

*State of Narragansett Bay and Its Watershed*  
2017 Technical Report

● *Landscape Stressor Indicators*

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INTRODUCTION

People are a fundamental driving force on the landscape. Human population growth increases the demand for larger or new infrastructure, which leads to land conversion (primarily from forest land to urban land), with construction of new roads, buildings, and other utilities and amenities. These changes in the landscape reshape the Watershed's functions by altering natural hydrological paths, strongly influencing the freshwater and estuarine ecosystems of the Watershed and the Bay. The increase and spread of the human population in the Bay's Watershed and the conversion of forest land to urban land has primarily altered the conveyance of rainfall as stormwater and decreased the connectivity of natural habitats, diminishing the Watershed's capacity to balance the effects of runoff and groundwater replenishment. The synergic impacts of these alterations include increasing flooding (or, conversely, worsening drought conditions), or exacerbating water quality issues through the transportation of contaminants, which, consequently, diminish the benefits of the Watershed's natural resources to public health and aquatic life. Therefore, the shift of the population from crowded urban areas to more rural areas is an important driver of landscape changes, where less people are using more land to settle. Today, previously developed lands provide the infrastructure that a high-density population demand, whereas new development, without proper planning, can create new stressors to the surrounding landscape.

The Narragansett Bay Watershed has three major population centers: Providence, Rhode Island, and Fall River and Worcester, Massachusetts. The locations of these cities near major water sources facilitated

the industrial expansion from the mid-1700s to the early 1900s. Population tripled during the industrial era (1850 to 1900) and then doubled over the next century (1900 to 2000). It was during this time that infrastructure such as wastewater treatment facilities, buildings, dams, and roads expanded dramatically to accommodate the growing needs of the population and their livelihoods. These historic changes created the foundation for the development that is currently reshaping the Watershed. The concurrent increases in impervious cover (i.e. roads, parking lots, driveways) and residential and industrial discharges of nutrients, pathogens and other pollutants stressed the Bay and Watershed. In recent years, development has sprawled into suburban and rural areas at a faster rate than the population has grown. At the same time, pollution from wastewater treatment facilities has declined due to improved treatment technologies, improving water quality. However, challenges remain in understanding the extent of pollution from individual onsite systems (septic systems and cesspools), affecting water quality in freshwaters and the estuary

The Narragansett Bay Estuary Program uses five indicators to determine the extent of potential impacts, or changes in the landscape that stress the Bay and Watershed: population, land use, impervious cover, wastewater infrastructure, and nutrient loading. The status and trends of these indicators inform the Estuary Program on where people are living, how they are using the land, and how their waste is being conveyed—all of which affect the condition of the ecosystem and its ability to provide benefits for people and wildlife.



**Photo:** Lincoln Woods State Park Beach, Lincoln, RI (Ayla Fox)