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The Science of Global Hydrology: Lessons from the U.S. Northeast Corridor

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The water cycle figures prominently in the study of global change and creates an important integrating theme for current and future studies of the Earth system. In addition to greenhouse warming and concerns about an accelerated hydrologic cycle, several other anthropogenic factors interact with the water cycle directly and modify the physics, chemistry, biology, and social systems associated with fresh water. Prominent among these factors are widespread land cover change, urbanization, industrial activities, plus a host of hydraulic engineering schemes that optimize water resource access and use, including dam and reservoir construction, irrigated agriculture, and interbasin transfers. These factors yield a broad spectrum of impact, distorting natural river flow and thermal regimes, polluting fresh water, destroying aquatic habitat, and creating substantial challenges to the sustainability of inland aquatic ecosystems. A rich history of research at the local scale already demonstrates these impacts clearly. Evidence now shows that humans are rapidly embedding themselves into the basic character of the water cycle over much broader domains, yet the collective significance of such a transformation of a basic building block in the Earth system remains an open question. This presentation will provide a broad overview of the nature of these new challenges, both from a scientific and technological point of view. A focus will be on the U.S. Northeast and how it is emblematic of changes that are taking place worldwide. The talk will offer a brief summary of two new efforts designed to monitor and assess the state of regional hydro-systems, and linked upland and coastal ecosystems - the UNH Earth Systems Data Collaborative and CUAHSI Pilot Hydrologic Synthesis Studies.