State of the Elizabeth River 2008

Prepared for

DEQ
Virginia Department of Environmental Quality

Prepared by

Elizabeth River Project
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*State of the Elizabeth River 2008*

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Prepared for
Virginia Department of Environmental Quality
Elizabeth River Monitoring Program
www.deq.virginia.gov
Contact: Roger Everett, 757-518-2150

Prepared by
The Elizabeth River Project
475 Water Street, Suite 103A, Portsmouth, VA 23704
www.elizabethriver.org
Contact: Joe Rieger, 757-399-7487

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Surely no other watershed on the Chesapeake Bay has been the focus of so intensive a restoration, by so many diverse partners, as the Elizabeth River in Southeastern Virginia over the last 11 years.

In 1996, compelling data told the first stakeholder planners, the original Watershed Action Team, to set the top priority at cleaning up some of the most contaminated river sediments in the world. From science to industry to non-profits and governments, the community has worked together to build tremendous momentum for “cleaning Elizabeth’s bottom.” Tackling a problem experts feared was insurmountable, four sediment remediations are now underway or in final planning, budgeted at more than $35 million.

Scorecards for 2008, developed by an advisory committee of scientists analyzing data made possible by Virginia Department of Environmental Quality’s Elizabeth River Monitoring Program and other data sources, once again call this strong partnership to new challenges. The data also confirms the original focus on bottom toxics, and identifies hard-won improvements in other areas.

- The data reports the dramatic decline of tributyltin (TBT) - probably the most lethal pollutant in the river. Regulations and industrial ingenuity have dropped the marine pesticide to all time lows in the Elizabeth. This toxin in the late 1980s was 20 times higher than current levels for this harbor river.
- Pointing out new directions needed, the data shows dissolved oxygen is too low to support healthy life during the summer in the Southern and Eastern branches. This challenge is related to a combination of elevated nutrient levels, poor flushing, and unnatural depth of the river.

*A newsroom photo of Elizabeth River Project staff celebrating a milestone in the clean up Money Point sediments, some of the most contaminated in the world. L to R: Robin Dunbar, Kathy Lawless, Joe Rieger, Dave Koubsky, Marjorie Mayfield Jackson and Pam Boatwright.*
For the first time, this State of the Elizabeth River report - the third prepared for the state by the non-profit Elizabeth River Project - provides data showing most of the river is not suitable for swimming. While important, this does not indicate a decline as prior reports did not analyze this data.

In fact, compared to other areas of the Chesapeake Bay, the Elizabeth shows the most positive trends for improving levels of nutrients in Virginia. Even though improving, the Elizabeth’s nutrient scores are still among the poorest on the Chesapeake Bay.

Although monitoring efforts currently do not focus broadly on living resources in the river, the data available shows the Elizabeth as a productive estuary demonstrating recovery in several areas.

- Data for oysters in the river shows the populations have increased significantly since the first restoration reef was created in the Elizabeth in 1989. An intensive effort by many partners has resulted in 15 reefs in this relatively small, 250-square mile watershed.
- The Elizabeth River Project, with partners ranging from industries to schools, cities and citizens, has restored 22 tidal wetland sites and planted at least 100 sites in native trees and shrubs - an intensive habitat restoration that is bringing the wildlife back.
- Scientists seining the river have found as many as 27 species of fish in restored wetlands.
- And bald eagles were reported nesting in Norfolk and Chesapeake for the first time in 2003, a sign that wildlife are finding habitat again in the watershed.

In regard to The Elizabeth River Project’s long-standing campaign, “the goo must go,” scientists have said from the beginning that the health of the Elizabeth River will not recover until some of the highest levels of bottom sediment contamination in the world are cleaned up. These levels still cause high rates of cancer in the resident mummichog fish, and leave areas on the river bottom with little to no life. While the health of the river bottom is still unacceptable, major progress is imminent through projects like the Money Point sediment remediation project, funded at $5 million by the Living River Restoration Trust and managed by the Elizabeth River Project. The project is in final planning to restore 19 acres of river bottom, four acres of wetlands and four acres of oyster reefs as the first community-led sediment cleanup project in the nation.

To the 2008 Watershed Action Team: Just point us in the right direction. The community restoring the Elizabeth River has demonstrated that we persevere with our top priorities.

The Virginia Department of Environmental Quality’s Elizabeth River Monitoring Program is one of the most robust for any river in Virginia. This report reflects trends in data collected by the program since 1997.
The big news here is not that the bottom of the river is in poor health. As expected, the Southern Branch of the Elizabeth scored the lowest on the Chesapeake Bay for how life is faring. Levels of PAHs (polycyclic aromatic hydrocarbons) in certain areas of the Elizabeth remain as much as 1,000 times the average in the Chesapeake Bay. The mummichog fish, selected as an "indicator species" similar to the canary in the coal mine for bottom health on the Elizabeth, exhibits up to 70 percent pre-cancerous lesions in the river.

Why is this exciting? Although you can't see the bottom of the river, it is the most important habitat for river life. When contamination is present, the bottom-dwelling community of worms, oysters, clams, crabs and other shellfish, along with bottom-dwelling fish like the mummichog, croaker and flounder are greatly reduced in numbers. In turn, larger fish, including the ones you may like to catch and eat have no food source. The ducks and wading birds you enjoy watching - blue herons; egrets - also depend on the bottom community for food.

For the last 11 years, The Elizabeth River Project's No. 1 priority has been to restore the health of the bottom of the river so the rest of the river will revive. Stay tuned as major projects near construction.

**Sediment contamination at Money Point includes some of the highest levels in the Chesapeake Bay. Red areas indicate the highly contaminated sediments. Funding is in hand to restore all of the site to the levels indicated in green. Source: SAIC.**

**The restoration plan for Money Point includes dredging all severe contamination and adding wetlands and oysters. The project, funded with $5 million by Living River Restoration Trust, is in the final planning phase. Source: SAIC.**
Restoration progress - bottom health

Most momentum on the Bay for cleanup of toxic sites

There is more momentum behind sediment cleanup in the Elizabeth River than anywhere else in the Chesapeake Bay. Sites underway or in final planning for cleanup include:

1) Money Point on the Elizabeth's Southern Branch, where The Elizabeth River Project and its sister non-profit, Living River Restoration Trust, have begun final design/construction to remediate 19 acres of some of the highest PAH contaminated sediments in the world, associated with former wood treatment industries in the area. About $5 million is in hand for the project. The US Environmental Protection Agency removed contamination from an upland site and a tidal ditch connected to the river to complement the off-shore efforts. The Elizabeth River Project completed a 10-year plan for Money Point in 2006 and multiple public and private partners are helping with the revitalization.

2) The US Army Corps of Engineers is in final design for a $3 - $5 million project to clean up 6 acres of sediments at Scuffletown Creek in Chesapeake. Requested by The Elizabeth River Project, this project won National Planning Achievement from the Corps in 2001 as the result of the diverse partners involved in the feasibility study for the site.

3) A site on the National Priorities List, Atlantic Wood Industries, next to the Jordan Bridge, is in final design by the US EPA for a $25 - $50 million cleanup in the next three to four years. The Elizabeth River Project is advising on redevelopment opportunities and community involvement.

4) The US Navy has removed metals and sandblast grit from a series of former landfills at Paradise Creek and the Southern Branch, and restored wetlands and wildlife habitat in place of the contamination. The Navy won a White House commendation for the progress along with Atlantic Wood and the Elizabeth River Project.

GOAL

2020: Make the "mummichog" well again, as a symbol for reducing contamination in the sediment to non-toxic levels in priority areas.

Elizabeth River Watershed Action Plan, 2002 revision

Money Point will be the first community sediment restoration project in the nation revitalizing this industrial shoreline on the Southern Branch in Chesapeake, Virginia.
Cancer in the mummichog - indicator for cleanup need

The health of a small non-migratory fish called the mummichog (Fundulus heteroclitus) is known to reflect the quality of habitat in which it lives. These tiny fish live among the marsh grasses along the edge of the river and because they are non-migratory, they spend their entire lives in a very restricted area. Mummichogs are sensitive to toxins and carcinogens and when exposed to elevated concentrations of contamination on the river bottom, such as polycyclic aromatic hydrocarbons (PAHs), they develop cancer in their livers. Because the mummichog reflects the condition of the habitat in which it lives, the Watershed Action Plan for the Elizabeth River (2002 update) adopted it to track the progress in cleaning up contaminated river bottom. It is expected that the high rates of cancer will be reduced as the river bottom is cleaned up.

Dr. Wolfgang Vogelbein, the Virginia Institute of Marine Science, tracks the health of this small fish. His most recent data shows that liver cancer is most prevalent in the industrialized portions of the Southern and Eastern branches. In the Southern Branch, high levels of liver cancer (both pre-cancerous and cancerous lesions) are correlated with contamination from former creosote facilities that polluted the river bottom with PAHs. Over 65% of the population sampled in 2001 off Atlantic Wood Industries, an old creosoting facility, showed pre-cancers and 9% liver cancer. In contrast, fish living in the more residential areas of the river (e.g., Western Branch and Lafayette River) do not have liver cancer and only show a baseline level of precancer.

Mummichogs (photo right) sampled at Western Branch and Lafayette River generally exhibit healthy livers (above), whereas fish inhabiting Eastern and Southern branches show high levels of liver cancer (left).

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Although you cannot see the Elizabeth River's bottom, it is one of the most important habitats in the river. Life that inhabits the bottom of the river is the foundation of the food chain and serves as a key indicator for environmental health. The communities of organisms living on the river bottom are referred to as "benthic" communities. These animals include clams, oysters, crabs, and worms which in turn serve as food for fish, birds, and mammals.

Because many of these species cannot move out of areas when conditions become unfavorable for life, these communities serve as environmental indicators of the health on the river bottom. Many spend their entire lives in the same place, permanently attached to rocks or buried in the river's muddy bottom. When environmental conditions are good, bottom dwelling animals will thrive; but when areas are polluted, few benthic organisms will be found in that area.

In turn, larger fish, including the ones you may like to catch and eat - spot, croaker, and flounder - have no food source.

The quality of the life on the bottom of the Elizabeth River has been studied for many years in the Elizabeth River by Old Dominion University's benthic ecologist, Dr. Daniel Dauer. A system called the Benthic Index of Biotic Integrity (B-IBI) has been developed to combine multiple important factors into one number to determine the river bottom health. Factors such as the number of species, density of species, and types of species are used to calculate the number. The score is then compared to established goals for benthic conditions in the bay and tracked over time to determine if areas are improving or deteriorating.

The long-term trends of the B-IBI from 1999-2005 showed improvement at one station in the main stem and Lafayette River. The Southern Branch is the most severely degraded branch of the river; however, one station there (at Gilmerton Bridge) showed improving trends 1989-2005. Meanwhile, data has also shown deteriorating trends at one station in the Western Branch (near City Park) and one in the Eastern Branch (near Harbor Park).

B-IBI, or Benthic Index of Biotic Integrity, measure species diversity and abundance on the river bottom. Scores for the Elizabeth River show little change between 2000 and 2005. However, four major cleanups are underway or in final design.
There are many different types of contaminants in the Elizabeth River; however, polycyclic aromatic hydrocarbons (PAHs) are the primary contaminants of concern because some hotspots in the Elizabeth River are over 1,000 times the average concentration found in the Chesapeake Bay. PAHs are toxic to aquatic life and are human carcinogens. PAHs make their way into the river from many different sources. In the Southern Branch of the river, four large historical wood treating plants which used creosote (the black tar found on telephone poles) contaminated the river bottom in front of their facilities. As a result, these areas now contain some of the highest levels of PAH contamination in the world. In addition, PAHs are generated by modern-day coal fired power plants, refuse burning facilities, coal importing facilities, and runoff from coal-tar based parking lot sealcoat.

The highly contaminated sediments in the river contain little life. The most recent data did not show any large reduction in sediment contamination in the Southern Branch and gave new indication that the industrialized portion of the Eastern Branch also has substantially high levels of PAH contamination which needs to be addressed. The data indicated that the Western Branch had the lowest levels of PAH contamination.
In very encouraging news, the Elizabeth River still boasts the most improving water quality trends for nutrients in the Chesapeake Bay region of Virginia. In fact, data shows that the river has the lowest percent of negative trends compared to other watersheds.

The data also suggests that the most dramatic improvement trend in the Elizabeth River is the consistently decreasing water concentrations, in all sections of the river, of tributyltin (TBT), a marine paint antifoulant that is probably the most lethal pollutant in the river.

On the other hand, water quality reports are less encouraging regarding some of the most basic needs for healthy river life, including dissolved oxygen. Also, improving water quality trends in the river have begun to level off in the last 5 years, showing less rapid improvement, while nutrient scores still are among the poorest on the bay.

Nutrients from runoff, wastewater, and industrial sources serve to reduce levels of dissolved oxygen in the river, along with poor flushing and unnaturally deep water from dredging. Significant efforts have been made to reduce nutrients to the Elizabeth River from these sources. Nutrient loads from waste water treatment plants have been significantly reduced since 1985. In addition, HRSD plans to spend $118 million over the next decade to upgrade sewage treatment facilities on the river, anticipated to significantly reduce nutrients from sewage sources.

Nutrients and dissolved oxygen deserve attention as a stakeholder team helps the Elizabeth River Project and the state revise the Watershed Action Plan in 2007-08.
The Elizabeth River Project’s “River Stars” program works with industries to achieve voluntary pollution prevention (P2) and wildlife habitat enhancement gains. The award-winning program, recognized as an international model, achieves results in wetlands, oyster reefs, wildflower meadows, and urban forests, as well as reduction of hazardous materials and treatment of toxic runoff. The participants include some of the largest public and private industrial facilities on the bay.

With 59 River Stars currently in the program and 17 at Model Level, the program has surpassed the 2007 goal of doubling the number of Model Level River Stars from seven in 2002 to 14 by 2007.

Since the program’s inception in 1997, River Stars have documented the reduction of pollution by 165 million pounds and the conservation or creation of 649 acres of wildlife habitat enhancement. Both P2 and habitat enhancement directly improve water quality.

The River Stars program is the voluntary complement to regulatory programs of agencies such as Virginia Department of Environmental Quality, whose TBT permit limit - the most stringent in the US - along with River Star innovative response - helped drive 2008’s most dramatic success story, the reduction of TBT.

Another encouraging water quality indicator is dissolved metals in Elizabeth River water. These were below the water quality standard established by the state in the 2003 State of the River Report and thus the state discontinued monitoring of these metals, harmful to aquatic life. However, future monitoring should be conducted to ensure concentrations are not increasing.

GOAL

2020: Engage River Star industrial partners to establish pollution prevention as the industrial ethic for the Elizabeth River watershed.

Elizabeth River Watershed Action Plan, 2002 revision

River Star industries like BAE Systems Norfolk Ship Repair (formerly NORSHIPCO) are doing their part for water quality through voluntary projects such as this wetland and oyster reef restoration. BAE has voluntarily restored five habitat sites.
State of the Elizabeth River 2008
Tributyltin (TBT) - dramatic success reducing the most potent toxin

Recent data show dramatic reductions throughout the river system for tributyltin (TBT), a marine pesticide that is probably the most harmful substance in the river.

TBT, potent for preventing barnacles that slow ships, also kills clams and oysters at extremely low levels. Other harmful effects include changing the sex of snails and whelks. Thanks to a combination of strict state permit limits for ship repair yards, innovative management systems invented by the repair yards, a ban on use of TBT on smaller vessels and reduced use of TBT around the world, the river now shows reductions in all branches. Dr. Michael Unger, head researcher on TBT at the Virginia Institute of Marine Science, reports "dramatic improvement" in the levels of TBT in the river based on comprehensive sampling from 1982 to the present.

Data reviewed for the State of the River showed that concentrations are nearing the target level of 1 part per trillion, the Virginia Water Quality Standard for the river. Since 2000, a six-fold decrease has been reported for the river. The industrialized areas of the Southern and Eastern branches still show the highest levels in the river, but have been upgraded from severely degraded to degraded status since 2002.

Paint containing TBT on this drydocked cruise ship was removed by BAE Systems Norfolk Ship Repair. The TBT was treated in a state-of-the-art facility to meet Virginia's stringent standards. This type of TBT management is part of a dramatic success story with reducing TBT in the Elizabeth River, a substance lethal to marine life at extremely low levels.
Dissolved oxygen - needs new emphasis.

If you have ever experienced shortness of breath at an extremely high elevation, this is similar to daily life in the summer for creatures trying to breathe in the Elizabeth River. Dissolved oxygen is necessary for all fish and other aquatic animals to live. Striped bass, American shad, and hard clams, common in the Elizabeth River, need between 5 and 4 milligrams per liter of dissolved oxygen. Levels in the river often fall below 5 milligrams per liter during the summer in the Southern and Eastern branches of the Elizabeth.

While other creatures need less oxygen - crabs at least 3 milligrams per liter; spot 2 milligrams, and worms 1 milligram per liter - at certain times in 2005, dissolved oxygen levels in the Southern Branch of the Elizabeth River dropped below 2 milligrams per liter. This level of oxygen is stressful even to those animals that are tolerant to lower dissolved oxygen levels. Fish kills can occur when oxygen levels fall below 1-2 milligrams per liter.

The Southern Branch of the Elizabeth has the poorest record on the Chesapeake Bay for dissolved oxygen, with a 75% exceedence rate of the Bay Program’s dissolved oxygen water quality standard, according to the Virginia Department of Environmental Quality reports.

Past trends show improving dissolved oxygen levels; however, current data suggest that this trend may be leveling off. Strategies to increase dissolved oxygen deserve a new look as the Elizabeth River Project and the state revise the Watershed Action Plan in 2007-08.

Scorecard - Dissolved Oxygen

Main Stem - Degraded
Lafayette River - Degraded
Western Branch - Degraded
Eastern Branch - Severely Degraded
Southern Branch - Severely Degraded

Dissolved Oxygen in Summer

During the summer months, the Southern and Eastern branches of the Elizabeth River have dissolved oxygen levels considered to be a severe problem because they could be stressful to a variety of river life.

Dissolved Oxygen in Non-Summer Months

However, during the non-summer months, dissolved oxygen levels in the river are good to marginal. Colder water holds more oxygen. Maps provided by Virginia Department of Environmental Quality.
Nutrients need focused attention in the Elizabeth, as in the bay.

One large factor leading to low dissolved oxygen levels in the Elizabeth River is high nutrient levels. These levels are partly the result of runoff from intense recent development activity on the Elizabeth River and lower Chesapeake Bay. Development increases “impervious” or hard surfaces that do not absorb rain. The rainfall in turn washes toxics and nutrients, such as fertilizers, directly into the river. One nutrient, nitrogen, causes algae to bloom. When the algae die, they fall to the river bottom where microbes deplete dissolved oxygen to breakdown the dead material. As a result, dissolved oxygen in the river is reduced to levels difficult for fish to survive. Elizabeth is much deeper than it would be naturally because of dredging to accommodate large vessels. The deeper water and poor flushing make it difficult for waters to re-oxygenate.

Data for this report indicate that the Elizabeth River shows the greatest number of positive nutrient trends in the Chesapeake Bay region of Virginia, indicating that nutrient levels are decreasing in some areas of the river. Nonetheless, nutrient levels increased at some of the monitoring stations in the Eastern, Western, and Southern branches of the river. Overall the Elizabeth may have the highest percent of positive nutrient trends; however it still has some of the highest nutrient levels in the entire Chesapeake Bay, indicating a need for focused attention.

In addition to nutrients, other factors such as deep water and poor flushing characteristics of the Elizabeth River result in low dissolved oxygen levels. The

Scorecard - Nutrients

Main Stem - Degraded
Lafayette River - Degraded
Western Branch - Degraded
Eastern Branch - Severely Degraded
Southern Branch - Severely Degraded

Steve Earley / The Virginian-Pilot

Algae blooms covered much of the Main Stem of the Elizabeth in late summer 2007. Excessive nutrients lead to algae blooms, which in turn deplete the dissolved oxygen that is needed for aquatic life to thrive.
Bacteria: A human health concern

Because of high concentrations of bacteria and other contamination, the harvest of clams and oysters in the Elizabeth River has been closed since the mid-1920s. These bacteria also make swimming inadvisable in most areas of the river.

Bacteria such as fecal coliforms and enterococci find their way to the river through contaminated stormwater drains, sewer overflows, sewage treatment plants, and animal waste.

Enterococci concentrations are used by the State of Virginia to assess if waters are swimmable. These bacteria are found primarily in the intestinal tracts of mammals and birds. They are released into the environment through human and animal feces and enter the river in stormwater runoff. Only a few areas in the main stem and near the mouth of the Lafayette River have low enough concentrations of bacteria to allow for safe swimming.

For both fecal coliform and enterococci, the smaller residential creeks and inlets in the Elizabeth have higher concentrations due to a smaller volume of water, less flushing and, in part, runoff of animal feces from backyards and wildlife. One way you can help reduce bacteria in our local waterways is to always scoop your pet’s poop!

The stakeholder team revising the Watershed Action Plan for the Elizabeth River may want to study the progress of the Charles River in Boston, the first urban river in America to achieve “swimmable, fishable” goals. Bacteria levels have improved there from a score of D- to B+. All the stations except one exceed the 10% bacteria violation rate and therefore are not suitable for swimming due in part to high levels of enterococci. Many of the stations are in small tidal creeks which typically show higher levels of bacteria.

Scorecard - Bacteria
Main Stem - Degraded
Lafayette River - Degraded
Western Branch - Degraded
E. Branch - Severely Degraded
S. Branch - Severely Degraded

None of the stations passed Virginia’s established bacteria level for shellfish consumption; however, some stations were close to reaching an acceptable level of bacteria.

Swimmers like these are at risk from bacteria in most of the Elizabeth River.
Since World War II, the Elizabeth River watershed has lost more than 60 percent of the wetlands and forests that once lined the shores. Because of these critical losses, the Elizabeth River has been the target of probably the most intensive habitat restoration in the Chesapeake Bay region.

The Elizabeth River Project pioneered tidal wetland restoration, with 22 wetlands restored in partnership with the community since 1995. In addition, many partners have worked together, with the Chesapeake Bay Foundation in the lead, to restore the largest number of native oyster reefs of any urban area on the Chesapeake Bay. Fifteen reefs have been constructed throughout the river system, four by the Elizabeth River Project. Almost 100 native plant restorations have been conducted to restore a forested shore, absorb runoff and replace habitat. An Elizabeth River Project effort to restore the entire Paradise Creek subwatershed included more than 20 projects to conserve 250 acres, culminating with the purchase of land in 2006 for Paradise Creek Nature Park. The park will be a 40-acre demonstration site for wetland restoration and conservation education, in partnership with the City of Portsmouth.

While limited long-term monitoring currently tracks the animals which use these habitats, sporadic sampling efforts have found a wide diversity of fish, birds and shellfish using the Elizabeth River watershed. Virginia Marine Resource Commission’s annual oyster monitoring has shown that the restored reefs are self sustaining and naturally attracting the growth of oysters on the restored reefs.

And the eagle, symbol of the nation, is now reported nesting in Norfolk and Chesapeake!
Restoration progress - living resources
A community takes responsibility - from industries to schools

Here’s how progress looks when the goal is to restore habitat in one of America’s intensely industrialized watersheds: The country’s largest and oldest naval shipyard, instead of paving over a toxic landfill to cap the contamination, digs up the “goo” and replants it as a lush wetland.

Across the Elizabeth River watershed, in between shipyard drydocks, next to cement storage silos, alongside busy highways, a total of 649 acres of wildlife habitat have been restored or conserved by industrial partners alone since 1997, the year The Elizabeth River Project launched its River Stars program to encourage voluntary stewardship by business partners.

Meanwhile, the rest of the community, from private citizens to city partners, was also doing its part. Cities became partners in signature wetland restorations - Birdsong Wetland and Pescara Wetland in Norfolk; and Oscar’s Landing in Chesapeake - The Corps of Engineers joined the partnership with more than 20 more wetlands planned.

Citizen backyard habitats are inspired by The Elizabeth River Project’s Wildlife Habitat Guide for Restoration and Landscaping ($10 suggested donation, 399-RIVR), offering guidance to select plants native to Hampton Roads for maximum habitat value.

GOAL

2020: Create 10 miles of Elizabeth River “corridors” - contiguous green shoreline - with sections in all river cities. Enlist River Star facilities along the corridors.

Elizabeth River Watershed Action Plan, 2002 revision

The Elizabeth River Project in 2007 helped students grow wetland plants in the classroom (top left). Father and son plant native shrubs to enhance the shoreline at Earl Industries (lower left). The diversity of fish shown above is a testament that wetland restorations by industries, government and citizens are making a difference. The 18 species of fish were caught in year-old wetlands that replaced a former toxic dump at Atlantic Wood.
The Elizabeth River watershed boasts one of the densest restorations of oyster reefs anywhere in the Chesapeake Bay. Within the 200 square mile watershed, 15 reefs have been constructed by partners ranging from Chesapeake Bay Foundation and Norfolk Rotary Club to Elizabeth River Project to Virginia Marine Resources Commission. Because of these restored reefs, the Elizabeth is an area where native oysters appear to be sustaining a consistent population from year to year. They are now seen growing on every piling, where 10 years ago one would be hard pressed to find any growing throughout the river.

American oysters (Crassostrea virginica) are essential to the health of the Chesapeake Bay and the highly urbanized Elizabeth River. The Elizabeth River reefs can be found along the river's shores at the edges of marshes. These living siphons can filter 60 gallons of water a day, reducing sediments and pollutants in the water. Oyster reefs also form three-dimensional structures, offering homes for over 300 different species. Some animals living on oyster reefs include crabs, gobies, blennies, and toadfish.

Oyster monitoring data show a substantial increase in oysters throughout the Elizabeth River watershed. Data reflect the adult oysters only and not spat recorded on the restored reefs. Over the last century, the oyster population in the Chesapeake Bay and the Elizabeth has been reduced by as much as 99 percent. Environmental stressors causing this decline include over harvesting, disease and pollution. Past harvesting techniques flattened reefs resulting in less than optimal population levels for reproduction. Two introduced parasites, MSX and Dermo, have taken a toll on oyster populations. While these factors still plague oyster populations, results seen in the Elizabeth River show that large-scale restoration is effective in jump-starting a local population of oysters.
Fish show a rich diversity of species

Despite the Elizabeth River’s many problems, the river harbors numerous species of fish which live among the wetlands and oyster reefs. The Virginia Institute of Marine Science sampled the river for fish and crabs in 1999 and 2000 in the Western Branch and Main Stem and found over 27 species, including: summer flounder, spotted sea trout and Atlantic menhaden.

During a fish sampling trip in the Southern Branch in 2005, 20 species of fish were recorded at the mouth of Paradise Creek adjacent to an oyster reef restored by the Elizabeth River Project; and more than 1,300 fish were caught in a recently restored 1.3 acre wetland at Atlantic Wood Industries. The diversity of this sampling included red drum, silver perch, white perch, and striped bass. This diversity showed that the restored habitats are supporting a viable population of fishes.

Nonetheless, the Virginia Department of Health has placed a fishing advisory for the lower part of the Chesapeake Bay, including the Elizabeth, recommending no more than two meals per month of striped bass, due to PCB levels. In addition no more

The Elizabeth River boasts a great diversity of fish and marine life. This is shown by sampling efforts that recorded up to 25 species of fish. Many of these species use wetlands and oyster reefs as habitat. than two meals per month of spot, croaker, and white perch should be consumed from the Elizabeth River. There are no advisories for mercury or pesticides in Elizabeth River fish.

Walter Priest, NOAA (R), and John McCloskey (L), National Fish and Wildlife Service, join the Elizabeth River Project to seine Paradise Creek to identify fish using newly restored wetland and oyster habitats. Paradise Creek is the focus of a five-year sub-watershed plan to restore the creek as a model for the bay. More than 80 young striped bass were captured at the site. Walter Priest (above right) holds up a puppy drum caught while seineing.
Tidal wetlands of the Elizabeth are the tall grasses along the shoreline which are flooded by the tides twice a day. These areas may be more productive ecosystems than rainforests. A great variety of fishes, crabs, birds, shellfish, insects and other life use these habitats for feeding and shelter. The wetlands also filter contamination from the upland areas before it enters into the river. They act similar to an air filter in your house which pulls dirt out of the air except wetlands pull the dirt and nutrients out of the water.

The Elizabeth River Project and partners have restored more than 22 wetland sites along the river since 1995. Some of these sites were once toxic dumps which have been converted to healthy wetlands which wildlife populate now.

A wetland at the Hermitage Museum in Norfolk was eroding, threatening the historic wall and providing severely degraded habitat (above left). Community partners restored the wetland and in a year’s time, the marsh was once again thriving (right). Funds were provided by NOAA through a Living Shorelines program of the Small Watershed Program, Chesapeake Bay Program. The museum now conducts educational programs regarding the value of wetlands.

Students from Western Branch Middle School (above) help plant wetlands at Hermitage Foundation Museum as a school project which included growing wetland plants in the classroom.
Eagles and pelicans rebound - symbols of hope

The bald eagle was placed on the federal list of endangered species in 1967, due to the extensive use of the pesticide DDT. This chemical made the eagle's eggs so fragile that when the parents attempted to incubate the eggs, they would break. In 1972, the first comprehensive eagle survey was conducted throughout the State of Virginia, documenting only 32 pairs of eagles. However, after being protected on the endangered species list and after a national ban was placed on DDT, the bald eagle populations statewide have seen an extensive increase with 469 pairs recorded in 2006.

In 2003, eagle nests were reported for the first time in the cities of Norfolk and Chesapeake. Two to five nesting pairs have been reported in the watershed each year since.

Along with the return of the bald eagle are other large birds such as the osprey and brown pelican, mascot of the Elizabeth River Project. Absent from the Elizabeth before the late 1980's, the brown pelican symbolizes the Elizabeth River Project’s hopes for the river’s rebirth.

The eagle data was compiled from the annual Virginia bald eagle survey conducted by the Center for Conservation Biology at the College of William and Mary (http://www.ccb.wm.org).

In 2003, nesting eagles were reported for the first time in Norfolk and Chesapeake. Brown pelicans (above) have made a dramatic comeback on the Elizabeth River and East Coast.
Acknowledgements
State of the Elizabeth River 2008

State of the Elizabeth River 2008 Advisory Committee
Alex Barron - Virginia Department of Environmental Quality
Harry Bennett - Portsmouth Health Department
Kristie Britt - Virginia Department of Environmental Quality
Robert Croonenberghs - Virginia Department of Health, Shellfish
Sanitation
Daniel Dauer - Old Dominion University
Roger Everton - Virginia Department of Environmental Quality
Jeffery Goodchild - Chesapeake Health Department
Will Hunley - Hampton Roads Sanitation District
Marjorie Jackson - The Elizabeth River Project
Larry Johnson - US Environmental Protection Agency, Region III
Demetria Lindsay - Portsmouth Health Department
Lennie Luke - City of Chesapeake
Tom Modena - Virginia Department of Environmental Quality
Mike Nickelsburg - The Elizabeth River Project
Jim Plell - Hampton Roads Sanitation District
Walter Priest - National Oceanic & Atmospheric Administration
Joe Rieger - The Elizabeth River Project
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Ram Tripathi - Virginia Department of Health
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Data reports available at www.elizabethriver.org

Principal author
Joe Rieger

Editor
Marjorie Jackson

Graphic design
Pam Boatwright

“The river is the livelihood of our industries and as a result we should serve as her stewards.”

J. Robert Bray
Executive Director Emeritus
Virginia Port Authority

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