

The Seed

Waterwise Landscapes

Nebraska Statewide Arboretum, Inc.
Sustainable Landscapes for Healthy Homes & Communities
Winter 2013

Trying to be Waterwise

Justin Evertson

"When the well is dry, we know the worth of water." Benjamin Franklin

When early governmental explorers surveyed the Louisiana Purchase in the early 1800s, much of the Great Plains region (primarily the area west of the 100th meridian) was labeled "The Great American Desert." In 1823, geographer Edwin James wrote of the area: "I do not hesitate in giving the opinion, that it is almost wholly unfit for cultivation, and of course, uninhabitable by a people depending upon agriculture for their subsistence."

Obviously the region was eventually settled and it became one of the most important agricultural areas of the world. How could the early explorers have been so wrong? First, these early explorations occurred at a time of significant drought. In fact, studies have revealed that the first half of the 19th century was a much drier period than we have seen since. So in reality, the area was very much the dry and parched region it appeared to be. Secondly, these early explorers did not yet know about one of the world's largest underground reservoirs, the Ogallala Aquifer, and they could not have foreseen the ability of future generations to pump incredible amounts of this ancient water to feed crops and communities.

Nebraska is fortunate to be sitting atop a great reservoir of underground water and also to have many relatively reliable rivers and streams coursing through the state, primarily draining runoff from the Rocky Mountains. This abundance of water in an otherwise semi-arid part of the world has allowed us to live well beyond our means and far beyond our normal rainfall. Are we pressing our luck? There is no guarantee that this abundance of water will be with us forever. Paleoclimatic research has revealed that multi-year megadroughts have occurred in our region fairly regularly in the past 2,000 years and they will almost certainly return at some point (see "Toward Drought-resilient Landscapes" on page 2). Such droughts would greatly impact future water supplies.

We would be wise to acknowledge in this discussion the uncertainty of a changing climate. Although there is no way to know for sure what a warming climate will mean for our region, most climatologists agree that much of the Great Plains will become hotter and drier. Multi-year droughts will likely have significant impacts on the area, especially the western half of the region. Because of the increased energy in the atmosphere,

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Bioswale for slowing, using and filtering stormwater

The Nebraska Environmental Trust
preserving NATURAL NEBRASKA™ for future generations

INSIDE

Toward Drought-resilient Landscapes

Justin Evertson

In just about any part of the world where drought is common, nothing beats a good rain. In Nebraska, we won't soon forget 2012, one of the hottest and driest years on record. Across the region almost no rain fell during the growing season, putting great stress on crops and landscapes. In fact, May through September of 2012 was THE driest growing season for Nebraska since the late 1800s when we started keeping records.

Drought cycling is a normal part of the Great Plains climate and no amount of wishful thinking is going to change that. Recent paleoclimatic research (study of climate over time) has analyzed tree ring data, lake sediments and even sand dune formation to reveal a pretty scary picture for the Great Plains over the last 1,500 years. What's become clear is that severe drought is a regular occurrence. The region has even seen several megadroughts lasting for several years or even decades at a time. Some of the more sobering findings of regional drought research (see final paragraph on page 3) reveal that:

- Multi-year megadroughts have occurred more than 30 times since AD 800. The period of 800 to 1,000 years ago (Medieval Warm Period) was especially hot and dry, with Nebraska's Sandhills looking much like the Sahara Desert.
- The droughts of the 1930s and 1950s are not anomalies. They actually pale in comparison to many prior, multi-decade droughts.
- The last 500 years has been relatively moist in comparison, but still punctuated by regular, multi-year droughts. The period of 1800 to 1850 was especially dry. The severely dry summer of 1855 was referred to by the Kiowa people as "the sitting summer."
- Even in eastern Nebraska, severe summer droughts have occurred 15 times in the last 125 years, more than one summer out of every 10. In 1936, Lincoln recorded only 14 inches of rain.
- Modern cropping systems probably would have collapsed in many of the past megadroughts and the water supplies many municipalities rely on would have been severely restricted or even dried up.

So how does our expanded knowledge of drought compare with how we've developed our community landscapes? Would our trees and other landscape plantings be able to survive and function in the face of severe and prolonged drought? Just think about this: the city of Lincoln gets its water from a well field under the Platte River near Ashland. On hot summer days, the system often pumps more than 75 million gallons of water, most of which gets used for landscape irrigation—primarily for watering lawns. The water is sucked from under the Platte River, treated for safe drinking and then pumped 30 miles to Lincoln in an often futile effort to keep lawns and landscapes green. That's 550 gallons per day for every water customer in town and enough water to fill 120 municipal swimming pools. Although some people might complain about the cost of this water, it's actually very cheap—costing just pennies on the gallon. And Lincoln is not alone in this regard.

Clearly, the impact of drought on our communities has been buffered by our ability to irrigate much of the landscape. For the last several decades we've gotten by in pretty good shape. With just a few exceptions and occasional restrictions, our water supplies and our ability to pump have kept up with usage. But what happens when a multi-year drought sets in and communities are forced to significantly restrict landscape irrigation to conserve water for drinking? What would become of our landscapes? There's no way to know for sure, but we can make some educated guesses:

- Most lawns would struggle. Some might survive a season or two, but they would fade over time. Shortly mowed areas would die fairly quickly, favoring tough and weedy plants that tolerate mowing such as knotweed, plantain, medic and dandelion.
- Heavily irrigated landscapes would likely fade the quickest—ones with water-dependent plants that lack the deeper and more extensive root systems to survive drought.
- Many of our favorite ornamental perennials, grasses and shrubs would struggle: hydrangea, rose, sweetspire, certain viburnums, feather reed grass, hosta, fern, etc.
- Native plant species would have an advantage, especially deeply-rooted prairie plants and our tough-as-nails trees and shrubs. However many non-natives would likely do quite well, including lilac, some spirea, catmint, sedum, daylily, Russian sage, yarrow and lambs' ears, to name just a few.

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when rainstorms do come there is a likelihood that they will be much more severe and with brief but torrential downpours. More flash flooding from these events will be the result. Are we ready for such a future?

Most Nebraskans are keenly aware that precipitation, especially in the form of rain, can be quite unpredictable. Dry periods occur with regularity and the record drought of 2012 is still fresh in our minds. And yet, ironically, when a good rain does fall, we almost always end up with the problem of too much water—as in too much stormwater running off the land and causing lowland flooding, soil erosion and nonpoint source pollution of water bodies.

This issue of *The Seed* focuses primarily on water and how we utilize it in our landscapes. We ask the question, are we doing all that we can to help insure an abundant and clean supply of drinking water for future generations? Nebraskans pump billions of gallons of water each year to maintain green spaces, primarily our lawns. And when the rains come, we watch billions of gallons run off and flow away, causing a myriad of problems. Can we find better, more efficient ways utilize rainwater? Can we find ways to better conserve ground water? And can we do this while still maintaining beautiful, functional and ecologically-smart landscapes? We think so. Let's at least discuss it.

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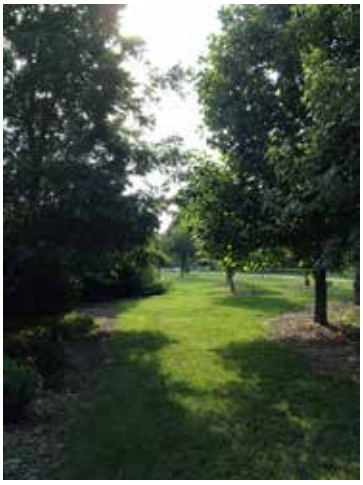
Toward Drought-resilient continued from page 2

- Regarding trees, some finicky and marginally-hardy deciduous species would probably struggle—Japanese maple, magnolia, birch and tulip poplar. It's also likely that evergreen species native to higher elevations and cooler climates such as white pine, some firs and some spruces would be lost. Most trees are actually quite drought-tolerant when established and we would hope that many of our larger shade tree species—oak, hackberry, elm, honeylocust, walnut, sycamore, green ash and coffeetree—could survive for several years. A lot would depend on how healthy they were going into the drought, and if they'd been babied with irrigation. Some of our least favorite trees are amazingly drought-tolerant and would likely survive quite well, including redcedar, mulberry and Siberian elm. Is that a good thing?

Obviously the color green is highly valued across a community landscape. Almost everyone would choose a lush, green landscape to one that is drab and brown. Green is soothing, it's refreshing, and we go to great lengths to achieve it in the landscapes around us: millions of gallons of water, lots of fertilizer, green lawns planted corner to corner, and trees—lots and lots of green trees. Ahhh. We want green communities.

But are we doing it right? Are we sacrificing potential landscape resiliency with an over-dependence on irrigation and with many non-native plants that don't offer much ecological value? We may be. There are basically two schools of thought in this regard. First would be the "Let's enjoy our nice green landscapes while we can" approach and assume we have several more decades before an especially severe drought cycle sets in. We can keep pretending we live in New England; after all, it's nice in New England. If severe drought does set in, then we'll adapt, but not worry too much ahead of time. That seems to be the prevailing attitude for most people and most community decision-makers.

The other option is to start creating more resilient green spaces so that when severe droughts do return (and they certainly will), the impact to our community landscapes won't be nearly as severe. This is what the Nebraska Statewide Arboretum is working toward through its programs and outreach. We're especially concerned with the long-term viability of our shade trees, many of which have benefited us for generations. We believe that if we do it right, our landscapes would not only become more resilient, but also more dynamic and ecologically sound—a true win-win.



Shady areas at Wayne Park in Waverly (photos this page) showed minimal stress from drought. Though much of the turf went dormant in 2012, it recovered in 2013.

One of the best and easiest ways to help our landscapes become more resilient is to utilize more native plants wherever we can (see pages 10-12). They tend to be drought-tolerant and they also offer significant ecological benefits. Because they evolved here, they typically provide more food and better habitat to a wider variety of native fauna—birds, pollinators, other insects and microorganisms. And to top it off, our native plants would help us derive a better "sense of place" in our landscapes. Sure, New England green is fine, but so is Great Plains prairie.

We also believe that landscape resiliency will be improved (along with resource sustainability) if we can further reduce landscape-related water consumption and become much more efficient with irrigation. What if we found a way to reduce summer landscape water consumption by at least 50 percent across most communities? Would our landscapes be drastically different? We don't think so. We think they would look very similar to how they are now. If our goal is golf-course lushness, then we won't get there, but if we relax our expectations just a bit by reducing the total amount of pristine lawn, allowing some summer dormancy and utilizing more drought-tolerant plant species, then we can make it. Reducing lawn irrigation would have the added benefit of helping to wean important trees and shrubs from water dependency and thus improving their drought-tolerance.

Some trends are already going in the right direction. For example, Lincoln's per capita water consumption has actually dropped nearly 30 percent since the 1970s. We are dumping less drinking water on the lawn. And more people all the time are discovering the value of native plants for landscape use, with more nurseries and garden centers offering them. It's not uncommon to see residential properties that are clear celebrations of our prairie heritage.

NSA has always played an important role in promoting native plants and native landscapes. But we also feel like we've only scratched the surface. We still have a long way to go.

To learn more about the history of drought in the Great Plains region, there are some fascinating publications online: *Multiple Year Droughts in Nebraska*, NebGuide G1551 by Michael Hayes, et al., 2005; and *A Thousand Years of Drought and Climatic Variability in Kansas*, by Anthony L. Layzell, Kansas Geological Survey, 2012.

Addressing Stormwater through Gardens

Christina Hoyt

In the United States water quality continues to be a problem, especially in waterways receiving stormwater runoff. The Clean Water Act requires communities with populations over 10,000 to have stormwater management plans to limit the pollution caused by runoff. On rainy days, rainwater (stormwater) flows over roofs, roads, parking lots and compacted lawns, picking up pollutants and carrying them into the stormwater system and ultimately untreated into streams, rivers and lakes. Snowmelt and irrigation runoff also can move these pollutants. The polluted rainwater carries natural and human-made pollutants such as pesticides, fertilizers, E. coli, hard metals, oils and sediment. Pollution caused by stormwater is called non-point source pollution because it comes from many places and cannot be tracked to a single source.

Parking lot pollution following rain

Stormwater pollution is not the only threat to the health of our waterways. The volume of stormwater runoff changes the natural flow of waterways and increases erosion and flash flooding. As water flows over impermeable surfaces, it increases its speed, temperature and volume. A large amount of fast-moving water is then concentrated into stormwater sewers and discharged at a single outlet, causing flash flooding and bank erosion of that waterway. Temperature increases also affect animals and microorganisms. Many aquatic organisms have limited optimal temperatures for spawning and survival. Increased temperatures also increase the growth rates of bacteria and algae and decrease the level of dissolved oxygen.

Since waterways are connected in a watershed, and these watersheds are part of larger watersheds, pollution problems continue to flow downstream. In Nebraska, our drainage eventually flows into the Mississippi River because we are part of the Mississippi River Drainage Basin. Where the Mississippi River meets the Gulf of Mexico, a hypoxic dead zone that spans 8,000 square miles has been formed. This is caused by decreased oxygen levels due to sediment, phosphorus and nitrogen pollution from poor agricultural practices and from community stormwater runoff.

Perspectives on stormwater are changing. In the past, the mentality was to get water off properties as quickly as possible. Now communities are trying to reduce stormwater runoff and improve water quality by finding ways to slow it down, spread it out and soak it in before it reaches waterways. There are many new practices, known generally as "green infrastructure," that can help. These practices mimic the natural hydrology through engineering, soil and plants. In natural areas, rainwater spreads out and soaks into the ground. As rainwater moves through soil and plant roots, it is cleaned and cooled and slowly recharges aquifers and water bodies. Green infrastructure practices seek the same results through urban forests; specialized gardens such as bioswales, rain gardens and bioretention gardens; greenroofs; and constructed wetlands. Innovative products such as permeable concrete and porous pavers also are being used. While stormwater is a broad challenge, it is truly a problem where "every little bit helps."

Rain Gardens

One way property owners can reduce stormwater runoff is to install a rain garden—a small garden that features deep-rooted plants and is specifically designed to hold rainwater temporarily (24-48 hours) from roofs, lawns, driveways or other surfaces. The water in the rain garden soaks into the ground, is absorbed by plants or evaporates into the air. A rain garden is not a pond and is not designed to stay wet all the time. Since a rain garden does not hold water for more than 48 hours, mosquitos are not a problem. Rain gardens are designed to be aesthetically pleasing; the best-looking rain gardens are tied into existing landscapes. It's best to site rain gardens at least 10 feet away from structures and avoid the drip lines of trees. To see if a rain garden will work in a particular location, dig a hole 6 inches deep and fill it with water. Allow the water to drain out, and then fill it again. If the water drains away within 24 hours, the soil is suitable for a rain garden. The size and depth of the garden is based on the amount of water entering it and the permeability of the soil. (More technical information on how to construct a rain garden can be found at water.unl.edu.)

Usually native or near-native plants are used in rain gardens because their deep root systems help absorb water and open up pore space in the soil, improving drainage over time. These plants also provide important habitat for many beneficial insects. It looks best to group plant species together in masses and choose a variety of species with different seasonal interest and textures. Plants in the low part of the garden should be able to withstand periods of inundation. Like typical perennial gardens, rain gardens require weeding and cutting back.

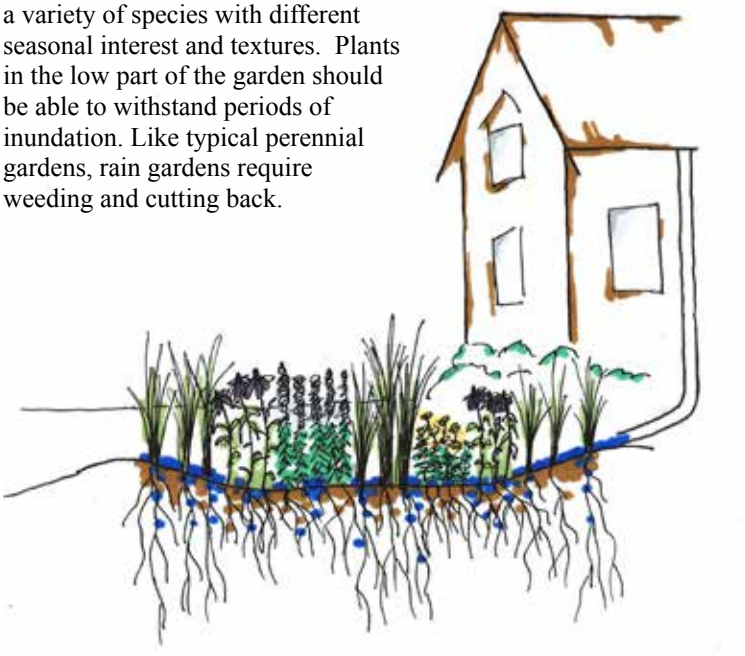


Illustration by Leah Goossen, NSA Landscape Design Intern

Bioretention garden at Metro Community College in Omaha

Bioretention Gardens

In areas such as parking lots where there is a large amount of stormwater runoff, bioretention gardens are used. Like a rain garden, these are gardens that use native soils and deep-rooted plants, but they also have an infiltration trench filled with a mix of compost and sand. Through the center of the trench runs a perforated pipe connected directly to the stormwater sewer. A valve at the end of the pipe controls the speed at which water can flow out of the garden. These gardens require an engineer or landscape architect to ensure that they are designed properly.

Bioswale at Fireworks Restaurant in Lincoln

Bioswales

The purpose of bioswales is to slow the flow of water and filter it. They do this by conveying water above ground from one point to another through plant material. Bioswales can be used in small and large areas, but at least a 1 percent slope is needed to move water. Typically bioswales are planted with deep-rooted native plants. Wide and shallow bioswales allow water to spread over a larger area. They don't necessarily have to "look" like a garden. Many times in parks or other public spaces they are less formally planted and maintained than most areas. Bioswales also can be used in combination with rain gardens or other green infrastructure features. For example, a bioswale may link several rain gardens together.

Water Fast Facts

Only about 1 percent of the Earth's water is available for human use since 97 percent is salty or undrinkable and another 2 percent is locked in glaciers.

Of assessed water bodies, about 44 percent of stream miles, 64 percent of lake acres and 30 percent of bay and estuarine square miles are not clean enough to support uses such as fishing and swimming.

Rainwater is dirty. It contains many pollutants: brake dust, heavy metals, sediments, oil/gas, animal droppings, chemicals, fertilizer, pesticides, trash, vegetation and bacteria such as E. coli.

Impervious surfaces in urban areas can generate five times more runoff than wooded areas the same size.

In a natural environment, 50 percent of the rainfall is absorbed in the ground, 40 percent is evapotranspired and 10 percent runs off. In urban areas with 75-100 percent impervious surfaces, 15 percent is absorbed, 30 percent is evapotranspired and 55 percent runs off.

Good Housekeeping Tips

- Redirect downspouts so they don't drain directly onto impermeable surfaces or directly into storm drains.
- Sweep driveways, streets and sidewalks after mowing the lawn, applying fertilizer or doing other landscape practices that leave debris behind.
- Don't wash cars on driveways or wash driveways with a hose.
- Don't dump anything down a storm drain. Only rainwater should go into storm sewers.
- Pick up pet waste on a timely basis.

Soil... Not Dirt

Kendall Weyers

Soil is not dirt. Dirt is the stuff you wash off your hands or sweep off the sidewalk, undesirable stuff to get rid of. Soil, on the other hand, is an ecosystem, a diverse and intricate mix of minerals, organic matter and a range of flora, fauna and fungi.

Although soil is possibly the most important factor in growing healthy landscape and food garden plants, it also may be the least appreciated and understood. Virtually impossible to observe, good soil is a highly functioning and incredibly dynamic ecosystem. According to the USDA Natural Resources Conservation Service, "soil is by far the most biologically diverse part of the earth."

The complex soil food web is versatile and adaptable. It includes microorganisms (bacteria, protozoa and fungi), earthworms, spiders, beetles, springtails, pillbugs, ants and other arthropods. That list might make your skin crawl, but all these creatures play crucial and interdependent roles toward the building up of healthy soil. Good soils provide ample amounts of available water, air and nutrients—essential to the growth of thriving, attractive and productive plants. Poor soils lack one or more of these essentials, making it challenging, if not impossible, to grow healthy plants.

What Healthy Soil Does

- Organic matter processing. Each organism listed above contributes to break down organic matter both on top of and within the soil, improving its physical and chemical makeup. The processing of organic residues into available and accessible nutrients, called nutrient cycling, is essential. Without it, life as we know it on Earth would not be possible.
- Symbiotic relationships. Some specialized bacteria and fungi form mutually beneficial relationships with plants. The ability of legumes to collect nitrogen from the air is made possible by bacteria called Rhizobia. Mycorrhizae are host-specific fungi that attach to roots and create extensive systems of filaments that act like an extension of the root system. This greatly increases the plant's ability to take up water and nutrients and its tolerance of environmental stress
- Water and air infiltration and storage. The movement of creatures through soil creates channels and space for air and water (both critical to plant health and survival) to move throughout the soil.
- Pest control. A biodiverse soil does a tremendous job of keeping a wide range of pest organisms in check. Keep this in mind before using pesticides, which reduce the number of beneficial organisms and not just the intended target pest.
- Soil stabilization. One product of the breaking down of organic matter is a highly stable material called humus. Humus binds soil particles together into aggregates or clumps, which improves soil structure and makes the soil more resistant to erosion. Humus also buffers the soil pH, helping keep it in a range ideal for plant growth
- Carbon storage. Humus, the end product of organic matter breakdown, is very effective at storing carbon. It is highly stable and can sequester carbon for decades.

If you are blessed with good soil, count your lucky stars and do all you can to keep it that way. If you are not so fortunate, there are a number of things you can do to improve the biodiversity of your soil and reap its many benefits. Even though their numbers may be low, the good news is that the necessary organisms are probably already present—or nearby and ready to move in. Their populations will increase rapidly with favorable conditions.

Ways to Improve Soil Fertility and Diversity

- Increase organic matter. Spading or tilling compost and/or plant residues into the soil is a great first step since organic matter is the key food in the soil food web. Organic matter also improves the structure and water-holding capacity of soil.
- Mulch with organic materials. Mulching is a way to add organic matter from the top down. As mulch breaks down, it filters into the soil. Mulch also helps moderate soil moisture and temperature and reduces compaction from foot traffic and heavy rain.
- Water properly. Soil organisms thrive and do their best work in damp, but not soggy, conditions. Too much water, such as from over-irrigating, is harmful to many beneficial organisms.
- Limit use of pesticides. If at all possible, let nature takes its course. As mentioned earlier, pesticide applications often have negative impacts on beneficial organisms and destroy the natural balance.
- Limit tillage. Excessive tilling can be devastating to beneficial fungal networks and soil structure.
- Avoid compaction. Compaction, whether from vehicles, mowers, people or the family pooch, limits root growth, increases runoff and reduces the ability of soil to transport essential air and water. It's especially important to stay off the soil when wet. Since correcting compacted soils is a very challenging multi-year process, avoiding compaction in the first place is the best strategy.
- Plant native prairie plants. Many native prairie plants have deep and extensive root systems. New roots grow each year, helping to break up tough soil. And old roots die off, providing organic matter and additional channels for air and water infiltration.

Soil really is a miracle of nature, a complex web of self-sustaining interaction that is definitely worth the time to nurture and appreciate. The rewards are beautiful, productive and resilient plants, as well as the satisfaction of knowing you are contributing to a healthier environment.

A Sedge for Every Garden

Christina Hoyt

Would you like to expand your plant palette? Here at the Nebraska Statewide Arboretum, we have become big fans of *Carex*, a genus often overlooked for our gardens. Sedges have beautiful, grass-like foliage that adds architectural interest, movement and fine texture to the garden, but they are not true grasses. You can distinguish *Carex* from grasses and rushes because their foliage is actually triangular rather than flat or round. They're incredibly cold hardy. Some are almost evergreen and others come up early, a perfect addition to drab spring gardens. *Carex* species are abundant in forests, wetlands and even prairies. For sun, shade, dry or wet, there is a species that will work.

Gardeners are often more familiar with the flashy Asian species, usually more available in nurseries, but there are more than 1,500 species of *Carex*, 590 of them native to the United States. Sedges are one of the best species to clean water and filter pollutants, so they are great additions to rain gardens. Their deep root systems also help improve the soil over time. The last few years the Arboretum has been trialing sedges in waterwise projects with bioswales, rain gardens and bioretention gardens. These gardens have moisture that fluctuates from very wet to very dry, and Carex have proven tough, adaptable and quick to establish.

Early in the spring, when warm season native grasses are slow to emerge, sedges shine with their glossy foliage, followed by attractive seedheads early in the season. As summer progresses, they tolerate the shade of large-growing grasses and perennials.

As always, check out a reputable local nursery first when looking for plants. Nurseries that specialize in native plants, locally or mail-order, will be the most likely to carry sedges.

Some of Our Favorite Sedges for Shade

Oak sedge, *Carex albicans*, has delicate, arching, semi-evergreen leaves and spreads slowly by rhizomes. Regionally native, often found growing around oak trees. Tolerant of dry shade.
H 12" x W 12"

Pennsylvania sedge, *Carex pensylvanica*, can take full to part shade, needs moisture and drainage and spreads slowly by rhizomes. H 8" x W 12"

Plaintainleaf sedge, *Carex plantaginea*, has wide, shiny, evergreen foliage that looks like seersucker. Prefers medium moisture. Regionally native.
H 24" x W 24"

Bristleleaf sedge, *Carex eburnuea*, has delicate, finely textured foliage that is bright green. An elegant plant that spreads slowly by rhizomes. Can take sun to shade, medium to dry moisture. Native to Nebraska. H 6-8"

Sprengle's sedge, *Carex sprengelii*, is a good groundcover for shaded areas. It performs best in medium moisture, but is drought-tolerant. H 24" x W 36"

Sedges for Part-sun to Sun in Moist Soil

Palm sedge, *Carex muskingumensis*, prefers moist to wet soils but has done well in dry soils. The attractive foliage is reminiscent of a palm. Native to the region. H 30" x W 30"
The cultivar 'Oehme' is variegated with green and yellow stripes; 'Little Midge' is a dwarf cultivar growing to 10 inches high; 'Wachtposten' is more upright and drought-tolerant; and 'Ice Fountains' is a green and white variegated form.

Fox sedge, *Carex vulpinoidea*, has narrow, glossy, grass-like leaves with seedheads that look like a foxtail. It has a beautiful, fountain-like form. Native across the U.S. H 24" x W 24"

Bottlebrush sedge, *Carex hystericina*, has coarse, grass-like foliage and seedheads that look like a nodding bottlebrush. Native across U.S. H 24" x W 24"

Gray sedge, *Carex grayi* (opposite), has coarse leaves and can handle medium to wet soil in partial shade. Good plant for low-lying areas of rain garden. Striking seedheads look like spiked clubs.
H 24" x W 24"

Longhair sedge, *Carex comosa*, is coarse-textured with bright green foliage. It prefers moist conditions and is perfect for low areas of rain gardens. H 12" x W 12"

Sedges for Sunny, Dry Spots

Shortbeak sedge or plains oval sedge, *Carex brevior*, has beautiful seedheads that look like oval spikes. It's native across the U.S. and is doing well in Scottsbluff rain gardens. H 12" x W 12"

Copper-shouldered oval sedge, *Carex bicknellii*, has fine foliage and copper-brown seedheads. Prefers dry to medium moisture; native to Nebraska. H 24" x W 36"

Waterwise Landscapes

Tom Bentley and Bryan Kinghorn, Kinghorn Gardens in Omaha

National Park Service Midwest Office
Riverfront Drive, Omaha

The landscape around the National Park Service facility is a wonderful example of waterwise plant usage. It is comprised entirely of Nebraska native or regionally adaptive turf (buffalograss), perennials, shrubs and trees. The site receives no irrigation and includes a vegetated stormwater-receiving basin within the parking area.

PLANTS: pitcher sage (*Salvia azurea*)
little bluestem (*Schizachyrium scoparium*)

Florence Streetscape
30th and Willit to Clay Streets, Omaha

This is one of Omaha's earliest urban curbside stormwater basins. Plant selections include Nebraska native and regionally adaptive waterwise plants that can endure periods of intermittent inundation as well as stretches of dry periods.

PLANTS: fox sedge (*Carex vulpinoidea*)
Shenandoah switchgrass (*Panicum virgatum* 'Shenandoah')
palm sedge (*Carex muskingumensis*)
miniature bull rush (*Typha Minima*)
Siberian and blue flag iris (*Iris siberica* and *versicolor*)
Fire Dance® redtwig dogwood

Shops at Aksarben
72nd and Pacific Streets, Omaha

This is a commercial parking lot application of waterwise planting.

PLANTS: prairie dropseed (*Sporobolus heterolepis*)
Shenandoah switchgrass (*Panicum virgatum* 'Shenandoah')
calamint (*Calamintha nepeta*)

Metro Community College Greenroof Shelter

Fort Omaha Campus Bioinfiltration Demonstration Garden, Omaha

This campus landscape provided a unique opportunity to use waterwise plants overhead. While there is a significant use of sedum cultivars in many greenroof installations, strides are being made to utilize native plant materials like grasses and sedges, which are accustomed to restrictive ecosystem conditions with shallow bedrock; sandy, quick-draining soils; and wetland or anaerobic soils.

PLANTS: The following plants were installed in 6 inches of lightweight growing media:
prairie dropseed (*Sporobolus heterolepis*)
blue grama (*Bouteloua gracilis*)
sideoats grama (*Bouteloua curtipendula*)
fox sedge (*Carex vulpinoidea*)
palm sedge (*Carex muskingumensis*)

Top photo shows the shelter, with the same plant materials in the demonstration garden as are planted in the greenroof. Photo opposite shows newly planted perennials peeking out from the roof.

The National Park Service landscape was designed and installed by Kinghorn Gardens.

Florence Streetscape was co-designed by Landscape Architect Tom Bentley.

Aksarben landscape was installed by Kinghorn Gardens.

Metro Community College Greenroof Shelter was constructed and planted by Kinghorn Gardens.

The Florence streetscape and Metro Community College Greenroof Shelter were part of the Waterwise Initiative funded by the Nebraska Environmental Trust, a beneficiary of the Nebraska Lottery.

Thoughts on Waterwise Landscapes

Tom Bentley, Kinghorn Gardens

"What is a waterwise plant? It's a plant that can withstand natural climatic occurrences, including both dry periods and intermittent periods of standing water—polar opposite conditions, but surviving both. Most plants that aren't native or regionally adapted can't survive a climate that is 'regularly irregular' to the extreme."

"While waterwise native and regionally adapted plants are durable in Nebraska, we need to recognize that we intentionally place them in very unstable sites—parking lot islands, urban streetscapes, etc. Landscape design and plant selection need to take into account conditions like heat, confinement and pollution. Native plants prefer a stable environment and need time to adjust to new sites."

"Waterwise/native vegetation should not be promoted as 'no maintenance.' Newly planted vegetation is by definition dramatically disturbed. These plants begin life in a greenhouse container, are regularly watered and cultivated in a prescribed potting soil, then thrust into an unfamiliar environment and expected to 'take it from there.' Successful plant establishment requires an initial period of care—including supplemental watering—as roots take hold and growth begins. This initial investment of time and resources after planting is crucial to the survival of any landscape."

"We are in and of the Great Plains and we encourage embracing and celebrating our own sense of place."

From Record Floods to Record Drought: What We're Learning

Although it's typically said as a joke, there is some truth in the old saying, "If you don't like the weather in Nebraska, just wait few minutes, it'll get worse." It's no secret to anyone living here that the Great Plains climate can be challenging. We get it all: scorching summers, bitterly cold winters, amazingly quick temperature fluctuations (especially spring and fall), strong winds, tornadoes, heavy rains, hail, blizzards and dust storms. Sometimes several in one day! Recent years have been especially challenging, with extreme floods in 2011 followed by one of the hottest and driest years on record in 2012. Some parts of the region have actually been stuck in a drought for most of the last decade. These fluctuations have been nothing if not informative. So what have we learned? Here are a few observations:

Justin Evertson
Nebraska Forest Service (NFS) in Lincoln

Photo–Rulo Bluffs woodlands

High quality, well-planted and well-cared-for trees are actually quite resilient to drought—especially our native species. Some marginal species struggled. I was a little surprised to see so much loss of white pine and Norway and blue spruce. But knowing that many evergreens come from either higher elevations or cooler latitudes, it makes sense that the blistering heat of 2012 caused problems. Trees that were compromised for various reasons including poor planting, poor root systems, insects and diseases, etc., were more prone to decline. Landscapes that had been babied with irrigation for many years, but then cut off in the worst of the heat and drought, seemed to struggle more than those that had been weaned from irrigation long ago.

I was actually surprised at how resilient many cool-season lawns seemed to be in eastern Nebraska. We've always heard that tall fescue can't go dormant, that it will die in summer if it gets too stressed. Well, 2013 revealed many tall fescue lawns that had survived and then greened up nicely by late spring. Some bluegrass lawns died out completely, as did some patches of buffalograss. It would appear that practicing tough love for lawns also helps in their drought-resilience. Those that are allowed to grow a little taller, develop deeper roots, aren't over-irrigated, are not monocultures and are in healthy soil are much more resilient. Conversely, lawns that were babied and shortly cropped stood no chance when water was shut off. And trees really struggled in such situations.

We can learn a lot from the native landscape. Native woodlands showed almost no stress. That certainly has something to do with shaded soil that is covered with moist, decomposing litter and shade-tolerant groundcovers. And although our prairies were stunted, they still grew and are obviously better able to ride out drought conditions than the shortly-cropped lawns we seem to covet so much.

Bruce Hoffman
Common Scents Nursery in McCook

Photo–Kentucky coffeetree in Alliance

We have been dry and hot for much of the last decade and we are always looking for rain. There is no sub-soil moisture. I have seen mature spruce trees (and other trees) die. Even our native buffalograss has died in some locations. Many people here don't seem to recognize just how much trouble we're in. I'm responsible for an extensive memorial tree planting on a tough site without water. The planting included various nut trees such as walnut, buckeye, bur oak, butternut and coffeetree. The plantings have endured many years of drought, no supplemental water from day one and, most recently, 17 minutes of soft-ball sized hail with 70 mph winds, not to mention having to re-leaf several times due to late freezes and other hail storms. Although many of the trees have struggled or died, many of the coffeetrees and bur oaks still look good. Why are we planting anything else out here?

The drought has been a time of learning for me as I have done more reading about scorch and its causes in the past year. I have come a long way from thinking everything is strictly environmental. In this climate, it's nearly impossible to sustain any significant plantings without irrigation. We now fully realize that we can't rely on Mother Nature to provide the water we need to maintain fully functional and visually appealing landscapes. Irrigation is a must, not only during establishment, but long after. That is how we at Common Scents approach landscape layouts. And, while I realize that drip irrigation does save much water, I still encourage people to water (more broadly across) the site if at all possible. I believe it is beneficial to create a more humid environment.

Dennis Adams
NFS in Lincoln

Photo–concolor fir

Trees (and other plants) need water.

- Native trees/plants are hardier than we think. That's why they're here.
- Introduced plants, particularly conifers like Norway spruce, Douglasfir and white pine, suffered more. However, I was impressed with the resilience of concolor fir.
- Some of the native trees like hackberry suffered more than I expected, probably because they are more acclimated to native forest situations than to yards.
- I didn't notice too much drought damage in natural woodlands, probably because of the better soil conditions, understory associates and groundcover.

Todd Faller
Faller Landscape & Nursery in York

Photo–Canaan fir

I thought more trees would show ill effects for a longer period in 2013, but was pleasantly surprised that they didn't. The worst thing I saw was the damage done to blue spruce and white pine. With blue spruce showing that level of stress, it makes one take a look at diversification of windbreak varieties even more. On the positive side, many Canaan and balsam fir in my pasture even came through in good shape. WOW! A Korean fir or two look to be dying but not those two varieties. I lose more Canaan in the landscape than in a forgotten pasture, apparently due to watering issues.

Sarah Browning
UNL Extension Educator in Lincoln

The damage to spruce was certainly an eye-opener! Most surprising of all was the loss of many windbreak trees in relatively undisturbed, good soil. I was also very surprised by the amount of damage to burning bush; I would have thought they were tough enough to tolerate 2012 conditions, but obviously not.

Amy Seiler
NFS in Scottsbluff/Gering

It's hard to measure what does well here in western Nebraska in drought years because so many landscapes are watered and over-watered. Even in 2012 our communities did not put water restrictions in place so no one turned off their water. Many spruce trees are really struggling—especially in windbreaks and where there is no supplemental moisture. But they are also struggling in overwatered landscapes. Also, many ponderosa and Austrian pine are showing considerable salt damage because there is no rain to help leach salts from irrigation water through the soil. This type of damage ONLY occurs on over-irrigated landscapes. In places where the pines depend only on rainfall we are not seeing damage to the needles in late winter and spring. I believe one of our biggest issues out here during the drought was that too many people damaged trees by over-watering their lawns.

Another thing I noticed for the first time this year was leaf scorch on linden and buckeye. We see some scorch on lindens every year but in 2012 and 2013 we had much more than usual, especially after that intense bit of heat we had in late August and September. Finally, our ash trees look absolutely HORRIBLE out here this year. I think they were damaged by our 4 degree temperatures the first part of April; then the heat kicked in and they just couldn't handle it. We have had trunk cracking on 30-year-old ash and entire limbs dying back. Laurie Stepanek and Rachel Allison concluded that many people are watering their yards to irrigate the turf but not watering enough to get down to the tree roots. Trees are actually drying out in irrigated yards. One couple was watering conservatively about 10-15 minutes twice a week. They thought that was okay because the turf looked great but the trees were in great distress and you could hardly get a screwdriver down into the ground.

Bob Henrickson
Nebraska Statewide Arboretum in Lincoln

Photo–sand lovegrass with perennials

I would like to believe that drought was the primary cause of death for most of the trees, shrubs and perennials that died recently, but I also wonder if poor siting or compacted, anaerobic soil conditions helped facilitate their demise. Some tree deaths may be due to poor planting practices and poor root systems. For trees to better tolerate drought, we need to establish procedures that result in a quality, well-structured root system with minimum root defects. To prepare our landscapes for future drought conditions, we may need to improve the soil structure and widen the planting zone by adding organic matter and topsoil prior to planting. Soil improvements may need to become part of the ongoing maintenance of the landscape.

Many of our native trees thrived during the drought, including most oaks and hickories. The trees I observe in our native woods are what I use as a barometer, and I can't think of one native that succumbed. That is based on walking the woods last fall after the drought and again this year.

Regarding shrubs, the drought reminded us that hydrangea, arborvitae and burning bush are a group of plants that will not survive extreme drought without supplemental irrigation. Beyond

that, there are many shrubs with extreme drought-tolerance (see list that follows). Finally, most native grasses and many introduced species came through fine and are proof that grasses should be prominent in every drought-tolerant landscape. The same can be said for many native prairie flowers and perennials. The drought facilitates damage from critters as well, but grasses are not bothered by deer, rabbits or grasshoppers.

From Record Floods continued on page 12

From Record Floods continued from page 11

Ryan Armbrust
Kansas Forest Service in Manhattan

I was initially concerned about some of our native woods, but they seem to have weathered the drought fairly well. Especially where the native plant community was fairly intact. Call it "tough love," but I appreciated how the drought winnowed out some of the poorly-adapted trees and shrubs from our landscapes. I'm looking at you, red maples! The silver lining is that perhaps we can look to more waterwise species in future plantings, which also will increase our community's plant diversity.

Favorite Drought-tolerant Plants

Kendall Weyers, NFS in Lincoln

Photo–sedum with grasses

Sedums (wide range of colors and textures and look good much of the year), Pawnee Buttes sandcherry and Hot Wings tatarian maple.

Sarah Browning, UNL Extension in Lincoln

Ornamental grasses, shrub roses and tough perennials like sedum, rudbeckia, etc.

Amy Seiler, NFS in Scottsbluff/Gering

Photo–gambel oak

Top performers for western Nebraska: ponderosa pine (no surprise), pinyon pine, bur oak, hackberry, lantana viburnum, rabbit brush, gambel oak (did not miss a beat), juniper, little bluestem, sandhills muhly grass (went CRAZY out by Alliance), catmint and prairie bee balm.

Bob Henrickson, Nebraska Statewide Arboretum in Lincoln

Photo–sargent viburnum

Trees include oaks, hickories, most of our natives and most deciduous species. Shrubs: siebold, sargent, blackhaw, rusty blackhaw and native viburnums. Grasses: prairie grasses especially, but many ornamental grasses as well. Perennials: bluestar, goldenrod, *Silphium*, leadplant, prairie clover, native purple coneflower, false indigo, blue flax, ironweed, clematis and primrose.

Ryan Armbrust, Kansas Forest Service in Manhattan

Photo–greenthreads

I was very impressed with Shantung maple, bur oak (of course!), shagbark hickory and chinkapin oak. One of the most impressive (and underplanted) perennials was greenthreads, which thrived like there was never a drought in the first place. The same can be said for Dallas Blues switchgrass and Fremont's evening primrose.

Justin Evertson, NFS in Lincoln

Trees and shrubs include bur, red and dwarf chinkapin oak, hackberry, American elm, buckeye, American hazelnut, blackhaw viburnum, snowberry, fragrant sumac and chokecherry. Herbaceous plants include just about any native grass (especially little bluestem!), poppy mallow, goldenrod, brown-eyed Susan, coneflower, butterfly milkweed, *Amsonia*, dwarf baptisia, false sunflower, dotted gayfeather, sedum, daylily, deadnettle and plumbago.

Lucinda Mays, Chadron State College

Here's my top drought survivors:

Black Hills spruce that are 75+ years old, self-mulched and close to irrigated lawns are in great shape.

Pinyon pines look great.

Bur oaks 10 years old, mulched and with drip irrigation, had no visible drought damage.

Apple Haralred, also mulched and close to irrigated lawn, had no visible drought damage.

Sandcherry (opposite) showed no damage.

Rabbitbrush thrived; a superior plant for northwest Nebraska.

Nearly Wild rose bloomed through drought from May into October with no die-back from previous year.

American bittersweet didn't seem to notice drought but fruited somewhat less in 2012, possibly from the heat.

Fringed sage filled out and bloomed well. They're easy to manage in cultivated soils if not too wet.

Brown-eyed Susan (opposite) has superior late summer color. We have an established self-sowing population under thin mulch with infrequent drip irrigation. It's probably the easiest and lowest maintenance *Rudbeckia*.

All warm-season bunch grasses did very well, whether in mulched beds or bare soils.

Rain Barrel Fast Facts

Why rain barrels?

- Gather water for use during dry spells.
- Reduce runoff and stormwater pollution.
- Rainwater is naturally soft and oxygenated, and it's free of chlorine, fluoride, salts and other minerals.
- Reduce water bills.

How much rain can they hold?

A 55-gallon rain barrel can be filled by just a half-inch of rain on a 160-square-foot roof. To increase capacity, multiple barrels may be necessary.

Requirements and recommendations:

- Sturdy enough to withstand pressure caused by the 50 or more gallons of water they may hold.
- Placed on a level, secure base since a typical rain barrel can weigh more than 500 pounds when full. Elevating them with blocks or bricks allows spigots to be placed closer to the bottom of the barrel so they're easier to drain.
- Screened for the safety of children or animals.
- Fitted with overflow ports or hoses to drain excess water away from buildings.

How much do they cost?

Prices vary enormously, from the minimal cost of a DIY model using scrap materials to large, custom-designed models that can cost more than $600.

Online Resources:

Many DIY guides to building your own rain barrel are available online. Other resources:
http://www.lincoln.ne.gov/city/pworks/watrshed/educate/barrel/
http://water.unl.edu/web/landscapewater/home
http://arboretum.unl.edu/nsa-publications

Photo courtesy Lincoln Public Works: www.lincoln.ne.gov/city/pworks/watrshed/educate/barrel/class/

"Rain is grace; rain is the sky descending to the earth; without rain, there would be no life."
John Updike

They Plant Themselves–Reseeding Annuals

Jan Riggenbach, author of *Your Midwest Garden: An Owner's Manual* from the University of Nebraska Press

The colorful flowers that always seem to attract the most attention from my garden visitors actually require little or no effort on my part. Mostly annuals plus a few biennials, these beauties reappear year after year.

Although unfamiliar to a lot of modern gardeners, many of these plants are actually heirloom plants. I love their charming, old-fashioned names such as love-lies-bleeding and love-in-a-mist. Garden mainstays in earlier times when everyone started their flower gardens from seeds, these plants fell into obscurity only after potted petunias and other inexpensive bedding plants became the norm. Tall annuals like kiss-me-over-the-garden-gate and woodland tobacco, which often make straggly bedding plants, all but disappeared from gardens.

Many gardeners began to think of annuals as plants that must be purchased and planted year after year at great cost and effort. No longer familiar with seeds, many began to fear them.

Although I wouldn't want to give up my perennials, small flowering shrubs and ornamental grasses, it is the self-seeding annuals and biennials that I depend on for summer-long color and unique flowers. Contrary to what many believe, they are actually the easiest and least expensive of all.

Unlike most perennials, which must be dug and divided regularly to keep them healthy, my self-seeding flowers renew themselves every year. The initial price for a packet of seeds is the only cost for years of enjoyment. As long as I allow some of the flowers to set seed every summer, volunteer seedlings reappear as if by magic the next spring. If some, such as annual poppies or sweet William, tend to get a little rambunctious in their self-seeding, I simply deadhead plants before the seeds mature.

Fortunately, seeds for many delightful self-seeding annuals and biennials are still available. The Fragrant Path (www.fragrantpathseeds.com) is a good mail-order source in Nebraska for many hard-to-find varieties.

Here are 10 of my favorite self-seeding flowers:

- Love-in-a-mist (*Nigella damascena*, opposite) is a charming heirloom that grows about 18 inches tall. Flowers of blue, pink or white nestle in feathery foliage, followed by inflated seed capsules that are attractive and long-lasting in dried arrangements.
- Kiss-me-over-the-garden-gate (*Persicaria orientalis*, also listed as *Polygonum orientale*) is a bold plant that grows about 5 feet tall, with large heart-shaped leaves and plentiful spikes covered with clusters of small pink flowers. Much to my surprise, volunteer seedlings from a plant with variegated leaves I was given a number of years ago continue to retain the variegation.
- Melampodium (*M. paludosum*) is a bushy plant with yellow flowers and clean-looking foliage. Descendants of bedding plants I bought 30 years ago, these plants grow much bigger than the originals, often standing 3-4 feet tall by the end of the summer. Unaffected by pests or diseases, they put out layer after layer of fresh flowers and leaves, always looking fresh and never requiring deadheading. I can always depend on them to perform well in baking sun and dry weather.

- Dahlberg daisy (*Thymophylla tenuiloba,* opposite) is a dainty little plant only about 6 inches tall, covered all summer with tiny yellow daisies. The fragrant, ferny leaves are an added delight. I enjoy letting plants volunteer throughout my vegetable garden, where they add a pretty touch without taking a lot of space.

- Standing cypress, also called Texas plume (*Ipomopsis rubra*, opposite), not only looks beautiful but also acts like a magnet for hummingbirds. Thick spikes of scarlet, tube-shaped flowers line up on stiff, unbranched columns 4-5 feet tall. A biennial, the plant grows as a low rosette of ferny foliage one year and blooms the next. For blooms every year, plant seed two years in a row to get the process started. Although two years is a long time to wait for the first flowers and the bloom season is much shorter than for annuals, the beauty is too good to miss.
- Globe amaranth (*Gomphrena globosa*) sports tightly-packed, ball-shaped clusters of flowers in pink, purple, red or white. The volunteers in my garden, which grow about 2 feet tall, are red-flowered descendants of a variety named 'Strawberry Fields'. Fresh or dried, the flowers are excellent in bouquets.
- Scarlet sage (*Salvia coccinea*) is a magnet for hummingbirds and butterflies all summer long. Spikes of pink or red flowers top the bushy plants, which stand about 3 feet in bloom.
- Tall vervain (*Verbena bonariensis*) would be a perennial in a bit warmer climate, but it doesn't matter that it behaves like an annual here. I always have plenty of volunteer plants blooming by the end of June in my garden. Rosy-purple flowers attract butterflies. Although topping out at a height of about 3 feet, the leafless stems of this narrow, see-through plant won't block the view of smaller plant behind.

Others to Try

False sunflower, *Heliopsis helianthoides*
Larkspur, *Delphinium grandiflorum*
Yellowdicks, *Helenium amarum*
Brown-eyed Susan, *Rudbeckia triloba*
Rocky Mountain columbine, *Aquilegia caerules*

Statewide Waterwise Efforts Enabled by Nebraska Environmental Trust

Christina Hoyt

Water, our most precious resource, is poorly managed in most communities. Nebraska ranks the fifth highest in the nation in community per/capita water consumption. Most of this water is used for landscape irrigation, a usage further increased by recent drought. Nebraska communities also are facing water quality issues—non-point source pollution, bank erosion and increased temperatures—caused by stormwater runoff.

Habitat is also critical. In the United States we now have 4 million miles of roads and 62 million acres in mowed grass. Cities and suburbs claim 54 percent of our land, with another 41 percent dedicated to agriculture, resulting in a huge loss in biodiversity. But this is a loss we can make up for by creating habitat for insects and birds in our own backyards and municipalities.

Nebraska Statewide Arboretum is addressing these problems through innovative initiatives aimed at enhancing green infrastructure in Nebraska communities. NSA's Waterwise Initiative, Trees For Nebraska Towns and Sustainable Schoolyard Initiative focus on water conservation and water quality landscapes, while providing habitat through use of native and regionally adapted plant materials.

Through the Waterwise Initiative, NSA is increasing public awareness of green infrastructure's many benefits and encouraging communities to adopt solutions wherever possible. We also want to empower Nebraska citizens, through outreach and demonstration projects, to make choices in their own landscapes on behalf of the environment. Projects completed in Omaha used cutting edge design principles which are now being adopted throughout the region, and shared with colleagues around the U.S. In Scottsbluff, a project that removed concrete to capture stormwater in parking lots has led to conversation, design and action in greening other areas of the downtown.

The Nebraska Environmental Trust has been critical to the Arboretum's success in implementing community landscape projects, giving more than $5 million toward the projects above and an older Green Space Initiative. Through these programs, 500 sustainable landscape projects have been implemented in more than 168 Nebraska communities—and we continue to seek project partners and allocate dollars.

These projects have encouraged and enabled Nebraska communities to use environmentally-sound landscape practices that conserve water, improve water quality, create habitat, improve air, save energy and restore community forests. The ultimate goal of these efforts is to change how we think about our landscapes—our yards, streets and parks—from an ornamental to an ecological view. The momentum is building, the body of research is growing and federal non-point source pollution regulations are helping the cause. The next step is to focus more on our community spaces as habitat, so there is still a lot to learn.

The Nebraska Environmental Trust

preserving NATURAL NEBRASKA™ for future generations

Tree-planting in Chadron, summer 2013

Parking lot bioswale in Scottsbluff

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Lots of Ways to Connect!

Visit us on the web at arboretum.unl.edu for plant and landscape recommendations and information, public gardens to visit and other events and resources for Great Plains gardeners. Like us on Facebook at www.facebook.com/NeArb, and see plant-related boards and pins at www.pinterest.com/nearboretum/.

For information on how to become an Arboretum member, look for the "membership" link at arboretum.unl.edu, call 402/472-2971 or email arboretum@unl.edu.

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Jacob North COMPANIES

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