

MAMCA 2017

Tuesday, Jan 31

1. David Gaines – Virginia Arboviral Surveillance, 2016
 - a. Mosquito control programs
 - i. 12 jurisdictions have mosquito control programs
 - ii. Located in jurisdictions with high human populations
 - iii. Regional groups monthly during mosquito season
 1. All do WNV Surveillance
 2. Tidewater region does EEE surveillance as well
 - b. Human endemic arboviral cases - 2016
 - i. WNV
 1. 8 cases
 2. 2 viral donors
 - ii. No SLE
 - iii. EEE
 1. No human cases
 2. 7 equine cases
 - iv. No LAC
 - v. No Powasson virus (TBD)
 - c. Imported cases
 - i. CHIK – 5
 1. Most from tropical Americas
 2. One from India
 - ii. DEN – 25
 1. About half from the Americas
 2. About half from India
 - iii. ZIKV- 112
 1. About a 50/50 split between the Caribbean and Central America
 2. 4 cases were actually from 2015
 - d. Specific info on arboviruses
 - a. EEE surveillance
 - i. Mosquitoes – 90+ pools
 1. All Cs melanura
 2. MIR – 1.009
 3. Tested with VectorTest and confirmed by RT-PCR
 - ii. Sentinel chickens – 25
 - iii. Equines – 7
 - iv. No human cases
 1. Cases in 2003 and 2012
 2. MIR > 0.7 leads to either human cases or lots of zoonotic positives
 - b. WNV Surveillance
 - i. First detected in 2002

- ii. MIR 4 or greater increases risk for human disease
 - iii. *Culex salinarius* positives associated with human cases
- 2. Delaware State Database and Sprayzone Notification System – James Joachimowski
 - a. Database
 - i. Issues
 - 1. Access db was outdated and limited
 - 2. Paper files were still used
 - 3. Improvements were made but db still had issues
 - ii. Salesforce platform
 - 1. Needs
 - a. Created db specific to mosquito control
 - i. Complaints
 - ii. Inspections
 - iii. Applications
 - iv. Inventory
 - v. Equipment
 - b. Incorporated interactive mapping feature
 - c. Cloud based
 - 2. Benefits
 - a. Case management
 - b. Document inspections
 - c. Document applications
 - d. Mapping
 - e. Chemical inventory
 - f. Customer relations management
 - g. Reporting
 - 3. Conclusions
 - a. Improved efficacy of operations
 - b. Did take a lot of staff time to get it up and running
 - c. Yearly edits as required
 - b. Sprayzone Notification System
 - i. 216 spray zones statewide
 - 1. Spray zone map
 - 2. Delaware Notification service
 - a. School closings
 - b. Other
 - ii. Improves communications in regards to spray activity
 - 1. Helps with beekeeper Notification
 - 2. Lets the rich folk on the coast know when spraying will occur
 - iii. Increases efficiency of daily notifications
 - 1. Former system
 - a. Create announcement
 - b. DNREC listserve
 - c. Took at least a half hour to get notification out

2. New system
 - a. Maps updated daily
 - b. Notification by text or email
 - c. Web-based page allows for remote updates
 3. Info available
 - a. Scheduled spray activity
 - i. Statewide
 - ii. Spray zone
 - b. Sent out for
 - i. Ground ULV
 - ii. Aerial adulticiding
 - iii. Aerial larviciding
 4. Sent to
 - a. 911 center
 - b. Town managers
 - c. Radio stations
 - d. Public (~1200)
3. Sustaining Member Presentation - Central Life Sciences
 - a. <http://www.centrallifesciences.com>
 - b. Public awareness program
 - i. World's Deadliest
 - ii. Free
 - c. Product
 - i. Duplex (new)
 1. Bti
 2. Altosid
 - ii. Four Star
 - iii. Pretreat
 - iv. Water-based Zenivex (can also mix with oil)
 - v. Cash back program
 4. Swimming Pool Update – Fred Koehle
 - a. Pool mitigation program
 - i. Started in 2008
 - ii. Put together a plan of action based on existing ordinance (HO-76-13)
 - b. Plan
 - i. Step one
 1. Investigate complaints
 2. Inspect
 3. Fill out inspection report
 4. Take photos
 5. Send 30 day compliance letter
 - ii. Step two – reinspect
 - iii. Either send thank you letter or another 30 day compliance letter
 - iv. After 2nd 30 days

1. Reinspect
 2. Either send thank you letter or sheriff department to issue citation
 3. Courts get involved
 - c. Environmental impact
 - i. Over 800,000 mosquitoes can be produced by one bad pool
 - ii. Impact can be felt over neighborhood
 - iii. Primarily quincis and albos
 - d. Results
 - i. 461 pools
 - ii. 6 in maintenance
 1. Monthly larviciding
 2. Either find owner or add mosquito fish
 - iii. In process – 30
 - iv. In court – 4
 - v. Mosquitofish – 10
5. Overview of Navy Pest Management – Chris Hohnholt
- a. Mission
 - i. Regulatory requirements
 - ii. NAVFAC's role
 - iii. Installation pest management team
 - b. Regulations
 - i. FIFRA
 1. EPA
 - a. States
 - b. DoD
 2. Pest management board
 - ii. Pest management programs
 - iii. Pesticide compliance ashore
 - iv. Pesticide pollution
 - c. NAVFAC applied biology
 - i. Enhance force health protection
 - ii. Protect property
 - iii. Regions
 1. Atlantic - lead
 2. Southwest
 3. Pacific
 4. Far East
 - iv. Entomologists in public health and pest control
 - v. Provide subject matter expertise
 - vi. Pesticide applicator recertification
 - d. Installations
 - i. Integrated pest management coordinator
 - ii. Pest management training

1. DoD civilian
 2. Certified applicator in state – contractor
 - iii. Plan
 1. Pest and pest management practices
 2. Oversight by IPM coordinator
 - iv. Pesticide approval
 - v. Require monthly reports
 1. Must keep daily records
 2. Done online
 - e. Measures of merit
 - i. Report to EPA
 - ii. Compliance driven by funding
 - iii. Herbicide use dominates
 - iv. Applicator certification required
 - f. Environmental
 - i. Bird aircraft strikes
 - ii. Agriculture
 - iii. Preventative medicine
6. Sustaining member presentations – Leading Edge Associates
 - a. Technology company - <http://www.leateam.com>
 - b. Systems
 - i. DropVision
 - ii. MapVision
 - iii. PrecisionVision (drones)
 - c. On Facebook and twitter
7. VMCA Events and Updates – Jay Kiser
 - a. Student competition
 - i. Team of 3 judges
 - ii. Virginia colleges and universities
 - iii. Sent in digital poster
 - iv. Printed and presented at meeting
 - v. First place winner giving presentation
 - b. Larval ID course
 - i. Collected 20 different species
 - ii. April 19-20
 - iii. Instructor – Bruce Harrison
 - c. VMCA Book of Guideline
 - i. Suggested protocols for board members and committees
 - ii. Should be reviewed every 5 years
 - iii. On website
 - d. Fund raising
 - i. Silent auction
 - ii. 50/50 raffle
8. Rabies in Virginia – Penelope Smelsor

- a. Overview
 - i. Bullet shaped
 - ii. RNA
 - iii. Variants in US
 - 1. Bat
 - 2. Raccoon
 - 3. Fox
 - 4. Skunk
 - iv. Spreads from the bite of an infected animal
 - 1. Saliva
 - 2. Brain or nervous tissue
- b. Mode of action
 - i. Cycle
 - 1. Travels along nerves
 - 2. Enters brain
 - 3. Enters salivary glands
 - ii. Time between bite and symptoms depend on where on body bite occurred
 - iii. Symptoms
 - 1. Flu-like
 - 2. Hallucinations
 - 3. Insomnia
 - 4. Disorientation
 - 5. Hypersalivation
 - 6. Difficulty swallowing
- c. Human cases
 - i. About 3 cases per year in US
 - ii. Bat variant accounts for ~70% of cases
 - iii. Almost always fatal
- d. Virginia
 - i. 1998
 - 1. Bat variant
 - 2. Inmate
 - ii. 2003
 - 1. Northern VA
 - 2. Raccoon variant
 - iii. 2009
 - 1. Imported
 - 2. Dog variant
- e. Prevention
 - i. Animals must be vaccinated
 - ii. Bites get reported to health department
 - 1. Human
 - a. Locate animal

- b. Place on 10 day quarantine
 - 2. Animal exposure
 - a. 45 day quarantine - vaccinated
 - b. 6 month quarantine – unvaccinated
 - 3. Testing only done with possible exposure
 - a. Report about 500 animals per year in Norfolk
 - b. Average 1-3 positives per year in Norfolk
 - iii. Oral Rabies Vaccination (ORV) Project
 - 1. Control rabies in raccoon population
 - 2. Prevent raccoon rabies from spreading west
- 9. It'll Never Work – Peter Connelly
 - a. Aerial applications to control peridomestic species
 - b. Importance
 - i. 40-50% of global population in DEN endemic areas
 - ii. *Aedes aegypti* is an important vector
 - c. Improving the odds
 - i. Smaller VMD at nozzle
 - ii. Good surveillance for peak activity
 - iii. Lower flying aircraft
 - iv. Latest delivery technology
 - v. Check for resistance
 - vi. Use multiple applications as necessary along with source reduction
 - d. If there is no insecticide resistance, then lack of kill is related to a delivery problem
 - e. Trials
 - i. Camp Blanding - 2013
 - 1. Bioassay cage
 - a. Inside
 - b. Outside
 - 2. Results
 - a. Open areas – 100% control
 - b. Closed areas – at least 50% control
 - ii. Process used in Miami-Dade County for ZIKV outbreak with great results
- 10. Sustaining Member Presentation – Adapco
 - a. Products
 - i. Larvicides
 - ii. Duplex Bti/Altosid multibrood
 - iii. Adulticides
 - iv. Barrier sprays
 - b. Traps
 - i. Biogent products
 - 1. Traps
 - 2. Counter

- ii. http://www.bg-sentinel.com/downloads/Publication_List_Biogents_Traps.pdf
 - c. Maryuama backpacks
- 11. ZIKV Virus and Arboviruses Surveillance and Control in Maryland – Kim Mitchell
 - a. ZIKV
 - i. Incubation period probably a few days to a few weeks
 - ii. Multiple means of transmission
 - iii. Maryland
 - 1. 159 travel-related cases
 - 2. 2 sexually acquired cases
 - 3. Threat?
 - a. Vector species
 - b. Unrecognized cases
 - 4. Response
 - a. Healthcare provider education
 - b. Public information
 - c. Surveillance and epidemiological investigations
 - d. Prevention kits for pregnant women
 - e. ZIKV Awareness Week
 - f. <http://phpa.dhmh.maryland.gov/pages/zika.aspx>
 - g. <http://www.mdruralhealth.org/wp-content/uploads/2016/10/8-Rural-Zika-Preparedness.pdf>
 - 5. WNV VS ZIKV
 - a. Mosquito-based surveillance is key to WNV control
 - b. This is not true for ZIKV
 - i. Surveillance is primarily for determining presence of Aedes spp
 - ii. Also used to develop source reduction plans
- 12. AMCA/NPDES Update – Dennis Salmen
 - a. AMCA
 - i. ZIKV task force
 - ii. CDC grant to develop a national mosquito surveillance and control program
 - b. Washington Conference - May 15-17
 - c. NPDES - Second permitting periods started this year
 - d. Armed Forces literature resources no longer available
- 13. Sustaining Member Presentation – AllPro
- 14. Entomological Warfare – Kyle Brinson
 - a. Biological warfare
 - i. Direct attack
 - ii. Indirect attack – attack resources
 - iii. Vector attack
 - b. Historical perspective
 - i. 1346

- 1. Plague victims catapulted into castle
 - 2. Fleas spread plague
 - ii. 1940
 - 1. Japanese dispersed plague infested fleas by plane
 - 2. Many Chinese died of plague
 - iii. Germany released Colorado Potato beetles in Germany as a trial, causing an outbreak of Colorado Potato beetles
 - iv. 1955 – Big Buzz
 - 1. Released *Aedes aegypti* over Georgia
 - 2. Checked survival, dispersal, and feeding
 - 3. Similar studies done elsewhere in the 60s
 - c. Biological Weapons Convention 1975
15. Sustaining Member Presentation – Crabbe Aviation
 - a. Aircraft
 - i. Fixed wing
 - ii. Rotary wing
 - b. Granular and liquid product
16. Private Sector Mosquito Control: Hero or Villain? Joey Osborne
 - a. Who is the private sector?
 - i. Entrepreneurs
 - ii. Trying to make the world a better place
 - b. What does the private sector do?
 - i. Barrier spray
 - ii. Special events
 - iii. Recurring survey (LBJ)
 - iv. Wide area ULV
 - c. Major historical shifts
 - i. Speech – 1.75 million years ago
 - ii. Written language
 - iii. Gutenberg press - 1440
 - iv. Microchip – 1959
 - 1. 8.6 billion mobile devices
 - 2. 1.8 billion active Facebook users
 - 3. Worldwide instant collaboration
 - d. Mosquito Authority - 2016
 - i. 400 franchise locations
 - ii. 150 franchise owners
 - iii. 38 States
 - iv. <2 hour emergency deployment
 - e. Ovitrap program
 - i. Willing to share data – open source
 - ii. Zikatrap.com and Facebook page
 - iii. Zika trap app
 - f. Job 1 – mosquitoes can be controlled

- i. People believe what they believe and resist being convinced
- ii. Be compelling

Wednesday, February 1

Morning

1. Pollinator Protection Plan – Keith Tignor
 - a. Virginia State managed
 - b. Concerns
 - i. Declines in managed pollinators
 1. Annual winter colony loss 33.1% (1978-2013)
 2. Continued decrease since 1978
 3. Summer month losses were as high as 56%
 - ii. Bumble bees
 1. 5 species tracked
 2. All but one has declined
 3. One species has been put on the endangered species list
 - c. Why the losses?
 - i. Environmental
 1. Temperature extremes
 2. Drought and flooding
 - ii. Nutrition
 1. Habitat loss
 2. Food resource changes
 - iii. Pathogens
 1. Pest
 2. Viral
 - iv. Genetics
 1. Loss of diversity
 2. Isolation
 - v. Toxicants/pollutants
 - d. 2014 – Strategy to protect pollinators
 - i. Presidential memorandum
 - ii. EPA
 1. Work with States
 2. Mitigating pesticide risk
 - e. Managed pollinator protection plan
 - i. Focus on communication and coordination between stakeholders
 1. Beekeepers
 - a. What actions should be taken
 - b. When should it be taken
 2. Pesticide consideration
 - a. Toxicity of active ingredients
 - i. Lethal
 - ii. Sublethal

- b. Residuals
 - c. Formulations
 - i. Dust is highest risk
 - ii. Granules are lowest risk
 - d. Proximity to hives and forage (average area is 5.87 square miles)
 - e. Timing of application
 - i. Bee activity based on environmental conditions
 - ii. Scout, forage, return
 - ii. Use of best management plan
 - iii. Voluntary and proactive
 - 1. Does not include pest hives
 - 2. Works with pesticide label
- 2. Sustaining Member Presentation – Bayer
- 3. Incorporating Education in your Mosquito Control Organization – Tom Smith
 - a. Why include education?
 - i. Lots of reasons
 - ii. Part of protecting people from mosquito-borne diseases (CDC/EPA)
 - b. Goals of education
 - i. Infectious diseases continue to be a concern
 - ii. Mosquito is the world's deadliest animal
 - iii. Mosquito-borne diseases have killed millions
 - iv. It is difficult to properly educate people
 - c. How do we do this?
 - i. Talk about barriers and methods
 - ii. Build on ideas
 - iii. Know your target audiences
 - d. What they need to know and how to tell them
 - i. What is IPM? (<http://extension.psu.edu/pests/ipm>)
 - 1. School programs
 - 2. Explain how the program operates
 - ii. Know your beekeepers
 - iii. Work with municipalities
 - 1. Tire removal
 - 2. Problem areas
 - iv. Advertising
 - 1. Brand your vehicles
 - 2. Partner with the library
 - 3. Partner with other agencies
 - 4. Get on local media
 - 5. Write articles
 - 6. Social media
 - 7. Have educational displays ready to go
 - 8. Get involved with youth programs

- 9. Internships/volunteers
- 10. Talk with birding groups
- 11. Insect fairs
- 12. Career days
- e. Commercial applicator programs
 - i. NPDES permit issues
 - ii. Recertification programs
- f. Website
 - i. Online reporting
 - 1. Surveillance
 - 2. Education
 - 3. Source reduction
 - ii. Post educational material
 - iii. Get the residents to take responsibility
- g. Share
- 4. What's Next? – Ture Carlson
 - a. One approach – what is happening now
 - i. Zika
 - ii. Yellow fever
 - iii. CHIK
 - iv. Rift Valley
 - v. Dengue
 - b. Globalization
 - c. What is happening, besides Zika?
 - i. Yellow fever in Angola
 - 1. Big outbreak
 - a. Imported cases elsewhere
 - b. Some local transmission in other areas
 - c. In Angola
 - i. 6000 suspected cases
 - ii. 884 confirmed
 - iii. 400+ deaths
 - 2. Shortage of vaccine
 - a. Finally got ~88% of population vaccination
 - b. Lots of issues
 - i. Product lost in transport
 - ii. Reduced dose size – gives temporary immunity
 - iii. Global supply deplete
 - iv. Fake vaccination cards
 - 3. Brazil
 - a. First case onset 12/18/16
 - b. Over 400 suspected cases
 - c. Largest outbreak since 2000
 - d. Why – deforestation?

- ii. Chikungunya
 1. Large numbers of cases in South and Central America
 2. Outbreak in Pakistan 2017
 3. Outbreak in India 2016
- iii. Rift Valley
 1. Small outbreak in areas of Africa
 2. Virus found in body fluids for months
- iv. Dengue
 1. Hawaii 2015-2016
 2. Americas
 3. Annually, 390 million cases (WHO)
 4. Vaccine is now in use in a few areas
- v. Malaria
 1. Venezuela
 - a. Political chaos
 - b. Surge in malaria
 2. Cuba
 - a. 2017
 - b. 10 confirmed cases
 - c. Good mosquito control
- d. A “new” viruses - Mayaro
 - i. Dengue-like
 - ii. Alphavirus
 - iii. Isolated in 1954
 - iv. Animal reservoirs
- e. Lots of possibilities out there
- f. Mosquitoes are also on the move
- 5. Insecticide Resistance in Mosquitoes – Stephanie Richards
 - a. Routine monitoring is an important part of mosquito control
 - b. Study
 - i. Why
 1. Determine susceptibility/resistance of several US population
 2. Different technical grade active ingredients
 3. Done over several years
 - ii. Design
 1. Ship eggs in mail
 2. Reared in lab
 - iii. Active ingredients
 1. Malathion
 2. Etofenprox
 3. Several pyrethroids
 - iv. Mosquitoes
 1. *Culex quinquefasciatus*
 2. *Aedes albopictus*

- v. Bottle bioassay
 - vi. Analysis
 - 1. Ordinal logistic regression
 - 2. WHO guidelines
 - 3. Odds ratio
 - c. Results
 - i. South
 - 1. Dallas, TX
 - a. Aedes generally more susceptible than Culex
 - b. Resistance seen in Aedes to several active ingredients
 - 2. Greenville, NC
 - a. No mosquito control
 - b. Collected from detention pond
 - c. Resistance changed over time
 - ii. Lots of variation
 - iii. Lots of resistance
 - 1. Resistance higher in Culex than Aedes
 - 2. Some populations are highly resistant to everything
 - d. Why the differences
 - i. Different pesticide applications
 - 1. Different products
 - 2. Different times
 - 3. Different methods of application (ULV vs Barrier)
 - ii. Mosquito control is only a small part of the pesticide pressure
6. Sustaining Member Presentation – Summit Chemical
7. South Carolina Rabies Presentation – Travis Shealy
 - a. Program
 - i. Centralized rabies program
 - ii. Regional offices
 - b. Rabies variants
 - i. US
 - 1. Raccoon
 - 2. Bat
 - 3. Skunk
 - 4. Fox
 - ii. South Carolina
 - 1. Raccoon
 - 2. Bat
 - c. Types
 - i. Furious (aggressive)
 - ii. Paralytic (dumb)
 - d. The only way to be sure an animal has rabies is to test it
 - e. SC 2010-2016
 - i. Bats

1. Last human rabies death in 2011
 - a. Bat exposure
 - b. DHEC never notified until the patient was hospitalized
 2. 8-10% bats tested are positive
 - ii. Breakdown of tested animals
 1. Raccoons 50%
 2. Skunk 19%
 3. Fox 15%
 4. Bat 8%
 5. Cat
 6. Dog
 7. Other
 - f. <https://gis.dhec.sc.gov/rabies/>
8. ZIKV Update – Abelardo Moncayo
 - a. Background
 - i. (+)ssRNA flavivirus
 - ii. Transmission routes
 1. Mosquito
 2. Pregnant woman to fetus
 3. Sex
 - a. Females 8 weeks
 - b. Males 6 months
 4. Blood transfusion and other fluids
 - iii. Attack rate ~75%
 - iv. Incubation period 3-14 days
 - v. Viremia
 1. 7-10 days (serum 7 days)
 2. Urine
 3. Semen
 - vi. Prevention is key
 - b. Worldwide transmission
 - i. 198607 confirmed cases
 - ii. 540176 probable cases
 - iii. 76 counties/territories
 1. 29 with microcephalic
 2. 21 with GBS
 3. 17 with sexual transmission
 - c. US
 - i. Travel associated
 - ii. Sexually transmitted
 - iii. GBS
 - iv. Pregnant women
 1. Birth defects
 2. Pregnancy losses

- v. Locally-acquired cases
- d. Tennessee
 - i. Made reportable in Feb 2016
 1. 651 preauthorized for testing
 2. Most are testing as not a case
 3. 64 confirmed or probable
 4. Peak was in Aug
 - ii. Testing
 1. Primarily through a public health lab
 2. Low numbers of commercial lab testing – some issues
 - iii. Specimen collection
 1. Originally serum
 2. Changed over to urine testing
 - iv. Population affected
 1. Vacation travelers
 2. Mission trips
- e. Case characteristics
 - i. More female than male
 - ii. Most cases in the 20-39 age group
 - iii. Next largest age group is 40-59
 - iv. Regions
 1. Caribbean
 2. Central America
 3. South America
- f. Local response
 - i. Education within 200 yards of case
 - ii. Source reduction
 - iii. Talk about testing, esp to pregnant women
- g. No *Aedes aegypti* collected
- 9. Vector-Borne Diseases in West Virginia – Eric Dotseth
 - a. Mosquito-borne diseases
 - (<http://www.dhhr.wv.gov/oeps/disease/zoonosis/mosquito/pages/default.aspx>)
 - i. LAC – number one MBD
 1. Recent decline
 2. Bunyavirus – California serogroup
 3. Risk factors
 - a. Home in or near woods
 - b. Hardwood trees
 - c. Containers
 4. Vectors
 - a. *Aedes triseriatus*
 - b. *Aedes albopictus*
 - c. *Aedes japonicus*
 5. Reservoir

- a. Sciurid rodents
 - b. Vertical transmission
 - ii. Mosquito control
 - 1. Education pamphlets
 - 2. Mobile billboards
 - 3. Ordinances/Statutes to reduce discarded tires
 - 4. Training
 - a. Mosquito ID
 - b. Pesticide license
 - 5. Door to door surveillance and education
 - 6. Partner with local health departments
 - 7. Community cleanup activities
 - 8. Tire drop off (partner with EPD-REAP)
 - 9. Litter control officers
 - iii. Environmental assessments
 - b. Tick-borne diseases
 - (<http://www.dhhr.wv.gov/oeps/disease/zoonosis/tick/pages/default.aspx>)
 - i. Diseases of consequence
 - 1. Lyme
 - 2. RMSF
 - 3. Ehrlichiosis
 - ii. Lyme is reported from most counties
 - iii. All TBDs are increasing
 - iv. Response
 - 1. Active tick Surveillance
 - a. Park System - drags
 - b. Veterinarians – attached
(<http://www.dhhr.wv.gov/oeps/disease/zoonosis/tick/pages/wv-veterinary-tick-submission-project.aspx>)
 - c. DNR – deer check stations
 - 2. Ticks tested in Cornell
 - 3. Interactive maps
10. Sustaining Member Presentation – Univar
11. ZIKV Task Force of Virginia – Robert Mauskapf and Dreda Symonds
- a. Background
 - i. 2294 residents tested for ZIKV since 1/29/16
 - ii. Task force put together to combat ZIKV
 - b. Data
 - i. Human
 - 1. 113 confirmed/probable cases
 - 2. Predominately females being tested
 - 3. Regional
 - ii. Mosquito pools
 - 1. No positives

2. Vector – *Aedes albopictus*

- c. Task Force
 - (<http://www.vdh.virginia.gov/content/uploads/sites/92/2016/08/Virginia-Zika-Response-Annex-Version-5.1-November-15-2016.pdf>)
 - i. Task groups – 7
 - ii. Everything feeds into communications
 - iii. Multiagency
 - iv. Initiatives
 - 1. Epidemiology
 - 2. Vector surveillance and control
 - 3. Communications
 - 4. Education
 - v. <http://www.vdh.virginia.gov/zika/>
 - vi. Incident management teams
 - d. Other activities
 - i. Increased lab capacity
 - ii. Contracted with private mosquito control
 - iii. MOU with Virginia Tech for vector surveillance
 - iv. Pregnancy registry
 - v. Monthly meetings
 - vi. Clinician Outreach Work Group
 - vii. Communications
 - e. Mosquito control
 - i. 12 programs
 - ii. Work with military base programs
 - f. Planned action for local transmission
 - g. ZIKV prevention kits
12. Sustaining Member Presentation – Dynamic Aviation

Business meeting

- Minutes
- Treasurer Report
 - \$1600+ in checking account
 - A little under \$7000 in education fund
- Committee
 - Audit
 - One discrepancy found
 - Paperwork delay
 - Constitution and Bylaws
 - Proposal that current term for Industry Rep be changed from 1 year to 2 years
 - Vote to amend the constitution
 - Newsletter
 - Distribution ~575

- Electronic
 - Awards
 - Fred Koehle – appreciation
 - Tom Smith – appreciation
 - Jeff O’Neil – appreciation
 - 2 awards will be given at the banquet
 - Nominating
 - Tim Dubois - President
 - Stephanie Richards - VP
 - Tom Smith – 2nd VP
 - Andy Kyle - ST
 - Board
 - Rose Kelly – GA
 - Kyle Brinson – MD
 - Christian Boyer - PA
 - Industry – Jason Conrad
 - Past president – Abelardo Moncayo
 - Program
 - 113 full registration
 - 11 students
 - Total attending ~156
- Old business
 - 2018 meeting
 - North Carolina
 - Feb
 - Mid-Atlantic Mosquito Key
- New business
 - Need to promote sustaining members
 - 2019 meeting - PA
 - New officers accepted

Wednesday, February 1

Afternoon

1. VDACS Update – Robert Christian
 - a. Pesticide licensing
 - i. Safety
 1. The label is the law
 2. Safety data sheets
 3. PPE
 - ii. IPM
 - iii. Product management
 - b. Handling pesticides
 - i. Situational

- ii. Must read the label
 - iii. Equipment must be calibrated
 - c. Handling spills
 - i. Protect anyone in immediate area
 - ii. Stop spill
 - iii. Contain spill
 - iv. Cleanup spill
 - v. Report it
 - d. Keep up with changes in regulations
- 2. Sustaining Member Presentation – Frontier Precision
 - a. www.frontierprecision.com
 - b. Geospatial information
 - i. Product and services
 - 1. Survey
 - 2. GIS
 - ii. Acquired Elecdata in July 2016
 - c. Representative – Clarke
 - d. Partners
 - i. Trimble
 - ii. ESRI
 - iii. Juniper Systems
 - e. Products
 - i. FieldSeeker
 - ii. Sentinel
 - iii. New in 2017 – windows ULV extension
- 3. Dangerously Venomous Snakes of the World – Joe Conlon
 - a. How snakes eat
 - i. Salivary glands modified to venom glands
 - ii. Fangs
 - 1. Rear
 - 2. Front
 - 3. Folded
 - b. Risk
 - i. Depends on species
 - ii. Commonness
 - iii. Range/location
 - iv. Venom
 - 1. Yield
 - 2. Toxicity
 - 3. Amount
 - c. Americas
 - i. Coral snake
 - 1. Red in yellow, kill a fellow
 - 2. Lots of variation outside the US

- 3. Very toxic venom
 - ii. Rattlesnakes
 - 1. Variation in venom type
 - 2. Lots of different species
 - 3. Not all are aggressive
 - iii. Most lethal snakes - vipers
 - 1. Bushmaster
 - 2. Fer de Lance
 - 3. Jararaca
 - 4. Cascabel
- d. African snakes
 - i. Many Mambas in Zika forest
 - ii. One reason why there wasn't much Zika transmission in the area
 - iii. Most lethal
 - 1. Spitting cobra
 - 2. Egyptian cobra
 - 3. Puff adder
 - 4. Black mamba
 - 5. Saw-scaled viper
- e. Middle East
 - i. Most venomous
 - 1. Levantine viper
 - 2. Desert horned viper
 - 3. Mole viper
 - 4. Saw-scaled viper
 - ii. Mole viper can bite even if held right behind neck
- f. Asia
 - i. King Cobras
 - 1. Aggressive stance – rise up
 - 2. Eat other snakes
 - ii. Most venomous
 - 1. Russell's viper
 - 2. King cobra
 - 3. Asian cobra
 - 4. Bamboo viper
 - 5. Saw-scaled viper
 - 6. Indian krait
- g. Oceania
 - i. Most venomous
 - 1. Death adder
 - 2. Taipan
 - 3. Tiger snake
 - 4. Brown snake
 - 5. Beaked sea snake

- ii. Australian venomous snakes are just bad news
 - 4. TickBot Efficacy in Residential and Wildlife Habitats in Portsmouth, VA – Alexis White
 - a. Tick 101
 - i. Acarids
 - ii. Egg-larva-nymph-adult
 - b. Study
 - i. Flagged sites
 - ii. Lone star ticks dominate field sites
 - c. Tick management
 - i. Vectors
 - ii. Finding effective methods is difficult
 - iii. Attracted to CO2 and movement
 - iv. TickBot
 - 1. Attract ticks to movement and CO2
 - 2. Ticks coming into contact with permethrin-treated drag die
 - 3. Rapid reduction of ticks
 - 4. Published study -
 - <http://www.sciencedirect.com/science/article/pii/S1877959X14002118>
 - d. 2016 study
 - i. Different types of CO2
 - ii. Eight trials
 - iii. 2 field sites
 - iv. Mark-recapture ticks before treatment
 - v. Adjacent control/treatment sites
 - vi. 2 different treatment times
 - vii. Results
 - 1. Treated areas – knocked down to zero for 24 hours
 - 2. Solid CO2 as effective as gaseous CO2
 - 3. Based off of lone star ticks
 - viii. Future study – look at *Ixodes scapularis*
 - e. *Tick lab at ODU is on Facebook*
- 5. Sustaining Member Presentation – Clarke
- 6. Beekeepers Update – Andy Westrich
 - a. Colonial beekeepers association
 - b. Hive misting system
 - i. Sprays a mist of water around hives
 - ii. Keeps pesticides away from bees
 - iii. Cools bees
 - iv. More likely to go into hive and not beard
 - c. <http://colonialbeekeepers.org/index.php/educational-information1/194-protecting-bees-against-aerial-spraying>
 - d. Nighttime spraying is less hazardous to bees than aerial daytime spraying
 - e. Beekeepers want to cooperate

7. Emergency Bee Response in South Carolina – Jennifer Tsuruda
 - a. Problem
 - i. Aerial application of naled due to ZIKV
 1. Public notice Aug 26
 2. Tentative spray date Aug 27
 3. Actual spray Aug 29
 - ii. Sprayed between 6:45 and 7:50
 - iii. Sprayed according to label
 - iv. Bees are out at the crack of dawn
 - b. Aftermath
 - i. DPR concluded investigation Sept 29
 1. Samples taken ~50 hours after application
 2. Problematic for testing as pesticide breaks down
 3. Lots of negative press by people outside the investigation
 - ii. Multiple agencies deal with bees
 1. Dept of Pesticide Regulation deals with bee kills
 2. Clemson deals with education and research
 3. Dept of Ag deals with honey houses
 - c. It's complicated
 - d. How to protect pollinators and people
 - i. Problems
 1. Need mandatory hive registry
 2. Migratory beekeepers are problematic
 3. *Aedes* spp vectors are active during the day, which changes spray times
 4. Most pesticides will kill bees
 5. Advanced notices can be problematic
 6. Pesticides break down quickly
 7. Climate can change bee behavior
 - ii. Solutions
 1. Practice IPM
 2. Understand thresholds – treatment should match level of threat
 3. Surveillance is key
 4. Limit exposure
 5. Have a plan
 - e. Pesticides
 - i. Adulticide vs larvicide
 1. Dose
 2. Formulation
 3. Mode of action
 - ii. Note: pesticides can cause a direct kill (adult bees) and an indirect kill (bee larvae)
 - f. What is needed
 - i. Beekeepers

1. More communication
 2. More education
 3. Advocate for mosquito control
 - ii. Mosquito control
 1. Make contacts with beekeepers
 2. Communicate – go to beekeeper meetings
 3. Be aware of all pollinators
8. Sustaining Member Presentation – Morrell Instruments
9. ZIKV Response in Miami-Dade County – Jeff Hottenstein
 - a. Urban warfare against *Aedes aegypti*
 - i. Door to door
 - ii. Larviciding
 - iii. Education
 - b. Background
 - i. Over 1000 locally-acquired cases
 - ii. CDC travel advisory
 - iii. Patients mostly don't get sick
 - iv. Need good history
 - c. Clarke Site Guard
 - i. Modeled after Rutgers University's container breeder program
 - ii. Designed to be a supplement to local mosquito control
 - iii. Design
 1. Surveillance – develop operational maps
 2. Inspections
 - a. Larval
 - b. Source reduction
 3. Adult control
 - a. Travel-related
 - i. Barrier treatment
 - ii. DUET
 - b. Locally-acquired
 - i. Truck spray
 - ii. Aerial spray of Naled
 - iii. Aerial larviciding
 - d. The program
 - i. Seasonal staff
 1. Recruiting
 2. Screening
 3. Interviews
 - ii. Training
 - iii. Equipment
 - iv. Staff were given an ID and uniform
 - v. Trucks had appropriate label
 - e. Protocols

- i. Knock on door
 - ii. Stand back
 - iii. Identify self
 - iv. Ask for access
 - 1. 95% spoke Spanish
 - 2. 50% had no English
 - f. The challenge
 - i. Surveillance
 - 1. Cryptic breeding
 - 2. Think like a mosquito
 - ii. Realtime mapping
 - g. <http://www.miamidade.gov/mosquito/index.html>
 - h. Problems
 - i. Protests over aerial spraying
 - ii. No complaints about spray trucks
 - i. Results
 - i. Got good control with ULV larviciding
 - ii. Aerial spraying knocked out transmission
- 10. October 2015 Flood in Richland County, SC – Tammy Brewer
 - a. The 1000 year flood
 - b. Set up
 - i. The players
 - 1. Hurricane Joaquin (Cat 5)
 - 2. High pressure system to north
 - 3. Low pressure system to south
 - ii. Funneled hurricane right through the Midlands
 - c. EVERYTHING was closed, even Church
 - d. Record rainfall ~21"
 - e. Outcome
 - i. Breached Columbia Canal
 - ii. Drinking water affected
 - iii. River gauge showed an all-time high
 - iv. Roads were washed out
 - v. Water drained into lower lying bottomland
 - vi. 20 of 200+ dams failed
 - vii. Lots of ponds are now gone
 - f. Vector control
 - i. Quiet summer
 - ii. 237 spray requests in October
 - 1. *Psorophora ciliata*
 - 2. Other floodwater species
 - 3. FEMA data
 - a. Before
 - i. 3 years previous ~13 requests per month

- ii. Average rainfall is ~3"
 - iii. Highest number of mosquitoes caught per trap night was ~14
 - b. After
 - i. 13+" of rain
 - ii. >50 mosquitoes per trap night
 - iii. Over 100 requests for service
 - iv. Pre-aerial overnight totals
 - 1. Site #1 - 663
 - 2. Site #2 - 686
 - 3. Site #3 - 360
 - v. *Ps ciliata* were too big to enter traps
 - vi. Post spray - zero
 - iii. Got permission to do late afternoon truck spraying
 - 1. Too dangerous to spray at night
 - 2. Water and debris
 - 3. Truck spraying was just too dangerous and not effective
 - 4. Got planes
 - iv. Aerial spraying - Naled
 - 1. Contracted with Clarke
 - 2. 112,640 acres
 - 3. Avoided federal lands, beekeepers, and organic farms
 - 4. Mission accomplished on 11/11/15 (5 rain delays)
 - 5. Evening spray
 - g. Other issues
 - i. Sewer overflows
 - 1. Effected WNV transmission in 2016
 - 2. Underground infrastructure changed
 - ii. One very annoying protestor needed handling
 - iii. Lots of happy people after spray

Thursday, February 2

1. Update on the Invasive Mosquito, *Aedes j japonicus*, in North America – Mike Hutchinson (canceled)
2. Evaluation of Natular XTR for Control of Larvae in Vacuum Pots – Elizabeth Hodson
 - a. Background
 - i. No info on larval control in vacuum sewers
 - ii. Lots of mosquitoes in the system
 - b. Study
 - i. What species?
 - ii. Did Natular work?
 - iii. Did it work for 180 days?
 - c. Vacuum sewer
 - i. First used in Europe in 1882

- ii. Alternative to gravity and septic
 - iii. Useful in problem areas
 - iv. System (AirVac Municipal Vacuum Sewer)
 - 1. 2 pits
 - a. Bottom – sewage
 - b. Top – clean water
 - 2. Opened up at least once a year for maintenance
 - 3. Amount of water in pits varied
 - d. Study area – York County
 - e. Method
 - i. 40 pits
 - 1. 20 treated
 - 2. 20 untreated
 - ii. May-Oct
 - iii. Sampled biweekly
 - iv. Collected larvae monthly
 - f. Results
 - i. Got *Aedes albopictus* and *Aedes japonicus*
 - ii. Many fewer larvae in treated pots
 - g. Conclusions – Natular worked
3. *Aedes albopictus* Peak Activity Times – Jay Kiser
 - a. Important info for mosquito control
 - i. Different species have different peak activity times
 - ii. Control is more effective if mosquitoes are out and active
 - b. Mosquito monitoring
 - i. BG counter
 - 1. Remote monitoring
 - 2. Data accessible by computer
 - 3. Used CO₂ and BG lure
 - ii. 2016 study
 - 1. Downtown area
 - 2. Focus on albos
 - 3. Twice a week
 - 4. June-Sept
 - 5. 24 hour trapping
 - 6. 29 trap nights
 - 7. Counter was 95% accurate
 - 8. 91% were albos
 - iii. Results
 - 1. There is an artificial peak due to introducing the trap
 - 2. Peaks
 - a. 5:30 pm – 2 hours before sunset
 - b. Smaller peak before sunrise
 - c. Landing rate counts

- i. 5 minutes
 - ii. 7:30-8:00 am
 - iii. Near trap and away from trap
 - iv. Results
 - 1. Lots of males
 - 2. Mating pairs
 - d. What was the distribution of males to females at different times?
 - i. Modified rotator trap
 - ii. Used with BG trap
 - iii. Aug-Sept
 - iv. 1 hour chambers
 - v. 11 trap nights
 - vi. Results
 - 1. Males peaked at around 5 pm
 - 2. Females were constant
 - e. Conclusions
 - i. Peak activity was about 2 hours 2-3 hours before sunset
 - ii. Peak may be driven by males, not females
 - iii. Needs further study
4. Forest Pest Management – Nathaniel Nagle
- a. Background
 - i. Program established in 1992
 - ii. Amended several times to include insects other than Gypsy moth
 - iii. Also includes mosquitoes
 - b. Why
 - i. Trees are economically and ecologically important
 - ii. Defoliation can cause tree mortality
 - c. Pests
 - i. Fall cankerworm
 - 1. Life cycle
 - a. Adult moths emerge in late fall after a hard freeze
 - b. Lay eggs
 - c. Larvae hatch in Spring
 - d. Feed on new spring growth
 - e. Mature caterpillars burrow into soil and pupate
 - 2. Surveillance
 - a. Where
 - i. Throughout county
 - ii. Focus on forested area with favored trees
 - b. How
 - i. Band on tree
 - ii. Tanglefoot
 - c. Numbers
 - i. Started in 2003

- ii. Peak numbers 2013-2014
 - iii. Suppression works
 - ii. Gypsy moth
 - 1. Life cycle
 - a. Adults emerge in July
 - b. Lay eggs
 - c. Larvae hatch April-May
 - d. Feed on new growth
 - e. Pupation occurs in late July
 - 2. Surveillance
 - a. 1069 sites in 2016
 - b. Each site surveyed once per year
 - i. 1/40th acre plot
 - ii. Count egg masses
 - c. Low populations last 6-7 years
 - iii. Emerald ash borer
 - 1. Cooperate with USDA APHIS EAB biocontrol program
 - 2. Parasitoid release
 - a. 12 release trees/sites
 - b. 2 test locations
 - 3. Release every two weeks
 - iv. Other surveillance
 - 1. Asian longhorn beetle
 - 2. Oak ambrosia beetle
 - 3. Other invasive species
 - d. Aerial suppression for leaf eaters
 - i. Btk applied by helicopter
 - ii. Pre and post spray surveys
 - 1. Leaf progression
 - 2. Defoliation
 - 3. Caterpillar development
 - iii. Monitor weather conditions
 - iv. Voluntary participation
 - v. Aggressive public outreach prior to spray event
5. Philadelphia 2016 ZIKV Response – Kaila Druetto and Emily Kehoe
 - a. Hot button topic
 - i. Birth defects
 - ii. Sexual transmission
 - b. US surveillance
 - i. Total 4930
 - ii. Sexual transmission 40
 - c. Philadelphia
 - i. 142.6 sq miles
 - ii. 5th most populated city in the US

- iii. Mosquito control
 - 1. 1700 yellow fever outbreak
 - 2. 1960s mosquito control
 - 3. Dept of Health
 - a. Vector control
 - b. Diseases control – epidemiology
 - c. ZIKV preparedness task force
- iv. ZIKV response
 - 1. Cluster response
 - a. 2 or more cases within 2 weeks within one mile of each other
 - b. 7 cluster responses in 2016
 - c. Procedure
 - i. Scout area
 - ii. Collect dip samples
 - iii. Set BGS traps
 - iv. Collect and analyze data
 - v. Source reduction/treatment
 - 2. Surveillance for *Aedes albopictus*
 - 3. Monitor for ZIKV cases, including pregnant women
 - a. Epidemiological investigation
 - b. Monitor for long term effects
 - 4. Testing
 - a. Molecular
 - b. Antibody
 - 5. Awareness campaign
 - a. City bus
 - b. Facebook
 - c. Google
 - d. Radio
 - e. Doctor's offices
- v. Results
 - 1. Areas of concern
 - a. Overgrown back alleys
 - b. Salvage yards
 - c. Overgrown properties
 - d. Abandoned houses
 - e. Containers
 - f. Tire shops
 - 2. Targeted education
 - 3. Community Life Improvement Program (CLIP) partnership
 - 4. CASPER survey
 - a. What does the community know about ZIKV
 - b. Questions

- i. Symptoms
 - ii. Route of transmission
 - iii. Prevention methods
 - iv. Importance of issue
- c. Results
 - i. 11% of population had not heard of ZIKV
 - ii. Some incorrect answers about mode of transmission
 - 1. Vaccines
 - 2. Polluted water
 - 3. Sneeze/cough
 - iii. Lower numbers of people (54%) were aware that Zika was sexually transmitted as opposed to those who knew it was transmitted by mosquitoes
 - iv. Prevention methods were fairly well understood, but over 30% thought wearing a face mask would be preventative
 - v. Women of childbearing years were most likely to see ZIKV as an important health issue

6. State Reports

- a. Delaware – James Joachimowski
 - i. 10-15% above average on service requests
 - ii. More spraying than usual related to marsh restoration project and heavy rains in the late summer
 - iii. Low numbers of viral activity
 - iv. ZIKV Response
 - 1. Improved communications with public health
 - 2. Responded to travel related cases
 - 3. Treated surrounding areas
 - 4. Surveillance
 - a. 25 NJ light traps statewide
 - b. Increased albo trapping effort
 - v. What's new in 2017?
 - 1. Tick control – maybe, based on funding
 - 2. Considering the use of drones – FFA involvement
 - 3. Increased surveillance and control of urban mosquitoes
- b. Georgia – Fred Koehle
 - i. ZIKV
 - 1. Task Force
 - a. Multiagency
 - b. Multidepartmental
 - 2. Education campaign
 - 3. Vector Surveillance Coordinators
 - ii. Low numbers of cases otherwise

- c. Maryland – Kyle Brinson
 - i. What's new? - Some new folks
 - ii. Rainfall VS Species
 - 1. Wet spring – *Ae canadensis*
 - 2. Dry summer – albos
 - 3. Wet warm end of year
 - a. *Aedes vexans*
 - b. *Ps columbiae*
 - iii. BGS traps
 - iv. Low numbers of arboviral cases
 - v. 2 purportedly locally acquired malaria cases
 - vi. ZIKV
 - 1. Responded to 91 of 161 travel related cases
 - 2. Door to door surveillance
 - 3. Source reduction
 - 4. Education
 - vii. Open Marsh Water Management
 - 1. Limited number of projects completed
 - 2. Repairs done to equipment
 - 3. 65+ projects ongoing
 - viii. Aerial spray
 - 1. Larviciding
 - 2. Adulticiding
- d. NC – Joe Andrews & Michael Reiskind
 - i. Overall, a low year for arboviruses
 - ii. Container species survey
 - 1. 30 ovitraps per county
 - 2. 17 counties
 - 3. May-Oct
 - 4. Species
 - a. Albos (>95%)
 - b. Triseriatus
 - c. Japonicus
 - iii. State survey of mosquito programs
 - iv. Hurricane Matthew response
 - v. Public survey on mosquito activities and opinions
 - vi. 2017 projects
 - 1. Invasive species education and surveillance
 - 2. Applied research
 - a. Insecticide resistance
 - b. Albo seasonality
 - c. Albo biting behavior
 - 3. ZIKV Response
 - 4. County assistance for mosquito control

- vii. Next MAMCA meeting in NC (2018)
- e. Pennsylvania – Tom Smith
 - i. Mosquito
 - 1. Primarily a WNV program
 - 2. Traps
 - a. Gravity
 - b. Light
 - c. BGS (2008)
 - 3. Test dead birds
 - 4. Statewide trapping for ZIKV vectors
 - 5. ZIKV cluster response
 - a. 13 reported
 - b. 10 responses
 - ii. Black fly program
 - 1. 40 participating counties
 - 2. Limited funding
 - 3. 48 waterways
 - 4. Larval and adult surveillance
 - iii. 2019 MAMCA meeting
 - 1. March 26-28
 - 2. Harrisburg
- f. South Carolina – Travis Shealy
 - i. Arboviruses
 - 1. WNV
 - a. Avian – 1 (owl)
 - b. Mosquito – 21
 - c. Human
 - i. 9 symptomatic
 - ii. 1 blood donor
 - 2. CHIK - 4
 - 3. Dengue - 6
 - 4. EEE
 - a. All equine - 15
 - b. Endemic areas
 - 5. ZIKV - 57
 - 6. Flanders or Flanders variant – 9 mosquito pools
 - ii. 2 malaria cases reported
 - 1. Not much info provided
 - 2. Probably travel related
 - iii. www.scdhec.gov/mosquitoes
 - iv. 2017 SCMCA meeting
 - 1. Nov 1-3
 - 2. Myrtle Beach
 - 3. www.scmca.net

- g. Tennessee – Ture Carlson
 - i. Mosquitoes
 - 1. WNV
 - a. Human cases
 - i. 7
 - ii. 1 death
 - b. 777 positive mosquito pools out of 5113 tested
 - 2. LAC – 7 human cases
 - 3. ZIKV – 61 imported human cases
 - 4. CHIK – 6 imported human cases
 - 5. Dengue – 11 imported human cases
 - ii. Ticks
 - 1. Anaplasmosis - 11
 - 2. Ehrlichiosis – 89
 - 3. Lyme – 21
 - 4. RMSF - 586
- h. Virginia – Ann Herring
 - i. Mosquito
 - 1. WNV
 - a. 8 human cases
 - b. 80+ positive mosquito pools
 - 2. EEE
 - a. No human cases
 - b. 4 positive horses
 - 3. CHIK – 5
 - 4. Dengue – 24
 - 5. ZIKV – 112
 - ii. *Culex coronator* collected in Suffolk County
- i. West Virginia – Eric Dotseth
 - i. Mosquito
 - 1. New species reported - 5
 - 2. No *Aedes aegypti* in WV
 - 3. WNV
 - a. 11 positive mosquito pools
 - b. 1 human case
 - 4. ZIKV – 11
 - 5. LAC – 8 human cases
 - ii. Flood – June 23, 2016
 - 1. *Culex pipiens* and *Cx restuans* numbers did not increase
 - 2. *Culex erraticus* did not increase
 - 3. Slight increase in LAC vectors
 - 4. Overall, no increase in mosquito activity
 - iii. Ticks
 - 1. Disease

- a. Lyme – 354
 - b. Ehrlichiosis – 6
 - c. SFGR – 14
 - d. Q Fever – 1
2. Tick Surveillance - Vet submission program