Combined Proceedings IPPS 68:184-193. 2018.

# Ecological All Stars

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*Keywords*: Pollinators, butterflies, caterpillars, bird habitat, carbon balance, ecology, *Liriodendron*, *Aralia*, *Populus*, oak, *Quercus*, holly, *Ilex*, willow, Salix, *Vaccinium*, *Tilia*, maple, *Acer*, *Prunus*.

## INTRODUCTION

For more than a century, baseball has been considered America's favorite pastime. References to playing baseball in America go back to the late 1700s and professional leagues were started in the late 1800s (baseball-reference.com). Since then, thousands of games have been played and player performance (statistics) has been recorded. The most celebrated of those statistics have traditionally been home runs, runs batted in, and batting average—the three prongs of the lauded triple crown. Others like hits, walks, on base percentage and so on were recorded but often not valued to the same extent.

That way of thinking began to change in the early 1980s with the growing usefulness and availability of computers and the introduction of sabermetrics (Schell, 2011). Developed by Bill James and introduced to the wide public in 1982, sabermetrics is, in short, calculations that consider various contributions a player has made to their team (Schell, 2011).

One of the most commonly used sabermetric statistic is called Wins Above Replacement (WAR). WAR considers numerous aspects of a player's performance, not just those that are most celebrated. The "power" numbers that once might have solidified a player as a Most Valuable Player candidate are now simply parts of the calculation. In recent years, players with a higher WAR have been given more consideration than those that might lead the categories like home runs, runs batted in, and batting average.

By now you're probably asking how this relates to ecology or plants at all for that matter. In truth, it doesn't, but it is what inspired me to take a closer look at plants and think more critically about all the ecosystem services that they provide, not just those that typically come to mind. Typically, when we discuss the ecological or environmental value of plants, our mind jumps to those that provide nectar for pollinators, or fruits and seeds for birds, or serve as host plants for a

range of moths and butterflies. Yes, these are all important and deserve consideration, but these are not the only considerations in determining the overall ecological value of a plant. That determination is complicated, convoluted, and likely incalculable. After a significant amount of reading, research, observation, and reflection, there is no doubt that some plants deserve much more celebration than they typically receive. Though I am sure there are more, I have identified seven factors that influence the environmental/ecological value of a plant.

## ECOLOGICAL VALUE FACTORS

### Factor 1: Pollinator value

When discussing the pollinator value of plants, we typically think of those that provide abundant nectar. Species like *Pycnanthemum muticum*, *Clethra alnifolia*, and *Phlox paniculata* are among the best nectar sources and their status as superior pollinator plants is well-known, as it should be.

Often, however, we forget about the importance of pollen. Jenkins Arboretum's long-time apiarist compared the two with the analogy that pollen is like cheeseburgers and nectar is like candy bars. Pollen, which provides mainly fats and proteins, is truly sustaining and vital to the survival of bees. Nectar on the other hand, provides mainly carbohydrate sugars which provide energy. Both are important, but is one more so than the other? Could it be argued that pollen is more valuable than nectar? Regardless of the answers to these questions, we should be including pollen plants in our lists of plants to attract bees. For the purposes of evaluating a plant's ecological value, species that produce both pollen and nectar are given more consideration than those that provide only one of the two.

Figure 1. The picture on left is American hazelnut (a great pollen source) Photo credit: Will Cook; and the picture on the right is summersweet (a great nectar source) Photo Credit: Willowbend Nurseries.

**Factor 2: Lepidopteran larval hosts**

Doug Tallamy's book, *Bringing Nature Home*, was the first time many of us have seen a quantification of the value of plants to butterflies and moths (Tallamy, 2009). Knowing that oak trees support 534 species of lepidopteran larvae (Tallamy, 2009), far more than all others, helps us to better understand the huge role these trees play in our environment. There are a couple of different ways to think about host plants though. First, we now know that oaks, cherries, and willows support hundreds of different moth and butterfly species and we label them as most valuable (Tallamy, 2009). This may be true, but we cannot discount the value of plants that support the specialists. That is, we must remember that without milkweeds (*Asclepias* spp.), we would not have monarchs; without pipevines (*Aristolochia* spp.), we would not have pipevine swallowtails; and without senna (*Senna* spp.) we would not have cloudless sulphurs. There are dozens of similar examples and this needs to be considered for overall ecological value.

**Factor 3: Food for birds**

Aside from backyard birdfeeders, when we think about feeding birds, most of us immediately picture plants such as hollies (*Ilex* spp.) and elderberries (*Sambucus* spp.) that produce fleshy berries. With a little more thought, we then realize we need to include plants such as pines (*Pinus* spp.), birches (*Betula* spp.), and coneflowers (*Echinacea* spp.) that provide high quality seeds. Fruits and seeds are both highly valuable, that cannot be denied, but these are only the things that the plants are producing. What is equally valuable, but often overlooked, is what the plants are supporting.

As noted in the previous section, there are countless plant species that support hundreds of different moth and butterfly larvae (and many other insects as well). These larvae are an important source of fats and proteins for various bird species (Figure 2). The plants that support insects are also supporting birds. That means that a black willow (*Salix nigra*) is just as important for songbirds as a black elderberry (*Sambucus canadensis*), if not more so, but I have never seen black willow listed as a plant to attract birds (Soren, 2018).

**Factor 4: Nesting and cover**

In the increasingly urban world we live in, with ever decreasing wildlife habitat, animals of all kinds need a place to escape—a place to den, nest, and raise offspring. Some plants provide better nesting and cover than others and they deserve some attention as well. Plants with dense foliage or branches and those that form thickets provide great nesting and cover opportunities. Evergreen trees and shrubs also provide protection from winter winds and snow and are perhaps the best for nesting and cover. Species like inkberry (*Ilex glabra*) which combines all of these traits are ideal.

**Factor 5: Erosion control**

With increasing human population, we also see increasing areas of impervious surface which increases stormwater runoff into our waterways and leads to severe erosion along streambanks. We also see soil erosion in areas that are only lightly vegetated. It could be argued that erosion is the most significant threat to our ecosystem because the land cannot support life if there is no soil on which to grow plants. Species like gray dogwood (*Cornus racemosa*) that form dense colonies or thickets, grow vigorously, and form a dense root system are highly valuable in helping to control erosion.

Figure 2. We typically think of berries and seeds. However, plants that host a lot of insects are just as valuable (if not more) than those that produce fleshy fruits or high-quality seeds. Photo Credits: Top left: Gypsy Flores, Top right: Ryan Sanderson, Bottom left: Fred Ortlip, Right: Johnny Wee.

**Factor 6: Stormwater mitigation**

The impervious surface mentioned above, combined with the more frequent and more extreme weather events we've seen over the past few years, have led to serious stormwater concerns including soil erosion and flooding. Stormwater management is a complex issue with many contributing factors. I will not go into those details here, but there are things we can do with plants that will help reduce stormwater. Trees that have large leaves and crowns will intercept significant amounts of rain water and, in some cases, will hold it, never letting it hit the ground. Next, trees that grow quickly and to a large size will pull water from the soil through evapotranspiration. Additionally, if we remember that water always runs downhill, bottomland species will likely remove more water than upland species. With all of that said, sycamores (*Platanus* spp.) and cottonwood (*Populus deltoides*) are among the most valuable plants at mitigating storm water.

**Factor 7: Carbon sequestration**

Climate change is a topic for a different time, but one that is hard to deny. We are well aware of the effects that carbon dioxide and other greenhouse gasses are having on our environment. Understanding this, we should be doing all we can to help offset the enormous emissions of these gasses. As horticulturists, we can help with plants—specifically, trees that are long-lived, fast-growing, and large in size (girth and height) that will store large amounts of carbon. There are several species that fit this description, but two of the best are tulip poplar (*Liriodendron tulipifera*) and baldcypress (*Taxodium distichum*).

## My Ecological All-Star Team

After considering all of the above factors, I have selected 10 species as "ecological all-stars". Each of these possesses a combination of characteristics that make them highly ecologically or environmentally valuable. There is no doubt that there are dozens more that deserve consideration, but I also wanted to promote diversity and show that there is a wide range of plant options. Some groups of plants, like the white oaks for example, would have several representatives in the list if allowed. The list that follows is in no particular order, that is, it is not a ranking. It is also important to keep in mind that these plants have been selected for their ecological value, not necessarily their horticultural value.

In fact, some have relatively little ornamental value or have other characteristics that might make them less desirable in a garden setting. They do; however, all have enormous value for restoration purposes. I should also mention that the explanations below are not a comprehensive evaluation of each of the plants, but rather an explanation of the factors that set them apart and led to their addition to the team.

### Species 1: Devil's walking stick (*Aralia spinosa*)

Considering I am promoting plants for their ecological value, devil's walking stick deserves significant attention. Its spreading, thicket-forming habit makes it valuable for erosion control as well as cover for wildlife. It produces enormous, 3 ft long flower panicles that provide both nectar and pollen rewards to pollinators (Trees, Shrubs, and Woody Vines of Illinois). These flowers are then followed by huge clusters of dark purple berries that are cherished by songbirds of all kinds (Trees, Shrubs, and Woody Vines of Illinois) (Figure 3).

Figure 3. *Aralia spinosa*. Photo credits—left: Ellen Honeycut, right: Bill Hubick.

**Species 2: Tulip poplar (*Liriodendron tulipifera*)**

Though often dismissed by gardeners for its weedy nature, the tulip poplar provides numerous ecological benefits. Perhaps the most obvious trait of this species is its enormous size (Figure 4). In fact, it is among the largest species in the eastern USA in both girth and height. It is also a very fast grower. Combined, these traits make tulip poplar very valuable for both stormwater mitigation and carbon sequestration. In addition, though they often go unnoticed because they are usually held so high on the tree, the flowers of tulip poplar produce high quality pollen (Eierman, 2013) as well as some of the highest volume of nectar (Angel, 2018).

Figure 4. Tulip poplar (*Liriodendron tulipifera*).

**Species 3: Eastern cottonwood (*Populus deltoides*)**

A fast-growing bottomland species with large leaves and crowns, the cottonwood is a great choice for both carbon sequestration and stormwater mitigation. It is the flowers though that really set this species apart. The male flowers of cottonwood, and other *Populus* spp., contain very high-quality protein (Collison, 2016). Not only is it high in nutritional value, but bees that consume this pollen realize significant health benefits, not the least of which is a significant increase in lifespan (Collison, 2016). This is an important consideration as beekeepers continue battling against colony collapse disorder and we're now seeing certain bumblebee species being listed, or considered for listing, on the Endangered Species list.

**Species 4: White oak (*Quercus alba*)**

Though it is not fast-growing like others on this list, the white oak is very long lived (Figure 5). The combination of slow growth, which makes for denser wood, and longevity make it another species that should be considered for carbon sequestration. Its broad crown and large leaves make it valuable for stormwater mitigation. In addition, *Quercus* spp. support 534 species of butterfly and moth larvae—more than any other plant (Tallamy, 2009). The sweet acorns of white oak are highly prized by all kinds of wildlife including certain birds, like blue jays and some woodpeckers. Overall, this species is an ecological workhorse.

Figure 5. White oak (*Quercus alba*).

**Species 5: American holly (*Ilex opaca*)**

The only evergreen on my list, American holly has several ecologically valuable traits (Figure 6). Its dense, evergreen branches provide great nesting and cover sites for birds. The flowers provide both nectar (female flowers) and pollen (male flowers) to pollinators (Encyclopedia of Life). In addition, the berries, though not highly nutritious (Encyclopedia of Life), are a valuable source of food for overwintering birds.

Figure 6. American holly (*Ilex opaca*).

**Species 6: pussy willow (*Salix discolor*)**

Most people, regardless of profession, are familiar with the fuzzy spring buds of the pussy willow. Many, however, do not realize that those buds open to become highly valuable flowers. The flowers of plants in the genus *Salix* produce both high quality nectar and pollen (Eierman, 2013; Forcone et al, 2011). This nutrition is valuable and important, but the very early bloom time boosts this plant onto the list as there are very few other foraging options for early season bees. In addition to this, pussy willow tends to sucker and form colonies which provides good cover for wildlife and helps to reduce erosion.

**Species 7: Farkleberry (*Vaccinium arboreum*)**

Farkleberry makes the list mainly because of its size (Figure 7). *Vaccinium* spp. rank #7 in the number of lepidopteran larvae they support, at 288 (Tallamy, 2009). As the largest member of the genus, growing 15–30 ft, it follows that it would support the most lepidopterans. Also, because it is the largest, it follows that there are more flowers for pollinators, like blueberry bees, whose visits are rewarded with both pollen and nectar (Trees, Shrubs, and Woody Vines of Illinois).

The abundance of flowers is followed by an abundance of fleshy fruits that are consumed by various songbirds.

Figure 7. Farkleberry (*Vaccinium arboretum*), Photo credit: Will Cook.

**Species 8: American basswood (*Tilia americana*)**

Another long-lived, large tree, American basswood is among the top performers in sequestering carbon and mitigating storm water. Its flowers, however, are its real claim to fame. Perfuming the air with a sweet fragrance in late spring/early summer, basswood flowers are bee magnets. The enormous volume of nectar produced by this species makes it among the most valuable plant for bees. Honeybees are especially

attracted to basswood and they can produce 800–1,100 pounds of honey per acre when nectaring on the species. This is rivaled only by black locust which can result in honey volumes of 800–1,200 pounds (Wikipedia) per acre.

**Species 9: Silver maple (*Acer saccharinum*)**

Though I debated adding the silver maple to the list for various reasons, there is no doubting this species' ecological value. Like many others on the list, the silver maple grows very quickly and very large which makes it valuable for carbon sequestration and storm water mitigation. It is also a valuable host plant for various moths and butterflies and maples as a genus support 285 different species, ranking them 8th highest (Tallamy, 2009). Being the largest of the maples, silver maple will support more than other species. Finally, like pussy willow, there is enormous value in the flowers, specifically the timing. The very early bloom and high nectar value make the silver maple highly valuable to early-season bees. Again, its large size means there are more flowers from which to forage.

**Species 10: Chokecherry (*Prunus virginiana*)**

Though often written off as a weedy tree, chokecherry combines numerous factors that might well make it the most valuable plant on my list (Figure 8). In spring, chokecherry's long panicles of white flowers attract pollinators of all kinds. It has been found that *Prunus* spp. are among the best producers of both high-quality pollen and nectar (Collison, 2016). Those flowers are followed by fleshy berries prized by various wildlife, especially songbirds and, containing 30% to 50% fat, they rank among the most nutritious of all berries (Wikipedia). In addition, as a host to 456 different species (Tallamy, 2009), *Prunus* spp. rank 2nd only to *Quercus* spp. in supporting lepidopteran larvae. What sets chokecherry apart from others in the genus though, is that it tends to form thickets. These thickets provide good nesting and cover sites for various wildlife and help to reduce erosion.

Figure 8. Black cherry (*Prunus virginiana*), Photo credit: Moonshine Designs Nursery.

## CONCLUSION

Throughout this article I have focused on the environmental and ecological value of plants with little regard to their aesthetic or economic value. I am aware that the latter are also important, especially for an industry responsible for supplying landscape architects and installers with plant material. In a capitalist economy, the product that sells is the product that gets produced, but I am proposing a shift in mindset. That is, we need to encourage a culture that prizes plants for their overall value— ecological as well as aesthetic. This shift needs to start at the producer level. Those of us who develop, propagate, produce, promote, and ultimately sell plants are the ones responsible for what ends up in the landscape.

I am not necessarily suggesting that we start producing more devil's walking stick or silver maple for our landscapes. What I am suggesting though, is that we start growing more of the plants that combine numerous aesthetic and ecologically beneficial traits. There are dozens of examples, but I will close with one that might help to clarify the point.

Burning bush, *Euonymus alatus*, is one of the most common plants in the landscape. They are tough, heat and drought tolerant, perform well in full sun to part shade, and have outstanding red fall color. They are great landscape plants, there is no doubt. Unfortunately, though, this species has escaped cultivation and become extremely invasive displacing native plants and reducing biodiversity in our natural areas. It provides very little ecological benefit and despite this ecological disaster, it is still a plant frequently propagated, sold, and planted in both home and commercial landscapes. The shift in mindset that I am proposing would see a phasing out of plants like burning bush and a phasing in of other species that would fill the same role in the landscape. These new, alternative plants would also provide numerous ecosystem services.

One possible alternative to burning bush would be winged sumac, *Rhus copallinum*, especially the cultivar 'Morton' (sold under the trade name *R. copallinum* var. *latifolia* 'Morton', Prairie Flame™ shining sumac). This species combines all of the same attributes as those listed for burning bush above. In addition, it is a native species that is much less aggressive, has flowers that are highly attractive to bees and other pollinators, and has nutritious fruits that are a valuable source of food for birds through fall and into winter when food is relatively scarce. In all, *Rhus copallinum* would be a much better addition to the landscape.

There are many other examples of plant alternatives. Though we are now starting to see more of those alternatives in the landscape, I hope that, in time, they become the rule rather than the exception. Again, it starts with us; let's see if we can make that happen.

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