

Hydrogeology and Water-Supply Availability in the New Jersey Pinelands

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Abstract: The availability of water supply from the Kirkwood-Cohansey aquifer system in the New Jersey Pinelands area is constrained by the water needs of sensitive wetland and aquatic habitats. Most of the Pinelands area is underlain by the Kirkwood-Cohansey aquifer system, and most of the current ground-water withdrawals from the aquifer system within the Pinelands are concentrated in and around regional growth areas designated by the Pinelands Commission. Because of the hydraulic connection between the aquifer system, streams, and wetlands, the withdrawal of ground-water can cause stream depletion and water-level decline in wetlands and wetland-transition areas, and thereby affect ecosystem resources. As demand for water increases in growth areas, concerns have been raised about the cumulative ecological effects associated with groundwater withdrawals. In response to these concerns, a multidisciplinary study, known as The Kirkwood-Cohansey Project, was undertaken to provide key information needed to determine how future water demand from ground-water resources can be met while maintaining sensitive water-dependent ecological resources. The project includes a number of hydrologic and ecological components. The hydrologic components are focused on three study areas representing a range of conditions relating to hydrology, ecological communities, and human activity. These study areas include parts of the McDonalds Branch, Albertson Brook, and Morses Mill Stream basins. Completed hydrologic components of the project to date include investigations of the hydrogeologic framework; assessment of hydrologic conditions and water budgets during a 2-year period; and aquifer stress testing. Ongoing work includes the development and application of ground-water-flow models that are capable of predicting hydrologic responses to withdrawal stress. Model simulations will be used to evaluate hydrologic responses under a variety of hypothetical ground-water withdrawal scenarios. One group of model simulations will be used to evaluate the sensitivity of hydrologic responses to various factors relating to a singular withdrawal condition, such as setback distance from wetlands, well depth, position within the basin, and withdrawal rate. A second group of simulations will be case studies representing basin-wide ground-water withdrawal scenarios, and results will be used in a landscape-modeling analysis of ecological effects to be conducted by researchers at Rutgers University based on ecological models developed by USGS and Pinelands Commission ecologists. Comparison of results among study areas will provide the basis for generalized approaches to evaluate effects of ground-water withdrawals in other areas in the Pinelands. Results will be used to formulate and evaluate water-management strategies throughout the Pinelands that aim to balance human and ecological needs for water.