

RELEASING MOSQUITOES

SAVANNAH MORNING NEWS ARTICLE

As COVID vaccine arrives, many Blacks in Savannah haunted by memory of infamous mosquito experiment

Mary Landers Savannah Morning News

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Chatham County Commission Chairman Chester Ellis stands in front of some of the first homes built in Carver Village. Ellis grew up visiting his uncle, who lived just a few houses down on Bowden Street. *Richard Burkhardt/Savannah Morning News*

SAVANNAH MORNING NEWS ARTICLE

But some Savannahians, including Ellis, have their doubts about whether the test mosquitoes were infected. He and others investigated the issue while applying for historic designation for the neighborhood.

"And I know some people will say, 'Well, there were mosquitoes, but they weren't infected,'" he said. "But they were."

Ellis recalled the infection as malaria. The Army Chemical Corps document indicates the research centered on yellow fever.

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Black Savannahians Haunted by Memory of Mosquito Experiment

By [Associated Press](#) | Feb. 6, 2021, at 12:01 a.m.

By MARY LANDERS, Savannah Morning News

SAVANNAH, Ga. (AP) — Black Americans are more hesitant than whites to take the COVID vaccine. Reasons for that hit close to home in Savannah, and include a classified military operation in the 1950s that dropped hundreds of thousands of mosquitoes — mosquitoes that many believe were infected with disease — on Carver Village.

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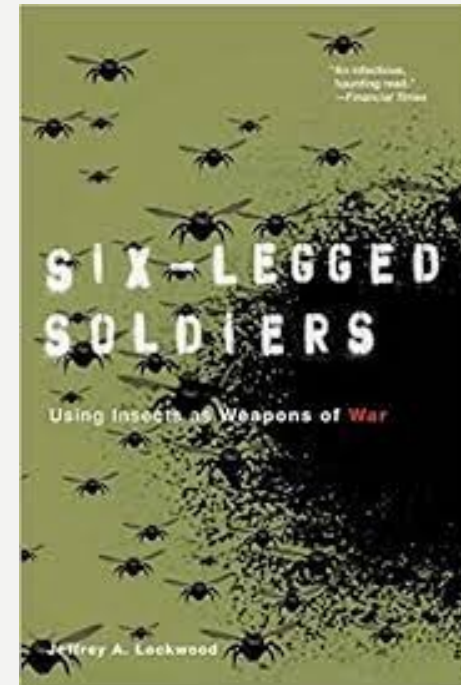
CARVER VILLAGE

- **Established 1948**
- **Provided affordable housing for African Americans**
- **600 individually owned homes**
- **Once the largest housing development for people of color**
- **Placed on the Registry of Historic Places in 2019**



MILITARY OPERATIONS

- Operations to see is mosquitoes can be weaponized
 - Operation Big Buzz
 - Operation Drop Kick
 - Operation May Day
 - Operation Grid Iron
 - Operation Magic Sword



HOW IT STARTED

- Need to rear mosquitoes
- Need to infect mosquitoes
- The big break
 - Feeding *Aedes aegypti* on infected animals not practical
 - Added Yellow Fever virus to a medium and let larvae swim in it
 - Adult mosquitoes transmitted YF to mice

OPERATION BIG BUZZ

- May 1955 approximately 1 million *Aedes aegypti*
 - 1/3 went through loading tests
 - 1/3 *aegypti* went through storage tests
 - 1/3 were pack into E-14 munitions and dropped on rural Georgia
- E-14 munitions dropped by airplane
 - *aegypti* dispersed up to 2,000 feet
- <https://www.alachuacounty.us/Depts/epd/EPAC/A%20military%20Conspiracy%20Against%20an%20Unsuspecting%20Public%20-%20Jim%20Lee.pdf>
- *aegypti* found hosts half a mile away
 - Volunteer humans and guinea pigs

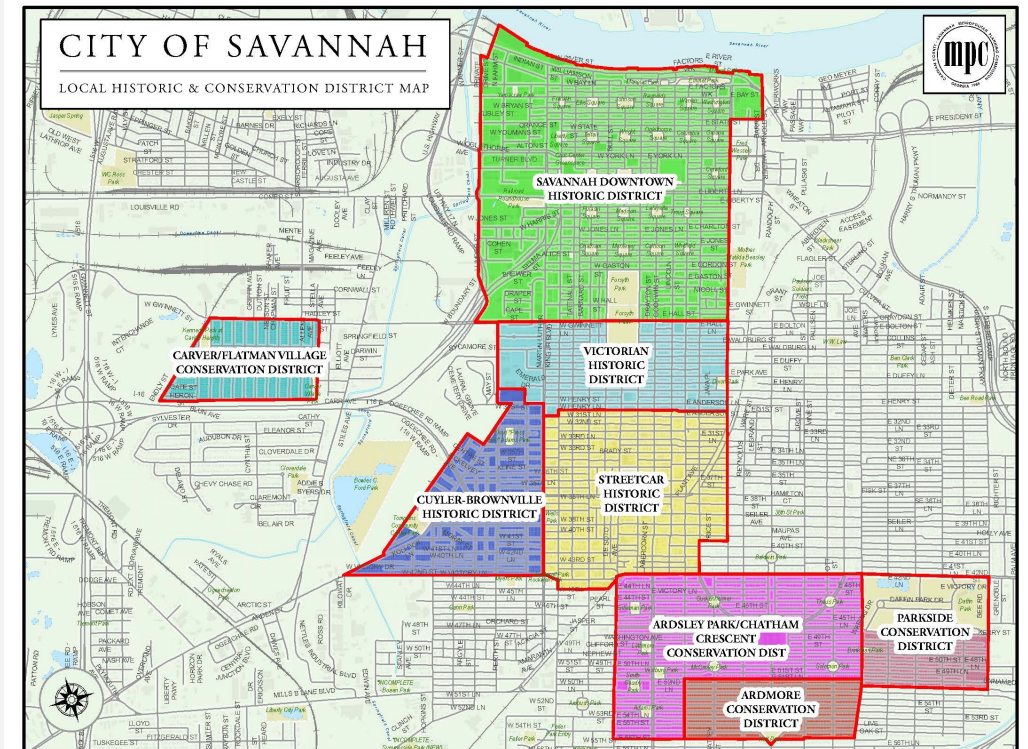
OPERATION BIG BUZZ

- A simulated mosquito-based attack
- No exact location only “rural Georgia”
 - Here’s my conspiracy theory, best guess with no evidence – Ft. Stewart
 - Camp Stewart opened in June 1940
 - Anti-aircraft artillery training center
 - Camp Stewart reopened in 1950
 - 1953 still anti-aircraft artillery training center but also armor and tank firing
 - Became Ft. Stewart in March 1956
 - Hunter Army Airfield very close by



OPERATION MAY DAY

- April – November 1956
 - Carver Village Savannah, GA
 - *aegypti* released from ground level
 - Mosquitoes recovered by dry-ice baited traps
 - DOD claims resident participation
 - Mosquitoes collected inside homes



OPERATION DROP KICK

- **1956**
 - Savannah, GA & Avon Park, FL
 - *aegypti* released by plane
 - 600,000 at Avon Park
- **1958**
 - May include a second release
 - Helicopter release was effective

and bit people. Also in 1956 the Corps released 600,000 uninfected mosquitoes from a plane at Avon Park Bombing Range, Florida. Within a day the mosquitoes had spread a distance of between one and two miles and had bitten many people. In 1958 further tests at Avon Park AFB, Florida, showed that mosquitoes could easily be disseminated from helicopters, would spread more than a mile in each direction, and would enter all types of buildings. These tests showed that mosquitoes could be spread over areas of several square miles by means of devices dropped from planes or set up on the ground. And while these tests were made with uninfected mosquitoes, it is a fairly safe assumption that infected mosquitoes could be spread equally well.¹⁶⁵

OPERATION GRID IRON

- Likely involved the release of mosquitoes
- No publicly available information
- Now refers to a 2008 - 2012 investigation into U.S. Air Force Academy football team.

OPERATION MAGIC SWORD (TEST 65-4)

- Several references to location being “southeast coast of U.S.”
 - First reference published in 1999
- Part of the larger SHAD (Shipboard Hazard and Defense) testing
 - USS George Eastman May 1965
 - 8 trials carried out off of Baker Island
 - Half way between Hawaii and Australia
 - Now a National Wildlife Refuge
 - Crew from Eastman participated in biting trials
 - *aegypti* released shortly after dawn
 - Island decontaminated prior to each release
 - *aegypti* can fly 3.5 miles from ship to shore

PREFACE (U)

[REDACTED]

[REDACTED] Mission support at the remote island test site was provided by the captain (LCDR John H. Church) and crew of the USS GEORGE EASTMAN (YAG 39). Volunteers from the crew also participated in the mosquito-biting trials.

[REDACTED]

The tests were conducted on or in the vicinity of Baker Island during May 1965.

- [http://sonmi.weebly.com/uploads/2/4/7/4/24749526/night_train - test 64-5 1964.pdf](http://sonmi.weebly.com/uploads/2/4/7/4/24749526/night_train_-_test_64-5_1964.pdf)

MARK RECAPTURE STUDY

- Near Savannah in 1954
- 2 million radioactive mosquitoes released
 - *Aedes taeniorhynchus*
 - On Oatland Island
- 428 captured
- 90% of females trapped within 4 miles
 - Max distance 20 miles
 - 4 days after release

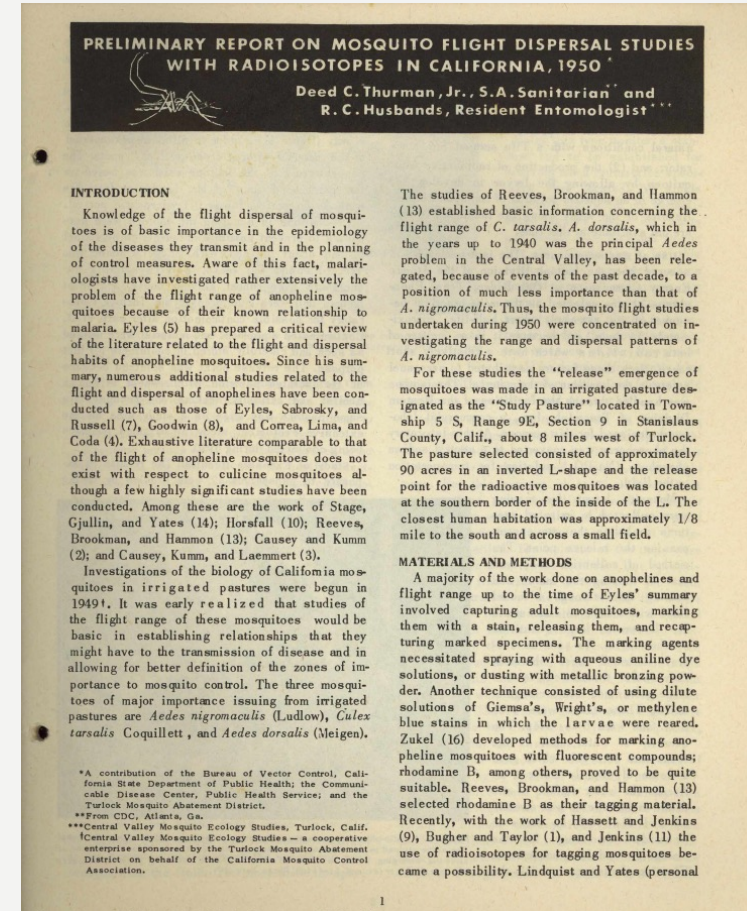
108 Bidlingmayer, W.L., Schoof, H.F. THE DISPERSAL CHARACTERISTICS OF THE SALT-MARCH MOSQUITO, *Aedes taeniorhynchus* (Wiedemann), Near Savannah, Georgia. *Mosquito News* 17, 3 (1957) 202-12.

Mosquitoes were produced by collecting mosquito-egg - infested sod samples or by inducing captive ♀♀ to oviposit on soil media. Radioactive marking was done at the 3rd instar by $H_2^{32}O_4$. From a release of approx. 2 million radioactive *A. taeniorhynchus* near Savannah, Georgia, 428 marked specimens, of which 13% were ♂♂, were recovered. Recapture of tagged ♀♀ was made at the maximum distances of trap locations (18-21 miles). However, most of the radioactive ♀♀ (90%) were collected within 4 miles of the release point, the number of recoveries decreasing as the distance increased. Females were observed to bite readily prior to their departure from the release site. Radioactive ♂ *A. taeniorhynchus* were recovered at maximum distances of 12 miles and for periods of 12 to 20 days after release. The majority of the ♂ recaptures occurred near the release point, but recoveries were made at 2, 4, 8, 10 and 12 miles. Some results are also given for *A. sollicitans*.

MARK RECAPTURE STUDIES

- Nigeria 1949
- California 1950
- Canada 1950
- Florida 1951
- Brazil 1951
- Egypt 1964, 1969, 1970
- Japan 2007
- China 2011
- Jan 2013 paper identified at least 29 Mark-recapture studies

- https://www.researchgate.net/publication/259095490_Flight_distance_of_mosquitoes_Culicidae_A_metadata_analysis_to_support_the_management_of_barrier_zones_around_rewetted_and_newly_constructed_wetlands



RELEASING MOSQUITOES FOR CONTROL

- **Sterile Insect Technique**
 - **Wolbachia**
 - **Genetically Modified**
 - **Irradiated**
 - **Chemosterilants**

WOLBACHIA INFECTED MOSQUITOES

- Regulated by EPA
- Experimental use permit required
- State approval
- <https://www.cdc.gov/mosquitoes/mosquito-control/community/sit/wolbachia.html>
- Lots of releases dating back to 1967
- A lot more activity lately
- A.K.A.
 - Cytoplasmic Incompatibility, CI
 - Insect Incompatible Technique, IIT
- Also released to limit virus transmission

WOLBACHIA INFECTED MOSQUITOES

- **Laven, H. – Cytoplasmic incompatibility**
 - Burma (Myanmar) 1967 <http://dx.doi.org/10.1038/216383a0>
- **Guangzhou Wolbaki Biotech Co. – Cytoplasmic incompatibility**
 - China 2015 <https://www.sixthtone.com/news/1008338/millions-of-lab-grown-mosquitoes-are-being-released-in-guangzhou>
- **MosquitoMate - Cytoplasmic incompatibility**
 - 2017 5 year limited EPA registration in 20 states
 - California, Connecticut, Delaware, Illinois, Indiana, Kentucky, Massachusetts, Maine, Maryland, Missouri, New Hampshire, New Jersey, Nevada, New York, Ohio, Pennsylvania, Rhode Island, Tennessee, Vermont, and West Virginia
 - Still required State approval
 - <https://www.epa.gov/pesticides/epa-registers-wolbachia-zap-strain-live-male-asian-tiger-mosquitoes>
 - Florida 2018 <https://entomologytoday.org/2019/05/03/wolbachia-infected-mosquito-release-shows-encouraging-results/>

WOLBACHIA INFECTED MOSQUITOES

- **World Mosquito Program – Stop virus transmission**
 - **Australia 2011** <https://www.worldmosquitoprogram.org/en/global-progress/australia>
 - **Vietnam 2013** <https://www.worldmosquitoprogram.org/en/global-progress/vietnam>
 - **Indonesia 2014** <https://www.worldmosquitoprogram.org/en/global-progress/indonesia>
 - **Brazil 2014** <https://www.worldmosquitoprogram.org/en/global-progress/brazil>
 - **Colombia 2015** <https://www.worldmosquitoprogram.org/en/global-progress/colombia>
 - **Sri Lanka 2017** <https://www.worldmosquitoprogram.org/en/global-progress/sri-lanka>
 - **Fiji 2018** <https://www.worldmosquitoprogram.org/en/global-progress/fiji>
 - **Kiribati 2018** <https://www.worldmosquitoprogram.org/en/global-progress/kiribati>
 - **Vanuatu 2018** <https://www.worldmosquitoprogram.org/en/global-progress/vanuatu>
 - **New Caledonia 2019** <https://www.worldmosquitoprogram.org/en/global-progress/new-caledonia>
 - **Mexico 2019** <https://www.worldmosquitoprogram.org/en/global-progress/mexico>

GENETICALLY MODIFIED MOSQUITOES

- EPA regulates release
- Requires an experimental use permit prior to release
- Also requires state and local authorities approval
- Much more recent technique
- <https://www.cdc.gov/mosquitoes/mosquito-control/community/sit/genetically-modified-mosquitoes.html>

THE CARTAGENA PROTOCOL ON BIOSAFETY

- **International agreement signed by 173 countries**
- **Safe handling, transport, and use of LMOs**
- **Adopted in 2000**
- **Entered into force in 2003**

GENETICALLY MODIFIED MOSQUITOES

- Oxitec - RIDL

- Cayman Islands 2009 <https://www.oxitec.com/cayman>
- Malaysia 2010 <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0042771>
- Brazil 2011 <https://www.oxitec.com/brazil>
- Panama 2014 <https://www.oxitec.com/panama>
- Florida Keys 2021 <https://www.oxitec.com/florida>
- Texas ??
- California ?? <https://www.oxitec.com/california>

- Target Malaria – Gene Drive

- Burkina Faso 2019

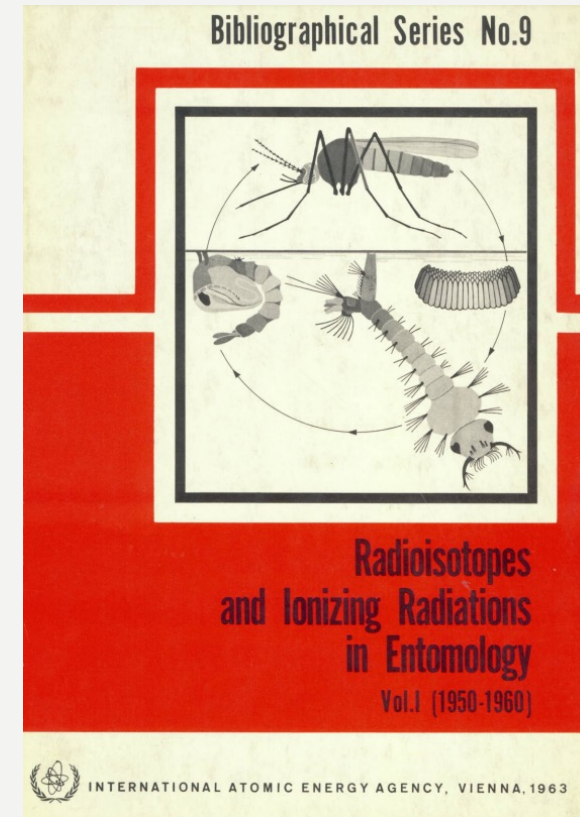
- https://targetmalaria.org/wp-content/uploads/2021/03/Development-pathway_FS_EN_Results-of-the-small-scale-release-of-non-gene-drive-genetically-modified-Burkina-Faso_March21.pdf

GENETICALLY MODIFIED MOSQUITOES

- Sterile hybrid due to genetic incompatibility
 - Burkina Faso 1968 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2427523/>
- Not GM but strain with natural low fertility
 - Pakistan 1977 <https://doi.org/10.1093/aesa/72.6.751>
- Irradiating mosquitoes causes genetic changes

IRRADIATED MOSQUITOES

- Considered the conventional SIT approach
- Currently no regulations
- <https://www.cdc.gov/mosquitoes/mosquito-control/community/sit/irradiated.html>
- A lot of smaller releases starting
- International Atomic Energy Agency
<https://www.iaea.org/topics/sterile-insect-technique>



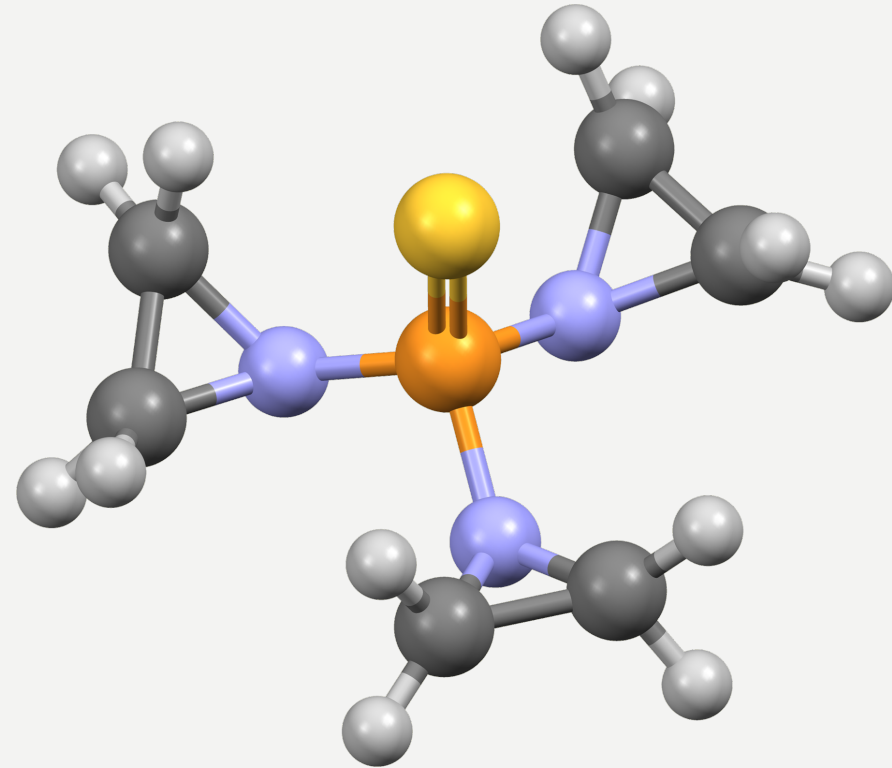
IRRADIATED MOSQUITOES

- **Gamma or X-Rays**

- Florida 1959 <https://www.cabdirect.org/cabdirect/abstract/19632903091>, 1962, 1977
- India 1962
- France 1972
- Kenya 1974, 1975 <https://doi.org/10.4269/ajtmh.1977.26.553>, 1976, 1977
- California 1977, 1978 https://www.biodiversitylibrary.org/content/part/JAMCA/MN_V40_N1_P083-090.pdf, 1980
- Pakistan 1980
- Italy 2004 https://link.springer.com/chapter/10.1007/978-1-4020-6059-5_47, 2005 - 2009 <https://doi.org/10.1603/me12048>
- Thailand 2016 <https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0007771>
 - Both Irradiated and Wolbachia infected release
- Spain 2018 <https://doi.org/10.3390/insects12030272>
- Cuba 2020 <https://www.mdpi.com/2075-4450/12/5/469/htm>

CHEMOSTERILIZED MOSQUITOES

- **Florida 1968, 1969, 1970**
 - <https://doi.org/10.1126/science.168.3937.1368>
- **El Salvador 1970, 1977**
 - <https://doi.org/10.4269/ajtmh.1974.23.288>
- **India 1976, 1977**
 - <https://malariajournal.biomedcentral.com/articles/10.1186/1475-2875-8-S2-S2>



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