

What Are We Protecting Anyway – Part 1

Although there's certainly nothing exciting about groundwater and freshwater habitat protection, it's definitely not a subject that grabs headlines and fuels social media websites, it has been an issue of sorts here in Rhode Island in general and North Kingstown in particular. As the state and the community struggle to shrug off the economic malaise that has gripped us for so long, we see, time and time again, the inherent realities that arise when environmental protection butts heads with economic development. Most often, here in North Kingstown, that point of conflict centers squarely upon the concept of groundwater protection, but as the State of Rhode Island Department of Environmental Management continue to sharpen their focus; freshwater habitat protection will also become another bone of contention. So all of this hullabaloo ultimately begs the question, "Just what is it that we are protecting anyway?" For that matter, what's the big deal about water anyway; why should we care?

So let's examine the answer to that question first. Heck, what is the big deal about water supply in North Kingstown? It rains all the time; how can there be a problem? The answer to that is really sort of complex and it involves hydrology, geology, glaciation, and an inter-related set of very specific localized features in the region. There is an easy way to visualize it though; imagine that the western half of North Kingstown consists of a stone water trough, exactly like the type of trough used in the days of yore to water horses, donkeys, oxen, cattle and the like, but on a massive scale. This trough is filled with sand and gravel, and overlain with top soil and vegetation. As it rains or as the snow pack melts, the pore spaces in that sand and gravel accept the rain or snow melt and that impervious stone trough fills up with water. As the big stone trough fills to capacity, three small to medium river systems and numerous ponds emerge from the natural irregularity of the surface features atop this imaginary stone trough. Those river systems, called the Hunt, the Annaquatucket, and the Pettaquamscutt, and all the ponds along their way, are completely and intimately connected to the water in that imaginary stone trough; they are in reality one and the same. What happens in the riverine systems affects the water lodged in the imaginary stone trough and vice versa. Add to this reality, the fact that the sides of the stone trough, which actually defines the aquifer area, are high enough and situated in such a fashion that, for the most part, no other riverine system, no other groundwater, can move into this aquifer. Additionally, there is no logistically practical or financially feasible way to bring, say, Scituate Reservoir water or any other for that matter, into North Kingstown for distribution to the water users of our system. For these reasons, the federal government has hung the tag of "Sole Source Aquifer" on our "big imaginary stone trough", an aquifer they designate as the HAP Aquifer, which of course stands for **H**unt/**A**ннаquatucket/**P**ettaquamscutt. So what this in essence means is that there is no other practical place for the citizenry of North Kingstown to get their water; the HAP is the only game in town. If we ruin it through pollution or overuse, we are in deep trouble. Next time, we will examine these three rivers and the complex ecosystems they support.

What Are We Protecting Anyway – Part 2

Back in June, we took a close look at the story behind our wonderful pristine water supply; what an aquifer is, how it works and why it is critically important to protect it. We also learned that there are three small river systems that are intimately interconnected to this aquifer, the Hunt, Annaquatucket, and Pettaquamscutt, and whatever we do to the drinking water aquifer affects these rivers and, whatever happens in the rivers and their associated wetland systems can affect our drinking water. This month, we are going to take a closer look at these river systems themselves. What is special about them? Why should we protect them, why should we concern ourselves so that our water usage as a community does not impact river, stream, and wetlands water levels? Let's work from south to north and take a close look at the three riverine systems that make up the wild places here in North Kingstown.



The **Pettaquamscutt** System, which includes the ponds known as Silver Spring, Shady Lea, Pendar, and Carr as well as the dams at Silver Spring, Shady Lea, and the Gilbert Stuart Birthplace, collects surface water in the south portion of our town and eventually feeds into the Pettaquamscutt and Narrow River on its way to the Narragansett Bay. As an overall river system the Pettaquamscutt has good water quality and supports, most importantly, perhaps the largest and most successful Alewife run in the region. Alewives, an anadromous species of herring, are the very fish we all remember from our primary school days and the

story of Squanto and the Pilgrims and the use of a fish as fertilizer in the planting of crops in the New World. Much of the land within this watershed is protected from development. The Pettaquamscutt is also a favored feeding area for local Ospreys and has been critical to their recent successful reintroduction into the region. Excess water withdrawals that might affect the Pettaquamscutt would be detrimental to both osprey and their favorite food the alewife.

The **Annaquatucket** System, which includes the ponds known as Kettlehole, Belleville, Secret Lake, Lafayette Millpond, Annaquatucket Reservoir, and Hamilton Millpond as well as the dams at Secret Lake, Lafayette, and Hamilton, collects water from the western portion of our town and eventually feeds into the Narragansett Bay at Bissells Cove. Its overall water quality is also



good, but has been impacted by development to a degree. The waters of the Annaquatucket support the state fish hatchery on Hatchery Road and also include a regular Alewife population, which although it was once the largest in the region, is now recovering slowly. This river system's most important contribution to the aquatic biota of the entire northeast is its unique position as the birthplace and childhood home of a great portion of the American eel population. The Annaquatucket is critical to overall eel life cycles in the region and as such has been studied extensively. As a place full of juvenile eels and alewives, along with other fish species like perch, pickerel, trout, and catfish, along with invertebrates like freshwater crayfish, the Annaquatucket, also with a great portion of the watershed protected from development, is home to not only aerial predators like ospreys, but also one of the most successful and plentiful populations of river otters

around. Excess water withdrawals that might affect the Annaquatucket would be detrimental to both these otters and a critical link on the aquatic food chain in the northeast, the American eel

The **Hunt** System, which includes the ponds known as Sawmill, Sandhill, Davisville Millpond and Potowomut as well as the dams at Davisville, Sandhill, and Potowomut, collects water from the northern portion of our town as well as much of our neighboring community East Greenwich and empties into the Narragansett Bay through a section of the river known as Potowomut at Pojac Point. Water quality in the far western feeder streams of the Hunt system is very good, but sadly as the river heads east its quality degrades quickly due to the impacts of residential and commercial development as it crosses under the Post Road. By the time the river reaches



Potowomut Pond its quality is such that it can support only a minimal level and variety of aquatic life. The western feeder streams on the other hand are a completely different story. These streams and brooks support an important population of fluvial specialist fish, those that require cold flowing water throughout their

life cycles, such as Brook, Brown, and Rainbow trout. Indeed the Hunt is viewed as an important fluvial habitat by all involved in the monitoring and protection of these important gamefish species. Excess water withdrawals that might affect the Hunt would be extremely detrimental to these important river occupants.

So as you can clearly see, these river systems do matter and are a critical part of what makes North Kingstown a special place to live. Next time, we'll take a look at what we've already done to help protect these important habitats and what we can do in the future.

What Are We Protecting Anyway – Part 3

Back in June, in part 1 of this series we took a close look at the story behind our wonderful pristine water supply; what an aquifer is, how it works and why it is critically important to protect it. Then in September, in part 2, we looked in some detail at the three riverine systems that make up the wild places here in North Kingstown. This time around, let's examine what we, as a community, have already done to protect these complex ecosystems from the accumulated consequences of having us as neighbors.

How we protect surface and groundwater quality now

Overlay Zoning – As the groundwater underlying the town is the sole source of its existing and future drinking water supply, the Town of North Kingstown developed two protective groundwater overlay zones. These zones, **GW1**, wellhead protection areas and associated groundwater reservoirs, and **GW2**, critical portions of the recharge areas associated with these reservoirs, have been mapped based upon the best available science and are subject to change as that science is refined. High hazard land uses, development density, and nitrate contributions have been restricted in these two overlay zones as follows.

Restrictions on High Hazard Land Uses – Restricted land use activities are listed as either permitted (Y) or prohibited (N) in either GW1 or GW2, or can be allowed upon the issuance of a special use permit(s). All permitted and special use permit activities must include specific provisions that include the implementation of industry accepted Best Management Practices (BMPs).

Density of Development – The average density of any residential development located within the groundwater protection overlay districts cannot exceed one dwelling unit per two acres of land. No developmental density bonuses of any type are granted in these districts.

Nitrate Loading – Nitrate loading modeling is required at present for all commercial and industrial development to be located within the groundwater protection overlay districts. These new development proposals must show that the nitrate loading standard of 5 mg/l can be met on the parcel using a conventional OWTS. This modeling must take into account all nitrate inputs proposed on the parcel, including, but not limited to wastewater impacts, landscape fertilizer impacts and natural contributions such as rainfall.

Wastewater management district ordinance

The Town of North Kingstown's Wastewater Management District Ordinance was promulgated in January of 1999. It was based upon the understanding that *“when properly designed, installed, used, and maintained, Onsite Wastewater Treatment Systems (OWTS) provide a viable and cost-effective alternative to municipal sewers.”* OWTS's also help maintain the hydrological balance through groundwater recharge. The focus of the ordinance is to require maintenance of properly functioning OWTS and to identify inadequate (i.e. cesspools, steel tank systems) and/or failed systems for timely replacement. This ordinance requires property owners to have their system inspected once every three years, to pump the system if needed, and to document these actions through regular reporting to the Water Department in the form of an Inspection Report or Proof of System Pumpout.

Land Acquisition

The preservation of open space in North Kingstown through outright purchase, development rights purchase, cooperative ventures with other entities such as land trusts and preservation organizations, and conservation easements continues to be a high priority, with, at present, nearly 20% of the entire community protected as open space in some fashion. By conscious design, a

majority of this preserved space also coincides with the Town's designated groundwater overlay districts.

Storm water management

Storm water impacts can have negative effects upon both groundwater quality and quantity and can impact groundwater through the introduction of not only excessive nitrogen from sources such as pet waste and lawn fertilizers, but also road salt constituents and a wide range of hydrocarbon components like benzene, toluene, ethylbenzene, xylenes and MBTE among others. The Town of North Kingstown requires utilization of the **Rhode Island Storm Water Design and Installation Standards Manual**, for all new development and additionally reviews all development projects on a case by case basis and, if warranted, may require even more stringent management strategies

Our Drinking Water Aquifer – How Do We Protect It?

Previously, we spent a number of issues of “The Puddle” taking a close look at our drinking water aquifer; what is it?, where is it?, How is it connected to the Town's numerous surface water features and why exactly is it so vital, so very important? Now that we have an understanding of aquifers in general and our Hunt-Annaquatucket-Pettasquamscutt aquifer in particular, we are going to begin to examine the strategies we as a community have in our “toolbox” to protect this critical asset – our sole source for drinking water. Let's start with a basic overview of land use and a snapshot look at the protections and risks that these different categories inherently possess. At the most basic, land use categories include Open Space, Residential, Commercial, Industrial, Light Industrial/Office, Agricultural, and Mixed Use.

Open Space – For obvious reasons, Open Space is the best for both groundwater quality and quantity protection. Little can occur on a site that can cause a risk of contamination, and there is very little impedance to groundwater recharge on an open space parcel. It is important to note though, that not all open space is created equal. Natural, undisturbed open space is better by many magnitudes at converting all rainfall into recharge rather than runoff and the natural biota present on undisturbed land is much better at cleansing impurities from surface water as it percolates through to the aquifer. Any changes done by mankind lessen these factors to some degree.

Residential – Strictly residential areas are probably thought of by most folks as being of very low risk to the aquifer, but you might be surprised to learn that nearly the exact opposite is true. Residential is actually second only to industrial, in overall level of risk. What! Why is that you wonder; well first off, groundwater recharge in residential areas is impacted by not only traditional impervious surfaces like roofs and pavements, but also by the normal highly compacted condition of grassed areas. The fact is that rainwater is more likely to run off than to sink in to the average yard. As for water quality, homeowners often buy into the “more is better” mantra of the fertilizer, pesticide, and herbicide manufacturers and regularly apply more chemicals than can be taken up by the plants and turf in their yard. The extras end up in the aquifer or nearby surface waters. Additionally, substandard or poorly maintained septic systems do their worst to our aquifer as well. Add into this, the impacts of pet wastes and accidental or purposeful spilling of petroleum based and other toxic substances and you can easily understand

why, even though they don't do it intentionally, the folks living in residential neighborhoods can put our drinking water at risk.

Commercial/Light Industrial/Office – These designations are sometimes lumped into the category of General Business, and, for this purpose, commercial means “selling stuff”, Light Industrial is “creating stuff that does not involve anything hazardous”, and office well, means just that, and all of these activities involves a lot of impervious surfaces; building roofs, roads, and parking lots associated with these land uses can have a big impact on groundwater recharge. Indeed, soils under paved over areas are often akin to a desert. That's why the few trees planted in parking areas often have a hard time surviving. Groundwater contamination risks are fairly minimal with the largest problem being related to the cars parked in the lots. This problem is minimized by protective devices built into the stormwater drainage systems of the vast majority of present day parking facilities. Septic impacts in these areas are minimized by the typically light usage and the reality that the odor of a failed septic is just not good for business.

Industrial – Industrial land use, as you would expect, offers some of the highest risk to our groundwater. Usually there is quite a bit of impervious surface, buildings, pavement and the like, that impede recharge and activities on these parcels can pose a contamination risk. For these reasons Industrial uses in general, are limited to areas outside of the aquifer. However, due to historic use that predates zoning some industrial activities to occur within the aquifer and require diligent monitoring and the implementation of additional protective practices.

Agricultural – Agricultural land use in Southern Rhode Island frankly gets a bit of an undeserved bad rap in regards to impacts on drinking water aquifers. Here's why; from a recharge perspective agricultural lands are second only to open space in regards to filling our aquifer. There is little to impede groundwater from entering the aquifer other than vegetative uptake. As far as water quality protection, the reality here is, that agriculture in the late 20th and 21st centuries operates on a razor thin profit margin. Independent studies have shown, time and time again, that farmers do not over apply fertilizers and other chemicals to their crops. The stuff just costs too darn much, as a controllable cost directly related to profits, farmers only apply exactly the amount that can be taken up by their crops, very little, if any, ever makes it to the aquifer.