Rainwater Harvesting

New Sustainable Water Source for Wineries

Bill Pregler

SCOTT SUMMERS

THE MARCH 2009 "What's Cool" column in *Wine Business Monthly* covered harvesting free water from the sky. With proper collection and containment, a winery can easily gather serious amounts of rain to augment a problematic well or even replace it. Given all the current water issues, the wine industry may well consider embracing this alternative source.

I have been directly involved with rainwater harvesting installations and witnessed just how easy and affordable the concept can be. I also had the opportunity to explore the code maze from the federal to county levels.

Although rainwater is already being captured, stored and used in many parts of the world, including some of the driest states in the U.S., what is really encouraging is how dramatically things are changing in our national political arena. Rainwater is rapidly becoming cool in the minds of the feds—and that means the easing of restrictions for communities throughout the country.

To understand the future of rainwater harvesting, we need to briefly discuss past and present regulations. Then we can talk about how to install a compliant system.

THE REGULATIONS—TIME FOR CHANGE

Other than places like Texas, where rainwater harvesting has been embraced for a long time, rainwater harvesting has been a big unknown for most permit and planning jurisdictions. It was not spelled out clearly on the books. At issue was the "official" **EPA** listing of viable potable water sources. This included lakes, rivers, reservoirs and ground water aquifers, but not rainwater harvesting.

In government, everything rolls downhill, so most regional and local agencies had no foundation from which to make decisions. In the minds of some federal bureaucrats, if rainwater harvesting is not on the list, then it must not exist as a resource. Captured rainwater has been included with run-off, grey water or wastewater, which it is not. Run-off, by contrast, is water that has already hit the ground. Anyone who associates grey water with harvesting rainwater is doing everyone a disservice. The Uniform Plumbing Code (UPC) and International Plumbing Code (IPC) do not include rainwater in their potable standards and lump run-off and rainwater together.

A seismic shift occurred in December 2008 when the EPA issued a municipal handbook (EPA-833-F-08-010) titled "Managing Wet Weather with Green Infrastructure—Rainwater Harvesting Policies." Prepared by **Christopher Kloss** with the **Low Impact Development Center** in Maryland, the EPA asked the center to help establish rainwater-harvesting guidelines as part of its new green and sustainable initiative.

The handbook was designed to help local officials implement green development within their communities. "The **GAO** (Government Accountability Office) has stated the United States is now identified as a country facing imminent water shortages. A survey found that water managers in 36 states anticipate shortages by 2020," Kloss said.

According to the handbook, these challenges will "require a more sustainable approach to using water resources. In addition to conservation methods, using alternative sources of water will be necessary for more efficient use of total water resources."

Here is the breakthrough. "Rainwater harvesting" is now officially part of the EPA lexicon.

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A second major shift was about to happen as this article was being written. This year, the **International Association of Plumbing and Mechanical Officials** (IAPMO) and the International Building Code (IBC) will be including rainwater as a resource in its statutes, according to **Tim Pope**, president of the Austin-based **American Rainwater Catchment Systems Association**. The ARCSA is at the leading edge of the rainwater harvesting movement.

With national acceptance and common verbiage now appearing imminent, rainwater harvesting is ready to move into the forefront of green/sustainable water management for both commercial and residential projects.

RAINWATER SYSTEMS ALREADY IN PLACE

Harvesting rainwater is already a way of life for many regions of the world like Australia, the Caribbean and the U.S. Virgin Islands. Arizona, Texas and New Mexico have implemented programs that actually include incentives. Hawaii has an entire subdivision that exists, thanks to the sky. Texas offers property tax exemptions, financial incentives and rebates. Even in San Francisco, with the cooperation of the **Public Utilities and Department of Public Health**, rainwater harvesting is now a viable alternative for garden irrigation and indoor toilet flushing.

But this is only a start. The key is to get officials to begin thinking beyond harvesting as something other than a 55-gallon drum set under your downspout for your tomatoes. A bigger picture—beyond irrigation for gardening—needs to be presented.

THINKING BIG—THE FUTURE

For many wineries with a properly sized installation, the amount of rain harvested could easily handle barrel washing and process water. It could also satisfy all requirements for county fire suppression codes (dedicated water) and is a perfect fit for LEED construction.

WBM statistics as of January 2009 tell us there are roughly 6,650 wineries in Canada, the United States and Mexico. Of this total, 72 percent produce 5,000 cases per year or less. How much water does a winery actually need? Here is the math:

- 1,000 square feet of surface (roughly a 30 x 30 foot roof) in a one-inch rain event will capture approximately 600 gallons of water. How big is your roof?
- A 50 x 100 square-foot roof surface in a 15-inch rain season will capture around 45,000 gallons of water.
- An efficient winery can use as little as three gallons of water to produce a gallon of wine, so it is conceivable that many of these wineries could work easily within these parameters.

PLANNING THE INSTALLATION

Now it is time to start researching installations, and the best resource for the winery is ARCSA (*www.arcsa.org*). Their membership has representatives from throughout the United States and the world. Wineries can print their January 2009 report, "Rainwater Catchment Design and Installation Standards," found on the group's home page (see Updated Draft of RWH Guidelines). These folks are leading the wave and should be considered as consultants.

The **Texas Water Development Board**, also in Austin, produced "The Texas Manual on Rainwater Harvesting." For those seriously considering using free rain as a new resource, download the 60-odd pages to get the basics for your project.

Finally, there are new companies emerging that promote systems integration; they now handle the entire project from design to engineering to installation. It is still a good idea, however, to do the research and understand what is needed when approaching an architect, civil engineer or government office.

Corrugated tanks are built from the top down. As a row is completed, the tank is raised until the finished tank sits on the concrete slab, is secured, then lined with a NSF-61 potable water membrane.

This study should also be in the library of every county building department. It addresses a litany of concerns for people like the **American Society of Testing and Materials** (ASTM), **American Society of Mechanical Engineers** (ASME), **American National Standards Institute** (ANSI), **National Sanitation Foundation** (NSF) and the **American Public Health Association** (APHA).

This report not only details acceptable materials and components, it helps address the inherent lack of communication between intra-governmental agencies that has long hindered rainwater harvesting.

It seems there is more information every day. One of the best clearing houses for the latest on rainwater harvesting is *www.Harvesth2o.com*. A vast number of articles are available. Research your individual states and read about restrictions, rules (if any) and incentives.

Following is a brief outline gleaned from the above publications, county officials, science labs that certify water standards, vendors and just common sense. These are systems that incorporate multiple thousands of gallons of "process or production" water, which may still fly in the face of local planners.

DESIGNING YOUR SYSTEM: GOOD WATER IN, GOOD WATER OUT

When talking with my local officials in Sonoma County, it became rapidly apparent that wineries should adhere to the best standards available. According to my local building and health departments, the phrase "no less than" were words to be enforced. Some may still be

Concealed high capacity aluminium gutters are integral to the capture of rain water from the roof area.

vague on what they are signing off on, so it makes sense to design for the best water standards already on the books.

The key is to show responsibility and "good intentions." Today that is easy. Simply design a coherent system and take regular water samples. An EPA spokesperson suggested, "A properly designed rain system could easily exceed all national standards for what comes out of any municipal tap, anywhere in the country."

That is a really good start. They know it; now we just need to prove it. My suggestion is to cut to the chase and design everything to "potable" standards.

The good news is the "mechanicals" already exist. Everything a winery needs to complete a system, from tanks to filtration to pumps, can be purchased off-the-shelf. Since we as an industry demand high standards, it makes sense that all components meet the criteria already in place and approved by the local plumbing codes or listed with ANSI/NSF-accredited product certification.

Rainwater harvesting is all about "catch and contain," so the logical place to start is catchment.

THE ROOF

The quality of water harvested begins with proper roofing material and removal of surrounding conditions such as overhanging trees. The quality of water is also a function of the texture of the roof. Metal is best as it is smooth and can be treated with acceptable paint certified to ensure proper toxicity levels approved for drinking water. Obviously lead, zinc or chromium paints are not allowed.

According to *The Texas Manual on Rainwater Harvesting*, clay and concrete materials tend to be too porous; while they can be coated, they can also promote bacterial growth. They also result in poor flow and water loss. Composite or asphalt shingles are not acceptable due to leaching of toxins. This follows for wood shingle and tar. Since the goal is clean water, each step in the process must follow the best standards After all, you are designing a "system."

CONVEYANCE—THE PIPELINE

This includes the drainage system or the gutters, downspouts, first flush and initial filtration. While sounding simple, conveyance is critical because it must be sized to accommodate the flow generated from your roof area. It is also contingent on the design of the roof to avoid overflow or spillage from roof valleys. The objective is to improve catchment efficiency.

This is also where filtration begins. The idea is to start with leaves and twigs on the roof and end up with individual, harmless micron particles in a coffee maker.

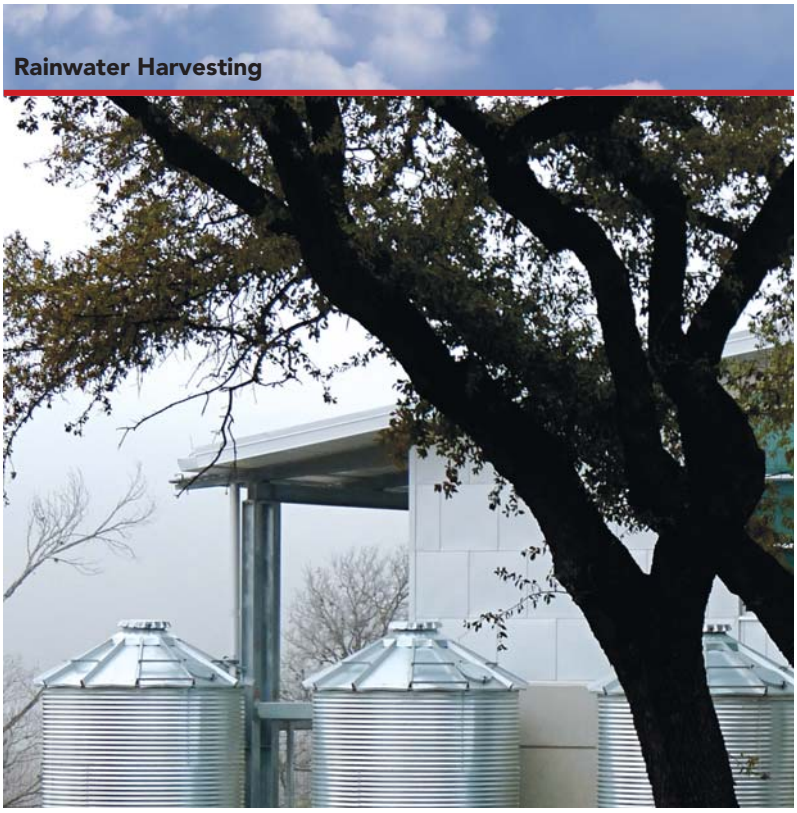
Materials count, and lead solders should be avoided. Seamless aluminum is preferred with leaf screens to prevent clogging. A roof is a natural collection for debris, so each step along the way to the collection tank must contribute to assure clean water.

An important component is the "first flush" diverter. When it rains, water begins to collect in the gutters before it exits the down-pipe. The first flush will contain bacteria, residue and sediments. Instead of flowing to the tank, these pollutants are simply diverted with the initial flow of water. They should have automatic means of self-draining between rain events.

Thereafter, any number of filtration devices can be incorporated. Among the best are the vortex filters from **Wisy**. With their stainless screens, these filters can either be a first flush or a second-stage filter sized to 280 microns. They come in a number of sizes to handle flows from 2,000 to 33,000 square-foot roof areas. The screens must be cleaned periodically and are usually dishwasher safe.

A Wisy vortex filter reduces particulate to 280 microns and is designed to handle the proper gallon per minute flow.

Prior to entering the collection tank, the final component is the stainless smoothing inlet that allows water to flow into the tank without disturbing the beneficial anaerobic sediment at the bottom of the tank.



CONTAINMENT—THE TANK

The storage tank is the most expensive piece of the rainwater harvesting system. There are any number of configurations available—made from polypropylene to corrugated steel to cement as well as above- or below-ground fiberglass. (For an in-depth product review on Water Storage Tanks, see the September 2007 issue of *WBM*.)

The type of tank will be determined by the demand (gallonage) of the winery, annual rainfall, budget and aesthetics. Regardless, they must all prevent any sunlight from entering the tank (algae growth) and must contain a NSF–61 potable drinking water liner or equivalent. Tank design must prevent insect and animal life from entering and be accessible for cleaning and maintenance.

It is imperative that tanks do not connect directly to any public or community water supply without the installation of approved back-flow protection. Tanks will be equipped with a floating outlet that draws water from just under the surface inside the tank and delivers to the supply pump and downstream filtration and treatment.

The best "bang for the buck" are aboveground-corrugated tanks. The winery must always factor dollars per gallon of containment for budgetary reasons, and corrugated tanks are a good way to go. The larger the tank, the fewer dollars per gallon. Corrugated can start small and grow in excess of 150,000 gallons. Poly tanks and concrete are limited in capacity.

Today's corrugated tanks are prefabricated and shipped in pieces (staves). A minimal crew can easily assemble them about anywhere. Built to custom specifications, they can be tall-narrow or short-wide. The latest features include cedar siding, copper roofs and exterior masonry. Architects who need a particular "look" could incorporate them into a winery design concept.

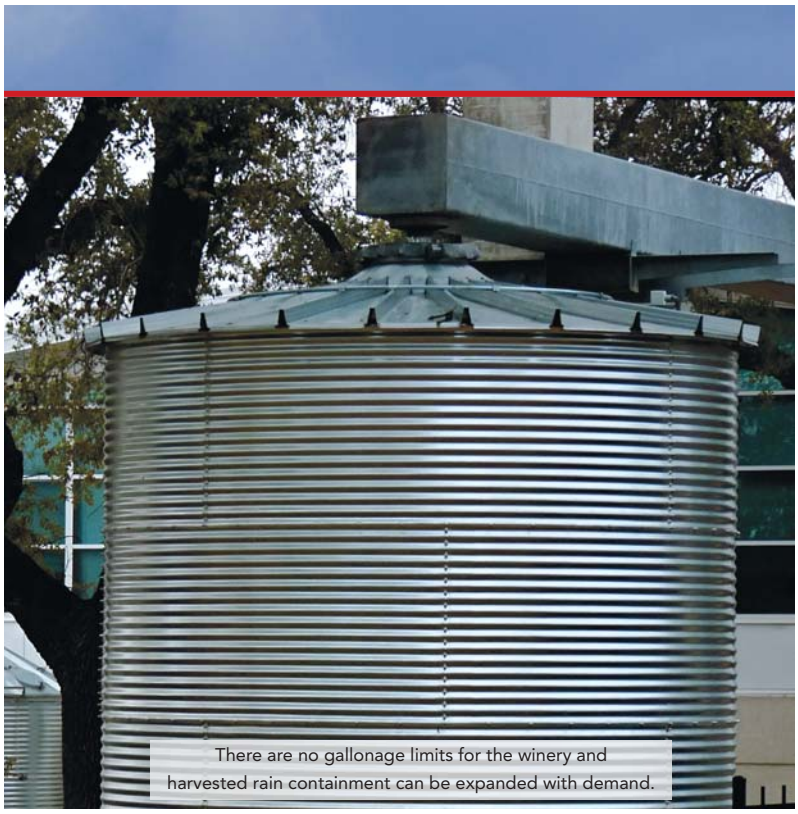
PUMPS AND PRESSURE TANKS

As with other components in the system, pumps need to be approved for potable use. Whether one employs the typical pressure tank or on-demand pump, the system pressures must meet standards per all local jurisdictions. If the water is to be used for irrigation, system design will determine sizing.

TREATMENT-DISINFECTION

Health Department people like to talk in terms of the "two barriers" for potable water. One is filtration, and the second is treatment.

There are plenty of self-contained, retrofit treatment systems available, and the idea is to size one that can handle the volume of water needed. Household requirements are different than a winery's. A good vendor will offer a solution for any application.



There are no gallonage limits for the winery and harvested rain containment can be expanded with demand.

Filtering should always be upstream of any disinfection system. Typically filtration should include a commercial 5-micron (or less) fiber cartridge followed by a 3-micron (or less) activated charcoal filter. All cartridges must be of adequate size for extended service life and should be replaced per manufacturer recommendation. They must also be approved to NSF Standard 53.

Water must then be disinfected by chemicals (chlorine), ozone, reverse osmosis or UV light. Certainly most wineries would forego chlorine, and UV light is the most common. UV systems should be certified to NSF Standard 55 for Class A treatment.

INSPECTIONS

Since rainwater-harvesting systems will be considered private water systems, maintenance is the responsibility of the owner. It is also a good idea to continuously monitor the "health" of your water and mechanicals on a regular basis.

Most people on wells already test their water for a litany of bacteria. E.coli and coliforms and a rain system are no different. There are plenty of public health laboratories available, and it is highly recommended to maintain good records for a minimum of two years for your local health departments.

Testing should also be in compliance with the procedures listed in the "Standard Methods for the Examination of Water and Wastewater" or ALPHA.

LOOKING AHEAD

"We do not need to reinvent the wheel," said ARSCA chairman **Bob Boulware**. "The science is done, the materials exist, and we can pick the best ideas from international professionals," he said. "The need is to get rainwater reclassified as a resource instead of something recycled. We simply need a new name."

That looks like where we are headed. With a new classification, commercial rainwater harvesting will be available to everyone and universally accepted by municipalities everywhere.

There are numerous other advantages to rainwater harvesting, such as energy savings, reducing demands on depleting groundwater, storm run-off and erosion control. These issues may be addressed in a future article.

Finally, people often ask about the payback on installation. It is relative and depends on each winery's water resources. Rain is super clean water, free from the sky and sustainable. It is not a renewable resource; it is a new resource. **wbm**

Bill Pregler has worked in the winery equipment industry for many years and is a staff writer for Wine Business Monthly.