History of the
New Jersey Light Trap Program
in Delaware

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83 Years of NJLTs in DE

- 1932 to present
- Never missed a year
  - WWII
  - Budget cuts
  - Program changes
Timing

- Electricity
  - President Franklin D. Roosevelt
  - Rural Electrification Act of 1935

- Automobiles were improving

- Roads
  - Delaware State Highway Department 1917
  - 1926 – 1935
    - consolidation & improvement of roads in DE

- Tourists travel to the Delaware beaches
In the beginning....

- Mechanical traps developed by Dept of Entomology of the New Jersey State Agricultural Experiment Station
  - Under guidance of Thomas Headlee
  - Sugar Can Trap in 1927
  - Model C circa 1930
  - Model 50 in 1934
- 1931 – interest in mosquito control in DE
- 1932 – initial mosquito survey in DE
  - University of DE Ag Experiment Station
    - L.A. Stearns & Donald MacCreary
  - $3,000 funding for initial project
  - 16 Model C traps were operated nightly
    - May 2 to Sept 27, 1932
Model “C” Trap

- 2’ long and 9” diameter
- Sheet metal
- Vane above it at one end to keep it directed into the wind
- Small white frosted 25-watt light bulb
- Fan
- Jar with cyanide
- Used in DE from 1932-1938

Stearns, et al. 1933
“Model C” Trap

Plate IV. Traps used at Fort DuPont for collecting mosquitoes.

(Source: Cairns, 1936)
Initial NJLT Survey - 1932

- 16 locations were chosen to evaluate the statewide mosquito problem
- Traps were installed at height of 5 ½’
- Trap operated 6:00-7:00 PM and 7:00-8:00 AM
- Relied on cooperators
  - operate the traps
  - remove nightly collections
  - transfer collections to dated containers

Stearns, et al. 1933
Initial NJLT Survey

- 98,922 mosquitoes collected
  - Includes females and males
- 72,792 were *Culex pipiens*

- Below average mosquito production conditions
  - April-Sept had a deficiency in rainfall
  - Fewer than normal storm tides

- Recommendations:
  - Municipal sanitation to reduce *Culex pipiens* habitat
    - Sanitation of farm, rural, communities, towns
  - State regulation is required
    - A statewide program will be costly
Aug 21st - 24th, 1933: Chesapeake & Potomac Hurricane
- 13.24” rain in Sussex Co.
- *Ae. cantator* brood in Sept

October 1933, 2 Civilian Conservation Corps were awarded to Delaware

Mosquito Control focused mainly on ditch construction & cleaning

In some areas, marshes were filled with hydraulic material from dredging

Collect & identify female & male mosquitoes
1940s

- L.A. Stearns head of program
- Collections were mailed from cooperators to University of DE
- Larviciding began
  - Aerial application of DDT common by 1947
  - Beaches treated with DDT by plane twice a month (June-August 1947)
- 1948 – Attempted mosquito-migration study
  - Difficult to dye *Ae. sollicitans*
- Ditch construction and clearing continued
- Trap collections indicate that rainfall is most significantly related to mosquito populations, not control methods
1950s

- 1950 – Richard F. Darsie, Jr. began his tenure with the program
- By 1951, DDT-resistance in salt-marsh mosquitoes was discovered in Delaware
- 1954 – DE City had the most adult mosquitoes trapped in all 22 years of record
  - 286/night
  - 9 aerial treatments with DDT
- 1956 EEE outbreak
  - NJLTs at 6 locations from Dover to Dewey Beach
  - Replaced the cyanide collection jar with removable plastic socks for live specimens.
  - 313 pools were tested
  - All negative for EEE
1950s

- Attempted to determine the flight range of mosquitoes in DE with NJLTs in 1956 & 1957 but weather prevented success.
- 1957 – L.A. Stearns retired after 28 years of service in DE
- 1958 – Mosquito Control moved from Lewes to Milford
- 1959 – severe number of *Ae. sollicitans* caused Governor Boggs to call for a conference on DE’s mosquito problem.
  - DDT aerial application failed and residents were upset by mosquito invasion.
  - Primary problem is DDT- and BHC-resistance.
  - Requested additional $100k for personnel for more inspections.
  - Lt Governor Buckson requested emergency spraying for immediate mosquito relief.
1960s

- Stopped trapping DE City from 1960-1965
  - This location continued to collect the most mosquitoes.
  - *Cx salinarius* problem in DE City hadn’t been solved.
  - Focus efforts on other studies.

- 1962 – New Castle County substation established in June

- 1963 – attempted study of the immigration of *Ae. sollicitans*
  - No larval control other than marsh drainage was done in Salem County, NJ
  - *Ae. sollicitans* could be coming to DE from NJ
  - Inconclusive results due to dry conditions and low number of mosquitoes

- 1966 – Trapped Prime Hook NWR to evaluate the effect of minimal adult spraying

- 1968 – EEE outbreak in horses lead to extensive trapping with additional NJLTs
1970s

- 1970 – Mosquito Control Section was transferred from State Highway Department to Division of Environmental Control in the Department of Natural Resources and Environmental Control.

- 1971 – one human case EEE
  - Followed by extensive trapping and spraying

- 1975 – excessive rain in July caused peak Ae. vexans in NJLTs

- 1976 – No change in mosquito populations noted in NJLTs after Hurricane Belle in August

- 1979 – Lewes location not trapped
1980s

- 1981 – compared effectiveness of NJLT and CDC trap for *Culex* spp pest problem
  - NJLT more effective due to more powerful light source
- 1983 – drought conditions; unusually high *Culex* and *Anopheles*
- 1984 – After Bob Lake retired from UD, the Mosquito Control Section took over the NJLT program
- Electronic database for NJLT collection records
1990s

- The NJLT program was no longer well-documented.
- The collection and taxonomy records were kept, but no formal reports.
- NJLT’s records in electronic database.
2000s

- 2000 – not a good year for taxonomy
  - Most records were not kept due to quality of ID
  - Stopped identifying male mosquitoes
- 2001 – Dr. Jack Gingrich at UD was contracted to manage the taxonomy of the NJLT collections
- 2003 – Due to rainy season and large NJLT collections, subsampling protocol was established
- Records kept in MS Access database
- Started recording *Ae. albopictus* in NJLTs regularly
2010s

- **WNV testing in 2010**
  - Used Culex spp that were collected in NJLTs for mosquito pools
  - PCR-testing
  - 1 WNV-positive Cx spp. pool from Wilmington area
  - Also submitted *Ae. albopictus* pools
    - All WNV-negative

- **Cut backs in 2014**
  - Reduced number of NJLTs throughout state
  - Reduced number of nights of collection
    - Used timers to determine which days the traps would collect mosquitoes
83 Years of Taxonomists

- 1932-1949: Donald MacCreary
  - Supervised by MacCreary through 1954
- 1963-1983: Robert Lake
- 1984-1990: transition
- 1991-1999: Dave Neumann
- 2000: transition
- 2001-2014: Jack Gingrich
Species Documented

- In 1933, 32 mosquito species were recorded in DE
- In 1951, 38 species
- 1962, 43 species
- 1966, added Aedes fitchii and Psorophora cyanescens
- 1967, 50 species known to occur in DE
- 1969 – 51 species
- Currently, it is estimated that 57 species of mosquitoes are found in DE
- Not all of these species have been collected in NJLTs
FUN FACTS

- Delaware has been a state for 227 years. NJLTs have been operated for 83 years; 36.6% of the history of the state.
- The NJLT in DE has been through WWII, Korean War, Vietnam War, Gulf War, War on Terror.
- While automobiles have changed a great deal in the past 83 years, the NJLT has not.
- In 1952, tried to use plastic freezer bags with phenol-soaked cotton ball and fumigation test cages instead of pill boxes for shipping collections, but it didn’t work since the collections arrived wet and crushed.
  - Pill boxes are still used today.
Then vs. Now

Delaware Population 1930-2010
Then vs. Now

FIG. 2—Locations of Mosquito Traps, Delaware, 1932.

Delaware 2014: New Jersey Light Trap Locations

NJLT Site
Total Sites: 25
Then vs. Now

Source: http://postalmuseum.si.edu/exhibits/current/on-the-road/1921-1940s.html

Source: USPS Facebook site
https://www.facebook.com/USPS/photos/pb.60774464809.-220752000.1420569954./10152835099494810/?type=3&theater
Then vs. Now
Records missing for 1974
References