POW labor
iv) The battalion leader
(1) LtCol Nicholson in the movie was really LtCol Philip Toosey
(a) Artillery command
(b) War hero
(c) Respected by Japanese
(2) 80000 prisoners put into camp in Singapore
(3) Prisoners under LtCol Toosey's command were sent to work on the railroad at Tamarkan - volunteered by Toosey
v) The camp
(1) 12 guards
(a) 6 Japanese
(b) 6 Korean
(2) Camp commander
(a) Saito
(b) Engineer - Futamatsu
(3) Tamarkan Camp
(a) Freshwater spring
(b) Camp above flood level
(c) Temporary housing
(d) Near river - allowed to fish
(4) Toosey enforced discipline and military bearing
(5) Officers were kept separated, but Toosey made the officers stay with the men
vi) Diseases
(1) Beri-beri
(2) Malaria
(3) Cholera
(4) Dysentery
(5) Pellagra (vitamin B deficiency)
(6) Tropical ulcer
(7) Worm infestation
vii) PTST was a problem after the war
viii) Situation was very primitive
(1) Boon Pong, a local mayor, smuggled in food and meds
(2) Civilian causalities were horrific
(3) Toosey talked Japanese into giving the prisoners better food to keep them healthier so they could work better
ix) Japanese mentality
(1) Made prisoners work to humiliate them

(2) Toosey volunteered his men to work, removing that humiliation
x) Wooden bridge had to be rebuilt 9 times due to storm damage and bombing
xi) Steel bridge was built after the wooden bridge - still there today

d) The movie
i) LtCol Toosey didn't know the movie was about him
(1) Saw many inconsistencies in interaction between Japanese and British in movie
(2) Thought it was an anti-British movie
ii) Col Saito was actually a Sergeant Major in the cavalry
(1) Hard but fair
(2) Could be trusted

e) What happened afterwards
i) Toosey
(1) Toosey was demoted and had his pay docked
(a) Eventually he was reinstated and made a Brigadier
(b) Suffered from a multitude of problems associated with his time as a prisoner
(2) Toosey got his men seen at the Liverpool School of Tropical Medicine and Hygiene
(a) Was appointed president of school
(b) Got Japanese reparation for the treatment of prisoners
ii) Saito
(1) Toosey testified on his behalf in the war crimes trials because he felt that Saito treated the prisoners fairly
(2) Converted to Christianity because of Toosey
(3) Was treated well by Toosey after the war ended

9) Potential for the Introduction and Spread of Exotic Viruses in the Mid-Atlantic Region – Dr. Michael Turell

a) VBD triad
i) The pathogen
ii) Vectors
iii) Susceptible hosts

b) Background
i) WNV
(1) Made the jump to the US in 1999
(2) Spread throughout the entire US by 2003
(3) Triad
(a) Pathogen - introduced every year by overwintering mosquitoes
(b) Vector
(i) Maintenance - Culex spp
(ii) Epidemics - various bridge vectors
(c) Hosts - birds
ii) Current VBDs in the MAMCA area
(1) LAC
(a) Virus in maintained in mosquitoes via transovarial and vertical transmission

(b) The chipmunk host is not really needed
(c) Mike Turell did his dissertation on vertical transmission in California-type arbovirus (LOOK THIS UP)
(2) EEE
(3) WNV
iii) Historic VBDs
(1) Malaria
(a) The vector is here
(b) The pathogen is continually being reintroduced
(c) People are the host
(d) It has not re-established
(2) Yellow fever
(3) Dengue
c) Basic transmission cycles
i) Zoonoses - other animals primary amplifying host
ii) Anthroponosis - human primary amplifying host
d) What is here?
i) Zoonoses have done well here
ii) Why don't we have anthroponotic diseases here?
(1) Window screens
(2) Air conditioners
(3) Television
e) What about chikungunya?
i) Vector
(1) Aedes albopictus
(a) A more susceptible vector
(b) Virus replicates better
(2) Aedes aegypti - much more effective vector
ii) Transmission
(1) It could, and will likely, occur
(2) It is not likely to be persistent
(a) Public health disaster - no
(b) Media disaster - yes
iii) Vertical transmission is possible but not a like means of long-term viral persistence
f) What might get here?
i) Rift Valley Fever
(1) Disease in livestock
(2) Dengue-like disease in people
(3) Vectors are likely present
ii) VEE
(1) Disease of rodents
(2) Can affect horses, who produce a high-level viremia
(3) People produce a high-level viremia
(4) *Oc taeniorhynchus* is a vector
iii) Japanese encephalitis

(1) Related to SLE and WNV
(2) Much more severe than WNV
(3) There is an FDA approved vaccine available
(4) Virus found in wading birds
(5) Produces a high-level viremia in pigs
(6) Possible vector in US is unknown
(a) *Oc japonicus* is a possibility
(b) Others? Not enough data

g) What needs to be done
i) Restore the mosquito control infrastructure
ii) Public education needs a new push
iii) Basic knowledge on mosquito species needs to be prioritized for control
iv) Better diagnostics are needed to get a jump on control
(1) WNV was mis-diagnosed as SLE
(2) JE will likely be mis-diagnosed as WNV

10) New Ticks in Town: Expanding Ranges and Emerging Pathogens in the Mid-Atlantic - Ben Pagac

a) Tick species
i) Amblyomma
(1) americanum
(2) maculatum
ii) Dermacentor variabilis
iii) Ixodes
(1) affinis
(2) scapularis

b) Tick ranges
i) Lone star
(1) Eastern US
(2) Before mid-80s they were found south of Maryland
ii) American dog tick is very widely distributed
iii) Black-legged tick
(1) Not found contiguously
(2) Found in eastern US and up into MI and WI
iv) Ixodes affinis
v) Gulf Coast tick
(1) Range
(a) Primarily Southern and coastal
(b) Found in three sites in TN
(c) Found up into Maryland
(2) Study
(a) Collected by tick drag
(i) Rapid crawlers
(ii) Rapid feeders
(iii) Painful biters
(b) Habitat
(i) Found in higher numbers out in the field away from woods

(ii) Established in burn area
(iii) Widespread with focal hot spots
(c) No time preference for activity

c) Pathogens
i) Ticks often carry more than one pathogen
ii) All are possible vectors of some vector
(1) *Borrelia* spp
(a) burgdorferi
(b) lonestari
(c) miyamotoi
(2) *Babesia* spp
(a) canis
(b) microti
(3) *Ehrilichia* spp
(a) chaffeensis
(b) ewingii
(c) canis
(4) *Rickettsia* spp
(a) rickettsii
(b) parkeri
(c) amblyommii
(d) monantensis
(5) Anaplasma phagocytophilum
(6) TBEV (powassan virus)
(7) Francerella tularensis

d) Conclusions
i) It's complicated
ii) Ticks can be pathogen is buses
iii) Ticks can be tough
iv) The Lone Star tick has now been found as far north as Maine
v) Things are different in the south
(1) Ticks behave differently
(2) Can not use data collected in the north to describe tick behavior in the south
(a) Recent paper on *Ixodes scapularis* - is *I dammini* coming back? (Dr Ginsberg)
(b) Georgia Southern work
(i) 5 distinct types of *I scapularis*
(ii) May be a species complex
(c) Larval scapularis prefer to feed on lizards
vi) The epidemiology of rickettsial diseases is in flux
vii) Tick ranges are expanding

e) What about red meat allergy associated with lone star tick feeding?
i) Alpha-GAL allergy
ii) Reaction to antibodies in red meat
iii) Other ticks may be involved

iv) Seems to be a real phenomenon

Session 4

11) The Future of Arboviral Surveillance - Rosmarie Kelly

12) OMWM in Maryland: From Boom to Bust - David Schofield

- a) County programs
  - i) Largest is Dorchester County
    - (1) $600-700 thousand budget
    - (2) Aerial capacity
    - (3) Thousand of acres sprayed
  - ii) Department of Ag office responsible for mosquito control
- b) OMWM
  - i) Practiced in
    - (1) Dorchester
    - (2) Somerset
    - (3) Worcester
  - ii) Beneficial to habitat
  - iii) Look at tidal marsh areas producing salt marsh mosquitoes
    - (1) OMWM opens up tidal flow and promotes biological control
      - (a) Ditch construction
      - (b) Pond construction to provide areas for fish to stay during tidal action
    - (2) Eliminate spoil areas
    - (3) Map vegetation before and after
    - (4) Mosquito surveillance
- c) Management techniques
  - i) Create ditches in depressions - open ditch system
  - ii) Pond construction -
    - (1) Closed ditch system
      - (a) Increase waterfowl carrying capacity
      - (b) Increased fish production
    - (2) Negatives
      - (a) Time consuming
      - (b) Can be issues in drought
  - iii) Fill breeding areas with spoil
  - iv) Water level control structures
- d) Budgetary crunch
  - i) 1976-early 1980s
    - (1) Good times
      - (a) Grants
      - (b) Good funding
      - (c) Public and private backing
      - (d) Money enough for personnel and equipment
    - (2) Opposition
      - (a) Lowering water tables
      - (b) Bringing in invasive plants
      - (c) Reducing waterfowl usage

(3) Outcome
(a) No management on wildlife management areas
(b) DNR didn't like open ditch system
(c) Issues with possible endangered species
(i) Impact of OMWM on black rail is unknown
(ii) Sudden loss of cooperation from other agencies
(iii) Natural Heritage Program concerned about dragonflies
(4) Result - increased use of pesticides

ii) Late 80s in 1990s
(1) Loss of cooperation
(2) Reduced work force
(3) Older equipment
(4) Delays in permitting process
(5) Issued permits very restrictive
(6) More use of pesticides
(7) Shift to more temporary programs

iii) Today - only allowed to do maintenance work

e) Effectiveness of OMWM
i) Reduction of mosquito breeding by 90%
ii) Reduction of adult biting
iii) Reduction in pesticide use
iv) Promote better habitat for marsh flora and fauna

f) Not sure why OMWM has lost desirability as a control measure

<u>Business meeting</u>
Minutes accepted
Treasurer Report accepted

Committee Reports
Audit report
April 1, 2013 to Jan 31, 2014
All in order
Constitution and Bylaws
Adding TN as a member state
Several other changes made
Changes accepted
Newsletter
Receipt by email
Posted to MAMCA website
2 in 2013
Awards
Outstanding student award
RE Dorer award
Nominations
President: Tony DeWitt
VP: Rosmarie Kelly

VP elect: Abelardo Moncayo
ST: Andy Kyle
Past president: Jasper Vam
States
GA - Fred Koehle
MD - Kyle Brinson
SC - Tammy Brewer
WV - Eric Dotseth
NC - Dennis Salmen
VA - Tim DuBois
TN - currently Abelardo but this will change
PA - Tom Smith
DE - Kim Brinson

2015 meeting
Savannah, GA
DeSoto Hilton
Jan 13-15

2016 meeting
Nashville, TN
Stay tuned for details

Session 5

13) Integrated Vector Management: A Few Ideas About Public Policy – Dr. Frederick Kutz
a) A few suggestions
i) Tell the whole story in presentations
ii) Partner locally
iii) Make alliances with those who have ideas that are different than yours
iv) Become a scientific advisor locally
v) Form advisory committees
vi) Dialog with anti-pesticide groups
b) Breaking down the points
i) The whole story
(1) Integrate your management
(2) Talk about research
(3) Disease surveillance
(4) Advertise
(5) Public relations
(6) All treatments great and small
(7) Vector surveillance
(8) Delineate wetlands
(9) Sound bites!
ii) Partnerships
(1) Make friends with homeowners and municipalities

(2) Notify them about management activities
(3) Let them help you get the message out
(4) Get their opinion

iii) Develop support from the environmental community
(1) NPMA has done a lot of this kind of work
(2) Vector management is a green program

iv) Become an advisor
(1) Most political decisions are based on economics
(2) Beware of hidden agendas
(3) Push good science and science-based policy

v) Advisory Committees
(1) Form groups to add more public awareness and science to vector control issues
(2) Open meetings
(3) Advise and dialogue

vi) Anti-pesticide groups
(1) Emphasize efforts to reduce pesticide use
(2) Ask for support in implementing IVM
(3) Join PESP
(4) Be open to notifying these people about control activities

14) Sustaining Members
a) Central Life Sciences - Steve Sullivan
i) Adulticide - Zenivex (etofenprox)
ii) Larvicides - altosid (methoprene)
b) Nation Air Aviation Insurance - Tom Kaiser
i) Safety newsletter for aerial mosquito control
ii) Insure mosquito control aviation
c) AMVAC - Peter Connelly
i) American Vanguard Corporation
ii) Agricultural products
iii) Sold through Univar and Adapco
iv) Working with Summit
d) Cheminova - Amanda Eade
i) Malathion
(1) Working on reducing the odor
(2) Looking at rates
(3) Going through registration review
ii) Mosquito Control Magazine
e) Univar - Mike Leahy
f) Bayer - Gordon Morrison
i) Old products
(1) Scourge
(2) Others
ii) New product
(1) ULV truck adulticide
(2) DeltaGard - deltamethrin

(3) Type II pyrethroid
(4) Single molecule - no isomers
(5) Reduced risk classification
(6) Will be introduced later this year for 2015 applications
(7) Good performance on trial
(8) Does well against pyrethroid-resistant mosquito (different class)
(9) Low application rate
(10) No synergist
(11) Submitted for an all crop tolerance

g) Clarke - Joe Strickhouser
h) Summit Chemical - Zack Cohen

15) Mosquito Control Operations in Maryland - Michael Cantwell (no slides)
a) Began after hurricane Hazel
i) Damage to drainage
ii) Lots of mosquitoes
iii) $250,000 for mosquito control on the lower Eastern Shore
iv) 50/50 cost split to counties wanting mosquito control
v) Hired seasonal employees
b) 1960 - 1970
i) Available to western shore
ii) Extended westward
c) IMM approach adopted in 1978
i) Prior to this - used 20,000 gallons of malathion annually
ii) After - used about 600 gallons
d) The golden years
i) Good support
ii) OMWM heyday
(1) ~28,000 acres remediated
(2) Less pesticide needed
(3) Areas still work well with maintenance
iii) 1987 - *Aedes albopictus* arrives
(1) Spread rapidly
(2) By early to mid-90s it had spread almost everywhere
(3) Primary pest species in MD today
iv) Aerial larviciding
(1) Salt marsh application
(2) Treated as much as 300,000 acres a year
v) Public education program
(1) Focus on peridomestic mosquitoes
(2) Homeowner response to reduction of tiger mosquitoes
vi) Expanded efforts for biological control
(1) *Gambusia holbrooki*
(2) Collect and distribute at end of season
(3) 17,000 storm water management practices just in Ann Arundel County
(4) Storm water management systems correlation with WNV risk
e) WNV

i) Baltimore City
(1) Dead crow
(2) 1999
ii) Beginning of arboviral surveillance program
iii) Partner with DoD

f) The decline, 2008-2012
i) Lost half of staff
ii) Lost a lot of institutional knowledge
iii) Currently down to
(1) 13 employees
(2) 6 counties, down from 28 (???)
(3) Communities with interest have increased
(4) Grass roots movement for mosquito control, likely due to the tiger

g) The future
i) Have probably reached a steady state
ii) NPDES is duplicative and wasteful but we are stuck with it
iii) Air spray program makes life tolerable in salt marsh mosquito areas
iv) Aging employees, but young people are coming into the program

<u>Session 6</u>

16) The Use of a Customized Field Data Management System in Mosquito Control - Tim McGonegal

a) Background
i) Prince William County
(1) Population base is 402,000
(2) Bedroom community for DC
ii) Control mosquitoes and various forest pests
(1) Full IPM
(2) 12 full-time, 5 seasonal
(3) Funded by tax levy ($1.7 million)
iii) Why a new system
(1) Old system
(a) Paper based
(b) Lots of missing data
(c) Lots of data entry
(d) Techs averaged 7 hours a week doing multiple data entry
(2) New system process
(a) Started with an off-the-shelf product
(i) It was better
(ii) Still not a good fit
(b) Bid project out to The Timmons Group
(c) Neither side knew much about the other side's job
(d) Development
(e) Beta testing

b) Benefits
i) Staff can spend more time doing their jobs

ii) Less error
iii) Reporting easier
iv) Can generate maps and reports for the public and for supervisors

c) The system
    i) Cost - $24,000 total
        (1) Software
        (2) Security
        (3) iPads
    ii) Pests
        (1) Mosquitoes
        (2) Cankerworm
        (3) Gypsy moth
    iii) The field part
        (1) Dashboard
            (a) Lists appointments
            (b) Has saved forms
            (c) Lists site visits
        (2) Map interface
            (a) Treatment areas are mapped
            (b) Site treatment info available
            (c) Site history available
        (3) Tools
            (a) Measure
            (b) Tracking
        (4) Data gathering form
            (a) Drop down menus
            (b) Time stamp
            (c) Required fields
            (d) Data go to the cloud as soon as you hit submit
            (e) Goes into a data fusion table
        (5) Search feature
        (6) Working on some updates for calculating amount of product needed
    iv) Lab part
        (1) Adult ID mosquito form
        (2) Mosquito larval ID form
        (3) Testing info
    v) Report generation
        (1) Executive report
            (a) By date range
            (b) By tech
        (2) Can generate a variety of reports using different parameters
    vi) Can dump data into excel files
    vii) Can use fusion tables

d) Updates
    i) Currently web-based
    ii) Will be converted to an app

iii) Look will change, functionality will improve

17) River Blindness: Winning the War Against a Neglected Tropical Disease - Dr Ed Cupp
    a) History
        i) 2nd leading cause of blindness worldwide
        ii) Caused by a filarial nematode *Onchocera volvulus*
        iii) First described in 1893 in sub-Saharan Africa
        iv) Vectored by black fly (*Simulium* spp)
        v) Humans are the only natural host
        vi) Adult female worms occur in nodules
        vii) Male worms move from nodule to nodule
        viii) Microfilariae
            (1) Cause skin and ocular disease
            (2) Infect vector
    b) The vector
        i) Larvae
            (1) Stream habitat
            (2) Riffle areas
        ii) Adults
            (1) Females are aggressive blood feeders
            (2) Fly long distances
            (3) Many species are migratory
        iii) Species of interest
            (1) Africa - *Simulium damnosum* complex
            (2) Americas - primarily *S ochraceum*
    c) Transmission in Africa
        i) In vector
            (1) Female picks up microfilaria when feeding
            (2) Larvae migrate to salivary glands
            (3) When female feeds the larvae exit through the fly mouthparts
            (4) Development in vector can be as little as 6-7 days
        ii) In host
            (1) Pre-patency is 12-18 months
                (a) Worms form skin nodules
                (b) Embedded in connective tissue
            (2) Many nodules are not evident
            (3) Microfilaria are released in bursts into the skin
            (4) Move through skin by digesting skin
                (a) Itching
                (b) Destruction of skin architecture
            (5) Move into eye, eventually causing blindness
                (a) Slow process
                (b) Blindness is caused by chronic exposure
                (c) Rates have been as high as 8-12%
            (6) Survey is by skin snip
            (7) Calculate the community microfilaria load (CMFL)

iii) Outcome
(1) Devastating to agrarian society
(2) Economic and social pressure
iv) Transmission in the Americas - associated with coffee production

d) Control
i) Nodulectomy
(1) Teams of lay surgeons visited villages
(2) Removed nodules under local anesthetic
(3) Went on for many years
(4) Not 100% effective as transmission can still continue
ii) Large scale vector control program
(1) Kill the larval flies
(2) Limit number of infected bites per person per year
(3) Need to reduce number of infectious stage larvae to <20 per person per year
(4) Demonstrated in Kenya in 1946-1955
(a) Vector eliminated after 18 years
(b) Used temephos
(c) Acres of land reopened
(5) Problems
(a) Insecticide resistance
(b) Switched to Bti
(c) Migration of parous infected flies during monsoon season
(6) Benefits
(a) Vector control worked
(i) Slow
(ii) Other issues
(b) In some place infection could not be prevented but blindness could
(i) Adults live a long time
(ii) Infectious larvae
(iii) Infectious larvae ~2 years
iii) Control of parasites using drugs
(1) Ivermectin was found to work against onchocerciasis in the 1980s
(2) Killed parasite with no side effects
(3) Study in Senegal (Lancet)
(a) Efficacious
(b) Safe
(4) In-depth studies done by WHO in Africa
(5) Greene et al, 1985, NE J Medicine 313: 133-138
(a) Study in the Americas
(b) Microfilaria gone in 2-3 days
(c) Fewer side effects than both the typical drug therapy and the placebo
(6) Ivermectin can reverse early eye disease
(7) Operational considerations
(a) Single treatment impacts seasonal transmission
(b) Clean for 4-6 months

(c) Mass treatment can break the cycle
(8) 1987 - Merck supplied ivermectin free of charge for treatment of onchocerciasis for as long as nit was needed
(a) Other companies started doing the same for other diseases
(b) Established programs for drug distribution
(c) Regional programs
(9) Strategy
(a) Treat 2x a year
(b) Treat at least 85% of the eligible people
(c) Surveillance occurs for three years after transmission is interrupted
(10) Results
(a) Still some transmission occurring in the Americas
(b) Eliminated in 96% of risk area
(c) Remaining 4%
(i) 2 overlapping foci in Venezuela and Brazil
(ii) Aboriginal tribes infected
(d) In Africa
(i) Treat 1x per year
(ii) Disease control, not elimination
(iii) Problems
1. Loa loa coinfection
2. Worm moves into the brain when exposed to ivermectin
(iv) Biggest threat - resistance in female worms to ivermectin
1. Continue to release microfilaria
2. Need a macrofilaricide

March 6 (Thursday)
<u>Session 7</u>
State Report
18) Delaware
a) Rain!
b) Record setting number of complaints
i) Over 3700
ii) Usually just over 2000
c) Slightly less aerial application
d) About the same for truck ULV
e) High virus activity
f) Low human cases
19) Maryland
a) 4 quadrants
i) Western shore
ii) Central
iii) Southern
iv) Eastern shore
b) Control
i) ULV ground

ii) Aerial adulticiding
iii) Larval - working on improving

c) Species
i) Oc sollicitans
(1) Low numbers
(2) Too much rain
ii) Culex salinarius
iii) Aedes albopictus

d) Rain!

e) Virus
i) Lots of EEE in mosquitoes but no cases
ii) 12 human WNV cases

f) Annually maintain tidal dike and gate systems

g) Website

20) North Carolina

a) Arboviral
i) LAC -
(1) 9 cases
(2) Drop from 2012
ii) WNV - 3 cases
iii) EEE -
(1) 1 human case
(2) 13 horses, drop from 2012

b) Rain!

c) All mosquito control is now local

21) South Carolina

a) Mosquito control is now county not state

b) Rain!

c) Mosquito testing
i) Pooled and ID in NC
ii) Tested at SCWDS

d) Viruses
i) WNV - activity down from 2012
ii) EEE -
(1) Lots of horses
(2) No human cases
iii) Highlands J
iv) Flanders virus
v) Bunyavirus
vi) LAC - 1 human case
vii) Imported dengue
viii) Imported chikungunya

e) SCMCA 2014
i) Hickory Knob
ii) Nov 5-7

22) Virginia

a) Rain varied
b) Limited surveillance and testing
    i) RT-PCR
    ii) RAMP - just WNV
    iii) VectorTesting - WNV and EEE
c) Drop in WNV cases from 2012
d) Lots of EEE in mosquitoes
e) 2 LAC cases

23) West Virginia
a) Lyme disease
    i) Epidemiology side
        (1) Primarily in the Eastern panhandle
        (2) Use 2-tier testing
        (3) LHD survey
        (4) Physician survey
        (5) Did a webinar series
    ii) Entomology side
        (1) Eight counties surveyed
        (2) Found ticks in all eight counties
        (3) Tick attach survey
        (4) Veterinary survey
        (5) Tested ticks
b) Mosquito surveillance
    i) Weekly sampling in high incidence areas
    ii) Rain!
    iii) Early peak in WNV+ mosquitoes followed by crash
    iv) Found LAC virus in mosquitoes in new areas
        (1) Found LAC in *Oc japonicus*
        (2) Found in *Culex* spp as well
        (3) Also *An punctipennis*

24) Georgia
a) Wet winter and spring
b) Lots of nuisance species
c) Arboviruses
    i) Early human WNV case
    ii) No mosquitoes until July
    iii) Extreme lack of surveillance coverage
d) GMCA
    i) Active outreach to commercial applicators
    ii) www.gamosquito.org

25) Pennsylvania
a) Arboviruses
    i) WNV -
        (1) decrease in 2013 human cases
        (2) Have surveillance in most counties
        (3) Continuing to do dead bird testing

(4) Decrease in WNV horse cases
ii) 26 counties receive DEP grants
iii) Vector management lab tests ticks and mosquitoes
b) Black fly suppression program
i) 33 counties involved
ii) Bti treatment of 40 streams/streams
iii) Additional county joining in 2014
c) Working on building a tick surveillance program - someday
d) Revising storm water BMPs manual
e) Great America Cleanup Event - *Aedes albopictus* control effort
f) New efforts
i) More educational advertisement
ii) Notification of spraying

26) Tennessee

27) Ecology of LAC Encephalitis in Endemic Western NC - Marcelo Schwartz
a) Background
i) No treatment
ii) No vaccine
iii) Wide range of symptoms
(1) Many asymptomatic cases
(2) Flu-like symptoms
(3) Nausea, vomiting, lethargy
(4) Severe long-term issues
iv) Pediatric disease
(1) Change of behavior
(2) Learning disabilities
b) Transmission
i) Amplifying host - small mammals
ii) Vertical and ovarial transmission
iii) Horizontal and venereal transmission
iv) Focal
v) Overwinters in mosquito eggs
c) Range
i) Appalachian region
ii) First identified in Wisconsin
iii) In NC
(1) Primarily in the west
(2) Occasional cases in central NC
d) Why the increase in cases? Some hypotheses.
i) Improved reporting
ii) Population growth
iii) Human disturbance
iv) Invasive species
(1) *Aedes albopictus*
(2) *Ochlerotatus japonicus*
e) Research

i) Silvatic vs disturbed areas
ii) 6 sites - Forest to Field Ecotone
    (1) Forested area (Silvatic)
    (2) Edge
    (3) Abrupt change to open field (disturbed area)
iii) Methods
    (1) 2 parallel transacts
    (2) 15 oviposition cups per transect
    (3) Had to use cinder blocks to protect oviposition cups from cows
iv) Results
    (1) 2011
        (a) Low numbers of japonicus
        (b) Increased numbers of albopictus in field
        (c) Decreased numbers of triseriatus in field
    (2) 2012
        (a) Similar results
        (b) Collected more triseriatus overall
    (3) Timing (2012)
        (a) Albopictus late in season
        (b) Triseriatus increased in middle of season
        (c) Japonicus early in season
v) Introduced tires
    (1) Albopictus found in field
    (2) Japonicus and triseriatus are found in both areas
vi) Future study will be done from forest through rural to suburban to urban
    (1) 36 sites
    (2) Socioeconomic factors
    (3) Vector abundance
    (4) Groundhogs???

28) Adult Control Strategies using the Vector Index - Matt Helwig
a) Vector Index - risk of mosquito population creating disease in people
b) Background
    i) Data collection
        (1) WNV found originally in 2000
        (2) Most cases are found where people live
        (3) 26 counties do surveillance
        (4) Gravid traps
        (5) Trapping effort varies
    ii) DEP
        (1) ID
        (2) Enter into database
        (3) Test via PCR
    iii) All control data are also loaded into the data management system
c) The Vector Index
    i) Components
        (1) Species presence - vector only

(2) Population density - mosquitoes per trap night
(3) Infectivity of the population - MIR or MLE

ii) Results are only as good as the data

iii) Now what?
(1) Determine VI for every human case to create an action level
(2) In PA, a VI of 150 or greater was associated with human cases
(3) Multiplied VI by 1000
(4) What it looks like statewide: highest VI corresponded to highest number of cases
(a) MMWR week
(b) #samples
(c) #pools
(d) #specimens
(e) #positive pools
(f) MIR
(g) Average trap nights (??)
(h) VI
(i) VI*1000
(j) Human cases
(5) How about at the county level? Highest VI corresponded to highest human cases

iv) What's next?
(1) Select permanent surveillance sites, 5 per county
(2) Weekly surveillance at these sites

v) Conclusions
(1) Only works for vector species
(2) Can be used to prioritize control

<u>Session 8</u>

29) History of ID Keys - Tim DuBois

a) 1939 - The Mosquitoes of Southeastern States
i) All words
ii) Only a few pictures

b) 1950 - Handbook of Malaria and Mosquito Control by RE Dorer

c) 1955 - Carpenter and LaCosse Mosquitoes of North America
i) Lots of plates
ii) Key is all words

d) 1958 - Handbook of Common Local Mosquitoes (for Virginia)

e) 1960 - Illustrated Key to Common Mosquitoes of the Southeastern US by Stojanovich

f) 1981 - Mosquitoes of North America, North of Mexico by Darsie and Ward
i) New illustrations
ii) Distribution maps

g) 1989 - A Key to the Mosquitoes of NC and the Mid-Atlantic States

h) 2002 or 2003 - Bruce Harrison's Key to Mosquitoes of Public Health Importance in the Mid-Atlantic Region

i) 2005 - latest edition of Darsie and Ward's key
    i) Added more species
    ii) Changed some maps
j) 2013 - Mosquitoes of the Southeastern US by Nathan Burkett-Cadena
k) Internet resources
    i) HTTPS://archive.org
    ii) www.afpmb.org

30) Avian Malaria and Other VBDs of Concern to Zoos – Dr. Allison Wack
a) Issues
    i) Wide variety of species
    ii) Lots of non-natives
b) Malaria
    i) Protozoan parasite
    ii) Many different types of animals affected
    iii) Many different vectors
    iv) Human malaria
        (1) *Anopheles* vector
        (2) Number of imported cases is increasing
        (3) Wide variety of symptoms
    v) Bird malaria
        (1) Primarily vectored by *Culex* spp
        (2) Worldwide except Antarctica
        (3) 40 known species
        (4) Chronic infection
        (5) Issue for naive species
            (a) Non-native birds in zoos
                (i) Penguins
                (ii) Snowy owls
            (b) Introduction of mosquito/parasite to new environment
                (i) Big problem in Hawaii
                (ii) Work done by Dennis LaPointe and others
        (6) Clinical signs
            (a) Lethargy
            (b) Anorexia
            (c) Anemia
            (d) Acute death
        (7) Management
            (a) Prophylaxis during mosquito season
            (b) Exclusion of mosquitoes - indoor exhibits
            (c) Promotion of natural immunity
                (i) Allow exposure for several mosquito season
                (ii) Look at blood smears
                (iii) Treat when the bird becomes positive
                (iv) Bird develops a natural immunity
            (d) Vaccination
                (i) Only effective for a year

(ii) Natural infection creates life-long immunity
(8) New issues
(a) 2 species seen
(i) P relictum
(ii) P longatum
(b) Could a new species have been introduced?

c) Arboviruses
i) WNV
(1) Most mortality in 2001-2003
(2) All in avian species
(3) 2011 - epornitic in crows and Cooper's hawks
ii) EEE
(1) No history at zoo
(2) Birds are usually asymptomatic but exotics can become ill and die
(3) Disease more common in mammals, especially in equids
iii) Vaccination program
(1) All new birds are vaccinated for WNV for at least 2 years
(2) Combo vaccine for mammals at risk

d) Lyme disease
i) Chimpanzee
(1) Low on social hierarchy
(2) Not terribly social
ii) Presented with lethargy and shifting leg lameness
iii) Unusual as great apes do a lot of grooming
iv) No previous cases had been reported
v) Looked at rest of chimps
(1) 4 of 9 were positive
(2) All ages and both sexes
(3) Data will be published

31) Wildlife and VBDs – Dr. Cindy Driscoll

a) One Health and disease interfaces
i) Environment and Wildlife EID
ii) Domestic Animal EID
iii) Human EID

b) Routes of transmission
i) Water
ii) Touch
iii) Vectors

c) EIDs
i) 60% are zoonotic
ii) 72% have wildlife origins
iii) Threats to biodiversity and human health
iv) Hotspots for emerging diseases
(1) USGS
(2) CDC
v) Potential for disease is due to changes

vi) Climate changes is a part of this

d) Climate change
   i) Environmental and Energy Study Institute
   ii) USGS
   iii) NFWS

e) Impacts
   i) Changing habitat
   ii) Changing migration patterns
   iii) Changes in range and distribution
   iv) Increases in numbers of vectors

f) Wildlife VBDs
   i) WNV is still here
   ii) EEE has had an impact on some of the endangered species and can be highly virulent in exotic birds
      (1) Neurotropic
      (2) Viscerotropic
   iii) EHD (Epizootic Hemorrhagic Disease)
      (1) Vector - biting midges
      (2) Host - deer and cattle
      (3) New serotypes being found
   iv) Deer fibroma
      (1) Transmitted by insect bites and trauma
      (2) Growths on deer
   v) Tularemia
      (1) Transmitted by a variety of vectors and by direct contact
      (2) Affects rabbits
      (3) Human pathogen (select agent)
      (4) Incidence has gone down
      (5) 2013 - outbreak at the Maryland beagle club
         (a) No human or dog cases
         (b) Lots of rabbits dead
         (c) Outbreak stopped with onset of cold weather
   vi) Pox virus
      (1) Lesions on birds
      (2) Transmitted by mosquitoes and midges
   vii) Vesicular stomatitis
   viii) Heartworm - wild animals are not considered a reservoir

g) Resources
   i) One Health Bulletin - Maryland (http://mda.maryland.gov/animalHealth/Pages/md-one-health.aspx)
   ii) Field Manual of Wildlife Diseases - USGS
   iii) Field Manual for Wildlife Disease of the Southeastern US - SCWDS website