

Holistic Vineyard Design— Maximizing Solar Energy & Income

by Kelly Mulville

My previous article on grazing sheep in vineyards concluded with the observation that many of the problems being encountered were design issues. Using the term “design” was perhaps overly generous. Most vineyards were never designed for sustainable practices, including grazing, and consequently implementation is often tedious, awkward, costly and time consuming—as is management. Tools are generally given: technology in the form of tractors and implements which dictates how vineyards and farms are laid out. Farms, therefore, tend to be a reflection of the requirements of machinery rather than the vision of a farmer attempting to mimic healthy ecosystems. “Form follows machinery” is too often the norm.

Transitioning from conventional to organic or even biodynamic practices often merely entails a change of inputs. Adapting these sites to grazing can feel like trying to modify a Hummer into something more ecologically intelligent. Putting solar panels on the roof and a hedgerow in the back doesn't change the fact that you are still working with an inappropriate design. Too often though, we manage as though the tool is the goal.

The majority of vineyards I have come across in over ten years of viticulture are great examples of underutilization of sunlight energy. The wasted potential of this energy is manifested in unnecessary fertility, labor, fuel and equipment costs. The imbalances are primarily due to a reliance on fossil fuel to perform these tasks.

If the basic design of most vineyards is dysfunctional in terms of sustainability, how do we create designs that are holistically sound? As with many of my experiences in practicing Holistic Management a key in my progress has been to keep things simple.

Holistic Design

Developing a holistic design is simply the process of using the Holistic Management® Framework to direct the creation of a design. In other words a holistic goal shapes and directs the design. This process has proven to be

helpful in testing and creating designs as well as evaluating existing designs for potential problems.

In the early stages a design can simply be a rough sketch for working out ideas and comparing options on paper—for instance how to lay out and trellis a vineyard to achieve elements of a holistic goal that call for fertility to be developed on site through biological means, high species diversity (including animals) and maximizing of solar energy through plants (in addition to the numerous viticultural requirements). At a broader scale layers can be developed to show best layout for vine blocks, options for paddock locations (in and outside the cropping area), soil types, water availability, etc. Bringing an idea to paper enables one to experiment and manipulate elements before committing them to reality.

Any design being considered should address both what is being managed and how you want to manage. This last issue is especially important in helping to realize your desired quality of life. Of particular importance to me is a preference of working with small livestock rather than equipment. Therefore, when designing for myself (or others with similar values) this objective is constantly in mind in order to create the environment, structures and the practices that will address the holistic goal.

As with all decisions made when practicing Holistic Management, one should assume that any design, while done to the best of our ability, may not necessarily prove to be correct and monitoring should be in place to provide early warning. With this in mind, I try not to design out possibilities. For instance, even though a design may be conducive to easy management of grazing animals I generally don't create a scenario that eliminates the possibility of ever using any equipment. I believe our farming practices should be rewarding, inspirational and even fun. If we can imagine such a scenario, we can create designs to make that possible.

While working on a design project I find myself continuously referring back to my holistic goal, utilizing testing questions, assessing how the ecosystem needs function, and testing for the most holistically sound tools and options. One element that seems to consistently come into play in my work is the idea of stacking or layering.

Grazing vineyards and orchards is a great example of this concept. To do this effectively it helps to think of your farm as an area of land available for harvesting solar energy through living plants rather than simply a vineyard, orchard, etc. Broadening your perspective beyond your current crop opens up numerous possibilities for diversification, profit and management. Using this idea, a skillfully designed and managed vineyard can become productive and profitable at a number of levels. In addition to the fruit crop, income and ecological services could be provided by grazing animals and their products (wool, meat, milk, nutrient cycling, etc.) Fertility then becomes a byproduct of your diversity rather than an expense (see sidebar on next page)

Model Stage

My dad was an architect, so as a kid I watched as he would scribble design ideas on a napkin later to become plans, models, and then completed buildings. The process seemed a natural progression of taking an idea from imagination to possibility to reality. In my design work I've found that the model or prototype stage is a great way to test out ideas on a

This is a conventionally managed vineyard with high canopy (54 inches). This vineyard could easily be grazed as the vines are trained high enough to avoid browse damage to the canopy. This would eliminate the need for herbicides, tillage, suckering, mowing, etc.



small scale and refine them before implementing. The model or trial stage can take a number of forms from trying out simple ideas or modifications to small scale experimentation of management practices in order to work out the kinks before moving to full implementation. The beauty of this stage of the design process is that it transforms elements or ideas into three dimensions which can greatly aid in the process of refining your work and verifying concepts.

Design Principles

When working on a holistic design there are a number of basic principles I keep in mind. Following is a list of some of the most common principles I use in vineyard and orchard projects:

- Mimic healthy ecosystems
- Keep soil covered at all times
- Build/maintain soil health on site rather than importing fertility
- Design for process as well as purpose
- Layering of complimentary enterprises to increase ecological and economic benefits
- Design to maximize solar energy—current solar income
- Design for ease of management—especially for daily elements like water, livestock moves
- Design for diversity of plant and animal species
- Design for effective use of biological tools—i.e. grazing animals
- Eliminate tillage
- Design for all aspects of holistic goal (especially keeping in mind quality of life)
- Design for flexibility (increased rather than reduced possibilities)
- Keep management needs and possible opportunities (or conflicts) in mind especially when stacking enterprises
- Design for simplicity, elegance, and flow
- Design for the specific locality: climate, hydrology, geography, topography, soils, ecology, etc.
- Design for beauty and abundance
- Design for whole ecosystem/farm rather than solely for specific crops

Currently this list functions as an adjunct to the Management Guidelines row of the framework when I work on design (or design evaluation) projects. Although, (this probably won't come as a surprise) I am in the process of restructuring the framework to include a Design Guideline row to more accurately reflect my own pattern of use for these particular projects.

As each holistic goal or holistically managed entity is unique and specific to the whole being managed the same is implicitly true of a holistic design of a vineyard, farm, etc. A holistically designed vineyard could look quite similar or dramatically different from the norm but would likely function much more effectively in terms of converting solar energy to healthy soils, provide increased economic stability and profitability, and function with more biological elegance.

In an ironic twist, one of the keys in designing vineyards holistically is to abandon the limiting view of considering a property as strictly a vineyard—moving beyond the idea of just farming a crop to creating a fecund, healthy, productive, and profitable landscape.

It is long past time to get out of the rut of trying to modify fossil fuel based agriculture to be more efficient and start designing and creating farms that are highly effective at maximizing current solar income, that are ecologically diverse and that are profitable. If there is to be any hope for future generations our agriculture endeavors need to be places of irresistible hope, inspiration, and intrigue to those of us on the land and especially to the young. If we design and manage for these values we are more likely to achieve them.

Ultimately I see Holistic Management as a creative process that utilizes

the “instrument” of the framework in order to create or manage anything from a landscape to a business to a life. Dovetailing the framework to the design process addresses what can often be a narrow focus in designs, from simple to complex. Taking a holistic approach to design illuminates a myriad of possibilities to make dramatic changes in the way we view and practice farming. ♪

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Holistic Vineyard Design Prototype Trial

by Kelly Mulville

In my ongoing work designing and managing vineyards holistically it's become obvious that the easiest way to go about this is to start with a clean slate. Designing and building a vineyard at a new site avoids the constraints of trying to remodel or adapt existing infrastructure. The reality, though, is that most good vineyard land is currently developed and sometimes just needs some tweaking to allow for grazing. Opportunities for enhancing these sites are great given a little creativity and clarity of intention.

As mentioned previously, one of the major obstacles encountered in working with existing vineyards is that they were never designed to be grazed throughout the growing season. Consequently grazing animals need to be removed just when they are most needed. This was an obvious design flaw from a holistic perspective as it reduced biological options for managing cover crops, soil health, and vines.

The potential options – aversion training of sheep and using the shorter Southdown variety didn't pass the testing questions at a number of levels. Aversion conditioning utilizes lithium chloride to

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Trial site in May shows the cover crop is still green and providing some forage for sheep. Offset wires can be seen just below vine canopy.



Here sheep eat lateral growth that Kelly wanted removed for canopy management. In spite of having abundant and desirable browse in the grape foliage, the sheep have avoided eating any of the canopy growth.

induce stomach pain and when combined with grape leaves “trains” sheep not to eat these. This approach sent up a bunch of red flags (i.e. sustainability—unknown effects on animal health and soil biology) and would eliminate the option of using sheep to do my suckering. Southdowns (Baby Dolls) appeared a better choice for many vineyards due to their small size, but I’d heard accounts of them standing on each other to overcome this handicap and they were priced unreasonably. Mainly though, I wanted a design that could function effectively with various breeds and sizes of sheep.

Looking through the tool row on the model I kept coming back to technology and human creativity. For several years I’d had a rough idea on using strategically placed electrified wires to deter grazing animals from eating the grape leaves. Following my dad’s inspiration, I pulled out a scrap of paper and penciled out my idea. This led to a materials list, an order, and a few weeks later a prototype.



(Photo left) Neighboring vineyard shows sucker growth on vines. These suckers will soon be removed by hand labor. Sheep effectively kept all sucker growth browsed and converted it to manure on the trial plot as can be seen from photos.

(Photo right) This photo (of trial site) was taken the same day as photo above. See how well the sheep kept the vines suckered.



I’d been managing a small vineyard in which I grazed sheep each year from January to the end of March, when the vines began to leaf out. This was an ideal place to try out the concept on a small scale and refine if necessary. My primary aim was to create an inexpensive and effective way to keep sheep (of all sizes) from browsing grapevines. This would then open up the possibility of grazing throughout the year. The system couldn’t interfere with viticultural practices, needed to be low maintenance, and simple to install.

With a little more design and installation work I set up the vineyard and tested the system. After working out a few kinks, the vineyard was stocked two months before bud break to give the sheep plenty of time to learn the off limits zone. The system was then monitored for five months, three during which the grapes were leafed out. The system turned out to be 100% effective and virtually problem free. One of the big surprises was the dramatic reduction in irrigation needs combined with an increase in fruit yield. Following is a list of

the benefits realized from this trial:

- Reduced irrigation use: from 24 gallons per vine in 2008 to 5 gallons in 2009 (both were drought years). Conventional neighboring vineyard water use averages 45 gallons per vine (same soils, rootstock and clone varieties).
- Increased yield: 461 pounds more fruit than the previous year which would equate to 1,245 pounds per acre increase
- Sheep did all suckering and converted it to fertilizer
- Provided enough meat to fill a large freezer at the end of the season
- Completely eliminated the need to mow between rows and cultivate under the vines while simultaneously converting this plant matter into fertility
- Converted all lateral removal, leaf removal and shoot thinning directly into onsite fertility

Converting figures at a per acre basis allows some interesting comparisons between conventional farming, organic practices and grazing trial:

	Conventional (UC Cooperative Extension—2004)		Organic (UC Cooperative Extension—2005)		Trial (2009)	
	TIME	COST	TIME	COST	TIME	COST
Fertilizing	2	\$102	2	\$68	*	*
Mow / Disc	1.77	\$57	2	\$62	*	*
Weeding			3.87	\$116	*	*
Suckering	8	\$124	8	\$124	*	*
TOTAL	11.77	\$283	15.87	\$370	4	\$231

** Time and cost were not broken out between the various tasks due to the fact that the sheep tend to perform these tasks simultaneously.*



By the middle of June, the cover crop is completely grazed, dead or dormant. There has been no browsing of vine leaves which the sheep relish.

As shown by the chart on the previous page, potential savings in both time and expense is considerable in the trial compared to both conventional and organic management. Had the sheep used in this trial been sold for their purchase price (rather than being harvested for meat for my own use) the total cost would have been \$61/acre for the year. With direct marketing or value adding, the livestock “layer” of this holistic design could become

profitable rather than an expense.

Creating the option of a vineyard as a productive grazing area opens a number of opportunities for utilizing livestock including: collaboration with neighbors, leasing the vineyard as pasture, renting sheep, or developing an onsite livestock enterprise. Holistic financial planning can help guide in the process of determining the most appropriate choice.

It is important to keep in mind that this trial tested out just one element (tool) of a concept to determine its effectiveness in leading towards a holistic goal. Designing for process as well as practice within the context of a holistic goal is simultaneously much broader and more focused than a conventional approach. Tools don’t become the goal and determiner of management practices but rather the appropriate means for achieving a well articulated vision.

Initial results of this trial indicate that removing the logjam of an extremely limited grazing window in vineyards opens up numerous creative options for holistically sound management practices.

Working through the testing and evaluation of this trial reinforced my belief that designing and managing vineyards holistically offers enormous potential for increasing profitability, by both reducing costs and providing additional income sources. In addition, significant improvements in ecosystem processes including healthier soils, increased diversity, better energy conversion, decreased reliance on equipment and fossil fuels, etc. can be expected—not to mention the continuous progress towards a higher quality of life. 🌱

Book Review *by Ann Adams*

Let the Water Do the Work: Induced Meandering, an Evolving Method for Restoring Incised Channels

*By Bill Zeedyk and Van Clothier
Quivira Coalition, Santa Fe, N.M.
2009 • 239 pages
www.quiviracoalition.org*

Why a book on induced meandering? So *Let the Water Do the Work* begins. The simple answer is, because it works. Specifically, it is a practical, affordable, and simple method that allows the creek, stream, or arroyo to do the work for you. In other words, you partner with Nature. By “thinking like a creek,” you can harness the regenerative

power of floods to reshape stream banks and rebuild floodplains along gullied stream channels.

This approach runs counter to the conventional approach to stream restoration because it looks at intentionally eroding selected banks while encouraging the deposit of sediment on evolving floodplains.

The authors of this book, Bill Zeedyk and Van Clothier, bring years of experience in this art of riparian restoration. They have worked on projects and taught many workshops and prepared training materials for professionals, laypersons, and volunteers. Moreover, these techniques have now been adopted by federal, state, and tribal agencies, as well as landowners and conservation organizations.

How is this information helpful to Holistic Management practitioners? It’s a valuable tool to consider for your toolbox if you own land on which water runs (which includes everyone from Sidney

to Seattle). I was lucky enough to attend an Induced Meandering workshop nearby a couple of years and can still remember the light bulb that went off for me when Bill Zeedyk talked about looking at the land around the stream or creek to see what the water was doing underneath the land, and how the water channel *influenced* the water table. As a stream bed continues to dig deeper into the land, the lower the water table drops. If you can induce meandering and let sediment build that streambed up, you actually raise the water table and restore floodplains.

Induced meandering reminds me of planned grazing (a technique often used in conjunction) because you are working with Nature to improve the function of the land and water. Planned grazing can really address ineffective water cycle “uphill” of the riparian area. Likewise, it can improve riparian function. But, if you’ve got a severely incised channel with years of damage, induced meandering will create amazing results in a relatively short amount of time—some of the examples in the book show a dramatic difference of restored floodplains in six years.

This book is chockfull of photos of various induced meandering projects with clear delineation of before and after and what was done to create the change. The design, layout, and illustrations are courtesy of Tamara Gadzia, making this book very user friendly. Whether you want to know how to trim pickets or build a one rock dam, there are lots of photos to help you as well as clear instruction. Moreover, there are plenty of forms to help with design, implementation, and monitoring.

Anyone interested in natural resource management will find this book helpful and thought-provoking. To order, go to the ad on page 23.