MOSQUITO SURVEILLANCE 2019

GEORGIA DEPARTMENT OF PUBLIC HEALTH, ENVIRONMENTAL HEALTH

Mosquito Surveillance 2019

Limited mosquito surveillance programs occur in many Georgia counties (http://www.gamosquito.org/resources/GA_Mosquito_Control_Programs2017.pdf), but most counties with mosquito control programs conduct control activities without appropriate mosquito surveillance. Data obtained from mosquito surveillance activities are important to guide vector control operations by identifying vector species, providing an estimate of vector species abundance, and by indicating geographic areas where humans and animals are at greatest risk of exposure to WNV or other arboviruses.

Our goals for the 2019 mosquito surveillance season included doing some level of mosquito surveillance in every county in Georgia, assisting mosquito control programs with surveillance where possible, continuing to provide equipment and training to Environmental Health Specialists in all 18 Public Health Districts, and having the ability to support local outreach for mosquito complaints. We also planned to continue to do pesticide resistance testing throughout Georgia. The accomplishment of these goals will allow the Georgia Department of Public Health to be better prepared for dealing with endemic mosquito-borne disease issues and for dealing with the next mosquito-borne disease to emerge.

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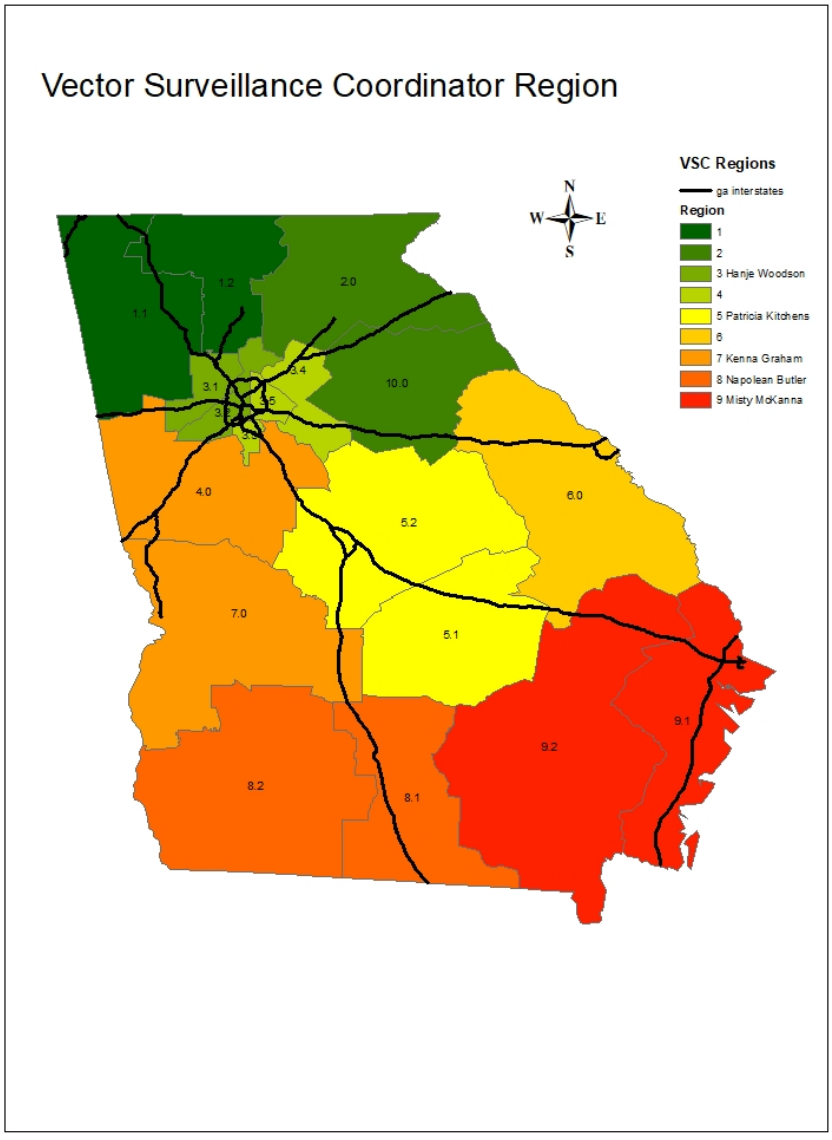
Overview

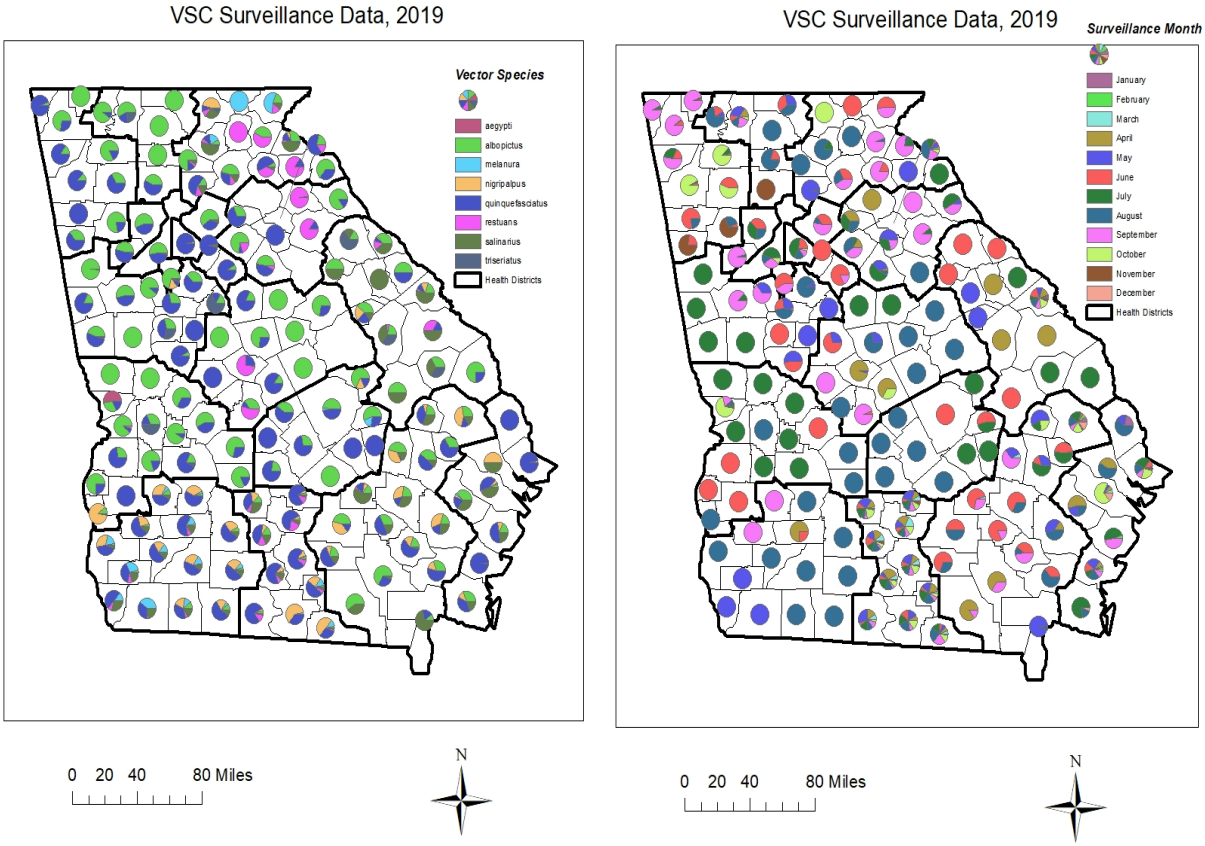
The Vector Surveillance Coordinator (VSC) program continued in 2019 with some personnel changes. Also, in addition to mosquito surveillance, the VSCs were involved in collecting mosquito eggs for statewide pesticide resistance testing and distributing collection vials to area veterinarians as part of our collaborative effort with GDA to survey ticks attached to animals.



Non-VSC Districts

Not all Health Districts are assigned a VSC. These Districts (1-1, 1-2, 2-0, 3-4, 3-5, 6-0, and 10-0) were assigned to the State Entomologists, Dr. Thuy-vi Thi Nguyen and Dr. Rosmarie Kelly. However, most of these Districts already had in-house or contracted mosquito surveillance programs, and some of them had an Environmental Health Director or Environmental Health Specialists (EHS) who had an interest in doing mosquito surveillance within their District or county. Also, VSCs stepped in to assist as needed.

The maps used in this document were all created in February 2020. They depict the month(s) in which surveillance was done in each county and the presence or absence of the important vector species *Aedes aegypti*, *Ae albopictus*, *Culiseta melanura*, *Cx nigripalpus*, *Cx quinquefasciatus*, *Cx restuans*, *Cx salinarius*, and *Ochlerotatus triseriatus*. All species trapped are listed in a table for each District by county.



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Surveillance

Adult mosquito monitoring is a necessary component of surveillance activities and is directed toward identifying where adults are most numerous. This information drives response to service requests and helps determine whether interventions (source reduction, larviciding, and/or adulticiding) are effective.

There are a variety of different mosquito traps, but generally two different types of traps are used. One type, a gravid trap, selectively attracts container- breeding mosquitoes that have had a blood meal and are looking for a place to lay eggs. The other type, a light trap, attracts mosquitoes looking for a blood meal. Recently, a third type of trap, the BG-Sentinel trap has been used in areas where exotic arbovirus cases have been detected. This trap is very specific for the ZIKV, CHIK, and DEN vectors, *Ae aegypti* and *Ae albopictus*. With all three traps, as the mosquito gets close, it gets suctioned into the trap by a small fan. Mosquitoes caught in these traps are counted and identified. They may also be pooled according to date, species, and location and sent to a lab for testing.

Most of the surveillance and mosquito identification was done by the Vector Surveillance Coordinator (VSC) and the two GDPH entomologists, as well as by Environmental Health Specialists (EHS) in the non-VSC Districts.

GRAVID TRAP

This trap selectively attracts container-breeding mosquitoes that lay eggs in stagnant organically rich water. These mosquitoes will have had at least one blood meal, so may possibly have picked up an infected blood meal if there are arbovirus-positive enzootic hosts in the area.

LIGHT TRAP

Light traps attract mosquitoes looking for a blood meal. The attractants used are light and CO_2, in the form of dry ice or as compressed gas in canisters. These traps are useful for providing information about the mosquito species found in the area under surveillance. Because they attract mosquitoes looking for a blood meal that may have just emerged and never had a blood meal previously, the likelihood of finding virus in these mosquitoes is much reduced.

BG SENTINEL TRAP

What makes the BG-S trap different? It:

- Mimics convection currents created by a human body
- Employs attractive visual cues
- Releases artificial skin emanations through a large surface area
- Can be used without CO2 to specifically capture selected mosquito species

Used in combination with the BG-Lure, a dispenser which releases a combination of non-toxic substances that are also found on human skin (ammonia, lactic acid, and caproic acid), the BG-Sentinel trap is especially attractive for the yellow fever (or ZIKV) mosquito, *Aedes aegypti*, the Asian tiger mosquito, *Aedes albopictus*, the southern house mosquito, *Culex quinquefasciatus*, and selected other species.

With the addition of carbon dioxide, the BG-Sentinel trap is an excellent surveillance tool for mosquitoes in general.

MOSQUITO BREEDING HABITAT TYPES

There are two general categories within which mosquito breeding habitats exist: natural mosquito breeding habitats and man-made mosquito breeding habitats. Female mosquitoes lay their eggs either on water or on soils that are periodically flooded. These breeding areas can be found in habitats that exist naturally, such as within a pond or flood plain, or in habitats that have been created by humans, such as bird baths, water-filled tires, or catch basins. Mosquitoes can breed in a wide variety of locations, and the discussion below provides a description of the general types of habitats where mosquitoes are known to breed.

NATURAL MOSQUITO BREEDING HABITATS

Temporary Woodland Pools:

Shallow, temporary pools are common in woodland areas during the spring and wet summers in low lying areas or in small depressions where a variety of mosquito species will breed, most commonly *Ochlerotatus canadensis* and *Aedes vexans*. These mosquitoes lay their eggs along the edges of the pool and when rainwater or melting snow fills these pools the larvae hatch.

Freshwater Ponds:

The larvae of Anopheles are found primarily in small ponds among the emergent vegetation. Ponds clogged with vegetation can breed large numbers of mosquitoes because of the vast amounts of organic matter available to mosquito larvae for feeding and because fish and other aquatic predators cannot readily feed on the larval mosquitoes.

Streams and Floodplains:

Streams with running water rarely produce mosquitoes. However, mosquitoes need to be near water in order to lay their eggs. Anopheles and Culex mosquitoes are two types of species that can sometimes be found in isolated pockets adjacent streams or within floodplain areas that undergo only periodic flooding.

Tree Holes and Other Natural Containers:

Tree holes and other natural containers, such as pitcher plants or water trapped in or on plant leaves, can also serve as breeding habitats for mosquitoes, such as *Ochlerotatus triseriatus*. Frequent rainfalls maintain standing water within these types of microhabitats and can breed mosquitoes throughout the summer.

Freshwater Marshes and Swamps:

Mosquitoes, such as *Coquillettidia perturbans*, breed in freshwater marshes and swamps consisting of emergent vegetation. These types of habitats can occur in both woodland and open field habitats. Larvae attach themselves to the stems and roots of the vegetation to obtain oxygen, and do not need to swim up and down in the water column to feed and to breath. Due to this adaptation, these larvae can avoid exposure to predatory fish.

MAN-MADE MOSQUITO BREEDING HABITATS

Stormwater/Wastewater Detention:

A catch basin typically includes a curb inlet where storm water enters the basin to capture sediment, debris and associated pollutants. Similarly, detention/retention basins that perform similar functions for other types of wastewaters, such as waste treatment settlement ponds, provide a similar type of breeding habitat to that of the storm water catch basin. These detention basins provide breeding habitat for urban mosquito species, such as *Culex quinquefasciatus*. Moisture and organic debris captured within the detention basin can aid in development and provide nutrients for growing larvae.

Roadside Ditches:

Roadside ditches are the suitable habitat for many species of Culex mosquitoes. The larvae of *Culex quinquefasciatus* and *Culex restuans*, for example, can survive in waters with high organic content. Culex mosquitoes will lay their eggs directly on the water's surface; therefore, ditches that hold water for extended periods of time can breed large numbers of mosquitoes.

Artificial Containers:

Artificial containers left out to collect rainwater such as tires, bottles, buckets, and birdbaths can provide an excellent mosquito-breeding habitat free from any predators. Many tree-hole mosquitoes have learned to adapt to using these man-made mosquito nurseries. *Aedes albopictus*, our most common pest species, also breeds readily in these artificial containers. The abundance of organic debris, which can also collect in these containers, allows for the proliferation of mosquito breeding during a season.

Control – A Message for the Public

The mosquitoes of most importance to public health in Georgia are *Culex quinquefasciatus*, the Southern house mosquito, and *Aedes albopictus*, the Asian tiger mosquito. Both these species lay eggs in such artificial containers as birdbaths, gutters, tires, flowerpots, and any other container that holds water for at least a week. The Southern house mosquito prefers organically polluted water for laying its eggs, and bites at dusk. It feeds primarily on birds, but will bite mammals, and is our primary vector for WNV. The Asian tiger mosquito prefers cleaner water for laying its eggs, and bites during the day. It feeds primarily on mammals. It has been found positive for WNV in Georgia and is a vector of ZIKV.

The best way to control these species is to dump out or treat standing water, treat catch basins with larvicide, and to cut back heavy vegetation where the mosquito will rest when not out biting. These mosquitoes will shelter in abandoned houses. Thermal fogging or barrier spray around these houses can help to reduce resting and overwintering mosquitoes. Two larvicides are available to the public for treating standing water, Mosquito Torpedoes (Methoprene) and Mosquito Dunks (Bti). Both are available online, and from Home Goods or Hardware Stores, and occasionally from large chain Pet Stores. Hand-held foggers can also be used to reduce biting populations of mosquitoes, but this solution is temporary and needs to be followed up with good source reduction (removing breeding sites) and larviciding.

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NOTE: Is it *Aedes*, or is it *Ochlerotatus*?

Ochlerotatus had been originally established as a genus in 1891. It became an aedine subgenus in the 1930s, but in 2000 John Reinert and his colleagues elevated the subgenus *Ochlerotatus* back to a genus based upon microscopic differences in the male genitalia between it and other subgenera of *Aedes*. However, in 2005 the *Journal of Medical Entomology* and the Entomological Society of America decided to put *Ochlerotatus* back to subgenera level (http://www.entsoc.org/Pubs/Periodicals/JME/mosquito_name_policy). After a contentious worldwide debate regarding the effect the taxonomic changes would have on names established over decades of work in scientific, government and lay communities, many scientists (including those at the CDC) and others affected by the change espoused the continued use of the previously established names. So, for the time being, everything is *Aedes* again.

HOWEVER, since the GDPH mosquito surveillance database was established after *Ochlerotatus* was elevated to genus status, we appreciate you continuing to use *Ochlerotatus* to make data access easier.

Aedes

- *Ae. aegypti*
- *Ae. albopictus*
- *Ae. cinerius*
- *Ae. vexans*

Ochlerotatus

- *Oc. atlanticus/tormentor*
- *Oc. atropalpus*
- *Oc. canadensis*
- *Oc. dupreei*
- *Oc. fulvus pallens*
- *Oc. hendersoni*
- *Oc. infirmatus*
- *Oc. japonicus*
- *Oc. mathesoni*
- *Oc. mitchellae*
- *Oc. sollicitans*
- *Oc. sticticus*
- *Oc. taeniorhynchus*
- *Oc. thibaulti*
- *Oc. triseriatus*
- *Oc. trivittatus*

MOSQUITO SURVEILLANCE 2019

Data by District

District 1-1

District 1-1		trap type	
County	**Species**	**CDC**	**Gravid**
Bartow	*Ae. albopictus*	1	1
	An. crucians	3	
	An. punctipennis (male)		1
	Culex spp. (male)	2	
	Cx. quinquefasciatus		4
	Oc. infirmatus	4	
Catoosa	*Ae. albopictus*		2
	Ae. vexans		2
	An. punctipennis	73	3
Chattooga	*Ae. albopictus*	1	
	Ae. albopictus (male)		2
	Cx. coronator	5	2
	Cx. quinquefasciatus		6
	Oc. infirmatus		1
Dade	*Ae. albopictus*		4
	Aedes/Ochlerotatus spp.		3
	Cx. quinquefasciatus	2	55
	Ps. ferox	1	2
Floyd	*Ae. albopictus*		20
	An. quadrimaculatus		1
	Cx. coronator		8
	Cx. erraticus	2	
	Cx. quinquefasciatus	42	99
	Ps. columbiae	1	
Gordon	*Ae. albopictus*	26	
	Ae. albopictus (male)		2
	Ae. vexans		3
	Cx. coronator		2
	Cx. quinquefasciatus		6

Surveillance in District 1-1 was done by local EHS. Surveillance was done from June through November over 28 trap nights.

Haralson	*Ae. albopictus*	1	2
	Ae. vexans		3
	Culex spp. (male)	2	
	Cx. quinquefasciatus		5
	Ps. ciliata		5
Paulding	*Ae. albopictus*	1	6
	Culex spp. (male)	2	
	Cx. coronator	1	4
	Cx. quinquefasciatus		2
Polk	*Ae. vexans*		11
	Cx. quinquefasciatus		15
Walker	*Ae. albopictus*	24	2
	An. crucians	1	
	Anopheles spp.		14
	Culex spp. (male)	1	
	Cx. coronator		2
	Cx. erraticus	1	66
	Cx. quinquefasciatus		10
	Ps. ciliata	1	

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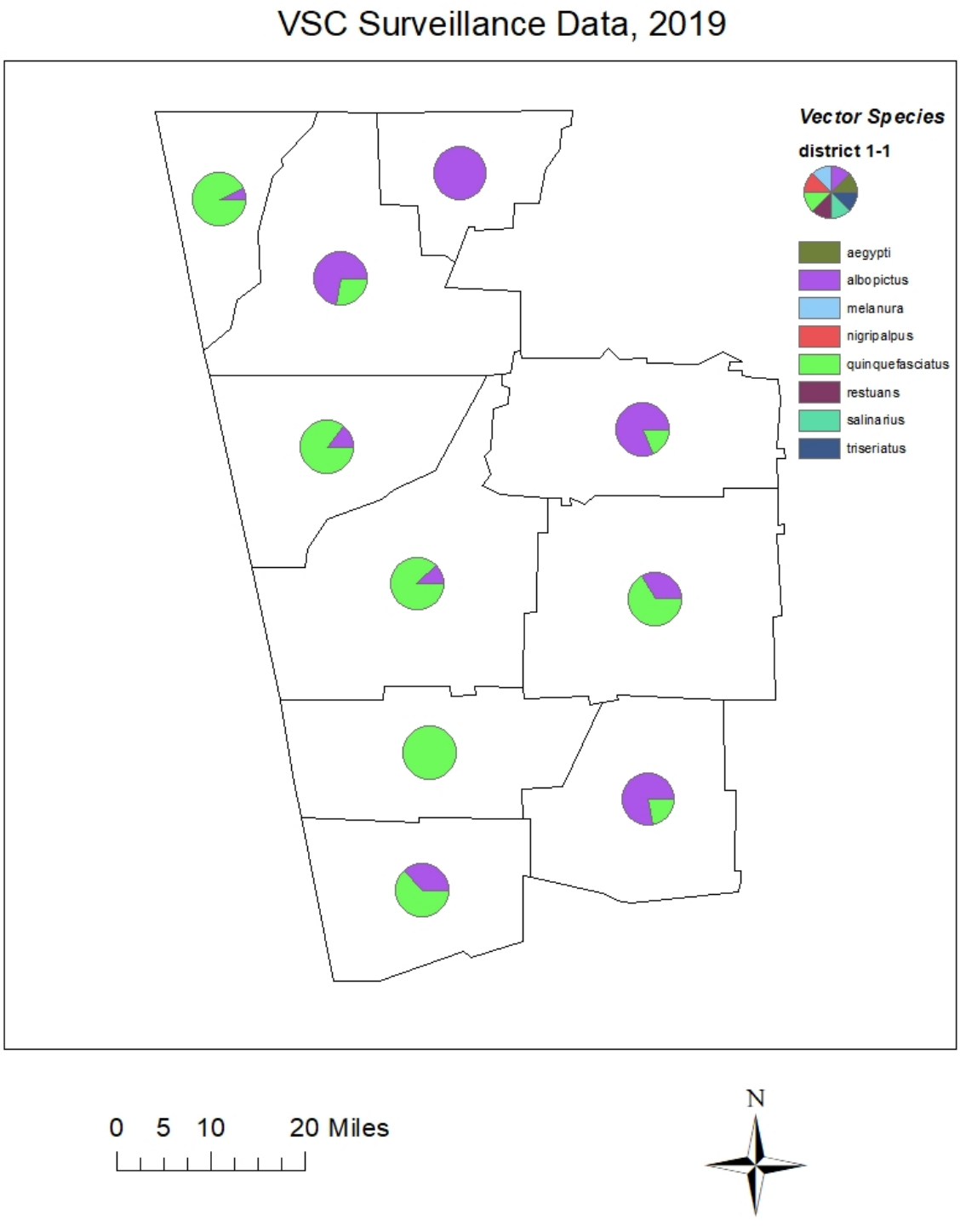

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District 1-2

District 1-2		trap type	
County	**Species**	**CDC**	**Gravid**
Cherokee	*Ae. albopictus*		7
	An. punctipennis	3	
	An. punctipennis (male)		1
	Cx. quinquefasciatus	4	5
Fannin	*Ae. albopictus*	16	
	Ae. vexans	2	
	An. punctipennis	3	
	Cx. quinquefasciatus (male)	1	
	Oc. japonicus	2	
	Oc. triseriatus (male)	1	
Gilmer	*Ae. albopictus*	4	
Murray	*Ae. albopictus*	36	
	Ae. cinereus	1	
	Ae. vexans	3	
	An. punctipennis	35	
	An. quadrimaculatus	1	3
	Cq. perturbans	1	
	Culex spp.		1
	Cx. quinquefasciatus	10	2
	Cx. quinquefasciatus (male)	1	
	Cx. salinarius	1	
	Oc. atropalpus	1	
	Oc. canadensis	5	
	Oc. cinereus	1	
	Oc. infirmatus	1	
	Oc. japonicus	63	1
	Oc. triseriatus	14	
	Oc. triseriatus (male)	1	
	Or. signifera	6	2
	Ps. cyanescens	1	

Surveillance in District 1-2 was done by local EHS with the assistance of one of the VSCs. Surveillance was done from April – June and Aug-Nov over 44 trap nights.

Pickens	*Ae. albopictus*	7	1
	Ae. vexans	37	
	An. crucians	1	
	An. punctipennis	15	
	Anopheles spp.		1
	Cx. erraticus	1	
	Oc. japonicus	8	
	Oc. trivittatus	41	
	Ps. columbiae	5	
	Ps. ferox	27	
	Ps. horrida	12	
Whitfield	*Ae. albopictus*	49	
	Ae. vexans	1	
	An. crucians	1	
	An. punctipennis	10	
	Cx. erraticus	7	
	Cx. quinquefasciatus	5	
	Oc. cinereus	5	
	Oc. dupreei	2	
	Oc. japonicus	5	
	Or. signifera	1	
	Ps. columbiae	1	
	Ur. sapphirina	2	

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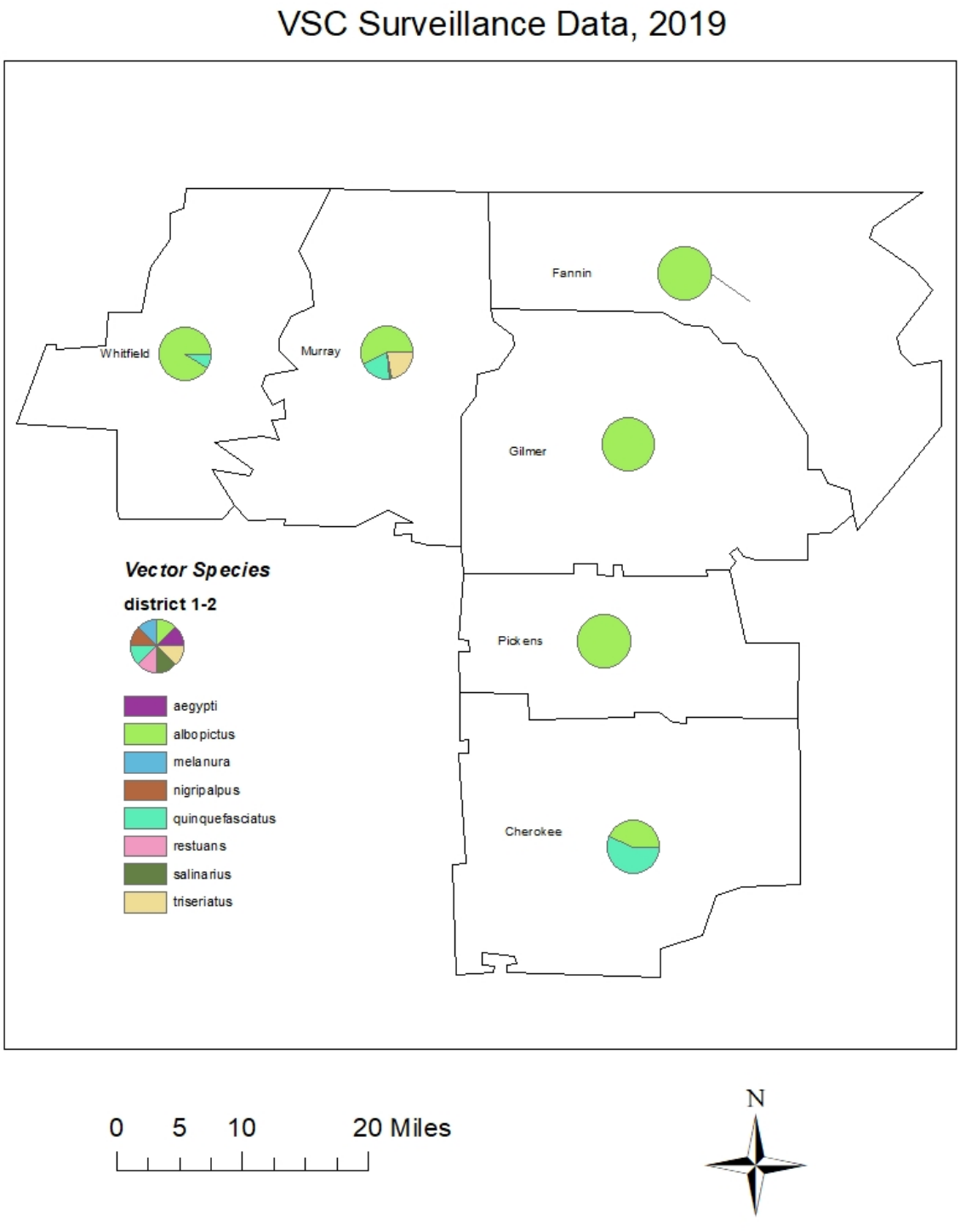

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District 2-0

District 2-0		trap type	
County	**Species**	**CDC**	**gravid**
Banks	*Ae. albopictus*	2	2
	An. crucians	14	
	An. punctipennis	3	
	Cx. erraticus		3
	Cx. quinquefasciatus	22	6
	Cx. restuans		22
	Cx. salinarius	3	
	Oc. japonicus		1
	Oc. taeniorhynchus		4
	Ps. columbiae	2	
Dawson	*Ae. albopictus*	5	7
	Cx. quinquefasciatus		2
	Cx. restuans		1
	Cx. salinarius	1	
	Oc. japonicus		4
Forsyth	*Ae. albopictus*	4	
	Ae. vexans	2	
	Cx. coronator		3
	Cx. quinquefasciatus	3	15
	Cx. restuans		4
	Cx. salinarius	1	3
	Oc. atropalpus	2	
	Oc. japonicus		31
	Oc. triseriatus	1	
Franklin	*Ae. albopictus*	1	
	Ae. vexans		24
	An. crucians		290
	An. punctipennis		26
	Cq. perturbans		4
	Cx. coronator	2	
	Cx. quinquefasciatus	11	5
	Cx. restuans	73	22
	Oc. japonicus	1	

Surveillance in District 2-0 was done by local EHS. Surveillance was done from May-Oct over 31 trap nights.

Habersham	*Ae. albopictus*	39	
	Aedes/Ochlerotatus spp.		1
	Cx. restuans	47	5
	Ps. ferox	31	
Hall	*Ae. albopictus*	17	23
	Ae. vexans	4	
	An. punctipennis	3	
	Cx. coronator	6	
	Cx. nigripalpus	1	
	Cx. quinquefasciatus	10	13
	Cx. restuans	7	2
	Cx. salinarius	12	
	Oc. canadensis	1	
	Oc. japonicus	6	17
	Oc. triseriatus	1	
	Or. signifera		1
Hart	*Ae. albopictus*	3	6
	Ae. vexans	5	
	An. crucians	21	
	Cx. quinquefasciatus	5	
Lumpkin	*Ae. albopictus*	2	2
	An. crucians	3	
	An. punctipennis	1	1
	Cq. perturbans	3	
	Cs. melanura	8	
	Cx. coronator	1	
	Cx. erraticus	1	
	Cx. quinquefasciatus	6	1
	Cx. restuans	3	
	Cx. salinarius	23	
	Oc. japonicus	1	4
	Oc. triseriatus		2
	Ur. sapphirina	4	

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County	*Species*	CDC	Gravid
Rabun	*Ae. albopictus*	2	3
	An. punctipennis	2	
	Cs. melanura	14	
	Cx. erraticus	3	
	Cx. restuans		4
	Cx. salinarius	3	
	Oc. japonicus	1	11
	Ps. ciliata	3	
	unknown	26	
Stephens	*Ae. albopictus*	80	6
	An. punctipennis	64	4
	Cx. erraticus	2	2
	Cx. nigripalpus		16
	Cx. quinquefasciatus		42
	Cx. restuans	10	
	Cx. salinarius	15	122
	Oc. canadensis	1	
	Oc. hendersoni		1
	Oc. japonicus		1
	Oc. triseriatus	6	6
Towns	*An. punctipennis*	3	
	Cs. melanura	2	
	unknown	17	
Union	*An. crucians*	1	
	An. quadrimaculatus		1
	Cx. nigripalpus	1	4
	Cx. quinquefasciatus		1
	Cx. restuans		1
	Cx. salinarius		3
	Cx. territans		1
	Oc. triseriatus	1	
	Ur. sapphirina	1	
White	*Cx. restuans*	2	
	Oc. japonicus	1	

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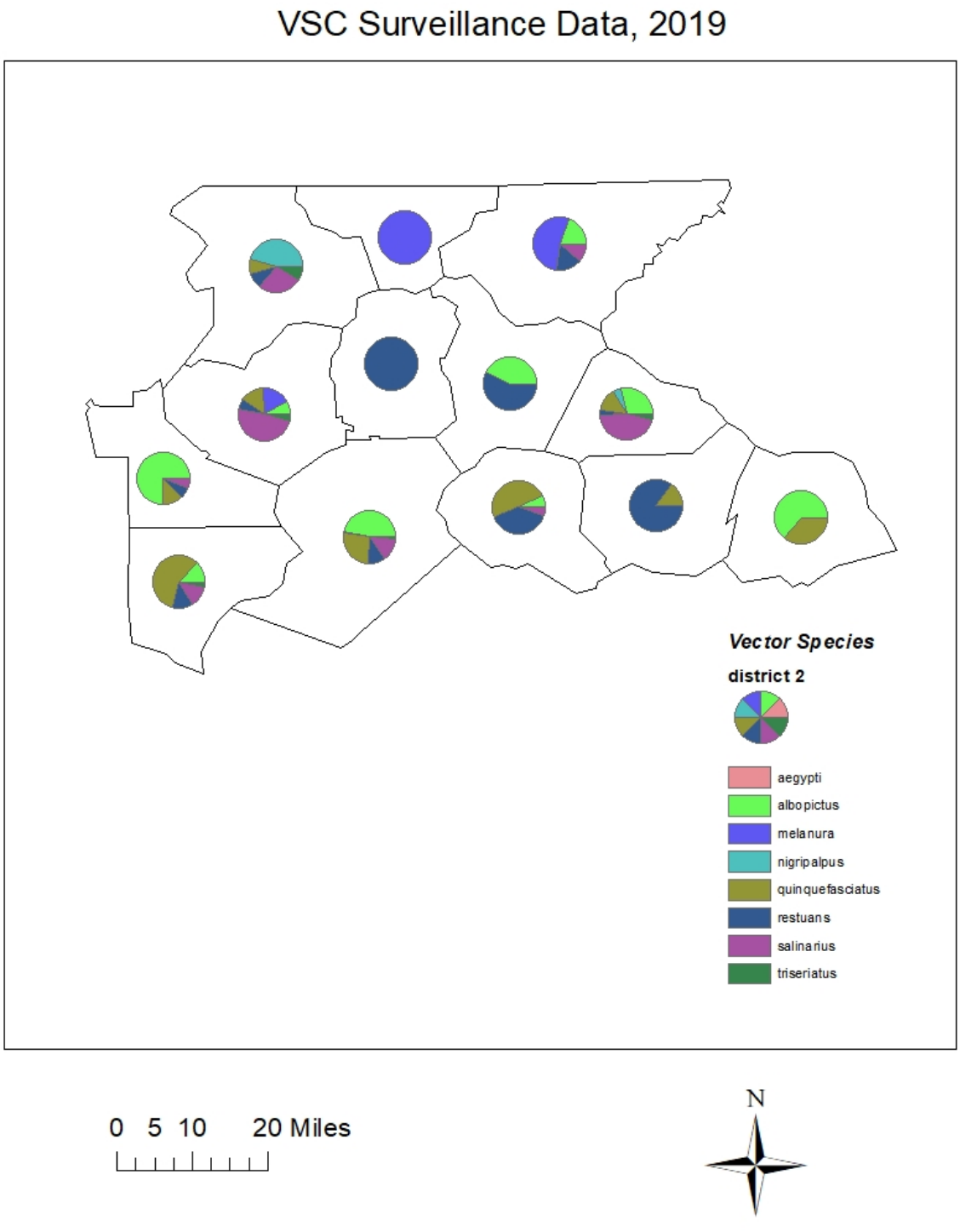

MOSQUITO SURVEILLANCE 2019

District 3-1

District 3-1		trap type	
County	**Species**	**CDC**	**gravid**
Cobb	*Ae. albopictus*	61	6
	Ae. vexans	10	
	An. punctipennis	2	10
	Culex spp.	1	40
	Cx. quinquefasciatus		54
Douglas	*Ae. albopictus*	18	4
	Ae. albopictus (male)		3
	An. crucians	1	
	Cx. erraticus	140	5
	Cx. quinquefasciatus	9	15
	Cx. restuans	1	
	Ps. columbiae	1	

Surveillance in District 3-1 was done by of the VSCs. Surveillance was done from June-September over 7 trap nights.

CULEX ERRATICUS

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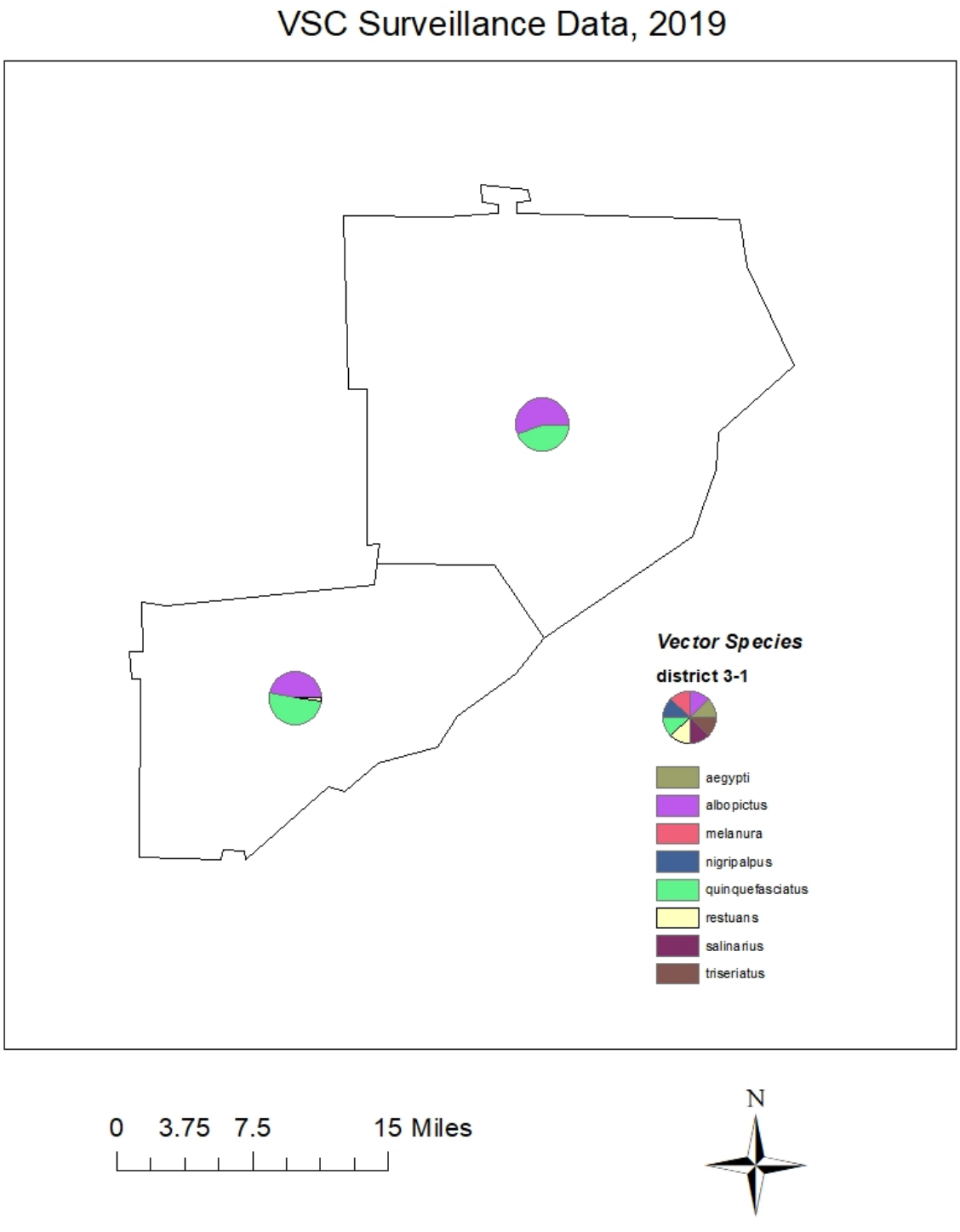

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District 3-2

District 3-2		trap type		
County	**Species**	**BGS**	**CDC**	**gravid**
Fulton	*Ae. albopictus*	452	98	370
	Ae. albopictus (male)			2
	Ae. vexans		30	5
	An. crucians		16	
	An. punctipennis		16	1
	An. punctipennis (male)		1	
	Culex spp.	106	167	811
	Culex spp. (male)			6
	Cx. erraticus	8	7	22
	Cx. quinquefasciatus	8	23	772
	Cx. restuans		2	
	Cx. salinarius	1	6	28
	Cx. territans		1	
	Oc. japonicus		5	
	Oc. triseriatus	1	11	5
	Ps. ciliata	1		
	Ps. ferox			3
	Tx. rutilus	2		4

Surveillance in District 3-2 was done by Clarke Mosquito, a company that contracts with the District to do mosquito surveillance and control, and one of the VSCs. Surveillance was done from May - Oct over 175 trap nights.

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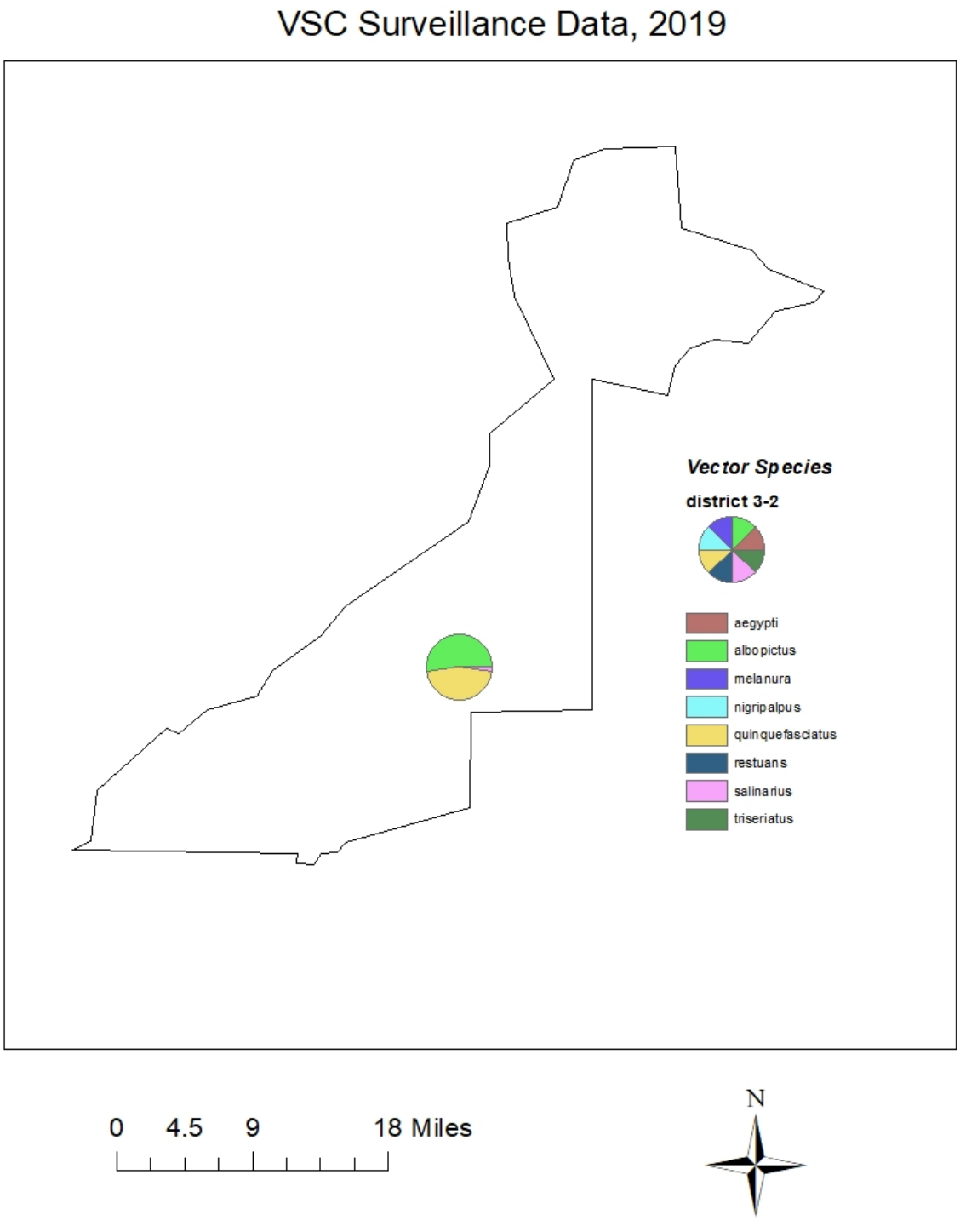


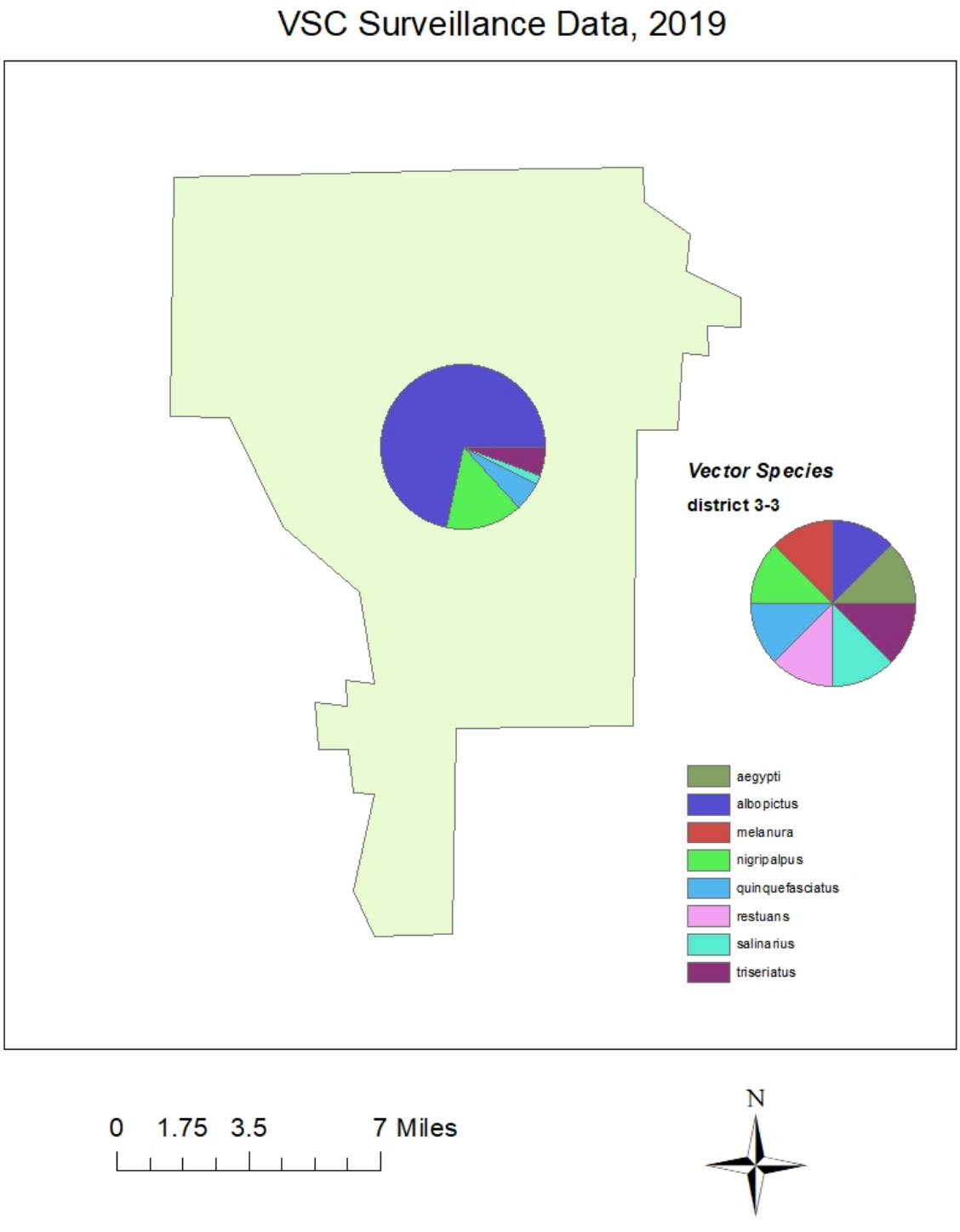
District 3-3

District 3-3		trap type	
County	**Species**	**CDC**	**Gravid**
Clayton	*Ae. albopictus*	24	14
	Ae. vexans	13	
	Aedes/Ochlerotatus spp.	10	
	An. punctipennis	32	
	An. quadrimaculatus	4	
	Cq. perturbans	1	
	Culex spp.	1	1
	Cx. coronator	8	
	Cx. erraticus	8	
	Cx. nigripalpus	8	
	Cx. quinquefasciatus		3
	Cx. salinarius	1	
	Oc. japonicus		1
	Oc. triseriatus	3	
	Ps. howardii	1	

Surveillance in District 3-3 was done one of the DPH entomologists. Surveillance was done in June and September over 5 trap nights.

PSOROPHORA HOWARDII

MOSQUITO SURVEILLANCE 2019

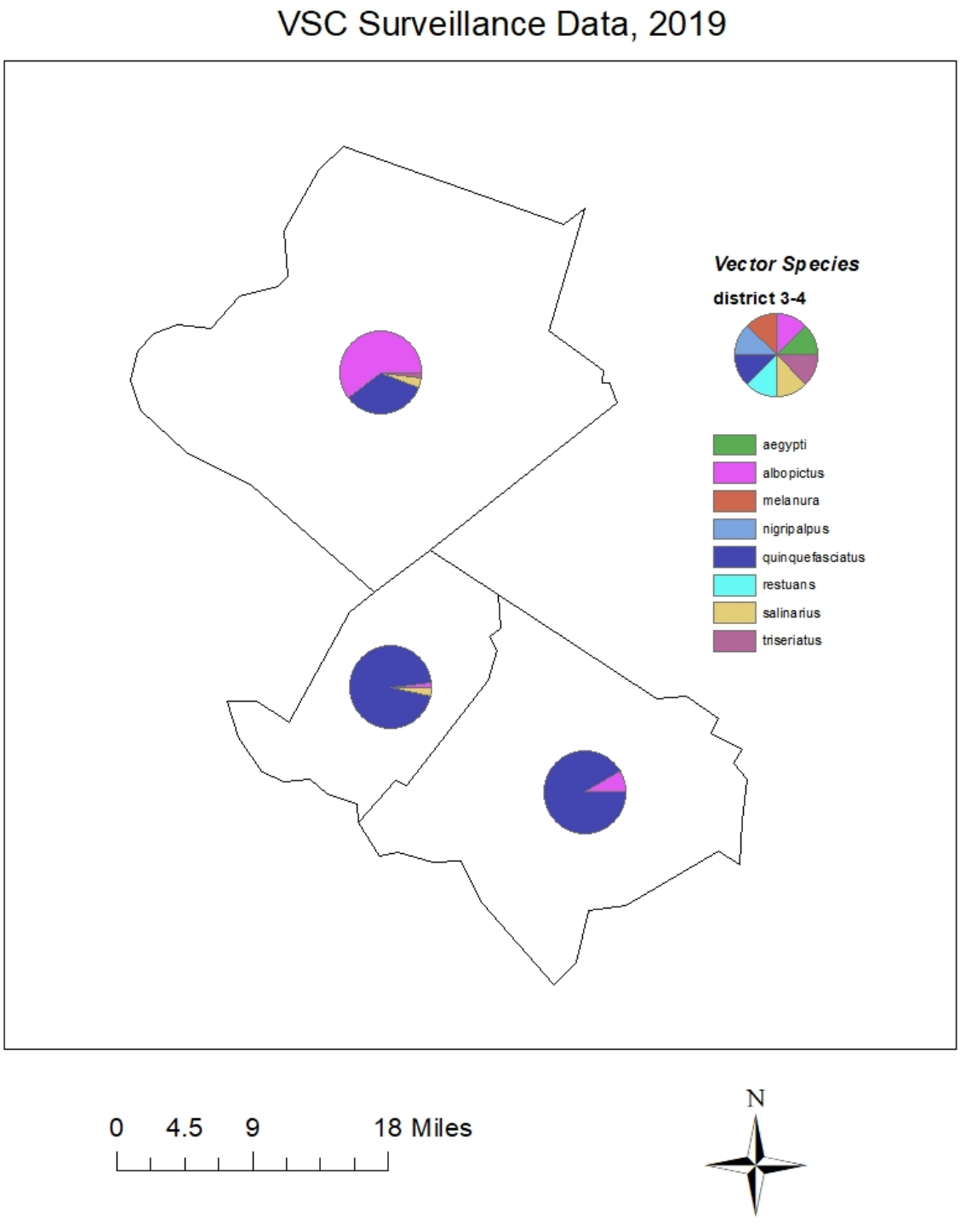


District 3-4

District 3-4		trap type	
County	**Species**	**CDC**	**gravid**
Gwinnett	*Ae. albopictus*	21	10
	Ae. vexans	8	
	An. crucians	4	
	Cx. coronator	1	
	Cx. erraticus	1	
	Cx. quinquefasciatus	2	15
	Cx. salinarius	2	
	Oc. japonicus	5	5
	Oc. triseriatus	1	
Newton	*Ae. albopictus*	9	14
	Ae. vexans	4	
	An. punctipennis	4	
	An. quadrimaculatus	10	
	Cq. perturbans	1	
	Cx. coronator	1	
	Cx. erraticus	53	1
	Cx. quinquefasciatus	2	244
	Cx. salinarius	1	
	Oc. canadensis	1	
	Oc. japonicus	1	3
	Oc. triseriatus		1
Rockdale	*Ae. albopictus*	4	2
	Ae. vexans	14	
	An. crucians	42	
	An. punctipennis	11	
	An. quadrimaculatus	2	5
	Cq. perturbans	2	
	Cx. erraticus	19	2
	Cx. quinquefasciatus	3	329
	Cx. salinarius	13	
	Oc. japonicus	6	
	Oc. triseriatus	2	

Surveillance in District 3-4 was done one of the DPH entomologists. Surveillance was done in June, August, and September over 12 trap nights.

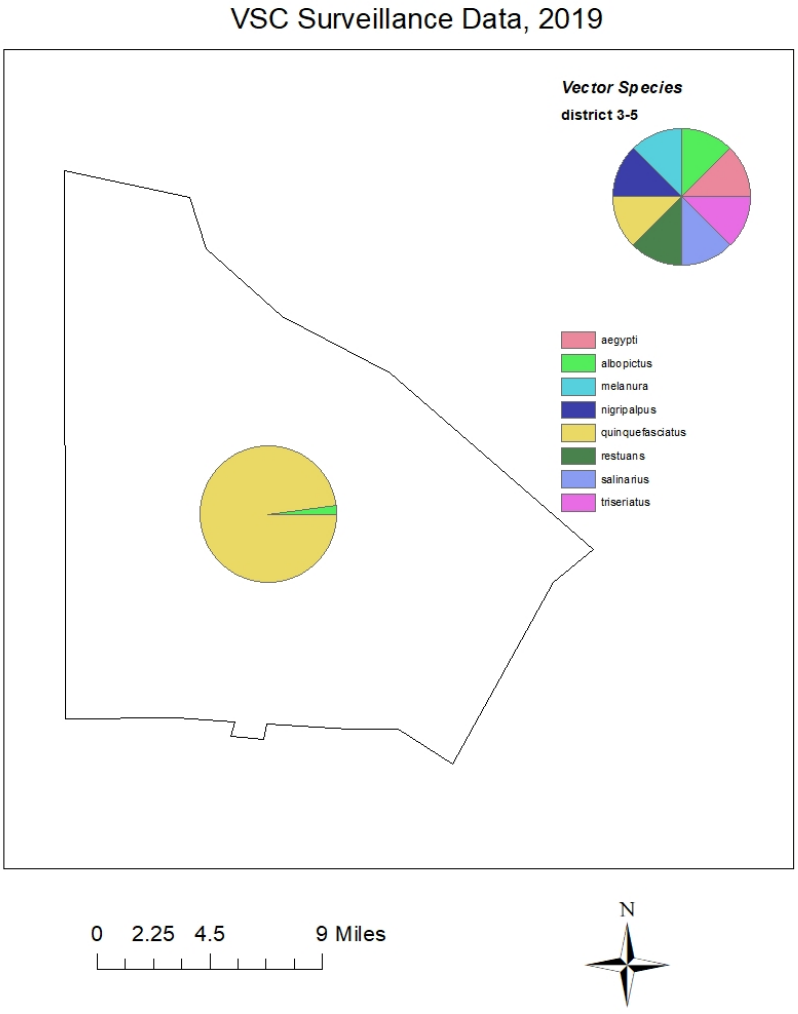
MOSQUITO SURVEILLANCE 2019



District 3-5

District 3-5		trap type	
County	**Species**	**BGS**	**Gravid**
DeKalb	*Ae. albopictus*	58	203
	Culex spp.		111
	Cx. quinquefasciatus		12709
	Cx. restuans		42

Surveillance in District 3-5 was done by interns in the Environmental Health program. Surveillance was done from June - Oct over 42 trap nights. Only data from mosquitoes sent for viral testing were shared with DPH.



District 4-0

District 4-0		trap type		
County	**Species**	**BGS**	**CDC**	**gravid**
Butts	*Ae. albopictus*		3	
	Cx. quinquefasciatus			3
	Oc. japonicus			5
	Oc. triseriatus			13
Carroll	*Ae. albopictus*	85	2	
	An. punctipennis	3		
	Anopheles spp.		2	
	Culex spp.		10	2
	Cx. quinquefasciatus			1
	Oc. canadensis		3	
Coweta	*Ae. albopictus*	67	102	9
	Ae. vexans		5	
	An. punctipennis		16	
	Cx. erraticus		1	
	Cx. quinquefasciatus	20		134
Fayette	*Ae. albopictus*	79	21	20
	Ae. vexans		1	
	An. punctipennis	2	7	
	Cq. perturbans		22	
	Cx. quinquefasciatus			13
	Oc. japonicus		10	19
Heard	*Ae. albopictus*			2
	Cx. quinquefasciatus			9
Henry	*Ae. albopictus*	57	7	14
	Ae. vexans		6	2
	An. punctipennis	1	19	2
	Cq. perturbans		1	
	Cx. quinquefasciatus	15		114
	Tx. rutilus			2
	Ur. sapphirina			1
Lamar	*Cx. quinquefasciatus*			30
	Oc. japonicus			3

Surveillance in District 4-0 was done by one of the VSCs. Surveillance was done in May - September over 62 trap nights.

Meriwether	*Ae. albopictus*		5	
Pike	*Ae. albopictus*			5
	Cx. erraticus		17	
	Cx. quinquefasciatus			7
	Oc. japonicus			15
	Oc. triseriatus		4	1
Spalding	*Ae. albopictus*	3	9	13
	An. punctipennis		18	
	Cx. quinquefasciatus			60
	Oc. japonicus			5
	Oc. japonicus (male)			2
	unknown		1	
Troup	*Ae. albopictus*		50	8
	An. punctipennis		6	
	Culex spp.		3	
	Cx. quinquefasciatus			71
	Oc. triseriatus			4
	Oc. trivittatus		3	
Upson	*Ae. albopictus*		2	
	An. punctipennis		4	
	Cx. erraticus		2	
	Cx. quinquefasciatus			29
	Cx. quinquefasciatus (male)			2
	Oc. japonicus			1

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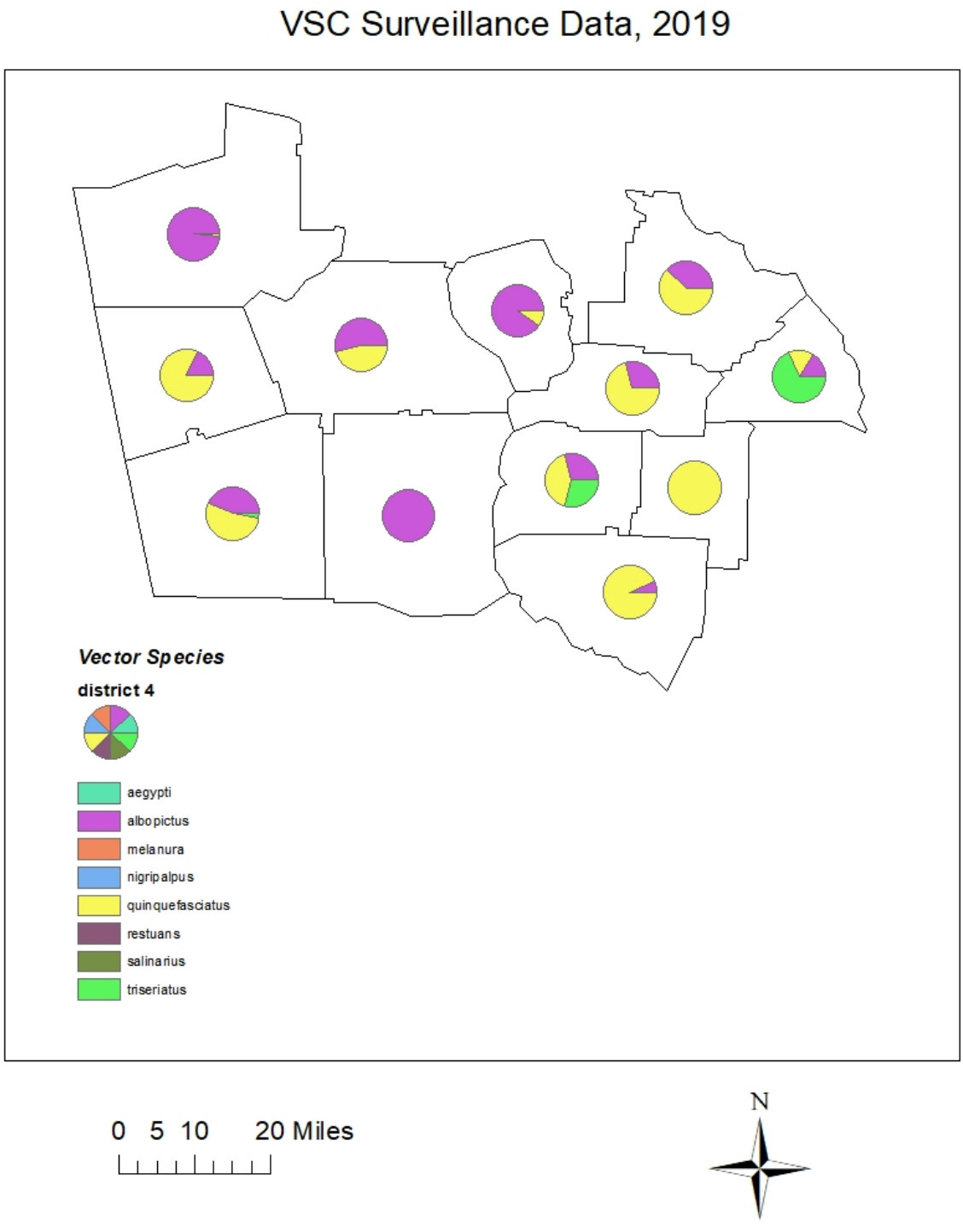


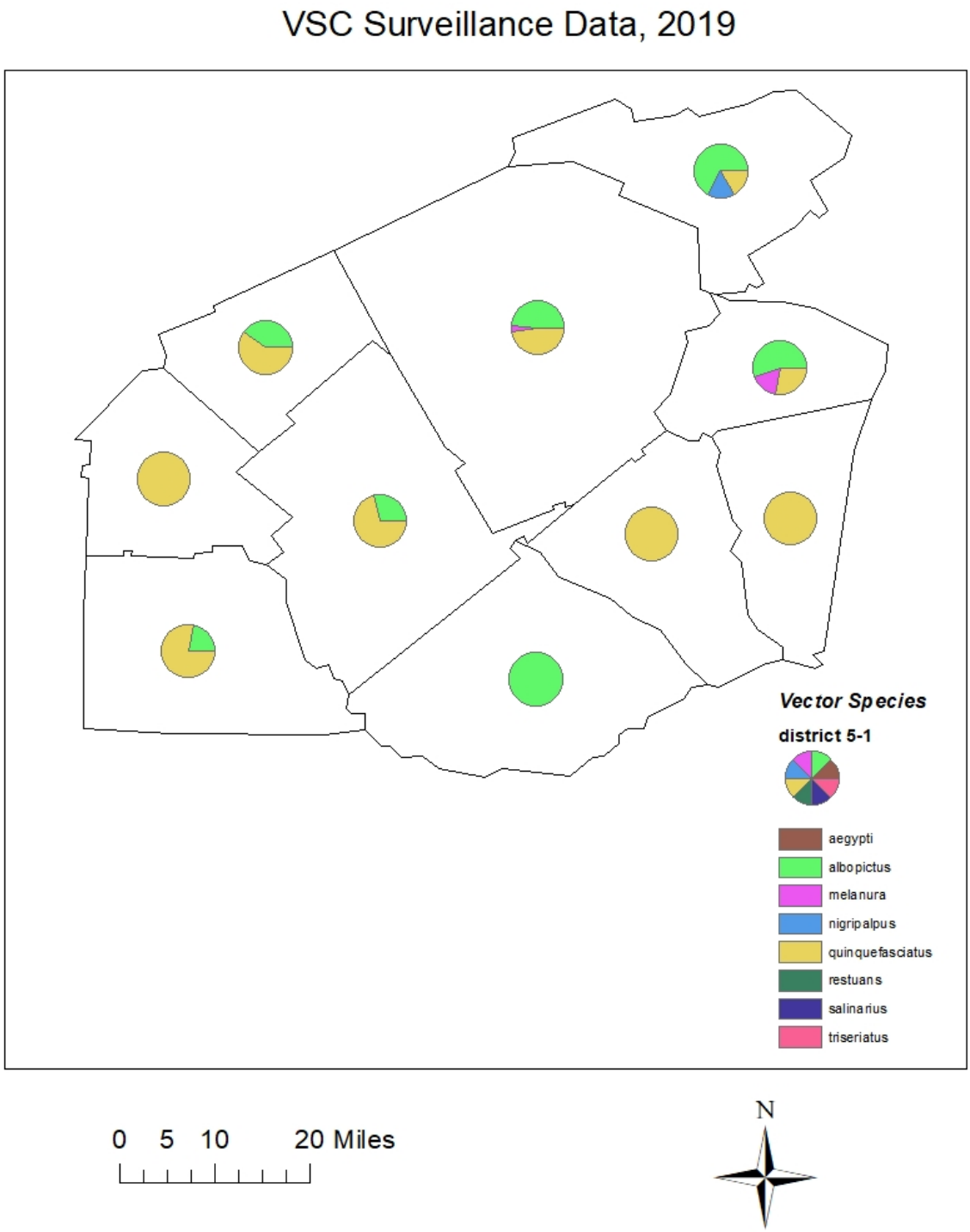
MOSQUITO SURVEILLANCE 2019

District 5-1

District 5-1		trap type		
County	**Species**	**CDC**	**gravid**	**other**
Bleckley	*Ae. albopictus*	2		
	Cx. quinquefasciatus		3	
Dodge	*Ae. albopictus*	2	2	
	Ae. vexans			1
	An. punctipennis		2	
	Cx. quinquefasciatus		10	
Johnson	*Ae. albopictus*	13	3	
	Cx. erraticus		1	
	Cx. nigripalpus	4		
	Cx. quinquefasciatus	2	2	
	unknown	1		
Laurens	*Ae. albopictus*	14	15	
	Aedes/Ochlerotatus spp.	3	1	
	An. punctipennis	2		
	Cs. melanura		2	
	Cx. erraticus		2	
	Cx. quinquefasciatus	1	27	
	unknown	1		
Montgomery	*Culex spp.*	2		
	Cx. coronator	3		
	Cx. erraticus		3	
	Cx. quinquefasciatus	3		
	unknown		2	
Pulaski	*Cx. quinquefasciatus*		24	
Telfair	*Ae. albopictus*		9	

Surveillance in District 5-1 was done by one of the VSCs. Surveillance was done from June-Aug over 17 trap nights.

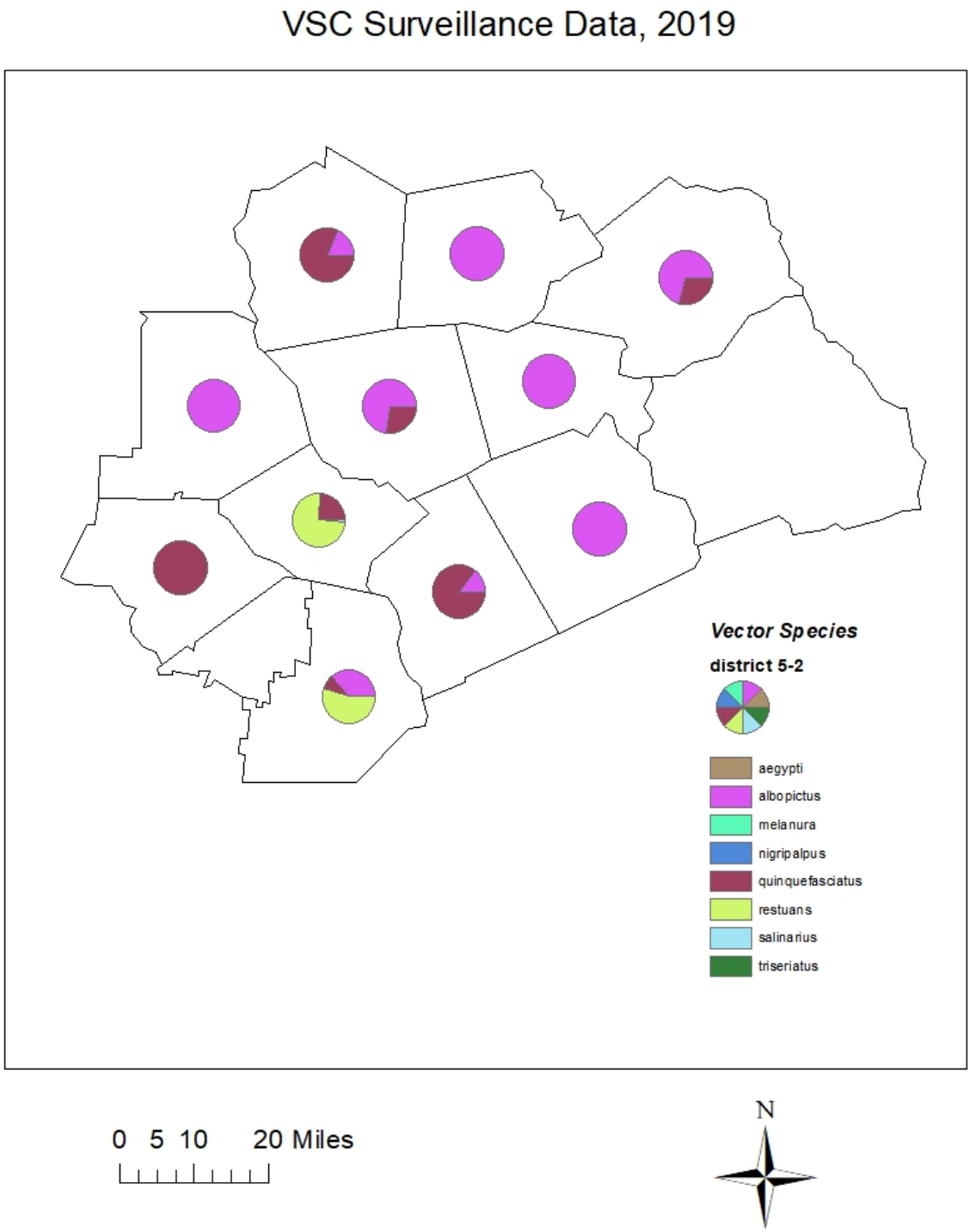
Treutlen	*Ae. albopictus*	6	10
	Aedes/Ochlerotatus spp.		1
	An. punctipennis	18	
	Cs. melanura	5	
	Cx. erraticus	6	2
	Cx. quinquefasciatus		8
	unknown	7	20
Wheeler	*Aedes/Ochlerotatus spp.*	3	
	Cq. perturbans	9	
	Cx. quinquefasciatus	48	
	Ps. columbiae	3	
	unknown	12	9
Wilcox	*Ae. albopictus*		5
	Cx. quinquefasciatus		18


VSC Surveillance Data, 2019
Vector Species
district 5-1
aegypti
albopictus
melanura
nigripalpus
quinquefasciatus
restuans
salinarius
triseriatus
0 5 10 20 Miles
N

District 5-2

Surveillance in District 5-2 was done by one of the VSCs. Surveillance was done from April - Oct over 29 trap nights.

District 5-2		trap type		
County	**Species**	**CDC**	**gravid**	**other**
Baldwin	*Ae. albopictus*	5	3	
	unknown		1	
Bibb	*Ae. albopictus*	3	1	
	Ae. albopictus (male)	2		
	An. punctipennis	3		
	An. quadrimaculatus		3	
	Cq. perturbans	2		
	Cs. melanura		5	
	Cx. coronator	1		
	Cx. quinquefasciatus		186	
	Cx. restuans		576	
	Cx. salinarius	9		
	Oc. japonicus		1	
	unknown	1	4	
Crawford	*Aedes/Ochlerotatus spp.*		3	
	An. punctipennis	2		
	Culex spp.		10	
	Cx. quinquefasciatus	3	2	
	unknown	3		
Hancock	*Ae. albopictus*	5		
	Cx. quinquefasciatus		2	
Houston	*Ae. albopictus*	2	2	
	Ae. vexans	16		
	Cx. coronator	5		
	Cx. erraticus	4		
	Cx. quinquefasciatus			1
	Cx. restuans		6	
	Ps. columbiae		1	
Jasper	*Ae. albopictus*	9		
	Cx. quinquefasciatus	9	30	
	unknown	6	6	
Jones	*Ae. albopictus*	24	3	
	Ae. vexans		3	
	Aedes/Ochlerotatus spp.	2	1	
	An. punctipennis	2		
	Culex spp.	5	5	
	Cx. coronator		12	
	Cx. erraticus	6	3	
	Cx. quinquefasciatus	9	1	
	Oc. japonicus		10	
	unknown	15	5	
Monroe	*Ae. albopictus*	6	5	
	Ae. vexans	4		
	Aedes/Ochlerotatus spp.	4	1	
	An. punctipennis	6	2	
	Or. signifera	1		
	unknown		2	
Peach	*Ae. vexans*	2		
	Ps. ciliata	14		
	Ps. columbiae	343		
	unknown	17		
Putnam	*Ae. albopictus*	15	4	
	Culex spp.	3		
Twiggs	*Ae. albopictus*		2	
	Cx. quinquefasciatus		12	
	Ps. columbiae		4	
Washington	*Culex spp.*	7		
Wilkinson	*Ae. albopictus*	5		
	unknown		2	


VSC Surveillance Data, 2019
Vector Species
district 5-2
aegypti
albopictus
melanura
nigripalpus
quinquefasciatus
restuans
salinarius
triseriatus
0 5 10 20 Miles
N

District 6-0

District 6-0		trap type	
County	**Species**	**CDC**	**gravid**
Burke	*Cx. quinquefasciatus*		1
	Cx. restuans		2
	Cx. salinarius	1	2
Columbia	*Ae. albopictus*		1
	An. quadrimaculatus		1
	Cx. quinquefasciatus		1
Emanuel	*Ae. albopictus*	1	
	Cx. salinarius		1
Glascock	*Ae. albopictus*	1	2
	An. punctipennis	2	
	Cx. coronator		1
	Cx. nigripalpus		2
	Cx. quinquefasciatus		2
	Cx. salinarius		1
	Tx. rutilus		1
Jefferson	*Ae. albopictus*	5	
	An. crucians	25	
	An. punctipennis	32	
	An. quadrimaculatus	5	
	Cq. perturbans	22	
	Cx. erraticus	1	
	Cx. restuans		1
	Cx. salinarius	6	3
	Oc. atlanticus	6	
	Oc. canadensis	1	
	Oc. triseriatus	6	2
	Ps. ferox	20	

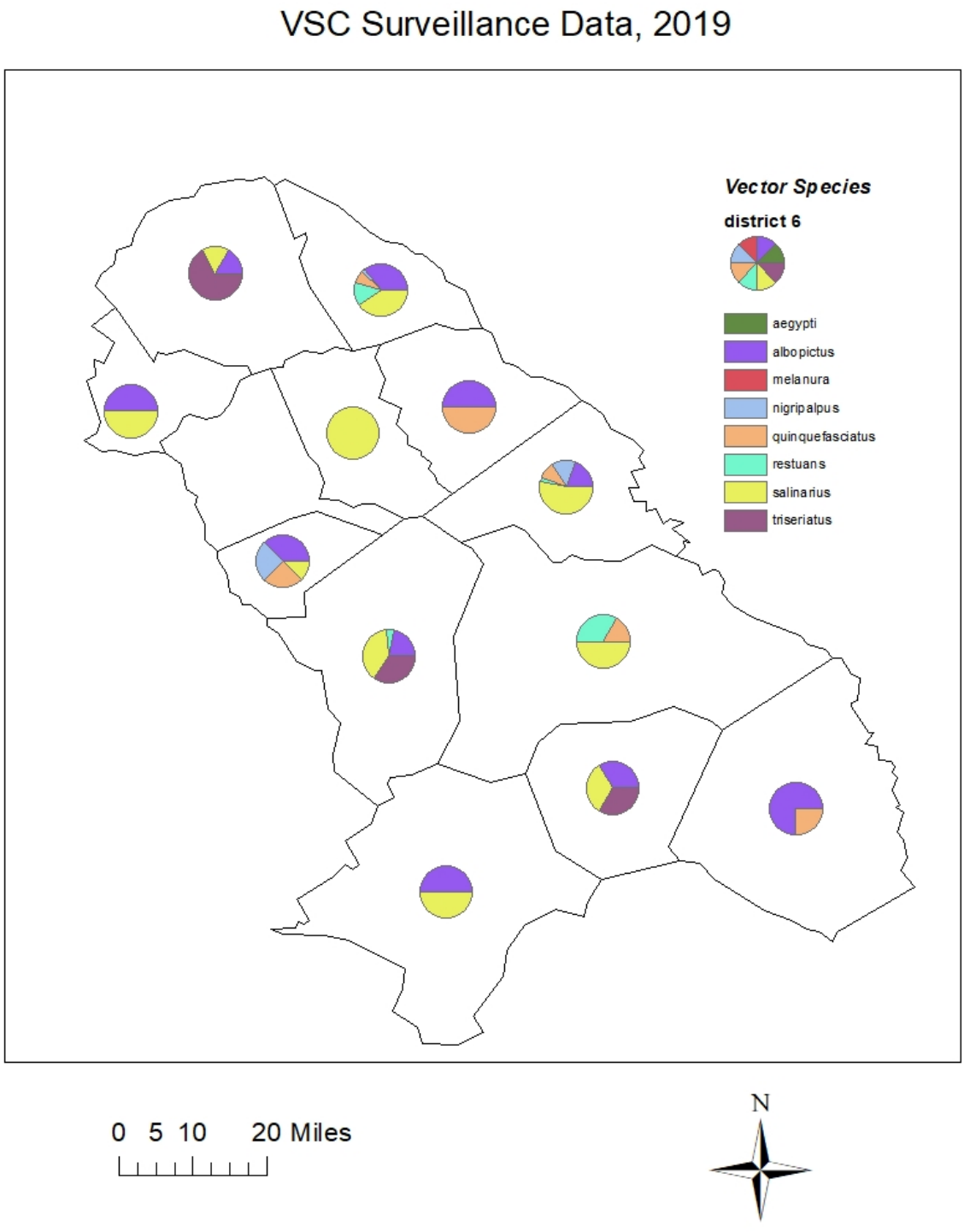
Surveillance in District 6-0 was done by the Richmond County Mosquito Control program. Surveillance was done from Jan - Dec over 328 trap nights.

Jenkins	*Ae. albopictus*	1	
	Ae. vexans	2	
	An. punctipennis	2	
	An. quadrimaculatus	1	
	Cq. perturbans	1	
	Cx. erraticus	2	
	Cx. salinarius	1	
	Oc. triseriatus	1	
	Ur. sapphirina	1	
Lincoln	*Ae. albopictus*	15	
	An. crucians	1	
	Cx. coronator		1
	Cx. nigripalpus	1	
	Cx. quinquefasciatus		3
	Cx. restuans		6
	Cx. salinarius		17
	Oc. sollicitans	3	
	Ps. ferox	1	
McDuffie	*An. punctipennis*	2	
	An. quadrimaculatus	1	
	Cx. salinarius	1	
	Oc. japonicus		1
	Or. alba		1

PSOROPHORA FEROX

District 6-0		trap type	
County	**Species**	**CDC**	**gravid**
Richmond	*Ae. albopictus*	420	73
	Ae. vexans	251	5
	An. crucians	202	3
	An. punctipennis	372	3
	An. quadrimaculatus	37	11
	Cq. perturbans	251	14
	Cx. coronator	58	4
	Cx. erraticus	555	20
	Cx. nigripalpus	338	29
	Cx. quinquefasciatus	39	215
	Cx. restuans	9	54
	Cx. salinarius	1164	184
	Cx. territans		1
	Oc. atlanticus		1
	Oc. fulvus pallens	4	
	Oc. japonicus	2	1
	Oc. sollicitans	1	
	Oc. triseriatus	7	14
	Or. alba		1
	Ps. ferox	39	1
	Ur. lowii	6	1
	Ur. sapphirina	20	3
Screven	*Ae. albopictus*		3
	Cx. quinquefasciatus		1
Taliaferro	*Ae. albopictus*		2
	Cx. salinarius		2
Warren	*An. crucians*	1	
	Ps. ferox		1
Wilkes	*Ae. albopictus*	1	
	Ae. vexans		1
	An. punctipennis	4	
	Cx. salinarius	1	
	Oc. triseriatus		4

MOSQUITO SURVEILLANCE 2019



MOSQUITO SURVEILLANCE 2019

District 7-0

District 7-0		trap type		
County	**Species**	**BGS**	**CDC**	**gravid**
Chattahoochee	*Ae. albopictus*		30	1
	Cx. quinquefasciatus			3
	Cx. restuans			1
Clay	*Ae. albopictus*	2		2
	Aedes/Ochlerotatus spp.		3	
	Culex spp.		5	
	Cx. nigripalpus	13	2	12
	Cx. quinquefasciatus			1
Crisp	*Ae. albopictus*	25	47	2
	Ae. vexans		4	
	An. quadrimaculatus		4	
	Cx. coronator		41	
	Cx. quinquefasciatus	10		6
	Ps. columbiae		2	
	Ps. ferox	1		
Dooly	*Ae. albopictus*			5
	Culex spp.		2	
	Cx. quinquefasciatus			2
Harris	*Ae. albopictus*		3	1
	An. punctipennis		2	
Macon	*Ae. albopictus*		6	16
	Ae. vexans		12	
	An. punctipennis		2	
	An. quadrimaculatus		26	
	Cx. erraticus		442	
	Cx. quinquefasciatus			16
	Ps. ciliata		2	
Marion	*Ae. albopictus*			2
	Cx. quinquefasciatus			1
	Oc. triseriatus		3	

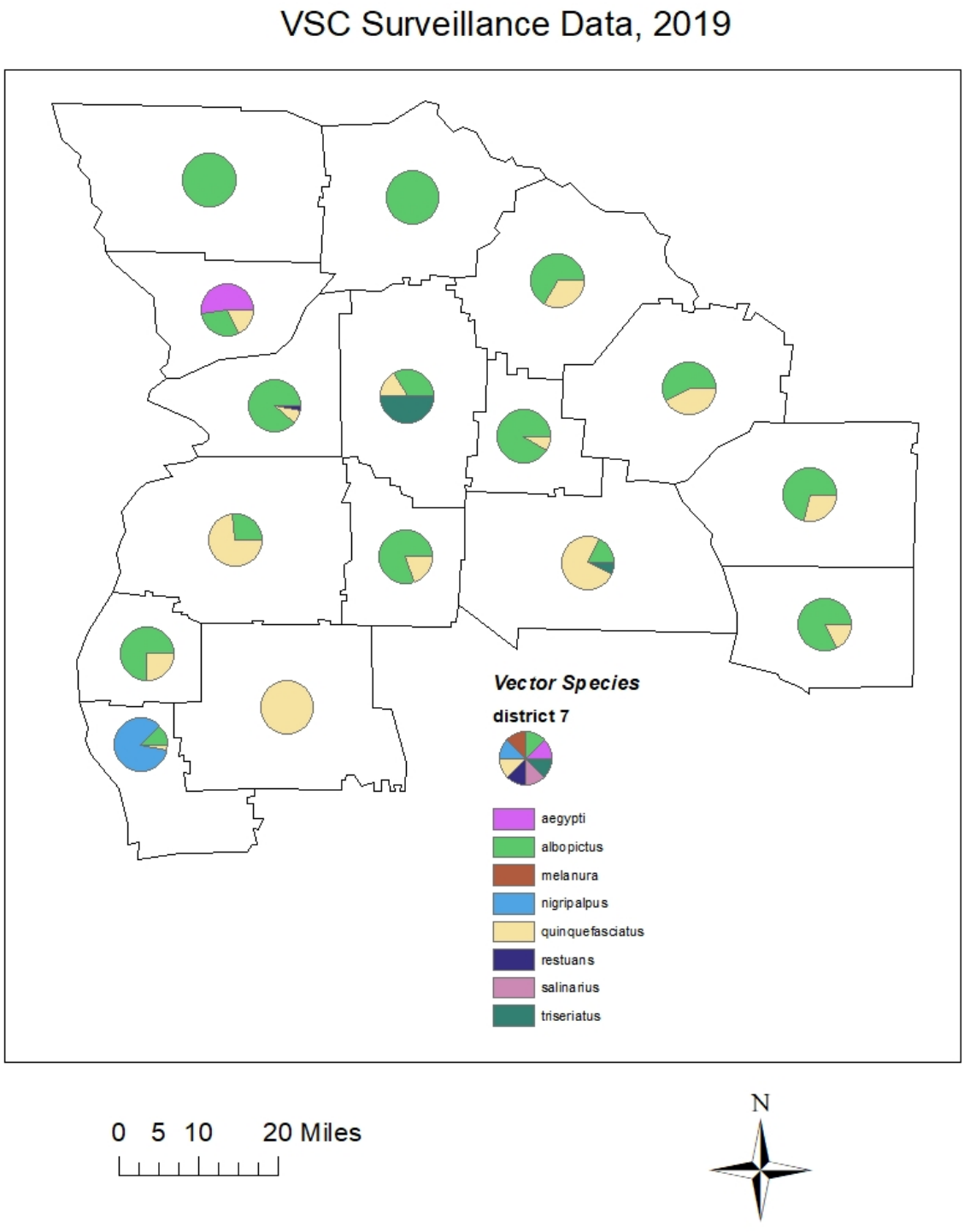
Surveillance in District 7-0 was done by one of the VSCs. Surveillance was done in June - November over 84 trap nights.

Muscogee	*Ae. aegypti*	3642	344	86
	Ae. albopictus	1786	505	63
	Ae. vexans	5	4	
	Aedes/Ochlerotatus spp.		3	
	Culex spp.	12	3	
	Cx. erraticus	44	16	
	Cx. nigripalpus	40	12	
	Cx. quinquefasciatus	212	8	1188
	Oc. triseriatus			6
	Ps. columbiae		2	
	Tx. rutilus	1		
Quitman	*Ae. albopictus*	53	9	
	Ae. vexans		1	
	An. punctipennis		4	
	Cx. quinquefasciatus			21
Randolph	*Aedes/Ochlerotatus spp.*		25	
	Cx. quinquefasciatus			79
	Ps. ciliata		1	
Schley	*Ae. albopictus*	17	12	2
	An. punctipennis		3	
	An. quadrimaculatus		9	
	Culex spp.		6	
	Cx. erraticus		17	
	Cx. quinquefasciatus			3

MOSQUITO SURVEILLANCE 2019

District 7-0		trap type		
County	**Species**	**BGS**	**CDC**	**gravid**
Stewart	*Ae. albopictus*		6	4
	Cx. quinquefasciatus			27
Sumter	*Ae. albopictus*		4	1
	An. quadrimaculatus			15
	Cx. quinquefasciatus			21
	Oc. triseriatus			2
Talbot	*Ae. albopictus*	16	5	5
	An. punctipennis		2	
	Oc. japonicus			2
Taylor	*Ae. albopictus*		2	2
	Cx. quinquefasciatus		2	
Webster	*Ae. albopictus*			4
	Cx. quinquefasciatus			1

MOSQUITO SURVEILLANCE 2019



District 8-1

Surveillance in District 8-1 was done by the local EHS and students from VSU, as well as one of the VSCs. Surveillance was done from March - Nov over 2195 trap nights.

District 8-1			
County	**Species**	**CDC**	**Gravid**
Ben Hill	*Ae. albopictus*	100	181
	Ae. albopictus (male)		5
	Ae. vexans	734	1
	Ae. vexans (male)	1	
	Aedes/Ochlerotatus spp.	14	1
	An. crucians	452	8
	An. punctipennis	9	1
	An. quadrimaculatus	70	2
	An. quadrimaculatus (male)		1
	Anopheles spp.	2	
	Cq. perturbans	181	1
	Cs. melanura	9	9
	Culex spp.	84	1532
	Culex spp. (male)	2	14
	Cx. coronator	127	42
	Cx. erraticus	45	9
	Cx. nigripalpus	208	160
	Cx. quinquefasciatus	333	5199
	Cx. restuans	5	799
	Cx. salinarius	167	77
	Ma. titillans	2	
	Oc. atlanticus	10	1
	Oc. canadensis	17	
	Oc. infirmatus	1	
	Oc. triseriatus	47	13
	Or. signifera		4
	Ps. ciliata	2	
	Ps. columbiae	37	2
	Ps. ferox	47	1

Berrien	*Ae. albopictus*	97	107
	Ae. albopictus (male)		1
	Ae. vexans	42	
	Aedes/Ochlerotatus spp.	24	
	An. crucians	399	5
	An. crucians (male)		1
	An. punctipennis	6	
	An. quadrimaculatus	63	1
	Anopheles spp. (male)	2	2
	Cq. perturbans	289	1
	Cs. melanura	136	17
	Culex spp.	153	1462
	Culex spp. (male)	2	61
	Cx. coronator	78	119
	Cx. erraticus	542	25
	Cx. nigripalpus	270	308
	Cx. quinquefasciatus	434	4554
	Cx. restuans	12	641
	Cx. salinarius	132	16
	Ma. titillans	10	1
	Oc. atlanticus	2	
	Oc. canadensis	4	
	Oc. infirmatus		1
	Oc. triseriatus	1	9
	Or. signifera	1	
	Ps. columbiae	22	1
	Ps. ferox	7	1
	Psorophora spp.	1	
	Ur. lowii	2	1
	Ur. sapphirina	186	1

MOSQUITO SURVEILLANCE 2019

County	*Species*	CDC	Gravid
Brooks	*Ae. albopictus*	98	306
	Ae. albopictus (male)		2
	Ae. vexans	100	16
	Aedes/Ochlerotatus spp.	8	
	An. crucians	1055	21
	An. punctipennis	56	7
	An. quadrimaculatus	81	5
	Anopheles spp.	6	
	Anopheles spp. (male)	1	
	Cq. perturbans	215	7
	Cq. perturbans (male)		1
	Cs. melanura	74	22
	Culex spp.	77	2226
	Culex spp. (male)	11	9
	Cx. coronator	115	98
	Cx. erraticus	1523	50
	Cx. nigripalpus	183	255
	Cx. quinquefasciatus	171	8756
	Cx. restuans	13	1374
	Cx. salinarius	214	123
	Ma. titillans	7	1
	Oc. atlanticus	56	4
	Oc. canadensis	34	2
	Oc. fulvus pallens	3	
	Oc. infirmatus	10	1
	Oc. sticticus		1
	Oc. triseriatus	1	3
	Or. signifera	1	2
	Ps. ciliata	3	
	Ps. columbiae	535	6
	Ps. ferox	4	2
	Ur. lowii	1	
	Ur. sapphirina	9	9
	Ur. sapphirina (male)		1

Cook	*Ae. albopictus*	53	52
	Ae. albopictus (male)		3
	Ae. vexans	185	1
	An. crucians	1234	4
	An. punctipennis	2	1
	An. quadrimaculatus	58	
	Anopheles spp. (male)	1	
	Cq. perturbans	581	2
	Cs. melanura	34	16
	Culex spp.	73	1653
	Culex spp. (male)	1	3
	Cx. coronator	23	7
	Cx. erraticus	345	17
	Cx. nigripalpus	63	194
	Cx. quinquefasciatus	90	2179
	Cx. restuans	1	238
	Cx. salinarius	353	35
	Ma. titillans	6	
	Oc. atlanticus	2	1
	Oc. canadensis	13	
	Oc. infirmatus	4	
	Oc. triseriatus		1
	Ps. ciliata	2	
	Ps. columbiae	71	
	Ps. ferox	6	1
	Ps. howardii	1	
	Ur. lowii		1
	Ur. sapphirina	1	1

MOSQUITO SURVEILLANCE 2019

County	*Species*	CDC	Gravid
Echols	*Ae. albopictus*	62	99
	Ae. albopictus (male)	5	1
	Ae. vexans	63	2
	Aedes/Ochlerotatus spp.	3	8
	An. crucians	629	6
	An. punctipennis	6	
	An. quadrimaculatus	68	
	Cq. perturbans	239	3
	Cs. melanura	596	99
	Cs. melanura (male)		1
	Culex spp.	155	518
	Culex spp. (male)	1	22
	Cx. coronator	11	4
	Cx. erraticus	840	65
	Cx. nigripalpus	2523	643
	Cx. quinquefasciatus	71	1860
	Cx. restuans	2	144
	Cx. salinarius	207	19
	Cx. territans	3	
	Ma. titillans	41	
	Oc. atlanticus	33	17
	Oc. atlanticus (male)	1	
	Oc. canadensis	28	
	Oc. fulvus pallens	2	
	Oc. infirmatus	12	
	Oc. sticticus	6	
	Oc. triseriatus		5
	Or. signifera		2
	Ps. ciliata	5	
	Ps. columbiae	138	1
	Ps. ferox	4	1
	Ur. lowii	2	4
	Ur. sapphirina	27	31

Irwin	*Ae. albopictus*	22	122
	Ae. albopictus (male)	1	1
	Ae. vexans	70	
	Aedes/Ochlerotatus spp.	2	3
	An. crucians	589	61
	An. crucians (male)		1
	An. punctipennis	31	4
	An. quadrimaculatus	32	1
	An. quadrimaculatus (male)		1
	Anopheles spp.		1
	Anopheles spp. (male)	2	
	Cq. perturbans	104	2
	Cs. melanura	11	4
	Culex spp.	66	1746
	Cx. coronator	6	5
	Cx. erraticus	69	5
	Cx. nigripalpus	160	223
	Cx. quinquefasciatus	125	4410
	Cx. restuans	10	1303
	Cx. salinarius	348	226
	Ma. titillans	3	
	Oc. canadensis	48	
	Oc. triseriatus	8	
	Ps. ciliata	3	
	Ps. columbiae	23	4
	Ur. sapphirina	3	1

County	*Species*	CDC	Gravid
Lanier	*Ae. albopictus*	45	69
	Ae. vexans	36	3
	An. crucians	786	6
	An. punctipennis	1	
	An. quadrimaculatus	118	2
	Anopheles spp.		1
	Cq. perturbans	322	
	Cs. melanura	418	18
	Culex spp.	106	990
	Culex spp. (male)	1	14
	Cx. coronator	17	18
	Cx. erraticus	680	27
	Cx. nigripalpus	552	244
	Cx. quinquefasciatus	58	1708
	Cx. restuans	5	217
	Cx. salinarius	121	30
	Ma. titillans	2	1
	Oc. atlanticus	22	3
	Oc. canadensis	25	
	Oc. infirmatus	4	1
	Oc. triseriatus	6	2
	Or. signifera		1
	Ps. columbiae	65	3
	Ps. ferox	3	
	Ur. lowii	7	7
	Ur. sapphirina	481	17

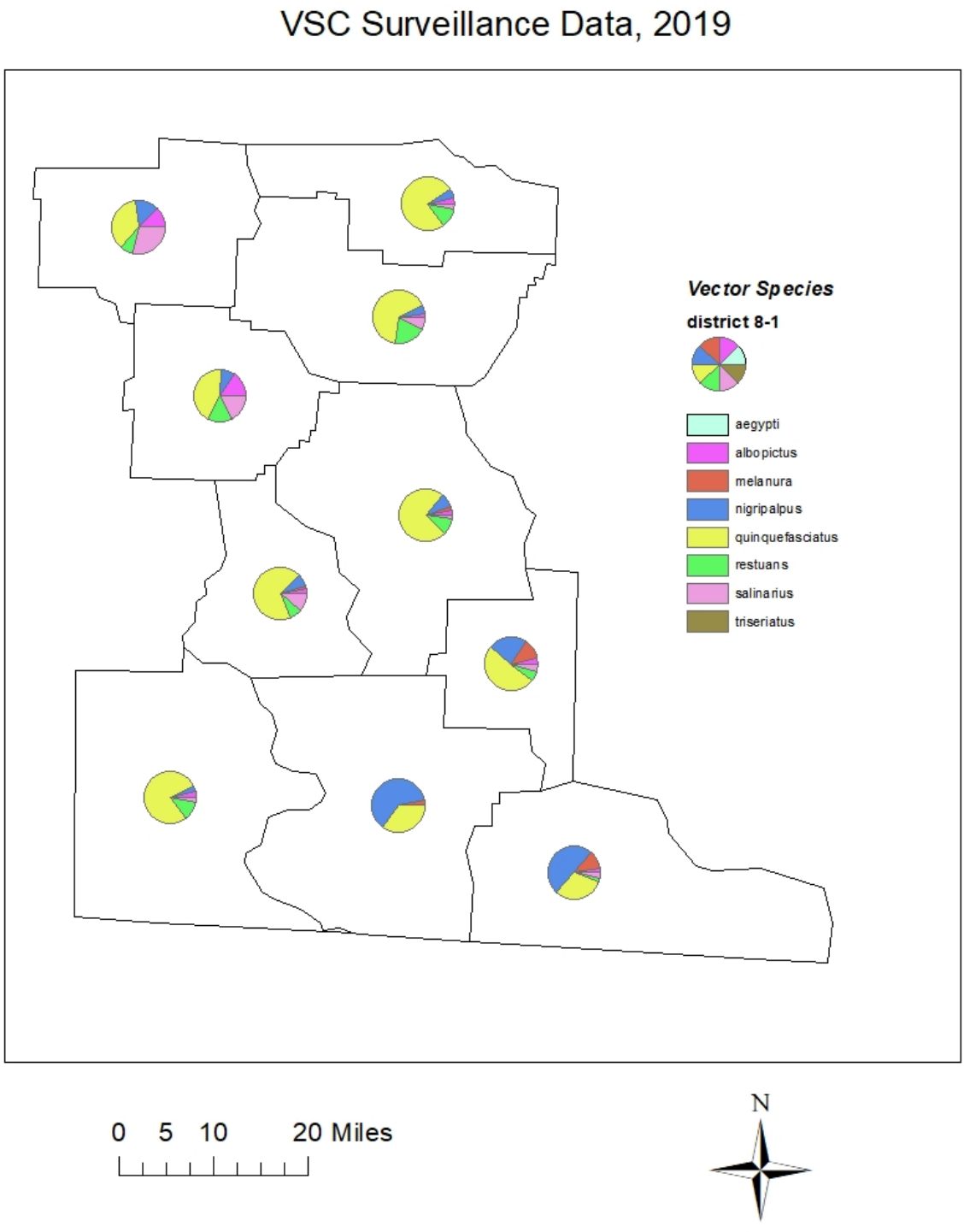
District 8-1		Trap type		
County	***Species***	**BGS**	**CDC**	**Gravid**
Lowndes	*Ae. albopictus*	9		
	Ae. vexans	1		
	An. crucians	56		3
	An. crucians (male)	1		
	An. punctipennis	2		
	An. quadrimaculatus	2		
	Cq. perturbans		928	103
	Cs. melanura		546	34
	Culex spp.			2
	Culex spp. (male)			5
	Cx. erraticus	2		1
	Cx. nigripalpus		8178	2642
	Cx. quinquefasciatus		73	6130
	Cx. restuans		1	37
	Cx. salinarius	1	6	11
	Ma. titillans		18	
	Oc. canadensis		2	
	Oc. triseriatus	1		
	Tx. rutilus	4		
	Ur. sapphirina	8		

MOSQUITO SURVEILLANCE 2019

County	*Species*	CDC	Gravid
Tift	*Ae. albopictus*	103	185
	Ae. albopictus (male)		1
	Ae. vexans	79	1
	Aedes/Ochlerotatus spp.	1	1
	An. crucians	351	6
	An. punctipennis	33	3
	An. punctipennis (male)	1	
	An. quadrimaculatus	78	4
	Anopheles spp.	2	
	Anopheles spp. (male)		2
	Cq. perturbans	244	10
	Cs. melanura	4	6
	Culex spp.	78	358
	Culex spp. (male)	1	9
	Cx. coronator	98	6
	Cx. erraticus	210	26
	Cx. nigripalpus	126	28
	Cx. quinquefasciatus	33	765
	Cx. restuans	4	290
	Cx. salinarius	197	116
	Ma. titillans	4	
	Oc. canadensis	3	
	Oc. infirmatus	1	
	Oc. sticticus	1	
	Oc. triseriatus	1	2
	Or. signifera		1
	Ps. ciliata	4	
	Ps. columbiae	70	1
	Ps. ferox	8	
	Ur. sapphirina	3	

Turner	*Ae. albopictus*	89	282
	Ae. albopictus (male)	2	2
	Ae. vexans	91	1
	Ae. vexans (male)	1	
	An. crucians	784	5
	An. punctipennis	104	
	An. quadrimaculatus	96	1
	Anopheles spp.	1	
	Cq. perturbans	314	4
	Cs. melanura	28	1
	Culex spp.	269	322
	Culex spp. (male)	2	5
	Cx. coronator	202	3
	Cx. erraticus	269	5
	Cx. nigripalpus	407	24
	Cx. quinquefasciatus	250	813
	Cx. restuans	47	187
	Cx. salinarius	799	39
	Ma. titillans	1	
	Oc. canadensis	1	
	Oc. infirmatus	44	2
	Oc. mitchellae	1	
	Oc. triseriatus	1	3
	Ps. ciliata	4	
	Ps. columbiae	300	2
	Ps. ferox	175	10
	Ps. howardii	5	
	Tx. rutilus		1
	Ur. sapphirina	2	1

MOSQUITO SURVEILLANCE 2019



District 8-2

District 8-2		trap type	
County	**Species**	**CDC**	**gravid**
Baker	*Ae. albopictus*	1	
	Cq. perturbans	10	3
	Cs. melanura	5	10
	Culex spp. (male)		2
	Cx. nigripalpus	8	16
	Cx. quinquefasciatus	1	58
	Cx. salinarius	4	11
Calhoun	*Ae. albopictus*	2	3
	Ae. albopictus (male)		2
	Cq. perturbans	5	3
	Cs. melanura	1	
	Culex spp.		2
	Culex spp. (male)		7
	Cx. nigripalpus	12	16
	Cx. quinquefasciatus	2	65
	Cx. salinarius	7	7
Colquitt	*Ae. albopictus*		8
	Ae. albopictus (male)		2
	Cq. perturbans	9	8
	Cs. melanura	10	11
	Culex spp.		3
	Culex spp. (male)		12
	Cx. nigripalpus	28	39
	Cx. quinquefasciatus		120
	Cx. salinarius	8	19
Decatur	*An. crucians*	5	
	Cq. perturbans	10	
	Cs. melanura	8	6
	Culex spp. (male)		2
	Cx. quinquefasciatus		12
	Cx. restuans		1
	Cx. salinarius	8	

Surveillance in District 8-2 was done by one of the VSCs. Surveillance was done from April – June and Aug - September over 39 trap nights.

Dougherty	*Ae. albopictus*		12
	Ae. vexans	3	
	An. crucians	16	3
	An. punctipennis	2	
	Cq. perturbans	15	1
	Cs. melanura	9	52
	Culex spp.		1
	Culex spp. (male)		10
	Cx. nigripalpus		8
	Cx. quinquefasciatus	2	255
	Cx. restuans	2	31
	Cx. salinarius	34	33
	Oc. canadensis	4	
	Oc. triseriatus	1	
Early	*Ae. albopictus*	2	
	Ae. albopictus (male)		1
	Ae. vexans	4	
	An. crucians		2
	Cq. perturbans	15	
	Cs. melanura	7	10
	Culex spp. (male)		1
	Cx. erraticus		1
	Cx. nigripalpus	17	11
	Cx. quinquefasciatus	4	33
	Cx. salinarius		5

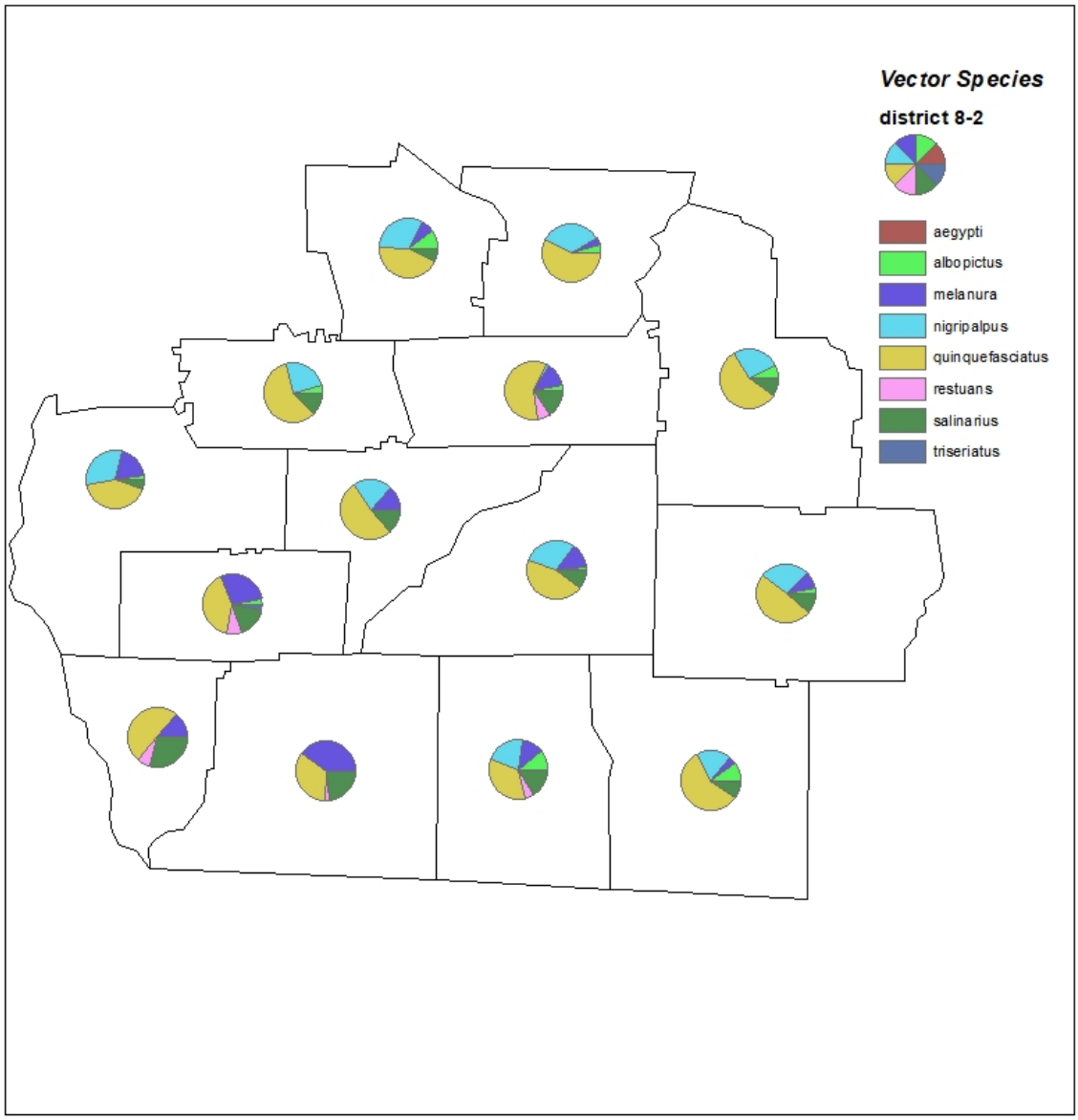
MOSQUITO SURVEILLANCE 2019

County	*Species*	CDC	Gravid
Grady	*Ae. albopictus*	5	4
	Ae. albopictus (male)	2	2
	Ae. vexans	4	
	Cq. perturbans	7	
	Cs. melanura	10	
	Culex spp. (male)		2
	Cx. nigripalpus	10	8
	Cx. quinquefasciatus		29
	Cx. restuans		4
	Cx. salinarius	9	5
Lee	*Ae. albopictus*		4
	Cq. perturbans	6	7
	Cs. melanura	4	
	Culex spp. (male)		5
	Cx. erraticus		2
	Cx. nigripalpus	16	17
	Cx. quinquefasciatus	5	51
Miller	*Ae. albopictus*		1
	An. crucians	1	
	Cq. perturbans	13	
	Cs. melanura	6	4
	Culex spp. (male)		1
	Cx. quinquefasciatus	2	12
	Cx. restuans		3
	Cx. salinarius	6	
	Oc. triseriatus	1	
Mitchell	*Ae. albopictus*		2
	An. crucians		1
	Cq. perturbans	10	
	Cs. melanura	7	11
	Culex spp. (male)		6
	Cx. erraticus		2
	Cx. nigripalpus	21	18
	Cx. quinquefasciatus		59
	Cx. salinarius	6	8
Seminole	*Cq. perturbans*	15	4
	Cs. melanura	5	3
	Culex spp. (male)		3
	Cx. quinquefasciatus	8	21
	Cx. restuans		4
	Cx. salinarius	9	8
Terrell	*Ae. albopictus*	4	3
	Ae. albopictus (male)	1	
	Cq. perturbans	10	
	Cs. melanura	5	
	Culex spp. (male)		2
	Cx. erraticus	2	1
	Cx. nigripalpus	13	9
	Cx. quinquefasciatus	2	28
	Cx. salinarius		5
	Ps. columbiae	2	

County	*Species*	CDC	Gravid
Thomas	*Ae. albopictus*	5	6
	Ae. albopictus (male)		3
	Ae. vexans	3	
	Cq. perturbans	16	
	Cs. melanura	5	
	Culex spp. (male)		1
	Cx. erraticus		4
	Cx. nigripalpus	3	17
	Cx. quinquefasciatus		63
	Cx. salinarius	4	7
	Oc. triseriatus		1
Worth	*Ae. albopictus*	2	4
	Ae. albopictus (male)		2
	Ae. vexans	6	
	Cq. perturbans	6	3
	Culex spp. (male)		5
	Cx. erraticus	3	
	Cx. nigripalpus	11	11
	Cx. quinquefasciatus	3	44
	Cx. salinarius	4	4

CULEX VS CULISETA

VSC Surveillance Data, 2019



District 9-1

District 9-1			
County	**Species**	**CDC**	**gravid**
Bryan	*Ae. vexans*	58	9
	An. crucians	68	4
	An. punctipennis	26	
	Anopheles spp.		3
	Culex spp.		2
	Cx. erraticus	59	5
	Cx. nigripalpus	58	
	Cx. salinarius	43	15
Camden	*Ae. albopictus*	40	2
	Ae. vexans	12	
	An. crucians	9	
	An. punctipennis	9	
	Cq. perturbans	33	
	Culex spp.	6	1
	Cx. erraticus	19	2
	Cx. nigripalpus	17	
	Cx. quinquefasciatus	36	16
	Cx. salinarius	26	
	Oc. cinereus	21	
	Oc. infirmatus	16	
	Ps. columbiae	5	
	Ps. ferox	1	

Surveillance in District 9-1 was done by one of the VSCs and by Hinesville Public Works (Liberty County), Mosquito Control Services (Glynn County), and Chatham County Mosquito Control programs. Surveillance was done from Jan - Dec over 1418 trap nights.

County	***Species***	**CDC**	**Exit**	**Gravid**
Chatham	*Ae. albopictus*	48		141
	Aedes/Ochlerotatus spp.			2
	An. crucians	42		14
	An. punctipennis	36		3
	Anopheles spp.	2		
	Cs. melanura	189	20	2
	Culex spp.	3		5756
	Cx. nigripalpus			1119
	Cx. quinquefasciatus	89		43202
	Cx. restuans			113
	Cx. salinarius	17		
	Oc. infirmatus	6		
	Oc. triseriatus	11		
	unknown	4		
Effingham	*Ae. vexans*	2		5
	An. crucians	2		16
	An. punctipennis	10		2
	Anopheles spp.	2		3
	Cq. perturbans			14
	Culex spp.			3
	Cx. erraticus	3		
	Cx. quinquefasciatus	9		
	unknown	1		

MOSQUITO SURVEILLANCE 2019

County	*Species*	CDC	Gravid
Glynn	*Ae. albopictus*	48	1
	Ae. vexans	76	5
	An. crucians	492	2
	An. quadrimaculatus	15	
	Cq. perturbans	20	
	Cs. inornata	26	1
	Cs. melanura	3	1
	Culex spp.		168
	Cx. coronator	1	
	Cx. erraticus	11	1
	Cx. nigripalpus	190	132
	Cx. quinquefasciatus	40	33408
	Cx. restuans		3
	Cx. salinarius	472	148
	Oc. atlanticus	26	1
	Oc. canadensis	25	
	Oc. infirmatus	14	
	Oc. sollicitans	16	7
	Oc. taeniorhynchus	4596	2894
	Ps. ciliata	4	
	Ps. columbiae	54	25
	Ps. ferox	18	
	unknown		164

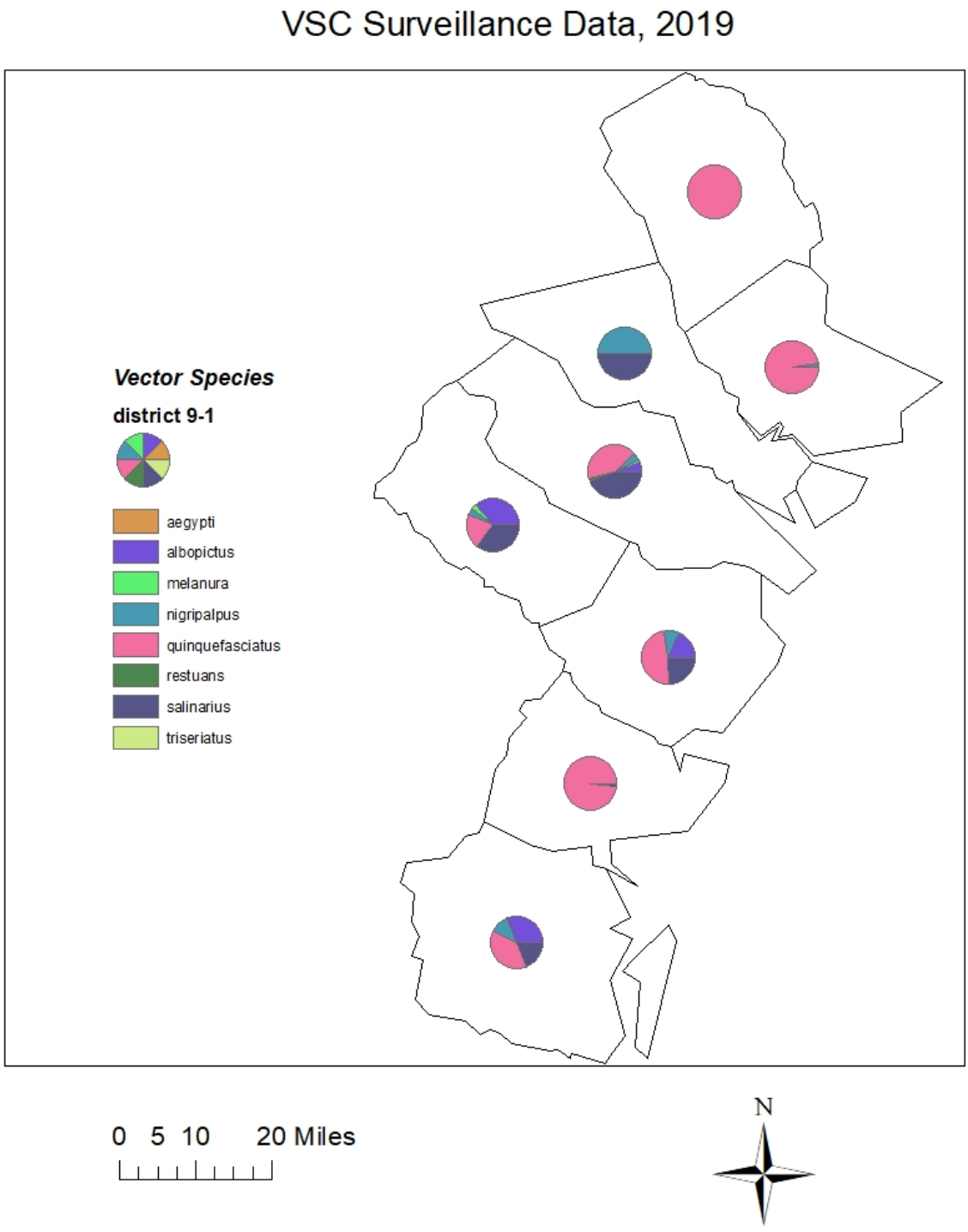
Liberty	*Ae. albopictus*	18	2
	Ae. vexans	223	
	Aedes/Ochlerotatus spp.	12	
	An. crucians	89	3
	An. punctipennis	3	
	An. quadrimaculatus	1	
	Anopheles spp.	10	19
	Cq. perturbans	51	2
	Cs. melanura	5	
	Culex spp.	100	12
	Cx. coronator	15	
	Cx. erraticus	87	5
	Cx. nigripalpus	14	
	Cx. quinquefasciatus	118	
	Cx. restuans	2	
	Cx. salinarius	160	
	Oc. atlanticus	157	
	Oc. canadensis	22	
	Oc. taeniorhynchus	1701	
	Ps. ciliata	17	
	Ps. columbiae	2	
	Ps. ferox	36	
	unknown	37	

MOSQUITO SURVEILLANCE 2019

County	*Species*	CDC	Gravid
Long	*Ae. albopictus*	70	33
	Ae. vexans	10	
	An. crucians	318	15
	An. punctipennis	19	
	Cq. perturbans	25	
	Cs. melanura	7	
	Culex spp.		14
	Cx. erraticus	18	
	Cx. nigripalpus	12	
	Cx. quinquefasciatus	52	9
	Cx. restuans	2	
	Cx. salinarius	98	
	Oc. cinereus	2	
	Ps. ciliata	5	
	Ps. columbiae	19	9
	Ps. ferox	23	4
	unknown	6	
McIntosh	*Ae. albopictus*	20	
	Ae. vexans	50	
	Aedes/Ochlerotatus spp.	1	
	An. crucians	7	
	An. punctipennis	16	
	An. quadrimaculatus	13	
	Anopheles spp.	6	
	Culex spp.		6
	Cx. erraticus	103	16
	Cx. nigripalpus	10	
	Cx. quinquefasciatus	42	10
	Cx. salinarius	27	
	Oc. atlanticus	24	
	Oc. sollicitans	46	
	Oc. taeniorhynchus	153	
	Ps. ciliata	21	
	Ps. ferox	10	
	Ur. sapphirina	171	5

OCHLEROTATUS TAENIORHYNCHUS

MOSQUITO SURVEILLANCE 2019



District 9-2

District 9-2		trap type	
County	**Species**	**CDC**	**gravid**
Appling	*Ae. albopictus*	40	2
	Ae. vexans	54	34
	An. crucians	49	13
	An. punctipennis	62	17
	An. quadrimaculatus	9	
	Anopheles spp.		3
	Cq. perturbans	26	
	Culex spp.	9	11
	Cx. erraticus	46	9
	Cx. nigripalpus	36	17
	Cx. quinquefasciatus	23	2
	Cx. salinarius	53	6
	Oc. canadensis	1	
	Oc. cinereus	4	
	Oc. infirmatus	20	
	Ps. ciliata	5	
	Ps. columbiae	23	19
Atkinson	*Ae. albopictus*	112	6
	Ae. vexans	46	11
	An. crucians	10	
	An. punctipennis	79	22
	An. quadrimaculatus	4	1
	Culex spp.	2	8
	Cx. erraticus	18	
	Cx. nigripalpus	54	
	Cx. quinquefasciatus	231	79
	Cx. salinarius	64	14
	Oc. atlanticus	72	
	Ps. ciliata	4	
	Ps. columbiae	19	6

Surveillance in District 9-2 was done by one of the VSCs. Surveillance was done from Jan - Dec over 133 trap nights.

Bacon	*Ae. albopictus*	36	
	An. punctipennis	22	2
	Culex spp.	9	
	Cx. erraticus	2	
	Cx. quinquefasciatus	56	
	Cx. salinarius	19	
	Oc. cinereus	6	
	Ps. ciliata	18	
	Ps. columbiae	31	14
	Ps. ferox	33	
	unknown	5	
Brantley	*Ae. albopictus*	117	19
	Ae. vexans	62	21
	An. crucians		6
	An. punctipennis	46	12
	An. quadrimaculatus	16	7
	Cq. perturbans	19	
	Culex spp.		5
	Cx. erraticus	20	
	Cx. nigripalpus	55	13
	Cx. quinquefasciatus	201	42
	Ps. columbiae	3	

MOSQUITO SURVEILLANCE 2019

County	*Species*	CDC	Gravid
Bulloch	*Ae. albopictus*	192	11
	Ae. vexans	292	
	Aedes/Ochlerotatus spp.	2	
	An. crucians	96	38
	An. punctipennis	60	
	An. quadrimaculatus	8	
	Anopheles spp.	3	
	Cq. perturbans	53	
	Culex spp.	100	8
	Cx. coronator	223	88
	Cx. erraticus	296	34
	Cx. nigripalpus	275	64
	Cx. quinquefasciatus	106	2
	Cx. salinarius	107	
	Oc. infirmatus	6	
	Oc. japonicus	6	
	Oc. taeniorhynchus	33	
	Oc. triseriatus	1	
	Ps. ciliata	1	
	Ps. columbiae	4	
	Ps. ferox	6	
	unknown	7	
Candler	*Ae. albopictus*	77	17
	Ae. vexans	35	1
	An. crucians	28	32
	An. punctipennis	8	
	An. quadrimaculatus	24	
	Anopheles spp.		3
	Culex spp.	6	8
	Cx. erraticus	32	3
	Cx. nigripalpus	29	6
	Cx. quinquefasciatus	119	57
	Cx. salinarius	121	8
	Ps. columbiae	6	
Charlton	*Ae. albopictus*	3	
	An. crucians	66	20
	An. quadrimaculatus	2	
	Cq. perturbans	77	1
	Culex spp.	4	1
	Cx. erraticus	4	
	Cx. quinquefasciatus	5	
	Cx. salinarius	19	2
	unknown	1	
Clinch	*Ae. albopictus*	31	1
	Ae. vexans	1	
	An. crucians	33	24
	An. punctipennis	22	3
	An. quadrimaculatus	2	
	Anopheles spp.	3	
	Cq. perturbans	111	21
	Culex spp.		1
	Cx. erraticus	7	
	Cx. salinarius	21	
	Oc. atlanticus	14	
	Ps. ferox	1	
	unknown	5	
Coffee	*Ae. albopictus*	14	
	Ae. vexans	16	
	An. crucians	17	
	An. punctipennis	4	
	An. quadrimaculatus	5	
	Cq. perturbans	23	2
	Culex spp.	4	
	Cx. nigripalpus	11	1
	Cx. quinquefasciatus	4	
	Ps. ciliata	2	

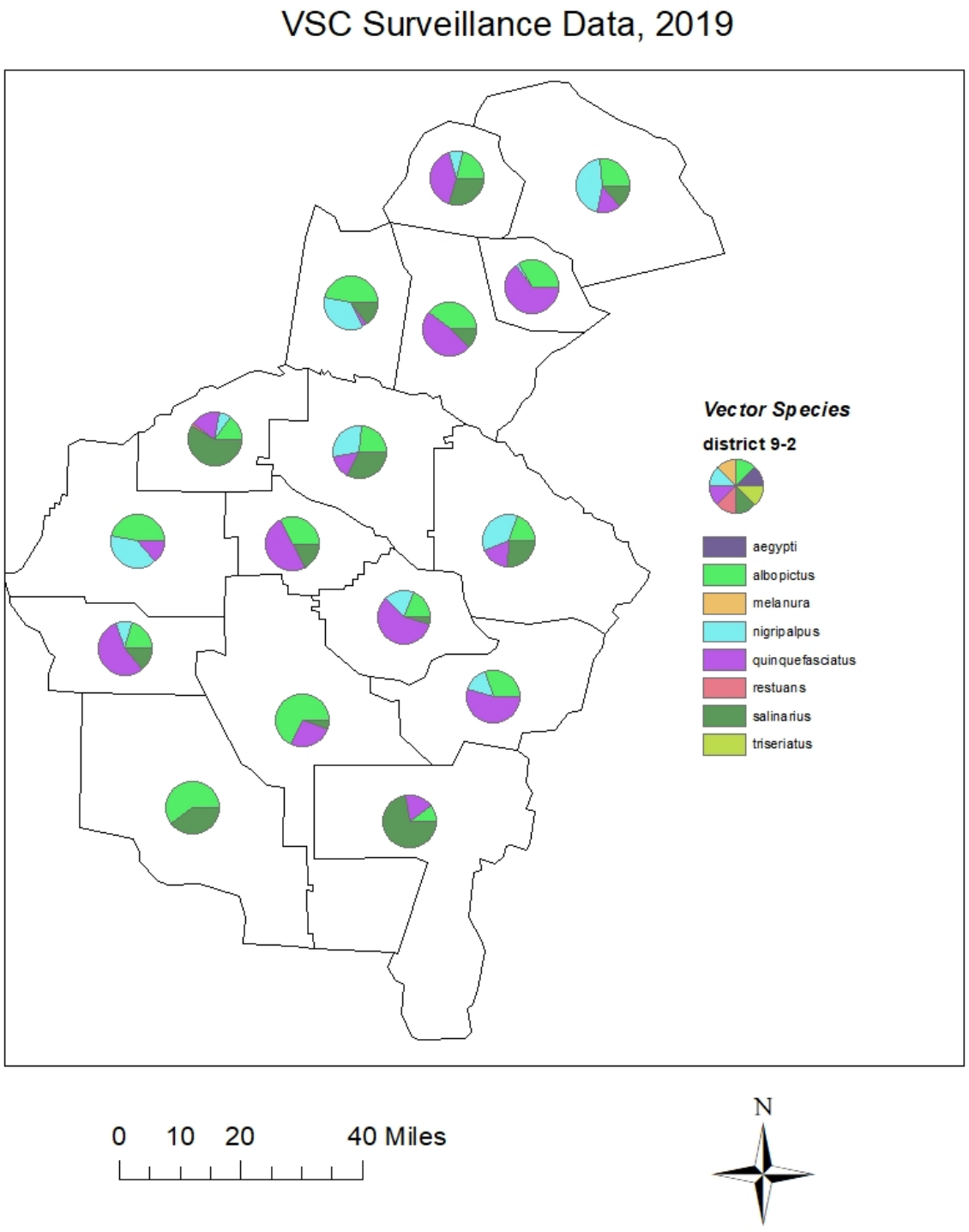
MOSQUITO SURVEILLANCE 2019

County	*Species*	CDC	Gravid
Evans	*Ae. albopictus*	60	3
	Ae. vexans	26	5
	Aedes/Ochlerotatus spp.	1	
	An. crucians	51	16
	An. punctipennis	22	
	An. quadrimaculatus	12	
	Anopheles spp.		2
	Cq. perturbans	26	
	Cx. nigripalpus	4	
	Cx. quinquefasciatus	94	28
	Ps. ciliata	9	
	Ps. columbiae	21	5
Jeff Davis	*Ae. albopictus*	24	
	Aedes/Ochlerotatus spp.	3	
	An. punctipennis	3	
	Cq. perturbans	19	
	Culex spp.	4	2
	Cx. nigripalpus	12	
	Cx. quinquefasciatus	28	
	Cx. restuans	4	
	Cx. salinarius	88	6
	Oc. atlanticus	3	
	Oc. canadensis	3	
	Ps. ciliata	26	
	Ps. columbiae	18	
Liberty	*Ae. albopictus*	2	
	Ae. vexans	4	
	Culex spp.	6	
	Cx. coronator	2	
	Cx. erraticus	6	
	Cx. nigripalpus	6	
	Cx. quinquefasciatus	39	
	Cx. restuans	3	
	Cx. salinarius	6	
	Oc. taeniorhynchus	1	
	Ps. columbiae	3	
	Ps. ferox	1	
Pierce	*Ae. albopictus*	40	1
	Ae. vexans	64	
	An. crucians	18	
	An. punctipennis	39	
	An. quadrimaculatus	19	11
	Anopheles spp.	1	
	Cq. perturbans	43	
	Culex spp.	11	
	Cx. erraticus	108	
	Cx. nigripalpus	35	4
	Cx. quinquefasciatus	96	27
	Cx. salinarius	10	
	Oc. atlanticus	24	
	Oc. trivittatus	7	
	Ps. ciliata	16	
	unknown	2	
	Ur. sapphirina	1	

MOSQUITO SURVEILLANCE 2019

County	*Species*	CDC	Gravid
Tattnall	*Ae. albopictus*	19	
	Ae. vexans	82	15
	An. crucians	23	16
	An. punctipennis	13	
	An. quadrimaculatus	5	
	Cq. perturbans	56	27
	Culex spp.	1	3
	Cx. erraticus	44	17
	Cx. quinquefasciatus	23	
	Cx. salinarius	6	
	Oc. infirmatus	4	
	Ps. columbiae	55	10
	Ps. ferox	3	
Toombs	*Ae. albopictus*	16	
	Ae. vexans	13	13
	An. crucians	4	5
	An. punctipennis	7	
	An. quadrimaculatus	4	
	Culex spp.	11	
	Cx. coronator	7	
	Cx. erraticus	10	
	Cx. nigripalpus	12	
	Cx. quinquefasciatus	1	
	Cx. salinarius	4	1
	Oc. canadensis	1	
	Ps. ciliata	10	
Ware	*Ae. albopictus*	35	1
	Ae. vexans	1	
	An. crucians	23	21
	An. punctipennis	12	9
	An. quadrimaculatus	6	
	Anopheles spp.	5	4
	Cq. perturbans	6	
	Cx. erraticus	6	
	Cx. quinquefasciatus	14	
	Cx. salinarius	3	
	Oc. canadensis	2	
	Oc. infirmatus	2	
Wayne	*Ae. albopictus*	33	
	An. punctipennis	30	
	Culex spp.	3	8
	Cx. erraticus	53	21
	Cx. nigripalpus	50	13
	Cx. quinquefasciatus	21	9
	Cx. salinarius	15	29
	Oc. atlanticus	6	
	Oc. canadensis	3	

MOSQUITO SURVEILLANCE 2019

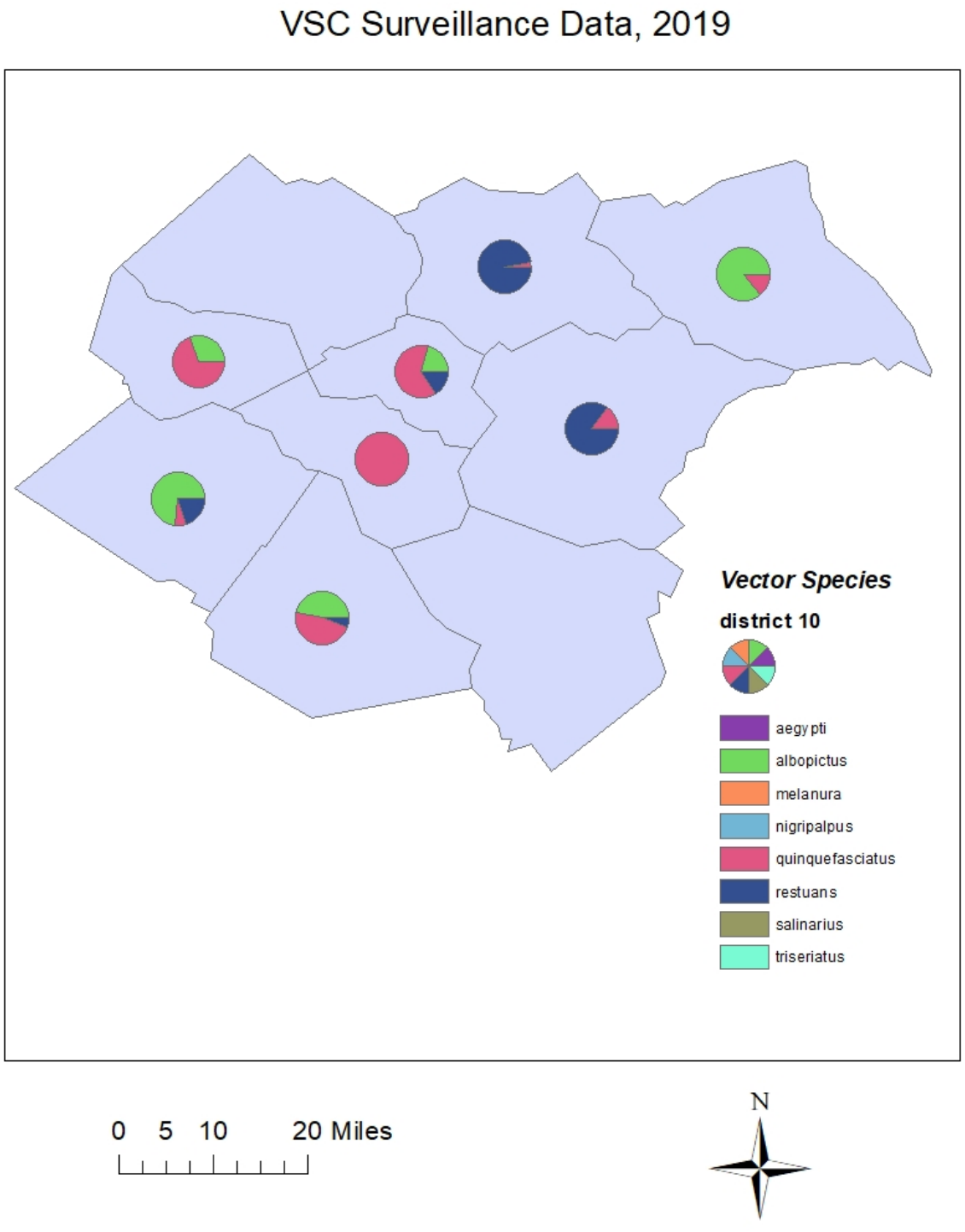


District 10-0

Surveillance in District 10-0 was done by the local EHS. Surveillance was done from April - Oct over 75 trap nights.

District 10-0		trap type	
County	**Species**	**CDC**	**gravid**
Barrow	*Ae. albopictus*		3
	An. punctipennis		1
	Cx. quinquefasciatus		7
Clarke	*Ae. albopictus*	27	42
	Ae. albopictus (male)	2	1
	Ae. vexans	6	
	Ae. vexans (male)	1	2
	Aedes/Ochlerotatus spp.	1	1
	An. crucians	1	
	An. punctipennis	3	
	An. punctipennis (male)	1	
	Anopheles spp.	2	1
	Culex spp.	1	
	Culex spp. (male)	13	4
	Cx. coronator	8	
	Cx. quinquefasciatus	60	149
	Cx. restuans	48	4
	Oc. japonicus	2	95
	Ps. ciliata	3	
	Ps. columbiae	11	
	Tx. rutilus	2	
	unknown	5	1
Elbert	*Ae. albopictus*		6
	Ae. albopictus (male)		1
	Cx. quinquefasciatus		1
	Oc. japonicus		4
Greene	*Ps. columbiae*		1
Jackson	*Ae. vexans*		1
Madison	*Ae. albopictus*	1	
	Culex spp. (male)	7	
	Cx. quinquefasciatus	22	3
	Cx. restuans	1030	
	Oc. japonicus		1
Morgan	*Ae. albopictus*	1	7
	Aedes/Ochlerotatus spp.		3
	An. punctipennis	1	
	Cx. quinquefasciatus	1	7
	Cx. restuans	1	
	Oc. japonicus		2
	unknown		1
Oconee	*Culex spp. (male)*		1
	Cx. quinquefasciatus		8
	Oc. japonicus		6
Oglethorpe	*An. punctipennis*	1	
	Cx. coronator	1	
	Cx. quinquefasciatus	2	2
	Cx. restuans	22	1
Walton	*Ae. albopictus*	9	2
	Ae. vexans		4
	An. crucians	1	
	An. punctipennis	1	
	Cx. coronator	1	
	Cx. erraticus	5	
	Cx. quinquefasciatus		1
	Cx. restuans	3	
	Oc. japonicus	1	1
	unknown	1	

MOSQUITO SURVEILLANCE 2019



MOSQUITO SURVEILLANCE 2019

Integrated Mosquito Management

What does mosquito control do to protect the public health? In Georgia, there are ~60 different mosquito species. Each species of mosquito has a different flight range, host preference, larval habitat and potential for carrying and transmitting infectious disease. Any mosquito that bites or annoys people can be considered a health problem, but in Georgia the definition includes mosquitoes that carry infectious diseases like West Nile Virus (WNV), LaCrosse Encephalitis (LAC), and Eastern Equine Encephalitis (EEE), as well as those can transmit new and emerging viruses like Chikungunya and Zika.

The best way to control the mosquitoes in order to reduce the nuisance factor and protect public health is by utilizing a wide variety of control methods known as Integrated Mosquito Management (IMM). The first part of IMM is trapping and surveillance, which help to quantify the numbers, species and location of mosquitoes.

What are the techniques of Integrated Mosquito Management (IMM) program that serve to eliminate the mosquito? If your county has mosquito control, it is usually located in the Public Works Department, but may be in Environmental Health or could be a stand- alone agency. The first response to a mosquito complaint is to send an inspector to find the source of the mosquitoes. Source reduction, also known as physical control, is an important part of IMM. This involves finding and eliminating potential mosquito breeding areas and is typically the most effective and economical of the various techniques used to control mosquitoes.

Mosquitoes need water for their eggs to hatch and for the larvae to survive until adulthood. In areas around a home these sources may include birdbaths, unscreened swimming pools, and old tires, anything that can retain water. This includes hollow stemmed plants like bromeliads. The inspector should educate the homeowner about keeping these items clean and dry, or rinsing them periodically with fresh water.

If the source is a new pond or other permanent- water area that cannot or should not be drained, the inspector may elect to stock it with small, non- descript mosquito-eating fish called Gambusia. Using the mosquito's natural predator to reduce populations is a method of biological control.

Another technique is called larviciding. Larviciding, as the name implies, kills mosquito larvae and pupae using a variety of products, both chemical and biological. This prevents the metamorphosis of the larvae into the flying, biting pests that we know and hate. Larvicide treatments can be applied by ground or air to standing water depending on the size of the area. Different types of larvicides include chemical pesticides that are absorbed or ingested by the larvae, surface control agents that suffocate the pupae, insect growth regulators, and microbial larvicides. Larvicides commonly used in Georgia include microbial larvicides and

insect growth regulators (IGRs). The microbial larvicide consists of two species of the bacterium, Bacillus (Bti and *B sphaericus*), that are toxic when ingested by mosquito and black fly larvae. Methoprene, an IGR, prevents mosquito larvae from molting to the adult stage.

Once adult mosquitoes are on the wing, the only way to control them is to use an adulticide. Using truck-mounted sprayers or aircraft, a condensed plume of ultralow volume (ULV) insecticide is released into the air, which spreads out with the prevailing wind and when it comes into contact with flying mosquitoes, kills them.

Mosquito control may also use a barrier spray to provide the homeowner some temporary relief. This is also one method of controlling day biting mosquitoes. A barrier spray is a coating of pesticide droplets sprayed onto foliage surrounding an area that has been inundated by mosquitoes. This will kill mosquitoes landing in the foliage, and it repels them. It adheres to the underside of the foliage, depriving them of their resting places.

Another technique, thermal fogging, can be used to control day biting mosquitoes or to control mosquitoes in areas where vegetation is dense and ULV does not penetrate.

The amount of chemical used is designed to be target specific, in that it kills mosquitoes without harming anything else. Since most mosquitoes do not fly during the daytime, adulticiding is done at dusk and beyond, and the hours just before dawn, when mosquito activity is at its peak. Additionally, pesticide sprayed by ULV machines during the heat of the day rises and never comes into contact with the mosquitoes, and so is wasted.

It is impossible to completely eradicate the mosquito, so the focus should be on controlling mosquito populations in order to reduce the nuisance factor and protect public health by using all aspects of Integrated Mosquito Management. It is important to remind homeowners that they can also play a role in mosquito control, especially where organized mosquito control is not present. Surveillance can be used to determine if the mosquito is *Aedes albopictus*, the Asian tiger mosquito, or some other species. By standing out in the yard during the day and waiting to see if a small black and silver mosquito comes to bite your legs, it is possible to determine if this species is present. This is the most common nuisance species in Georgia and, unless there have been heavy rains recently or the area is along the coast, the mosquito most likely to come and bite during the day.

Why is this important? This species is a container breeder and does not fly very far from where it lays its eggs. Source reduction is the best means of control. Picking up anything that holds water and disposing of it correctly, refilling bird baths and animal water bowls at least once a week, raking up big leaves, and cleaning gutters will help reduce the populations of this species and other container breeders. Additionally, pools need to be maintained properly as “green” pools breed large numbers of mosquitoes, including the WNV vector. Homeowners can also buy larvicide, both Bti (mosquito dunks) and methoprene (mosquito torpedoes). This

can be applied to standing water to control mosquitoes by killing larvae. As with any pesticide, it is important to follow the label instructions explicitly.

Finally, it is important to wear repellent outside when mosquitoes are biting. Information about the various types of recommended repellents can be found at http://dph.georgia.gov/mosquito-borne-viral-diseases.

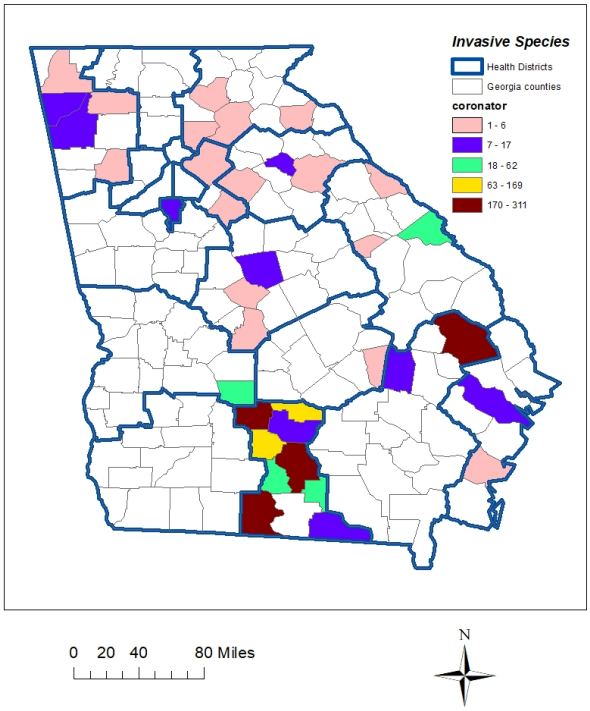
Invasive Mosquito Species

One of the benefits of mosquito surveillance is determining where mosquito species are found. This is especially important for vector species and for invasive species which may become involved in arboviral disease cycle.

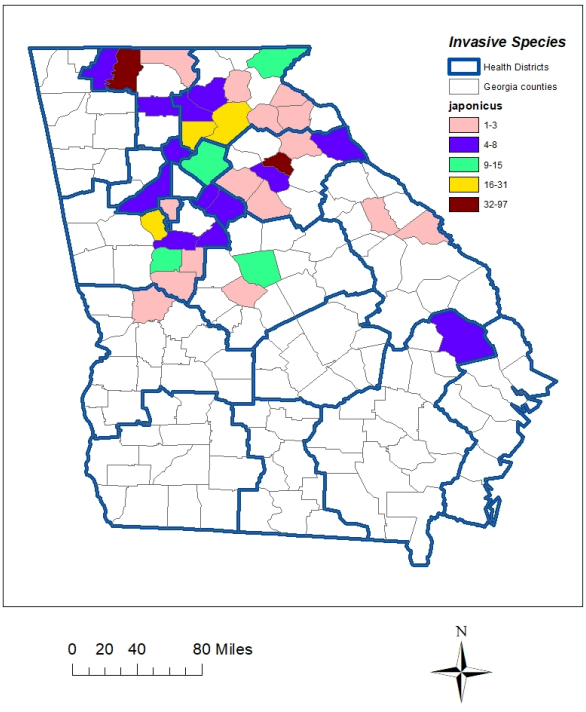
Culex coronator was first detected in Georgia in 2006. It was found initially in counties below the Fall line. Mosquito surveillance done in 2017 - 2019 has shown that this species can now be found in most regions of Georgia. It is important to monitor *Cx coronator* as it has the potential to be involved in the WNV cycle.

Ochlerotatus japonicus was first detected in Georgia in 2002. This species lays its eggs in rock pools, so was initially found only above the Fall line. Mosquito surveillance done in 2017 - 2019 has shown that this species can now be found in most regions of Georgia. It is important to monitor *Oc japonicus* as it has the potential to be involved in the WNV cycle.

Culex coronator, 2019



Ochlerotatus japonicus, 2019



Conclusions

In 2019, mosquito surveillance was again done in all 159 of Georgia's counties. This is compared to surveillance being conducted in 60 counties in 2016, and only 13 counties in 2015. Surveillance was limited in many counties, but these data add to the 2017 and 2018 baselines.

Species	BGS	CDC	Exit	Gravid	Other	TOTAL
Ae. aegypti	3642	344		86		4072
Ae. albopictus	2709	3764		2793		9266
Ae. albopictus (male)		15		39		54
Ae. cinereus		1				1
Ae. vexans	6	2994		208	1	3209
Ae. vexans (male)		3		2		5
Aedes/Ochlerotatus spp.		125		30		155
An. crucians	56	8085		669		8810
An. crucians (male)	1			2		3
An. punctipennis	8	1614		141		1763
An. punctipennis (male)		3		2		5
An. quadrimaculatus	2	909		75		986
An. quadrimaculatus (male)				2		2
Anopheles spp.		47		55		102
Anopheles spp. (male)		6		4		10
Cq. perturbans		4468		247		4715
Cq. perturbans (male)				1		1
Cs. inornata		26		1		27
Cs. melanura		2171	20	343		2534
Cs. melanura (male)				1		1
Culex spp.	118	1556		17813		19487
Culex spp. (male)		48		212		260
Cx. coronator		1068		429		1497
Cx. erraticus	54	6799		485		7338
Cx. nigripalpus	53	14056		6323		20432
Cx. quinquefasciatus	265	3482		131116	1	134864
Cx. quinquefasciatus (male)		2		2		4
Cx. restuans		1371		6143		7514
Cx. salinarius	2	5287		1399		6688

MOSQUITO SURVEILLANCE 2019

Species	BGS	CDC	Exit	Gravid	Other	TOTAL
Cx. territans		4		2		6
Ma. titillans		94		3		97
Oc. atlanticus		457		28		485
Oc. atlanticus (male)		1				1
Oc. atropalpus		3				3
Oc. canadensis		248		2		250
Oc. cinereus		39				39
Oc. dupreei		2				2
Oc. fulvus pallens		9				9
Oc. hendersoni				1		1
Oc. infirmatus		149		6		155
Oc. japonicus		126		251		377
Oc. japonicus (male)				2		2
Oc. mitchellae		1				1
Oc. sollicitans		66		7		73
Oc. sticticus		7		1		8
Oc. taeniorhynchus		6484		2898		9382
Oc. triseriatus	2	140		99		241
Oc. triseriatus (male)		2				2
Oc. trivittatus		51				51
Or. alba				2		2
Or. signifera		10		13		23
Ps. ciliata	1	185		5		191
Ps. columbiae		1897		114		2011
Ps. cyanescens		1				1
Ps. ferox	1	505		27		533
Ps. horrida		12				12
Ps. howardii		7				7
Psorophora spp.		1				1
Tx. rutilus	7	2		8		17
unknown		181		217		398
Ur. lowii		18		14		32
Ur. sapphirina	8	912		70		990
Ur. sapphirina (male)				1		1

MOSQUITO SURVEILLANCE 2019

Year	# counties doing surveillance	% of counties
2001	2	1.3%
2002	11	6.9%
2003	26	16.4%
2004	56	35.2%
2005	55	34.6%
2006	28	17.6%
2007	28	17.6%
2008	28	17.6%
2009	26	16.4%
2010	22	13.8%
2011	19	11.9%
2012	12	7.5%
2013	13	8.2%
2014	15	9.4%
2015	13	8.2%
2016	60	37.7%
2017	159	100.0%
2018	159	100.0%
2019	159	100.0%

This level of surveillance was only possible through the combined effort of State, District, and County Environmental Health, as well as assistance from several other agencies.

Our goals for the 2020 mosquito surveillance season include:

- Doing some level of mosquito surveillance in every county in Georgia again
- Doing targeted surveillance in areas where *Ae aegypti* were found in the 1950s

- Providing continued training to Environmental Health Specialists in all 18 Public Health Districts
- Having the ability to support local outreach for mosquito complaints and arboviral disease cases
- Continuing doing testing for adulticide resistance, esp in high risk areas of Georgia
- Beginning testing for larvicide resistance in localized areas

The accomplishment of these goals will allow the Georgia Department of Public Health to be better prepared for the next mosquito-borne disease to emerge.

Pesticide Resistance Testing

Statewide Insecticide Resistance Testing of Mosquitoes in Georgia

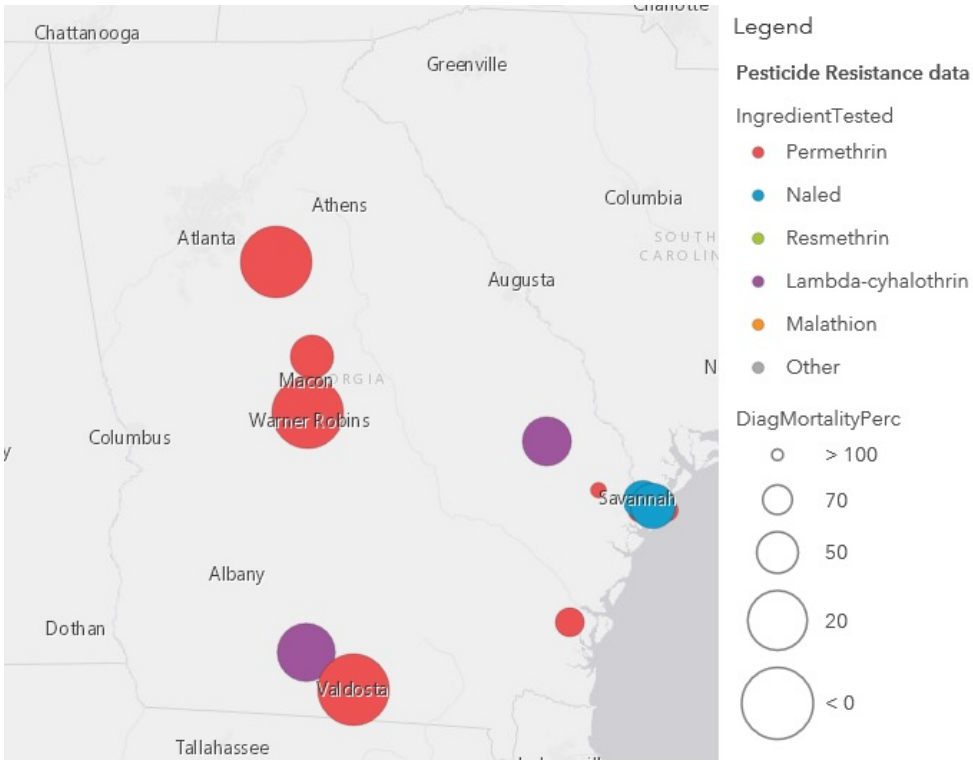
With the continuation of positive human cases of arboviral diseases such as La Crosse Encephalitis, St. Louis Encephalitis, Eastern Equine Encephalitis, and West Nile Virus in Georgia in 2019, mosquito control methods are critical. Pesticide Resistance has been found to be a component for ineffective mosquito control. There is a lack of insecticide resistance studies conducted statewide in Georgia and minimal knowledge of which pesticides mosquitoes are resistant to.

The state entomologists and regional entomologist are tasked to conduct insecticide resistance testing in all high-risk urban regions of Georgia for the next two years. Mosquito egg collections were performed by Vector Surveillance coordinators and Environmental Health specialists around the state. Mosquito egg collection training was included during the Adult Mosquito Identification class April 15-16, 2019 in Albany, GA.

Resistance testing is performed using the CDC Bottle Bioassay procedure and the chemicals that were provided in the CDC Bottle Bioassay kits. Preliminary data from several central and southern counties showed *Ae albopictus* to be exhibiting varied levels of resistance to permethrin and deltamethrin but were susceptible at varied levels to bifenthrin and deltamethrin used along with the synergist, PBO. *Culex quinquefasciatus* showed varied levels of resistance to permethrin, lambda cyhalothrin, and deltamethrin; they were susceptible to malathion.

Further testing with mosquitoes from more high-risk counties around the state will be tested with a greater diversity of chemicals in 2020.

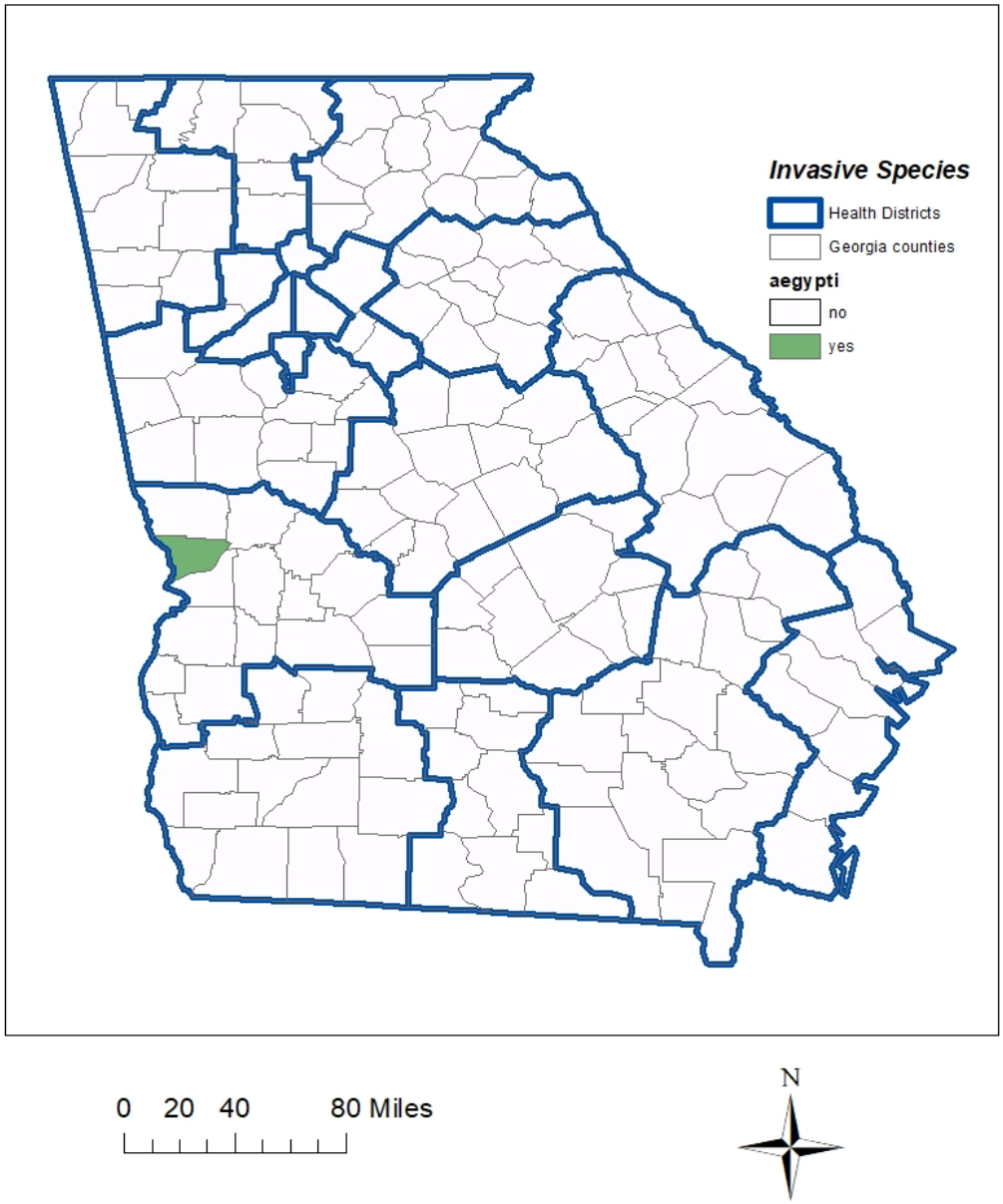
With the implementation of the first statewide pesticide resistance testing program, a clearer picture of the type of mosquitoes and their resistance to specific pesticides commonly used in Georgia will be determined. This information enables DPH to advise and train current mosquito control operators in using the most effective and cost-efficient pesticide for their target-mosquito. The statewide pesticide resistance testing program is a major component in reducing the exposure of mosquito-borne disease risk to the public.



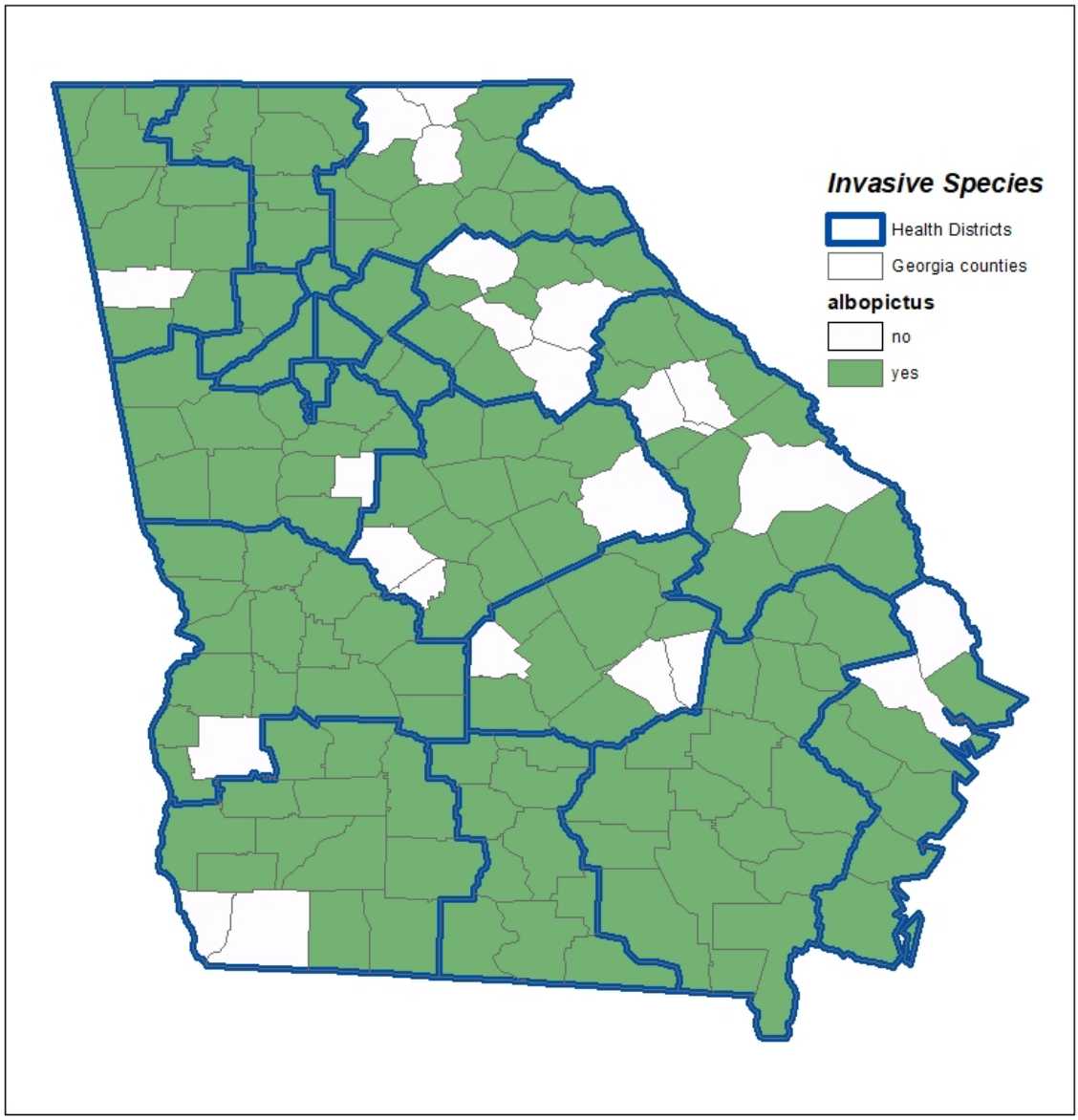
PESTICIDE RESISTANCE MAP, GEORGIA

Maps – Important Vector Species

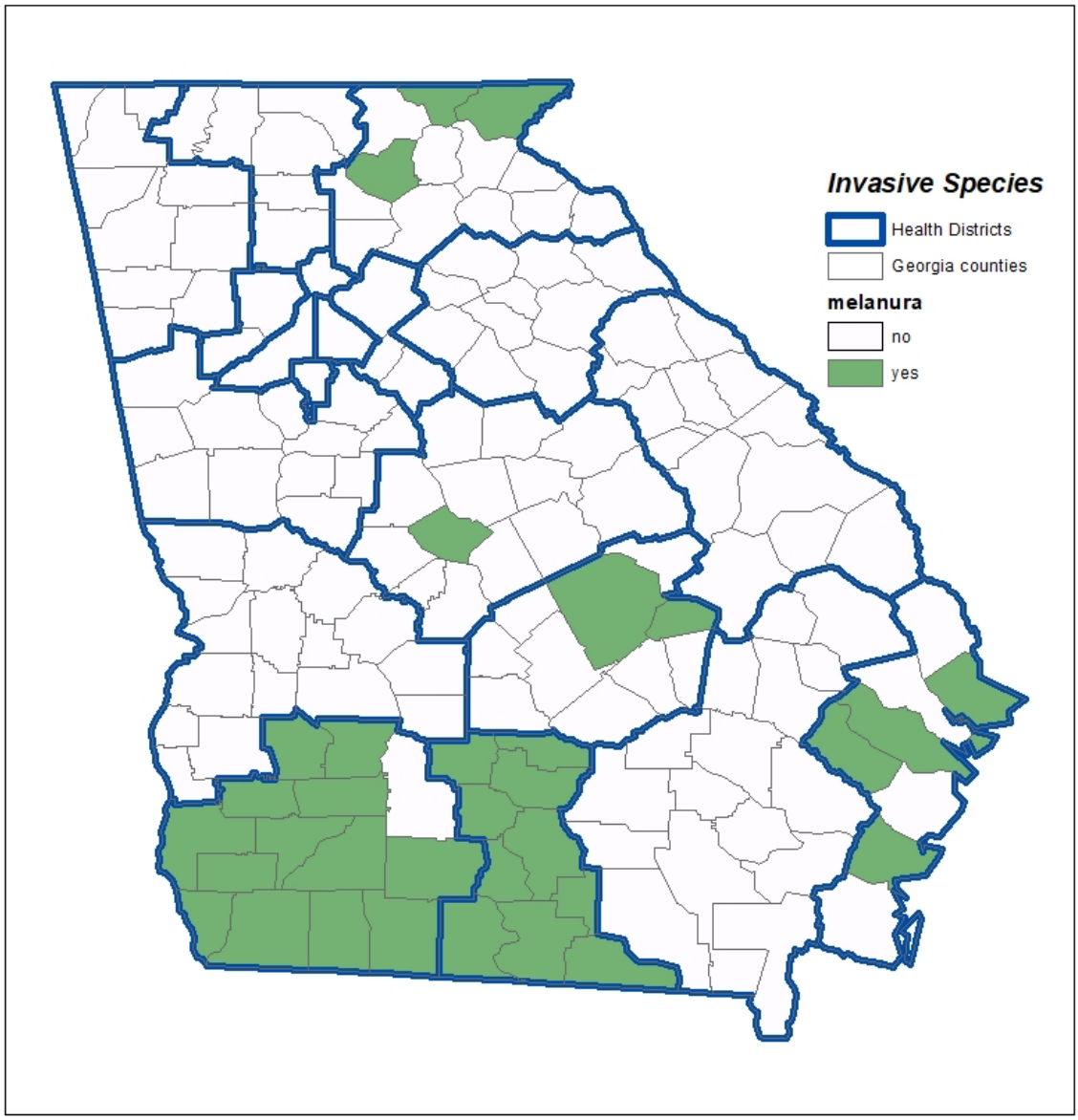
Aedes aegypti, 2019



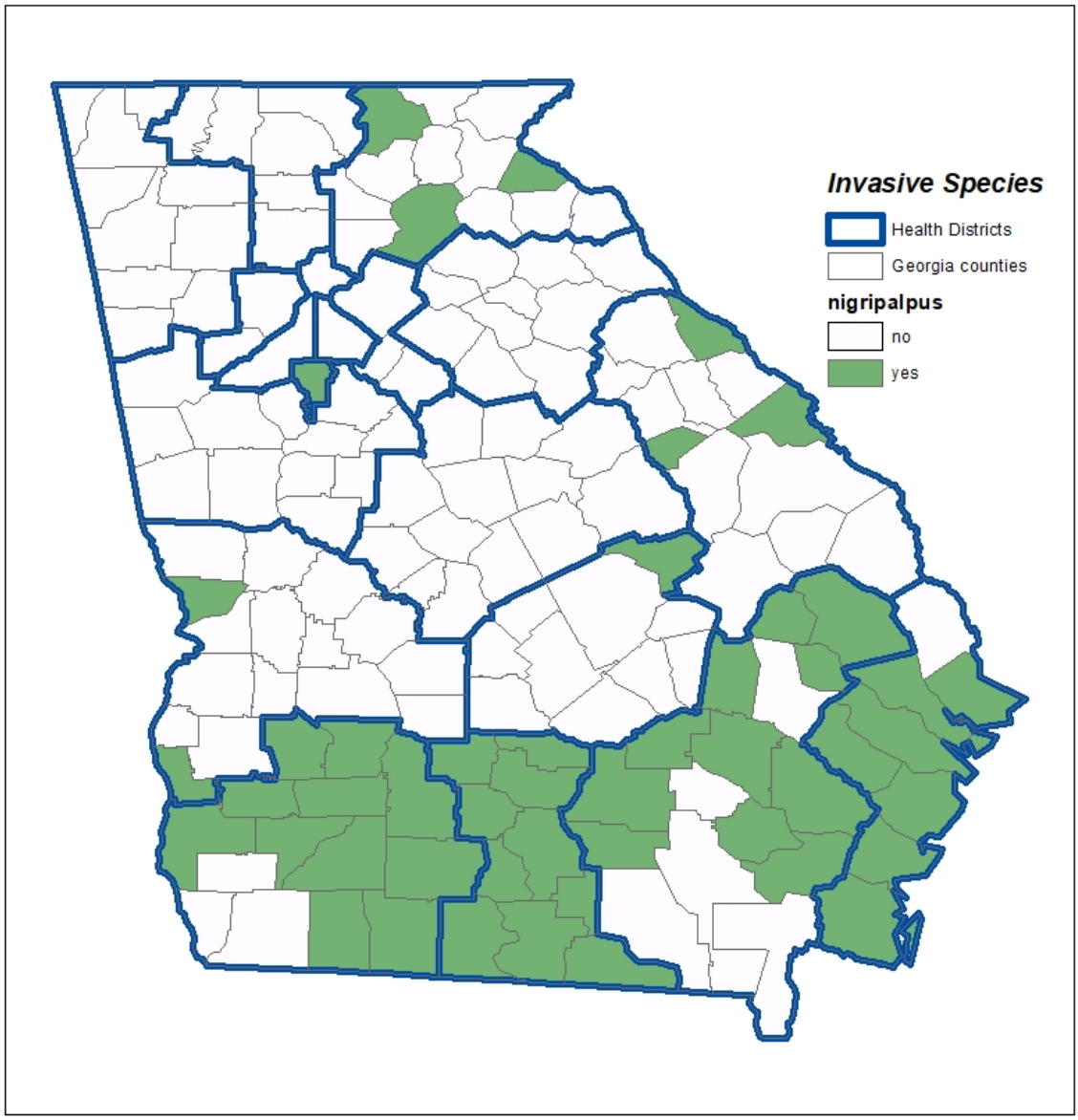
Aedes albopictus, 2019



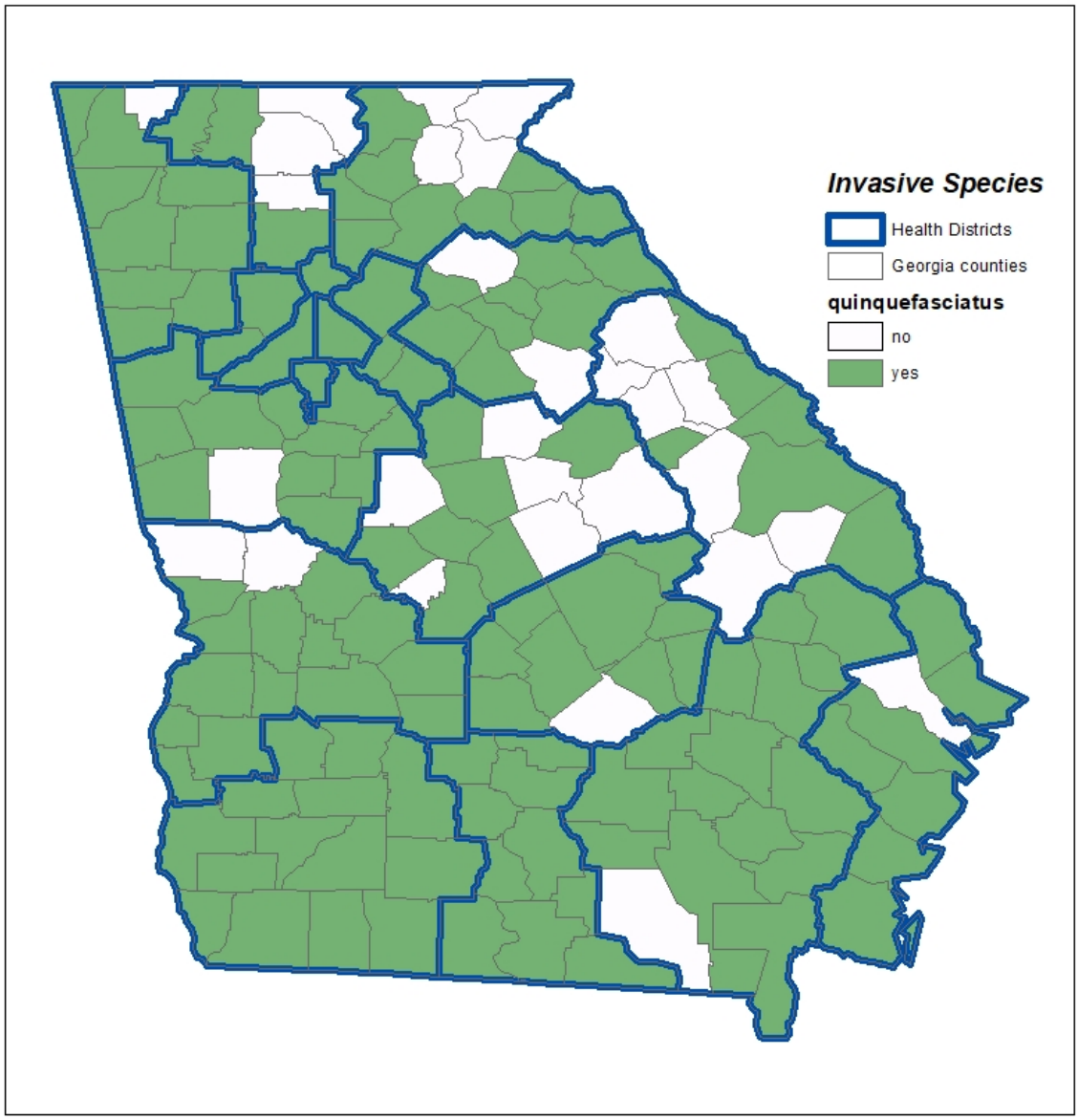
Culiseta melanura, 2019



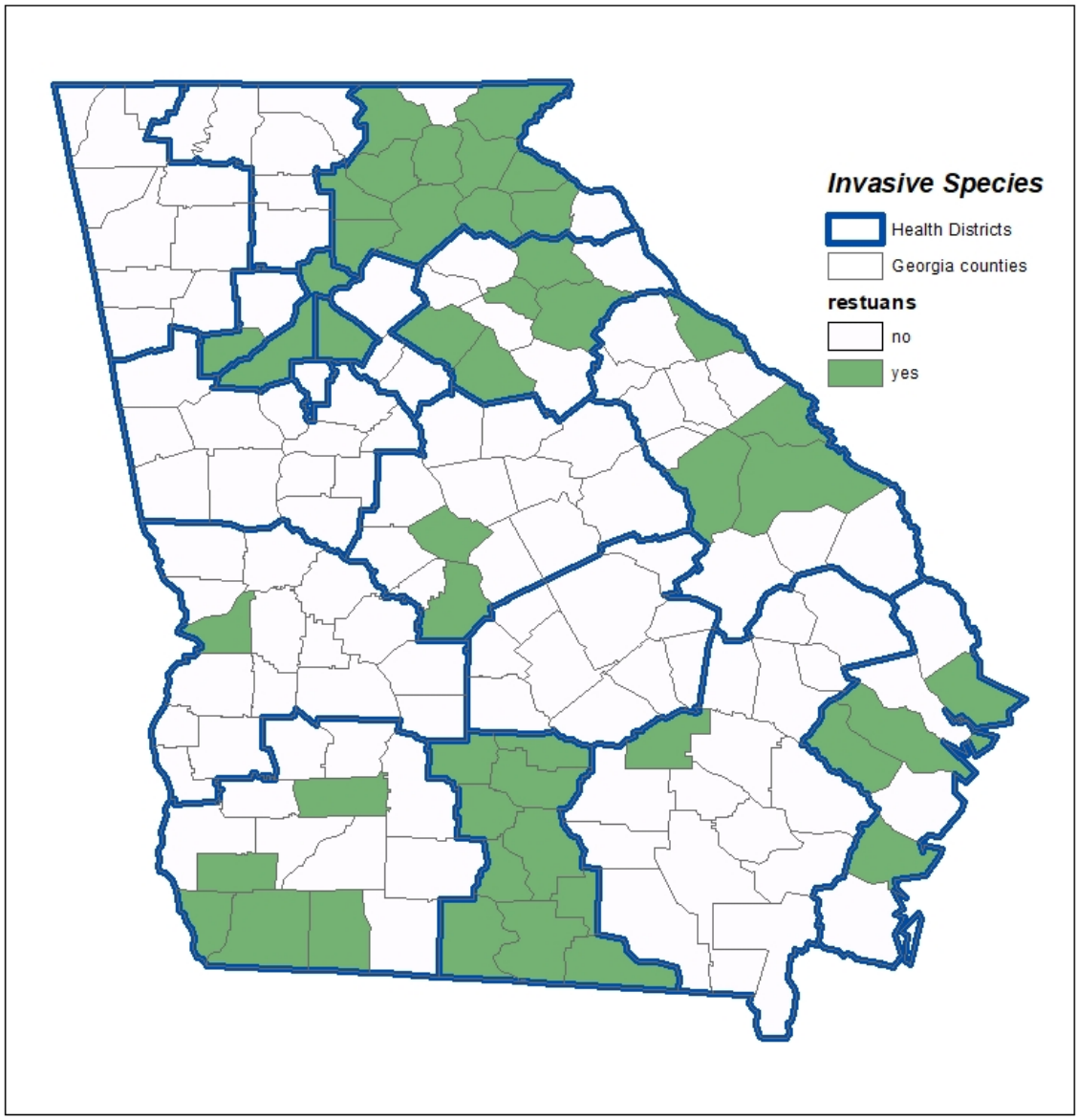
Culex nigripalpus, 2019



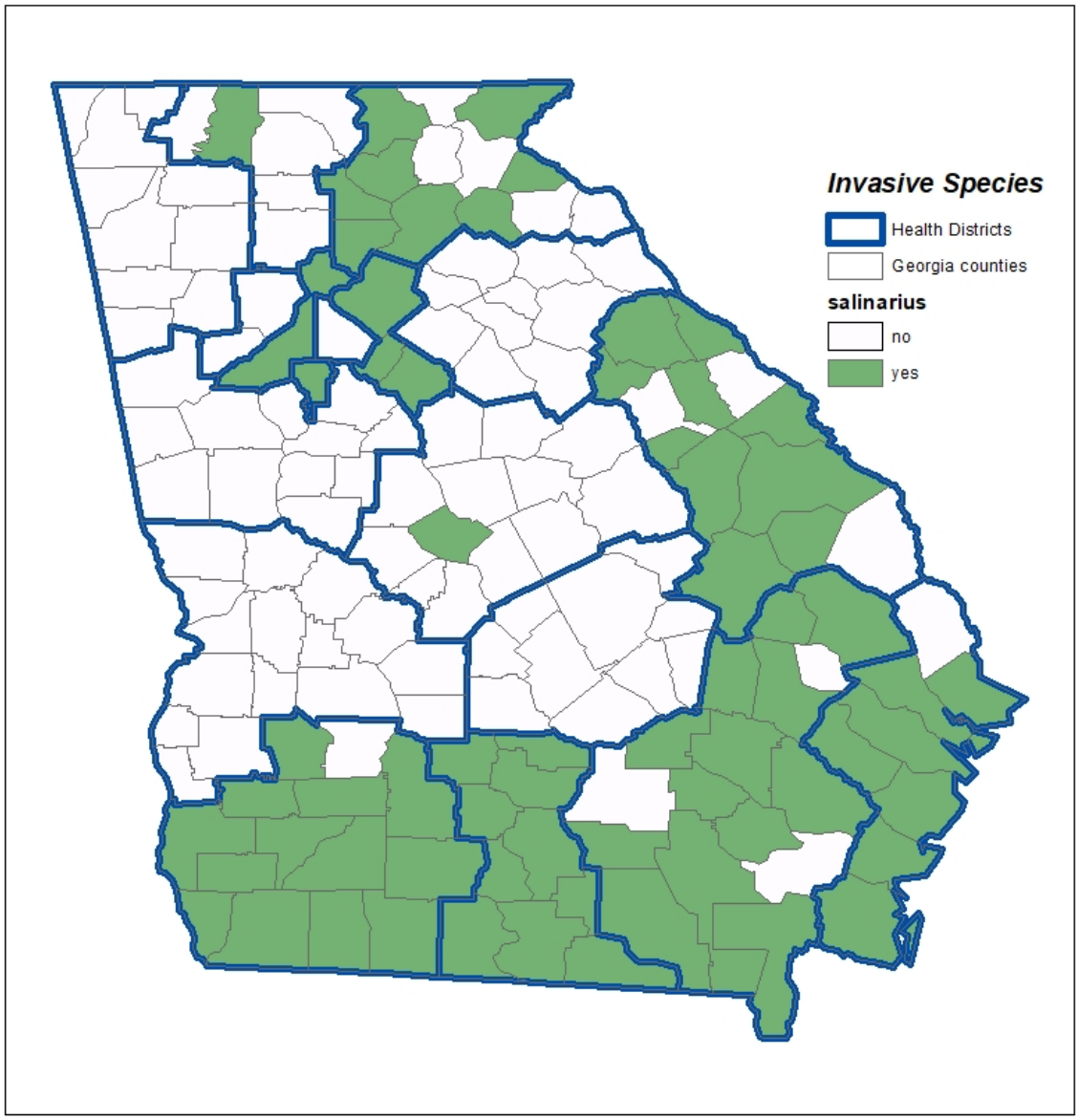
Culex quinquefasciatus, 2019



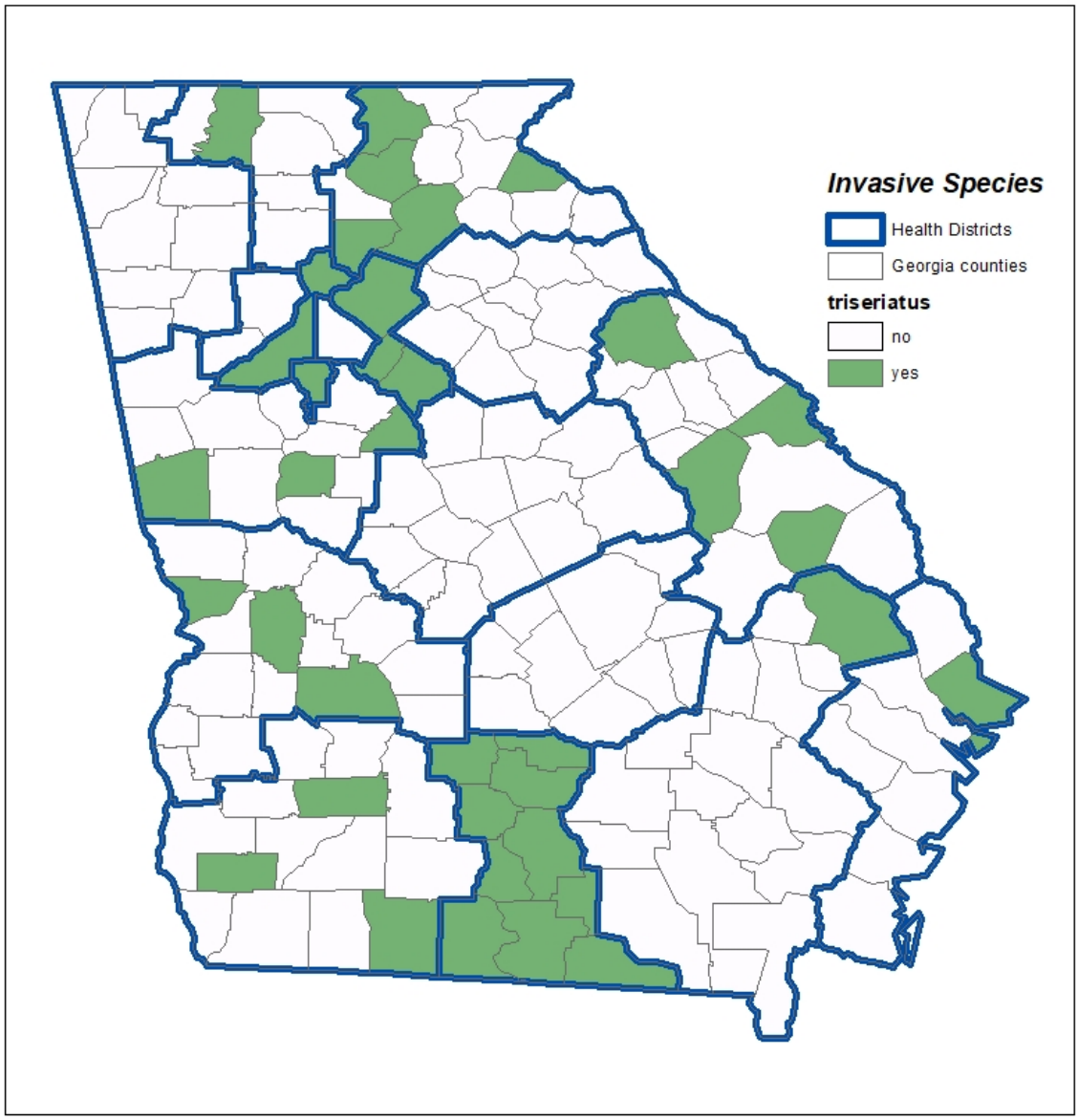
Culex restuans, 2019



Culex salinarius, 2019



Ochlerotatus triseriatus, 2019



Resources

https://mosquito.site-ym.com/page/control

https://c.ymcdn.com/sites/mosquito.site-ym.com/resource/resmgr/docs/Resource_Center/Mosq_Control_Facts/Best_Practices_Mgmt/amca_guidelines_final_pdf.pdf

http://www.gamosquito.org/publications.htm

http://cdcsercoevbd-flgateway.org/

https://www.cdc.gov/parasites/education_training/lab/bottlebioassay.html

Acknowledgements

I would like to thank everyone who assisted with this mosquito surveillance project, at the State, District, and County Public Health levels, as well as the mosquito control programs that contributed data.