



The Seed

Beneficial Landscapes

Nebraska Statewide Arboretum, Inc.
Sustainable Landscapes for Healthy Homes & Communities

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Bringing Nature Home to Your Own Backyard

Justin Evertson, Nebraska Forest Service

People in general seem to harbor a natural fear toward many of the creatures inhabiting our yards and the landscapes around us. Some of this fear is certainly understandable, after all, a bee or wasp sting hurts! Others of these creatures are just creepy—spiders, mantids, ants, snakes, bats. If we stop and think about it, however, we'll soon realize that we really don't have much to fear and in fact there is much to be gained if we can find a way to better appreciate these creatures. The beautiful goldenrod invites crab spiders and soldier beetles who love to dine on aphids and other small insects. A milkweed will feed the larvae of the beautiful monarch (and many other species) while also scenting the garden with its sweet fragrance. Planting a penstemon will attract bumblebees, coneflowers will attract goldfinches, columbine will bring hummingbirds, a serviceberry will feed many birds and an oak tree provides habitat for literally hundreds of species. These are all creatures to be celebrated, not feared.

Dr. Douglas Tallamy, Professor of Entomology and Wildlife Ecology at the University of Delaware, wrote a book in 2007 titled *Bringing Nature Home*. This book and its message of sustainability definitely caught our fancy. In fact many of us have been using it as a primary point of reference for the last several years. Tallamy's message is simple: by utilizing more native plants in our home landscapes, we'll better sustain wildlife—and ultimately, better sustain ourselves. We strongly encourage anyone with an interest in the environment and their own home landscape to give it a read.

This issue of **The Seed** is our take on "Bringing Nature Home." In it you'll find a variety of information covering



Photos by Eric Berg, Nebraska Forest Service

such topics as biodiversity, native plants, beneficial wildlife, landscape design, healthy soil and a sustainability checklist. There has been an explosion of good information on these subjects in recent years and we've tried to include a list of some of the best websites and books to peruse for additional information. Ultimately, we hope the information helps make it clear that just about anyone can make a positive difference for native flora and fauna with very simple efforts right in their own yards.

There are many things we can all do to live more sustainably. One of the most enjoyable is growing native plants in our own yards that attract a menagerie of birds, insects and other native wildlife that promise to entertain and inspire us year-round.

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Beyond Sustainable

Kendall Weyers, Nebraska Forest Service

Nature can be a wonderful teacher, offering lessons in biology, chemistry and physics that range from subtle to dramatic, intricate to simple. Yet maybe the most important lesson is nature's ability to provide for all while wasting nothing in an elegantly self-sufficient system. A balanced ecosystem takes care of itself, with each cast member—from birds to bugs, microbes to fungi, sun to soil—playing an essential role. Learning from and mimicking the efficiency, diversity and beauty of nature is the foundation of sustainable landscaping. Of course we can't duplicate the complex connections of nature, but the closer we move toward following its effective rules of a closed-loop system, the more sustainable our home landscapes become.

More and more people are finally realizing our own health and well-being depends on healthy ecosystems, and that "traditional" or standard landscaping leads us in the opposite direction ("traditional" landscaping has only developed to its extreme level over the last several decades and is far from landscaping norms further back in history). Reviewing the potential negative impacts of standard landscaping makes it obvious that how we care for our yard has impacts far beyond the property lines:

- ☹ Consumes excessive amounts of natural resources (water, fertilizers, fuel, etc.)
- ☹ Consumes excessive amounts of time, labor and money
- ☹ Reduces biodiversity (reducing ecosystem resiliency, balance and beauty)
- ☹ Degrades the soil
- ☹ Creates air, noise and water pollution
- ☹ Contributes to flooding problems

The main objective of sustainable landscaping is to reduce negative impacts. But true sustainable landscaping goes far beyond reducing the negative to become, not neutral or static, but beneficial:

- ☺ Enhances the health, productivity and structure of the soil
- ☺ Provides habitat for beneficial wildlife (birds, pollinators, microorganisms, etc.)
- ☺ Provides edibles for ourselves
- ☺ Enhances the beauty and psychological benefits of the landscape
- ☺ Expands the teaching and recreational capacity of the landscape
- ☺ Enhances our connection to nature

Photos are from Nebraska Statewide Arboretum unless otherwise noted.



So how do we do this? One approach is to try to "think" and act like nature—use what you have, use it efficiently, stick with what works and diversify. For example, instead of treating clippings and leaves as waste and expending fuel, money and effort bagging and hauling them to the dump where they become a problem, treat them as the resources they are. By composting them and working with nature, the result is a valuable product that can be returned to your landscape—and you've just created a closed loop system.

Look at anything you are doing in your yard and use common sense and logic to see if there may be a better way. Consider doing things differently than you were taught or the way the neighbor might be doing it. The basic goal is to take any step that reduces inputs and negative outputs. Inputs should be as long-lasting and benign as possible—think organic instead of chemical fertilizer or local recycled stone instead of pavers shipped across the country.

Following is a long list of potential measures that can be taken to make your landscape beneficial. It's important not to look at this as an all-or-nothing effort. No matter where you are on the scale, you can take steps to become more sustainable. Be realistic in your expectations and take manageable steps: gauge where you stand by checking off tasks you've already accomplished, pick the next easiest or most appealing tasks (the low-hanging fruit) and just do what you can. Your yard, as well as your time and energy, are unique to you, so set your own pace and make it fun.

Nature has taken millions of years to fine-tune her beautiful system, so be patient and realize that perfect and complete results probably won't happen on your first try. Take pride in your efforts, learn from mistakes, savor successes and, most importantly, enjoy being more in tune with natural systems and having a positive effect on and closer connection to nature.



Toward a More Beneficial Landscape

For you, your family, future generations and the broader environment

Kendall Weyers, Nebraska Forest Service

Use the checklist below to check off, if you want, the things you're already doing and put a star by things you want to start doing. No scorecard, just enjoy the process and do what you can!

Lawn care, watering (if you water):

Water infrequently and efficiently for ideal plant health and resiliency, rather than over-watering for lush growth that leads to more demanding, less hardy turf

Water early in the day to avoid loss from wind and evaporation and limit potential fungal problems

Water efficiently (don't water pavement, make sure any automatic system is working properly, use rain sensor to avoid watering after rain, etc.)

Allow summer dormancy of cool season grasses

Lawn care, mowing:

Mow high to help retain moisture, shade and cool the soil and reduce weed germination

Mow only as needed instead of the common practice of once a week no matter what

Leave clippings on the lawn to decrease mowing time and provide valuable nitrogen

Try a quiet, person-powered reel mower (and rake and broom) to reduce fuel use, air and noise pollution (and use it as an excuse not to go to the gym that day)

Lawn care, fertilizing and pest and weed control:

Reduce chemical use by applying efficiently and only as needed (not by the pre-determined "4-6 step" plans). Overuse increases the need to water and mow, may create fungal problems, may kill beneficial insects, earthworms and microorganisms and may harm non-target plants, especially trees.

Use organic fertilizers and pest and weed controls
Adjust attitude: some "weeds" are beneficial (like clover); any monoculture is vulnerable; the neighbor may not be the best example to follow; not everything that moves is out to kill the lawn; and change can be good

Lawn care, other:

Plant lower-maintenance turfgrass varieties

Replace areas of turf with mulched beds of groundcovers, perennials, ornamental grasses and shrubs

Plant selection and placement:

Plant species that are adapted to specific site conditions to maximize their health and reduce need for supplemental water, fertilizer and pest control

Group plants by their water needs

Select natives or other well-adapted, non-invasive species

Increase the diversity of plants to increase interest, resiliency and benefits to wildlife

Select low-maintenance plants that thrive and look good without constant attention

Plant for shade to reduce home energy use and create comfortable outdoor spaces

Plant conifers to shield winter winds and reduce home heating costs

Materials selection:

Use local materials to reduce transport

Divide perennials and share or trade with neighbors

Grow plants from seeds and cuttings

Use materials that will last

Reuse and recycle

Use organic mulches, not rock. Organic mulches modify soil temperatures, add organic matter to the soil, reduce weed problems and help retain soil moisture.

Water conservation:

Mulch planting beds, trees, gardens (ideally with locally generated materials)

Direct downspouts to planted areas instead of pavement to reduce stormwater runoff

Use drip irrigation

Aerate lawn if compacted

Create a rain garden to allow more rainwater infiltration and reduce runoff

Collect water in rain barrels for use later

Use porous pavement or other permeable surfaces for driveways, walks and patios

Compost:

Garden waste, leaves, weeds (ideally before they seed) and grass clippings

Kitchen scraps, tea bags, etc.

Coffee grounds from home and office are good sources of nitrogen

Manure, hay, etc.

Grow your own:

Vegetables and herbs

Fruits (strawberries, raspberries, grapes, apples, cherries...)

Nuts (pecan, hazelnut, walnut...)



Photo by Eric Berg, Nebraska Forest Service

Creating a Beneficial Landscape— without breaking the bank



Christina Hoyt, Nebraska Forest Service

Beneficial landscapes have a wide array of positive environmental and human impacts. The EPA says, “Beneficial landscaping, sometimes referred to as natural or native landscaping though it is more than that, contains a number of principles that revolve around balancing our needs and sense of beauty with those of nature (our ecosystems) because, in the long run, they are interrelated.” Beneficial landscapes are intentionally created to protect existing natural areas, conserve resources such as energy and water, capture and provide ecosystem services, improve water quality and soil health and increase biodiversity.

In general, our landscapes are far from beneficial. We may feel overwhelmed about how to begin or maybe we just see dollar signs. How can we make our home landscapes more beneficial little by little? The key is to put our dollars to work in ways that add environmental and aesthetic benefit. Few of us have thousands of dollars to throw at a landscape and some of us may be on a ramen noodle budget. But it is possible to have a landscape that is beautiful and good for the environment without breaking the bank. In fact, over time a beneficial landscape will save you money.

Most homeowners spend more money on their landscapes than they realize. These dollars usually go toward traditional lawns in the form of water, fertilizer, herbicide, pesticide, gas, equipment and lawn care companies. Most of this money is simply mowed off and is not a long-term investment. Turfgrass is a nice visual green, but it doesn't add much environmental benefit. We have to stop comparing the greenness of our lawns and start looking at the benefits of our landscapes. I'm not saying you shouldn't water, fertilize or apply herbicide but most lawns can thrive on much less water, fertilizer and pesticide than we apply. Fall applications of fertilizer and pre-emergent are far more effective. If you truly want a budget landscape or want to find some chunk change to use other places in your yard... let go of the lawn, just a little.

In creating more beneficial landscapes, design and management are very intertwined. Every homeowner is going to have a different situation in terms of time, money, expectations or knowledge. The reality is that not every person wants an extensive landscape. Take into account what you can manage and what you most enjoy, and then start to integrate beneficial design and management principles (see checklist on page 3). Also take into account your site. A house in a new subdivision is going to have different environmental challenges than a house in an older part of town.

Since budget can be such a limiting factor for most people, the following suggestions take that into account. Here are some places to start:

- 1. Look at changes in maintenance first.** These things cost little or no money. Lower-input lawn care, redirecting downspouts, creating a compost pile, mulching your lawn clippings back into the yard, mulching around trees and shrubs with organic material like non-dyed wood chips, etc. It doesn't matter what you plant in your landscape if the way you manage it is not beneficial.
- 2. Always, every time you create a landscape bed, add some organic matter** (see page 8). This is especially important in newer sub-divisions. Compost from local landfills is often free or available for a small fee.
- 3. The most common landscape shrubs** are barberry, spirea, yew, juniper, hydrangea and burning bush—shrubs with little value to insects and wildlife. If you have a clean slate, it's easy to plant diversely from the beginning. If you already have landscape plants, don't take everything out. Evaluate which ones aren't working and replace those. Otherwise just add to your landscape! Buying one or two high-impact shrubs (those that have high value to insects and wildlife) each year over a few years can really enhance the landscape. A typical 3-gallon shrub will cost you \$35-45. You can also save money by being patient and buying smaller-sized containers.
- 4. Add a tree to your landscape—a shade tree!** Shade trees grow large and have positive environmental impact. They cool our homes and cities, reduce energy use and offer habitat. One oak tree can support over 500 species of moths and butterflies. Not all trees are created equal when it comes to insect and wildlife habitat or longevity, so make a careful selection. There is no reason to buy a large nursery tree. Smaller trees quickly catch up and usually establish better root systems. A small grow-bag tree may run \$100-150, a seedling \$10 and an acorn is FREE!
- 5. Add a second tree to your landscape—add a small- or medium-sized native tree!** Small trees often have beautiful flowers and fruit. Pick a native species such as pawpaw, black cherry, redbud or serviceberry. These species typically grow in the understory canopy of the forest and do well in a similar micro-climate on the north or east side of a building with shelter from wind.
- 6. Embrace clover:** At one time, before synthetic fertilizer was readily available, clover was added to all lawn seed

mixes for its nitrogen-fixing capabilities—free fertilizer! Allowing white clover in the lawn can have environmental benefits by making the lawn more bio-diverse. It is a favorite of honeybees (pollinators of fruits, vegetables, and flowers) and parasitoid wasps (harmless to humans, but enemies of aphids, scales and whiteflies).

7. Add some grasses or perennials that are native to this area. They have extensive root systems that help break up compacted soil. Each year the root systems are renewed, leaving the dead roots behind to decompose and add organic matter to the soil. They also are drought-tolerant, beautiful and GREAT habitat for beneficial insects. There is no need to buy gallon perennials and grasses if your budget doesn't allow. Look for smaller plugs, 3" or 4" sizes. Choose plants that may gently reseed themselves (free plants!) such as little bluestem, penstemon, coneflower, Indiangrass, gayfeather and lanceleaf coreopsis. If I was going to the nursery I might buy three falso indigo plants because they can't be divided, but only one purple coneflower, knowing it may reseed or I could divide it after a few seasons.



8. Direct your dollars for perennials and grasses into a rain garden! Rain gardens help capture and infiltrate rainwater from roofs, sidewalks, driveways and yards. This reduces the load on stormwater systems and also helps filter pollutants before they reach fresh bodies of water. Many larger municipalities have cost-share programs for homeowners to install rain gardens (free money!). The great thing about rain gardens is that they consist of deep-rooted native plants—so you can skip number 7 and just focus your efforts on a rain garden.

9. After you have done all of the above, keep adding beneficial plants to new or expanded beds to gradually reduce turfgrass over time.

I asked staff members what they would do to make their landscapes beneficial on a limited budget. Here's what they said:

Budget	Kendall	Bob	Christina	Justin
Dead Broke	I'd start a compost pile. You can build a bin with basic homeowner tools & salvaged materials. 	I'd build up the soil and make landscape beds. It's sweaty, but mostly free. I would gather leaves from my own yard and others nearby and ask around for old manure and straw that I could add.	I'd look at simple maintenance changes like managing my grass differently and redirecting my downspouts. I'd also mooch off my neighbors for plant material! 	It's not what you do but what you don't do. Relax on mowing, let mother nature take its course. If I could get free mulch, I'd mulch around my trees and shrubs. Beg plants from other people. Plant an acorn! I have eight shade trees in my yard I started from acorns.
\$100	Plant a vegetable garden! The supplies to create one are cheap, it will feed my family and I can put the compost to use!	I would spend some money on tree seedlings (they will grow!) and a few small container shrubs that would eventually grow to larger specimens.	I would add compost to existing landscape beds and purchase some high-impact shrubs (those with great habitat value).	Buy a shovel and wheelbarrow to build soil & move plants. 
\$500	Buy a reel lawn mower, which runs from \$100-\$500. I would also buy a few fruit trees.	Install a perennial garden. I would also add some more shrubs to my landscape.	I would spend some money on a small grow-bag shade tree. I would also buy more shrubs and perhaps a small-growing native tree, like serviceberry or pawpaw.	Holy cow, we could really change the landscape! For under \$500, I built a shade frame, compost bin and working area where I've started tons of new plants.
\$1,000	I would tear out the existing privet, Alberta spruce and hydrangea shrubs in my front yard and replace them with more beneficial plant material.	I'd buy bigger-sized plants! 	I would install a rain garden! It's a great way to capture rainwater, they're beautiful and insects love the native grasses and perennials used in them. Most large municipalities have cost-share programs for homeowners (free money!)	I'd do all of the above and replace a third of my lawn with beneficial plants for insects and birds. With the \$500 left over, I'd go to the Smoky Mountains and hug some of the ancient trees there.

Embracing Biodiversity

Justin Evertson, Nebraska Forest Service

Let's cut right to the point here. Biodiversity in the landscape is vitally important for human well-being as well as the general health of our planet. And bluntly speaking, we can and should do a much better job of improving and managing the biodiversity of our own yards and the community landscapes around us. This article is not an effort to lay out all the facts and research that back up those statements, but for the people who study such things, such as ecologists and biologists, there is consensus that biodiversity is the cornerstone of nearly all healthy ecosystems (see lists and links that follow). Most experts also agree that biodiversity is important for our human managed landscapes as well:

"Biodiversity has a fundamental value to humans because we are so dependent on it for our cultural, economic, and environmental well-being. Some argue that it is our moral responsibility to preserve the Earth's incredible diversity for the next generation. Others simply like knowing that nature's great diversity exists and that the opportunity to utilize it later, if need be, is secure. Scientists value biodiversity because it offers clues about natural systems that we are still trying to understand. Arguably, the greatest value to humans, however, comes from the "ecosystem services" it provides. Biodiversity forms the backbone of viable ecosystems on which we all depend for basic necessities, security, and health. By breaking down plant and animal matter, for example, insects and other invertebrates make nutrients available to plants and are integral to the carbon and nitrogen cycles. Other species pollinate crops, an essential service for farmers and gardeners. Healthy ecosystems can mitigate or prevent flooding, erosion, and other natural disasters. These ecosystem services also play a hand in the functioning of our climate and in both air and water quality." (Environmental Literacy Council)

When talking about biodiversity and the benefits derived from it, it is not enough to focus on just planting a wider variety of plant species. It is equally important that those plant species have a relationship to each other and the other life forms sustained from them. This concept is sometimes referred to as mutuality or symbiosis. Just about



Landscaping for Birds & Other Wildlife

Tips from Dave Titterington, Wild Bird Habitat Stores

Plant Some Shrubs

If you're just getting started, consider shrubs. They mature quickly, so in just 3-5 years they can start providing food, shelter and nesting sites for birds. Most birds nest just 4-6' off the ground so the denser the shrub, the more protection it offers from predators.



Photos by Eric Berg, Nebraska Forest Service

Let 'em Go to Seed

Seedheads not only add color and excitement to the landscape, they're also an excellent food source for birds.

Stack the Sticks

Instead of putting broken twigs and branches in the garbage, stick them in an out-of-the-way corner where they can provide shelter for birds and a place to escape from predators.

Leaf the Litter

And that leaf litter under the shrubs? It harbors a multitude of insects and larvae that are wintering over. Perfect for ground-foraging birds like thrushes and native sparrows. It will also help protect plant roots during the cold Nebraska winters, providing nutrients to the soil as it breaks down and decomposes.

Get Certified!

Join thousands of wildlife enthusiasts across the country who have been recognized for creating havens for neighborhood wildlife in their own yards through the National Wildlife Federation's Certified Wildlife Habitat™ program.

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Attracting Butterflies

Few of us take pleasure in seeing insect-nibbled leaves, but entomologist Douglas Tallamy says, "A plant that has fed nothing has not done its job." The survival of particular insects may not matter to us, but some of them are necessary to the butterflies and birds we love having in our yards. They may also help pollinate our favorite vegetables, nuts and fruits. Butterfly larva, in particular, require specific plants—native plants—for survival. So before you add a new plant or squash a bug, you might want to consider the effects a little farther up the food chain.

Recommendations and photos below from Steve Spomer and Jim Kalisch, UNL Entomology Research Technologists.

If you want...

Plant...



Cecropia moth

Wild plum



Polyphemus moth

Dogwood



Gorgone checkerspot

Coneflower



Monarch

Butterfly milkweed



Crescent

Aster



*Other valuable plants for butterflies, skippers and moths include oak, birch, crabapple, goldenrod, aster and sedge. More at: entomology.unl.edu



From the Ground up

Karma Larsen, Nebraska Forest Service

“Mankind owes its existence to the top six inches of soil and the fact that it rains.” Anonymous

Soil makes a difference... ask any gardener. And the longer they've gardened, the more attention they're likely to give to it. Soil can determine whether plants survive or thrive, how quickly root systems develop, whether roots winterkill from too much moisture, how often they have to be watered and their susceptibility to pests, diseases, wind and heat.

Those problems won't reveal themselves until later, but sticking a spade in the soil can tell you a lot. If it's hard to get the spade in and the soil doesn't readily break apart, it's probably high in clay. If it sinks in with almost no effort and doesn't clump at all, it may be high in sand. If it forms clumps that break apart easily, it should be good soil.

Healthy soil is made up mainly of rock and mineral particles, with 5-10 percent organic matter and about 25 percent each of water and air. The soil type is generally defined by the size of the inorganic soil particles: sand has large particles so water and nutrients flow through it quickly and it feels gritty; silt has medium-sized particles that crumble in your hands and feel smooth and powdery when wet; clay has very small, flat particles that feel sticky when wet and pack together in clumps when dry.

In the midwest, clay tends to be the most problematic soil. The small particles pack together and leave little pore space so it drains slowly and can stay waterlogged for a long time. It's usually low in organic matter and in microbial activity and even though it may be nutrient-rich, those nutrients may not be accessible to root systems.

Though organic matter normally accounts for only 5-10 percent of soil make-up, its importance is dramatic. It contains essential nutrients, retains moisture and binds particles together in a way that allows air and water to move through. Just as important, it provides food for bacteria, fungi, worms, insects and microbes that help convert it into the vitamins, nutrients, hormones and disease-suppressing compounds plants need to grow. These microorganisms need air and water to survive and they in turn create passageways for air and water and, through their excretions, slow their transport so they can be absorbed by plant roots.

If you think you have a nutrient deficiency, you can have a professional soil test done by Cooperative Extension Service or by an independent soil lab, preferably one nearby. If the pH of your soil is much higher or lower than 6.5 to 6.8, nutrients may be bound to the soil particles and not available for plant growth.

Regardless of the soil pH, organic matter tends to moderate imbalances on either side. And the best amendment for soil of any texture—clay, silt or sand—is organic matter. In clay, it forces the tightly packed particles apart, improves drainage and allows plant roots to penetrate. It enriches silt. And in sand, it lodges in the large pore spaces and acts as a sponge, slowing drainage so the soil stays moist longer.

Improving soil is no quick matter, but it doesn't have to be overwhelming either. Keep in mind that most plant roots and most soil microorganisms are located in the top 6" of soil; so we're not talking about digging a basement!

“I want better soil as quickly as possible and without a lot of effort.”

Simply add compost while you're doing normal garden work. Add it when you're putting in new plants or filling in holes in a garden bed. When the weather warms up and it's time to mulch existing beds, mulch them with compost instead of wood chips. Wood chips will eventually break down into compost, but slowly. They're too large to seriously improve soil texture in the short-term and new wood chips remove nitrogen from soil rather than provide it.

What is compost? Basically compost is a mixture of decaying organic matter—leaves, kitchen scraps, grass clippings, hay, manure—used to improve soil structure and provide nutrients.

“I want a new garden bed with great soil and I'm willing to wait 6-12 months.”

Starting a new garden bed can be overwhelming—especially if you're getting rid of turf or breaking up hard pan. Regardless of what your soil is like, adding organic matter is one of the best things you can do; and one of the easiest methods we've found is the “mulch-gardening” method recommended by Cathie Draine, Master Gardener and writer from South Dakota.

To create a new garden bed, you build up a series of thin layers of organic waste and then—the essential part—heavily water down the whole area to decompose over the winter. Watering encourages insect and worm activity, settling in, decomposition and prevents drying out or “pressing” the materials. Since layers are quite thin, moist and only stacked about 12-20" high (resulting top soil will be half that height), the temperature doesn't get as high as in normal composting; and since it offers the right conditions for worm and insect activity, more labor-intensive methods

of turning and mixing the layers are unnecessary.

To start a new bed on top of lawn, you may want to first lay down soaked layers of newspaper to help smother existing grass. Then begin the layering process, alternating 2-3" layers of leaves (the more decomposed or broken the better), kitchen waste, compost, grass clippings, soil and hay. Moldy, rotted hay is best if you can find it. You can also add used coffee grounds, still in filters if you want. Water the layers in regularly as you're piling them on, mix the layers with a pitchfork slightly and don't add woodchips or sawdust, which will slow down the decomposition. As it breaks down, it will settle to about half the depth of the original layers. Keep it moist through winter, and by spring you'll have rich, workable soil. (Note: You won't be skeptical once you've tried this; it works.)



Creating a mulch bed is similar to creating a compost pile, and in fact you are creating compost. The difference is that this is done in very small layers, right where you want the new bed, it's heavily watered down and the temperature remains low enough so that earthworms and microorganisms do the mixing. Some over-the-counter insecticides and fungicides kill 60 to 90 percent of the earthworms present in the soil, so don't use pesticides nearby.

This is far easier than you might imagine and the benefits are numerous: garden beds can be built on top of soil or even on top of existing lawn; it requires less physical labor than bagging and hauling away lawn and leaf waste; doesn't have to be tilled in or spaded over; uses materials already at hand; and, if it's done correctly and with a lot of water, can do its work in the course of just one season.

What about beds for trees and shrubs?

Trees and shrubs need slightly different planting environments and also benefit greatly when planted within a new garden bed. Woody plants develop such large root systems that it's usually best NOT to amend just the backfill going back into the planting hole. If the soil varies too greatly from the root ball to outlying soils, roots may not spread out away from the root ball as desired. Instead, it is better to create a planting bed and amend the soil in the entire bed. Breaking up the soil around the root ball and adding compost within a planting bed will help roots spread and grow quickly into the loose, organic soil.

If you want to enrich the soil for trees already in the landscape, be careful not to damage roots... but you can spread an inch or so of compost over the soil surface to gradually improve the soil.

Resources for Biodiversity

Host plant and insect information from Doug Tallamy: udel.edu/~dtallamy/host/index.html

Prairie Plains Resource Institute from Aurora, NE is a membership organization offering good how-to information on prairie planting and management: prairieexplains.org/

Environmental Literacy Council information on sustainability and biodiversity: www.enviroliteracy.org/subcategory.php/354.html

People's Trust for the Environment has information for young people: www.ypte.org.uk/environmental/wildlife-in-the-garden/111

Planet Natural has some good pest ID and management guides: www.planetnatural.com/site/garden-pests.html

Beneficial Insects 101 describes some important insects to attract to the landscape, with information on alternatives to pesticides: beneficialinsects101.com/

USDA Natural Resources Conservation Service has information about soil quality: soils.usda.gov/sqi/concepts/soil_biology/soil_food_web.html

Life Under Your Feet has good soil ecology information: lifeunderyourfeet.org/en/

Web Links to commercial nurseries and seed farms offering good on-line information include: Stock Seed Farms (Nebraska); Prairie Moon Nursery (Minnesota); Prairie Nursery (Wisconsin); Ion Exchange (Iowa); Nebraska Statewide Arboretum

Recommended Reading:

Tallamy, D. 2007. *Bringing Nature Home*. Timber Press
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Farrar, J. 1990. *Wildflowers of Nebraska and the Great Plains*. NebraskaLAND Press

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Stolzenberg, W. 2009. *Where the Wild Things Were*. Bloomsbury

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anywhere in the world, it is the local native landscape that offers the best chance for mutuality. Those plants, insects, microorganisms, birds and other animals co-evolved over thousands—if not millions—of years and have come to support each other in the quest for survival. This mutuality can be generally described as the web of life. It can also be considered in terms of food chains, where native plants help feed numerous insects or microorganisms, which in turn are eaten by organisms higher up the food chain and so on. In general, the more natively diverse a landscape is, the closer it will come to having a natural balance of life processes. Such landscapes typically require less energy and fewer inputs on our part to maintain.

In Nebraska, the native landscape was primarily prairie in origin, ranging from the tall grass prairie in the east to the shortgrass of the Panhandle. There were also a few native woodlands, nestled primarily along waterways or other areas where fire was not as frequent or intense. This native landscape has been altered significantly since the time of



European settlement in the 1800s. Except for the Sandhills and other areas of non-tillable land suited better for grazing, the vast majority of the state's prairie has been converted to farm ground and the communities in which we live. Obviously, moving from a richly diverse prairie eco-system to one built on just a few agricultural crops has greatly reduced the biodiversity of the landscape. How else could it be? Where once there was grassland supporting hundreds of plant species and thousands of animal species (insects, amphibians, reptiles, birds, mammals, etc.) there are now vast fields of just a few crops supporting very little associated wildlife. The few natural areas that remain are small and disconnected.

This observation of land conversion is not meant as a value judgment. I'm personally proud of my own farm heritage and we can all be proud that Nebraska's rich soils help feed the world. And of course agriculture is vitally important to our social and economic well-being. I would not want to return our state to pre-settlement prairie even if we could. A rural state like Nebraska is a big and beautiful place, with clean water and air, and which exists at a more



leisurely pace. I like it. But having traipsed around some native prairies and after getting acquainted with many of the wonderful plants and animals that call them home, I can't help but feel we're missing out by relegating this once proud biome to just a few remnant pockets here and there.

In general, we do a poor job of managing our landscapes for biodiversity. Although in total the community landscape may include a fairly wide variety of plants, most of these plants are introduced from foreign places and they hold very little natural relationship to each other. They are desired primarily for their predictable shapes and colors – and for their “clean” foliage that is not bothered by insects. Most importantly, nearly EVERY landscape is now dominated by a tightly-coiffed carpet of turf. In our efforts to keep this grass lush and weed-free, we regularly apply pesticides to keep out as many other life forms as possible. The result is a fairly sterile urban and suburban landscape built around conformity and ornamentation.

Our modern comforts and busy urban lifestyles have allowed us, perhaps even forced us, to become disconnected from the land. Few of us now garden, pursue game for food or explore nature. We have forgotten the value of biodiversity. In fact many of us have come to equate biodiversity with “wildness” and lack of order. And we see most insects as harmful or creepy. We no longer intuitively know that the vast majority of the living creatures around us are either benign or vitally important to our survival.

Of course not all insects are benign. I can think of several types such as bagworms, aphids, lace bugs, slugs, ticks, sawflies, squash bugs, etc., that have caused me trouble over the years. Foreign invaders such as emerald ash borer and Japanese beetle are headed our way and will likely cause major problems in the landscape. But what we've learned, and which is so eloquently described in *Bringing Nature Home*, is that by including a wide variety of native plants in the landscape, along with some important non-natives, we can attract a wide range of beneficial insects, birds and other creatures that help minimize the damage of the pest species.

Lady beetles, soldier beetles and lace wings love to eat the aphids, mantids love to eat just about anything they can get their hands on, parasitic wasps and flies do their part, chickadees eat bagworms, many birds make their living eating insects of all shapes and sizes, dragonfly larvae eat mosquitoes, snakes eat crickets, grasshoppers and mice and hawks eat snakes (and just about anything they can get their claws on). What a show!

Biodiversity can be a visually inspiring endeavor. By planting the right mix of plants, an incredible menagerie of fascinating insects, birds and other creatures will appear as if out of the blue. Butterflies and moths are some of the most attractive insects to behold and a diverse landscape will help bring such things as monarchs, fritillaries, checkerspot, angelwings, admirals, swallowtails, sulphurs, azures, painted ladies, sphinx moths, cecropia moths... (literally hundreds of potential species). Other fascinating insects and arthropods that I've come to greatly enjoy include spiders of all kinds (especially crab and garden spiders), soldier beetles, milkweed beetles, assassin bugs, mantids, bees, dragonflies—the list goes on and on. And although I'm no



Photo by Eric Berg, Nebraska Forest Service

bird expert, I've now counted over 30 different species that have visited my yard, along with other important animals such as garter snakes, toads, frogs, squirrels and even an opossum or two.

So what can people do to help achieve a more biodiverse landscape and one that is more naturally balanced and sustainable? Thankfully it's not a difficult endeavor. Anyone who owns property or helps care for a landscape can make a huge difference. Here are a few suggestions:

1. Start small and work in manageable steps. The entire landscape doesn't have to be converted, and drastic change doesn't have to happen overnight. Just do something.

2. Don't be upset when native (beneficial) insects are feeding on your landscape. This counter-intuitive notion is contrary to what we regularly read about many landscape plants in the nursery catalogs: that the best ones are free from insect feeding. It really is a good thing that plants are

being chewed on by insects. It is these insects that will in turn provide a very important food source to animals higher up the food chain—especially birds. And remember that every colorful butterfly requires some sort of host plant for its larvae to eat. Most landscape plants will tolerate some feeding and many gardeners actually plant some things solely for the benefit of insects (try parsley or dill for swallowtail larvae or milkweed for monarchs).

3. Learn about the important native plants in your area and the beneficial insects, birds and other wildlife they would attract to your landscape.

There are many great places to find this information, much of which is just a few clicks away via an internet search. Good sources include the Nebraska Statewide Arboretum (NSA), local native plant societies, Audubon groups, specialty nurseries, Master Gardeners, University Extension resources, etc. (see list of resources on page 9 for additional information).

When buying plants, seek out nurseries or other plant providers that specialize in native plants. A few local commercial nurseries have carved out a niche in this market and there are many on-line sources for mail-order plants and seeds. Avoid the big-box, national retailers as they rarely carry native plants. And of course, NSA is a great source for native plants.

4. Remove problematic and invasive non-natives. Such invasive plants displace our good natives in the wild and they support very little in the way of important wildlife. Nebraska Invasive Species Project is at: snr.unl.edu/invasives/.

5. Many non-natives are okay. Several non-native flowers such as sedum, salvia, yarrow, Russian sage, etc. are good sources of nectar for bees and butterflies. Other species such as parsley and dill (carrot family), mints and composites of all kinds are good food sources for butterfly larvae. Still other non-natives just help make our gardens more beautiful (azalea, spirea, feather reed grass, most



Continued on next page

annuals, etc.). The goal is to not get rid of every foreign plant but to strive for a better balance of natives and non-natives.

6. Plant native trees and shrubs and work in layers! Research by Tallamy and others clearly shows that native woody plants host hundreds of important bird and insect species. Working in layers, including an overstory tree layer, an understory tree and shrub layer and a herbaceous ground layer greatly expands wildlife diversity. A diverse ground layer attracts the most beneficial predatory insects, while trees and shrubs are important to most bird species.

7. Designate an area or two in the yard to be as wild as you can allow, planted primarily to native plants that are allowed to “do their thing.” These “rough edges” or mini-prairies can be a great excuse to be lazy with part of the garden and they will act as important insectaries feeding the biodiversity machine. Possible spaces include tough-to-manage fence lines, the back corner, the area behind the shed, near the wood pile, the boundary near a nosy neighbor or just about anywhere you desire.

8. Let the landscape be an “edible landscape.” Many of the best plants for biodiversity are edible to us as well. Nettles, milkweeds, Jerusalem artichokes, sunflowers,



violets, dandelion, serviceberries, roses, hazelnuts, currants, oaks, nut trees, cherries, apples, etc. The list goes on and on. Nothing is more satisfying than picking and eating something you grew.

9. Grow healthy soil! The best soils for biodiversity are themselves biodiverse. Soils should be a living medley of insects, arthropods, microorganisms, fungi, bacteria and other organisms. The best way to achieve healthy soil is by adding organic matter. Don’t throw away grass clippings, twigs, leaves, garden debris and kitchen scraps—compost them instead, and return them to the landscape. Let leaves lie underneath trees and shrubs. Try to avoid the neat and



Photos by Eric Berg, Nebraska Forest Service

tidy. Embrace decay and decomposition in the landscape—it is a very good thing!

10. Share the effort with your family, friends and neighbors. Learning together about biodiversity and enjoying the wondrous pageantry of nature with others can be very socially and emotionally satisfying. We especially need to share this wonderment with our children, grandchildren and other young people around us.

There you have it. Biodiversity in the landscape is imperative to our well-being. In fact our long-term survival as a species will only be possible if we embrace and make room for a wide variety of other organisms (especially those that are locally native) to live alongside us. In Nebraska, where much of the native prairie has been converted to farmland and where this farmland is itself vitally important to people around the world, it will likely not be possible to restore large tracts to prairie. However, we can certainly bring more of the native flora and fauna into the places we live—on our farms and acreages and within our communities. Our native plants have hung on despite our best efforts to get rid of them. Let’s throw them a lifeline and, by doing so, throw ourselves a lifeline as well.

Native Plants for Biodiversity

Justin Evertson, Nebraska Forest Service

With literally hundreds of species of native plants to potentially include in a landscape, it's not easy to focus on just a few to whet the appetite. But that's just what we're going to do here. The following lists represent a few of our favorites, but they aren't intended to be perfect for everyone. This is a big state with a wide range of native plants and plant communities adapted to a wide-range of soil and climate conditions. In general, most plants are considered to be adaptable to favorable locations statewide. Those marked with a (W) are primarily native to and intended for the far western part of the state. More complete lists can be found on the NSA website (arboretum.unl.edu).

Ten Native Trees

- Bur oak, *Quercus macrocarpa*: this king of hardwoods hosts hundreds of insects/birds.
- Chinkapin oak, *Quercus muehlenbergii*: acorns feed turkeys, jays, squirrels, etc.
- Hackberry, *Celtis occidentalis*: a favorite of waxwings and other birds.
- Cottonwood, *Populus deltoides*: our state tree is a bird and insect magnet.
- American elm, *Ulmus americana*: hosts over 200 species of Lepidoptera.
- Black cherry, *Prunus serotina*: feeds a wide range of insects and birds.
- Ironwood, *Ostrya virginiana*: shade-tolerant understory tree.
- Shagbark hickory, *Carya ovata*: edible nuts for people and wildlife.
- Boxelder, *Acer negundo*: sap can be tapped for sugar/syrup.
- Ponderosa pine, (W) *Pinus ponderosa*: hosts an amazing variety of birds.

Native Shrubs & Vines

- Eastern wahoo, *Euonymus atropurpureus*: fruit poisonous to humans but loved by birds.
- Roughleaf dogwood, *Cornus drummondii*: feeds at least 40 species of birds.
- Snowberry/coralberry, *Symphoricarpos*: important winter food for many birds.
- Fragrant sumac, *Rhus aromatica*: berry-like fruits, red fall color.
- Virginia creeper, *Parthenocissus quinquefolia*: fruiting vine feeds birds in winter.
- Rabbitbrush, (W) *Ericameria nauseosa*: late summer flowers are butterfly magnets.
- Common juniper, (W) *Juniperus communis*: berry-like seeds feed many birds.

Prairie Plants: A Baker's Dozen

- Little Bluestem, *Schizachyrium scoparium*: 2-3' tall; red in fall.
- Indiangrass, *Sorghastrum nutans*: 4-5' tallgrass native with attractive yellow blooms.
- Prairie Dropseed, *Sporobolus heterolepis*: 2-3'; clump-forming.
- Blue Grama, *Bouteloua gracilis*: 10-15" tall; can be used as a lawn alternative.
- Butterfly milkweed, *Asclepias tuberosa*: 18-24" tall; a monarch favorite.
- Dotted gayfeather, *Liatris punctata*: 15-30" tall; late summer purple flowers.
- Shell-leaf penstemon, *Penstemon grandiflora*: 18-30" tall; a bumblebee favorite.
- Narrow-leaved coneflower, *Echinacea angustifolia*: 12-30" tall; seeds feed small birds.
- Prairie coneflower, *Ratibida columnifera*: 12-18" tall; sombrero-like yellow flowers.
- Showy-wand goldenrod, *Solidago speciosa*: 2-3' tall; flower spikes attract soldier beetles.
- Dwarf blue indigo, *Baptisia minor*: 18-24" tall; blue flower spikes become rattle pods.
- Joe pye weed, *Eupatorium maculatum*: Reaches 3-5' tall; pink summer flowers.
- Standing milk-vetch (W), *Astragalus laxmannii*: 12-18"; common in the Panhandle.

Fruits & Nuts for People & Wildlife

- Serviceberry, *Amelanchier alnifolia*: one of the tastiest fruits for people and birds.
- Chokecherry, *Prunus virginiana*: fruits are good in wine, jellies and bird bellies.
- Clove currant, *Ribes odoratum*: clove-like fragrance and tasty fruits.
- American hazelnut, *Corylus americana*: great multi-purpose shrub and good-tasting nut.
- Elderberry, *Sambucus canadensis*: nutritious fruits.
- Sandcherry, *Prunus besseyii*: cherry fruits, relished by birds.
- Black Walnut, *Juglans nigra*: edible nuts with strong flavor.

Native Woodland Plants for Shade

Woodland phlox, *Phlox divaricata*: 20-30" tall; blue flowers in spring.

Solomon's Seal, *Polygonatum biflorum*: 20-30" tall; arching stems with blue berries.

Mayapple, *Podophyllum peltatum*: 10-15" tall; can form colonies; apple-like green fruit.

Columbine, *Aquilegia canadensis*: 18-30"; bell-like red flowers attract hummingbirds.

White snakeroot, *Ageratina altissima*: 2-3' tall; flowers favored by many insects.

Creeping mahonia, (W) *Mahonia repens*: 12-24" tall; holly-like leaves; grape-like fruits.

Non-Native Plants To Exclude

In our opinion, the following plants should no longer be used in the landscape, especially in any areas near important native ecosystems. Species marked with a * are listed as noxious weeds in Nebraska and should be removed from landscapes.

Honeysuckle, *Lonicera tatarica*, *L. maackii*

Russian Olive, *Elaeagnus angustifolia*

Common buckthorn, *Rhamnus*

*Purple loosestrife, *Lythrum salicaria*

Oriental bittersweet, *Celastrus orbiculatis*

*Saltcedar, *Tamarix ramosissima*

Ox-eye daisy, *Leucanthemum vulgare*

*Japanese knotweed, *Fallopia*

Chinese bush-clover, *Lespedeza cuneata*

Multiflora rose, *Rosa multiflora*

Crown vetch, *Securigera varia*

Siberian elm, *Ulmus pumila*

Callery pear, *Pyrus calleryana*

Wildlife Indicators of Biodiversity

If a landscape contains a diverse mix of plants, including many native species, then the amount of wildlife attracted to those plants, especially birds and insects, should be significant. The following lists of wildlife represent some of our favorites. They can be used as indicator species of a more biodiverse landscape. For more information, see links on page 9.

Our Ten Favorite Lepidoptera (butterflies, skippers & moths)

Monarch
Red admiral
Painted lady
Clouded sulphur
Angelwings
Regal fritillary
Spring azure
Black swallowtail
Cecropia moth
Sphinx moth



Ten Important Birds

Cardinal
Dark-eyed junco
Black-capped chickadee
Nuthatch
Goldfinch
Brown thrasher
Cedar waxwing
Blue jay
Downy woodpecker
Ruby-throated hummingbird



Ten Insects & Spiders to Watch for

Spiders of all kinds!
Bees of all kinds!
Soldier beetle
Praying mantis
Lady beetle
Lacewings
Dragonfly
Milkweed beetle
Assassin bug
Lightning bug



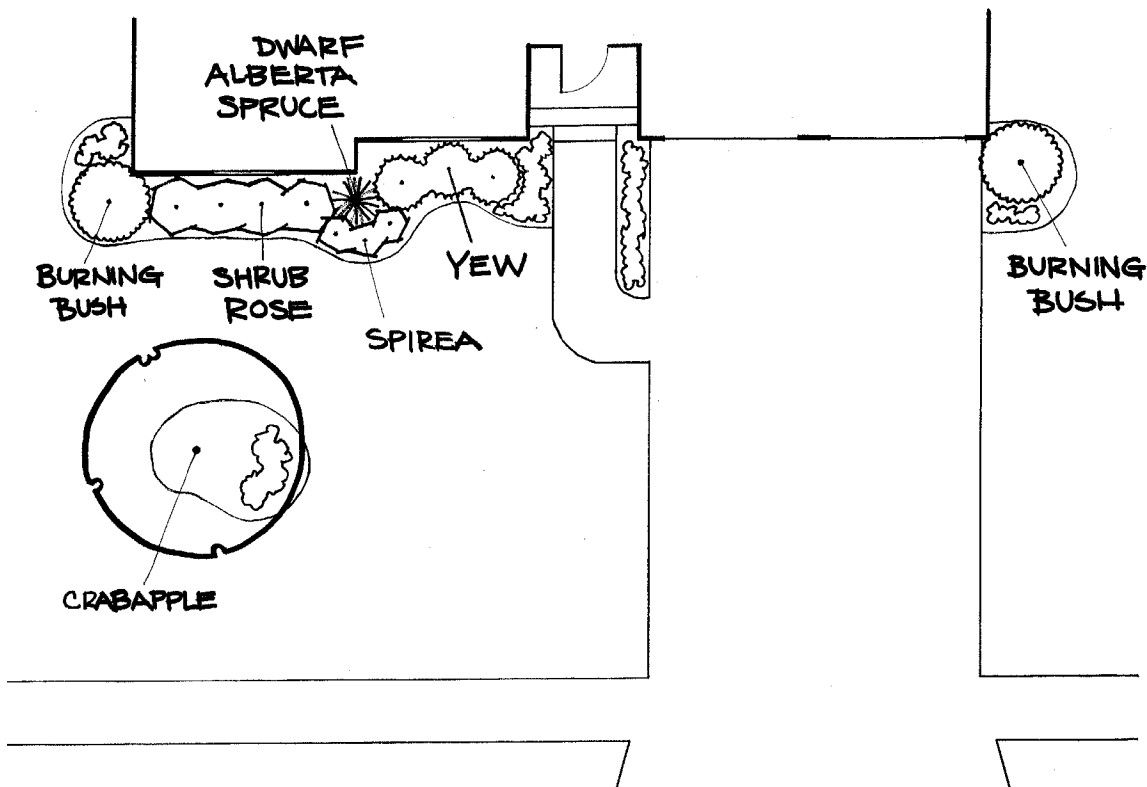
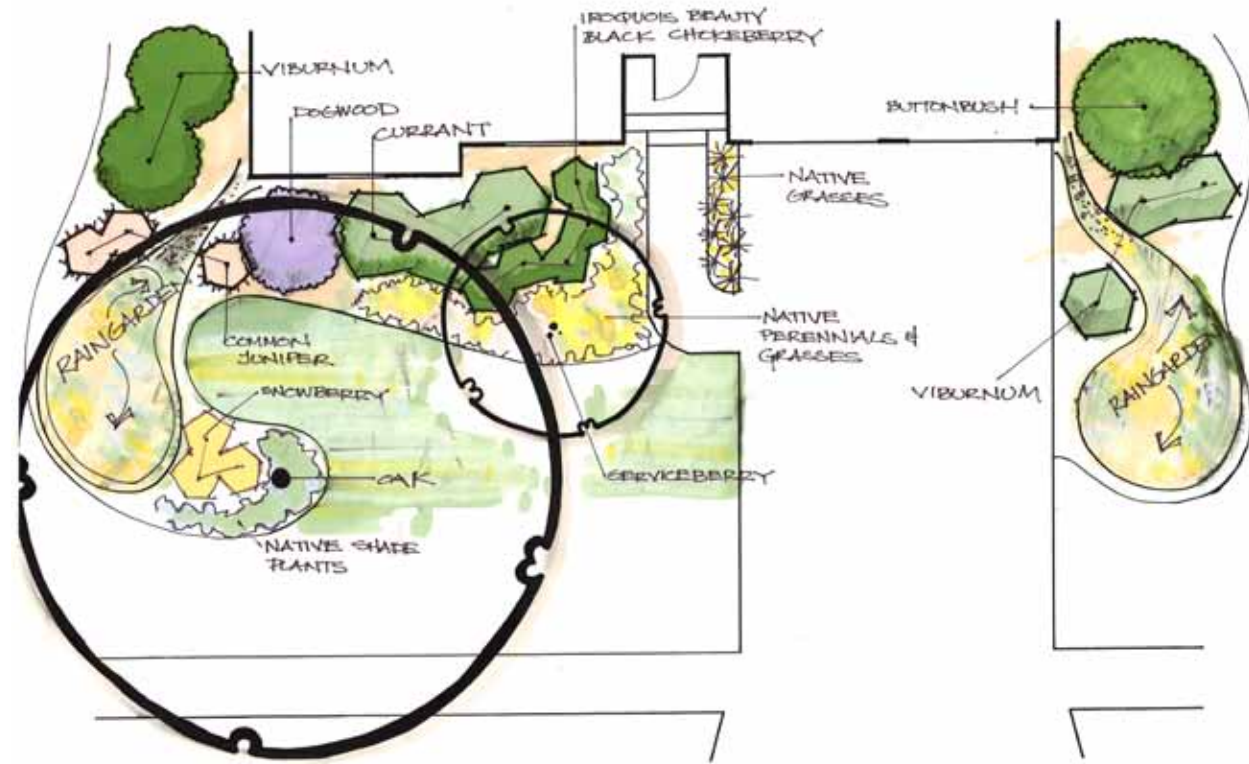
Other Animals to Look for

Garter snake
Tree frog
Box turtle
Bat
Fox squirrel
Toad



Not Just a Foundation Planting

In the before (bottom) and after designs below, principles of beneficial landscape design were incorporated into a foundation planting for a typical ranch house. Plants were chosen based on their value to wildlife, the broader landscape and seasonal interest. The rain garden, situated to capture rainwater, has deep-rooted native plants that are favorites of beneficial insects. The large shade tree was separated from turf by extending the landscape bed.



Before (opposite) and after landscape designs by Rachel Anderson, Nebraska Statewide Arboretum intern

Nebraska Statewide Arboretum, Inc.
University of Nebraska–Lincoln
102 Keim Hall
P.O. Box 830964
Lincoln, NE 68583-0964

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If Everyone Did One Thing

Kendall Weyers, Nebraska Forest Service

If you're feeling like your sustainability efforts are just a drop in the bucket, consider the following examples of the dramatic impact if we all took the step described:

The U.S. currently has over 40 million acres of turf-grass. **If each property owner converted only 10-25 percent of their turf**, it would create 4-10 million acres of wildlife habitat, low-maintenance plantings and productive gardens and the many associated benefits.

Over 800 million gallons of fuel per year are currently used in the U.S. to mow our lawns. **If each property owner reduced power mowing by 25 percent** (through turf area reduction, fertilizing less, using human-powered mowers, etc.) it would save over 200 million gallons of fuel every year, as well as reduce mower-generated air and noise pollution by 25 percent.

The U.S. uses more than 7 billion gallons of water a day maintaining landscapes. It's estimated that 30-50 percent of that water is wasted through over-watering, inefficient design, broken sprinkler heads, watering pavement, etc. That's a precious resource going down the drain with all the costs (water extraction, pumping and pre-treatment, and runoff sediment and pollution) and no benefit. Several billion gallons could be saved every day **if each property owner simply watered their existing landscape efficiently**. By planting more drought-tolerant plants and taking other water conservation measures, the savings would multiply significantly.

You may not get direct feedback on sustainability steps you take, but people do notice. Even if they aren't aware of the issues or don't agree, it does cause many to at least think about it. Though hard to measure, it can be argued that leading by example may have the biggest impact of all—changing the attitude of an entire culture.



Lots of Ways to Connect!

To receive our monthly e-newsletter filled with garden-related articles, ideas and photos, send an email to klarsen1@unl.edu. Visit us on the Web at arboretum.unl.edu, where you'll find plant and landscape information and recommendations, public gardens to visit and other events and resources for Great Plains gardeners.

For information on how to become an Arboretum member, call (402) 472-2971, email cpaxton1@unl.edu or visit us on the Web at arboretum.unl.edu.

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