

The Surprise of 2023- *Cx. salinarius*

An Overview of 2023 in Chesapeake

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Chesapeake Mosquito Control Commission

We went from **record breaking WNV positives** and *Cx pipiens* numbers in **2021**

A very **quiet 2022** with record **low *Cs melanura*** numbers and only **4 positives (3-WNV/1-EEE)**

To **2023** with **record breaking *Cx salinarius*** numbers and more **normal year of arbovirus detected (7-WNV/15-EEE)**

So....what happened?

Theories:

Several years of below average rainfall for the region

Then in **2023-Extended** periods of **Northeast winds** early in the season, influencing **tidal inundation** in prime *salinarius* habitat and **higher precipitation** for much of the **mosquito season**.

Coupled with the previous **mild winter** and plenty of **natural habitats** for **overwintering** adult *Cx salinarius*

What is prime
Cx salinarius
habitat in
Chesapeake?



Cx salinarius larval & adult habitat

- Referred to as the “**Salt Marsh *Culex***” but **prefer a less saline “brackish” water environment and capable of breeding in purely fresh water**
- “When *Cx. salinarius* does occur on the salt marsh it is generally **limited** to the **upper edges where brackish**, rather than saline conditions are found. **Flooded stands of Phragmites** frequently produce *Cx. salinarius* in numbers. **Roadside ditches, moderately polluted groundwater and artificial containers provide secondary larval habitat.**” Wayne J. Crans, Rutgers University
- “***Culex salinarius* populations peak** immediately **after flooding** because the **rotting saltmarsh vegetation** creates an infusion that functions as an **oviposition attractant**. Virtually **any freshwater habitat with dying vegetation** can support *Cx. salinarius* larvae.” Wayne J. Crans, Rutgers University
- “**Hugh swarms** have been reported at **twilight** near brackish water habitat when the **species emerges** from its **daytime resting sites in cattail and Phragmites.**” Wayne J. Crans, Rutgers University
- “**Hibernation** is thought to take place in **natural shelters** with **muskrat huts** and **animal burrows** cited as **likely overwintering habitat.**” Wayne J. Crans, Rutgers University

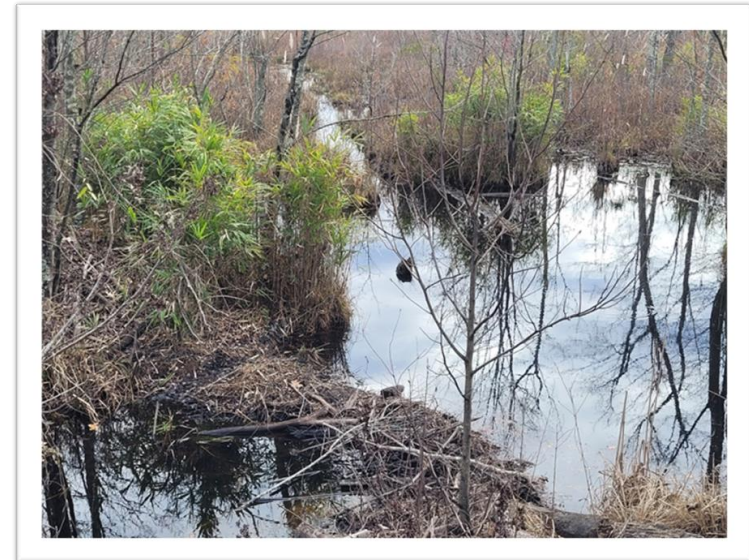
Reed Grass or “Phrag”- (*Phragmites australis*) Creating Larval Habitat

- **Invasive plant** found in brackish, tidal and non-tidal wetlands
- Utilizes an **underground rhizome system** up to 40 ft long
- The density of plant colonies **crowds out native plants**
- **Impacts water flow** characteristics of wetlands
- **Thick interconnected system** offers an advantage over other plants and makes **control** and **eradication difficult**.
- Reaches heights **up to 12 ft.**
- **Found all over Chesapeake!**



American Beaver-(*Castor canadensis*) Creating Larval Habitat

- Referred to as “**Ecosystem Engineers**” capable of significantly altering a habitat to suit their needs
- Build **watertight dams** impeding waterflow to form **ponds**, providing **aquatic habitat** for dozens of other species- **including mosquitoes!**
- Construct **dome-like lodges** with sticks, brush, rocks and mud.
- **Populations most abundant** in the **southern Piedmont** and **Coastal Plain** regions of Virginia- including **Chesapeake**.



Borrowing animals- Creating *salinarius* hibernation sites

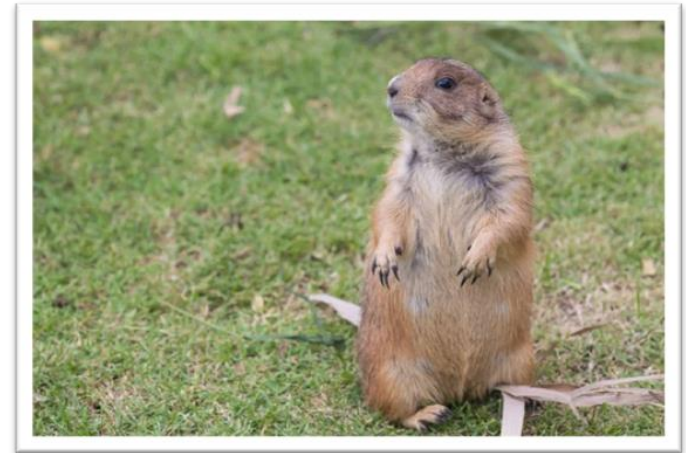
- “**Hibernation** is thought to take place in natural shelters with **muskrat huts** and **animal burrows** cited as likely overwintering habitat.” Wayne J. Crans, Rutgers University



**Nutria (*Myocastor coypus*)- Invasive-
Borrows in vegetated banks**

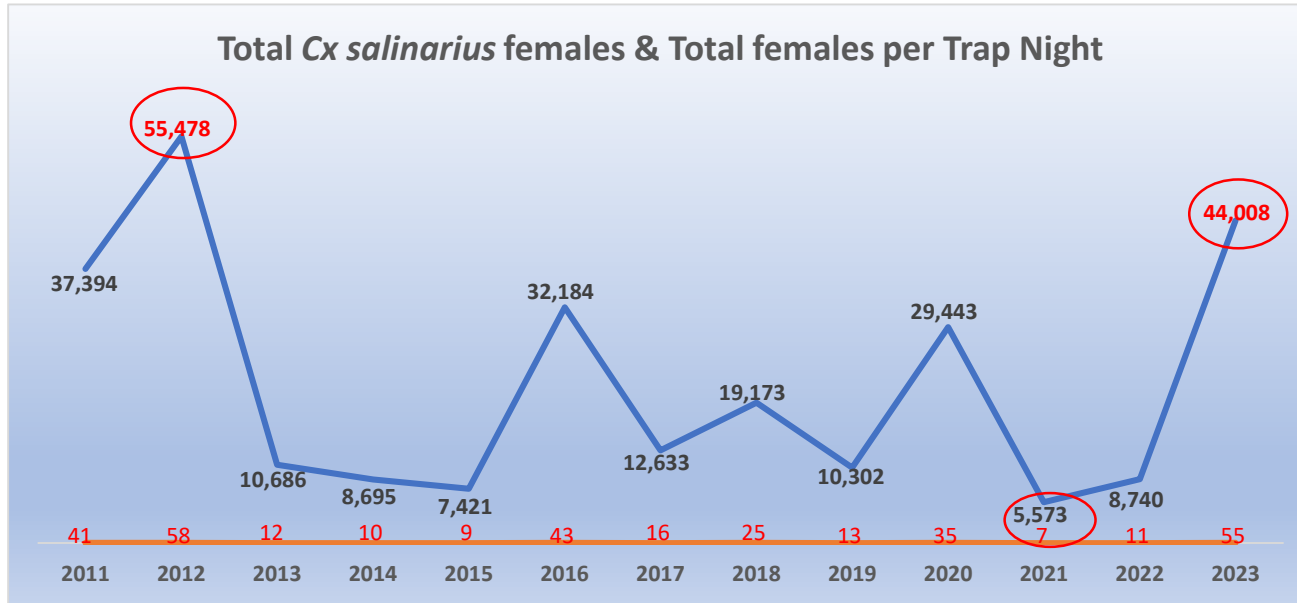


**Muskrat (*Ondatra zibethicus*)-
Builds lodges or tunneling dens**



**Ground Hog (*Marmota monax*)- Expert digger-
complex underground tunnels-multiple
entrances**

13 years of *Cx salinarius* trap data



2012- Highest trap count ever recorded!

2021- Lowest trap count ever recorded!

**2023- Highest trap count in 11 years!
32% of all female species trapped!**

In Chesapeake- *Cx salinarius* peak every 3-4 years

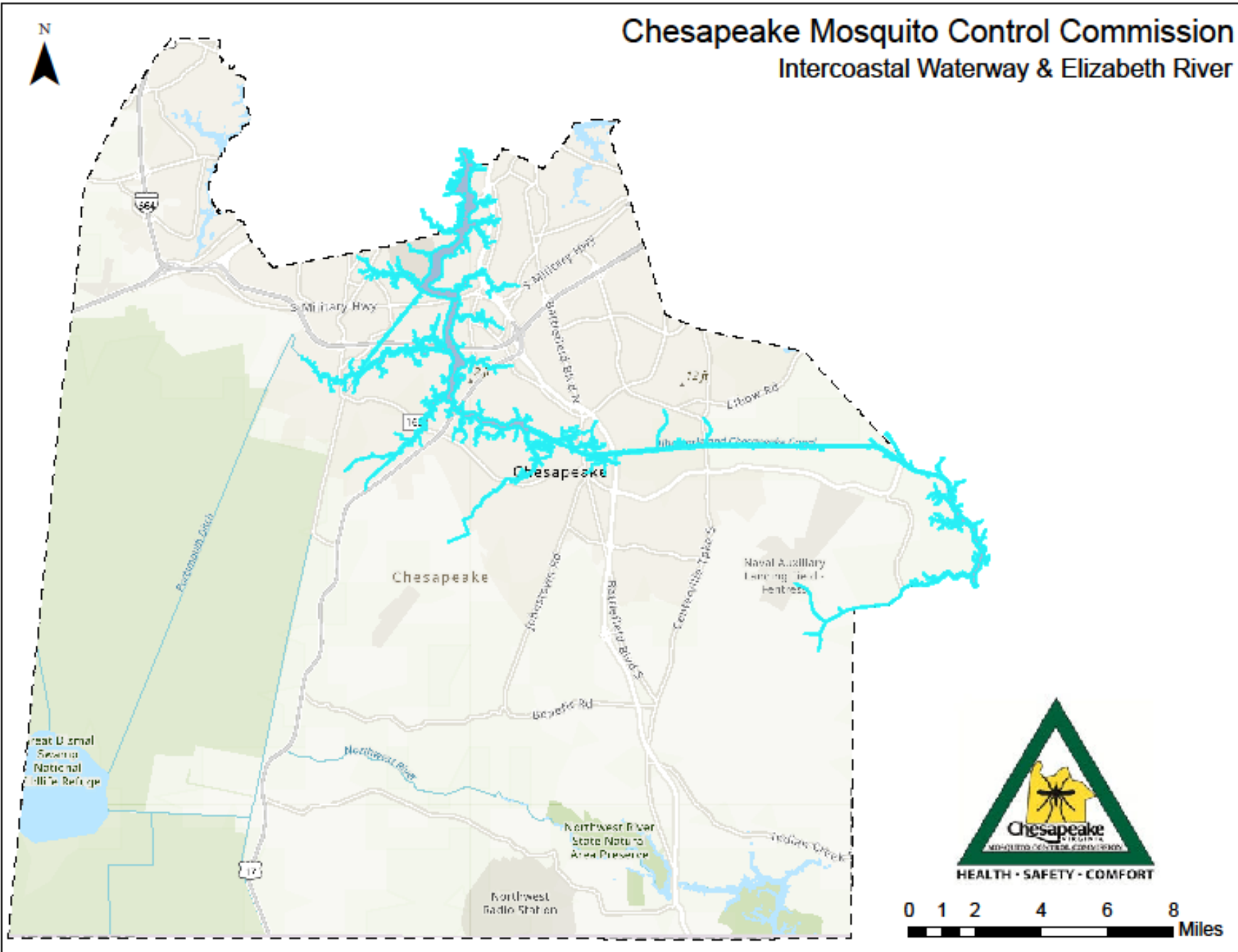
2023 Totals by species

Species	Total Females
<i>Cx salinarius</i>	46,322
<i>Cs melanura</i>	26,415
<i>Cx pipiens</i>	19,457
<i>Ae albopictus</i>	11,263
<i>An crucians/bradleyi</i>	10,936
<i>Cx erraticus</i>	8,548
<i>Cq pertubans</i>	5,565
<i>Cx restuans</i>	4,289
<i>An quadrimaculatus</i>	2,066
<i>Ae vexans</i>	2,027
<i>Oc canadensis</i>	1,744
<i>An punctipennis</i>	1,206
<i>Ps ferox</i>	965
<i>Ps columbiae</i>	677
<i>Oc infirmatus</i>	592
<i>Oc taeniorhynchus</i>	201
<i>Ur sapphirina</i>	136
<i>Cx territans</i>	132
<i>Or signifera</i>	132
<i>Oc atlanticus tormentor</i>	125
<i>Oc triseriatus</i>	112
<i>Oc japonicus</i>	22
<i>Ps howardii</i>	10
<i>Oc sollicitans</i>	6
<i>Ps ciliata</i>	6
<i>Tox rutilus</i>	6
<i>Oc fulvus pallens</i>	1
<i>Cs inornata</i>	0
<i>Oc cantator</i>	0
<i>Oc grossbecki</i>	0
<i>Oc hendersoni</i>	0
<i>Oc mitchellea</i>	0
<i>Oc sticticus</i>	0
<i>Ps mathesoni</i>	0

Where is prime
Cx salinarius
habitat in
Chesapeake?



Chesapeake Mosquito Control Commission Intercoastal Waterway & Elizabeth River

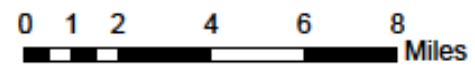


Highlighted blue area-
Intercoastal Waterway
& Elizabeth River
including tributaries.

Chesapeake has an
abundance of **prime**
Cx salinarius **habitat!**

Historically, the same sites
produce the most *salinarius*-
even in low years!

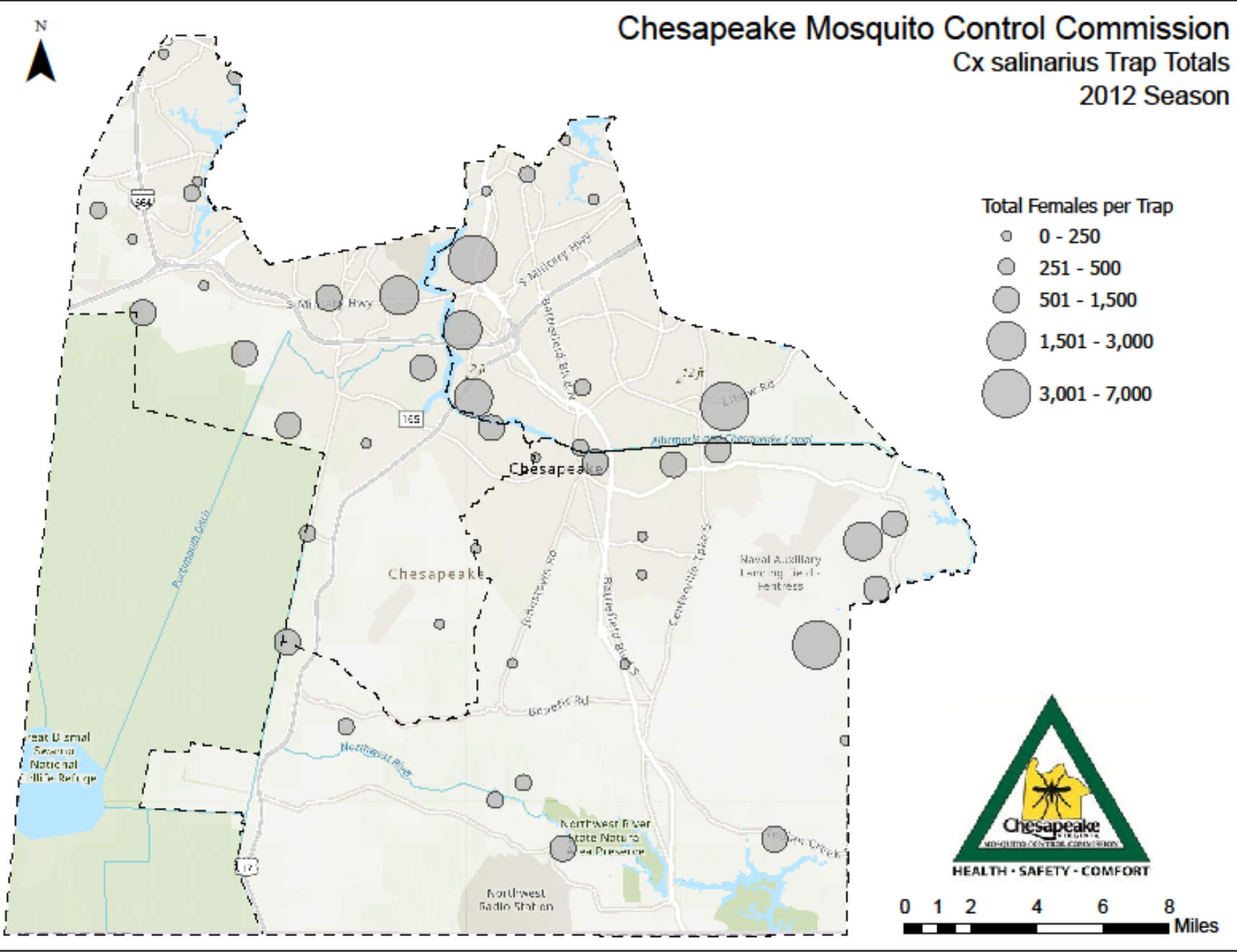
**Remember the pattern and
watch!**



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Cx salinarius Trap Totals

2012 Season

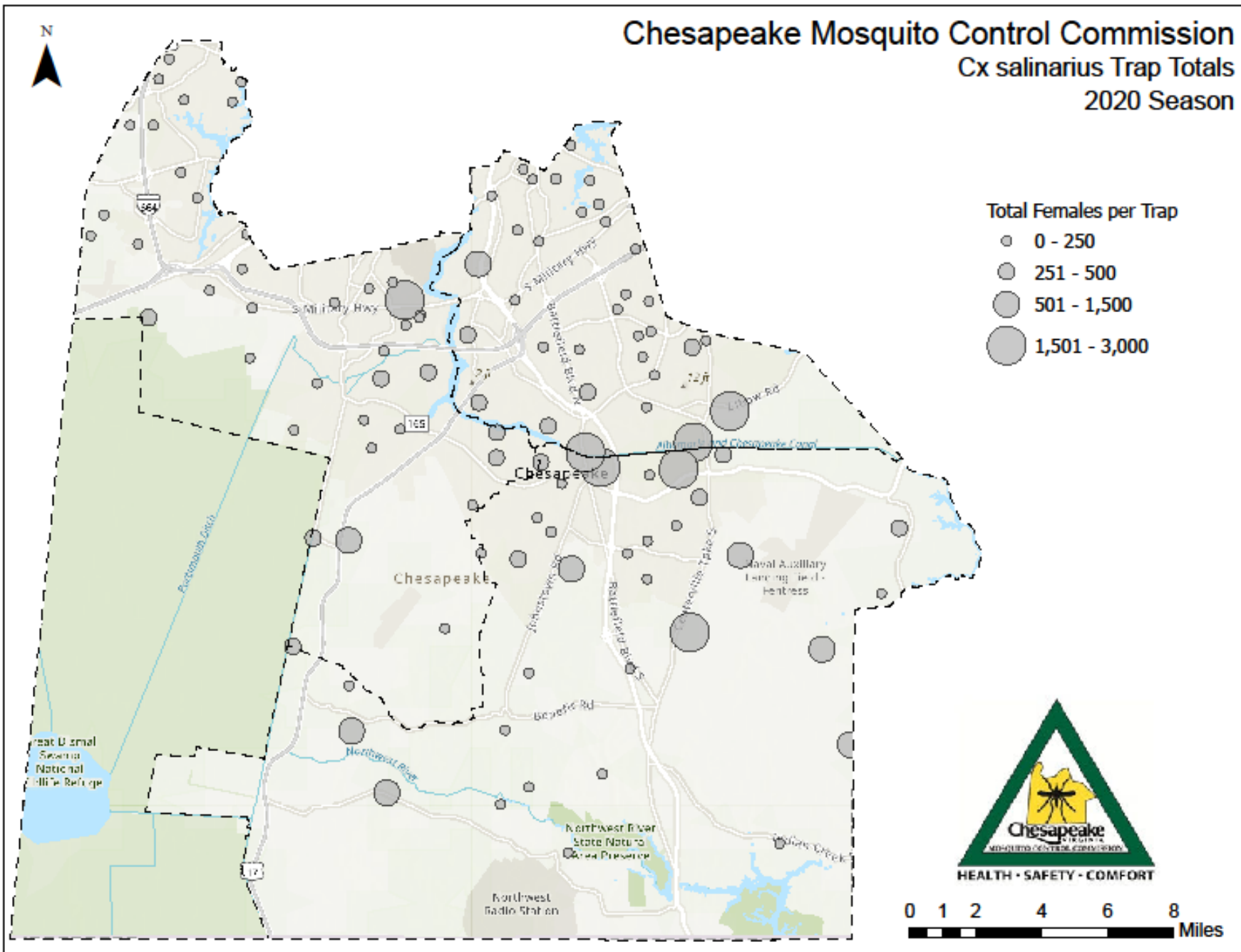


***Cx salinarius*-2012**
Trap Totals- 53,372
Highest ever recorded!

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Cx salinarius Trap Totals

2020 Season

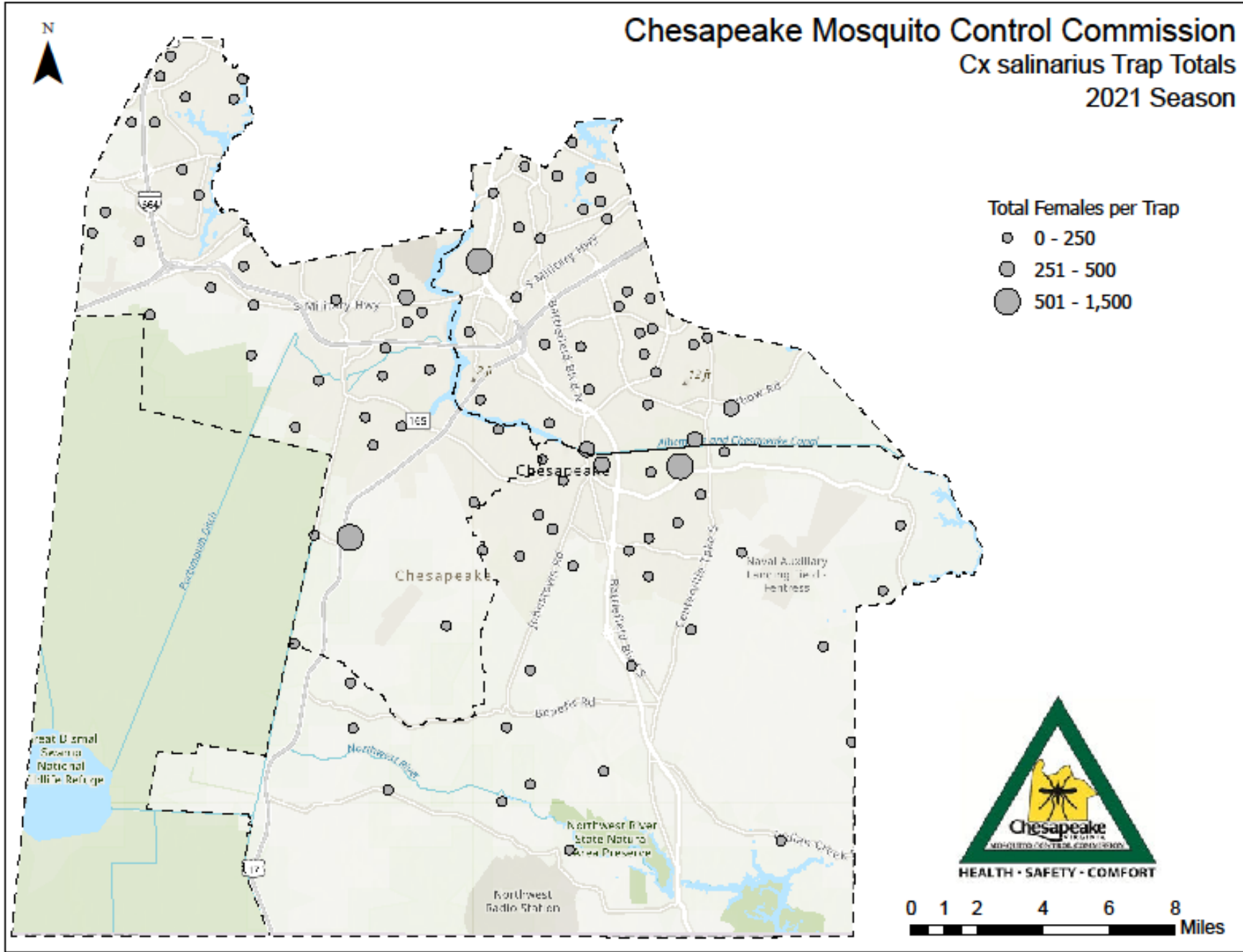


Cx salinarius- 2020
Trap Totals- 30,799

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Cx salinarius Trap Totals

2021 Season



***Cx salinarius*- 2021**
Trap totals dropped to only **5,573**
The lowest ever recorded!

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Cx salinarius Trap Totals

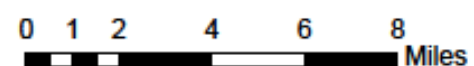
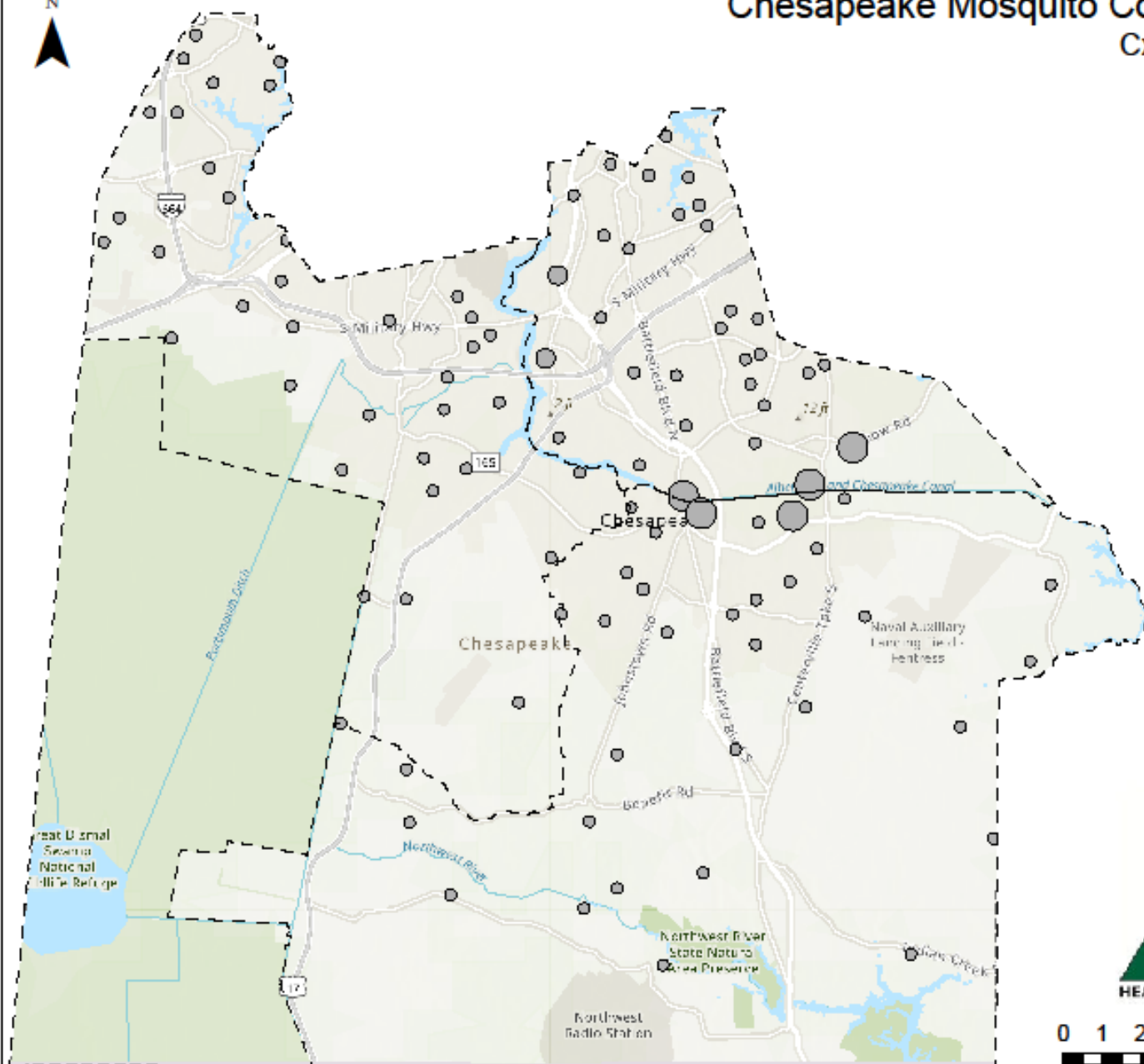
2022 Season



Total Females per Trap

- 0 - 250
- 251 - 500
- 501 - 1,500

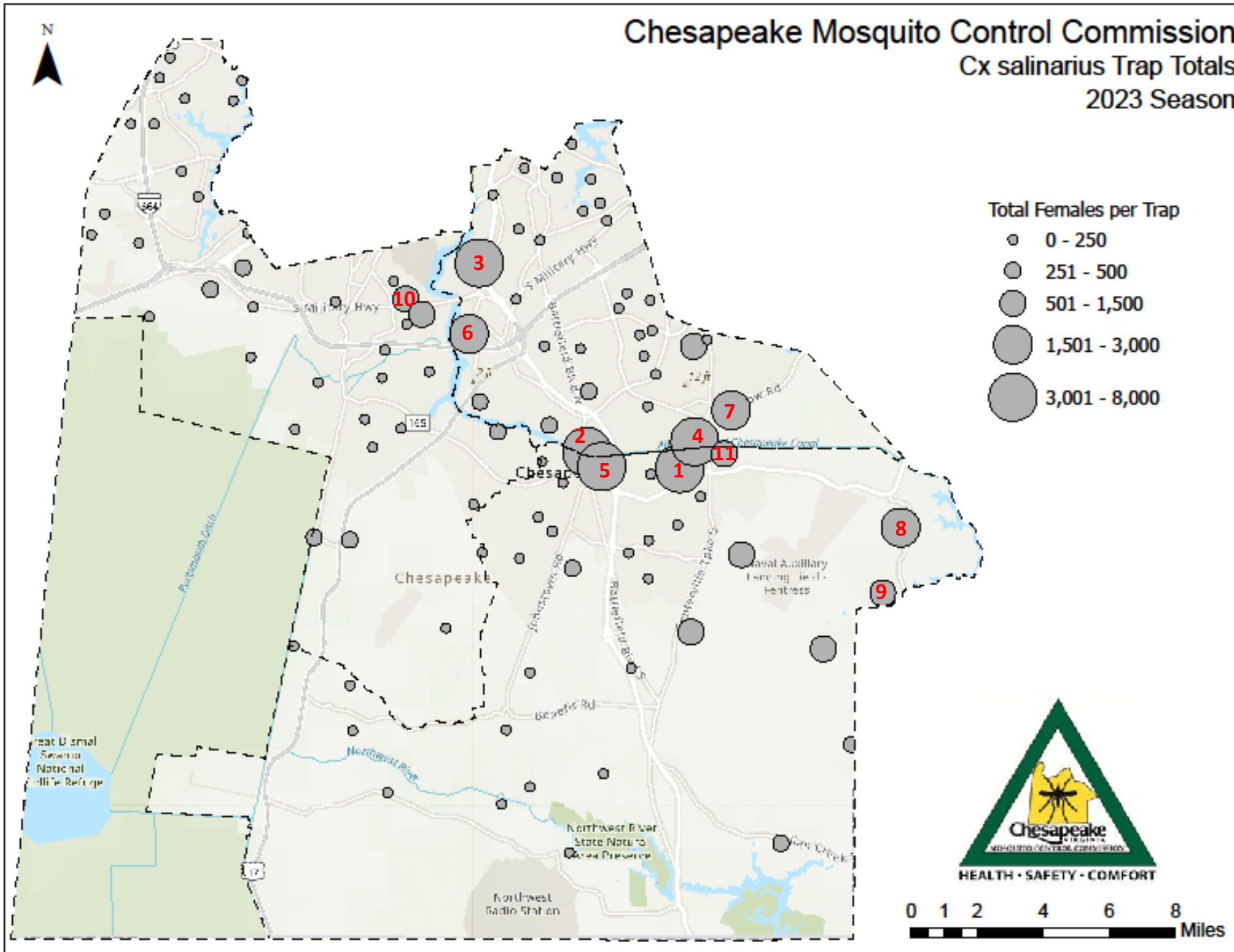
Cx salinarius- 2022
Trap totals- 9,136



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Cx salinarius Trap Totals

2023 Season



Cx salinarius- 2023

Trap Totals- 46,322

Highest trap count in 11 years!

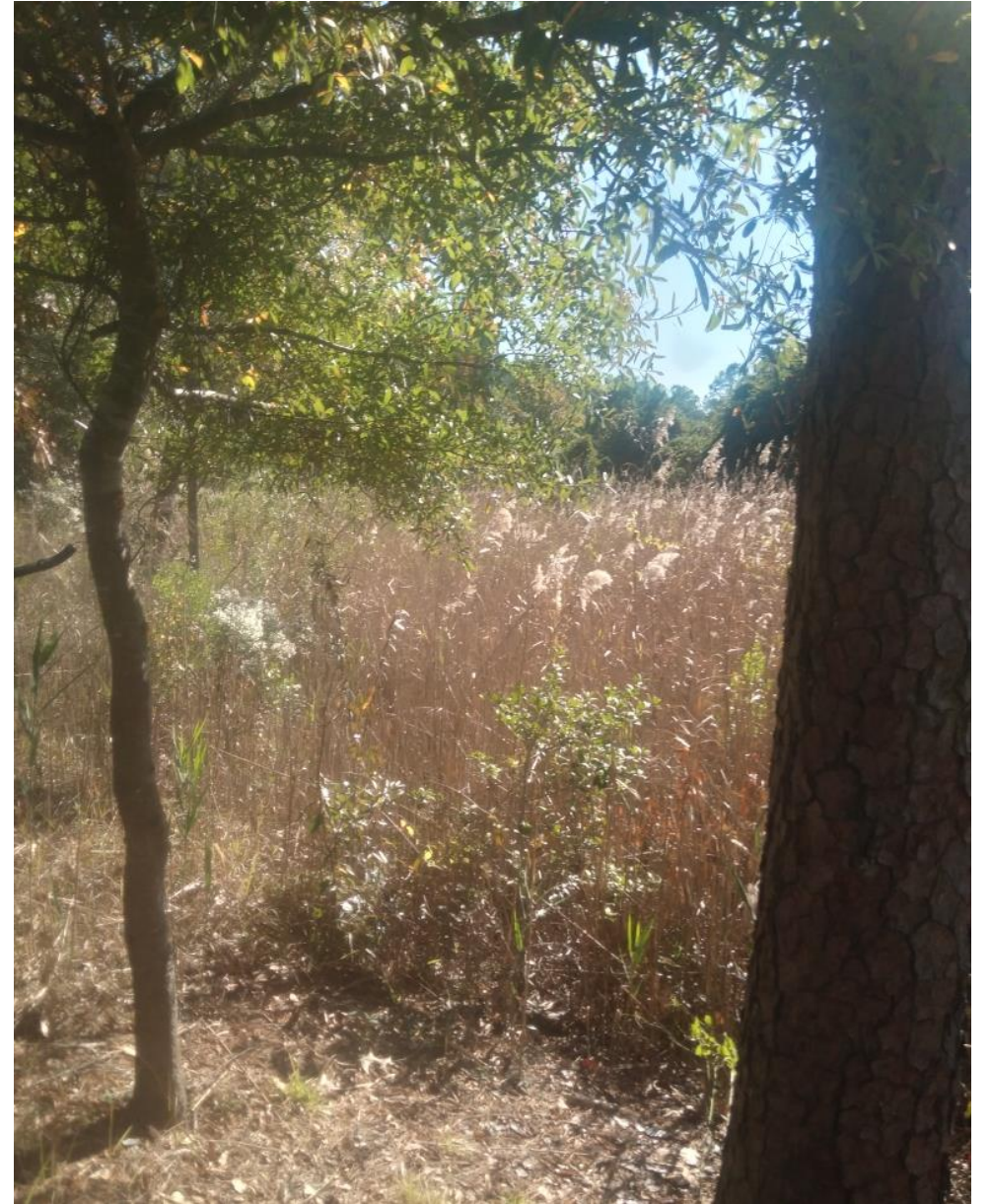
1. Tunbridge- 7,553
2. Great Bridge Monument- 4,780
3. Hanes- 4,734
4. Norfolk Dredging- 3,789
5. Chesapeake Colony- 3,884
6. Precon- 2,610
7. Graphite Trail- 2,506
8. Saddlehorn- 1,528
9. Pocaty- 1,365
10. State St.- 1,054
11. Ravenna- 1,046

Tunbridge- 7,553
Intercoastal waterway
Busting a beaver dam!





Great Bridge Monument Park-4,780
Intercoastal waterway



Norfolk Dredging- **3,789**

&

Graphite Tr- **2,506**

Intercoastal waterway





Hanes- **4,734** & Precon- **2,610**
Elizabeth River

State St- **1,054**
Elizabeth River



2023 Response to high *Cx salinarius* trap counts

Current trap threshold set at 150

Conducted a spring and fall treatment in historically high *Cq perturbans* areas with Vectolex FG- share some of the same areas with high counts of *Cx salinarius*

Utilized backpack sprayers throughout the season- Vectolex FG, Metalarv SPT, Vectomax FG

ULV-truck and ATV adulticide- Zenivex E20 and Deltagard

2024 Plan:

Investigate sites further and **larvicide accessible** areas

Use **larval surveillance** and **trap counts** for adjusting **treatment techniques** and **products**

Final Thoughts & Questions

- What we know:
 - Locations of potential *Cx salinarius* habitat in Chesapeake
 - *Cx salinarius* run a 3-4 yr. cycle
 - In high years- can't **definitively** say *Cx salinarius* increase our Service Calls
- What role,if any, do *Cx salinarius* play in the virus cycle?
 - **Not** a strong **correlation** between #of *salinarius* and #of virus detections
 - “Laboratory studies suggest that the mosquito has an extremely **high threshold of infection** and probably only functions as a **secondary vector** during epizootic episodes” Wayne J. Crans, Rutgers Uni.
 - So..., do we treat *salinaruis* as a **potential bridge vector** or a **nuisance nighttime biter**?