

Assessing Water Availability in the Seacoast Region of New Hampshire using Ground-Water-Flow Modeling

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The Seacoast region of New Hampshire is a rapidly urbanizing area where population has increased by nearly 40 percent over the past 20 years. With limited potential for increased water supplies from surface water or surficial aquifers, similar to many other areas of the state, the region's bedrock aquifers are being developed to meet the growing demand for water. The availability of ground-water resources, particularly in crystalline bedrock aquifers, and the effects of increased stresses on those aquifers, were previously not well known.

A regional ground-water-flow model was developed to assess the availability of ground water and the potential effects of future growth on the hydrologic system of a 240 mi² coastal area of New Hampshire. The model was constructed to account for 1) complex hydrologic boundaries, 2) hydrogeologic characteristics of major rock types, and 3) domestic, commercial, industrial, and municipal water withdrawals and returns compiled at the census block level. The model was calibrated using the parameter estimation capabilities of MODFLOW-2000; the calibration used more than 1,000 water levels, streamflow discharge records from subwatersheds, and ground-water age data. The model provides an improved understanding of the regional ground-water-flow system by 1) quantifying the availability of water in the system, 2) determining stream-aquifer interactions, and 3) assessing the potential effects of increased future withdrawals and sewerage. Simulations of potential future conditions indicate that decisions regarding water use, including water withdrawals and returns, may be critical for balancing the future needs of water supply and the environment.

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