NEWS & IDEAS FOR LOCAL FOOD PRODUCERS

growing FOR MARKET

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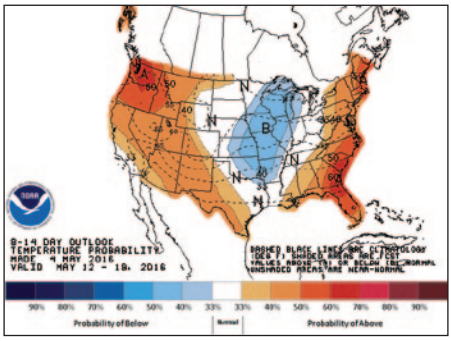

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How to grow heading chicories

There's a lot more than just radicchio

By Josh Volk

Market growers have been adding radicchio and frisée to baby lettuce mixes for many years to add color and texture to salad mixes. More recently I've been seeing increased interest in full head production for these two members of the Cichorium genus. (Some pronuciation tips here - "c" when following "i" in Italian is usually pronounced like the "ch" in cheese, and counter intuitively to an English speaker "ch" followed by "o" is usually pronounced like the "c" in corn, "cch" is like the k in key.) Chicory (an English word, with standard English pronunciation rules) usually refers specifically to Cichorium intybus, the species that includes radicchio, sugarloaf, Belgian endive, as well as many others, but not frisée, escarole, or others of the Cichorium endivia species, the other main culinary species. Out of laziness, but also common production characteristics and common genus, I use the English term chicory to refer to all of the Cichorium species.

Chicories are in the family Asteraceae, which means they're related to lettuce, as well as sunflowers. And chicories broadly share some production characteristics with lettuce, as well as some marketing and culinary niches. As I've gotten to know them better I've begun to realize how much broader their application is than that of lettuce, and I now see them as very complementary to lettuce production in terms of their seasonality here in the Northwest. From a field production standpoint, I slot chicories in the opposite season from lettuce. Being in the Northwest, with cool summers and cold, but only intermittently freezing winters, lettuce gives good harvests for me from mid-spring, through early-fall. Chicories start to come into their peak flavor as temperatures drop in the fall, and they are more hearty than lettuce, surviving occasional freezes well, and in fact sweetening over the course of winter. They also hold well in the cooler, much better than lettuce, especially when harvested slightly immature with an inch of root attached.

In their simplest form culinarily, they make excellent salads, but unlike lettuce they also hold up well to a variety of cooking methods, roasting being one of my favorites. There is great variation between varieties and different types, but all have some level of "bitterness" and "sweetness," and the balance of the two can swing widely depending on the production method - especially influenced by temperatures during the harvesting season, and stresses on the plants.

Before 2004 I had grown a little radicchio and frisée, mostly not very well and then a fellow farmer introduced me to escarole - the gateway chicory.

Escarole is the most similar to lettuce in appearance and flavor, and in production. When I first started growing it I had a tough time finding more than one or two varieties, but now it's possible to find at least a half dozen easily, and more if you look harder.

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Reflecting on a year of editing, and 25 years of GFM

This November/December magazine is the last issue of my first year editing *Growing for Market*. It also marks the final issue of our 25th year of publication. For me the time has flown by. Learning how to run the magazine has kept me even busier than when I was working off-farm full-time and farming. Plus I was busy editing my new book, which will be out in February, at the same time. (See p. 14 for details about the book.) Luckily I had GFM founder Lynn Byczynski's gracious help in getting up to speed on the magazine.

In addition to being able to work from my farm and spend more time with my family, one great thing about the job is that I have been able to connect with so many subscribers. Lynn built a great community in GFM, and a year later I still feel honored by the opportunity to steward it into the future.

Coming through this farming season and political season caused me to reflect upon how important what we are doing is. The desire to have a safe, healthy food and agricultural system is something everyone can relate to. Thank you for helping make that happen.

By the time the next magazine comes out on January 1, it will be winter. Until then, I wish you a warm end to fall and a happy holiday season!

Andrew Mefferd
Editor

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New State of the Soil virtual marketing conference

I'd like to tell you about a new virtual conference taking place this winter specifically to help small farms with marketing. With more than 25 speakers over five days, there will be a lot of angles covered. As one of the speakers I will be presenting the marketing ideas from my new book, which will be available in February 2017 from Chelsea Green Publishing called *The Greenhouse and Hoophouse Grower's Handbook: Organic Vegetable Production Using Protected Culture.*

The motivation behind a virtual conference is that there are already a lot of great winter conferences, and more growers can participate if they don't all have to travel to the same location. I know that is the case for me as both a speaker and virtual attendee- I will be able to present and watch others' talks from the comfort of my own farm. And speaking as a person who has had a Facebook page for less than a year (I only got one when I needed to become the administrator for the GFM Facebook page), I am definitely going to be tuning in for some of the social media marketing talks.

If you want to watch the conference live it is free. There are other paid options to access the content after the fact. There's more to this conference than I could possibly do justice to here. See the ad on page 7 of this magazine, and head over to stateofthesoil.com for more details.

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Renew before 2017, avoid the postage increase

It's been five years since we raised the price of a print subscription despite the fact that postal rates have been increasing steadily. We will raise the price next year, but we would like to give our current subscribers the opportunity to renew now at the current rates.

Current subscription rates will apply until the end of 2016; anyone renewing before the end of the year can take advantage of current pricing.

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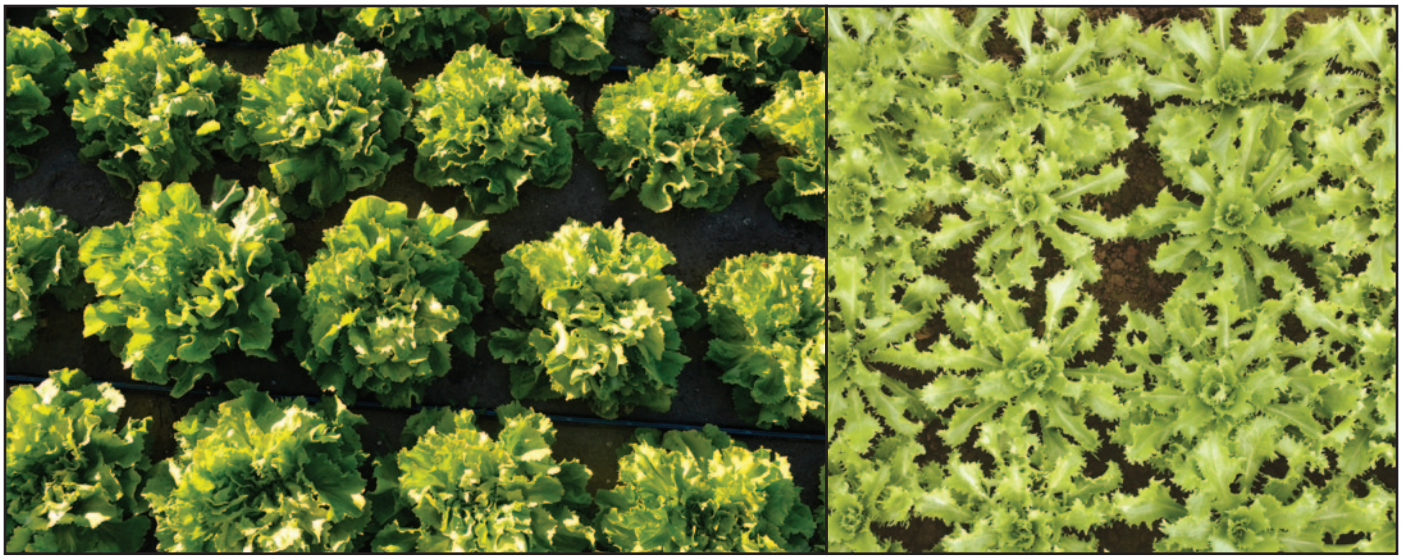
In the future you can still save 12% by renewing for 2 years at a time, or 17% for 3 at a time. Starting January 1, 2017, the new rates for print subscriptions will be: $39 for 1 year, $69 for 2 years, $97 for three years.

Digital subscription prices will remain the same at $30 for 1 year of the electronic edition, $79 for 1 year of the electronic edition plus access to the archives (Full Access), or $99 for access to the archives and electronic edition, plus a printed copy for one year (Full Access Plus).



Above left, a planting of escarole shows the typical appearance that is similar to a looseleaf head of lettuce. Above right, this planting of the frisée variety Bellesque shows how much more frilly it is than escarole. All photos by Josh Volk.

Chicory

continued from page 1

There are variations in leaf size and shape and how upright the plants are, as well as how cold hardy they are, but generally escaroles look like a large head of green leaf lettuce and can be grown on similar spacing, tending to like a bit more room than leaf lettuce. I plant mine on pretty tight spacing, typically about 12"x12", but for larger heads, and larger varieties, you might go as far apart as 18"x24" or wider. For me, escarole and other chicories follow lettuce, which I grow in the summer and early fall. I expect to do my first harvests in mid-October, just as my lettuce harvests are wrapping up. The weather is cooling down at that point and my experience is that harvesting any chicory in warmer weather increases the amount of bitterness. Escaroles can be very bitter in bad conditions (just as lettuces can be), but in the best conditions there is just a faint hint of bitter behind a lot of sweetness. My real revelation with Escarole was on a trip to northern Italy in November of 2006. Staying at a small vineyard outside of Sienna I had a very simple salad with escarole cut into fine ribbons dressed with a bit of lemon, freshly pressed olive oil and salt - still the best preparation I've had anywhere. One trick with the chicories to reduce the bitter and increase the sweetness and crunch in salads is to soak the leaves (cut or not) in ice water (or just cold water) for at least 10-20 minutes before dressing or cooking. Any cooking will also help reduce bitterness, but at some point you may come to enjoy and even crave the slight bitterness (or at least I do in the winter).

I grow escarole from transplants, similarly to lettuce. In Italy chicories are grown both from transplants and are direct seeded, depending on grower preference. Some people believe the direct seeded plants to be more cold hardy, and that's likely true. I was told while I was in Italy that it is very important to not let the transplants get too big - only 3-4 weeks in seed flats. The plants can be quite small at that point, but they will take off once they get into the ground. This year I planted some that had leaves hardly 1/4" across with just a few long trailing roots and a month later they are big beautiful plants. For mid October harvests I seed all chicories in late June or early July, and for later harvests I'll seed as late as mid-July, planting into mid August.

I know some growers who plant many successions and successfully (more or less) grow chicories through the summer and most of the winter. Chicories in general are prone to not only bitterness, but also bolting when the weather is warmer. Their more wild (than lettuce) tendencies show through in this weather, giving very uneven maturity and harvests when they are grown in less than optimal conditions. For the best results in warmer spring and early fall condi-

tions, varieties that are faster to maturity (55-80 days) are the best choice.

These growing guidelines work pretty well for most of the chicories in my experience, not just escarole. Below are a few notes on other common and less-common types that I've grown.

Frisée - I grow this very similarly to escarole. The blanched hearts of these heads are the real culinary treat and to blanch the heads there are numerous approaches possible. I've experimented with using a rubber band and tying the heads up about 5 days in advance of harvest, putting opaque plates on top of heads 5 days before harvest, and storing harvested heads in dark, but not cold conditions for 5 days after harvesting, before distributing. All of these work and each has its own issues. A lot of the modern varieties are somewhat self blanching, and I've mostly given up on the above methods, instead crowding the plants a bit so as they get large they push each other up, increasing the self blanching. This isn't perfect, but it's a lot less labor and space than the other methods.

Radicchio - There are two main types: Chioggia (round and red), and Treviso (oblong and red). The Chioggia is sometimes found in green, or speckled versions as well. I'm going to lump a few other types in here that don't strictly belong, but are so similar that I hope the purists will forgive me. Both Chioggia and Treviso types are very recognizable, even here in the US, with pure white ribs and dark red to almost purple leaves. There are varieties of varying days to maturity from 55-130, allowing one to make a single planting and harvest over the course of many months (although that range of varieties is hard to find here in the US). The longer maturing varieties tend to be more cold tolerant, the shorter maturing more heat tolerant. There are also green varieties, and both Castelfranco and Lusia types are very similar to the red radicchio, but are green and red speckled. All of these start with a leaf shape and coloring that is nothing like the heads they will ultimately make, similar in some ways to butter lettuce, or cabbage.

Sugarloaf (Pan di Zucchero) - This is a heading type similar in some ways to treviso radicchio, but light green and much, much larger, sometimes the size of a large baguette. It is one of the sweetest, least bitter chicories, and also least cold hardy. It's great raw, but it's also wonderful split in half longwise, drizzled with oil and salt and roasted or grilled.

Catalogna and Puntarelle - I lump these two together because they are basically two types of the same plant. Catalogna is harvested for the leaves and there are different leaf shapes, but basically this looks a lot like dandelion (a close relative). This is one of the more cold tolerant, and more bitter of the chicories, but it's ribs can also be quite sweet and it is great in soups and stews, or just cooked on its own and dressed with a strongly sweet or salty dressing (think along the lines of a fig vinaigrette or anchovy dressing - these are also good on other chicories). Puntarelle is a type of Catalogna that is used for its flower stalks and is harvested at a very particular stage and prepared in a very particular way. It is typical of the region around Rome and grows best in similar conditions, but I see more folks succeeding with it here in the northwest so apparently it can be grown other places (I haven't grown it successfully, it is very finicky).

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Below left, a mature head of Chioggia radicchio with the outer leaves pushed back to reveal the tight head, to the right it is cut open to show the interior color. Below right, a field of Treviso radicchio in Chioggia, Italy with a few other vegetables for the farmer (and to give a sense of scale).

Chicory

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Belgian Endive (Witloof) - This is a forcing chicory, meaning the roots are harvested, put into storage, and then warmed up to force leaves to grow in the dark, forming a tight, very pale head of leaves. I've had limited success with this one, and the seeding date needs to be earlier than other chicories in order to get a large root for harvest before the ground freezes. It also requires a warm, completely dark space where you can force the roots in the winter.

Tardivo - Similar to Belgian endive, this is one that is traditionally a forcing chicory, although it's not harvested quite the same way. I've had limited success with this one, but I know a handful of growers who are making it work here in the US, and are growing beautiful heads. Look up "radicchio di treviso rosso tardivo" on Youtube if you want to see a great promotional video about production in Italy. Some growers are forgoing the forcing and just growing and harvesting it in the winter here in the Northwest. It has long strap leaves and has looser heads than other radicchios.

Grumolo - This is a type that produces florets. I've trialed it a few times, but with limited yields. It's one of the more bitter types in my experience, but it is both beautiful and cold tolerant.

A few final notes

When harvesting chicories you'll find that the cutting point is tighter than for lettuce, meaning if you cut too high the heads will fall apart, but if you cut too low you'll end up with a lot of root. Nearly all of the types have many outer leaves that are best discarded due to toughness and bitterness. The hearts are the real treat, and the hearts can be big when grown well.

The biggest pest problem I have by far is voles. Deer come in a close second. The roots and hearts of these plants are like candy to them when it gets cold, and for good reason (the roots are actually very tasty roasted). I've had no problems with insect pests, and no more trouble with slugs than with any other crop. Rot can be a bit of an issue later in winter in our cold, wet conditions, but it usually works from the outside in, and leaves the heart untouched. I've harvested the most beautiful heads of radicchio out of what looked like a pile of slimy goo (not recommended - just saying it's possible).

Chicories are a great crop, especially in the colder months. As demand grows I hope to see more variety availability, similar to what I've seen in Europe.

Josh Volk farms in Portland, Oregon, and does consulting and education under the name Slow Hand Farm. He is the author of the new book Compact Farms from Storey Press, available February 2017. He can be found at SlowHandFarm.com

Josh Volk's new book, *Compact Farms: 15 Proven Plans for Market Farms On 5 Acres or Less* is available for preorder from growingformarket.com.

Mill logs into lumber on your own farm

By Mark Lieberth

I enjoy the side projects on our farm in which I learn a new and unexpected skill. The most interesting and satisfying thus far was the time my wife and I hired a sawyer with a portable mill and made our own lumber.

Milling our own lumber all started with a need to expand one of our fields. The area we were expanding into was wooded. What were we going to do with the trees once they were cut? We had plenty of firewood already. We tried to contact a commercial logger, who laughed at our half-acre project. The idea of cutting these trees and burning them or leaving them to rot was not an option. That's when we hit upon a great solution. On one of our evening walks, my wife and I ran into a neighbor who is a carpenter and suggested we mill our own lumber. We always need lumber for projects around the farm. I like woodworking. This seemed like a great option.

You don't have to have a clearing project to benefit from milling your own lumber. Timber is a renewable resource and it may be time to thin your woodlot. Wind blown trees from a summer storm or trees with ice damage from winter weather can also be sources of valuable timber that can be turned into lumber.

Farms have been milling their own lumber for centuries. The rise in popularity of portable saw mills has made it more accessible recently. Portable saw mills come in many sizes, styles and are manufactured by several companies. A portable saw mill is a horizontally mounted gasoline (or diesel) powered band saw that slides on a track. They are either disassembled and reassembled on site, or are attached to a trailer and moved by truck. They are expensive and generally not something that can be rented.

It takes a lot of skill and practice to operate a mill and cut lumber. Operation of the mill is an aspect of this project that is not a do-it-yourself task. We hired a local sawyer. We found our sawyer through a neighbor, although they can also be found online or through your local arborist community. Wood Mizer, a manufacturer of portable mills, also has a "sawyer finder" page on its web site. A search of this site yielded 36 sawyers in Virginia where we are, and several who are close to our farm.

The basic steps of milling lumber from start to finish are:

- Have a specific farm project that requires lumber; OR
- Have a tree that needs to be cut down
- Make a list of the size boards you want
- Decide how you want the lumber cut
- Cut the tree or trees down
- Create a staging area
- Move trees to the staging area
- Mill the lumber
- Use the lumber right away or stack for future use.

When we started clearing, we first identified trees we wanted to save and use for lumber. Not all trees are suitable. Trees must be at least 12" in diameter, straight for at least 8' and free of branches. Larger diameter, taller

and straighter trees will yield more lumber. Live disease and pest free trees are best. If a tree is dead it may or may not be worth milling based on condition. That is a judgment call you can make once you cut it down.

Your desire for lumber may start with a specific project; building a new barn, packing shed or fencing installation. It is also possible that your lumber may be a marketable product. Many woodworkers are looking for a special piece of lumber. A Craigslist search in our area found a few folks selling rough-cut lumber.

Like most farm jobs, this one starts with planning. For a specific construction project, you will need a cut list or materials list of lumber sizes you need based on your project. Building a fence would require cutting boards 16' long, 1" thick and 6" to 8" wide. If you are building a structure you may need 6"x6" posts or 2"x4" framing lumber. You will need to know not just the size of the lumber, but also an approximate count of how many boards you will need.

After making a list of boards needed, you have to decide how the logs are cut. The three basic saw cuts are through sawn, flat sawn (also called plain sawn), and quarter sawn. Each has advantages in certain situations. Through sawing is the fastest, but requires the edges to be squared later. For the more advanced woodworker or serious wood aficionado quarter sawing produces the highest quality lumber. Flat sawing is quick, efficient, and produces lumber ready for use, so for the vast majority of farm work, flat sawing is probably best.

If flat sawing, (or through sawing) you can choose between a live edge and a square edge. A live edge maintains the tree bark on one edge and looks really cool when used for furniture and barn siding. A square edge removes the bark and will look like standard commercial lumber. For most farm work, a square edge is best.

It's important to note that the lumber you make is great for farm projects like fencing, general use, and woodworking; however, you should check local codes before using it to build a barn or structure. This lumber is not suitable for structural framing in residential construction, per the International Building Code, IBC 2015. Many state governments exempt agricultural buildings from IBC, but the exemption varies from state to state and is based on use of the structure. In Virginia where we live, agricultural buildings like an equipment storage barn or packing shed are exempt from IBC, so farm-made lumber can be used in their construction.

"Sawn lumber for load supporting purposes shall be identified by the grade mark of a lumber grading or inspection agency that has been approved by an accreditation agency that complies with DOC PS 20 or equivalent," says the IBC.

Now it is time to do the dirty work; time to cut down the trees. If you do

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Above left, a board is sawn from a log on the author's farm with a portable sawmill. Above right, a closeup of the blade running horizontally, cutting a board from the top of the log. All images courtesy of Mark Lieberth.

Logs to lumber

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not feel comfortable felling large trees or do not have a saw with a long enough bar to cut the trees you have, an arborist will certainly be happy to help. Safety is key, as this step can be dangerous. When cutting the tree down, cut as close to the ground as possible to maximize the length of the log.

After the tree is on the ground, saw out the longest, straightest log possible free of large branches. Many portable saw mills can handle logs twenty feet long, some longer. Check with your sawyer and ask their mill's maximum length. Always cut the log a little long. If you want 10' long lumber, cut the log six inches longer (or more) to give you extra length to work with. Any part of the tree not used for lumber is great firewood.

After cutting the logs to size, it is time to move them to a central staging area. Setting up the mill takes a little time and it is much easier to move the logs to the mill than the other way around. What makes the ideal staging spot for the logs? The spot you pick will need to be accessible by truck and relatively flat so the trailer sits level. Another finer point, the preferred spot for the logs should be slightly uphill from the mill location. Gravity will be your friend as you load the logs on the mill.

After selecting the staging area, the logs need to be moved. A tractor can do this job and even a small tractor will work. We have a small, nineteen horsepower four wheel-drive Yanmar with a front loader, and had no problem moving most of the logs. Hitch a heavy duty logging chain around the log about two to three feet from the end closest to the tractor and to the lowest point on the tractor. The pulling angle should be kept low to avoid flipping the tractor over, a very dangerous and often fatal problem. The front-end loader on our tractor helped, because additional weight in front counteracts the weight of the load being pulled. Our tractor pulled all but the largest and longest logs. A few of the logs it would not budge. I simply cut them to a shorter length that could be pulled by our tractor. As with felling trees, moving logs is a potentially dangerous operation and you should seek help if you are not comfortable operating the tractor. For more on safely skidding logs, information from Penn State Co-operative Extension can be found here: http://tinyurl.com/zonm8yr

In moving the logs, I made a small rookie mistake. We

had several species of trees that we cut: ash, cherry, pine and poplar. I moved the logs as I came upon them and that led to the species being mixed up in the staging area. I stacked the lumber to dry as it came off the mill and now the different species are mixed in the stack of boards. I could have sorted it prior to stacking, but the mill was surprisingly fast, and tough to keep pace with (think Lucille Ball and the chocolate candy conveyor belt). In hindsight, I would have much preferred to have each individual species grouped together prior to milling.

A simple explanation of the milling process is as follows. Once the mill is moved into place and set up, the sawyer will roll a log onto the mill. This is either done manually, or with a hydraulic lift attached to the mill. The sawyer will position the log on the track in such a manner to get the most lumber out of the log. Assuming you want flat sawn, square edged lumber, the sawyer will first cut the top off the log and make it flat. They will then rotate the log ninety degrees and make that side flat. They will do this two more times, until they make a square from the circular log. The first four pieces of wood cut to make the log square are waste. From the square log the sawyer will cut the usable lumber from your cut list.

In addition to lumber, the milling process will produce waste wood and saw dust. There is a surprising amount of each. Having an area for these byproducts as they come off the mill is important. The waste wood should be stacked off to the side and out of the way. It makes great kindling and firewood. If you plan on growing anything in the area of the mill, it is best to remove the sawdust since the decomposition of wood ties up nitrogen in the soil. We put 5-gallon buckets under the mill's sawdust discharge and carried the sawdust off the field.

The author's staging area, where logs are gathered close to the mill for quick sawing.

The lumber should be stored under cover if possible and left to dry. We used a back portion of our barn. If your barn is too messy or there is no unused corner, a spot outside will work. If storing the lumber outside, put some concrete blocks down first to keep the wood off of the

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Logs to lumber

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ground and promote air circulation. The blocks should be level front to back and across the length.

Ideally, the lumber would be stacked and air-dried to lower the moisture content. Have the sawyer first cut stickers, or one inch by one inch sticks of wood used to stack the lumber. After the stickers are cut, begin to build up layers, placing the boards side by side with an inch gap between them several boards wide as the space will allow. Then place the stickers at ninety degrees angles across the boards about two feet apart. This will create an air gap between layers. Continue the process of alternating boards and stickers until all the lumber is cut. If your stack is outside, cover it with a tarp, roofing tin or tarpaper (something waterproof) so that no rain or snow comes in from the top.

As the lumber is cut, it could be used right away for projects. If the lumber is used right off the mill, it will contain a lot of water and will be "green" just like unseasoned firewood. Keep in mind that green lumber will shrink as it dries. Watch the saw blade as does its work. You can sometimes see water being forced out of the log by the blade.

Internet sources vary widely on how long to wait until the wood is dry. Opinions range from months to years. The goal for air-dried lumber is 12%-15% moisture content, which is only measureable with a special moisture meter. From a practical standpoint, dry your lumber as long as you dry firewood. Drying time will vary for different regions of the country depending on how humid or rainy they are.

There is a third option in addition to using green lumber or air-drying, which is kiln drying. This process using heat and fans will remove moisture from the wood. The lumber will be very dry, approximately 6%-9% moisture content, similar to commercially available lumber. There are plans on the Internet for solar kilns and there are commercial kilns that will rent space, however, this step is really only necessary for furniture quality lumber which requires a lower moisture content.

To continue with our farm's example, in total we cut about fifteen hundred (1500) board feet of lumber and our sawyer charged $400. I had an arborist help cut a tree down that I did not feel comfortable cutting myself. The arborist charged $50. In total, we had $450 dollars in expenses. Our 1500 board feet cost about 30 cents a board foot. If you add in my time at $20 an hour, and estimate 8 hours to cut and move, and 8 hours staking the lumber, the cost of the lumber is a very reasonable 51 cents a board foot.

As a comparison, on Craigslist in our area, I found one source selling rough-cut poplar for $1.30 per board foot, two and a half times our cost. At the lumberyard, poplar can be $3 or more a board foot. Poplar is a lower

Finished lumber stacked in the author's barn. Note how one inch "stickers" are placed evenly between each layer of boards for airflow. If no covered area is available, lumber can be stacked like this outside as long as it is covered. Photo by Mark Lieberth.

priced wood, too. The cherry and ash would cost many times more if purchased.

So far I have used the lumber for a small greenhouse, high tunnel end walls, a play fort, custom trim for our house, and some of our bedroom furniture. We still have a lot of wood left for future projects.

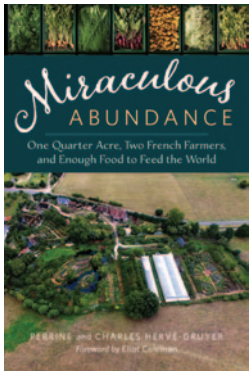
Overall, this project has been a huge success for our farm. It used the logs we cleared and made a useful product at a cost significantly less than market rate. I highly recommend it for anyone who has trees on their property and is planning to build a small farm structure. I also had a lot of fun, and learned a new skill I never saw myself doing.

Mark Lieberth, alongside his wife Steph Meyers, own New Branch Farm in Charlottesville, Virginia. He is head carpenter, chief mechanic and jack-of-all-trades while his wife handles all farm production. Professionally he works off farm as a landscape architect.

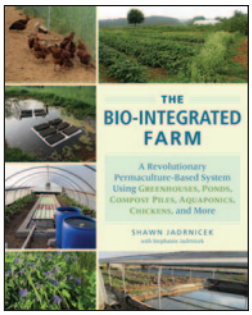
New books available from GFM

Many new farming books are scheduled for publication in late 2016 and early 2017. Here are the best of them.

Compact Farms: 15 Proven Plans for Market Farms on 5 Acres or Less by Josh Volk
GFM writer Josh Volk will show you how to be efficient and do a lot with a small area. Particularly useful for those trying to earn a livelihood on a small acreage, and urban farmers who are space limited. Includes profiles of succcessful small-scale growers. Preorder for $19.95, ships Feb. 2017.

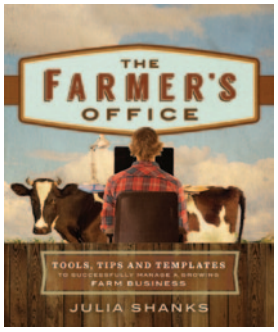


Miraculous Abundance One Quarter Acre, Two French Farmers, and Enough Food to Feed the World by Perrine and Charles Hervé-Gruyer
This is the story of two French farmers who set out to see how much food they could grow, and whether they could support themselves solely through farming on a quarter acre. Their farm has since become a celebrated model of innovative, ecological agriculture in Europe. Read the full review in the October 2016 GFM. $24.95

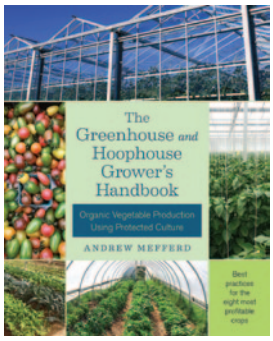


The Bio-Integrated Farm: A Revolutionary Permaculture-Based System Using Greenhouses, Ponds, Compost Piles, Aquaponics, Chickens, and More by Shawn and Stephanie Jadrnicek
This book is extremely practical. The author uses a unique permaculture-based system to tie the physical elements of farms together and make them more efficient by harnessing the free powers of nature through design. Read the full review in the October 2016 GFM. $39.95

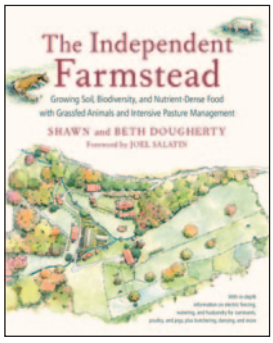
The Farmers Market Cookbook The Ultimate Guide to Enjoying Fresh, Local, Seasonal Produce by Julia Shanks & Brett Grohsgal
THE user's manual for seasonal produce with sections on eating seasonally, produce descriptions, and storage tips in addition to recipes. An update on an old favorite. See the review on page 20 of this magazine. $29.95



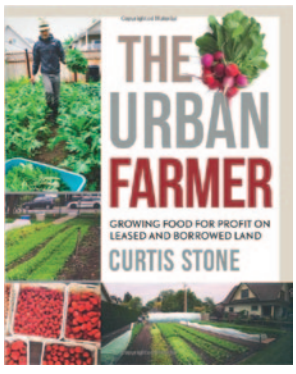
The Farmer's Office: Tools, Tips and Templates to Successfully Manage a Growing Farm Business by Julia Shanks
Whether you use Quickbooks, spreadsheets or pencil and paper, this book can help you improve your recordkeeping, and comprehend financial reports and why they are important. Read the full review in the September 2016 GFM. $24.95



The Greenhouse and Hoophouse Grower's Handbook: Organic Vegetable Production Using Protected Culture by Andrew Mefferd
Every year, more growers are turning to protected culture to deal with unpredictable weather and to meet out-of-season demand, but many end up wasting time and money on unprofitable crops grown in ways that don't make the most of precious greenhouse space. With chapters on temperature control, crop steering, pruning and trellising, grafting, and more. Preorder for $39.95, ships Feb. 2017.



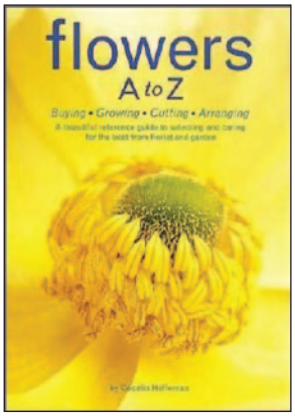
The Independent Farmstead: Growing Soil, Biodiversity, and Nutrient-Dense Food with Grassfed Animals and Intensive Pasture Management by Beth and Shawn Dougherty
Anyone interested in incorporating animals into their farm and minimizing off-farm inputs should read this book. Not just for homesteaders, it shows how to make the most of your resources, feed animals from your farm as much as possible and minimize purchased feed. $34.95



The Urban Farmer Growing Food for Profit on Leased and Borrowed Land by Curtis Stone
The author runs an urban farm in Kelowna, British Columbia. This book is his blueprint for a successful urban farm business. Covers every aspect of growing food in an urban area, including how to gain access to usable land. As the author points out, there are 40 million acres of lawns in North America. Go dig em up! $29.95

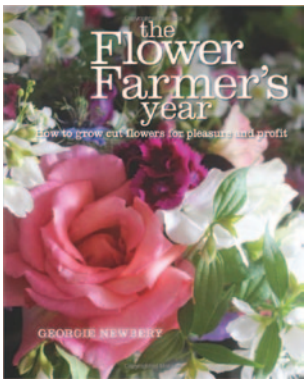
Books for cut flower growers

The Wreath Recipe Book and The Flower Recipe Book by Alethea Harampolis and Jill Rizzo
By the designers at Studio Choo, each book has 100 "recipes" for either wreaths or arrangements. Both books are seasonal, so the wreaths aren't just for winter. Follow their directions or use them as a starting point for your own. $24.95 each.



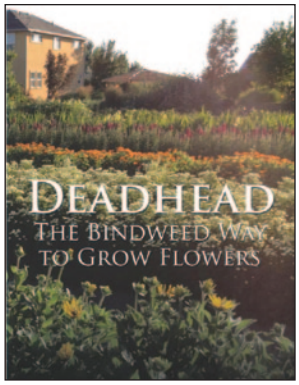
Flowers A to Z: Buying, Growing, Cutting, Arranging - A Beautiful Reference Guide to Selecting and Caring for the Best from Florist and Garden by Cecelia Heffernan
This reference guide has an alphabetical listing of blooms of interest to cut flower growers along with relevant information such as available colors, vase life, and basics of cut flower handling and arranging. As beautiful as it is useful with brilliant photography. $30

Floret Farm's Cut Flower Garden: Grow, Harvest, and Arrange Stunning Seasonal Blooms by Erin Benzakein
I was lucky enough to see an advance copy of Erin's new book. The first part looks at her methods for growing and harvesting, while the second part has arrangements you can make by season. All illustrated with the gorgeous photography you would expect from Floret. Preorder for $29.95, ships Feb. 2017.

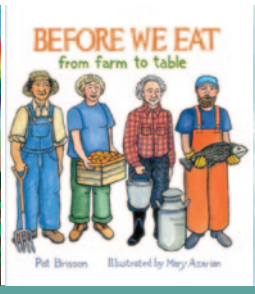


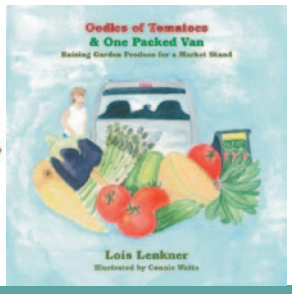
The Flower Farmer's Year: How to Grow Cut Flowers for Pleasure and Profit by Georgie Newbery
This well-written book takes you through a year on the author's farm. Particularly helpful with planning for beginners as well as those already growing. $39.99

Deadhead: The Bindweed Way to Grow Flowers by Jeriann Sabin and Ralph Thurston
The authors, veteran flower growers from Idaho, talk both about how they grow flowers and the business of farming. An entertaining read. See the excerpt in the May 2016 GFM. $19



Books for the next generation





My mother being a children's librarian is no doubt one of the reasons I'm so fond of children's books. Between having been read to and reading books to my own kids, I have had lots of time to consider children's literature. I chose just a few favorites that have to do with market farming or growing in general. They have been carefully tested by reading them to my own children. Whether you want to tell relatives or your own kids about what goes on at your farm, these books are a great way to talk with kids about what you do. See reviews online or call 800-307-8949.

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Order by mail: Send a check to GFM, PO Box 75, Skowhegan, Maine 04976. Include $5 shipping for the first book plus $1 for each additional book.

Online weather tools for farmers

By Eric & Joanna Reuter

Market farmers benefit from the ability to anticipate and manage weather conditions. Here in Missouri, we experience extremely variable weather, from single-digit winters to triple-digit summers, punishing drought to drenching rain, and a wide array of damaging severe weather. Our farm's need to mitigate the Midwest's meteorological whiplash led us to develop a toolkit of online resources and analytical skills that help us to better understand and anticipate the weather conditions we face.

There are as many opinions about weather information sources as there are interpretations of a forecast. The internet presents a plethora of colorful maps, animations, and features to attract weather buffs, but not all are truly useful for farmers. We've come to rely heavily on the various forecast products and datasets managed by the National Oceanic and Atmospheric Administration (NOAA) and its partners and sub-organizations, such as the National Weather Service (NWS). While there are many private sources of forecast information out there, NOAA is still the original source for a lot of climate/weather modeling and data. As scientists we prefer to go to the original source, and besides it's taxpayer funded and free of advertising.

Below, we introduce and discuss a series of online resources that we find most helpful. Many of these tools are map-based, allowing for a broader understanding of how regional weather patterns affect specific locations. These graphical tools are also easy for busy farmers to take in at a glance. We combine these resources with our own knowledge of local conditions to more accurately understand and predict on-farm weather, helping our farm make important planning decisions.

Climate Prediction Center (CPC)

www.cpc.ncep.noaa.gov/

The Climate Prediction Center (CPC) website offers map-based outlooks for temperature and precipitation over a range of time scales from 6-10 days to 3 months. We find the 6-10 and 8-14 day outlooks (updated daily) to be the most useful and accurate of the CPC forecasts. These products display the model-based probability that temperatures or precipitation will be above or below normal during the chosen period. (The term "normal" is used by the NWS to mean the 30-year average of the parameter in question.) Clicking on the "Interactive Display" will allow you to explore what normal means for your location and season.

We find the CPC very useful for general planning. During early May, for example, we're intent on knowing when it's safe to transplant cold- and frost-sensitive crops into our fields. This year, the 8-14 day outlook issued May 4, 2016 (see figure) showed a 40-50% chance of below-normal temperatures during the period from May 12-18. Knowing that we've had mid-May frosts before, we

were conservative on transplanting. Sure enough, the morning of May 15 brought a light frost to our fields.

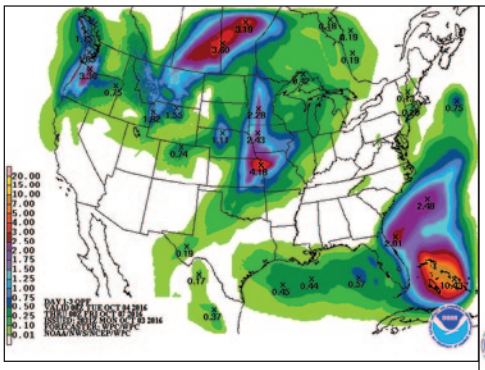
Using the CPC properly means understanding that these are probabilities of departure from normal, not predictions of the magnitude of that departure. A high likelihood of above-normal temperatures does not necessarily imply a severe heat wave; it could mean just a little extra warmth. In our experience, though, strong CPC signals tend to relate to high-magnitude events, especially for temperature. In other words, if weather models two weeks out see a very high likelihood of colder temperatures, it's likely to be a significant cold spell.

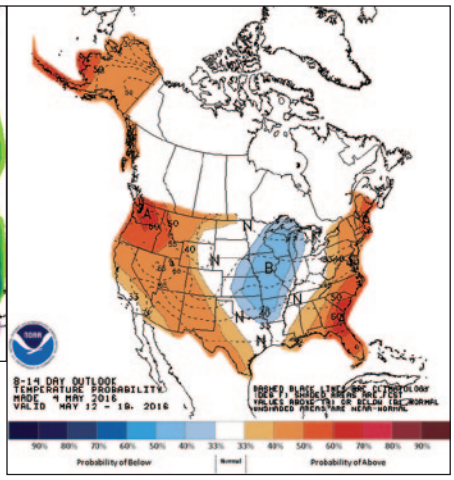
CPC maps are most effective when combined with your own knowledge of local weather patterns. For example, in our part of the Midwest, temperature tends to be regionally similar while precipitation can be highly localized, particularly in summer. CPC may suggest above-normal rain for our region, only to have it arrive in a narrow band of strong thunderstorms that misses our farm, but the suggestion of a regional heat wave or cold spell is reasonably reliable.

Another useful CPC product is the US Hazards Outlook map, which presents 3-7 and 8-14 day outlooks for significant weather events at a national and regional scale, including high winds, heavy rains, severe weather, extreme heat, and more. This map provides an at-a-glance view of notable regional weather concerns and how they relate to your location. The map view is also helpful when forecasts are right about an event but wrong about its location; attentiveness to map-based forecasts, as opposed to local forecast icons alone, can help prevent being caught completely off guard if a system's geographic impact develops differently than initially forecast.

We find CPC especially indispensable for anticipating spring and fall frosts, but it's a valuable tool for making scheduling decisions year-round. What tasks should be prioritized over the next week or two? As we write this, the outlook for late October shows a high probability of above normal temperatures, so we're leaving our warm-season crops in a bit longer and postponing garlic planting until soil temperatures cool. Advance anticipation of an early spring warm spell might motivate some early preparation (such as mulch removal) for opportunistic plantings. A warm, dry forecast in early summer might be encouragement to install/maintain our irrigation systems.

Below left is a 1-3 day quantitative precipitation forecast for the US and southern Canada for October 4-7, 2016. Below right is the CPC 8-14 day temperature outlook from May 12-18, 2016, issued May 4, which helped the authors anticipate a May 15 frost on their farm (which is in the middle of the blue area on the map).





Quantitative Precipitation Forecast (QPF)

www.wpc.ncep.noaa.gov/qpf/day1-7.shtml

Standard forecasts will mention upcoming chances for rainfall, but the amount and timing may not always be clearly conveyed. When planning for irrigation or harvest, it's helpful to know the difference between inches and tenths of inches of expected precipitation. The NWS's Quantitative Precipitation Forecast (QPF) fills this need by issuing nationwide maps of predicted rainfall amounts for the coming 7 days. The first three days can be viewed as daily totals or in six-hour increments. The latter part of the 7-day outlook comes with greater uncertainty, and thus the forecasts apply to 48-hour time frames (days 4-5 and days 6-7).

The QPF helps guide our decisions for everything from planning irrigation to preparing for torrential rain. When the 7-day cumulative map shows no forecast precipitation, we irrigate with enthusiasm. When the region's forecast includes multi-inch totals, we take appropriate actions such as covering compost piles to minimize leaching, mulching to

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Online weather tools

continued from page 17

protect bare soil, and cleaning culverts.

Between such extremes, there's a lot of middle ground and potential for uncertainty. For example, in the image shown, the QPF for October 4-7 2016 shows a forecast of heavy rain over northwestern Missouri, but a sharply declining rainfall gradient to the southeast. Our central Missouri farm falls right in that gradient. In this case, the system behaved as forecast, and we received just over an inch as most of the rain passed northwest of us. That gradient may also be a warning that if the storm behaves differently than expected, a wide range of outcomes are possible. For all its usefulness, the QPF paints precipitation forecasts with a broad brush. Geographic distribution of actual rainfall can be very uneven, especially when delivered by thunderstorms, and the QPF can't provide that level of forecast detail.

Probabilistic Quantitative Precipitation Forecast (PQPF)

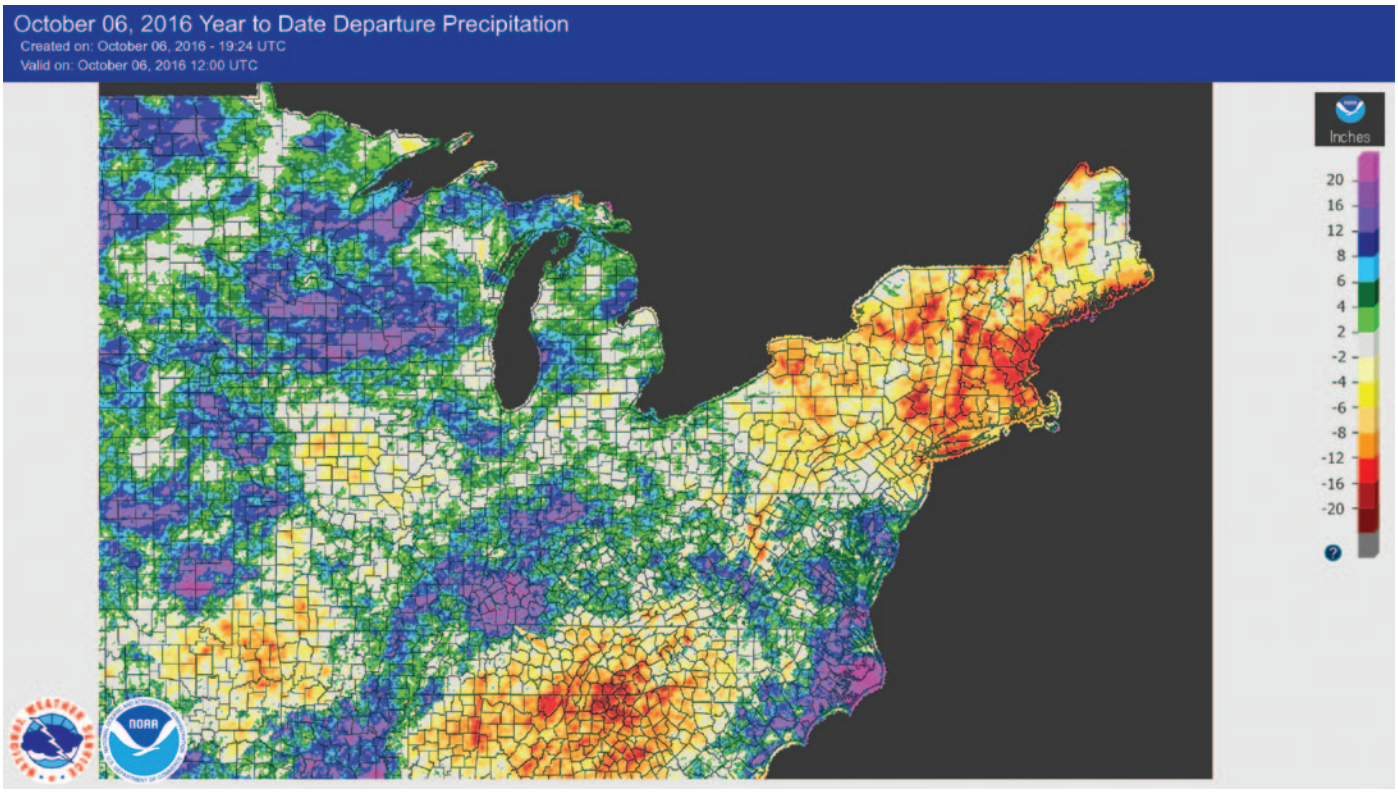
www.wpc.ncep.noaa.gov/pqpf/conus_hpc_pqpf.php

To better understand the possible range of precipitation outcomes, not just the single most likely precipitation total, we turn to the Probabilistic Quantitative Precipitation Forecast (PQPF). In contrast to the QPF, which forecasts a specific amount of rain, the PQPF will answer questions such as the following: How likely is it that we'll get at least 0.1" in 6 hours? How likely is it that we'll get at least 1" in 24 hours? And so on. The PQPF does a good job of capturing the uncertainty of precipitation forecasts over space and time.

This dynamic product is hard to illustrate on paper, but it starts with a map that allows you to set parameters such as minimum expected amount of rainfall (selected from a menu on the right-hand side) over a given time frame (choice of 6 or 24 hours). The map displays the probability of receiving at least the specified amount of precipitation. Mousing over the upper navigation bar of time periods produces an animation of estimated regional weather patterns that can be extremely addictive. Using this tool can really help you understand how a weather system is expected to evolve for the next few days, and how it might affect your specific location.

The PQPF informs our farm planning in numerous ways. Do we need to make special preparations for torrential rains? Do we need to scramble to do all equipment-based work before the ground turns soggy, or are we highly unlikely to receive more than a quarter-inch today? If we hoe weeds this morning, will they wilt and die or be rained on and revive? Should we alter our harvest plans if there's a high probability of even a little rain in a particular time frame, so that we can pick crops when the leaves are dry in the interest of minimizing disease spread?

A potential source of confusion when using the PQPF is its presentation of times in Coordinated Universal Time (UTC); for example, 18Z is 12 noon, Central Standard Time. For North American users, the site's four forecast periods generally represent morning (end time 18Z), afternoon (00Z), evening (06Z), and overnight (12Z). For a convenient conversion table to get the specifics for each time zone, see: http://ready.arl.noaa.gov/READYtime.php.



Above is the AHPS map of precipitation departure from normal for the northeastern US, January 1 through October 6, 2016. Note the extreme droughts in New England and southern Appalachia. All images courtesy of Eric and Joanna Reuter. Images taken from the U.S. government weather sites are in the public domain.

Advanced Hydrologic Prediction Service (AHPS)

http://water.weather.gov/precip/

The Advanced Hydrologic Prediction Service (AHPS) provides flood forecasts along rivers, and to provide that service, forecasters need to know how much rain fell across the landscape (among other things). Thus, the AHPS site also provides maps of past precipitation based on radar-indicated precipitation and known gage measurements. These data sets are presented in a variety of useful formats, including observed rainfall, normal rainfall, departure from normal, and percent of normal. The data can be displayed over a variety of time frames, from annual to daily, with archives going back over a decade. While this is not a forecast tool, we find it useful and interesting to understand how the season's precipitation fits in the context of normal.

The map patterns also show how precipitation varies across the landscape. For example, on the associated map, note the one wet spot in northern New Hampshire, or the gradient from wet to dry across the southern Kansas-Missouri border. These uneven rainfall patterns are part of the reason that precipitation forecasts pose a challenge to forecasters and farmers.

Other AHPS features that could be relevant to farms include the River Observations and River Forecast tabs. These provide data and forecasts on river levels at stream-gauge locations throughout the US, including descriptions of the expected flood impacts at various stages. Farms that are subject to flooding, or farmers that need to travel through floodable areas to sell or deliver produce, may benefit directly from this information.

This is the first of a two-part article. Read more about the online tools available to farmers in the January Growing for Market.

All images in this article were generated from the online weather services they are describing. Because they are a government service, the images are in the public domain.

Eric and Joanna Reuter have been integrating food and farming into the ecosystem at Chert Hollow Farm in central Missouri since 2007. Visit their website at cherthollowfarm.com.

The place for this cookbook is on your market stand

Reviewed by Andrew Mefferd

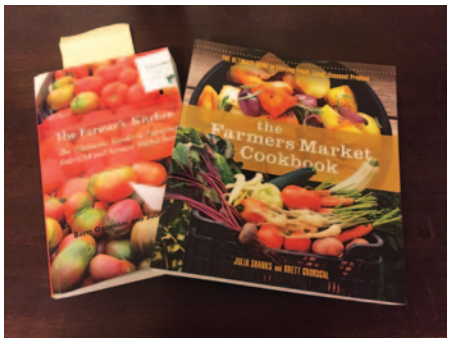
To a brand new CSA or farmers market customer, the variety of produce can be overwhelming. Many people are not used to cooking with the range of seasonal ingredients that are available. Which is why I love *The Farmers Market Cookbook*. It reads like a user's manual for a CSA or farmers market.

The book is filled with simple and delicious seasonally appropriate recipes using ingredients that are probably already grouped on your farm stand or CSA box. With sections on eating seasonally, storing produce and produce descriptions, it tells customers what they need to know to get the most out of your produce.

The other reason I love this book is because I love to cook. A good part of my enjoyment of the produce we grow is in the cooking and eating of it. And the recipes here are excellent, showcasing fresh vegetables and herbs at their finest. You can tell that authors Julia Shanks and Brett Grohsgal, both chefs, have spent a lot of time in the kitchen as well as the field.

The Farmers Market Cookbook is an update on a previous book the authors produced called *The Farmer's Kitchen*, which I have had and enjoyed for years. I was excited to hear that there was a new version that has been updated and expanded. It's also why this book seems so familiar even though it's brand new.

I've always been amazed at how well it works to give recipes away at a farmers market. Whenever we have a glut of something, we make up recipe cards featuring whatever is in excess and reliably sell more of the item that we would without recipes. Recipes are in the public domain once printed, so the authors encourage you to use and share their recipes "most freely." All they ask is that you credit the source when they are copied. Test drive the recipes in *The Farmers Market Cookbook* in your own kitchen this winter, then put your favorites on your stand in 2017.



Here's *The Farmers Market Cookbook*, and my old copy of the previous version, slightly spattered with post-its marking my favorites. The *Farmers Market Cookbook* is available for $29.95 from growingformarket.com or call 800-307-8949.

Phenology for farm planning

By Pam Dawling

Phenology is the study of recurring plant and animal life cycle changes in relation to the weather. Some changes are temperature-dependent, not calendar-dependent. The opening of some buds and the emergence of some insects from the ground are related to the accumulated warmth of that season. It isn't just superstition that some events occur simultaneously every year, but on dates that change from year to year. It is the result of two events being triggered by the accumulating warmth having reached a certain threshold. It's about what is happening, not a premonition of what will happen based on the width of woolly bear caterpillar stripes!

By noticing when the lilac reaches full bloom, you know when it's warm enough to sow beans and squash. This skill can be a useful tool for vegetable growers to increase resilience in the face of a variable climate. The old almanacs are of less use now as the long-term weather changes. Growing Degree Days (GDD) are calculations based on average daily high and low temperatures, totaled over time. They are related to phenology although they rely on observations of a thermometer rather than of plants and animals. Both are useful tools for making decisions based on actual conditions where you are.

A good resource for further study is *The Phenology Handbook*, by Brian P. Haggerty and Susan J. Mazer.

Phenology network

The National Phenology Network brings together "citizen scientists, government agencies, non-profit groups, educators and students of all ages to monitor the impacts of climate change on plants and animals." Their Peer-Reviewed Results section includes the delightfully named "Legacy Lilac Data". If you have any doubts about the validity of phenology findings they will soon evaporate after looking at this website. Their "Nature's Notebook" section is "a national, online program where amateur and professional naturalists regularly record observations of plants and animals to generate long-term data sets used for scientific discovery and decision-making." Individuals can join as observers and record observations online, and also receive a regular newsletter.

Planting signs

Each year I fill out a chart with our phenology records, adding a new column for each year's observations. We reckon it's warm enough to plant potatoes when the daffodils bloom. This date has varied from February 17 (2012, everything was earlier that year) to March 21 over the past 15 years. The start of shadbush flowering is another sign for potato planting.

We consider it warm enough to plant peas when we hear spring peepers. The date for that has varied from February 23 to March 11. Flowering maple trees are another sign that it's warm enough to plant peas. We plant snap peas under row cover when the forsythia blooms. That has been March 10 to April 8. Snap peas are not as cold hardy as shelling peas, because of the higher sugar level in the

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seeds, they are more likely to rot. If you don't have any forsythia, check for crabgrass seedlings – they germinate around the same time, when the soil at 4"/10cm deep stabilizes at 55F/13C.

Bush beans, pole beans, squash and cucumbers can be planted when the apple blossom falls. The white oak leaves reaching the size of a squirrel's ear is our signal to sow sweet corn - from April 12 to April 29 (our average last frost is April 20-30). Other sweet corn indicators are blooming tulip poplars and germinating ragweed. Both require 200 GDD, on a base of 50F/10C, and their dates have been 4/17-5/10 and 4/16-4/26, but I'm a poor observer of ragweed seedlings! When iris blooms fade (soil temperature of 65F/18C), conditions are right for sowing peanuts and lima beans.

Steve Albert's website Harvest to Table has good phenology information for beginners, including a table of 20 crops and their phenological signs for planting. One I didn't know is to transplant tomatoes, eggplant and peppers when daylilies start to bloom and the flowering dogwood is in peak bloom. About the dominance of lilac in planting phenology, Steve Albert says: "Lilacs bloom first in the west and south and then in the east and north. Naturalists have observed that most phenological events on a large scale progress from west to east and south to north. This progression is known as "Hopkin's Rule" . . . which states that phenological events are delayed by four days per degree of north latitude and 1.25 days per degree of east longitude. But there are exceptions; in particular, altitude and topography will impact the progression of natural events." In other words, believe what you see, not the calendar.

Phenological signs for succession planting

There are two phenological ways to get information to help with deciding when to make sowings of various crops after the first one in the spring. One is by observing other types of plants; the other is observing previous sowings of the same crop.

A standard recommendation for when to sow fall cabbages and broccoli is when catalpas and mock oranges bloom. In the fall, I watch for new seedlings of purple dead-nettle, chickweed and henbit to tell me the soil has cooled enough to sow spinach with a hope of germination. The dead-nettle and henbit germinate at very close to the same date – and look very similar! Our dates are 8/4-9/1. The chickweed is generally a week or so later. I wrote a blog post about these three with seedling photos. Just put "henbit" in the search box at sustainablemarketfarming.com.

Some crops have their own inbuilt bio-indicator for when it's time to make the next sowing. With outdoor sown lettuce, as soon as one sowing is visible, sow the next. This naturally leads to the planting interval between one sowing and the next shortening during the season, from every two weeks in February to every two days in September. Our simplified instructions for a continuous and even supply of full-sized head or leaf lettuce are to sow twice in January, twice in February, every 10 days in March, every nine days in April, every eight days in May, every six or seven days in June and July, every five days in early August moving to every three days in late August, and every other day until Sept 21. After that we ease back to every three days until the end of September. The starting and finishing dates might be different in your climate, as well as the speed of the progression. So watch the germination, and let that be your guide.

Sow another planting of sweet corn when the previous one is 1"–2" tall. For us, the intervals between our six plantings are 23, 18, 18, 13 and 9 days. Slow germination and growth at the beginning of the season, a plateau and a dash to the finish.

Sow more beans when the young plants start to straighten up from their hooked stage. We now sow beans six times, at intervals are 28, 28, 22, 20 and 15 days. This isn't sowing as soon as the previous plants straighten up their loops. We buy the Pediobius foveolatus parasitic wasp and get rid of our Mexican bean beetles that way, so our plants stay healthier than they used to, and we harvest them for much longer than we used to (three weeks rather than two).

There are some good GDD models for planning succession plantings of sweet corn. There is one from the University of Connecticut, one from the Crookham Company for the seed varieties they sell, and in the UC Davis collection of degree-day (DD) models.

Signs for predicting ripeness/maturity

There are ways to use GDD to predict ripening, and logic says that warmer seasons will provide earlier ripening of wild fruits and dying of flowers, but I do not know of any plant or animal indicators that can predict crop maturity directly.

From the uspest.org list of online GDD models, we can see the relative ripening times to first harvest of four varieties of broccoli: Green Magic broccoli 2103 DDs after transplant; Emerald Pride broccoli 2151 DDs after transplant; Arcadia broccoli 2281 DDs after transplant; Imperial broccoli 2383 DDs after transplant. This kind of information can be useful in crop planning for a continuous supply of broccoli, or for as long a harvest period as possible.

Oregon State University has good GDD information on Using Heat Units to Schedule Vegetable Plantings, Predict Harvest Dates and Manage Crops in their Small Farms Program. Also see Montana State University Using Growing Degree Days to Predict Plant Stages

For orchardists, there are efforts to create models predicting fruit maturity based on the date once the chilling requirement has been met, but it is complex because cultivars vary, and each may need its own model.

Signs for pest prediction

Knowing when to expect insect pest outbreaks helps sustainable growers avoid pest problems by protecting crops in time, or the information can alert us to monitor more carefully. Integrated pest management (IPM) is a least-toxic approach to managing pests by scouting for them and only taking action if the numbers exceed a pre-determined action threshold.

I'm not so good at using phenology for pest prediction. I've read that Mexican bean beetle eggs hatch when the foxgloves bloom. I tried tracking each of these events. I've see new larvae between 6/4 and 6/20, and foxglove flowers opening between 6/6 and 6/11, but I don't have enough observations to prove anything.

Steve Albert says that cabbage root maggots are active when wild arugula blooms, and Japanese beetles arrive when morning glory vines begin to climb. Gypsy moth eggs hatch when the shadbush flowers. Grasshopper eggs hatch when lilacs bloom; eastern tent caterpillar eggs hatch when the buds of wild plums and crabapples open; squash vine borer activity peaks when chicory flowers (they are most active for about two weeks). Redbud flowers are an indicator for the appearance of flea beetles, but I don't know if it's all types of flea beetles, or the brassica ones (which seems most likely).

Increasingly, there are GDD models for pest outbreaks, such as from the uspest.org list of GDD models, this table for the brown marmorated stink bug life cycle:

85 DDs after Jan 1: 1st adults begin reproductive maturation
360 DDs after Jan 1: 1st active spring adults
566 DDs after Jan 1: 1st egg laying
700 DDs after Jan 1: 1st nymphs
1608 DDs after Jan 1: 1st adults summer generation
1734 DDs after Jan 1: peak 3rd instar nymphs (mid-season hosts)
2022 DDs after Jan 1: 1st egg hatch 2nd generation (S. states only)
2092 DDs after Jan 1: final peak summer generation nymphs
2213 DDs after Jan 1: peak summer generation adults
2905 DDs after Jan 1: 1st 2nd generation adults (S. states only)

Tracking climate change

There have been people tracking phenological observations for centuries, including Thomas Jefferson, Aldo Leopold and Henry David Thoreau in the US. The Central England Temperature Record, from 1659 to the present, was compiled by Gordon Manley in 1953. The old records are being consulted to better understand how the weather and other environmental conditions have changed since those records were made, and to predict future trends. The website Real Climate: Climate Science from Climate Scientists makes interesting reading.

Project Budburst is a national network of citizen scientists monitoring plants as the seasons change. Individuals create an account, learn a bit about how to make observations (as needed), then choose particular plants

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Bloom times of common species such as daffodils and morning glories can be used to predict many events on the farm. Top photo by Twin Oaks Ornamentals, bottom photo by Raddysh Acorn.

to observe, and fill out reports. This can become a school project too, and Project Budburst offers educational materials for various age groups.

Growing Degree Days

I won't go into how to calculate GDDs in this article. For more information about using GDDs, read the explanation in Lynn Byczynski's Market Farm Success (available from growingformarket.com) or that on Wikipedia (I wouldn't routinely offer Wikipedia as a source, but that writer did a good job). For Michigan, see also enviroweather.msu.edu. There is a free smartphone app at farmprogress.com and by now, perhaps elsewhere too. Some of the weather forecast websites offer GDD calculators for nearby weather stations – not as accurate as recordings on your farm, but close. Weather.com has one, as does Wunderground.com. I found a general search for "Growing degree days calculator" quicker than searching their sites – maybe October is a poor time of year to look!

Limitations of phenology

Phenological models, especially in dry areas, can be thrown off by limited moisture. If there is insufficient seedbed moisture, germination processes will be delayed. Emergence will occur later because seeds require more time to take up enough water to begin the germination process. In response to drought stress, some crops actually increase their rate of growth. The most probable reason is that temperatures in the crop canopy rise more than they would normally, because water transpiration (which would cool the plant) is reduced. This increased temperature can go unnoticed by thermometers above the crop canopy. Some plants bolt sooner under drought conditions, and if, for example, you are watching for blooming of a wildflower in a dusty roadside, it may not accurately reflect what to expect in an irrigated crop.

Pam Dawling grows vegetables at Twin Oaks Community in central Virginia. Her book, Sustainable Market Farming is widely available, including by mail from Sustainable Market Farming, 138 Twin Oaks Road, Louisa, Virginia, 23093. Enclose a check (payable to Twin Oaks) for $40.45 including shipping. Pam's blog is on her website sustainablemarketfarming.com, and on facebook.com/SustainableMarketFarming.

Favorite perennials for flower growers

By Jane Tanner

When Erin Benzakein and her family started growing flowers commercially eight years ago at Floret Flower Farm in Washington State's Skagit Valley, perennials were an important part of the mix. After weed pressure and voles wreaked havoc on the perennials, they switched to annuals only. "We were focusing on high volume and annuals," Benzakein said recently.

Fast forward to today where the emphasis at Floret is on design work, which has garnered prestigious awards, accolades, and workshops fully subscribed as soon as registration opens. Benzakein said the prominence of design work brought Floret back to perennials and woodies because of the rich pallet of flowers, foliages, textures and unique elements these long-producing plants offer. Recently, they planted an eighth of an acre in perennials within the two acres in cultivation.

Horticulturists and some farms make clear distinctions between trees and shrubs (woodies) and the herbaceous perennials that die back in the fall and reemerge in the spring. Farms and nurseries that specialize certainly make those divisions, but small-scale flower farmers who grow them along with a mix of annuals may not draw a hard line between them.

"The perennials and woodies are all planted in areas and systems that make them easy to maintain from year to year with the understanding that they won't be moving," said Jennie Love, owner of Love 'n Fresh Flowers, an urban flower farm and design studio in Philadelphia.

The differences between annual flowers and floral elements versus perennials (both woody and herbaceous) are more clear-cut, and there are significant trade-offs each farm has to weigh. To begin with, perennials require dedicated space for many years. How much good soil is a farm willing to devote to a crop that may take years to produce? "That is useable ground I have to let go, that is hard for me," said Benzakein.

At Perry-winkle Farm in Chapel Hill, North Carolina, where four cultivated acres are spilt between vegetables and flowers, the approach doesn't allow for permanent beds. "We have an intense five-year rotation and perennials wouldn't fit in," says Cathy Jones of Perry-winkle. "Everything gets turned in and moved."

For Benzakein, permanent beds offer welcome relief from what she calls "turning and burning" of the annual beds. "I would say once established, [perennials] are pretty low maintenance compared to our annual production.

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Above left, an arrangement by Jennie Love, owner of Love 'n Fresh Flowers, incorporating mountain mint and northern sea oats. Above right, Jennie in her greenhouse.

Perennials

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It's nice to not have to flip the entire field."

The degree of maintenance depends on plant selections. There's no escaping some labor in watering, mulching, pruning, dividing and weeding.

At Floret, where choking weeds drove them away from perennials, now they mulch heavily with wood chips and are more alert and regular about weeding. As for the vole nests they break up with regular tilling, Benzakein says the voles were nesting in the paths under landscape fabric. With a new practice of pulling up the fabric each fall and replacing it each spring, they expect to be free of the rodents.

At Love 'n Fresh, they plant perennials in black woven plastic for long-term weed control. The annuals that are rotated every year are planted into one-season use plastic for weed control.

Advantages of perennials include good moisture retention that results from not tilling and the robust roots in established perennials. With less need for watering, perennials can be a good choice for drought prone areas. In fact, some perennials can flourish in poor soils that wouldn't support annuals, said John Dole, Interim Associate Dean and Director of Academic Programs in the College of Agriculture and Life Sciences at North Carolina State University. "I would say any of the low maintenance perennials such as baptisia, convallaria (can tolerate some shade), eucomis (Pineapple Lily), hellebores (shade), and some penstemons."

While perennials can reduce labor costs over time, start-up costs generally are considerably higher than for annuals. Perennials produce for many years, but not right away like annuals. "It can take up to five years to begin really harvesting from some perennial and woody crops," Love says. "The return on investment is slow."

New farmers may not be able to wait. "When we started we were cash strapped and perennials were more expensive," Jones said. For Perrywinkle, which has a deeply loyal following at regional farmers markets, reliable and abundant annuals that can be arranged into bouquets for the markets are what works best.

On the other hand, at Floret and Love 'n Fresh, known for high-end design work and workshops, they perpetually seek out unique textures, colors and shapes. "The good stuff you can't grow from seeds," Benzakein says. Perennial plugs can be expensive in general and specialty choices can ratchet the cost up. Benzakein pays extra for certain patented heuchera cultivars.

She also prefers larger bare root plants to smaller liners. Obviously, larger transplants cost more. In other cases, where only smaller liners are available, she puts them in one-gallon pots for a year before planting them in the fall. "I've done it the other way," she says, "trying to find two-inch hydrangeas swallowed in weeds." Potting them up has additional labor and input costs and, of course, takes up space that might be used for something else.

While the bloom period can be shorter for many perennials, flower farmers are harvesting more than the blooms. Benzakein recommends flower growers select perennials that produce great foliages. "Our mixed bouquets are 60 percent foliage and filler," she said.

Ninebark (Physocarpus opulifolius), the most productive woody at Floret, offers a good example of harvesting at many stages. Starting with a large bare root plant, they can harvest a little the second year and in abundance the third year with flowers produced on the previous year's wood. First, they harvest flowers, and after the flowers shed, they use the beautiful seedpods. After that, they harvest straight foliage that can last 14 days in the vase. With flowers, seedpods and foliage, they harvest from May through October.

Sometimes permanent perennial beds are part of an overall plan to manage elements of the landscape. Floret sits in a flat, open valley that had been heavily logged. They created eight rows of woodies, each 150 feet long and 15 feet wide, that run along the farm's boundaries to filter and break the wind. They protect the greenhouses in the windy valley. There's also an environmental motivation: wildlife habitat. The perennial borders are stopover sites for songbirds. One of the rows is exclusively native plants. "It's for pollinators and for critters to hide and nest," Benzakein said. They cut very little from the native row.

The topic of native plants is a good place to start looking at a sampling of specific perennial flowers, foliages and other elements that Love and Benzakein favor. Of course, each farmer has to consider his or her horticultural zone, soils and markets.

On her website, Love lists "Five Native Perennial Cuts I Could Never Do Without" (http://tinyurl.com/hlwlbun). Here is a short description.

Mountain Mint (Pycnanthemum muticum) is native throughout the East, as far west as Texas and Illinois (excluding Indiana) and up the East coast from Georgia to Maine. [The source of native plant ranges is the USDA Natural Resources Conservation Service.] Its sturdy stems — once hydrated — hold up out of water. In the Philly area, Love harvests flushes of stems in late June and early September. While it spreads rapidly, it's more contained on her farm because heavy cuts reduce its energy. Honeybees and other pollinators love the tiny flowers.

Northern sea oats (Chasmanthium latifolium) is native throughout the eastern United States and reaches into New Mexico and Arizona. "The nodding heads add beautiful movement to mixed bouquets and center-

pieces," Love wrote. She favors using it green, but also dries some. To keep it from spreading too aggressively, she plants it in shade and mows it down.

False Blue/Wild Indigo (Baptisia australis) is native throughout the eastern half of the country with the exception of Louisiana, Mississippi and Florida. Love says it's one of the hardest working plants on her farm. In spring, she uses the yellow or purple flower spikes, in June the green seed pods for wedding work, and the foliage the rest of the year. The three-year wait for the first harvest is worth it, she says.

Joe Pye Weed (Eupatorium dubium) is drought tolerant and native along a band of the East coast and Mid-Atlantic from South Carolina to Maine and into Nova Scotia. Love uses the delicate umbel of creamy pink flowers in bud stage in late summer and autumn for mixed bouquets and design. For a rustic, wildflower look she waits until it's fully open.

Heuchera villosa 'Autumn Bride' is native to rocky wooded slopes in Virginia, Georgia and Tennessee. This cultivar, larger than most with six-inch stems and wide leaves, is key for Love 'n Fresh in late spring and early summer when good foliage is in short supply. The fall's tall white flower spikes are used in mixed bouquets and wedding work.

In the Pacific Northwest at Floret, heuchera is harvested from early May through the summer. "The leaves come back in shocking amounts," Benzakein said. It's good for shorter arrangements, covering the vase lips of centerpieces, and the leaves are leathery enough for boutonnieres. Among her favorite cultivars is Heuchera micrantha "Palace Purple" with its cranberry and maroon leaves.

Among the favorite ninebarks at Floret: "Diabolo," with dark purple leaves, white flowers, red seed pods; and, "Coppertina," purple-leafed with pinkish white button shaped flowers. Benzakein said florists love the novelty colors.

They also love the mints at Floret where there's 150 feet of Apple Mint (Mentha suaveolens "Ehrh"). It's the first foliage, harvested by Mother's Day. "It smells wonderful," Benzakein said. It is tall with "a beautiful sagey green." Floret grows 50 feet of Pineapple mint (Mentha suaveolens "Variegata"), which is shorter and comes on a little later. The green and white variegation is popular for wedding work. "Fifty percent of the orders from florists are going to be white," Benzakein said.

Each year, the Association of Specialty Cut Flower Growers holds trials and selects winners among annuals, perennials and bulbs. The following link offers winners back to 2000- http://tinyurl.com/jkcjxlx.

Dole, who with his colleagues at NC State conducts trials, offers a few of his favorite woodies and perennials. Among the hydrangeas, he especially likes the Hydrangea paniculata cultivars, valued for their vigor and range from zones 3 to 8. They produce large pyramidal clusters of white flowers that can be preserved and dry well. The Hydrangea arborescens cultivars are also valuable. Michael Dirr calls 'Annabelle' "…unabashedly the queen of the Hydrangea arborescens bash." Flowering on new growth it's a workhorse for cut flower growers. Dole also likes the ninebarks, Bleeding heart (Dicentra), variegated Solomon Seal, Monarda 'Raspberry Wine,' and Lily of the Valley.

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This is the first in an occasional series of articles talking with growers about their favorite perennials.

Resources

Woody Cut Stems for Growers and Florists, by Lane Greer and John M. Dole, Timber Press.

Specialty Cut Flowers, by Allan M. Armitage and Judy M. Laushman, Timber Press. (available from growingformarket.com)

Jane Tanner grew cut flowers and specialty crops at Windcrest Farm and Commonwealth Farms in North Carolina, and helped manage the biodynamic gardens at Spikenard Farm in Virginia.

Below left, Erin Benzakein working with ninebark. Photo by Chris Benzakein. Erin's new book, *Floret Farm's Cut Flower Garden: Grow, Harvest and Arrange Stunning Seasonal Blooms* is available for preorder from growingformarket.com or call 800-307-8949.