# Mosquitoes & Mosquito-Borne Diseases

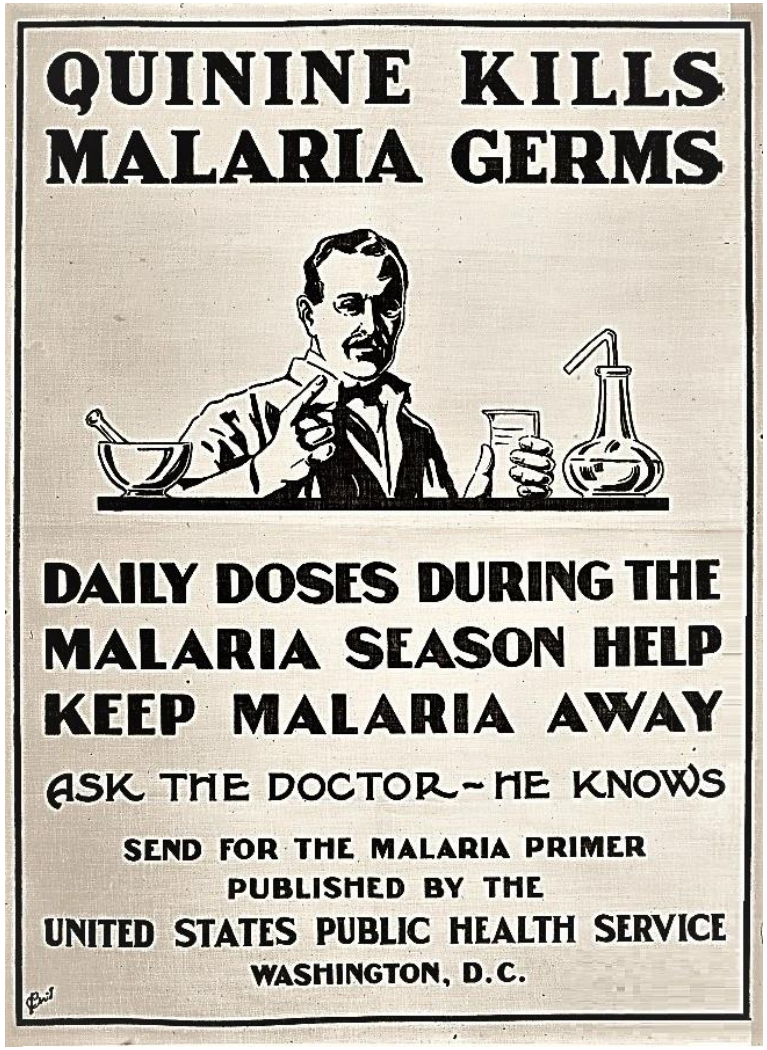
## The History of Mosquito Control in Georgia

https://www.gamosquito.org/resources/BriefHistoryofMosquitoControlinGeorgia.pdf

GMCA / Rosmarie Kelly / Oct 15-17, 2025

# Early Mosquito Issues

- Mosquitoes have been documented as pests in Georgia since the earliest English settlers arrived on the coast in the early 1700s.
- From a disease standpoint, Savannah and Brunswick were the primary hubs of introduction due to shipping, particularly from Caribbean areas.
- Quarantine stations were established all along the coast of GA, FL, and SC and arsenic was used to sterilize the ships before releasing them to a main port.



# "Musketos in their Vigour"

- Fort King George was the first fort built by the English on the land that would become the Georgia colony, making it a crucial point in the early history of the region.
- From 1721 until 1736, Fort King George was the southern outpost of the British Empire in North America.
- Journal notations from the construction period for Fort King George describe "Musketos in their Vigour".
- A significant number of deaths came not from battle, but from poor sanitation and camp diseases like malaria.

# Historic mosquito-borne diseases

**Malaria:** This was the most significant and widespread mosquito-borne disease in Georgia's history.

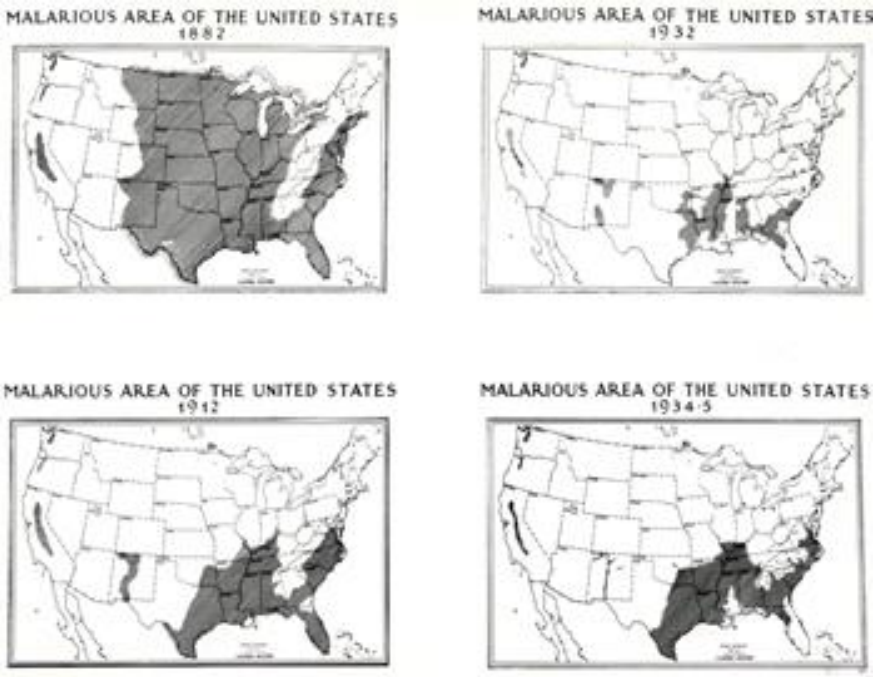
- It was so common that in 1806, the state capital was moved from Louisville to Milledgeville due to frequent outbreaks.
- The disease was endemic in the state until the 1930s and caused thousands of deaths during the Civil War.
- The need to control malaria in the American South was a primary reason the Centers for Disease Control and Prevention (CDC) was founded in Atlanta.

**Yellow Fever:** This disease was once common in the United States, with outbreaks occurring in Georgia during the 17th and 18th centuries.

**Dengue:** Like Yellow Fever, Dengue was historically common in the region.

# Malaria

- According to the New Georgia Encyclopedia, the threat of malaria affected Georgia's settlement patterns.
- In 1806 the state capital had to be moved from Louisville to Milledgeville in part because of so many malarial outbreaks in Louisville.
- In the 19th century, malaria killed thousands during the Civil War, and during the twentieth century, the disease threatened America's military readiness.
- Mosquito control efforts, including the use of DDT, drainage improvements, and educational campaigns, played a vital role in eventually eradicating the disease in the US.

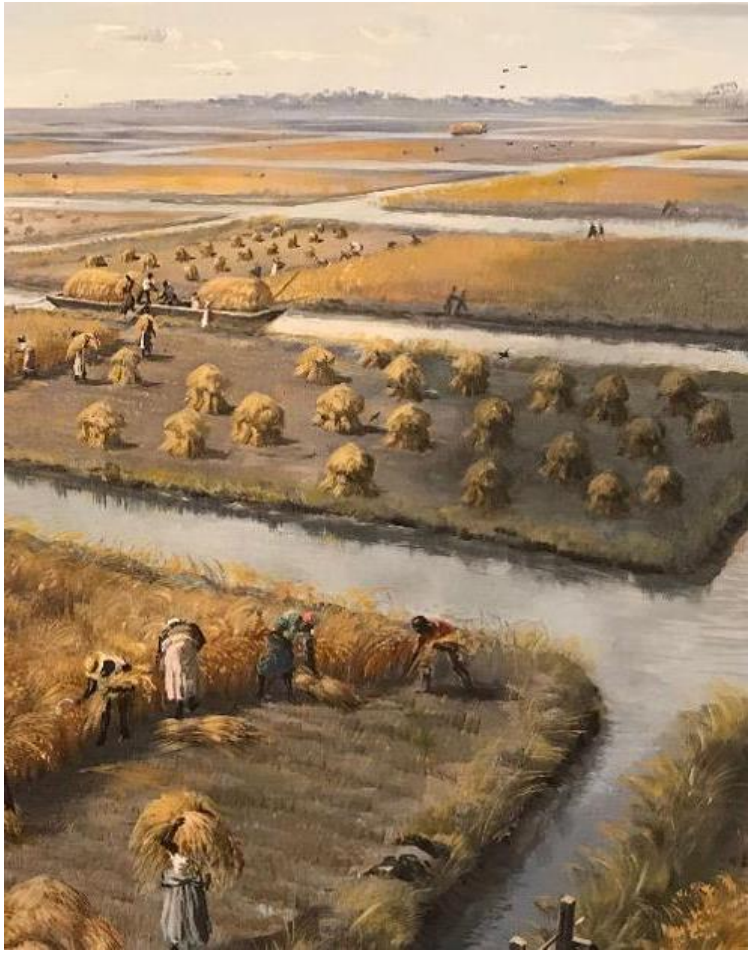


# Malaria and Window Screens

- As an interesting side note, in the spring of 1903, James Troup Dent of Hofwyl plantation screened the porches and windows of his home on the mosquito-infested banks of the Altamaha and remained there with his family throughout the malaria season.
- Dent suspected that the heavy prevalence of mosquitoes in the Altamaha caused the transmission of malaria and that by reducing their exposure to the insects he and his family would be protected from the summer diseases.
- The Dents suffered no ill effects and families throughout the section adopted his screening methods in future years (Ophelia Troup Dent, unpublished Memoirs).


9 September 1920

# Malaria & Rice Cultivation



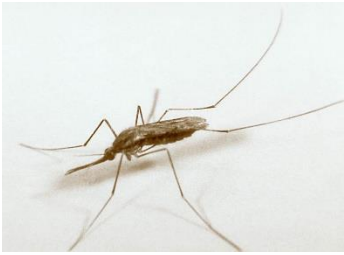
- The porous soils, temperate climates, tidal influences, and saline atmosphere of the sea islands and adjoining salt marshes of South Carolina and Georgia proved to be ideal for the cultivation of rice and black seed, long-staple (Sea Island) cotton in the period between the American Revolution and the turn of the twentieth century.
- Rice cultivation in Georgia began in the coastal areas in the mid-18th century, with the swampy lands along the Savannah, Altamaha, and Ogeechee rivers proving ideal for the crop.

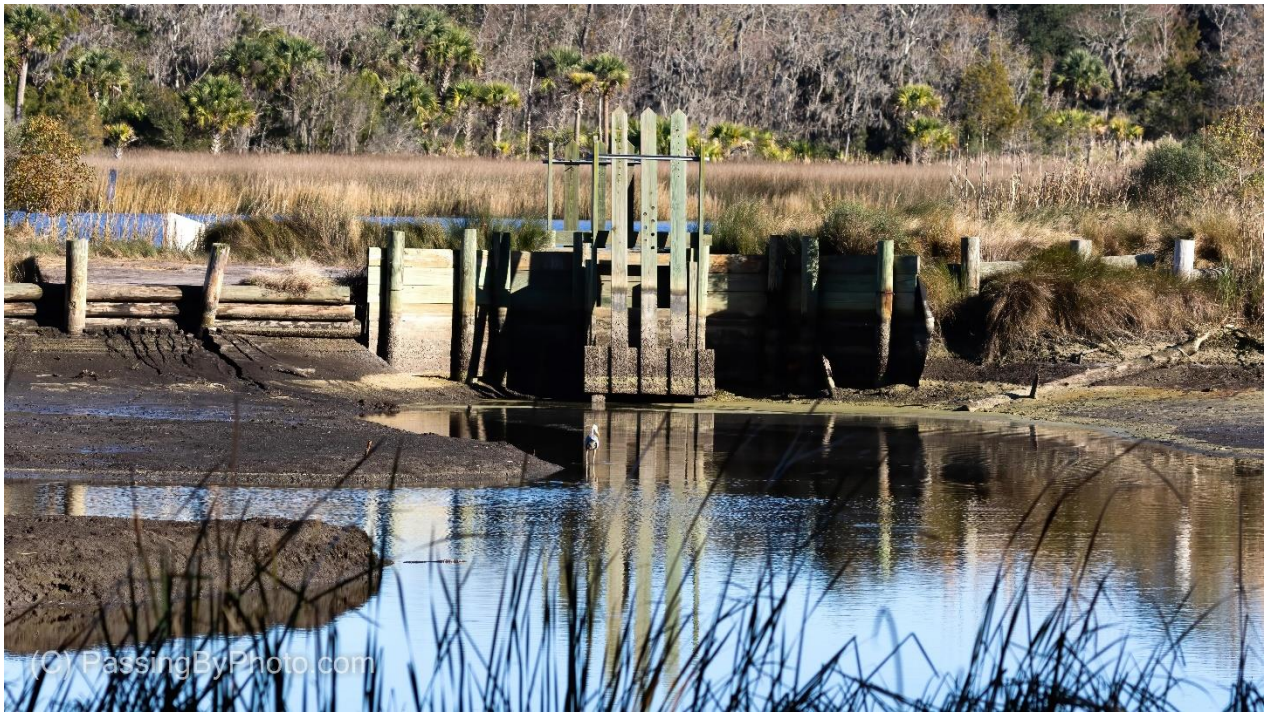
# Malaria & Rice Culture

- Taking advantage of the large and predictable tides resulted in the most efficient method of rice cultivation.
- Thousands of acres of marshland and tidal rivers were altered by networks of dikes and canals to create rice fields.
- Structures, called trunks, were strategically placed along the dikes and used to control the water level in the fields.
- The tidal influence in old rice plantation fields was usually cut off by dikes and flow control structures.
- During the early and mid-1800s, this system of impoundments allowed the rice industry to become the dominant form of agriculture along the South Carolina and Georgia coast.
- It also allowed the emergence of huge numbers of *Anopheles quadrimaculatus*, the southeast's malaria vector.

# Malaria & Rice Cultivation

The flooding of rice fields and the impoundment of water on the fields through the use of wooden rice trunks were factors that led to a greater occurrence of local mosquito infestation with an associated rise in malaria, as reported from plantation records and newspaper accounts.





# Malaria & Mosquito Control

- Historically, Savannah, GA was a major center for rice production, primarily along the Savannah, Ogeechee, and Altamaha Rivers.
- Wet rice cultivation, as practiced in Savannah's swampy Lowcountry, created an environment conducive to mosquito development.
- In 1817 the City of Savannah, which supported a large rice growing culture, approved an ordinance authorizing the city to buy the right of culture from wet to dry from the surrounding landowners.
- From 1817 to 1829 the city had expended $72,537 so that only dry rice field culture would be practiced on the adjacent lands.
- City records show the health of its citizens was much improved.
- This successful reduction in mosquito breeding sites was likely the first time that local tax monies were expended to control mosquitoes in the New World.

# The Demise of the Rice Fields

- Abandoned rice fields and irrigation ditches are now havens for migratory waterfowl and the intricate systems of canals and rice dikes remain as visible symbols of a way of life that has forever disappeared.
- The tide gates are rotting away in the levees, no longer able to keep the flooding and ebbing tides out of the square fields where rice once thrived.
- However, these remnants have allowed large numbers of saltmarsh mosquitoes to take advantage of areas blocked to fish predation to plague the coastal areas today.

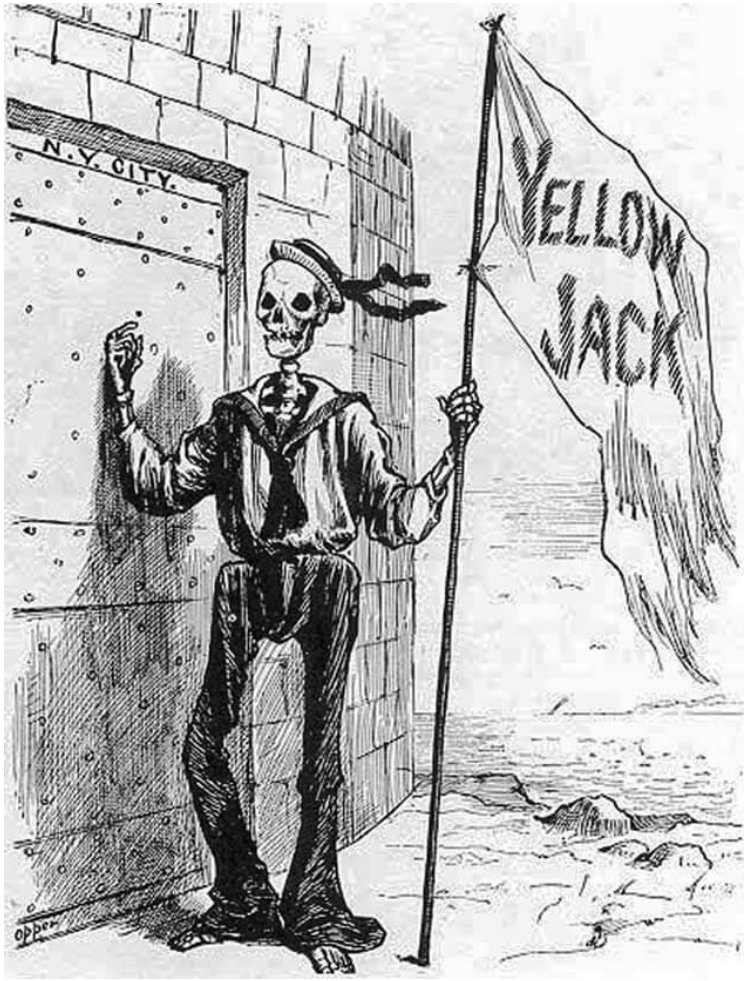
# Malaria & the CDC

- The CDC had its start in Atlanta, GA as part of the malaria control initiative in the Southeast.
- The Office of Malaria Control in War Areas (MCWA), the WWII organization that was to become the forerunner of the present Centers for Disease Control and Prevention, was established by the Public Health Service.
- In 1942, the US government established a research center in Atlanta as part of the US Public Health Service. Called the Malaria Control in War Areas program, or MCWA, its location was no accident, given Georgia's strategic role in infantry training as well as the growing prominence of the Ichauway field station in the Public Health Service.
- Today, the Centers for Disease Control and Prevention (CDC) is one of the major operating components of the Department of Health and Human Services and is recognized as the nation's premiere health promotion, prevention, and preparedness agency.

# Yellow Fever

The first yellow fever outbreaks in the United States occurred in late 1690s.

*Dead House on the Schuylkill during the yellow fever in Philadelphia in 1793*, David Johnson Kennedy, Watercolor, Historical Society of Pennsylvania.



# Yellow Fever in the US, 1870-1879

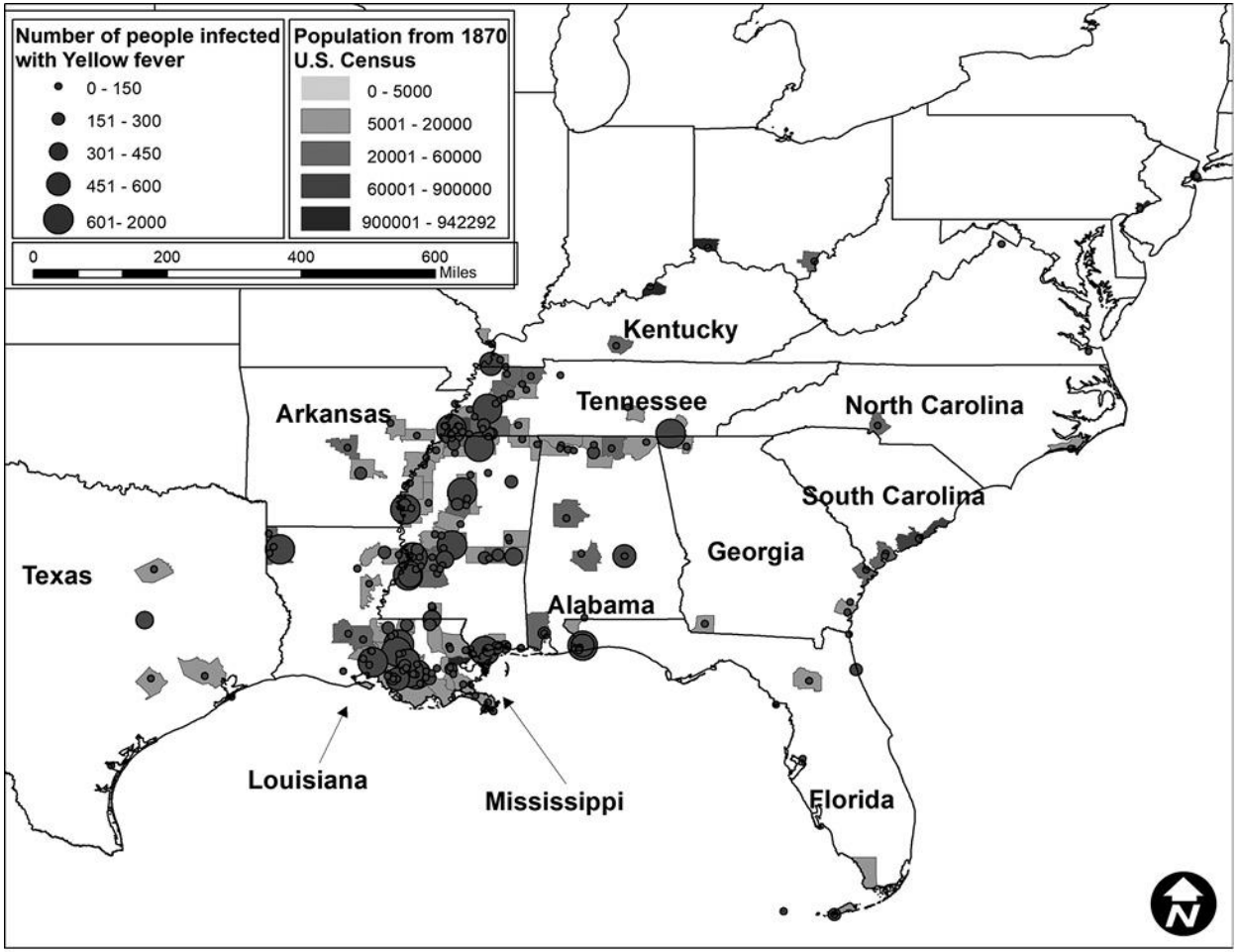



Fig. 1: location of Yellow fever (YF) occurrences and the number of infected humans with YF from 1870 to 1879. The counties are colored based on the human population density, where darker colors represent locations with more people. This decade has the most occurrences of YF, especially in 1878, when a wide spread epidemic of YF affected places as far north as Ohio. Sources Esri, National Atlas of the United States, US Geological Survey.

https://asm.org/articles/2021/may/history-of-yellow-fever-in-the-u-s

# Yellow Fever in Georgia


- Yellow fever significantly impacted Georgia, claiming hundreds of lives due to the prevalence of mosquitoes in the humid climate.
- These epidemics were often triggered by immigrant ships arriving from Africa, with black vomit and internal bleeding as prominent symptoms.

# Yellow Fever in Savannah

- Savannah faced recurring outbreaks of yellow fever, with significant ones in 1733, 1820, 1854 (1040 deaths), and 1876.
- The 1820 epidemic resulted in the deaths of approximately 700 people, including local physicians who were caring for the sick.
- Many victims were buried in unmarked graves in Colonial Park Cemetery.
- The 1876 epidemic was particularly severe, with the city losing an estimated 6% of its population (1066 deaths).

# Yellow Fever Control

Major Ely McClellan, a surgeon in the US Army, analyzed data from the 1876 epidemics in Savannah, Brunswick, Darien, Augusta, Macon, and Atlanta to determine if yellow fever was caused by a miasma or an infection and how it was spreading.

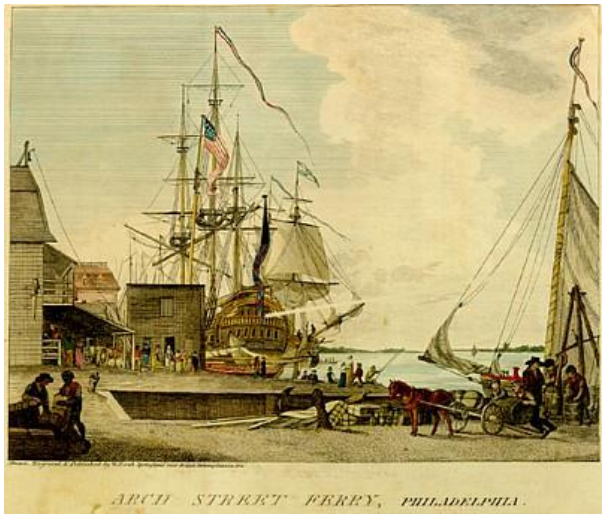
He concluded that:

- Yellow fever was most severe in port island cities with outbreaks that were usually located on major roads or rail lines,
- Refugees carried the disease inland, and
- Yellow fever was carried on ships with the largest outbreaks associated with ships from Cuba.

Because of these observations, a quarantine station was established on Blackbeard Island, to try and limit the spread of the disease.

# Quarantine Stations

- Quarantine stations have a long history, dating back to the 14th century, with the primary purpose of protecting communities from imported diseases. Initially, they focused on isolating ships and travelers, particularly from plague outbreaks. Over time, the practice evolved, becoming more formalized and eventually involving federal oversight in many countries.
- In the US, quarantine stations date back to the colonies, where they were used to manage diseases like smallpox and yellow fever.



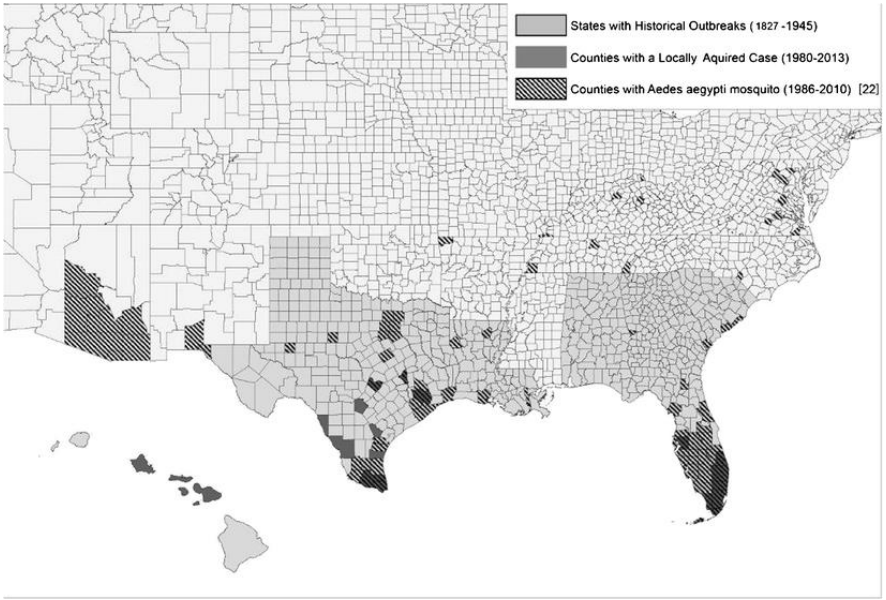
# Quarantine Stations

# Dengue

- Dengue has a long history in the U.S., with outbreaks reported since the late 1700s, notably in Philadelphia in 1780.
- Throughout the 19th and early 20th centuries, epidemics occurred in port cities along the Gulf and Atlantic coasts, such as New Orleans, Pensacola, and Charleston.
- Efforts to eradicate the primary mosquito vector, *Aedes aegypti*, in the mid-20th century led to a decline, but the disease has re-emerged in recent years, with local transmission in states like Florida and California.

# Dengue – Early History

- **1780:** A dengue-like epidemic was reported in Philadelphia, described by Dr. Benjamin Rush as "break-bone fever".
- **1820s:** Outbreaks occurred in the Gulf Coast region, including Pensacola, Florida; Charleston, South Carolina; Savannah, Georgia; and New Orleans, Louisiana.
- **1873:** A large epidemic struck New Orleans, affecting 40,000 people.
- **1879-1880:** Another large epidemic affected several southern U.S. port cities.



# Dengue – 20th Century


- **Early 1900s:** Dengue outbreaks continued, especially in the southeastern U.S., Hawaii, and U.S. territories.
- **1940s:** Efforts to eradicate the *Aedes aegypti* mosquito, the primary vector, began in earnest with the help of the Rockefeller Foundation and later the Pan American Sanitary Bureau (PASB).
- **Mid-20th century:** These large-scale eradication campaigns, aided by the use of DDT, were initially successful in controlling the vector in many areas.

# *Aedes aegypti* in Chatham County

In Chatham there is no record of *Aedes aegypti* from 1958-1966.

In 1967, *Aedes aegypti* are found in an Adult Resting Station in Pooler

- 1967
  - 9/13/67 = 1
  - 10/12/67 = 5
  - 10/31/67 = 2
- 1968 = 11 (3 sites - all Adult Resting Stations)

# *Aedes aegypti* in Chatham County

*Aedes aegypti* are found in NJLT collections every year from 1971 through 1993 (data for 1976-1999 for all the other trap types are still being digitized).

*Aedes aegypti* counts after 1993:

| | |
|---|---|
| 1998 = 2 | 2006 = 1 |
| 2000 = 50 | 2009 = 2 |
| 2001 = 7 | 2012 = 1 |
| 2002 = 5 | 2020 = 1 |
| 2003 = 2 | 2022 = 1 |
| 2005 = 1 | 2023 = 1 |

It appears *Aedes albopictus* really gained a foothold in Georgia in 1992.

# *Aedes aegypti* – Historical Eradication Efforts

**Pilot program:** The US Public Health Service started a successful pilot program in Pensacola, Florida, in 1957, which served as the basis for a nationwide program.

**Full-scale program:** A nationwide *Aedes aegypti* eradication program was launched in 1965, but it was discontinued four years later due to a lack of funding and political will.

*Aedes albopictus* was introduced into the US in 1985:

**Competition:** *Aedes albopictus* can outcompete *Ae aegypti* for resources, leading to the suppression of *Ae aegypti* populations in areas where they co-exist

**Reproductive advantage:** Studies have shown that *Ae albopictus* will mate with *Ae aegypti* females, with no viable offspring produced (Satyrization)

**Ecological niche:** *Aedes albopictus* can potentially fill the ecological niches that were originally occupied by *Ae aegypti*, further suppressing the *Ae aegypti* population

# Public Health & Mosquito Control

- During the 1930s and 40s in the southeastern United States, state boards of health employed entomologists to combat malaria, a significant public health problem at the time.
- Malaria cases saw a rise during the Great Depression before decreasing in the early 1940s.
- Mosquito control districts, where present, could be directly under the supervision of the state public health department or there could be a cooperative agreement.
- Historically, Environmental Health (EH) programs within Public Health had been tasked with dealing with mosquito complaints.
- Many of these programs were lost as other, mandated, programs took precedence.
- Before the arrival of WNV, only 2 County EH programs still did mosquito control at some level.

September 1951

TABLE 1

*State and Territorial Health Department Entomologists*

| *State or Territory* | *No. of Entomologists* | *Administrative Allocation* | *Time Allocation (In Percentages)* | | | | *Principal Coöperating State Agencies* |
|---|---|---|---|---|---|---|---|
| | | | *Taxonomy* | *Insect Control* | *Disease Transmission* | *Non-entomological* | |
| Alabama | None | — | — | — | — | — | — |
| Alaska | None | — | — | — | — | — | — |
| Arizona | None | — | — | — | — | — | State Entomologist |
| Arkansas | None | — | — | — | — | — | Univ. of Arkansas, Rice Exp. Sta. |
| California | 13 | Vector Control | 10 | 60 | 30 | — | Calif. Mosquito Control Assn., Univ. of California |
| Colorado | None | — | — | — | — | — | State Entomologist |
| Connecticut | None | — | — | — | — | — | Agr. Exp. Sta. |
| Florida | 8 | Sanitary Engineering | — | 30 | 65 | 5 | — |
| Georgia | 4 | Epidemiology Division | 15 | 20 | 15 | 50 | — |
| Hawaii | 1 | Sanitation Division | 25 | 50 | — | 25 | Board of Agriculture and Forestry |
| Idaho | 1 | Sanitary Engineering | 10 | 20 | 10 | 60 | Extension Service |
| Illinois | 1 | Laboratory | 10 | — | — | 90 | Natural History Survey |
| Indiana | None | — | — | — | — | — | Purdue Univ. |
| Iowa | None | — | — | — | — | — | Iowa State College |

# State Entomologist Research Projects – 1950s

Current research projects by state department of health entomological personnel are many and varied. Representative research works include:

- California-ecology of irrigated pasture and rice field mosquitoes, fly ecology, studies on insecticides and mosquito resistance;
- Florida-mosquito, sandfly, and dog fly studies;
- Georgia-tick control, vectors, reservoirs of eastern equine encephalomyelitis, and the fly problem in pit privies;
- Hawaii-biological control of *Aedes albopictus;*
- Texas-arthropod reservoirs of the Q fever rickettsiae.

# Public Health Entomologist

Orlin K. Fletcher, Jr. (1908-1975) from Augusta, Georgia was a medical entomologist with a biology degree from the University of Georgia. He served in a variety of public health roles in the state of Georgia and was president of the Georgia Entomological Society. He has at least two publications of public health importance:

- Studies on Fly Breeding in Sanitary Pit Privies in South Georgia, Orlin K. Fletcher Jr., James Major, and Robert Cable, Volume/Issue: Volume 5: Issue 3, DOI: https://doi.org/10.4269/ajtmh.1956.5.562, Publication Date: 01 May 1956
- Mass Destruction of Adult Anophelines by DDT as a Suggested Malaria Control Measure: A Preliminary Report, Orlin K. Fletcher, Jr. and James B. Krause, II, Volume/Issue: Volume s1-28: Issue 2, DOI: https://doi.org/10.4269/ajtmh.1948.s1-28.323, Publication Date: 01 Mar 1948

# History of Mosquito Control - Brunswick

- In Brunswick, GA, reports sent to the Public Health Service from the local quarantine station indicated local mosquito control measures in 1923 had been successful in reducing mosquito numbers.
- Active measures had been taken to reduce mosquito development during the winter and spring months.
- "Up to the end of July no *Stegomyia* (*Aedes aegypti*) were observed.
- If *Stegomyia* were breeding, they were passive.
- During July there was practically an absence of mosquitoes in Brunswick and the neighboring vicinities.
- This situation was unquestionably due to the active measures taken by the civic and county authorities to suppress mosquito breeding.
- This work was done under the direction of the sanitary department of Brunswick and the local Board of Health.

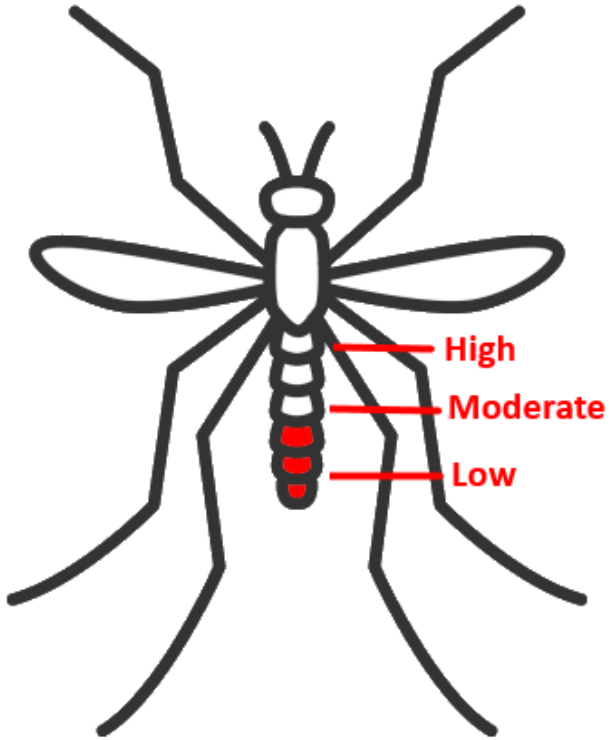
# History of Mosquito Control in Savannah

From Public Health Reports, v36 (14), April 8, 2021, pp 705-706:

- Mosquito control was conducted in Savannah, GA during the summer of 1920 at the request of the city health officer of Savannah to the US Public Health Service to control malaria.
- "Approximately $50,000 was expended in and around the city of Savannah during 1920 in malaria-control operations, of which $30,000 was contributed by the city, $7,000 by the Seaboard Air Line Railroad, and $3,000 by the Central of Georgia Railroad.
- Convict labor employed by Chatham County was estimated at $10,000.
- The biggest problem were *Anopheles quadrimaculatus* and *An crucians* from abandoned rice fields, and the subsequent malaria issues.

# History of Mosquito Control in Savannah

- The Chatham County Mosquito Control program was voted into existence in 1956. Prior to 1956, mosquito control efforts in Chatham County were limited.
- A Savannah Morning News article reported that some residents even resorted to using kerosene-soaked rags to ward off mosquitoes.
- In 1957, Chatham County officially organized its mosquito control efforts, adopting the Integrated Mosquito Management (IMM) approach.
- This method emphasizes a combination of strategies rather than relying solely on one method like pesticides.
- https://mosquitocontrol.chathamcountyga.gov



# Larviciding

The primary aim of MCWA was malaria prevention; the basic method used was vector control, principally by larviciding.

# Truck Spraying

# Truck Spraying

# Aerial Adulticiding

A Bi-Plane Is Spraying DDT Insecticide During Malaria Control Operations In Savannah, circa 1950

# Current Location of Mosquito Control Programs in Georgia

Public Health/Environmental Health Programs

- Richmond County (1970s)
- Muscogee County/Columbus
  - Insect and Rodent Control Program – 1955
  - Vector Control Program – 1965
- Metro Atlanta – seasonal vector surveillance - 2001

Other Types of Programs

- Independent Programs
  - Chatham County - 1957
  - Liberty County
- Public Works
- Contracted Mosquito Control

https://www.gamosquito.org/resources/GA_Mosquito_Control_Programs2017_update.pdf
https://www.gamosquito.org/resources/GA_Mosquito_Control_Map.pdf

# MAMCA and the GMCA

- In 1975, in Hilton Head Island, SC at the William Hilton Inn, the Virginia, North Carolina, and South Carolina Mosquito Control Associations held a joint meeting to explore the possibility of creating a regional association.
- Some of the Georgia mosquito control people were also invited to attend and they created the Georgia Mosquito Control Association in a hallway at the meeting facility.
- All four associations concurred, and the Mid-Atlantic Mosquito Control Association came into being.
- Rowland "Rollie" Dorer from Virginia was elected the first President and L.A. Williams of South Carolina was elected Vice President.
- The Georgia delegation invited MAMCA to hold their 1976 meeting in Savannah, Georgia.

# GMCA

- The Georgia Mosquito Control Association is a non-profit, professional organization whose membership consists of local and state government officials, commercial applicators, industry, and research/academic members from the state.
- The Association was founded on the belief that mosquito and other public health pest control problems have a significant impact on the citizens of Georgia.
- The Association hosts an annual educational and trade conference for its members.
- These conferences help promote inter-governmental cooperation and serve as a forum for the advancement of responsible mosquito and vector control (http://www.GAmosquito.org).
- A spring workshop was held for the first time in 2025 and was actively supported by the profession.
- This workshop expanded the impact of the GMCA and will continue in some manner moving forward.


# ANY QUESTIONS???

https://dph.georgia.gov/environmental-health/insects-and-diseases
https://www.gamosquito.org