Taking a Stand on Clover

The benefits of clover to bees, soil biology, and water quality

by Drew Toher

"If you see little white flowers in your yard with bees active around them, chances are you have clover," says Scotts Miracle-Gro's website on *How to Kill Clover in Lawns*.[1] Each spring, a wave of commercials and advertisements encourage consumers to rush to their hardware store or garden center and purchase a bag of 'weed and feed' before unwanted plants invade their otherwise lush, green, unvaried turf. To rid lawns of those pesky white flowers, Scotts and many other lawn chemical companies typically prescribe a broadscale application of synthetic nitrogen fertilizer, the chemical 2,4-Dichlorophenoxyaceticacid (2,4-D), and a mix of other herbicides, such dicamba, mecoprop, or triclopyr. 2,4-D, linked to neurotoxicity and endocrine (hormone) disruption,[2] and classified as a possible human carcinogen by the World Health Organization,[3] may be tracked inside of homes,[4] drift through windows, or run-off into local streams and rivers. The other herbicides that may be in 'weed and feed' products are linked to a range of health effects, from neurological to reproductive. [See *Beyond Pesticides' Gateway on Pesticide Hazards and Safe Pest Management.*] Meanwhile, the loss of clover in the landscape eliminates a natural source of nitrogen, food for those active bees, and habitat for earthworms.

Growing awareness of the function and benefits of 'weeds' like clover, their importance to rapidly declining pollinator populations, and the high costs related to the hazards associated with chemical herbicides has more and more homeowners rethinking the 'weed and feed' paradigm and opting for more diverse, resilient lawns and landscapes. Clover has a rich history in American lawns and plays an important ecological role in a turfgrass landscape. Ultimately, it will take consumer action to restore this unjustly maligned plant on lawns and property community-wide.

The Rise of the American Lawn, Complete With Clover

The idea of cultivating a lawn was unimportant to most Americans until the mid-19th century. Historically, lawns were confined to the estates of English nobleman, who often grazed sheep or otherwise used the turf for lawn games.[5] Author and journalist Michael Pollan, who has written on the history of gardening and landscaping, attributes the rise of the American lawn to two men, landscape architects Fredrick Law Olmsted and Frank J Scott.[6] Mr. Olmsted, who helped design New York City's Central Park and the grounds of U.S. Capitol, pioneered one of the nation's first planned

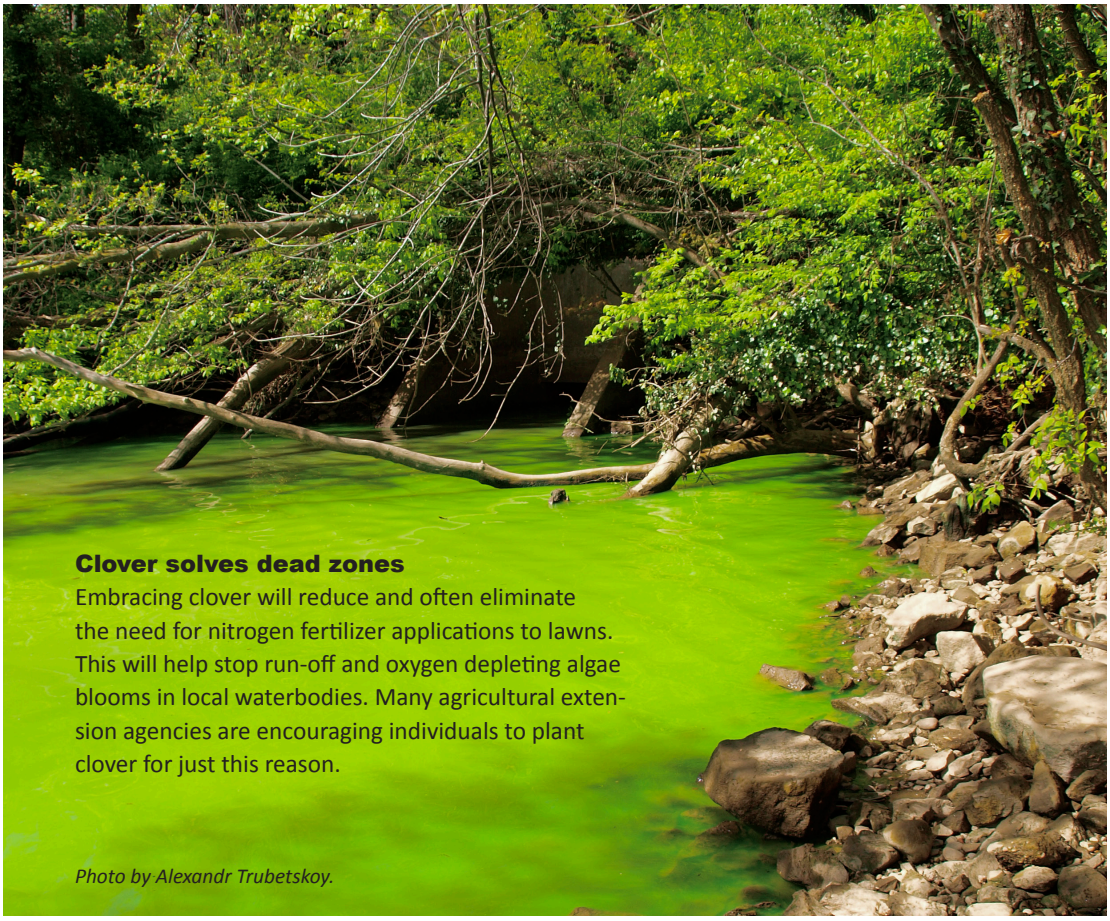
communities in suburban Chicago in the late 1860s, setting houses back 30 feet from the street with green, trimmed lawns contiguous to one another. Later in the century, as Mr. Pollan recounts, Mr. Scott applied Olmstead's landscape aesthetics across the country, publishing the book *The Art of Beautifying Suburban Home Grounds* (1870).[8] Mr. Scott wrote, "It is not necessary to have an acre of pleasure ground to secure a charming lawn. Its extent may always be proportioned to the size of the place; and if the selection of flowers and shrubs and their arrangement is properly made, it is surprising how small a lawn will release some of the most pleasing effects of larger ones."

With the American public firmly sold on the beauty and benefits of managing a small patch of lawn on their property, one component would still stand out as unseemly to today's lawn purists –clover. "No better varieties of grass for lawns can be found than those that form the turf of old and closely fed pastures," wrote Mr. Scott. "Blue-grass and white clover are the staple grasses in them, though many other varieties are usually found with these, in smaller proportions."

As the lawn rose to prominence in the U.S., clover was a critical part of the scenery, with small white blossoms and busy bees dotting over dark green landscapes. "White clover used to be a standard ingredient in every grass seed mix; 75 years ago no one planted a lawn without mixing a little white clover in with the grass seed," recounts Roger Swain, host of PBS' *The Victory Garden*.[9] After World War II, as the middle class grew and moved to suburban communities, chemicals developed during wartime found new uses on U.S. lawns. Chief among them was 2,4-D, an herbicide originally developed with the intent to wipe out potatoes in Germany and rice crops in Japan, in a plan to starve the Axis powers into surrender.[10] While 2,4-D was never used for that purpose, its selectivity, or ability to kill broadleaf plants, but spare grass species, made it desirable on the farm for removing weeds around crops like wheat, corn, and rice.[11] Chemical companies hoped these same characteristics would win over American homeowners, who would simply need one blanket application to rid their lawn of weeds. In 1945, the American Chemical Paint Company released the first residential use 2,4-D herbicide, Weedone, and later in the decade, Scotts packaged its first 'weed and feed' product. Some say that it was not until the 1966 Masters golf tournament's bright green turf was broadcast on color television that the idea of a monoculture lawn really took hold. Despite clover's role in the rise of the American lawn, its susceptibility to broadleaf herbicides, like 2,4-D, put it at loggerheads with the new technology, and through aggressive marketing and advertisements, by the 1950s it began to be regarded as a weed.

Clover's Long-Awaited Comeback

The dramatic declines in honey bee and other wild pollinator populations, spurred by the damaging effects of systemic insecticides, like neonicotinoids, habitat loss, and synthetic fertilizers, have reignited the debate about the ecological utility of clover in green spaces. Public awareness of the largely human-driven pollinator crisis has galvanized individuals to think about their landscaping practices. Urban meadows, suburban hedgerows, and flower-filled "bee lawns" are making their way into American yards. Monoculture lawns are not disappearing completely, but more and more homeowners, businesses, and local governments are making space for clover and other broadleaf plants that provide food and shelter for pollinators and wildlife.



Clover solves dead zones
Embracing clover will reduce and often eliminate the need for nitrogen fertilizer applications to lawns. This will help stop run-off and oxygen depleting algae blooms in local waterbodies. Many agricultural extension agencies are encouraging individuals to plant clover for just this reason.

Photo by Alexandr Trubetskoy.

Benefits of Clover in the Landscape

Incorporating clover into green spaces is a boon not only for bees and soil-dwelling organisms like earthworms, but also for the wallet. Clover is a low-growing, drought tolerant perennial that reproduces through the growth of stolons, or runners, which spread horizontally through stems located just at or below the ground. There are nearly 250 species of clover in the world,[12] and though red, crimson, and white are the most familiar, it is white, or dutch, clover that is best suited to be incorporated into turfgrass. A variety of low growing white clover called microclover is becoming increasingly popular, as it can provide all the benefits of clover yet produce fewer flowers attractive to bees, and is somewhat hidden below the grass.

Photo by Jürgen, Sandesneben, Germany.

Contrary to the perception that clover is an eyesore, the plant will remain verdant green all year round. This is because clover, as a member of the legume family, is able to "fix," or accumulate nitrogen from the air through beneficial soil bacteria that form nodules on its roots. Clover makes quick use of this nutrient, with data showing that roughly 75-80% of its nitrogen is stored in its topgrowth.[13] Clippings left on a lawn after a mixed grass-clover turf is mowed can provide a significant source of free nitrogen. Sowing roughly one to two ounces of white clover per 1,000 square feet will provide a lawn with between 5 and 10% clover cover (up to 10 ounces for the whole lawn to be a bouquet of clover).[14] At this rate, leaving clippings on the lawn will add between one to two pounds of slow release nitrogen per 1,000 square feet.[15] For many soils and grass types, this is enough nitrogen to eliminate the need for any additional nitrogen fertilizer applications over the course of the year.[16]

Increased pollinator populations. Recent research finds that clover acts as a food source for a wide range of important pollinator species. A 2014 study published by Larson et al. in the *Journal of Insect Conservation* on species richness in mixed grass-clover lawns in the Lexington, KY metro area documented over 200 pollinator species over the course of spring sampling, including approximately 21 different species of bees. On average, each lawn contained between 2-12 different pollinator species. City-dwellers tending a small patch of lawn certainly are not doing so in vain, as researchers found species richness to be similar in urban, suburban, and periurban-rural areas.

Improved soil health. In addition to providing food for pollinators, clover's benefits extend below the surface to soil-dwelling organisms. Studies performed on grazing lands show that when clover is mixed into grass-dominated landscapes, earthworm abundance increases.[17] Research published by van Eekern et al. in the *Journal of Applied Ecology* (2009) found that planting grass-clover mixtures provide a wide range of positive benefits to the landscape and increase soil health and microbial diversity. "We suggest that when clover is introduced in grassland to reduce the reliance on inorganic fertilizer, the mixture of grass and clover maintains the positive impact of grass roots on soil structure and increases the supply of nutrients via the soil food web," the author's note.[18] When managed organically, clover can support a soil system that sequesters carbon and helps to reduce the advancement of global climate change.

The use of insecticides diminishes the numerous services that clover provides for lawns and landscapes. While the use of herbicides eliminates this critical habitat for a range of species, insecticides pose a direct danger to pollinators and soil dwelling organisms. Neonicotinoid pesticides represent the greatest threat, as scientists have shown that these chemicals interfere with the mobility, navigation, feeding behavior, reproduction, and overall colony health of bees.[19] Studies find that these hazards are just as real in urban and suburban green space as they are on agricultural lands.

Limited use on playing fields

Clover on, but take note: clover is a needed addition to a lawn, but it's not a panacea. Don't plant pure clover or a high percentage of clover in areas where there will be frequent high intensity sports or foot traffic, simply because dense stands of clover can be a bit slippery.

Photo courtesy of Imgur.

Other clover applications

Clover is useful in a number of other areas apart from the lawn. Plant a ring of pure clover around your garden to both attract earthworms and deter rabbits, which will stop at the clover before reaching your veggies. Also use it as a ground cover, to accent walking paths, or as a cover crop during the winter months. Let pure clover stands grow around your garden and "chop and drop" by letting it grow out and using the cuttings as nitrogen-rich mulch.

Larson et al's 2014 article in the journal *Ecotoxicology*, which examines the effects of common lawn care insecticides, finds significant adverse impacts to beneficial insects and parasitoids. Applications of the neonicotinoid clothianidin, as well as a formulated clothiandin-bifenthrin mixture (bifenthrin being a synthetic insecticide in the pyrethroid class) to residential lawns, results in high mortality to ground beetles and wasps that prey on black cutworm pests. Another species of wasp that parasitizes the larval stages (grubs) of various species of scarab beetles show reduced predation, and bumble bee colonies that forage on white clover in clothianidin-treated turf show, unsurprisingly, reduced numbers of workers, honey pots, and immature bees.[20] A 2013 study by Cycon et al. found slight changes to soil diversity occur after applications of the neonicotinoid imidacloprid at recommended label rates, with significant adverse effects seen at higher doses. In a 2012 study published in *Pest Management Science* by Larson et al., clothianidin applications to turfgrass reduced earthworm biomass by 32% after one week, while a clothinidin-bifenthrin mixture reduced biomass by 49% during the same period of time.[21]

Joining in Defense of Clover: What you can do

Bringing clover back into American lawns is predominately a cultural issue. It requires a change in perception about what constitutes an aesthetically pleasing landscape, and education about the ecological benefits and cost-savings that clover can provide. Individuals can press their local government to incorporate grass-clover seed mixes into their public parks and green spaces, and inform residents of the benefits of doing so. At the same time, they can make the case for restrictions on the use of synthetic herbicides that treat clover as a weed, and insecticides that undermine the services the plant provides. However, the beauty of reviving clover on the American lawn is that every individual with a patch of green space can make a stand. Let the clover already present flower, and don't be afraid of seeding more. Yes, your lawn will contain small white flowers, and yes, you'll attract bees to your yard, but you know that's a good thing for your wallet and the environment, and when your neighbor asks what you're doing, you'll be ready to respond.

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Reviving the American Lawn with Clover

Clover was not always considered a weed. In fact, 75 years ago every lawn contained some amount of clover. Incorporating this three leaved (four if you're lucky!) plant into public and private green spaces is a great idea. Here's why:

Clover:

- Provides your lawn with a free source of nitrogen for your grass (usually enough to eliminate any need for additional fertilizer applications), replacing ecologically hazardous synthetic fertilizers
- Acts as an important food source for declining pollinator populations
- Attracts earthworms and other beneficial soil microorganisms
- Remains green year-round
- Resists drought
- Helps your lawn resist disease

Seeding your lawn:

When planting a new lawn, pure clover seed can be added at a rate of 1 to 2 ounces per 1,000 sq ft, which will produce about 5 to 10% clover cover. With grass clippings, this will add 1 to 2 pounds of slow release nitrogen per 1,000 square ft. You can also overseed with clover at the same rate. Since clover seed is too small for most spreaders, try mixing it with sand, soil or compost to ensure an even distribution throughout the lawn. Make sure to cut the lawn and remove thatch before sowing to allow for good germination. Clover can be added throughout the growing season, though spring is ideal. It may take a few years of overseeding to establish clover, but this will still be less expensive than nitrogen fertilizer applications. If you already have clover on your lawn, let it spread! Adding clover and leaving clippings on the lawn will provide enough nitrogen fertilizer most lawns need for the year!

Buying Clover:

Dutch White clover is the traditional option to add to turf grass. Many garden centers and hardware stores now carry clover seed, and it can also be purchased online at retailers like Gardeners Supply Company. For folks who want the economic benefits of clover, but are still concerned about aesthetics and less enthused about attracting pollinators, microclover is a new option on the market. It will grow lower than grass and produce fewer flowers while still remaining dark green and fixing nitrogen from the air. DFL organics and EarthTurf are two companies which specialize in grass-microclover seed mixes.

Maintaining Clover:

Tend to your grass-clover lawn just as you would a pure grass lawn. Organic practices are the best way to keep your lawn healthy. Visit www.beyondpesticides.org/lawns for details on organic lawn care.

Tell Your Neighbors, Your Local Government, and Beyond Pesticides

Educate your neighbors, friends, and family about the benefits of clover! Ask your local government to help pollinators and reduce nitrogen pollution by incorporating clover-grass mixes at local parks. Hold a workshop at the local library or public event about why and how to add clover to a lawn. Let Beyond Pesticides know when you or your community has established a clover-grass lawn by signing the pesticide-free and pollinator-friendly yard declaration http://bit.ly/LawnDeclaration, and sending us a picture of your clover-filled green space to info@beyondpesticides.org!

Endnotes

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