



LIQUID ASSETS: WATER MANAGEMENT AT SHAFER VINEYARDS

Of all the elements intrinsic to the making of wine, perhaps none has such an all-encompassing role as water. From irrigation to sanitation, it is water, more even than earth and sun, that pervades all aspects of wine production.

The need for water by vine and vintner alike varies by season, although the needs don't always coincide. At harvest, the liquid is a vintner's friend — cleaning picking bins, gondolas and crush equipment — but a vine's foe, when rain can dilute grape sugars and introduce the possibility of rot.

Desirable in one season, it is dreaded in the next. Healthful in sufficient quantity, it can be harmful in excess. Whether deriving from moisture-laden clouds or wells deep within the earth, water is even more precious than the vintner's bottled product.

THE SEARCH FOR WATER

Long before a vineyard is planted, a vintner must determine the source of water for irrigating the new vines and plot methods of drainage and diverting runoff from winter rains.

At an average cost of \$10,000 - \$20,000 each, water wells represent a substantial cash outlay, and determining the optimum site is critical. Along with consulting geologists, many Napa Valley land owners opt for a lower-tech means of locating water called dowsing, or "water witching," an old-time practice with many modern adherents.

The dowser visits the proposed vineyard site, surveying the lay of the land and native vegetation. Then, using a tool which can run from

a forked willow stick to a bent brass brazing rod, the dowser walks the land holding the divining rod in outstretched hands, waiting for the tell-tale movement in the rod as unseen forces "pull" the tip toward subterranean water.



Three acres of prized vineyards were removed to create "Jake's Lake," the pond used to irrigate Shafer's estate hillside vineyards.

Long-time Napa Valley dowser Laurie Wood describes dowsing as "a gut feel... together with the process of eliminating which sites won't work." When a potential well site is located, the dowser gets out a string with a weight at one end, gives it a clockwise swing, and counts the resulting number of revolutions, using a mathematical formula to determine the depth of the aquifer and its capacity. The proposed vineyard site is crisscrossed on foot and the process is repeated until the optimal well site is determined, and then the well driller's called in. Unlikely sounding as the dowsing process may sound, it appears to work too often to be discounted, and dowsing's success rate at finding water has been reported on a par with that of geologists.

In addition to drilling wells, grape growers may build reservoirs to store water accumulated during the rainy season, or fill these ponds with well water to insure a supply of water when it's needed. Electric valves allow for automated irrigation, with water pumped on a pre-determined schedule through the series of irrigation lines and emitters that water the vines.

Sometimes water is more important than the vines themselves: in 1998, Shafer removed three highly profitable acres of vineyard to build a 30 acre-foot pond to irrigate the estate hillside vineyards.

Vineyards near a river may tap the river to fill an irrigation pond, although such water diversion is strictly regulated and the ever-increasing competition for this limited resource decreases a newcomer's likelihood of obtaining water rights. The right to divert water from rivers and streams is governed by the state of California, which grants rights depending on the watershed and other water users in the vicinity, and monitors usage annually.

Irrigation needs are both site and season specific, calculated according to a vineyard's elevation, soil, varietal planted and vine density, and water systems are engineered accordingly. Availability of water also determines the choice of rootstock in planting a vineyard. St. George rootstock, for example, will send its roots six to eight feet below the surface of the soil in search of water, making it a good choice for moisture-deprived hillsides, but less desirable in vineyards where the water table is high. From planting to bottling, water plays a role throughout the seasons in a winery.

WINTER: LET IT RAIN

The deciduous grapevine goes dormant in the months after harvest, when winter rains serve as a valuable source of future irrigation water, filling reservoirs and replenishing the underground aquifers.

Winter is the season that tests drainage systems, engineered to prevent erosion and ensure that runoff is diverted effectively to irrigation ponds. As the ground becomes saturated with seasonal rainfall, water can be reclaimed from hillside seepage, diverted via underground drainage systems into the same storage ponds.

While occasional winter floods provide dramatic film footage of vineyards under water, in reality dormant vines can safely withstand a week or more with their roots submerged, and few vineyards are prone to flooding. Erosion, rather than drowning, poses a greater risk. In extreme cases, a few vines will be lost, but most importantly, rain replenishes the aquifers that will sustain the next summer's crop.

SPRING: FRIEND OR FOE

The welcome rains of winter can plague growers in the spring, leaving vineyards a quagmire of mud that prevents tractors from mowing the vegetation that thrives in winter's moisture. High weeds increase the chance of damage in a late spring frost, since the ground is less able to absorb and retain the sun's warming rays.

As spring progresses, growers who embrace sustainable agriculture and who grow cover crops for soil nourishment and erosion control begin mowing alternate rows, maintaining cover for beneficial insects, but reducing competition for moisture with the vines themselves.

Ironically, along with wind machines and vineyard heaters, water itself is used as protection against spring frosts in cooler areas,

with sprinklers spraying vines to form a protective layer of ice, maintaining the temperature of the new growth at 33 degrees and preventing frostbite. The practice, however, is considered wasteful of water, and is used less than it once was.



Among many uses inside the winery, water's used for cleaning the barrels.



The rolling Carneros vineyards are reflected in the irrigation pond at Shafer's Red Shoulder Ranch.

Protective against frost, water assumes the guise of a foe as spring moves into early summer, when precipitation can cause shatter in the blooming vines, knocking off minuscule

flowers and instantly reducing the size of the future crop. Rain also interrupts the flowering, resulting in uneven set, and bunches of grapes with varying sizes and maturity.

Spring is the time to check irrigation systems in preparation for the growing season ahead, repairing leaks caused by tractors and coyotes during the winter. Although it's thought the four-legged marauders chew on lines during thirsty summers, Shafer's Director of Vineyard Operations David Ilsley speculates that much of the damage is caused by newborn pups chewing on the hoses in the winter or early spring.

SUMMER: TURN ON THE PUMPS

Early summer marks the start of irrigation season, with vines typically receiving eight to ten gallons of water a week beginning in May. Dependent on the site, irrigation starts sooner in hillside vineyards, where soil is measured in inches rather than feet, and water drains quickly away from vine roots.

The goal is to keep the soil profile moist during the growing season, but not drown the roots. A single vineyard site can have different contiguous underlying soil structures, which the grower attempts to identify prior to planting and plan irrigation accordingly. Once a vineyard is planted, the best indication of proper irrigation is observing the vines, whose leaves exhibit visible signs of thirst by turning their faces from the sun and losing their deep green color.

The grape variety itself helps determine the frequency and amount of irrigation, with some varieties, such as Sangiovese, showing water stress earlier than others. Temperature is a key factor in a vine's need for water, with growers giving the vineyard extra water in anticipation of a predicted heat spell.

After veraison, when the grapes begin to color, the focus turns toward ripening the fruit and irrigation may be maintained or cut back, depending on the grower's visual assessment

of the vines. Weekly testing of grape sugars begin in late August, as the days lead up to harvest.

AUTUMN: EYES ON THE SKIES

As grape sugars rise and the season moves closer to crush, vines are monitored closely for their water needs. Although the focus is on fruit rather than foliage, it's important to keep the leaves green in order to ripen the fruit.

A late harvest, while offering lengthy hang time for optimal flavor development, raises anxieties of rain. Less common in California than in European grape growing regions, fall precipitation causes problems in several ways. First is the possibility of rot, which can follow extended periods of rain unbroken by sun. The potential for rot varies by variety, with thin-skinned Chardonnay and Merlot more damage-prone than the hardy Cabernet Sauvignon.

Rains dilute grape sugars and further delay harvest, lowering sugar content as the vine soaks up extra moisture from the soil. As in the spring, rain presents logistical problems, as tractors pulling gondolas get bogged down in the mud. Even the prediction of rain can impact harvest, forcing apprehensive growers to pick before grapes reach their optimum sugar and flavor.

But while water is unwelcome in the vineyards during crush, inside the winery water use rises dramatically. Now water assumes its role in winemaking as new barrels are soaked with water and tested for leaks, and gondolas, crusher, hopper, presses, pumps, hoses, tanks and picking bins are sterilized on a daily basis.

Even this water is reclaimed, as underground drains take water to the reservoir where, after monitoring and pH adjustment, it will be used to irrigate the next year's crop. Internal water use will continue through the winter and spring, as barrels are cleaned between quarterly rackings of red wines.

As crush winds down, pomace from the harvest is distributed throughout the vineyard and cover crop seeds are planted in anticipation of winter rains. Grape harvest complete,

vintner and grower await the winter harvest of water, and the replenishing of the liquid asset that makes all their efforts in vineyard and winery possible.

A REVIEW OF SUSTAINABLE AGRICULTURE AT SHAFER

Bats

These nocturnal insectivores are increasingly playing a part in keeping vineyard pests under control and Shafer is currently investigating what role they might play in the winery's sustainable agricultural practices.

Bees

The blooms of cover-crop clovers provide valuable sustenance for honey bees, which are in great demand and short supply in California's agricultural community. Bee keepers have utilized Shafer's cover crops by placing their hives in the vineyards during spring bloom.

Compost

Shafer composts the pomace (grape skins and seeds) left after harvest, along with the mowed cover crops, adding them back into the vineyards to enrich the soil naturally.

Cover Crops

Shafer plants and maintains a mix of native cover crops including oats, peas, clover and vetch in the winery's vineyards to prevent erosion, enrich the soil and provide a habitat for beneficial insects. Cover crops also tend to choke out unwanted weeds, reducing the need for herbicides.

Hawk Perches

Tall poles erected in Shafer's vineyards afford hunting perches to resident and migrating red-tailed and red-shouldered hawks, which prey on gophers that would otherwise feed on tender vine roots.

Insects

Beneficial insects such as ladybugs, green lacewings, anagrus wasps, spiders and the red-shouldered fungus beetle are drawn to Shafer's cover crops, which provide prime habitat for attracting insects that prey on pest species. Pest species prefer the cover crops as well, sparing the vines.

IPM

Integrated pest management (IPM), as opposed to strictly organic farming, combines chemical, cultural and biological controls into a practical pest management system. Pesticides are used as little as practicable and beneficial insects are encouraged.

Owl Boxes

Voracious predators, barn owls are encouraged to take up residence in Shafer's vineyards by the presence of nesting boxes erected on tall poles. Taking up the gopher hunt at night, a family of owls can consume 1,000 vine-damaging gophers a year. Tended and cleaned yearly, Shafer's owl boxes show an occupancy rate that's close to 100%.

Water

From channeling winter runoff into irrigation ponds to reclaiming all water used in the winery during production, Shafer treats water as the limited and valuable resource it is. Treated and sent to irrigation ponds, the water that cleaned equipment during crush will irrigate next year's crop. Even hillside seepage into the winery's cave is recycled through an intricate system of grids and drains and utilized for irrigating the vineyards.