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Native Plant Gardens and their Role in Sustaining Wildlife in a Post-Wild World

Introduction

This Spring I worked with the Strawberry Plains Audubon Center (SPAC) as a native plant nursery intern growing native plants to sell and display to the local community. The mission of the National Audubon Society's Plants for Birds program is to inspire ecological stewardship and lead community action to conserve and manage our landscape for biodiversity and habitat for birds and other wildlife. In this position, I learned about the critical role native plants play in supporting wildlife habitat. In our current geological epoch, known to many as the Anthropocene, anthropogenic forces are contributing to the sixth mass extinction of species since the beginning of life on Earth 3.8 billion years ago. While there are many forces at work, there is a significant consensus between conservationists, ecologists, and other wildlife experts that the synergy between habitat fragmentation, invasive species, and global warming plays a major role in this drastic decline in species populations and biodiversity. Despite our best efforts in understanding this issue, humanity is faced with a great deal of uncertainty in how best to address mass extinction in a rapidly changing world; however, I argue that gardening with native plants is one solution that can help sustain wildlife in a post-wild world.

The Post-Wild World

In Charles Darwin's research on descent with modification, he found that the limits of dispersal accounted for life's richness. Descent with modification demanded that each species arise at a single place of origin and, over time, become widely dispersed. The barriers imposed by mountain ranges, rivers, and the oceans explained why areas along the same latitude, with

similar climate and topography were populated with completely different flora and fauna. The species on each continent had evolved separately in the contexts of their own ecosystems, and this transmuted into biological disparity (Kolbert, 195). What Darwin failed to address, however, was that with the rise of *Homo sapiens,* the limits of dispersal became negligible.

In the beginning, around 200,000 years ago, humans as a species were "not particularly swift, strong, or fertile," but they were extremely resourceful (Kolbert, 1). In a short matter of time, humans were able to push into regions with different climates, predators, and prey and cross the mountain ranges, rivers, and oceans that limited the majority of other species. Ultimately, humans were able to migrate to every corner of the globe, and populations rapidly increased. Humans have cleared forests and reassembled the biosphere, changed the composition of the atmosphere, climate and chemistry of the ocean. Many species have tried to adapt to our changing world, climbing mountains and migrating toward the poles, but many have been driven to extinction because of our actions (Kolbert, 2). The post-wild world is the present human-dominated geological epoch.

The complexity and magnitude of our species' impact on wildlife on this planet are extreme and difficult to gauge, but there are some things we know with a fair amount of certainty. In 2017, there is no pristine wilderness on planet Earth. Currently, about fifty million square miles of land on the planet are ice-free. Of that fifty million, only eleven million square miles have not been converted to urban areas, irrigated cropland, and populated forests. But even these so-called wildlands are interspersed with pipelines, seismic lines, hydroelectric projects, ranches, and plantations (Kolbert, 177). Disturbed areas are "areas from which species, whether a few or many, have been removed" (Tallamy, 44). Only 3 to 5 percent of land in the United States remains as undisturbed habitat for plants and animals (Tallamy, 36). Because our refuges,

woodlots, parks, and other protected areas are not contiguous habitats, but survive as scattered islands from coast to coast, the effective size of the undisturbed land in the United States is far smaller than those statistics indicate. Tiny habitat islands, like our national parks and protected areas, have high rates of species extinction and emigration and low rates of speciation and immigration (Tallamy, 29) If you turn the clock forward to the point that equilibrium has been reached in these disturbed ecosystems, the number of species that will survive human habitat destruction is a simple percentage of the amount of habitat we leave undisturbed, a 1:1 correspondence (Tallamy, 31).

Much of what we know about the effects of habitat loss in the United States is derived from studies of birds. Neotropical migrants, species that fly thousands of miles to Central or South America to spend the winter have declined an average of 1 percent per year since 1966. Adding up those percentages, we are faced with nearly a 50 percent reduction in populations sizes for many of our bird species within 50 years. Globally, the World Conservation Union has estimated that 12 percent of all bird species are threatened with extinction because of habitat loss and invasive species (Tallamy, 34).

More recent studies have documented evidence of a sharp decline in insects in many parts of the world. On three occasions from 1989 to 2014, entomologists set up traps in 88 different areas in western Germany so they could calculate how many bugs live in each area over a full summer period. The average biomass of insects caught between May and October has steadily decreased from 3.5 pounds per trap in 1989 to 0.7 pounds per trap in 2014. There has been an estimated 45% decline in insects throughout the world in the last four decades. Entomologists claim the dramatic decline in populations affects all types of insects, including butterflies, wild bees, and hoverflies. Scientists cite many factors in the fall-off of the world's insect populations,

but chief among them are the toxic use of pesticides, the spread of monoculture crops, urbanization and habitat destruction (Schwagerl, 2016).

Native Plants Defined

In the U.S., native plants are broadly defined as "any plant that historically grew in North America" (Tallamy, 65). Some argue that a plant adapted to, for example, a desert ecosystem on the western coast of the country should not be considered native to the pine barrens of New Jersey, so native plants are sometimes also defined by maps of U.S. hardiness zones. By this reasoning, a plant adapted to zone 6 in Tennessee could be considered a native in areas of Pennsylvania with a zone 6 climate. However, neither of these definitions take into account the roles plants play within their respective ecosystems. Over immense periods of time, plants and other species interact, and this coevolution shapes the plants and wildlife to function specifically within the context of particular relationships in a particular place. A plant is non-native "when it is transported to an area of the world that contains plants, animals, and diseases with which it has never before interacted, the coevolutionary constraints that kept it in check in its native habitat are gone, as are the ecological links that made that plant a contributing member of its ecosystem" (Tallamy, 66). In most cases, non-natives are excluded from the biological interactions between native species. Non-natives that can survive in a new ecosystem will occupy space and use resources that would otherwise be available for another plant, but it will not necessarily pass the energy it harnesses from the sun up the food chain. A plant can only function as a "true" native while it is interacting with the community that historically helped shape it (Tallamy, 66).

Native Plant Gardens Could Foster Healthy Ecosystems

Plants provide the energy that sustains all life by converting solar energy into food through photosynthesis. The diversity of animals in a particular habitat is closely linked to the diversity of plants in that habitat. Plant diversity – differences in size, shape, habitat, soil, water, and leaf chemistry – creates niches to which animals adapt over evolutionary time (Tallamy, 20). Worldwide, 37% of animal species are herbivorous insects. Insects convert plant tissues of all types to insect tissues, providing food for animals that cannot directly eat plants. 96% percent of the terrestrial bird species in North America rely on insects to feed their young (Tallamy, 21). Native plants support a much greater number of insect species (mainly Lepidoptera, i.e. butterflies and moths) than non-native plants. After millennia of coevolution between plants and insects in the context of their ecosystems, up to 90% of herbivorous insects have evolved to become plant specialists. Plant specialists have developed abilities to eat the tissues of one particular plant lineage, and are unable to eat other plants that differ in timing of development, leaf chemistry, or physical defenses. In undisturbed ecosystems, the specialized relationships between insects and their native host plants reduce competition for resources between insects and allow for greater levels of biodiversity within their ecosystems (Tallamy, 50).

Because of the long period of time it takes for these specialized relationships to develop between plants and insects, non-native plants that have been introduced into an ecosystem have no natural enemies and can therefore outcompete most native plants. Many non-native plants that have been introduced to North America are specifically selected because insects cannot eat them. Non-native species like the Bradford pear, English ivy, and kudzu, can become highly invasive, thriving and spreading throughout our disturbed ecosystems, replacing native plants, and drastically reducing biodiversity (Tallamy, 50).

Our impact on every square mile of the earth's biosphere, the thin zone on the planet's surface in which the conditions for life are ideal, has been so great that we must give up the old notion of preserving nature in its pristine form. Luckily, evidence suggests that pristine wilderness is not required to sustain life on earth. Most species could live alongside humans if their most basic ecological needs were met (Tallamy, 37). Because food for all animals starts with the energy harnessed by plants, the plants we grow in our gardens have the critical role of sustaining, directly or indirectly, all of the animals with which we share our living spaces. The degree to which the plants in our gardens succeed in this regard will determine the diversity and numbers of wildlife that can survive in managed landscapes (Tallamy, 25).

Creating Wildlife Corridors with Native Plant Gardens

As stated above, healthy, intact ecosystems in this country and throughout the world are few and far between. They have been heavily fragmented by millions of acres of urban landscapes, cropland, pasture, and roads. Even greenspaces like our gardens have been taken over by invasive species. Habitat islands, like national parks and protected areas, which are heavily managed to maintain a semblance to the undisturbed ecosystems, can only protect a fraction of the species that once thrived in North America. The species-area relationship is such that the smaller the fragment of land, the fewer species it contains. Wildlife corridors are strips of land managed for connectivity so small areas won't lose species, so migrating herds and flocks can get to where they're going, so gene pools can stay large and vital, and so species sensitive to changing conditions of the climate can move toward the poles or uphill to better suited habitat. Rather than remain in isolation, parks should be surrounded with areas without much development, and these wildest landscapes should be well connected to each other. We need well connected wild lands to sustain biodiversity (Marris, 136).

The Biological Dynamics Forest Fragments Project (BDFP) studies habitat islands in the Amazon rain forest. Members of the BDFP conducted bird censuses before and after the forest fragments were isolated. Over time, the data they gathered showed an initial rise in the populations, followed by a steady decline in both number and variety of the population (Kolbert, 179). This continuous decline of species, also known as relaxation, is due to the fact that smaller areas are inadequate and must harbor smaller populations, and smaller populations are more vulnerable to chance. Furthermore, if a percentage of the already small population succumbs to disease, natural disaster, etc., recolonization can be difficult and sometimes impossible in these isolated areas. In the absence of recolonization, local, regional, and global extinctions can arise (Kolbert, 181). If a species needs migrate, but gets trapped in a forest fragment, it will not likely survive. Frustratingly, in our current global epoch, the world is changing in ways that compel species to move, and simultaneously creating barriers that prevent them from doing so (Kolbert, 189).

It is estimated that in the U.S., by 1986, we had converted between 32 and 40 million acres into suburban lawns (Tallamy, 32). If suburban homeowners stopped putting their time, money, and energy into ensuring their sterile grass lawns were cut regularly and nursing non-native ornamental plants in their gardens, they could instead focus on the use of native species to create simplified vestiges of the ecosystems that once made this land such a rich source of life. Native plant gardens could create wildlife corridors, bridging the gaps between habitat islands. Connecting these fragmented ecosystems is essential in mitigating the effects of climate change and habitat destruction on wildlife populations.

During my internship at the SPAC, I witnessed firsthand the importance of reconciliation ecology – the redesign of human habitats for the accommodation of other species – in creating

corridors that connect ecosystems and supporting migratory birds. Holly Springs, Mississippi, where the center is located, lies along the Mississippi Flyway. Migratory birds use the flyway from central Canada to areas along the Gulf of Mexico and in Central and South America. Migratory birds do not typically fly nonstop from their starting point to their final destination, instead they stop along the way to rest, forage, and breed. More than 325 bird species, about 40% of all North American shorebirds and water fowl, make the round-trip each year. Since the establishment of the SPAC in 1998, a few dedicated people have converted 3000+ acres of neglected cotton plantation back to hardwood forests, wetlands, and native prairie, and now provides critical breeding, wintering, and migratory resting habitat for nearly 200 species of birds, including a number of Watchlist species (McAlexander, vii).

Limitations of Native Plants as a Solution

Of course, native plant gardens cannot be the only solution we provide in the face of such catastrophic problems as climate change, habitat destruction, and the spread of invasive species. There is no one best solution to these issues and complex compromises will have to be made. For example, establishing wildlife corridors with native plants could be ineffective in the future if habitat destruction continues and society fails to prioritize the protection of biodiversity and the preservation of open land (Marris, 169). This week, to the dismay of conservationists, ecologists, indigenous peoples, and nature lovers, President Trump drastically reduced the size of the Bears Ears National Monument and the Grand Staircase-Escalante by approximately two million acres. This reversal of protections is a part of the Trump administration's push for fewer restrictions to development on public lands. Aside from the threat of development to native nations' heritage and thousands of sites of archaeological importance, the decision to reduce these two national monuments is "expected to set off a legal battle that could alter the course of American land

conservation, putting dozens of other monuments at risk, and possibly opening millions of preserved public acres to oil and gas extraction, mining, logging and other commercial activities" (Turkewitz, 2017). Without large tracts of undeveloped land to connect, native plant wildlife corridors could become effectively useless.

Another limitation to the use of native plants in sustaining wildlife is that they can also be incredibly difficult to reintroduce and maintain in disturbed areas. The average American yard size is just 0.14 acres, and most gardeners could relatively easily remove invasive or non-native ornamental species and replace them with native plants in such a small parcel of land (McGill). However, as plot sizes get larger, invasive species get exponentially harder to control. Once established, many invasives disperse countless seeds into the seed bank that may continue to sprout years after their removal. Chinese privet (*Ligustrum sinense*) is notoriously difficult to combat due to birds eating its fruit and dispersing its seeds through their waste. Gardeners may have the time and resources to keep invasive species at bay in their own yards, but invasive species removal and native species reestablishment may just be too inefficient and costly to achieve on a large scale.

Furthermore, not all non-native species are invasive. And for the 10% of insects that are not plant specialists, and may eat a variety of plant species, non-native species could actually provide a critical food source for these insects if the decline in our diverse native flora continues (Marris, 169). It is important to note that ecosystems are constantly changing, adapting, and evolving. We cannot only focus on maintaining vestiges of ecosystem that existed hundreds or thousands of years ago and expect them to still perform well in our post-wild world. Instead, we must do what we can to support and sustain wildlife today, while also carefully observing novel

interactions between native and non-native species to see what new relationships emerge, and perhaps move us toward unfamiliar, yet functioning ecosystems in the future.

Conclusion

While native plants may not be the ultimate solution to the problems the post-wild world presents, they are critically important to supporting wildlife habitat. With ongoing habitat destruction, climate change, and the rise of invasive species, using native plants in our gardens can create a safe haven for local wildlife. If planned strategically and extensively, native plant gardens can also connect the isolated few remaining healthy ecosystems of our planet, and mitigate the effects of destructive anthropogenic forces.

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