

WILLARD BEACH WATERSHED ASSESSMENT EFFORTS (8/10/23)

Introduction

South Portland is largely defined by its close proximity to water, particularly the Fore River and Casco Bay. Consequently, Willard Beach is an important community resource given that it is the only publicly accessible swimming beach in the City. It is also a popular year-round destination for visitors from the greater Portland area and beyond.



To protect and preserve this vital coastal amenity, the City has been partnering with the Maine Healthy Beaches (MHB) Program **since 2003** on regular [beach water quality monitoring](#) during the summer months. MHB uses enterococci to indicate the potential for fecal contamination from sources such as wildlife, dogs, and humans (enterococci results do not distinguish between animal and human sources). When enterococci levels exceed MHB’s safety threshold or there is a significant rain event, beachgoers are advised to avoid water contact to minimize the potential for illness. The City notifies the public about the water quality at Willard Beach using a flag system that aligns with [MHB’s advisory postings](#):

-  Green Flag – **OPEN**: no advisory or closure
-  Yellow Flag – **RAINFALL ADVISORY**: bacterial levels may be elevated; water contact not advised
-  Orange Flag – **CONTAMINATION ADVISORY**: bacteria levels may be unsafe; water contact not advised
-  Red Flag – **BEACH CLOSED**: no swimming or water contact activities

Water Quality, Wet Weather and the Built Environment

Nationally, according to a [study](#) by Environment America Research & Policy Center, approximately half of U.S. beaches had fecal contamination levels considered unsafe on at least one occasion in 2022, and 1 out of 9 had potentially unsafe levels on at least 25% of the days when testing took place.

Locally, enterococci concentrations at Willard Beach have historically been closely related to rainfall. Drier summers generally result in fewer exceedances of the MHB safety threshold. Over the past decade, the City and MHB have been proactive in identifying and eliminating

pollution sources, but unfortunately enterococci exceedances still occur. This is partly due to the fact that the 223 acre Willard Beach watershed is one of the most densely developed areas in the City along with aging private and public infrastructure.

Numerous studies have established a clear link between water quality and the extent of impervious surfaces, such as buildings and pavement (Figure 1). When impervious surfaces exceed 10% of a watershed area, water quality and aquatic health begin to decline. Approximately 41% of the Willard Beach watershed (~92 acres) consists of impervious surfaces (Figure 2). Consequently, during significant rain events pollutants such as fertilizers, petroleum products and animal waste are carried by stormwater into the storm drain system which directly discharges into the ocean (Figure 3).

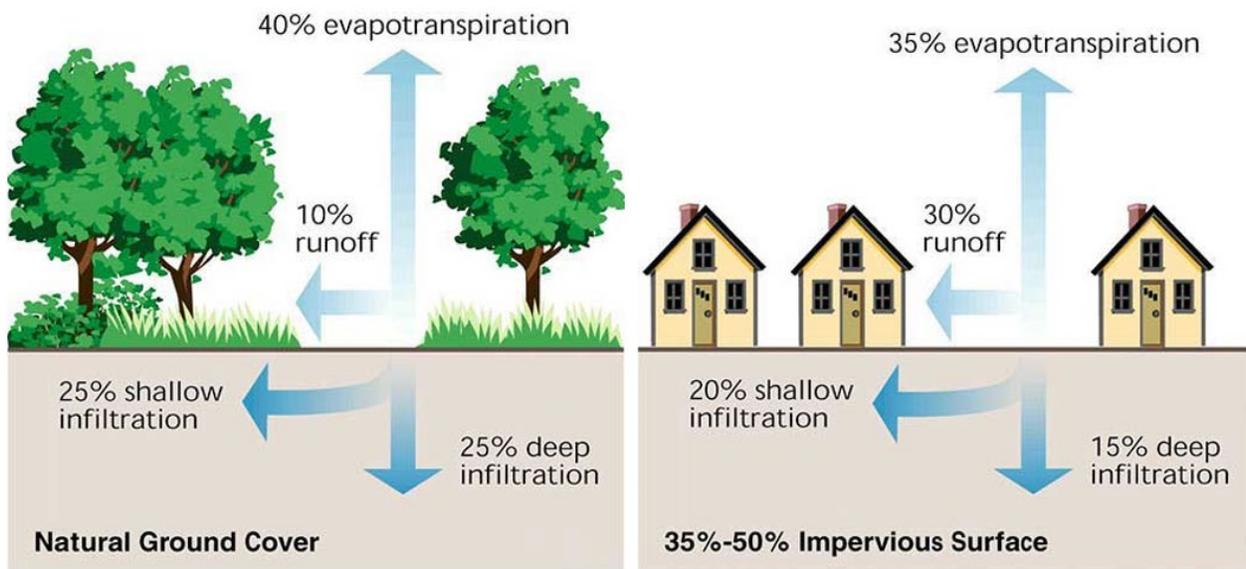


Figure 1: increasing development density increases the amount of stormwater runoff

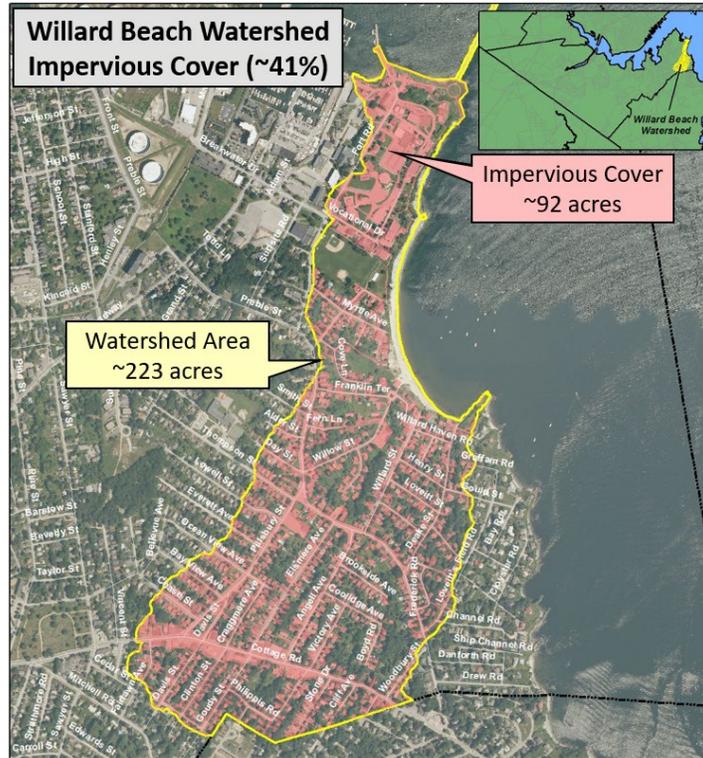


Figure 2: Willard’s watershed has a significant amount of impervious area (in pink)



Figure 3: petroleum products entering the stormwater system

Aging private and public storm drains and sewer lines may also be contributing to episodic enterococci exceedances at Willard Beach. Most of the underground pipes in the watershed are in excess of 60 years old. In areas where sewers and storm drains are located closely together and the storm drain is lower than the sewer main, sewage may be inadvertently leaking into storm drains, particularly during periods of wet weather. [This problem is common](#)

in many Maine and New England cities where a number of strategies have been developed to upgrade aging infrastructure.

Asset Management & Watershed Assessments

The City has completed several watershed assessments to inform asset management decisions. Virtually all of the sewers and many of the storm drains owned by the City [have been visually inspected with specialized cameras](#) to determine pipe conditions, including in the Willard Beach watershed. Condition assessment is a critical part of the City's asset management program, which provides a rational basis for the most efficient and effective allocation of limited financial resources to meet key water resource protection goals. Based on these evaluations, the City has developed a prioritized list of sewer mains to repair by lining the inside of the existing pipe, which minimizes the need for excavation and traffic disruptions (Figure 4). In 2022, the City invested over \$300,000 to line approximately 1,400' of sewer mains at several Willard Beach locations.

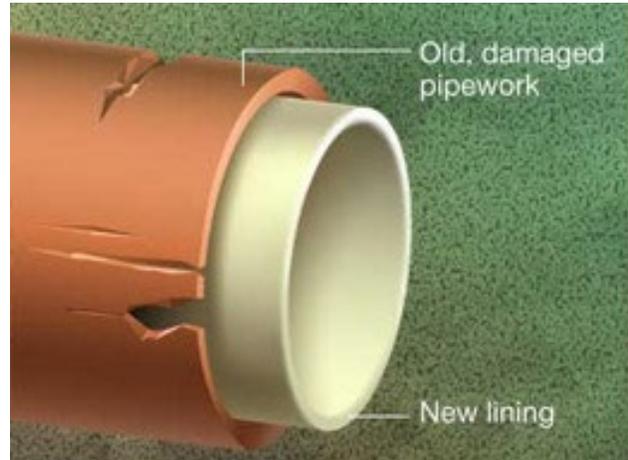


Figure 4: new plastic pipe lining inserted into existing clay pipe

Over the past **10 years**, the City has partnered with MHB to conduct water quality sampling throughout the Willard stormwater system. The results of this effort are published in a [2020 MHB report](#). In addition, we have used fluorescent dye and specially trained dogs (Figures 5 & 6) in our sewer and storm drain systems to confirm and remove sewage sources from the stormwater system.



Figure 5: fluorescent dye in drain manhole



Figure 6: dogs investigating storm drain system

Next Steps

This summer, in addition to the enterococci samples taken at the beach, the City is collecting enterococci samples from the stormwater outfall (WB17) located on the beach. This outfall drains the largest portion of the 223 acre Willard Beach watershed (~117 acres). Stormwater samples are collected on Mondays and Wednesdays from Memorial Day to Labor Day at or near the same time as the beach water quality samples are collected.

We will use this year's water quality sampling results in tandem with prior watershed assessments and sewer main condition assessments for targeted DNA sampling that identifies potential human bacteria sources. The DNA results may inform decisions on which sewer main(s) to focus on in the Willard Beach watershed. We will then determine if the sewer main needs to be lined or the issue is originating from a private property.

There are at least three streets in the Willard Beach watershed where the storm drain and sewer main are close together and the storm drain is lower than the sewer main. We will conduct a thorough and detailed review of our piped infrastructure throughout the watershed to determine whether there are any other similarly situated storm drains and sewer mains. If there are, we will re-inspect these sewer mains to identify any new signs of deterioration since our previous inspections. Sewer pipes that show signs of new exfiltration or infiltration will be assigned a new condition rating and placed on the asset management lining program based on this new rating.

Finally, we will continue exploring grant opportunities for the installation of stormwater treatment systems at strategic locations in the watershed that reduce pollution discharges to Willard Beach. The submittal of any grant applications will be contingent on the City's staffing capacity to maintain these treatment systems in perpetuity.