



Golden Ragwort (*Packera aurea*) is an excellent ground cover that even keeps invasive ivies at bay. Photo by Pru Foster.

Climate Resilient Gardening in Maryland

by PRU FOSTER

As a retired climate scientist, and current gardening fanatic, I'm often asked "What should I grow that will survive coming climate change?" My usual articulate response is to murmur something like "Uh", or possibly "Um", and then later hope that I didn't drool. The difficulty is that trying to answer the what-to-grow question is vastly complicated, even without the uncertainty of climate change. Different species of plants have different light, soil, moisture, wind, pollination, and pest requirements. Heck, different strains within a species can have different requirements. Layer on top of that the unique characteristics of a planting site and the habits of the gardener, and it's quite a challenge to

give good planting advice. Sprinkle in the uncertainty of climate change and it's a wonder that there are indeed some rules of thumb that can help us to create gardens that will thrive into the future.

Let me emphasize that the uncertainty of future climate patterns is not just uncertain, it is wildly uncertain. There is a whole cascade of uncertainties including the scale of future emissions, the earth system's response including possible tipping points, and the complexity of local climates. That said, climate models are our best guess of the future climate and we can query these models' predictions through NASA or NOAA websites.

Of particular interest to gardeners is a new tool produced by the Davey Institute (hardinesszones.daveyinstitute.com)—where you can input your zip code and see how your planting zones are likely to change. For example, my 20854 zip code is currently a 7b planting zone, having warmed from a 7a zone just a couple decades ago. Under a best case scenario, my region is expected to warm to zone 8a by the end of this century and, under a 'worst case' scenario to zone 8b. While I am hopeful that we'll avoid the worst case scenario, it is a good idea to choose tree species, in particular, that can survive these warmer temperatures.

In addition to temperature changes, global warming is altering rainfall

patterns. In general, warmer air temperatures mean more rainfall as more water evaporates off the oceans, although some regions will experience less precipitation. In Maryland, and most of the Eastern Seaboard, a 5-7% percent increase in rainfall is expected. That might sound like good news, but unfortunately, most of the additional rainfall is expected to occur in winter months and as more intense rainfall events. This can mean both more runoff and more erosion. Rising summer temperatures will lead to increased evapotranspiration by plants, which are likely to outpace any increases in precipitation. Simply put, we can expect warmer, wetter, and wilder weather, with drier summers that can stress plant growth. Very roughly, these results are expected to be greater or lesser, depending on the level of climate-warming emissions that occur.

Coping with this future climate is a pretty big ask of the plants we put in the ground. Our best strategy is to plant tough species, that is, plants we can put into the ground and largely ignore until they are looking lovely. The tougher the species, the more likely the individual plant will survive climatic shifts. And the greater the genetic diversity, the more likely the plant population will survive the increased stresses, because some strains may have characteristics which are key to the species survival.

Who would these magical superstar plants be? Natives. And, for the genetic diversity that facilitates adaptation to a changing climate, our superstars will perform best if they are “straight species” natives, not cultivars. Cultivars, including nativars, are the result of intentional hybridization and are usually propagated by taking cuttings rather than through sexual reproduction. The resulting plants are thus clones which are genetically identical to their parent plant. Using cultivars instead of straight species thus reduces genetic diversity in the population, and makes a species more vulnerable to extinction.

While sticking to straight native species might sound a bit restrictive, the

good news is that these are the easiest of plants to grow. Native species are already adapted to our climate and soil, as well as to our climate’s fluctuations. This is especially true of populations that have been living in the wild near us, the so called local-ecotypes. In general, natives, and especially local ecotypes, won’t need to be watered, fed, or mulched, once they are established. They also don’t require soil amendments as we plant them, because



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they are adapted and co-evolved with local soil. Further, native plants benefit gardeners because they are resistant to many pest species and they host beneficial insects that are predators of garden pests. True, native plants can also harbor the pests themselves, but in a healthy ecosystem the predators will generally keep the pests at bay. Native plants also provide essential food and shelter that our native birds, turtles, frogs, mammals and other wildlife depend upon for survival. They are an essential part of the nutrient and water flows of our ecosystems.

So locally sourced natives are the gold standard for climate resiliency and native wildlife. But these are not always easy to source! Luckily, the Maryland Native Plant Society has a new google map tool on its website that can help. You can look for native plant nurseries near you at www.mdflora.org/nurseries.html or find announced native plant sales www.mdflora.org/plantsales.html. Another

excellent source of local ecotype natives is through the Wild Ones chapters. For example, the Nation’s Capital Wild Ones has plant swaps twice a year and members share seeds throughout the year at meetings. Finding neighbors and new friends with whom to share native plants is an excellent strategy as well.

Another golden rule of resilient planting, including climate resilient planting, is to plant a diverse range of plants. Indeed, for all shocks, and quite possibly for all systems, diversity rules the resiliency roost. This is because if some plants/stocks/peoples/schemes succumb to a given stress others may survive, indeed some may thrive. For the garden, this means diversity in species—golden-rods and bee balm and oaks—but also genetic diversity within a species. For instance, it is beneficial to plant paw paw trees from different lineages, which is also likely to give you more fruit anyway. Research shows, time and again, that diverse ecosystems are far more likely to survive and adapt when faced with stressors. Monocultures can be wiped out in a season—think the potato famine, the loss of 3 billion chestnut trees on the US’ eastern seaboard in the 1900s, and the banana’s doom.

Beyond resilient plant choices, there are also some gardening practices that can help our gardens to thrive long into the future. With more summer dry spells and intense downpours in non-summer months expected in the coming decades, we can plant densely and nurture the soil. Planting densely is just what it sounds like—putting as many plants as possible into the ground—the less bare soil the better. The more plants in a given area the greater the root mass, which will help to retain your soil, and perhaps somewhat counter-intuitively, reduce water stress. Deeper rooted plants bring water closer to the surface and thus can moisten the upper soil column during dry periods. But that’s not the only way dense plantings reduce water stress, a thick canopy also reduces evaporation because soil temperatures are lower, wind is reduced,



The seeds of Toad Trillium (*Trillium sessile*) are transported by ants, a process called “myrmecochory”, an association that could be impacted by climate change. Photo by Pru Foster.

and whatever water that is evaporated tends to stay within the dense leaf canopy. A moist canopy environment means there is less of a difference in the water vapor concentration inside the leaf and outside it. Therefore, less water is transpired to the atmosphere. The net result of dense planting is less water loss, less water stress, less runoff, and reduced soil erosion. And, the cherry on top is that dense planting leads to a great reduction in maintenance time—far fewer weeds, no need to mulch, and a reduction in watering requirements.

Part of dense planting’s magic comes from its role in protecting, aerating, and moistening of the soil column, as well as contributing to the well being of the soil’s microbiome. The microbiome within the soil is of paramount importance to plants’ health because the soil fungi provide plants with many important nutrients. We can further nurture this underground ecosystem by practicing no dig or low tillage gardening. The old technique of forking over a garden bed is loosing ground (cringe). Turning over a garden bed not only brings weed seeds to the surface, but it also accelerates the loss of organic matter from the soil—important for water and nutrient flow and retention. Digging up the soil also physically disturbs the soil microbiome thereby reducing mineral and nutrient uptake by plants. Not to mention, digging over a garden

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bed is hard work. Taking care of your soil is another top management tip for a climate resilient garden.

There is even more we can do to make our gardens more climate resilient—and that is to garden with the wider biosphere in mind. By protecting our local ecosystems, our gardens will benefit from regulated water flows, reduced local temperatures, and all the other benefits of a healthy diverse biosphere. Gardeners can help the critters in our garden and beyond by avoiding pesticides and the over application of fertilizers, leaving the leaves, and encouraging wild areas. The base of

many food webs are the critters that live in plant litter. We can not overestimate the importance of local pockets of diversity, especially in light of a recent estimate that we’ve lost 70% of wild animals in the past 5 decades. That’s beyond disturbing. And if you find leaf litter and twigs untidy—you may find that after a while your sense of what is beautiful shifts. I now see the garden litter as crinkly and beautiful in its own right. And it is not just because it means I get to see more bluebirds, indigo buntings, bald eagles, barn owls, and red tailed hawks. I like the noises the litter makes, the smells it exudes, and even have come to appreciate the color of decaying leaves on my winter beds.

That’s a lot of strategies to make our gardens more climate resilient, but you just need to remember one golden rule. Nurture biodiversity. Biodiversity means both many different kinds of plants and just more plants. Burgeoning comes to mind. Ensuring biodiversity means planting densely, practicing wildlife friendly gardening, nurturing our soil, and connecting to other native plant areas. Here’s a rewrite of “Something old, something blue” to amuse us:

*Something native, something true.
Sometimes dense, a mixed crew
A happy planting to ensue.*

Happy nurturing!