LAKE AUBURN WATERSHED

SEPTIC SYSTEM ORDINANCE

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The current Lake Auburn Septic System ordinance requires a minimum depth to Limiting Factor (LF) of **36 inches**. Limiting Factors include hard pan, bedrock and seasonal high groundwater table. The ordinance also requires the disposal field to be installed **at least 12 inches below the bottom of the organic duff layer** (below the mineral soil surface**) in the lowest point of the ground where the disposal field is installed**. These two requirements are, in my professional opinion, actually counter productive in accomplishing the objective of the ordinance which is to provide greater protection of water quality in Lake Auburn. I will explain my reasoning in the following paragraphs:

Background:

In the early days of determining septic system suitability, the State of Maine relied on the **perc test**. The perc test was done by digging a hole in the ground and pouring water in the hole. The length of time it took for the water to disappear was the determining factor for suitability and how large a disposal field was needed. Getting rid of the water, below ground, was the main focus of septic system designs in those days. The faster the water disappeared, the better. The perc test was replaced by the process we use today referred to as **Site Evaluation.** The reason for this change was because the perc test worked fairly well if done in the spring or late fall, when groundwater tables were at their seasonal high levels, but didn't work very well when done in the dry summer months. A soil would "perc" nicely in August when the groundwater table was low but the septic system would fail in the spring when the groundwater table was high. Our present process of Site Evaluation bases a septic system design on observed soil properties such as soil texture, soil structure, soil consistency (hard pan) and evidence of the seasonal high groundwater table made by observing soil colors. By using site evaluation, we can tell how large a disposal field is needed, how deep into or above the ground it can be installed and how high the seasonal high groundwater table is even in the dry summer months.

As time progressed, scientists and regulators began to look not only at how fast the effluent would disappear below ground but also how well the effluent was treated or renovated before it reached the groundwater table, a waterbody or property line. We learned that the most effective treatment was accomplished by installing disposal fields either very shallow or, preferably, on or above the original ground surface. That is because the majority of the biologic activity in a soil is in the upper 6 inches and that is also where most plant roots (feeder roots) are found as well. Soil microbes and plant roots remove and utilize many of the constituents in waste water including nutrients and pathogens. Installing disposal fields deep into the ground, particularly coarse textured soil or soil that is shallow to bedrock can result in what I refer to as **"Short Circuiting"**. Short circuiting occurs when the effluent moves through the soil without being treated or only being minimally being treated.

Another component of wastewater treatment in a septic system disposal field is cation exchange where fine textured soil particles, silt, clay and fine organic particles, which are negatively charged, hold onto positively charged ions such as phosphorous until they can be utilized by microbes and plants. Cation exchange is negligible in very coarse textured soils such as sands and gravels.

A third component of wastewater treatment in a disposal field is in what we call a bio-mat. This bio-mat is a black gelatinous layer at the interface of the bottom of the disposal field and soil material below. It is comprised of particles that escape from the septic tank and the living and dead bodies of micro-organisms. This layer is sometimes called the "clogging Matt" because, if it becomes too thick, it can cause the septic system to hydraulically fail. If the bio-mat is absent, it removes one of the more important components of wastewater treatment. The reasons why a bio-mat may be absent are too little organic matter (BOD5 and TSS) coming from the septic tank, which is very rare, or a soil material that is very coarse textured or when the disposal field rests on fractured bedrock. Coarse textured soils and disposal fields resting on bedrock are extremely permeable and very oxygenated so organic particles are readily decomposed or pass through the soil and do not build up to create a bio-mat.

Lake Auburn Watershed Septic System Ordinance:

The Lake Auburn Septic System Ordinance requires at least 36 inches to the limiting factor, including seasonal high groundwater table. Very few soils in the State of Maine have 36 inches or more depth to the seasonal high groundwater table and most of those that do are very coarse textured sands and gravels. Sand and gravel soils in Maine were deposited by flowing water from rapidly melting glaciers. They were the river or stream bottom but became dry land after the glaciers melted and retreated, removing their water source. After the glaciers melted and/or retreated back north, the land remained bare for many years until vegetation moved its way up from areas not covered by the thick sheet of ice. In the hundreds of years it took for vegetation to become established, wind blew soil material around and some of it was deposited on the surface of the gravel. The depth of the fine textured topsoil material depends on location and length of time it was bare but is typically 6 inches to 12 inches thick.

As you can imagine, almost all of the biological activity in these soil types is in the finer textured topsoil layer. It is where there is water holding capacity as well as nutrients due to cation exchange capacity and organic matter for food. The sand and/or gravel below is a plant and microbe desert with no water or nutrients available for plants or microbes. When a septic system is installed below the topsoil layer of sands and gravels, very little treatment of the wastewater occurs which can result in a short circuit (depends on how coarse or fine the sand is). With the Lake Auburn Watershed District Septic System ordinance requiring the bottom of all disposal fields to be installed a minimum of 12 inches below the bottom of the organic duff layer the likelihood of a short circuit is high. In actuality, unless the site where the disposal field is to be installed is relatively level, much of the disposal field will be installed more than 12 inches below the top of the mineral soil. That is because the site evaluator must determine that the minimum depth to limiting factor of a disposal field site is present in the entire area. If the 36 - inch depth is found in the lowest point in a proposed disposal field area, more than 36 inches is likely to occur in higher parts of the disposal field area allowing for a deeper installation for those parts of the disposal field.

Because soils in Maine with at least 36 inches to limiting factor are not very common, it encourages people interested in building a home within the watershed boundary to sell easements to their suitable soil site. Clustering wastewater disposal systems in a relatively small area where very little wastewater treatment occurs is not going to achieve the intent of the ordinance, providing an additional layer of protection for the water in Lake Auburn. It would be much better to allow septic systems to be installed on finer textured soils, even if the seasonal groundwater table is shallower than 36 inches.

It may sound like allowing a reduction in depth to the seasonal groundwater table for new septic system installations would be a risk to water quality but it is not as much of a risk as it might seem. First, the bottom of a disposal field is required by State regulations to be 12 inches to 24 inches (for sands/gravels and from bedrock) above the seasonal high groundwater table. The shallower the groundwater table is, the greater the separation required. For soils with a groundwater table between 9 inches and 15 inches from the mineral surface, an 18-inch separation is required. For soils with a groundwater table less than 9 inches from the mineral soil surface, a 24 - Inch separation is required. Second, because of capillary action in fine soil pores, water can be drawn up as much as 18 inches above where standing water can be seen in a soil pit. The top of that saturated zone is what is identified by Site Evaluators when they determine the seasonal high groundwater table. That means the bottom of a disposal field, installed per state regulations, is more than the state minimum of 12 inches to 24 inches above the actual groundwater table. In coarse textured soils the capillary fringe is much less, usually less than a foot. In addition, the groundwater table in sands and gravels may be an aquifer that is always present though it may go up or down some depending on the season and rainfall amounts. That is why the State requires a minimum of 24 inches of separation from the bottom of the disposal field and seasonal high groundwater table in sandy or gravelly soils. In finer textured soils, the seasonal groundwater table is generally perched above a hardpan and disappears in the summer and winter months. They are never an aquifer. In addition, the groundwater table moves through them very slowly in the fine capillary pores. In sands and gravels, the groundwater moves very quickly on its way to a wetland, stream or pond. While it is always a good idea to protect the groundwater table from contamination, it is much more important in coarse textured soils. In fact, the main concern with a disposal field installed too close to the seasonal high groundwater table in a fine textured soil is not contamination of that groundwater table but the fact that effluent from the disposal field would have no place to go so it would back up in the home or surface at the toe of the disposal field fill extension posing a threat to human health. There is no short circuiting in fine textured soils unless the bottom of the disposal field is resting upon fractured bedrock.

In summary, for the most effective protection of Lake Auburn from septic systems, they should be directed to fine textured soils and any systems proposed for installation in sandy or gravelly soils should be installed on or within the finer textured topsoil layer.