

VIRGINIA HURRICANE EVACUATION GUIDE



Ready Virginia

Ready Hampton Roads

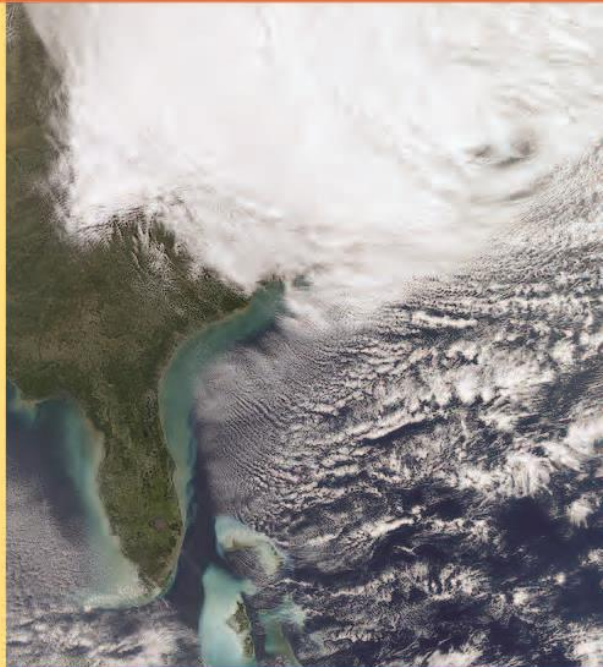
VDOT
Virginia Department of Transportation

How to Use This Guide

Use this Virginia Hurricane Evacuation Guide to help you keep yourself and your family safe before, during and after a hurricane or tropical storm.

This guide will help you with the following:

How to Know Whether to Evacuate	This Page
How to Prepare Your Home When a Storm is Coming	2
How to Plan for Those with Functional and Medical Needs	3
How to Provide Shelter for Pets	3
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Superstorm Sandy hitting the Mid-Atlantic.
The National Weather Service

How to Know Whether to Evacuate

To know whether to evacuate, be aware of your “storm surge risk” and stay informed on current conditions by listening to local media for the announcement of an official evacuation order. “Storm surge” is an abnormal and dangerous rise of water pushed to the shore by strong winds from a hurricane or tropical storm. It is also the main reason that evacuations are ordered.

All residents and visitors of coastal Virginia should know their storm surge risk. To find out your storm surge risk, check the surge map page on www.ReadyVirginia.gov or contact your local emergency manager.

Those who may require assistance when they need to evacuate should check the “How to Plan for Those with Functional and Medical Needs” section on page 4.



How to Prepare Your Home When a Storm is Coming



1

Get cash and gas:

Without power, gas stations and ATMs may not be working during and after a storm.



2

Stock up on supplies:

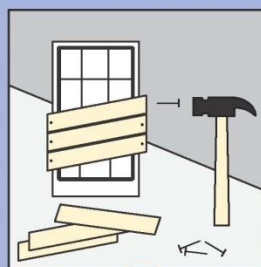
You may not be able to get to grocery stores for three days or more.



3

Bring things inside:

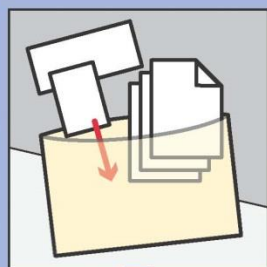
Trash cans, signs and outdoor furniture can blow away and damage homes or injure people.



4

Cover windows with plywood or boards:

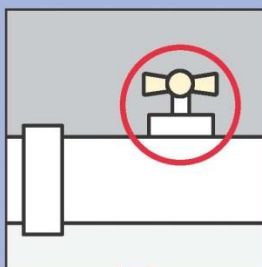
Trees, debris and other flying objects can shatter glass.



5

Bag important documents:

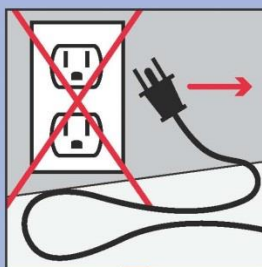
Passports, birth certificates and insurance policies could get lost or soaked.



6

Turn off gas:

Leaking gas lines can cause fire or explosions.



7

Unplug:

Electrical equipment can cause electrocution or be destroyed.



8

Use mobile devices and radio:

Listen to local forecasts and NOAA radio; download the "Ready Virginia" app.



Unsure about the meaning of Watches and Warnings?

Visit www.ReadyVirginia.gov for definitions.

Looking for a way to stay prepared for an emergency at your fingertips?

Download the Ready Virginia app on the App Store and on Google Play, or visit <http://go.usa.gov/T7wG>.



App Store



Google Play

How to Plan for Those with Functional and Medical Needs



Having a support network can help anyone survive a disaster, but having a network in place before a storm is vital for people with medical or functional needs. **If you think you will need help before, during and after a disaster, talk to family, friends and others who will be part of your personal support team.** Write down and share your emergency plan with them. Practice ways to communicate with your support network, and have a backup plan if cell phones, computers or landline phones don't work.

Be familiar with the emergency plan for your office, school or any other location where you spend a lot of time. Make sure managers at these places know your needs.

The Ready Hampton Roads Functional/Medical Needs Planning Registry is a regional emergency preparedness tool for persons with medical or functional needs. The Ready Hampton Roads Registry is a planning tool used by local emergency managers to plan for the needs of its residents during disasters. This registry does not imply or guarantee direct services of any kind but will help your emergency manager identify the community's needs in advance of an event. Registering for the Ready Hampton Roads Registry is an important step in preparing for disasters but does not replace having a personal emergency plan.

If you live in the Hampton Roads region, go to www.ReadyHamptonRoads.org, click on Functional/Medical Needs Registry, and fill out the electronic registration form. To request a form by mail or in an alternate format, or to get more information about the Ready Hampton Roads Functional/Medical Needs Planning Registry, call 757-420-8300 (voice) or 757-390-2578 (TTY) or email em@hrpdcva.gov.

How to Provide Shelter for Pets

Make a plan now. Not all emergency shelters, hotels or motels accept pets. Talk to your veterinarian or local humane society or visit the Virginia State Animal Response Team website at www.virginiasart.org in advance to learn more about emergency planning for your pets. Don't forget to include supplies for pets in your emergency supply kit.

You may need to plan on staying with family, friends, or at a pet-friendly hotel if any rooms are available. It is recommended that you bring copies of your pets' immunization records with you when traveling.



How to Safely Evacuate

Leave early. An evacuation will increase traffic on evacuation routes, and your trip will take longer than usual. Be prepared for delays. The sooner you leave, the sooner you will get to your destination and out of harm's way. You will also spend less time in traffic.

Check Road Closures and Conditions



Road closures and traffic conditions are available by calling 511 or by visiting www.511Virginia.org, where you can also download the free 511 mobile app. The Virginia Department of Transportation (VDOT) also provides this information through Twitter (@VaDOT for statewide, @VaDOTHR for Hampton Roads, and @VaDOTRVA for Richmond) and Facebook updates (www.facebook.com/virginiaDOT). Local radio and television broadcasts have this information, as well as local media websites and social media accounts.

If emergency officials order an evacuation, bridges and tunnels should remain open until the evacuation is terminated. It is important for residents to be prepared and ready to evacuate immediately if instructed to do so.

NOTE: VDOT does not manage the Chesapeake Bay Bridge-Tunnel, which connects Virginia Beach to the Eastern Shore of Virginia. The Chesapeake Bay Bridge-Tunnel is not an evacuation route. For closure information, visit www.cbbt.com.

Use Caution Around Bridges, Tunnels and Ferries

Based on weather conditions, many bridges and tunnels may be closed to restrict their use. If a facility is not barricaded, gated or otherwise physically closed to vehicular traffic, this does not mean the bridge or tunnel is safe for passage. Motorists should consider their personal safety before using these facilities during severe weather.



Evacuation Routes

If officials order an evacuation for your area, use one of these designated routes to leave the Hampton Roads region. Get familiar with these routes and plan to **leave early to avoid major traffic delays**.

<p>Peninsula</p> <ul style="list-style-type: none"> • Interstate 64 • U.S. Route 64 North • U.S. Route 17 North • U.S. Route 60 West • Route 143 <p>During severe weather, the Jamestown-Scotland Ferry is removed from service and should not be considered part of a reliable evacuation plan.</p>	<ul style="list-style-type: none"> • Interstates 64 & 264 • Interstate 64 North Monitor Merrimac Memorial Bridge-Tunnel • U.S. Route 17 North • U.S. Route 58 West • U.S. Route 460 West • Route 10 West <p>All Eastern Shore residents will use U.S. Route 13 North toward Salisbury, Maryland.</p>
<p>Evacuating Norfolk and Virginia Beach (North of I-264)</p> <p>Lane Reversal</p> <p>Interstate 64 is the only route with a lane reversal plan, but it is not the only way out of the area. In the event of a hurricane or other disaster, the governor can order a lane reversal of the eastbound lanes on I-64 to help evacuate Hampton Roads. During a lane reversal, traffic will be directed onto the Hampton Roads Bridge-Tunnel (Exit 273), and continue to the I-295 interchange in Richmond (Exit 200).</p> <p>For more information on the I-64 lane reversal and emergency hurricane gates, please visit the online guide at www.virginiadot.org</p>	<p>Reversing I-64</p> <ul style="list-style-type: none"> • Motorists on I-64 at 4th View Street (Exit 273) will travel in the reversed eastbound lanes to I-64 westbound. • Motorists traveling westbound on I-64 before 4th View Street will be directed onto the reversed eastbound lanes. • All traffic entering I-64 west of the Hampton Roads Bridge-Tunnel will travel in the normal westbound lanes. <p>There are only two possible exits from the reversed lanes between Norfolk and I-295 in Richmond:</p> <ul style="list-style-type: none"> • Exit 234 in Williamsburg (route 159 for gas, food, lodging) • Exit 205 in Bottoms Bridge for gas and food <p>Without exiting, motorists on the reversed lanes can also access a temporary comfort station on I-64 near Jefferson Avenue (near Exit 255) and the rest areas in New Kent County (between exits 214 and 211). Motorists exiting the reversed lanes at Exit 234 or Exit 205 cannot re-enter the reversed lanes. If motorists exit the reversed lanes, they can re-enter I-64 using only the normal westbound ramps.</p> <p>Motorists traveling in the I-64 westbound lanes can exit and enter the interstate as usual, though some entrance and exit ramps could be closed for traffic control.</p>



Stay Informed

Depending on the storm, only those residents at risk for storm surge flooding or those who live in mobile homes may need to evacuate. Stay informed by listening to local media for the most up-to-date information from emergency officials. Local media will carry instructions from local, state and federal government partners for the following:

- Orders to evacuate and evacuation route details
- Locations of emergency shelters and where to find assistance
- Weather warnings and watches



As part of your emergency kit, include a hand-crank or battery-powered radio with extra batteries. NOAA weather radios also provide severe weather warnings issued directly from the National Weather Service. For traffic information, call 511 or use the 511 app on your smartphone.

How to Find Shelter or How to “Shelter in Place”

Emergency officials will provide public information about open shelters through the local media. Shelters can fill quickly, and shelter information may change frequently. Shelter information will be available by calling 211.

If you shelter where you are, or “shelter in place,” be sure to follow the steps on page 3 on “How to Prepare Your Home When a Storm is Coming,” and to shut off gas and water if emergency officials tell you to do so. You will need a professional to turn water and gas on after the storm.

During severe weather, public shelters should be a last resort.

Public shelters provide basic necessities such as food, water and a small amount of space for your family to stay. However, most shelters do not provide cots, bedding or items for infants or those with functional and medical needs. Relief organizations may provide some of these items after a storm, but you should be prepared to use your own supplies until help arrives.

Consider local options.

If you have family or friends who live outside of storm surge areas, make plans ahead of time to stay with them. If you can stay in a hotel or motel outside of storm-surge areas, then you may not need to travel long distances. As a storm approaches, rooms may fill up fast, so make plans early.

Photo courtesy of the American Red Cross



How to Return Safely After Evacuation



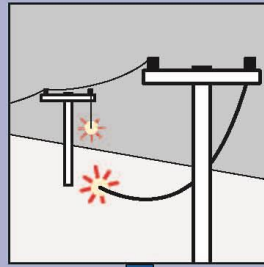
1

Before returning, check road conditions by calling 511, check www.511virginia.org, or follow VDOT social media updates. Once authorities say it is safe to return home, confirm passable road conditions by calling 511, checking www.511virginia.org, or following local media.



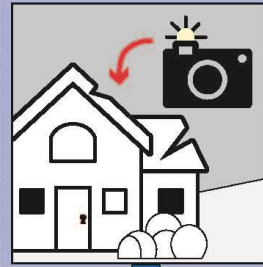
2

If you see someone who needs to be rescued, call 911 for help from official emergency responders. People have lost their lives trying to rescue others in flooded areas.



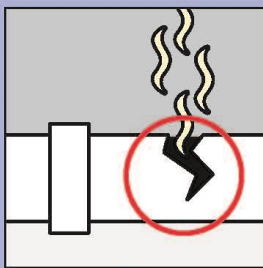
3

If you see downed power lines, stay away and report them to the electric company or police and fire departments.



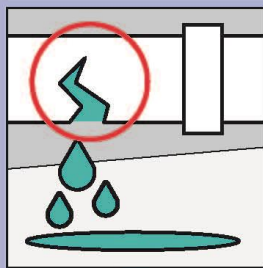
4

For insurance purposes, inspect your home, taking pictures of any damage to the structure and your belongings.



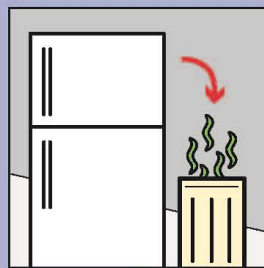
5

Check for gas leaks. If you smell gas or hear a blowing or hissing noise, stay out of the building and call the gas company.



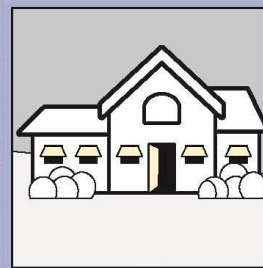
6

Check for sewer and water pipe damage. If sewer lines are damaged, avoid using the toilet. If water pipes are damaged, do not use water from a pipe. Check local media to determine the safety of drinking water.



7

Check refrigerated food for spoilage – “If in doubt, throw it out.”



8

Open doors and windows to ventilate and dry the building.



How to Get Flood Insurance

There is usually a 30-day waiting period before flood insurance takes effect, so be sure to speak to your insurance agent about purchasing a policy to cover damages to structure and contents of your property.

- Contents coverage helps renters and homeowners protect their personal belongings and business inventory.
- Structure and contents coverage helps home and business owners repair or rebuild homes and business facilities.
- You can receive flood insurance payments for flood-related losses even if a national, state or local disaster is not declared.
- Buying flood insurance is the best way to protect your home, your business and your family's financial security from the costs associated with flooding. Information about the National Flood Insurance Program is available at www.FloodSmart.gov or by calling 1-800-427-2419.

What to Have in Your Emergency Supply Kit

Below is a list of items to collect before a storm threatens. Have enough supplies to last at least three days, but remember that if you need to evacuate, you may not be able to return home for more than a week. Each person should have supplies in an easy-to-carry bag, such as a backpack or gym bag. Virginia has a hurricane preparedness sales tax holiday in May to encourage residents to assemble their emergency supplies.



Visit www.ReadyVirginia.gov for more tips on building your emergency supply kit.

For an emergency supply checklist on your mobile device, download the free Ready Virginia app on the App Store and on Google Play.



App Store



Google Play



Pocket / Wallet Guide Checklist

Emergency Kit Checklist

Before anything else, be sure to have:

- Non-perishable food and water for three or more days (one gallon of water per person, per day)
- Battery-operated and/or hand-crank radio, extra batteries
- Emergency plan for your family or support network
- Flashlights and extra batteries

FOLD HERE

- First-aid kit
- Spare contact lenses or glasses
- List of prescriptions, allergies and prescribing doctor(s) and at least one week's supply of medicines
- Toilet paper, soap, plastic garbage bags, personal hygiene items
- Change of clothing, shoes, bedding and pillows

FOLD HERE

- Copies of important documents, such as insurance policies, identification and bank account records, in a portable waterproof container
- Necessary items for infants, elderly or disabled family members

PET SUPPLIES

- Medications, immunization records and a first-aid kit for pet

FOLD HERE

- Sturdy leashes, muzzles and harnesses
- Bedding, carriers or cages to transport pets safely
- Current photos of your pets
- Food, drinking water, bowls, cat litter/pan and can opener
- Information on feeding schedules, medical conditions, behavior problems, and name and number of your veterinarian

Where to Find Additional Help and Information

Traffic Information

Call 511
www.511Virginia.org

Virginia Department of Transportation (VDOT)

1-800-367-7623 (FOR-ROAD)
www.VirginiaDOT.org/hurricanes
f www.facebook.com/VirginiaDOT
t @VaDOT for statewide
t @VaDOTHR for Hampton Roads
t @VaDOTRVA for Richmond

Virginia Department of Emergency Management (VDEM)

1-866-782-3470
www.vaemergency.gov
www.ReadyVirginia.gov
In Spanish at www.ListoVirginia.gov
f www.facebook.com/vaemergency
t @VDEM

American Red Cross

1-800-733-2767
www.redcross.org
f www.facebook.com/redcross for national
f www.facebook.com/redcrossSEVA for Coastal Virginia Region
t @RedCross for national
t @RCCoastalVA for Coastal Virginia Region

Federal Emergency Management Agency (FEMA)

www.fema.gov

FEMA Hurricane Hazards Fact Sheet

www.fema.gov/hazard/hurricane

FEMA Kids Page

www.ready.gov/kids

FEMA National Flood Insurance Program

1-888-CALL-FLOOD
1-800-638-6620
www.floodsmart.gov

Your Emergency Contact Information



Ready Virginia is a statewide public education effort to prepare Virginians for all hazards. Ready

Hampton Roads is a regional initiative to increase the emergency preparedness of Hampton Roads residents.





The best source of emergency preparedness

information for your community is your local emergency manager. Links to local emergency management office websites are available at <http://go.usa.gov/TF6m>

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Emergency Contacts	Emergency Resources		
<p>Emergency Contact Name: -----</p> <p>Phone #: -----</p> <p>Emergency Contact Name: -----</p> <p>Phone #: -----</p> <p>Neighborhood Meeting Place: -----</p> <p>Out-of-Town Meeting Place: -----</p>	<p>Traffic Information Call 511 www.511Virginia.org</p> <p>Shelter Information Call 211</p> <p>Virginia Department of Emergency Management www.vaemergency.gov Toll-free line 1-866-782-3470 f facebook.com/vaemergency t @VDEM</p>	<p>American Red Cross 1-800-733-2767 www.redcross.org</p> <p>FEMA www.fema.gov</p> <p>Virginia Department of Transportation (VDOT) www.VirginiaDOT.org/hurricanes f www.facebook.com/VirginiaDOT t @VaDOT for statewide t @VaDOTHR for Hampton Roads t @VaDOTRVA for Richmond 1-800-367-7623 (FOR-ROAD)</p>	<p>For more tips on preparing your family, business and animals for an emergency, visit www.ReadyVirginia.gov.</p> <p>For information in Spanish, visit www.ListoVirginia.gov.</p> <div style="text-align: center;">   </div>

Appendix 3 – Watermen

You and your group members are acting as a group of watermen which will be having a discussion about how climate change could impact your success with catching blue crabs. You all live near the coast and have some prior knowledge about the blue crabs in our area. Discuss with your group members what you already know about blue crabs, for example when and where you catch them. Please write your discussion points in the space below:

-
-
-
-

Increased temperature, salinity, and runoff are projected with climate change and will affect water quality in our local area. The health and distribution of blue crabs could be affected by this change, impacting our local waterman. Please use the provided materials to help you answer the following questions. Look through all of the materials first; some of the materials are general information about blue crabs and maps of the Chesapeake Bay. Your discussion will then be reported to the class as a conclusion of the program in a discussion panel. Please ask the instructors should you have any questions.

Few points to consider:

1. Blue crab life cycle is highly regulated by salinity and water temperature.
2. Under water grasses are a very important habitat and nursery area for blue crabs.
3. Salinity and water temperature vary with each season.
4. Storm events bring in a lot of extra freshwater to the Chesapeake Bay and its tributaries.

Questions:

1. Where in the bay do blue crabs mate, and where do they spawn or release their offspring?
2. What is the salinity like in those regions during the season in which each event occurs?

3. Dissolved oxygen is very important for Blue crab survival. Where in the bay do we typically see a dead zone, or very low oxygen levels, in the summer months
4. What does this mean for the blue crabs and watermen? Do you know what causes this dead zone?
5. What is a blue crab "jubilee"?
6. The population of eel grass beds is declining in the Chesapeake Bay. Where in the bay can you find eel grass beds, what salinity and temperature range is best for this plant?
7. As water temperatures continue to increase in the Chesapeake Bay due to climate change, how could the eel grass be affected, and how could that impact the blue crab population.
9. Now that you have reviewed the materials and know the best temperatures, salinities, and habitats for blue crabs; in order to collect the most crabs, where is the best location to set the crab pots, and when would be the best time?
10. How could a large storm event influence and change the distribution of crabs over a short period of time?
11. How could the local waterman be impacted by climate change? What does this mean for our local economy?

Blue crab – *Callinectes sapidus*



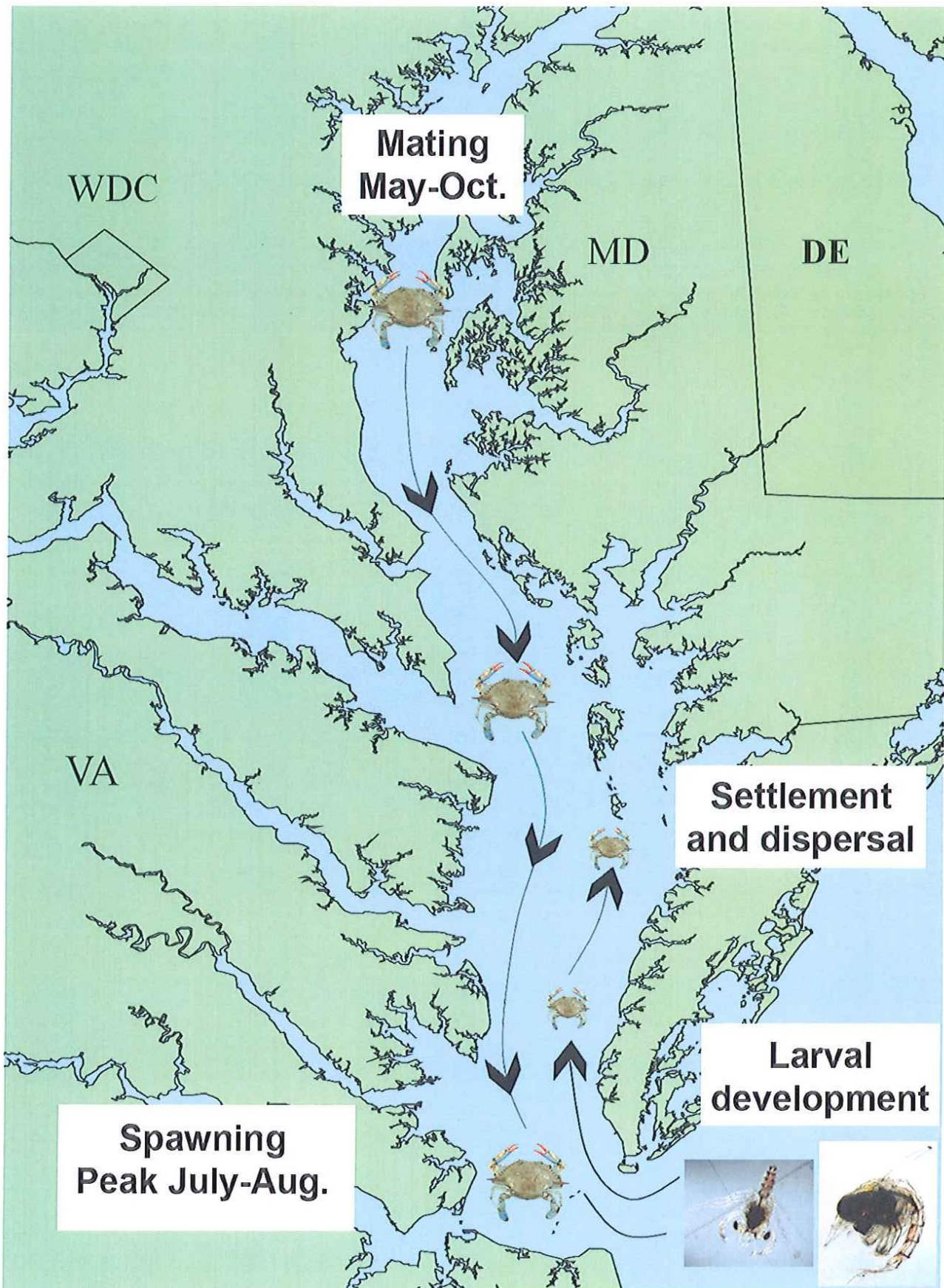
The blue crab is widely distributed along the Atlantic and Gulf coasts. It is a swimming crustacean with bright blue claws- the mature female's claws are tipped in red – and an olive to bluish green carapace. It is one of the most recognizable species in the Chesapeake Bay. Blue crabs are found in the Chesapeake Bay and its tributaries year-round. Their distribution varies with ages, sex, and season.

When air temperatures drop below 50°F (10°C), adult crabs leave shallow, inshore waters and seek deeper areas where they bury themselves and remain inactive throughout the winter. Blue crab growth is regulated by water temperature. Growth occurs when water temperatures are above 59°F (15°C). Water temperature above 91°F (33°C) is lethal. Blue crabs are susceptible to sudden drops in temperature. Salinity requirements vary by life stage for blue crabs, generally they do best in salinities of 3 – 15ppt. They can tolerate a pH range of 6-8, but anything less than 6 is lethal.

As both predator and prey, blue crabs are a “keystone species” in the Chesapeake Bay food web. Blue crabs are prey for fish and birds. Blue crab larvae are fed on by filter feeders like oysters and menhaden, as well as juveniles of other fish species.

Blue crabs also make up the most productive commercial and recreational fisheries in the Bay. It is estimated that more than one-third of the nation's blue crab catch come from the Chesapeake Bay. Blue crab mating occurs from June through October in the mid-Bay salinities during warmer temperatures. Mating takes place after the female molts. Males have a strongly tapered abdomen or apron that resembles a rocket ship. Mature females have a broad rounded abdomen. Immature females have a triangular abdomen.

The blue crab population is vulnerable to increased harvest pressure, as well as the effects of habitat loss. Reduced acreage of underwater bay grasses due to poor water quality and irregular weather conditions have contributed to the decline of the blue crab population. Bay grass beds provide important habitat for blue crabs by protecting juveniles, molting adults and feeding adults from predators. Predatory fish like striped bass and Atlantic croaker rely on juvenile blue crabs as part of their diet.



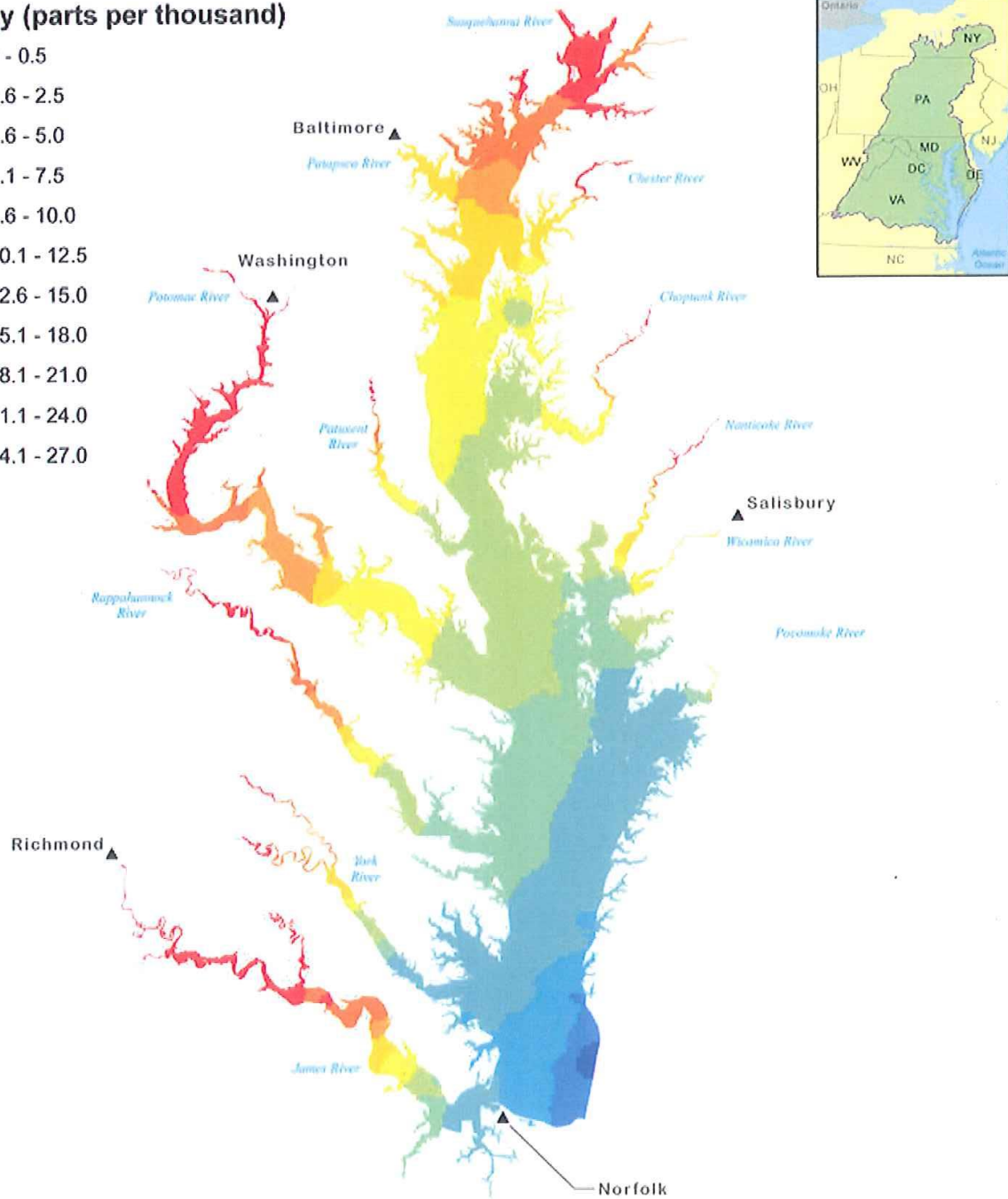
Source: Smithsonian Environmental Research Center,
http://serc.si.edu/labs/fish_invert_ecology/bluecrab/migration.aspx

Chesapeake Bay Mean Surface Salinity

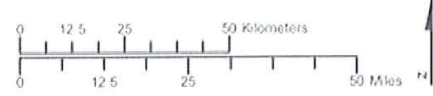
Spring (1985-2006)



Salinity (parts per thousand)



Data Sources: Chesapeake Bay Program
For more information, visit www.chesapeakebay.net
Disclaimer: www.chesapeakebay.net/terms_of_use.htm



Created by HW, 2/13/08

UTM Zone 18N, NAD 83

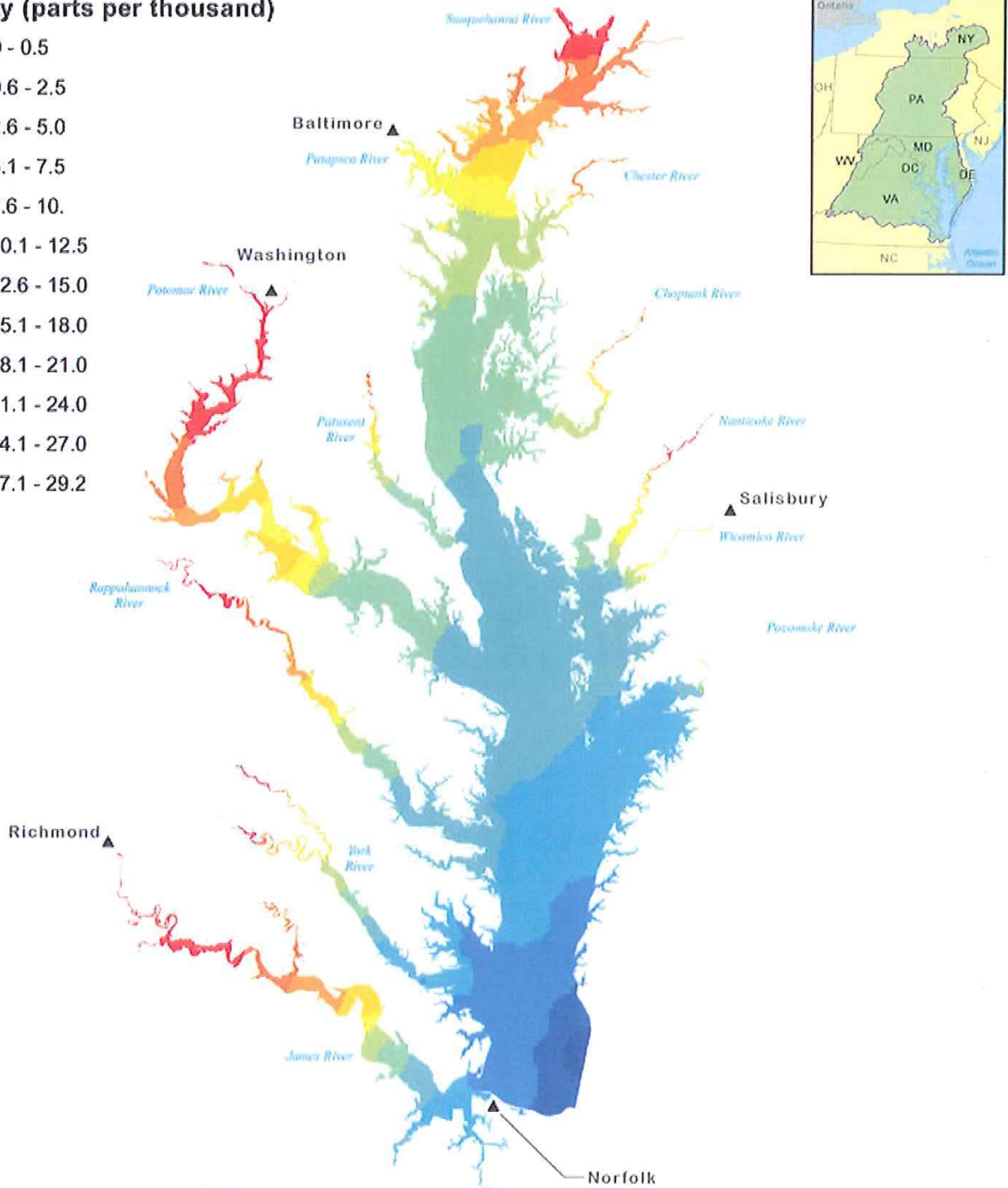
Chesapeake Bay Mean Surface Salinity

Fall (1985-2006)

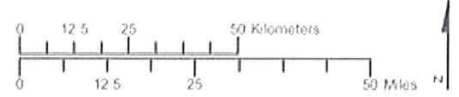


Chesapeake Bay Program
A Watershed Partnership

Salinity (parts per thousand)



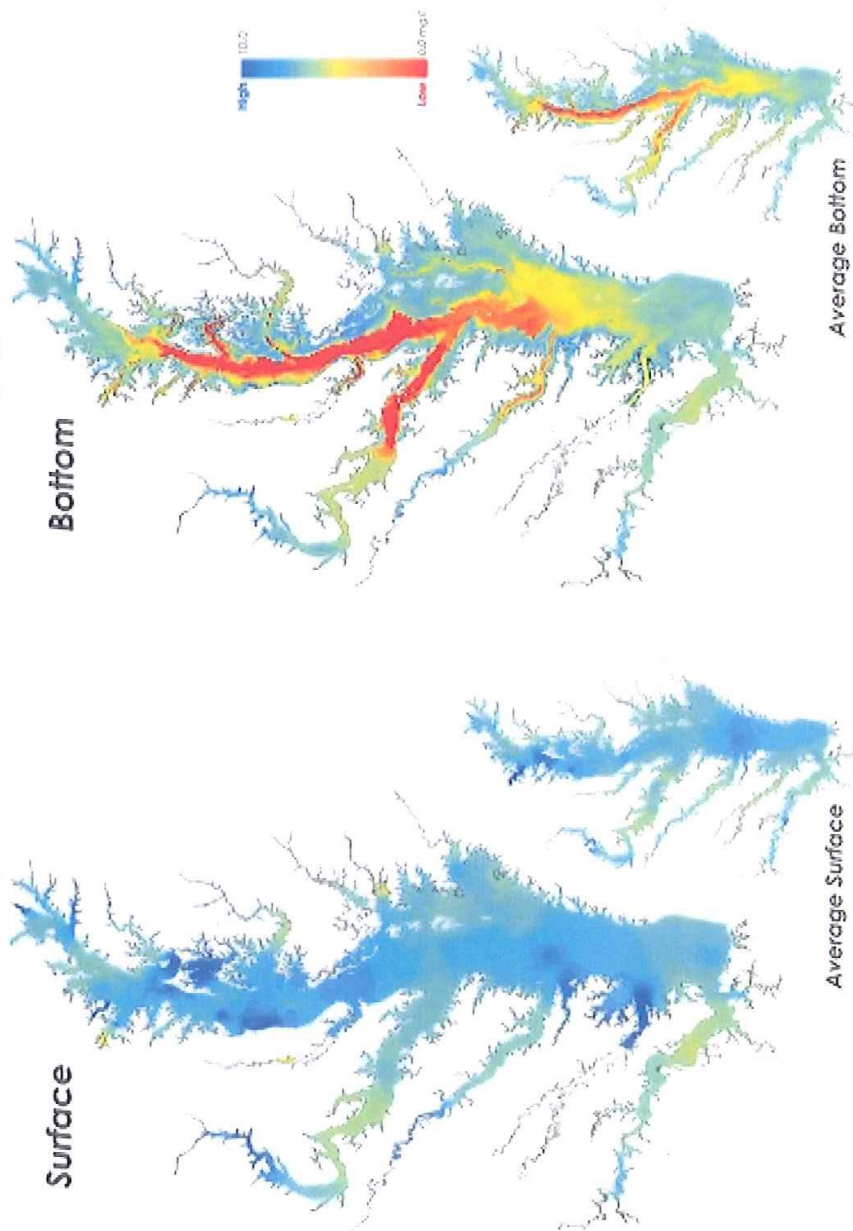
Data Sources: Chesapeake Bay Program
For more information, visit www.chesapeakebay.net
Disclaimer: www.chesapeakebay.net/termsfuse.htm



Created by HW, 2/14/08

UTM Zone 18N, NAD 83

August Dissolved Oxygen



Source: Chesapeake Environmental Communications, <http://www.chesapeake.com/>

CRAB JUBILEES



Kevin Fleming

Crabs crawl out of the water to get oxygen when dead zones force them ashore.

“Crab jubilees” are probably the most dramatic demonstrations of the effect of bad water quality on Bay life. The term sounds cheerful, but it is an ugly problem. Blue crabs and other organisms literally crawl out of the water seeking oxygen when wind and tide combine to force dead zones all the way to the shoreline. These “jubilees” probably occur a few times a year, but documentation is very poor.

At least two such events were documented in 2008. A July jubilee near Calvert Cliffs, in southern Maryland, was reported by ecologist Kent Mountford in the *Bay Journal*. And in late August, ferry riders in Portsmouth, Virginia, saw scores of blue crabs out of the water, clinging to pilings and docks, as dead fish floated in the water beneath them, according to the (Norfolk) *Virginian Pilot*.

The dead zone’s massive volume of water nearly devoid of oxygen fills the deeper sections of the Bay for about four months during the hottest time of the year. During this time the Bay is stratified into two distinct layers, a surface, oxygenated layer, and the deeper dead zone. Circulation between the two is limited due to temperature and salinity differences.

But the two water layers can move around, especially if the surface layer is driven by the wind. When the wind blows across the Bay it pushes surface waters away and draws deeper waters up

onto the shoulders of the channel and into shallow water. Crabbers working pots along the flanks of the main Bay sometimes have huge catches of crabs followed a day later by empty pots. This is when the timing is just right and they fish their pots as a mass of crabs and other organisms are moving toward shore ahead of advancing dead zone waters. If the timing is not ideal, those crabs can be trapped and overtaken by the suffocating water, and the crabber pulls up pots full of dead crabs.

Strong and protracted cross-Bay winds cause pronounced upwelling of the deeper, low-oxygen water that can draw dead zones all the way to the shoreline. Anything that needs oxygen (all fish and any mobile invertebrates like blue crabs) will move toward shore, eventually crowding at the water’s edge seeking oxygen. A host of sedentary or slow animals—including clams, oysters, mussels, mud crabs, and a variety of small bottom-oriented fish—are overtaken by the dead zone and either die or endure a period of stress until the waters recede.

Crabs are the lucky ones, because they can crawl out of the water and breathe air for a brief period. But when an otherwise hardy animal like a crab must leave the Bay because it can not survive, it should be obvious there is a serious problem. They call it a jubilee because people on the shore can easily collect a crab dinner. But it is anything but a joyous occasion for the crabs.

Bad Water and the Decline of Blue Crabs in the Chesapeake Bay

CHESAPEAKE BAY FOUNDATION, DECEMBER 2008 • cbf.org/badwaters

Eelgrass – *Zostera marina*



Eelgrass is a bay grass with long, ribbon-like leaves. Also known as submerged aquatic vegetation or SAV, bay grasses can be found in the shallow waters of the Chesapeake Bay and its tributaries. Lack of sunlight prevents their growth in deeper waters. Plant beds may be exposed for short periods during extreme low tides, but for the most part they do best only when entirely covered with water. They usually grow in shallow 1 – 3 ft. deep, sandy, salty tidal waters from 10 – 35ppt.

SAV provides important ecological services in the Chesapeake Bay by providing habitat for juvenile and adult fish, molting blue crabs, and shellfish, and by protecting them from predators. It also provides food for waterfowl, fish, and mammals. Bay grasses absorb wave energy and nutrients, produce oxygen, and improve water clarity. They help to settle suspended sediment in the water and stabilize bottom sediments. SAV is valuable to people because it provides good places for fishing, crabbing, waterfowl hunting, wildlife study, and bird watching and because it protects shorelines from erosion.

There has been a decline in recent decades in the amount and variety of submerged aquatic plants in the Chesapeake Bay and its tributaries. The loss of this important habitat can have drastic secondary effects on waterfowl, fish and other animals that depend on it for food shelter, or protections. Reasons for the decline include chemical additions from the runoff of agricultural fields, changes in normal temperature and salinities, destruction by cownose rays, disease and boat traffic. Because bay grasses are sensitive to pollution but quick to respond to improved water quality, their abundance is a good indicator of Bay health. Improving water clarity is the most important step in bay grass restoration.

In addition to murky water, rising water temperatures (one of the consequences of climate change) pose a threat to eelgrass in the Chesapeake Bay. This species can tolerate very cold water, growing as far north as the Arctic, but it cannot tolerate prolonged summer water temperatures above 25° C. The Chesapeake Bay, where summer water temperatures can reach 32° C or more, is near the southern limit of its range on the East Coast of the United States.

EELGRASS AND THE BLUE CRAB LIFECYCLE



Dr. Robert J. Orth
Professor of Marine Science
Virginia Institute of
Marine Science

"The eelgrass beds provide lots of cover. They are a key ingredient in the crab's life history."

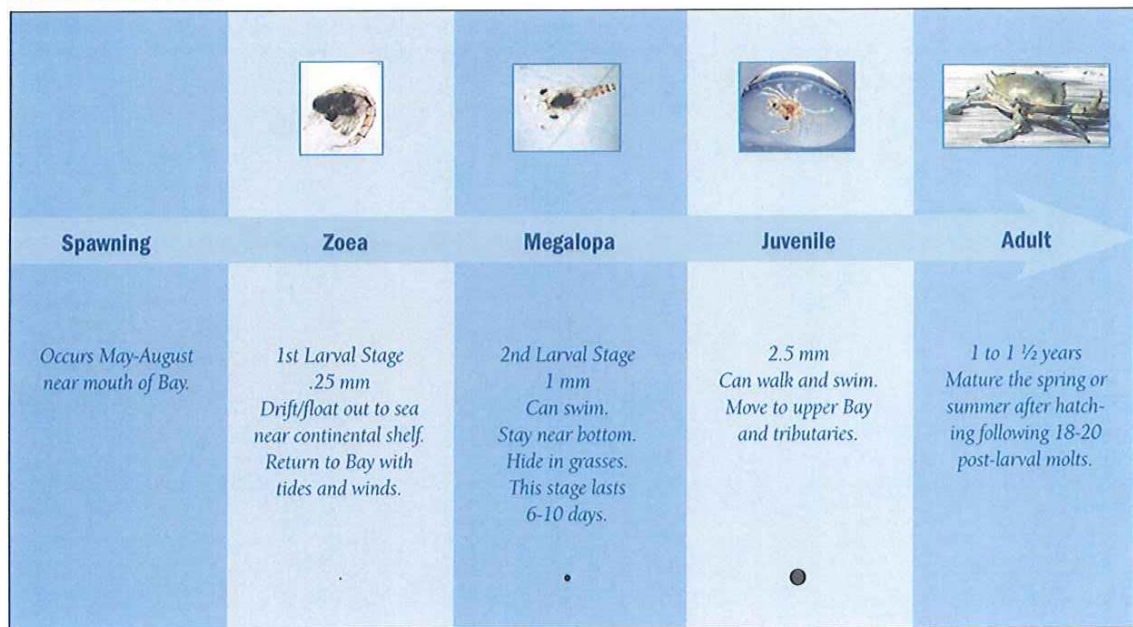
The disappearance of eelgrass is especially harmful to crabs because a crucial part of their lifecycle unfolds in the southern Bay, among these underwater plants with long, slender leaves.

Blue crabs spend the first months of their life as larvae, floating free in the Atlantic Ocean. (FIGURE 9) Then they are swept by currents into the southern Bay. At this point, they look like tiny lobsters and they are called megalopae. But essentially they are a form of plankton.

The megalopae settle out of the water column in the southern Bay into the eelgrass where they find shelter from predators like red drum and croakers. Without the hiding places, the megalopae would be gobbled up. Scientists have counted 30 times more young crabs in grass beds than on the barren bottom.²⁷

Eating smaller crustaceans that thrive in the grass, the megalopae molt and grow into juvenile crabs. Over a period of two or three weeks, the crabs molt about a half dozen times in the protective jungle of underwater plants. When they are big enough to move out—about a half inch—the crabs start migrating northward up the Bay, where many spend much of their lives.

FIGURE 9
CRAB LIFECYCLE



Bad Water and the Decline of Blue Crabs in the Chesapeake Bay

CHESAPEAKE BAY FOUNDATION, DECEMBER 2008 • cbf.org/badwaters

The retreat of eelgrass may hold an answer to the crucial question of why blue crab populations fell off after 1990 after being robust the previous half century.²⁸

While different varieties of grass in the northern Bay (some of them exotic species) have done well in recent years, they are not vital to the crab's survival. It is the eelgrass in the southern Bay that has significantly withered or died off since about 1990. (FIGURE 10)

However, the fact that crabs have been hurt by the disappearance of eelgrass—as well as nitrogen and phosphorus pollution and low-oxygen “dead zones”—does not mean that harvest pressure is not also an important issue.

If the Bay were healthier, it would support a larger total number of crabs. So if the watermen caught the same number they are taking out today, the percentage they would be landing would be lower—and it might not exceed the 46 percent level that scientists have identified as key for sustaining the species.²⁹

With a clean Bay, Maryland and Virginia might not be forced to impose as many new restrictions on crabbing. But when the crab population declines so steeply, the states have no choice but to step in and impose more limits. Because a polluted Bay holds fewer crabs, harvests must be reduced for this vital part of Chesapeake life to be sustainable.

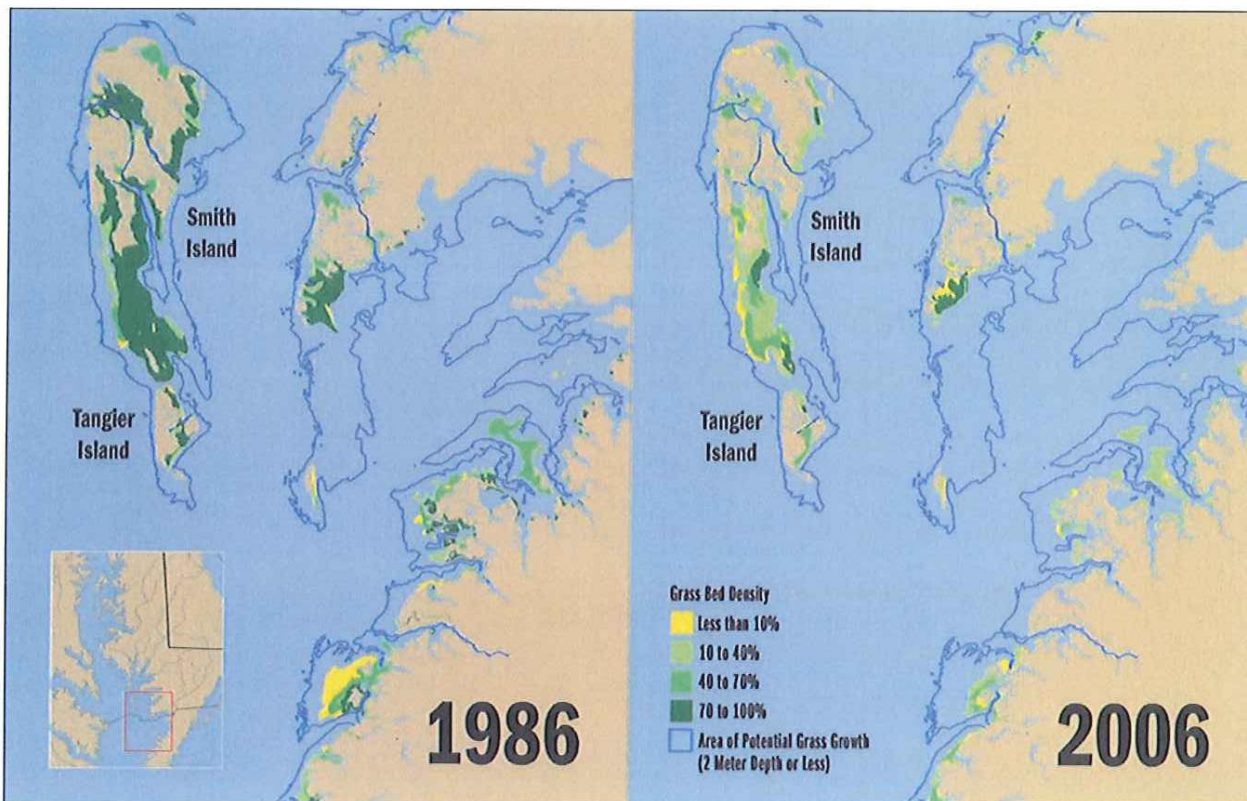
For this reason, watermen are becoming among the loudest advocates for a cleaner Bay.



Dr. Romuald N. Lipcius
Professor of Marine Science
Virginia Institute of
Marine Science

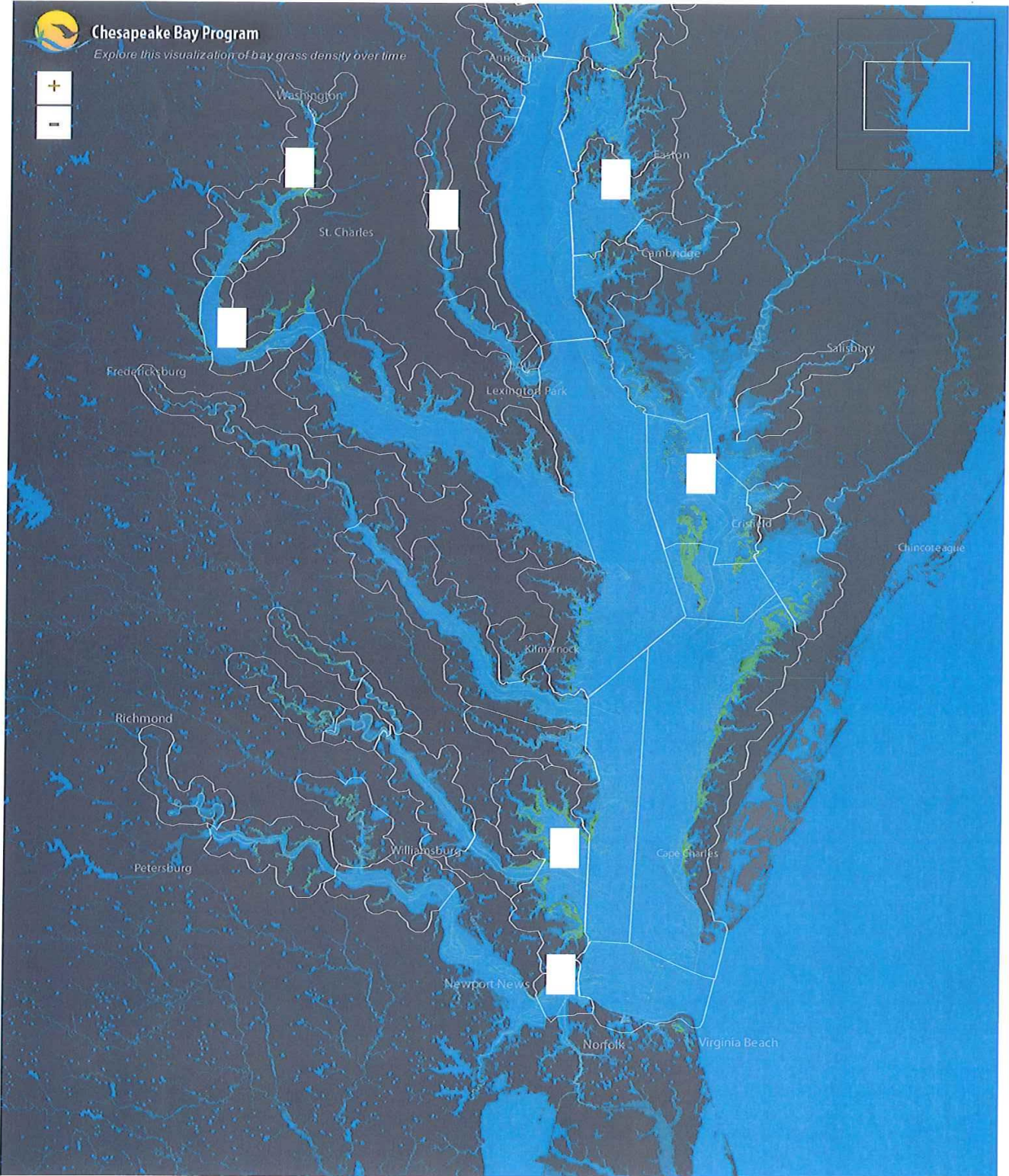
“Watermen are definitely victims of the degradation of the Chesapeake Bay...It’s a vicious circle they’re caught in....And that is an unfortunate consequence of a damaged environment.”

FIGURE 10
TWO DECADES OF AERIAL MAPPING REVEAL SHRINKING GRASS BEDS
IN THE SOUTHERN BAY



Source: Virginia Institute of Marine Science SAV Monitoring Survey

Bad Water and the Decline of Blue Crabs in the Chesapeake Bay
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Chesapeake Bay Grasses

[Learn more about this site](#)

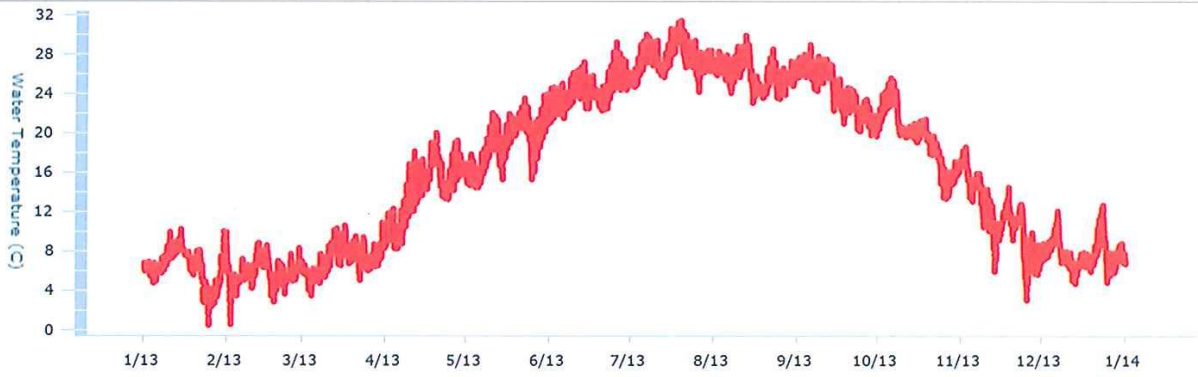
1985 1990 1995 2000 2005 2010 2012 patchy ← → dense i

Source: Chesapeake Bay Program, www.conservationgateway.org/Documents/CBF-BadWatersReport.pdf

NERRS Graphing Application

Map - Displaying Water Quality Stations

Graph



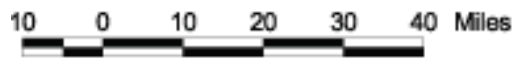
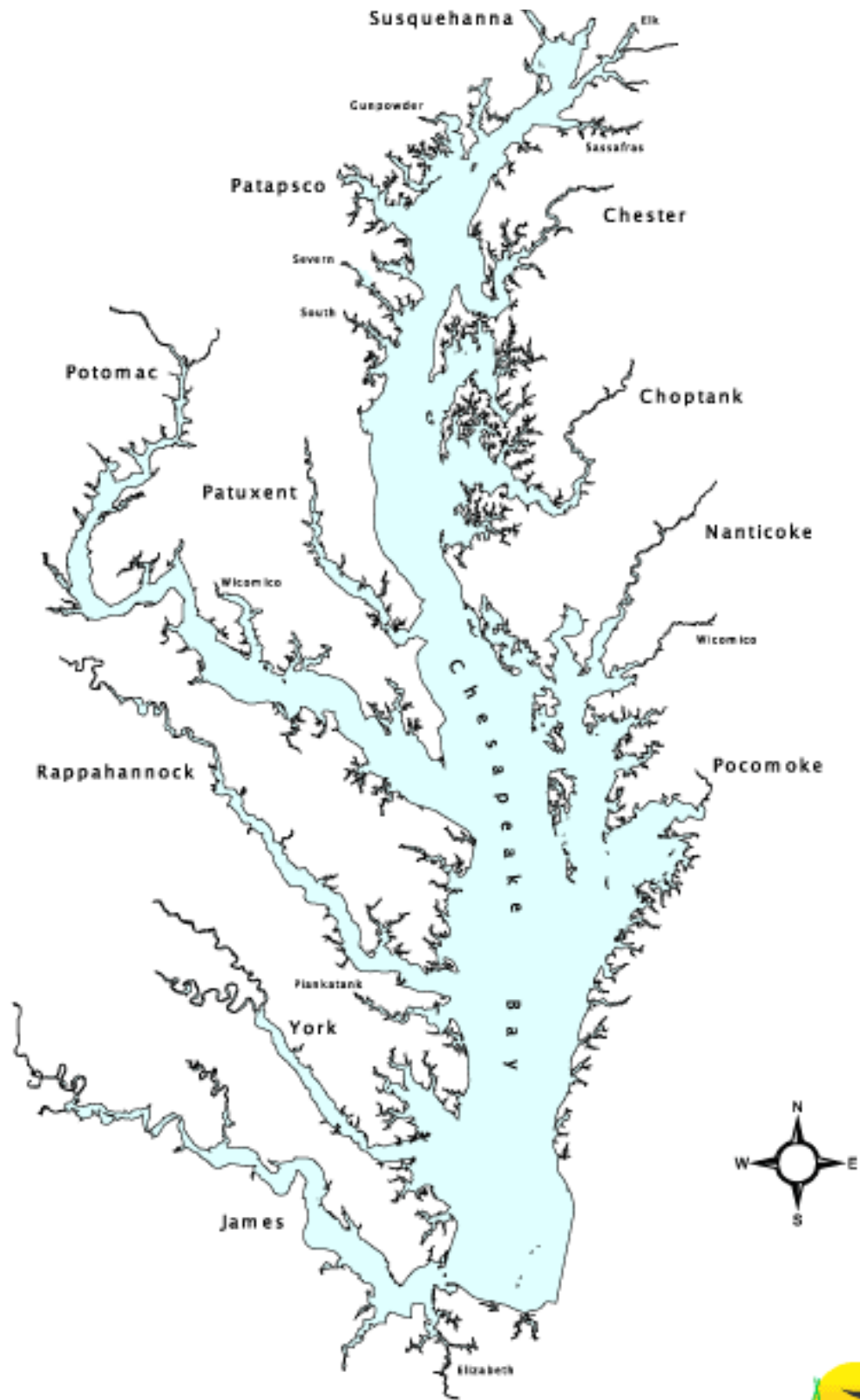
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● Water Temperature @ VA >> Chesapeake Bay >> Goodwin Islands

**To add a second parameter to the graph above click the Add Data button below

Water Weather Nutrients VA >> Chesapeake Bay >> Goodwin Islands

**To generate a graph first click on one of the markers on the map above or click the 'Add Data' button and choose your station and parameter!



Source: Chesapeake Bay Program, <http://www.cbf.org/about-the-bay/maps/major-tributaries-of-the-chesapeake-bay>