Rainwater catchment at Vandemusser Residence. Photo by Jay Coble

Towards Net Zero Water

▫ By Stephens Smith Farrell ▫

"Know Water —
Know Life.
No Water —
No Life"

This flagrant plagiarization and adaptation of a signboard on a rural South Carolina church neatly sums up the need to understand the concept of Net Zero Water (NZW).

Those of you familiar with Net Zero Energy get ready – we're in for some tough sledding; NZW poses an even more difficult challenge. There are, however, several examples of NZW in climates even more arid than our (normally) moist region so it is doable.

For those of you unfamiliar with the unique language of green building design and construction these few lines will serve as an introduction to this critical subject. We'll attempt to define NZW, why it's important, what steps we can take towards this goal, and some of the more imposing obstacles.

The Living Futures Institute, the umbrella organization of the Living Building Challenge (LBC), defines NZW as a building or system that collects all of it's water from on-site (rainwater) or from a closed loop and one that manages all of its water discharge (storm-water, grey water, and black water) on site.

The LBC invites us to consider a flower that manages to accomplish these tasks both elegantly and efficiently. Like a building, the flower cannot move to obtain the resources it needs to survive. It gathers the water it needs without depleting its savings account (groundwater) or kicking the can down the road with respect to its byproducts (compare this to an expensive centralized sewage treatment system).

Why is NZW important?

Waste is not natural, it's not sustainable, and it's just not cool. Nothing as precious and essential to life as water should be wasted, no matter how seemingly abundant.

Following the flower as metaphor, observe that it does not even create waste! In fact, in a biologically balanced system there is no such thing as waste. The "by products", if you will, of the flower are nutrients and oxygen.

Wasting water cost money, both yours and your community's. Collecting, treating and distributing potable water, treating wastewater, and handling storm water are extravagantly expensive civil endeavors (think ever higher taxes).

Drilling wells costs big bucks; running pumps uses electricity which cost money and, you guessed it, uses even more water in the production of centralized grid electricity. Apparently power plants are one of the largest consumers of clean water.

The flip side of this aspect is that if you're already saving energy you're saving water as well. Similarly with recycling; while it won't help you reach NZW per se, it does save tremendous amounts of water in the avoidance of manufacturing raw materials such as glass, aluminum, paper, and plastic.

Putting city water on your plants or grass is subsidizing everyone else's water use as you are paying for a sewer that you're not using; remember, water supply (In) is metered, while sewage (Out) is not. Sewer bills are based on water usage, whether or not you use the sewer treatment.

Private sewers such as septic systems can be managed to last much longer if less water is introduced into them. Conserve water or achieve NZW and your system will thank you (although it's not clear if a typical septic system qualifies as NZW on the discharge side).

Speaking of plants and other living things, rainwater is better for them as it does not contain fluoride and chlorine. By the way, do you recall authorizing the introduction of these chemicals into your drinking water?

And finally, getting to NZW is important because to not do so suggest a lack of understanding of the interconnectedness of all these life sustaining elements. We save water because it connects to energy, to food security, to habitat, to social and environmental justice, and to one another. As the bumper sticker says, "We all live downstream".

What steps can we take towards NZW?

NZW is one of the toughest issues in an overstuffed basket of challenges facing the resilient community (by which I mean all of us). Don't get frustrated if you cannot solve all of the technical and legal obstacles between where we are and where we inevitably must arrive, but do take heart that there are some things we all can do to move in this direction.

■ Educate yourself and your elected officials on NZW; a tangled thicket of uncoordinated laws, ordinances and regulations unnecessarily complicate this work. In most jurisdictions all water into a system must be of potable quality, no matter its intended use. Similarly, all water out must be treated as sewage no matter it's impacted quality.

■ Build a cistern or other rainwater-harvesting device. Since we live in the mountains collecting water high and gravity feeding to gardens below is sometimes an option. Collecting rainwater for other uses usually involves pumping.

■ Learn about different qualities of water and their corresponding uses (referred to as the quality/use cascade). Not every activity requires potable water, the highest quality generally available.

■ Consider reusing grey water (water from showers, clothes and dishwashing, basically everything but sewage or black water) on gardens, lawns and other task not requiring the good stuff.

■ Look into the technical and legal issues of composting toilets and other methods of dealing with the stuff which must not be named. This subject could take hundreds of pages as it involves public health but suffice it to say that this is the critical disconnect in the loop that must be repaired but please, don't break the law! Author Joseph Jenkins has written an interesting book on this subject.

■ Learn about bio-digesters and how they fit into the technical and legal realms. These are often the only way for a commercial building to achieve NZW.

■ Include pre-plumbing for dedicated supply lines for the use of rainwater and for the separation of grey and black water (not commingling the two, such as it were) in new construction and remodeling.

■ Create a rain garden to slow, cool, and reintroduce storm water into the ground. This has the added benefit of attracting native plants and animals (especially butterflies! What's not to like about a butterfly?)

■ Remember that a roof or other impervious surface acts as a collection area that concentrates, warms, and accelerates storm water. This powerful force needs to be slowed down, cooled, and redistributed, preferably on site (for NZW) but at the very least before introduction into a creek or other natural body of water.

What should we stop doing?

■ Planting non-native flora that are not evolutionarily adapted to our bio-tone and its rainwater quantities and frequencies.

■ Leaving the water on as you brush you teeth.

■ Washing partial loads of laundry or dishes.

■ Letting storm water erode your property and carry sediment into our creeks, lakes, and streams (via streets, streams or directly).

■ Over fertilizing lawns and gardens; preferably we should use organic fertilizers that do not cause as much trouble if they get washed into a storm sewer or creek/river. At the very least, be frugal with the use of fertilizers.

■ Building in or otherwise negatively impacting natural storm-water recharge areas such as wetlands and floodways.

What are some of the obstacles to NZW?

As mentioned the biggest obstacle is regulatory. The good people of Building Inspections and DNER are our hard working friends and neighbors and are only doing what they've been authorized to do. It's almost impossible to argue with, "I'm just doing my job."

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Greywater plumbing.
Georg Efird, A-2-Z Plumbing photo

Instead get policy makers to learn about the problems and opportunities of NZW. It has been remarked that our building codes and regulations are reactionary and need to be anticipatory. Presently the primary navigation tool of policy is the rear view mirror!

There are many technical challenges as well. Separating grey water from black, dealing with black water (or avoiding creating it altogether; again see Jenkins), rainwater capture and storage, stormwater capture and storage, etc. are among the many solvable technical challenges.

One small but significantly important obstacle is the inclusion of "algaecides and mildewcides" in composite asphalt roof shingles. While there are few studies one would be wise to consider the effects of these poisons, however minute, in the uses of water collected from such catchment areas.

Cleaning rainwater of other large debris is readily accomplished by so called first flush devices. Further on site filtration and treatment for various purposes is fairly well trodden ground and can be addressed by professionals with experience in this field. Water can be filtered to any level deemed appropriate for the intended use.

So the challenges are real but the fact remains - we have to figure this out!

Resilient cultures practice the Precautionary Principle, which states, among other things, that we shouldn't wait until we have a problem before we begin planning. We're not talking about a nicety here – we're talking water!

Let's learn from California. They never thought they'd run out of water and they were more or less unprepared when disaster struck (and is still painfully striking!). As if that weren't enough, satellite measurements indicate a dire depletion of California's aquifers from wells so they are depleting their savings accounts as well.

We're not immune to drought here at home either. Western North Carolina has been experienced more frequent and more severe droughts in the past decade than any other on record. As this article goes to publish the French Broad River is too low to float an inner-tube.

Net Zero Water represents the next plateau of resiliency planning and design. It is not an easy problem and it will not be solved overnight but with creativity, focus, and the requisite resources it is an imperative issue that can be resolved.

Steve is chief cook and bottle washer at Stephens Smith Farrell Architecture in Asheville. He is Architect of Record for the first LEED Certified Building in Western North Carolina and sits on the Western North Carolina Green Building Council Board of Directors. He is an Ambassador for the Living Building Challenge and is a member of the Asheville Living Building Challenge Collaborative. He lives and gardens in a net zero energy home in the Kenilworth neighborhood of Asheville. www.AshevilleArchitect.com.

Sources:
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Joseph Jenkins