

## OARS: Early fall on the Assabet, Sudbury and Concord rivers

By Ingeborg Hegemann

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People canoe along the Assabet River. Courtesy of Dave Griffin

It is early autumn and the river level is low. The water lily's long stems lie prostrate on the shores, which are wide now and muddy, able to tell the story of who walked here last. The five toed footprints could be those of an opossum perhaps looking for insects or of a river otter seeking small fish, or perhaps a raccoon resting in the late evening before its nighttime meandering. The arrow arum plants, their leaves shaped like Native American flint, are clustered together like bouquets. With the water this low, we can see how their stems look all the way to the root level. Its Latin name, *Peltandra*, sounds like a song. There is a silence to a summer river like nothing else.

The seasonal fluctuations of rivers in New England can be extreme. The summer's slow flow brings to mind a lazy canoe ride. The smell of organic soils wafting along a warm wind is the inland version of coastal salt marsh sea breezes. Conversely, the high spring floods, dramatic, both exciting and scary, tell a different story. In the spring, even the river bank shrubs can be under water. With the documented increasing intensity of rainfall and changes in the timing of snowmelt, what should we expect to see? Understanding how water above ground and underground interact will help provide an answer — and inform our priorities for land use management, and pro-active planning.

A river is a perfect place to see groundwater and surface water in action. In many New England rivers, the water level of the river is related to the level of the groundwater, the upper surface of which is the water table. Groundwater can contribute to and play a role in river water levels. In the spring, the combination of snow melt and spring rains that filter into the ground raise the groundwater level and cause the water level in the river to rise. During this period, the river is considered a gaining river; it is gaining water from groundwater as well as rainfall.

During summer months, as the ground water levels drop, the river can become a losing stream. During these periods, the water in the river water may start to replenish the groundwater by soaking into the riverbeds, i.e. the river is losing water to the groundwater.

There can also be losing and gaining stretches within the same river or stream. This is most visible in a

small stream, which can be dry during the summer months, but as it runs through a large wetland, can start to flow for a short stretch before it dries up again.

The filtering of rain water into the ground provides a slow sustainable source of ground water to the river, as well as to our wells. When rainfall and snowmelt have an opportunity to recharge to the ground and contribute to groundwater, the groundwater level is maintained, and provides a base flow, a steady contribution of water to a river. The groundwater is able to contribute to a river's water level even during months when there is no rain.

Many factors can influence a river's hydrology. Base flow is largely influenced by a region's geology and its land uses, which influence the ability of water to recharge to groundwater rather than run off directly to the sea.

Precipitation patterns can influence a river. Large more intense summer storm events, like thunderstorms, drop a lot of rain for a short period of time, causing it to run quickly overland into storm gutters, down streets, and into the river. A summer storm event may cause the river to rise and flood in response to the high flash of rain and storm water (Urban river, or mountainous rivers with little groundwater base flow, are often called flashy rivers). Changing climate patterns will have an effect on rivers as well. The more intense and more frequent storms that New England has been experiencing over the past several decades affect the base flow (less base flow), the surface water contribution (more surface water and higher flood levels), and groundwater (reduced levels). Rivers may become more flashy and may overtop their banks, resulting in increased flooding, bank erosion, and reduced water quality. Our infrastructure (utilities, roadways) as well as homes and businesses along the river may be threatened.

Land use plays a major role in the hydrology of a river and can exacerbate the both flood and loss of stream flow if not managed well. In urban areas with a high proportion of impervious surface; such as roads, parking lots and buildings, the rainwater can't soak into the ground. Instead, like the rain during a thunderstorm, it quickly flows over the surface toward a river, resulting in a temporary and often rapid rise in the river's water level, causing flooding. Adapting land use to take climate change into account means making greater efforts to recharge storm water, protecting floodplains and wetlands, and making our built areas behave more like forests than like concrete.

As one quietly floats down an early autumn river, the wide variety of land use along its banks is uniquely visible. Viewing a community from a river provides a perspective that cannot be seen by walking or running or driving. In the Sudbury-Assabet-Concord river communities, each land use plays a role in the river's health, and conversely in the ability of the river to contribute to the health of our communities. Rivers provide water to private and public drinking water supplies, to farms and to wetlands and floodplains and their wildlife. The combination of old industrial buildings that used the rivers for power, the housing along the rivers, the small towns and larger cities, all tell a story about the past. How we use our land will write the story of our future. The ability of the river to sustain itself is an important component to our sense of place, and to our ability to sustain our communities.

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