



# Section 319

# NONPOINT SOURCE PROGRAM SUCCESS STORY

# Virginia

## Implementing Stormwater Practices Reduces Bacteria in Shellfish Beds

### Waterbody Improved

Elevated fecal coliform (FC) levels in Virginia Beach's Lynnhaven Bay, Broad Bay and Linkhorn Bay violated Virginia's FC water quality standard in shellfish-supporting waters and prompted the Virginia Department of Health (VDH) to condemn these waters' shellfish beds for harvest in 1998. As a result, the Virginia Department of Environment Quality (VDEQ) listed these three waterbodies on Virginia's 1998 Clean Water Act (CWA) section 303(d) list of impaired waters for FC bacteria. Virginia Beach and its partners implemented numerous best management practices that reduced FC bacteria and allowed the impaired waters to achieve the FC standard for shellfish waters. VDEQ proposes to remove these three waterbodies from the 2010 CWA section 303(d) list of impaired waters for FC.

### Problem

The 64-square-mile watershed area draining into Lynnhaven, Broad and Linkhorn bays is entirely within the city of Virginia Beach, in southeastern Virginia at the southern shore of the mouth of the Chesapeake Bay, near Cape Henry (Figure 1). The three bays once supported a thriving and renowned shellfishing industry. By the early 1980s, however, shoreline development, overharvesting and pollution had decimated the local shellfish beds. In April 1998 the VDH Division of Shellfish Sanitation (VDH-DSS) condemned a number of shellfishing areas, including those in the three bays.

Data collected by VDH-DSS between January 2001 and February 2003 show violations of Virginia's FC bacteria standards and criteria for the production of edible and marketable natural resources. The two-part standard for FCs in waters for direct shellfish harvest is a geometric mean no greater than 14 most probable number (MPN) FC/100 milliliters (mL) and an estimated 90th percentile no greater than 49 MPN/100 mL for the most recent 30 consecutive samples. Because they failed to meet standards, VDEQ added Lynnhaven Bay, Broad Bay and Linkhorn Bay (totaling 5.77 square miles) to Virginia's 1998 CWA section 303(d) list of impaired waters for FC bacteria in shellfish-supporting waters.

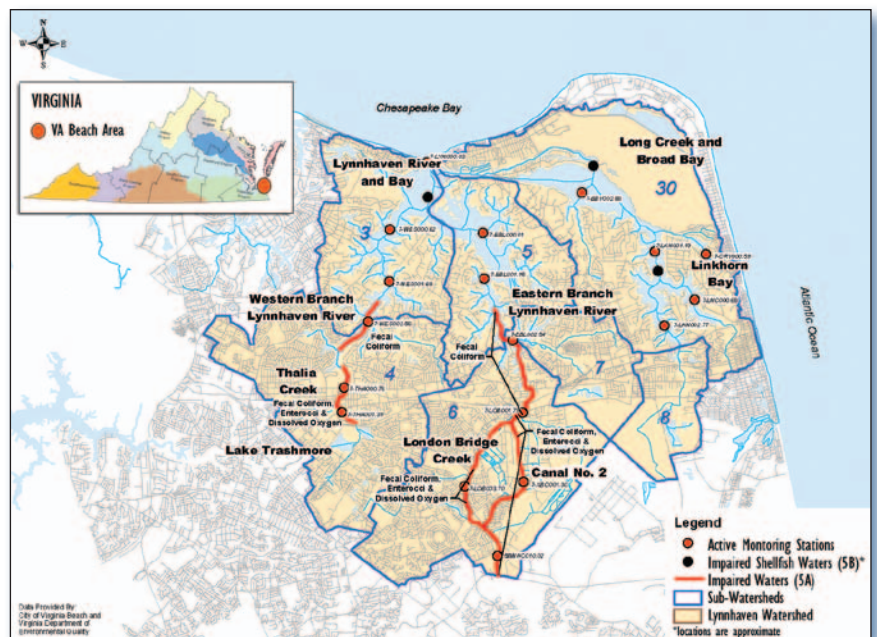


Figure 1. Virginia Beach's Lynnhaven Bay watershed includes three waterbodies listed in 1998 as impaired for shellfishing use (see black dots).

VDEQ completed a total maximum daily load (TMDL) study for the Lynnhaven Bay, Broad Bay and Linkhorn Bay watersheds, which the U.S. Environmental Protection Agency (EPA) approved in 2004. The TMDL identifies both point and nonpoint sources of FC bacteria. Nonpoint sources of bacteria include failing septic systems,

sanitary discharges from boats, improper pet waste disposal practices, exfiltration from existing sewer lines, sanitary sewer overflows and sheet flow runoff from lawns and urban areas. Natural sources of FC bacteria include migratory and resident birds along with the natural mammalian populations, which are estimated to occupy 30 percent of the watershed area.

## Project Highlights

In 2006 numerous partners collaborated to develop a TMDL implementation plan. Virginia Beach took the lead in implementing the plan, including retrofitting many of its sewage pump stations with generators that will alleviate the impact of power disruptions during extreme storm events; constructing wet ponds, extended detention ponds and wetlands; creating seven oyster reefs; revegetating 2,800 feet of riparian buffers (including 15 shoreline buffer projects, 6 stormwater projects, 4 school projects and establishing extensive greenways); using antimicrobial mats in stormwater pipes; installing three solar aerators in each of two stormwater impoundments; and building one fish ladder and five outfall sediment traps.

Additionally, the city focused staff and financial resources on reducing and preventing sanitary sewer overflows. The city performs smoke testing of the sanitary sewer system and installs manhole inserts and cleanout plugs to prevent stormwater inflow. The city has also developed an ongoing and intensive campaign to connect properties to the public sewer. In fact, Virginia Beach requires that all properties be connected to public sewers where the service is available. Moreover, the city aggressively pursues repairs of its sanitary sewer systems using a “find and fix” approach.

The city successfully sought and advocated that EPA establish a “no discharge zone” for the Lynnhaven watershed, reducing bacteria and nutrient inputs from boats. The boating public embraced the requirements through the efforts of a citizen advocacy group called Lynnhaven River 2007 (now called Lynnhaven River NOW). Its education and publicity campaigns advocated for the availability of sanitary pump-out facilities at city and private marinas. Partnering with Lynnhaven

River NOW, the city undertook an extensive public education campaign that included installing watershed and storm drain identification markers and conducting an education campaign targeted at pet waste management.

## Results

These efforts significantly reduced FC counts. All three bays are meeting water quality standards (Table 1) and their designated shellfishing uses. In November 2007 state Health Commissioner Robert B. Stroube of VDH lifted the shellfish condemnation of 1,462 acres within the three waterbodies (effective November 26, 2007). VDEQ expects to remove them from Virginia’s CWA section 303(d) list of impaired waters for FC bacteria in 2010.

## Partners and Funding

The comprehensive implementation strategy cost approximately \$6 million. Virginia Beach funded the majority, spending \$4.6 million alone on retrofitting sewage pump stations with generators. Since it began building sewers in the Lynnhaven watershed in 1975, Virginia Beach has spent approximately \$180 million on sewer extensions and sewer rehabilitation and repairs. VDEQ funded the development of both the TMDL and implementation plan using approximately \$35,000 of CWA section 319 funding provided by the Virginia Department of Conservation and Recreation.

**Table 1. Water quality summaries for Lynnhaven, Broad and Linkhorn bays in 2003 and 2008.**

Location	February 2003		September 2008	
	Geometric mean (MPN/100 mL)	90 <sup>th</sup> Percentile (MPN/100 mL)	Geometric mean (MPN/100 mL)	90 <sup>th</sup> Percentile (MPN/100 mL)
Area 70: Lynnhaven Bay	25	264	6.7*	35.1*
Area 71: Broad and Linkhorn Bays	10.9	90.8	4.8*	27.7*

Source: VDEQ

\* Meets water quality standards, which require a geometric mean of no greater than 14 MPN /100 mL and an estimated 90<sup>th</sup> percentile of no greater than 49 MPN/100 mL.



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