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THE RETURN OF THE GARDEN

Our annual Eco-Landscaping issue looks at growing interest in lawn removal, natural stormwater retention and local food production. Join the garden resurgence, and grow new relationships with your clients.

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EDITOR'S NOTE

The Inside Scoop

By Matt Power
Editor-in-Chief

Search for Gardening Trends Unearths the Limitations of "Big Data"

Raw information produces barren fruit if not weighed in context.

AT TIMES, the skills of traditional journalism still prove their relevance. "Big Data," a new catchphrase in the business world, is one such instance. Without the journalist's ability to compare, contrast and understand statistical information, Big Data is just numbers—"full of sound and fury, signifying nothing."

While researching the scope of interest in eco-landscaping topics for this month's issue, I stumbled into a trove of trend data. An organization called Meetup (www.meetup.com) allows you to find and join cultural, social and business groups in communities around the world.

The data, divided by topic, tells us there are 653 gardening groups worldwide, comprising over 159,000 members, most of whom are located in the U.S. and the UK. No big surprise there. We have a lot better Internet access than all of Africa, and backyard vegetable gardening arguably got its start in England. But is this number significant at all?

There's the rub. Raw data is just that: raw. Is gardening on the rise in the U.S. or not? How do the numbers compare with Americans' many other hobbies and interests?

Here's how our staff tackles a question like that: We know that about the same number of *Day Trading* Meetup groups exist as *Gardening*. And the *Dungeons & Dragons* group is pushing 200,000 members.

But we don't know if *Gardening* is the right "keyword" used by consumers. So we look at other Meetup topics. The *Home and Garden* group rivals the *Gardening* group for total members. So does the *Organic Gardening* group and the *Permaculture* group. But how much overlap in membership is there?

That data's not available, so rather than report a "hunch" we can't confirm—that interest in gardening is on the rise—we look for other sources to triangulate. Is Amazon selling more books on gardening? Do Google trends indicate more searches for agricultural topics? Yes and yes. Gradually, we're able to support the decision to present you with our annual Eco-Landscaping issue. It's a "trend" we can substantiate, and one you can add to your toolbox for success.

There's a reason we cover the topics we do in *Green Builder*: It's because we still do the traditional hard work of professional journalists, chasing down what *really* matters to your clients—not because Big Data gives us all the answers. Enjoy this year's fact-packed Eco-Landscaping issue. We're confident it's a genuine trend, with genuine data to back it up. **GB**

If you're a builder, here's a marketing tip I discovered during my garden researching. Try going to this page: **http://www.meetup.com/topics** *and typing in "Buying a Home." You may find some very local leads looking for homes.*

IMAGE CREDIT: MEETUP.COM

So What? **Without journalistic context, raw data can be meaningless.**

Certified Product Choices for Builders and Architects Expand

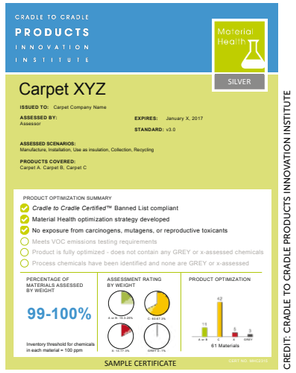
The number of Cradle to Cradle certified products in the built environment category grew by 36 percent last year.

ARCHITECTS AND DESIGNERS have even more options than ever to specify healthy, safe products, as the Cradle to Cradle Certified program continues to expand.

In 2015, the Cradle to Cradle Products Innovation Institute issued 71 new certifications under the Built Environment banner, bringing the total up to 268. These represent 1,630 product variations sold by 129 companies. The new certified products include EcoWorx tile carpets, W.F. Taylor's line of flooring adhesives, Steelcase's *B-Free* furniture and Saint-Gobain's *Gyproc* (Bronze).

In 2015, Cradle to Cradle also launched the Material Health certificate. This stand-alone certification option, which draws from the program's Material Health section, gives manufacturers a way to transparently communicate information about the chemicals present in their products and supply chains. There are four levels of certification. The most basic level requires that manufacturers list all of a product's "ingredients," and products can't contain any components found on C2C's "Banned List" of chemicals (above relevant thresholds).

Since May of 2015, Cradle to Cradle has issued 17 of these new stand-alone certificates. Examples of certified products include GAF's *EverGuard Extreme* TPO roofing membrane and Owens Corning's *PB Binder* unfaced ceiling board.



CREDIT: CRADLE TO CRADLE PRODUCTS INNOVATION INSTITUTE

Large-Scale 3-D Printing for Cheaper Wind Turbine Blades

The Department of Energy is working with several partners to manufacturer wind turbine blade molds with "additive technology."

THE METHODS CURRENTLY used to make utility-scale wind turbine blades are complex, energy-intensive and time-consuming. First, a "plug" must be created, which is then used to form a mold, out of which fiberglass blades can subsequently be created. These blades average over 150 feet in length, and the trend is toward even larger turbines.

The DOE's Oak Ridge National Laboratory has partnered with Cincinnati Incorporated to develop a large-scale 3-D printer which can create the molds directly, eliminating the "plug" step. This new additive manufacturing tool, called the Big Area Additive Manufacturing (BAAM) machine, is being tested at ORNL's Manufacturing Demonstration Facility. It is 500 to 1,000 times faster, and can print polymer components 10 times larger than today's industrial machines. This technology holds the potential for drastically cutting the cost of manufacturing turbine blades, and can potentially be scaled up to print even larger components.

CREDIT: ORNL

Micro Plant. The BAAM in action.

Source: DOE

CREDIT: TECHNICRAFT PRODUCT DESIGN, INC.

Tool Prevents Water Damage From Sprinklers

Shutgun can be used to shut off a fire sprinkler that has been accidentally triggered.

HIGH-PRESSURE WATER DISCHARGING from fire sprinklers can save a building from fire, but if accidentally triggered during a construction project, this water can cause thousands of dollars in damage. *Shutgun* is a simple tool designed to quickly shut off sprinkler heads. Developed by Technicraft Product Design, Inc., the small aluminum gun works on all types of sprinkler heads by simply placing it over the valve and squeezing the trigger. The tool remains in place until the system can be drained, but if a fire should occur while *Shutgun* is attached, the fusible link is designed to melt, so the sprinkler system can still activate.

In addition to the original *Shutgun*, the company offers a *Concealed Head* model and the *Sheared Head Shutgun*, which can be used on a sprinkler head that is broken or sheared off.

Shutgun can be ordered directly at **www.shutguntool.com**

Wanted: Comments on New Insulation Standard

Green Seal is seeking feedback on its new proposed standard for insulation materials.

NON-PROFIT GREEN SEAL is developing a standard to help purchasers easily identify environmentally preferable insulation products. GS-54 "establishes environmental, health and performance requirements for architectural insulation materials that provide thermal resistance and are used in buildings." These include all types of insulation, from batts and blankets to spray foam and rigid fiber; the scope includes products made from fiberglass, rock wool, and other mineral wools; polyurethane; polystyrene; polyisocyanurate; paper, wood, and other cellulose materials; denim and other fabrics; vermiculite; perlite; and animal wool.

The section on product-specific health and environmental requirements includes minimum thresholds for recycled content. It also sets limits for VOCs, based on the chamber testing method described in California Specification 01350.

Components present in either the insulation (0.1 percent or more by weight) or blowing agents (1.0 percent or more by weight) cannot be classified as known or probable carcinogens, reproductive toxins or other specific hazards. The standard also limits the "intentional introduction" of certain chemicals, including formaldehyde, Triclosan and phthalates.

To read the proposed standard and/or to comment, visit: **http://bit.ly/1oy9WBT.** *Comments will be accepted until March 31, 2016.*

CREDIT: COPWEB161

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GREEN BUILDER MAGAZINE
Po Box 97
Lake City, CO 81235
360-376-4702
F: 360-376-4703
www.greenbuildermedia.com

GREEN BUILDER MEDIA LEADERSHIP

Sara Gutterman CEO
sara.gutterman@greenbuildermedia.com
360-376-4702 x101

Ron Jones President
ron.jones@greenbuildermedia.com
360-376-4702 x102

Cati O'Keefe
Chief Development Officer / Editorial Director
cati.okeefe@greenbuildermedia.com
360-376-4702 x105

GREEN BUILDER MAGAZINE STAFF

EDITORIAL

Matt Power Editor-in-Chief
matt.power@greenbuildermedia.com
360-376-4702 x104

Juliet Grable Managing Editor
juliet.grable@greenbuildermedia.com
360-376-4702 x110

O'Brien Design Art Direction
john.obrien@greenbuildermedia.com
207-865-9908

Therese Workman Copy Editor
info@greenbuildermedia.com

PRODUCTION

Mary Kestner Production Manager
mary.kestner@greenbuildermedia.com
360-376-4702 x107

ADVERTISING SALES

Craig M. Coale Publisher
craig.coale@greenbuildermedia.com
360-376-4702 x103
or 513-344-9754

CIRCULATION
Mary Kestner
mary.kestner@greenbuildermedia.com
360-376-4702 x107

GREEN BUILDER MEDIA STAFF

GENERAL INFORMATION
admin@greenbuildermedia.com
360-376-4702 x109

FINANCE

Drew Lyon Accounting & Invoicing
drew.lyon@greenbuildermedia.com
303-501-3499
or 360-376-4702 x108

Josh Sroge CFO
josh.sroge@greenbuildermedia.com
720-334-4409

SPECIAL PROJECTS
Heather M. Wallace
Director VISION House® Series / Marketing & Social Media Manager
heather.wallace@greenbuildermedia.com
360-376-4702 x106

ISSN 1559-4971

Problems with your subscription?
For assistance, please contact
Mary Kestner, Project Coordinator
mary.kestner@greenbuildermedia.com
360-376-4702 x107

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MISSION STATEMENT: "Our mission is to effect meaningful, positive change for a better world. As advocates for sustainability, we provide mind-expanding information that catalyzes and inspires commitment to sustainable living."

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HERE'S A SAMPLE OF WHAT'S INSIDE:

"Mineral amendments include perlite, hadite and pumice. These commonly used minerals help create large pores in the soil through which both air and water can move; they are also sterile and dimensionally and chemically stable."
(p.35)

ON THE COVER
THE RETURN OF THE GARDEN
Artist: Liza Kelley

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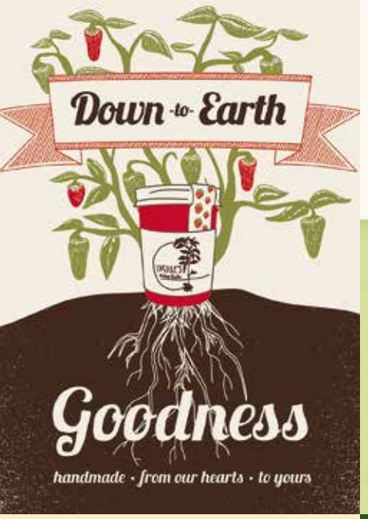
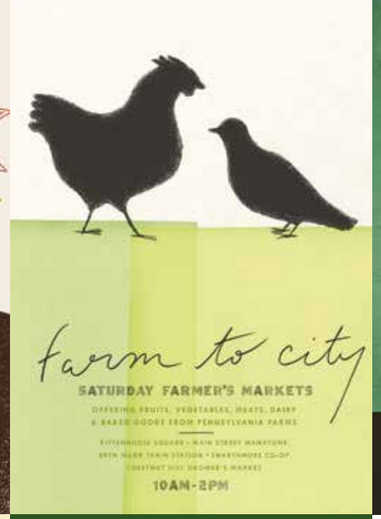
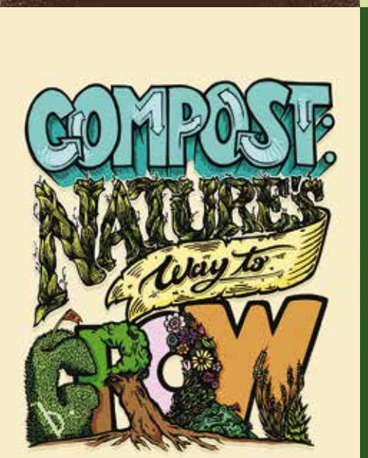
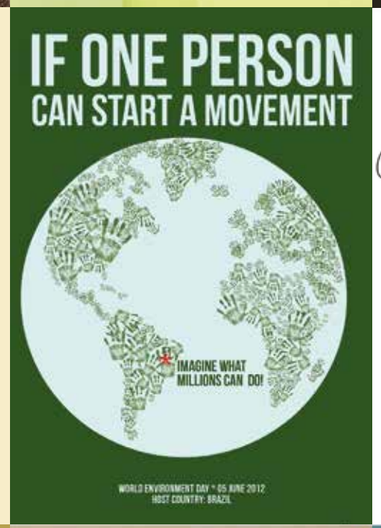
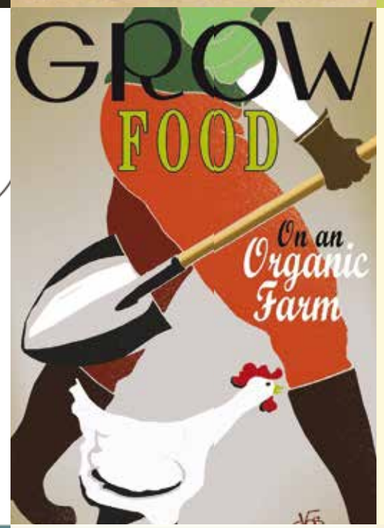
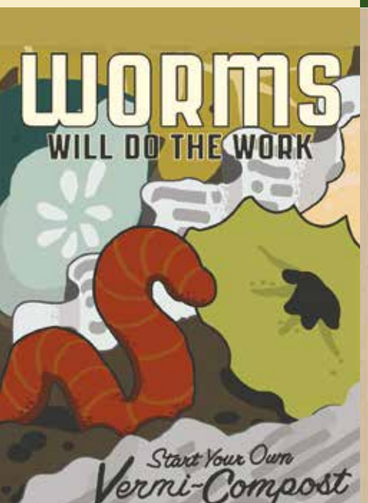


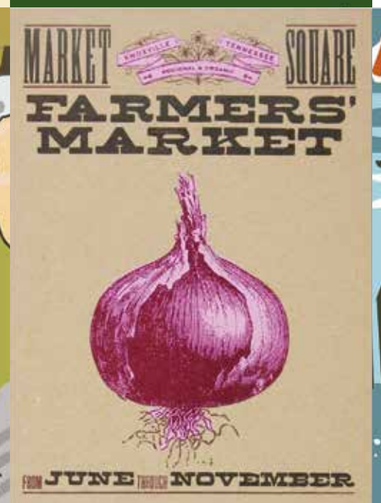


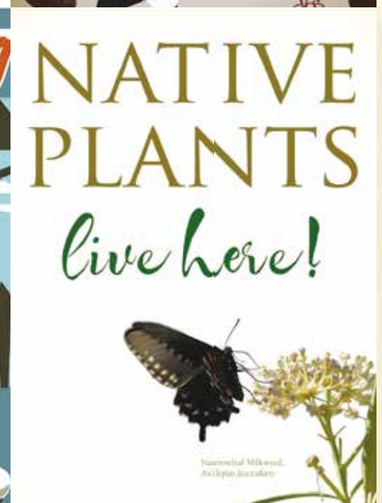












GARDENS: Fertile Ground for Loyal Customers

GREEN BUILDER'S ANNUAL Eco-Landscaping Guide

Climate change is forcing us to rethink the role of landscaping—and how it can help our homes become more resilient.

LANDSCAPING SHOULDN'T BE an afterthought. The plants, shrubs and trees that surround your projects could make the difference between whether a home can guard itself against wildfire, or whether it will be consumed by flames. Whether it will contribute to stormwater pollution, or whether it will help replenish groundwater. Whether it will poison bees and other pollinators, or whether it will serve as a haven for wildlife.

The features in our Eco-Landscaping issue will help you design sustainable landscapes that complement your sustainable homes.

Suburban Makeover

An inspiring project outside of Portland, Oregon, illustrates the potential for transforming suburban lawns into biodiverse sustainable landscapes.

BY JULIET GRABLE

PHOTO CREDIT: ETHAN TIMM, THE FIGURE GROUND STUDIO

ACCORDING TO A RECENT STUDY conducted for NASA, lawns take up more surface area than any irrigated crop. To keep them the way we like them—manicured and green—the nation's 32 million acres of lawn require lots of coddling in the form of irrigation water, fertilizers and pesticides.

But attitudes toward that verdant, uniform swath of green are starting to change, thanks to heightened interest in growing food and growing awareness of the importance of creating "backyard habitat" for pollinators, birds and other creatures, along with concerns about the rising cost (and availability) of water.

A case study in the suburbs of Portland, Oregon, shows the potential for suburban yards everywhere. This ¾-acre site, which had been previously dominated by large expanses of lawn and non-native ornamental plants, has been completely transformed into a dynamic landscape that not only helps to feed the homeowner's family, but also provides habitat for birds, bees, insects, butterflies and other pollinators.

The site had its challenges, including a fairly steep grade and a sinkhole that contained debris from an old chimney. The front of the house was exposed to the street, where construction on a new development was about to begin. There were a few existing trees, but most of the planted area was lawn and non-native ornamentals.

The Figure Ground Studio worked in collaboration with Fiddlehead LLC and clients Mark and Jeanette Swafford to turn this humdrum suburban landscape into an Audubon-Certified Backyard Habitat. Pete Wilson's stonework helps tie the many elements of the landscape together.

The transformed landscape includes edible gardens, meandering paths, a firepit, a children's garden, a small orchard and a rain garden for treating stormwater. It also includes whimsical touches, such as a ring of boulders for children's play, and a "moon garden" with gray-leaved and white-flowered plants that glow in the moonlight.

On the following pages, we'll break down the elements of the Swaffords' makeover. Most of these solutions can be implemented on any scale, so you'll be sure to find strategies for your next project.

CREDIT: JUSTIN JAMES MUIR

Complements. Stone and vegetation work together to create a landscape that is both stimulating and calm. Over 1,000 plants were planted to replace lawn areas.

Transformation. An exposed front lawn has been reimagined with a curving path flanked by a diversity of native and native-adapted plants, which help create a sense of privacy and provide food for pollinators. The birch trees in the background were retained.

CREDIT: ETHAN TIMM, THE FIGURE GROUND STUDIO

CREDIT: JUSTIN JAMES MUIR

A Permaculture Approach

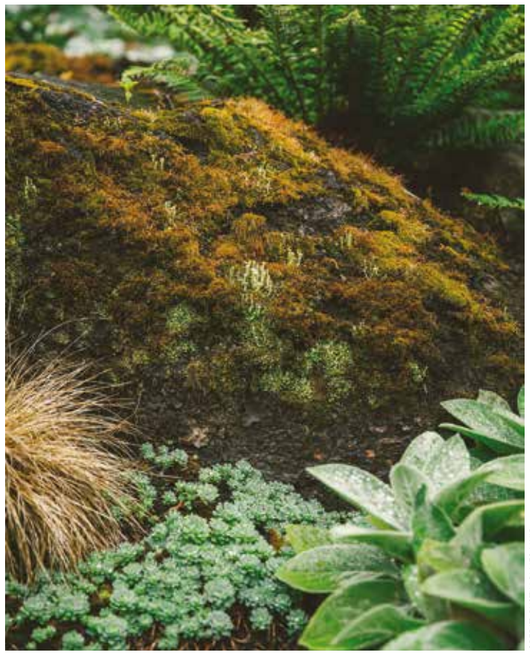
Mimicking natural ecosystems can help create low-maintenance landscapes that achieve several goals at once.

THE SWAFFORD PROJECT is a good example of permaculture design principles in action.

"We really tried to 'stack' functions, so features perform more than one task," says Erin Muir, principal at The Figure Ground Studio.

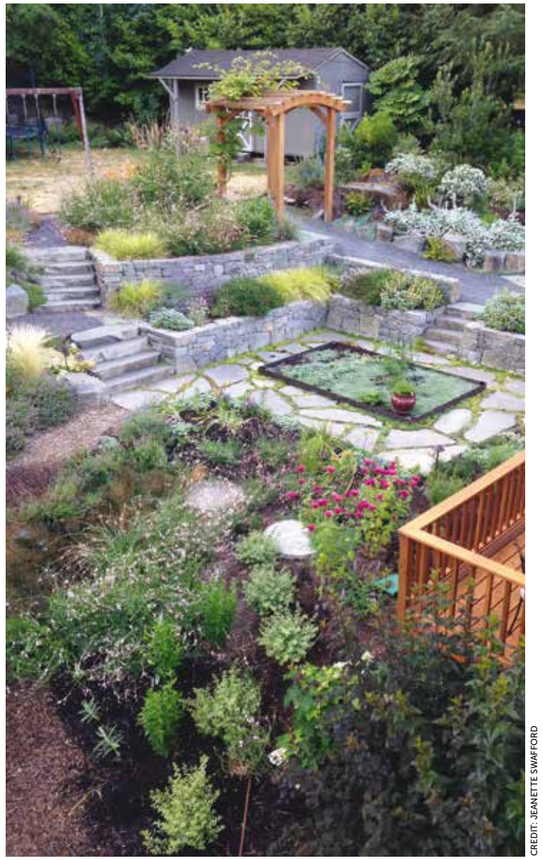
Permaculture is the practice of emulating natural ecosystems by closely observing them. Permaculture-inspired designs are naturally self-sustaining. They don't require outside inputs of fertilizers, pesticides, or even supplemental irrigation. Nothing is wasted; in fact, waste is seen as a resource.

Here are some of the permaculture principles implemented in the Swafford project, which can be easily incorporated into any landscaping project:



CREDIT: JUSTIN JAMES MUIR

Creating Niches. A diversity of plants creates structure, texture and color to the landscape. It also provides more opportunities for beneficial insects, birds and other wildlife.



CREDIT: JEANETTE SWAFFORD

In the Zone. The terraced gardens, created by layered stone walls, can be used to grow vegetables and herbs close to the kitchen door. Muir grouped planting with similar watering needs together.

Stacking functions. This principle recognizes that natural features in a landscape rarely do just one thing. For example, the stonework planters in the Swafford landscape serve as containers for plants, but the terraces also interrupt and slow stormwater flows. Stonemason Pete Wilson also designed in places for people to sit. Similarly, flowering plants help stabilize slopes, mitigate rainwater, produce food for people, attract and feed native and naturalized pollinators and other wildlife, and add beauty.

Zoning. If the home is the center of the design, zones are the concentric circles that radiate outward from that center. This practical principle recognizes an essential fact of human nature: We're much more likely to take care of something if it's close by. Therefore, vegetable and herb gardens that may be used frequently (and that may require daily care) are located as close to the house as possible. Lower-maintenance perennials are located farther away.

Double Duty. Opportunities for quiet contemplation are built into the landscape; for example, the stone seating at the edge of the "moon garden."

CREDIT: JUSTIN JAMES MUIR

Design for Diversity. Following Muir's planting design, Fiddlehead LLC installed over 1,000 plants to replace the lawn. The Swafford site plan shows very little empty space. The differing heights of plants provide structure in the landscape and offer more opportunities for birds and other creatures to take cover and build nests. Diversity and redundancy ensure that if one plant fails, something else will likely take its place, and also ward against the takeover by a single invasive species.

"When you have a mature ecosystem that includes trees, which creates shade, it naturally prevents weeds," says Dave Barmon, co-owner of Fiddlehead LLC.

Pollinator Plant. *Monarda* species, commonly known as beebalm, are easy-to-grow perennials savored by hummingbirds, bees and butterflies. Monarda Raspberry Wine, pictured here, is native to Eastern North America but grows well in many regions.

CREDIT: JUSTIN JAMES MUIR

Going Native (and Naturalized)

Plants, shrubs and trees adapted to the region are more likely to thrive without outside inputs, including irrigation water.

FROM THE BEGINNING, the Swaffords conceived of their project as one with ecological landscaping goals. Midway through they decided these goals dovetailed with those promoted in their region's Backyard Habitat Program. This voluntary certification program lays out specific guidelines for removing invasive species, planting natives, reducing pesticide use and creating wildlife habitat (see Page 23).

Native and native-adapted plants generally require little maintenance once established. Natives resist diseases and are more tolerant of droughts, storms and temperature swings. These plants evolved with specific soil conditions, including pH, bacteria and fungi associations, and beneficial insects; planting them creates a self-sustaining positive feedback loop. Native plants can even be used to remove contaminants from the soil, a process known as phytoremediation.

It's still important to choose favorable locations for specific plants; for example, ferns are more shade tolerant. And the soil should be conditioned, if necessary.

There's another important reason to plant natives. According to the National Park Service, 25 percent of North American native plants are at risk of extinction. Planting natives adds to the nation's "genetic database" and helps creates patches of habitat for wildlife.

Good Medicine. A perennial "stroll garden" was planted with both medicinal plants and those that attract and nourish birds and bees.

CREDIT: JUSTIN JAMES MUIR

LAWNS VS. NATIVE PLANTS

CREDIT: JUSTIN JAMES MUIR

Lawns	Native Plants
Usually rely on chemical fertilizers and pesticides	Little to no amendments required
Water intensive	Little to no supplemental irrigation required
Monoculture doesn't support wildlife	Diversity of plants, shrubs and trees provides food, shelter and nesting habitat for wildlife
Grass isn't edible	A native landscape can include food plants and trees
Maintenance requires fossil fuels	Minimal maintenance beyond pruning and weeding; (lawnmowers, edgers, etc.) once established, maintenance decreases
Lawns sequester carbon, but the amount must be measured against emissions related to pesticide and fertilizer use and maintenance	Greater potential for carbon capture
Some potential for stormwater infiltration	Greater potential for stormwater infiltration

Creating Habitat

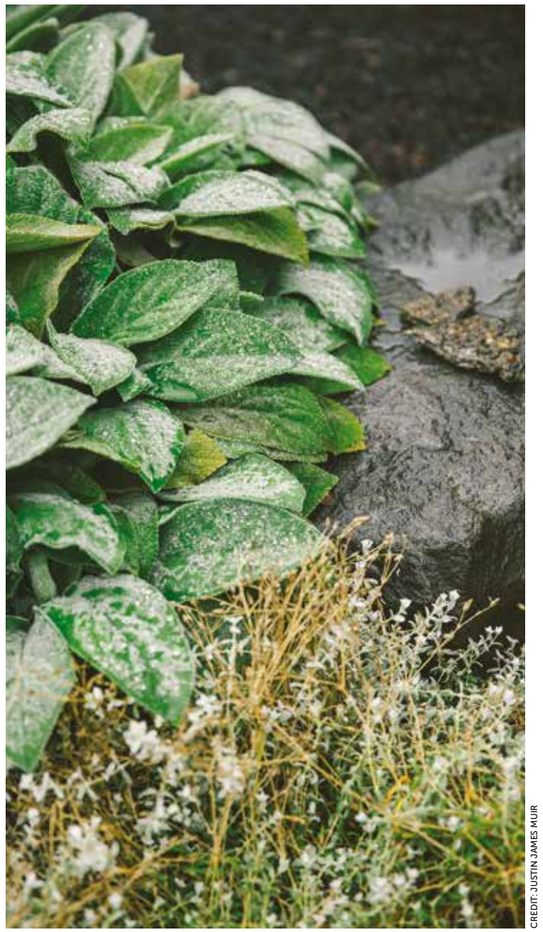
When enhancing a landscape for wildlife, make sure the design includes all of the elements of good habitat.

BIRDS, BEES, INSECTS and other wildlife need more than food to thrive. High-quality habitat includes food, water, cover and places for nesting and raising young. To support pollinators, this means making sure there are food plants throughout the year.

Wildlife water features in the Swaffords' garden include strategically placed concave boulders. The depressions catch water, which is then available for birds, butterflies and bees. It's also important to provide food for insects in different stages—for example, host plants for caterpillars as well as nectar plants for butterflies. In the Swafford project, these caterpillar-friendly plants include milkweed (see Sidebar), elderberry and native rhododendrons.

The different layers—tree, shrub and groundcover—create structure in the landscape that supports wildlife. "We also left dead snags and logs, which provide habitat," says Muir.

Leaving slightly "wild" edges benefits wildlife, but you can also enhance the landscape with nest boxes for birds, bats and insects.



CREDIT: JUSTIN JAMES MUIR

Water Feature. **Depressions in the stones collect water, which can attract birds and butterflies.**

CREDIT: FRITZ FLOHR REYNOLDS

Milkweed for Monarchs

By now, many people are familiar with the plight of the beautiful monarch butterfly, which makes impressive migrations of up to 3,000 miles. Intensified agriculture, which often involves the loss of habitat at the edges of fields, along with increased herbicide use and mowing along roadsides has decimated milkweed, the primary food plant of monarch caterpillars. Planting milkweed is the best thing you can do to support the monarch. However, there are many different kinds of milkweed, and it's important to plant species native to your region. For more specific recommendations, visit the Xerces Society's Project Milkweed: **www.xerces.org/milkweed**

CERTIFIED FOR WILDLIFE

THE NATIONAL WILDLIFE FEDERATION (NWF) and National Audubon Society offer programs through which can certify your property, large or small, as wildlife habitat. The NWF Garden for Wildlife Program (formerly called the Backyard Habitat Program) requires the property owner to evaluate his or her own property. Once you fill out the required forms and pay a fee, you receive your certificate and a sign for your yard. The Audubon program is administered by various regional chapters, sometimes in conjunction with other partners. Each one is a little different; for example, the Swaffords participated in the Certified Backyard Habitat Program in the Portland, Oregon, area. A collaborative effort between the Audubon Society of Portland and the Columbia Land Trust, the program has five elements: invasive weed removal, native plants, pesticide reduction, stormwater management and wildlife stewardship. A qualified technician evaluates the property, helping identify invasive weeds and making recommendations that are right for the specific property and fit with other landscaping goals.

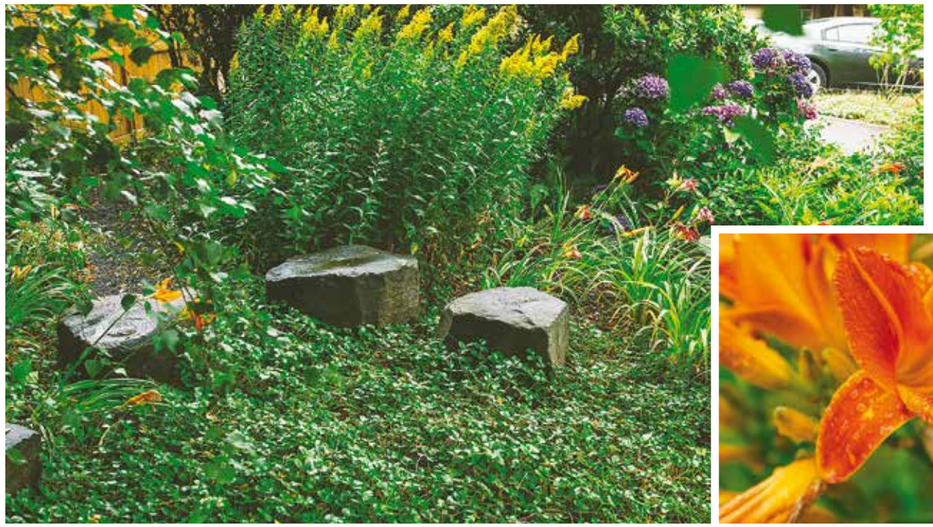
CREDIT: NWF

CREDIT: AUDUBON SOCIETY OF PORTLAND

Why certify? Enrollment in programs can potentially help researchers track their impact on certain species, such as monarch butterflies. The signs can generate interest from neighbors, who might be inspired to create habitat in their yards, too. In the case of the NWF program, proceeds go toward increasing declining habitat for bees, birds and wildlife.

RESOURCES

Audubon Programs: Contact your nearest regional chapter, NWF Certified Wildlife Habitat Program: **http://bit.ly/1KlewHw**



Wildlife Welcome. **The boulder ring, conceived as a play area for the Swaffords' children, is surrounded by pollinator plants, such as daylilies.**

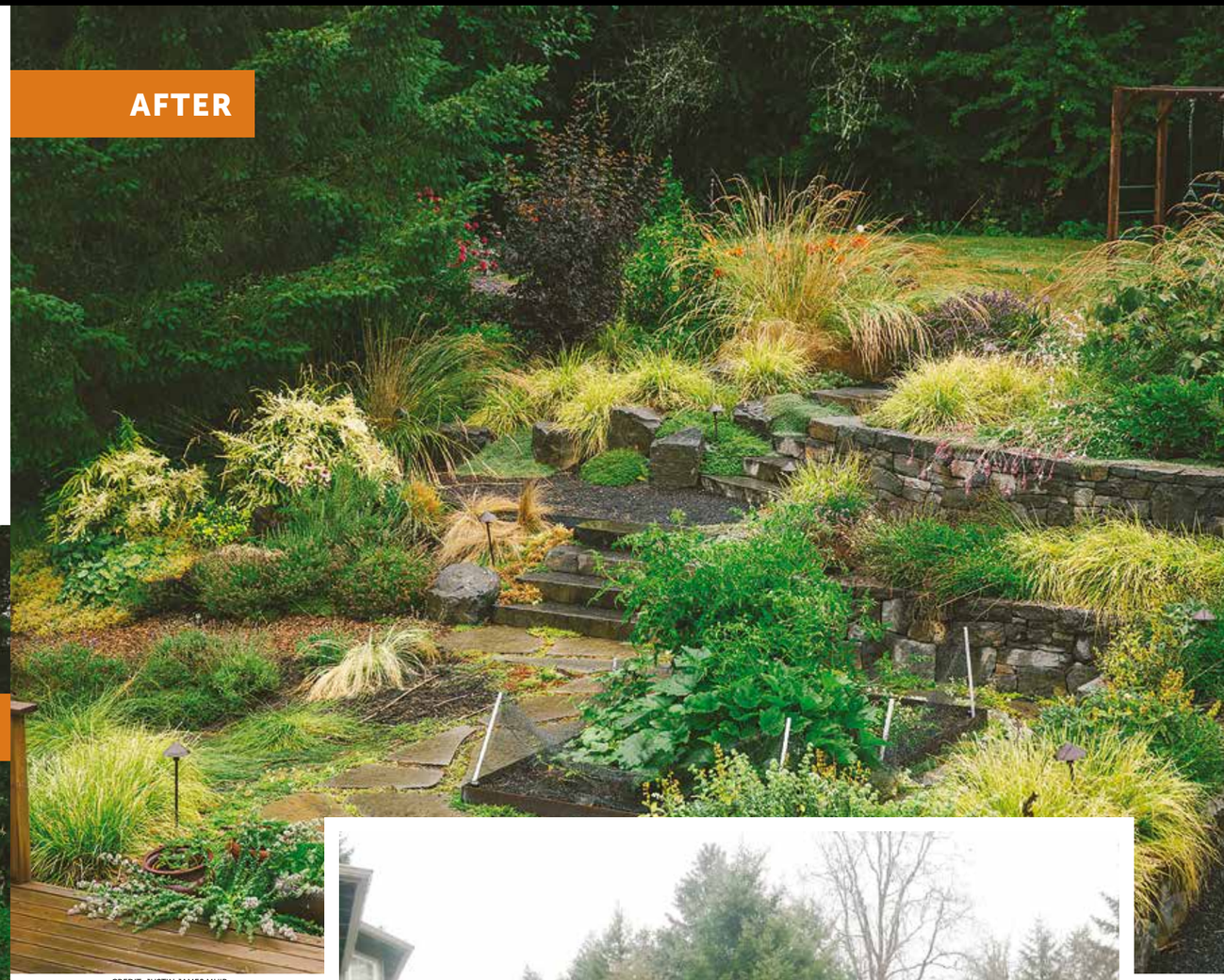
CREDIT FOR BOTH: JUSTIN JAMES MUIR

BEFORE

Making the Grade. A wide path has been narrowed and a steep grade mitigated by stone planters. The new landscape creates several new zones, including a firepit surrounded by a "moon garden."

CREDIT: ETHAN TIMM, THE FIGURE GROUND STUDIO

AFTER



CREDIT: JUSTIN JAMES MUIR

AFTER

CREDIT: JUSTIN JAMES MUIR

Design Goals. Terracing makes the landscape more walkable and helps slow the flow of stormwater. Vegetable and herb gardens are located conveniently close to the house.

BEFORE

CREDIT: ETHAN TIMM, THE FIGURE GROUND STUDIO

Working with Water

Several strategies work together to slow the flow in this suburban landscape.

STORMWATER MANAGEMENT WAS an important goal for the Swaffords' steep site.

"We tried to slow the flow in a couple of ways," says Muir. The strategies include capturing and directing stormwater, infiltration features and pervious hardscaping, which work together to ensure stormwater is treated by plants and soil (and recharges groundwater) rather than carrying sediment and pollutants to the creek that flows to the northwest of the property.

Slough Sedge (*Carex obnupta*)—a clumping grass-like native that can handle having "wet feet"—was planted along the porch to intercept overland flow. Simply replacing the large swaths of lawn with a mixture of plants of varying heights helped intercept water and improves infiltration. The stepped gardens interrupt the flow of stormwater, while making the site more walkable.

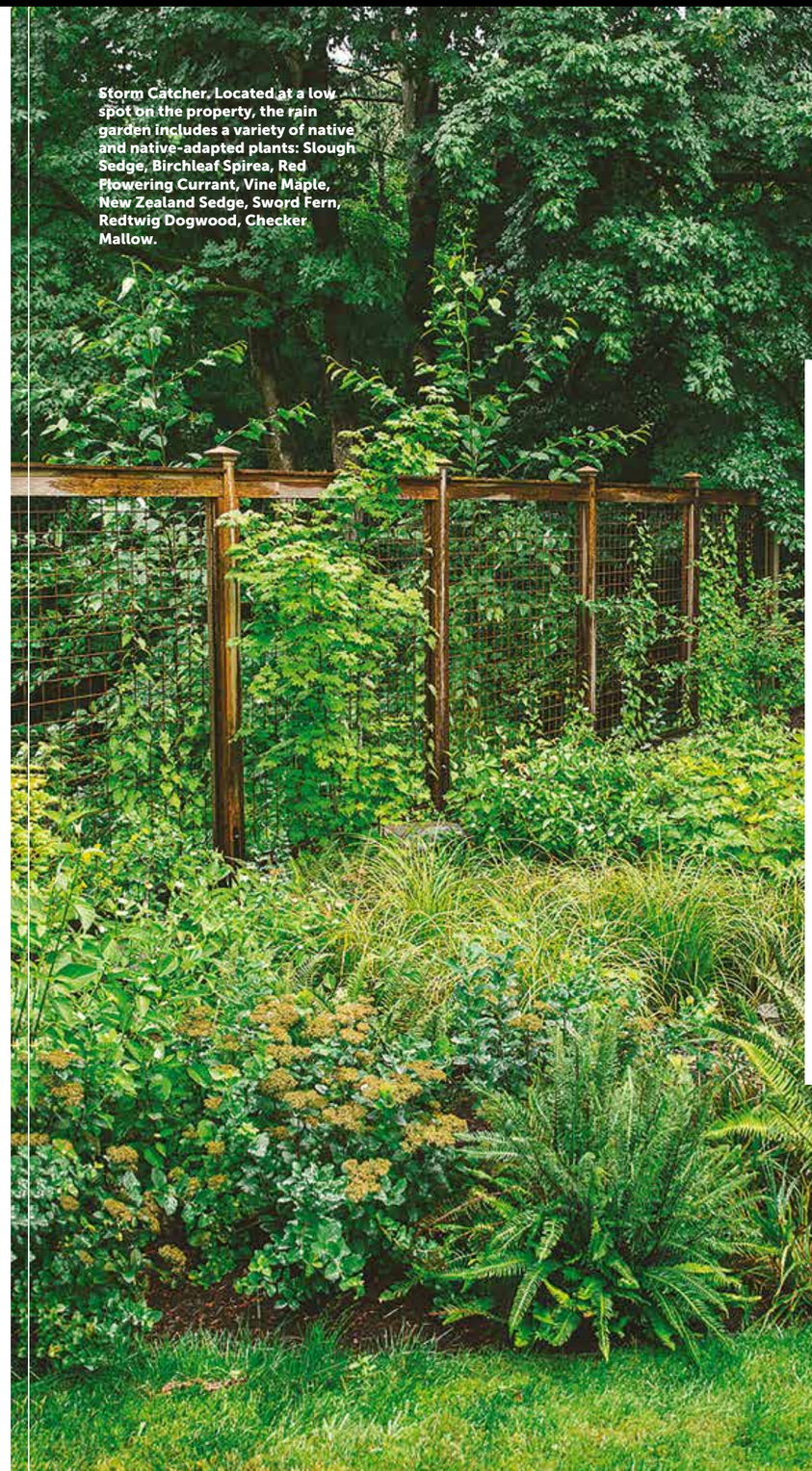
CREDIT: JUSTIN JAMES MUIR

Edgy Strategy. This "butterfly border" was planted thickly, creating a break for run-off between the lawn and children's play area.

CREDIT: JUSTIN JAMES MUIR

Pervious Pathways. Much of the hardscaping includes wider joints which allow stormwater to infiltrate.

A rain garden serves to actively treat stormwater. Water is directed from the home's roof to a naturally low spot in the orchard; from there it is piped underground to the rain garden. The rain garden includes a mix of species; river rock helps filter out sediment and adds texture.



Storm Catcher. Located at a low spot on the property, the rain garden includes a variety of native and native-adapted plants: Slough Sedge, Birchleaf Spirea, Red Flowering Currant, Vine Maple, New Zealand Sedge, Sword Fern, Redtwig Dogwood, Checker Mallow.

CREDIT: JUSTIN JAMES MUIR

Good Match. The small home orchard is a manageable size and is stocked with easy-to-grow varieties. These include Prolific Paw Paw, Paw Paw NC-1, Early Fuyu Persimmon, Desert King Fig, Spartan Apple, Spitzenberg Apple as well as Amity Raspberries, Jewel Blackcap Raspberries

CREDIT: JUSTIN JAMES MUIR

Food for People

Food-growing can be easily integrated into suburban and urban landscapes.

THE SWAFFORDS' LANDSCAPE design incorporates several opportunities for growing food. The home orchard replaced a sloping lawn that was hard to traverse. It includes figs, apples, persimmon and pawpaw, a North American native that produces oblong yellow fruit that tastes a little bit like mango crossed with banana. Some older fruit trees, including an apple and a plum, were retained. Blueberry bushes and raspberries round out the orchard.

"Because it was a sloped site, we seeded a native plant mix under the orchard," says Muir. These plants helped stabilize the soil and fix nitrogen. Today, a path winds through the orchard to allow for ease of plant care, harvest and enjoyment.

"Food security is important, but people should grow food because they enjoy it," says Dave Barmon, co-owner of Fiddlehead LLC.

The vegetable and food gardens are strategically located close to the house. A central vegetable plot serves as a flexible space, depending on the family's available time for gardening. One year, it was planted with a variety of veggies; the next year, it was planted with a cover of mint. GB

CREDIT: JUSTIN JAMES MUIR

Planting for Success. Three varieties of mid- and late-fruiting blueberry were planted in the orchard. Blueberries require slightly acidic soils.

CREDIT: ANDREW DUNN

Tips for Home Orchards

VISIONS OF BASKETS full of fruit often compel homeowners to buy inexpensive bare-root fruit trees during the first sunny days of early spring. But it's far better to proceed with caution. Share these tips with your clients to help them design a home orchard that's a good match for their skills and, more importantly, their time and energy.

Plant for success. Research what varieties are commercially grown in the area, and match varieties for the region. Peaches are a good choice for central Texas, not for the Pacific Northwest coast.

Choose easy varieties. Species that produce well with little maintenance include common medlar (a bushy tree that produces an apple-like fruit), Asian persimmons, pawpaw, figs, cherries and some citrus varieties. Raspberries and blackberries are fairly easy to grow; blueberries require more care.

Keep it close. As with vegetable and herb gardens, the closer your orchard is to your house, the likelier you are to take care of it.

Be honest with yourself. Planting and even growing the trees is the easy part. When fruit is ready to harvest, will you have time to harvest and process it?

Prune faithfully. Maintain a strong central leader and remove water spouts and suckers each year. In general, semi-dwarf fruit trees are a good choice for their manageable size.

Maintain your orchard. This includes picking up ripe fruit that has fallen. If left on the ground, it can be a vector for diseases.

Keep records. You might think you'll remember what varieties you've planted, but years down the road, you will be grateful to have a record of what worked and what didn't.

Source: Fiddlehead LLC

CREDIT: JUSTIN JAMES MUIR

Fruit Stand. Food-growing plants needn't be confined to areas designated as such; for example, the arbor structure supports a vining kiwi.

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Up to the Challenge

Several site challenges can compromise the effectiveness of stormwater infrastructure. Here are strategies for overcoming them.

REPRINTED IN PART FROM EPA PUBLICATIONS, EDITED BY JULIET GRABLE

Flexible Features. Swales and rain gardens can be adapted and sized even for tight urban lots.

CREDIT: CENTER FOR NEIGHBORHOOD TECHNOLOGY

LET'S SAY YOU WANT TO DESIGN a rain garden, but the heavy clay soil won't allow water to infiltrate effectively. Or you want to direct roof runoff into a swale, but you're dealing with a tiny lot.

"Green infrastructure" refers to the host of techniques and strategies that slow stormwater runoff, clean and filter stormwater and enhance groundwater recharge. These include rain gardens, bioswales, permeable pavement, "green" parking areas, trees and disconnected downspouts. Designers must always choose from this menu of practices, selecting those best suited to the site. However, sometimes restrictive site conditions can be addressed—and the options widened. Here are the most common issues, along with the solutions that will help you design around them.

1. SLOW SOILS

Soils that are dominated by clay and/or glacial till often have low infiltration rates, and stormwater may run off before it can be captured on the site. But it is still possible to design infiltration-based stormwater controls, such as rain gardens and swales, for sites with these soils. Take these steps to ensure your plan succeeds:

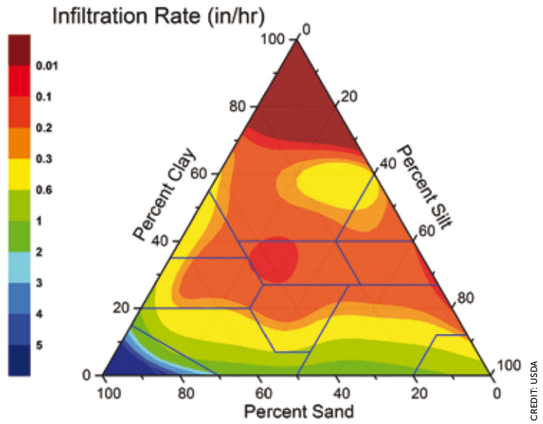
Measure infiltration rates. This should be done before designing stormwater controls. A generally accepted guideline is that the infiltration rate of native soils beneath swales and rain gardens should be greater than 0.25 to 0.5 inches/hour.

Amend soils. Adding compost or other organic matter can increase soil infiltration rates, while improving the soil's fertility and its ability to remove pollutants (see Sidebar).

Go deep. Enhance soil infiltration rates by planting deep-rooted vegetation. The roots create small conduits for water to infiltrate and increase biological activity in the soil. The U.S. Geologic Survey found that the median infiltration rate of a clay soil planted with prairie species was more than three times the rate of a clay soil planted in turf (0.88 inches/hour compared to 0.28 inches/hour).

CREDIT: U.S. BOTANIC GARDEN

Below the Surface. The roots of native prairie plants penetrate five to 15 feet into the soil. In contrast, shallow-rooted turfgrasses don't penetrate beyond a few inches.



CREDIT: USDA

Tough Soils. As the diagram shows, the higher the percentage of clay, the slower the infiltration rate.

Expand storage. Including a larger storage layer with an underdrain can significantly slow peak flows and increase infiltration, protecting stream banks and potentially reducing combined sewer overflows.

Use alternative practices. For sites for which mitigating clay soils is too difficult or expensive, choose features that do not require infiltration. These include rainwater harvesting, green roofs and vegetated swales.

2. POOR URBAN SOILS

It's especially important to manage stormwater on urban lots, since urban areas are often dominated by impervious surfaces. But the soils on these lots are often severely compacted, lack sufficient organic matter and/or contain construction debris. (This is, of course, also a problem if you want to incorporate other types of landscaping and/or grow food.) Fortunately, there are a number of methods for transforming these soils.

Before doing anything, the soil should be evaluated for its structure, percentage of organic matter and possible presence of contaminants.

Physical reconditioning. These methods physically change the characteristics of the soil to improve its structure.

Raking can remove construction debris, stones, loose root pieces and other objects as small as ¾". The jobs can be done by hand if the area is small; otherwise a landscape rake and a tractor can make quick work of it.

Tilling requires turning over and/or mixing the top 12 to 24 inches of soil, and is a time-honored method for loosening and aerating soil. For more extreme cases, "subsoiling" may be required. This involves fracturing the soil at deeper levels with a machine consisting of metal shanks and either pointed or winged tips.

You can improve drainage through grading or by altering surface drainage routes, or by amending the soil. Proper plant selection can mitigate areas where changing drainage and infiltration rates is difficult (for example, in naturally low, wet spots).

As a last resort, you can remove the soil from the site. This extreme (and extremely expensive) measure should only be taken when no other options are available.

Soil amendments and additives. Physical, organic, biological, mineral and chemical amendments can improve soil structure and fertility.

Physical amendments include structures such as geowebs and turf cells, which stabilize soils within the root zone.

Organic amendments include compost. One of the best all-around amendments, compost can improve both soil structure and fertility; it also stimulates biological activity and promotes healthier, more disease-resistant plants. The quality of compost can vary, so make sure you know the source. If making it yourself, make sure the organic materials are thoroughly broken down before using.

Mineral amendments include perlite, hadite and pumice. These commonly used minerals help create large pores in the soil through which both air and water can move; they are also sterile and

CREDIT: WICKO

Rockhound. Some landscape rakes, such as this model from Wicko, even have hoppers that collect the stones and other debris.

CREDIT: NEW BRUNSWICK DEPT. OF AGRICULTURE

Fix-It. Vetch and clover are good choices for cover crops, as they fix nitrogen in the soil.

dimensionally and chemically stable. Sand and gravel improve infiltration and are good materials to layer under rain gardens and other stormwater infrastructure, but by themselves they will not correct the drainage issues with clay soils.

Biological amendments improve the diversity and number of soil organisms. Typical amendments include mycorrhiza, a symbiotic fungus that colonizes plant roots, and compost teas, which inoculate soil with microorganisms. "Macrofauna" such as earthworms provide a number of benefits, including improved pore structure and detoxification of contaminants.

Chemical amendments, also known as fertilizers, are used to change soil pH or add missing nutrients, but in general, they are the least effective type of amendment and can have unintended consequences. They can also run off the landscape and end up in waterways, especially if over applied. Chemical amendments should be used only after other methods have been tried.

Mulch. Anything added on top of the soil layer can be called mulch, and common mulching materials include peat moss, leaves, wood chips, bark, compost, rice hulls and straw, and synthetic materials such as sheet plastic and geotextiles. Mulch protects soil, keeping it cool and moist and stimulating biological activity. A layer of mulch can also help soils recover from mild compaction or prevent further compaction.

Cover crops. Planting a cover crop such as oats, clover or alfalfa is a good strategy for improving the soil before installing a rain garden or other stormwater feature. Cover crops can add organic matter, stimulate biological activity, inhibit weeds and protect the soil from erosion and moisture loss. Cover crops can be sown in the fall or summer.

Bioremediation. Taking advantage of organisms' natural process to repair soil is called bioremediation. Plants, microorganisms and/or soil amendments such as compost can all be used to digest harmful chemicals and transform them into nontoxic byproducts. Phytoremediation refers to the practice of using plants to take up harmful chemicals from the soil and groundwater and storing them in their roots, stems or leaves. The plants are usually harvested once they have done their job.

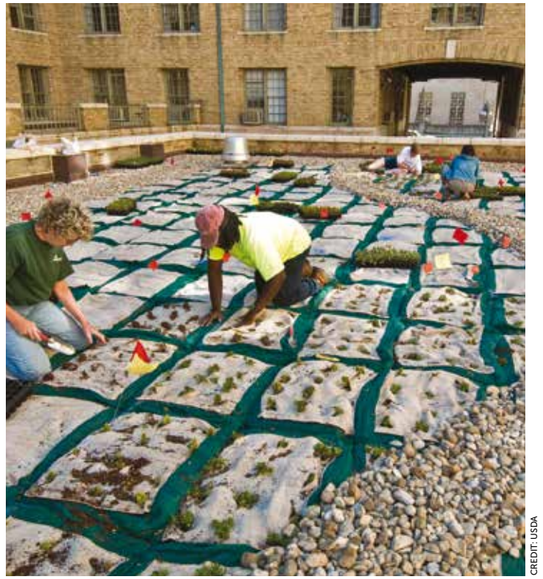
3. BROWNFIELD SITES

If your project involves redeveloping a brownfield site, the possible presence of contaminants could affect stormwater infrastructure, especially if the features rely on infiltration. These features must be designed carefully, so contaminants in the soil are not mobilized, which could increase the risk of groundwater contamination.

Any lot that's being redeveloped could house contaminants in the soil, so it's a good idea to take the following steps before designing green infrastructure or other landscaping.

Learn the history of the lot. Contact previous property owners and

Just Add Worms. When adding earthworms to soil, they need to be "planted" several inches below the surface. They also need organic matter for a food source.



CREDIT: USDA

Alternatives. In some cases, you may decide to avoid the problem of existing soils by choosing stormwater features that don't rely on infiltration, such as green roofs, and by incorporating raised beds or vertical gardens.

take advantage of public records available at county offices, planning departments and historical societies. In general, lots that were previously used for housing are less likely to have soil contaminants than those used for industrial purposes.

Conduct a field survey. Observe drainage patterns, identify foundations of previous structures and look for evidence of compaction.

Sample the soil. At a minimum, the soil test should include pH, percent organic matter, nutrients, micronutrients and metals, including lead. Soil samples can be sent to USDA Cooperative Extension System offices, land grant universities or private local laboratories.

In 2013, EPA released *Implementing Stormwater Infiltration Practices at Vacant Parcels and Brownfield Sites* (http://bit.ly/1RqPoaV). This document guides decision-makers through a series of questions to determine whether infiltration or other stormwater management approaches are appropriate for a specific brownfield property.

Lead Removal Best Practices

1. Remove soils and replace.
2. Add clean soil on top of the lead-contaminated soil.
3. Maintain soil pH levels above 6.5 by adding organic matter. Lead binds to organic matter, making it less available to plants.

4. SEDIMENT-LADEN STORMWATER

In arid regions, bare soils are common and rates of erosion and sedimentation are relatively high. Stormwater flows can deliver fine sediments to infiltration features, clogging and degrading their performance. The following strategies are recommended for infrastructure in areas with high sediment loads.

Mulch it. Mulch acts as a filter for sediments carried in stormwater. Add a mulch layer above infiltration practices and replace the layer when it is filled to protect the soil and gravel layers below from sedimentation.

7 STEPS TO HEALTHIER SOILS

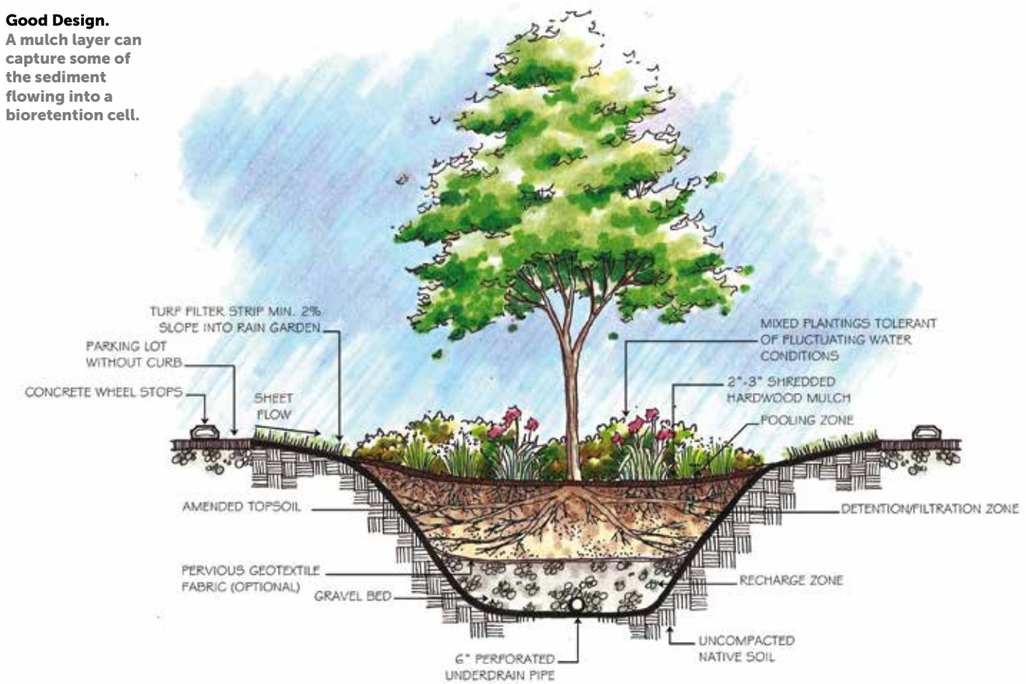
WORKING IN COMPOST can improve drainage or moisture retention, encourage biological activity and grow healthier plants. A good rule of thumb is to add two inches of compost over the entire area and work it in to a minimum depth of six inches, adjusting this depth to accommodate tree roots and other obstacles.

Here's a simple formula for estimating the volume needed:

ONE INCH COMPOST SPREAD OVER 1,000 SQUARE FEET = THREE CUBIC YARDS.

Here are some general guidelines for application:

1. Rototill to a depth of six to eight inches. If the soil is too dense for a rototiller, the soil should first be broken up into large aggregates using a soil ripper.
2. Clear obstructions. The soil surface should be reasonably free of large clods, roots and stones greater than two inches.
3. Distribute compost evenly to a depth of two inches over the soil surface. For small areas, compost may be spread by hand with a shovel and raked evenly over the soil. For larger areas, use a tractor-mounted spreader or similar device.
4. Spread lime and nutrients, if indicated by soil testing.
5. Rototill several times in perpendicular directions to incorporate compost and other soil amendments.
6. Water thoroughly. Allow soil to settle for one week; if compost is immature, extend settling period to two to five weeks.
7. Finely grade soil to desired evenness.



Good Design. A mulch layer can capture some of the sediment flowing into a bioretention cell.

CREDIT: CLEMSON UNIVERSITY

Trap it. A "sediment trap" is a small depression bordered by a small berm that captures and collects sediment at the entrance to a bioretention area, such as a rain garden. Use traps at the inflow of green infrastructure features to facilitate the removal of accumulated sediment and prevent the feature from becoming clogged.

Maintain it. If you include a mulch layer or sediment trap in your stormwater management practice, regularly remove the accumulated sediment to maintain its function.

5. LIMITED IRRIGATION SUPPLY

Limited water resources can be a barrier to green infrastructure in arid and semiarid regions. Follow the principles of xeriscaping to conserve water, and create a plan that balances water supply and demand. You will first need to determine the annual water budget (assuming the feature will use native plants at native densities).

Use low-water use plants. You can drastically reduce, if not eliminate the irrigation requirements of green infrastructure by using native and drought-tolerant plants. These include drought-tolerant shrubs and trees. Rain garden plants should be able to tolerate occasional inundation.

Use efficient irrigation. Make your irrigation systems most efficient by grouping plants according to their water needs, and by adjusting the frequency and depth of irrigation according to plant type, plant maturity and season.

Amend it. Healthy soils are essential to retaining soil moisture, sustaining vegetation, and treating stormwater runoff. If your site's soils are poor, amend them with organic material.

CREDIT: ENVIROMAT

Tough Customers. Plants chosen for green roofs in arid and semi-arid regions should be able to tolerate wind and temperature extremes, as well as periodic drought.

Mulch it. Organic mulch can increase water retention and pollutant removal while building soil structure and suppressing weeds. Note, however, that many desert trees and shrubs react poorly when their trunks come in contact with mulch.

Maintain it. All landscapes require maintenance; xeriscaping is no exception.

6. SPACE CONSTRAINTS

Many green infrastructure features require land area to allow stormwater to infiltrate into the soil. This can pose a challenge

CREDIT: JAMES STEAKLEY

Go Native. Rain gardens can be designed for any region. Native plants are usually the best choice for these features, as they are adapted for the climate, which may include periodic drought.

CREDIT: ENVIROMAT

Double Duty. When constrained by space, consider designing in stormwater features that serve more than once purpose, such as a permeable parking area.

when space is limited (for example, in a retrofit project or tight urban lot). Designers have developed strategies for overcoming this challenge:

Features that serve multiple purposes. Integrate swales and bioretention areas into landscaped areas, medians or parking strips. Permeable pavements provide volume reduction and water quality treatment without requiring additional space.

Features for small spaces. Planter boxes, tree pits and other green infrastructure features can be custom designed to fit into small spaces.

Subsurface storage. Underground storage or infiltration tanks can serve as an alternative when space is too limited for any surface features. GB

CREDIT: PHILADELPHIA WATER DEPARTMENT

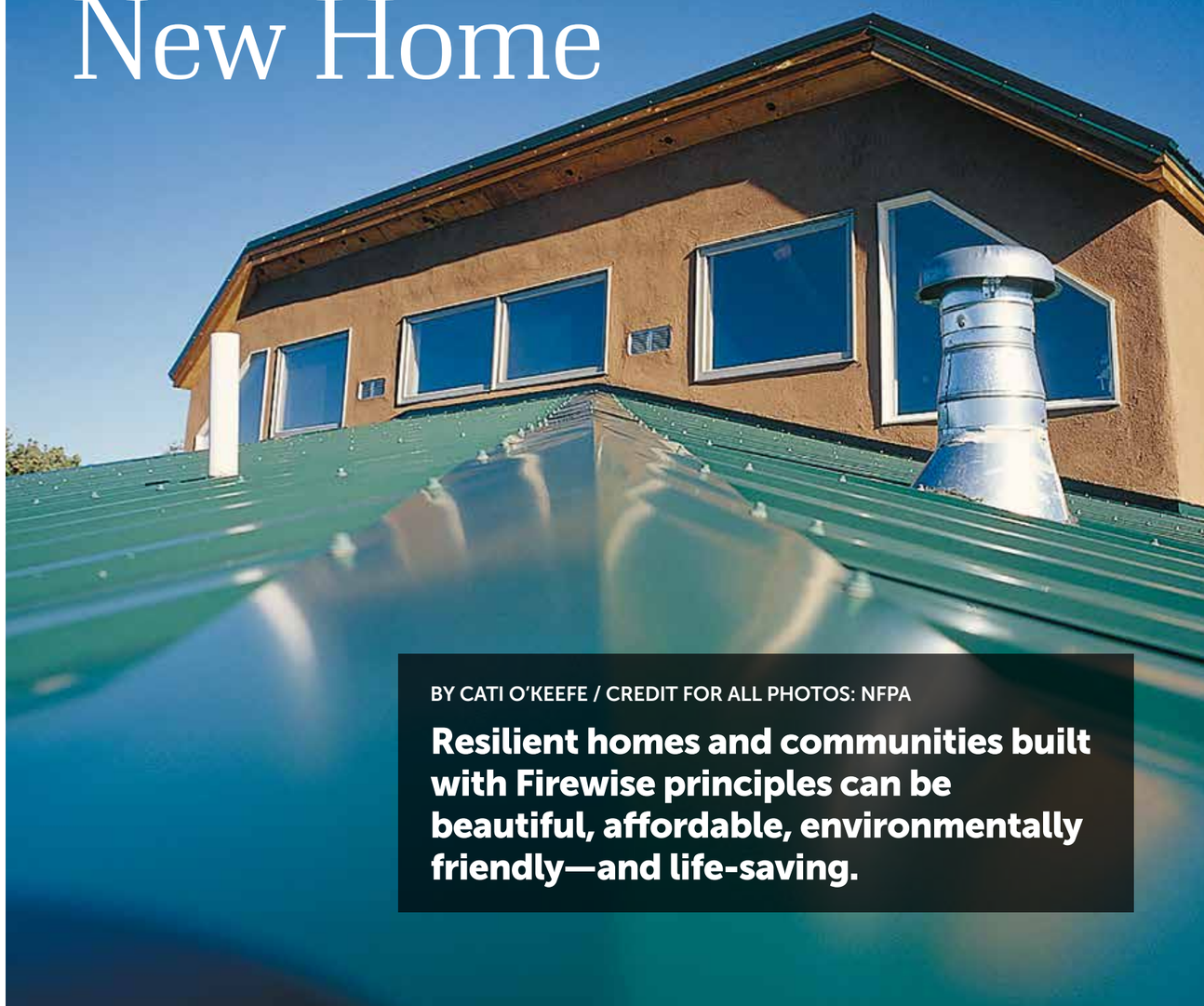
Tight Squeeze. Stormwater planters, such as this one installed along a street in Philadelphia, make the most of tight spaces.

RESOURCES

EPA Green Infrastructure website: **http://1.usa.gov/1SlVDH3**
Evaluation of Urban Soils (EPA publication): **http://1.usa.gov/1Q9oUtO**

FIREWISE DESIGN

Three Steps to a Safer New Home



BY CATI O'KEEFE / CREDIT FOR ALL PHOTOS: NFPA

Resilient homes and communities built with Firewise principles can be beautiful, affordable, environmentally friendly—and life-saving.

At Risk. Communities in beautiful natural areas can also be fire-prone. Applying Firewise principles in new developments can reduce wildfire risk.

WILDFIRE THREATENS HUNDREDS of homes each year and causes millions of dollars in damage to property. It doesn't have to be this way. With some forethought, communities and homes can be sited, designed and built to mitigate losses caused by fire.

The nonprofit National Fire Protection Association (NFPA), a fire and life safety organization, created the Firewise Communities Program with support from the USDA Forest Service and state foresters, and provides developers/builders with simple and easy steps to help reduce a home's wildfire risk by preparing ahead of a wildfire.

These steps are rooted in principles based on solid fire science research into how homes ignite. The research comes from the world's leading fire experts whose experiments, models and data collection are based on some of the country's worst wildland fire disasters.

Who's At Risk? *Everyone*

First, it is important to keep in mind that when it comes to wildfire risk, it is not a geographical location, but a set of conditions that determine the home's ignition potential in any community.

Wildfire behavior is influenced by three main factors: topography (lay of the land), weather (wind speed, relative humidity and ambient temperature) and fuel (vegetation and manmade structures). In the event of extreme wildfire behavior, extreme weather conditions are normally present, such as extended drought, high winds, low humidity and high temperatures, coupled with excess fuel build-up. This includes both the accumulation of live and dead vegetation.

Region is no longer an indicator of whether you will be impacted by fire, notes Lorraine Carli, Vice President, Outreach and Advocacy, for the National Fire Protection Association. "While there are more communities in the West and South impacted than other areas of the country, increasingly everyone is susceptible. Because of climate change, fires are occurring in places they never have before."

It can be hard to get people to focus on the problem because many simply don't think it will happen to them. "As we see more fires happening—and the media is focusing on longer fire seasons—we are breaking through people's perceptions that it won't happen in their neighborhoods," Carli says. "People are more aware, and that's a good thing because awareness means action for their home and community. "

Beyond the Walls. If it's attached to the house, it's part of the house. Use nonflammable materials for attachments such as fences.

The Firewise Communities Program is a national program, with concepts and best practices that can help any community. The basic premise of a Firewise home is that to be wildfire resilient, a home must be ignition-resistant. It's a package deal: Home design and construction materials are one piece; the immediate surroundings of the home are the other.

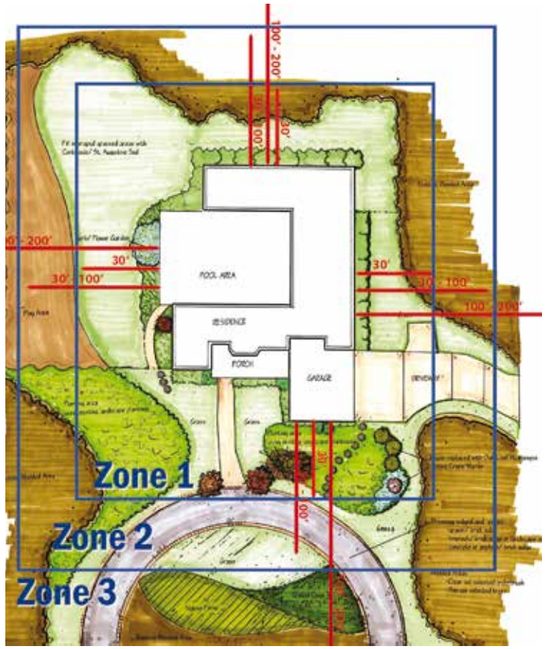
Here are three important steps you can take to make the homes and communities safer for your home buyers:

Step 1: Plan a Firewise Landscape

Images of wildfires in action often show a house engulfed in flames, rarely showing how in some cases the surrounding landscape was on fire first, and, depending on its composition, hastening or slowing down the wall of flames. In short: Landscaping is *pivotal* to protecting homes from fire.

When considering surroundings, the primary goal is fuel reduction—limiting the amount of flammable vegetation and materials surrounding the home and increasing the moisture content of remaining vegetation.

The home itself and everything around it up to 100–200 feet is known as the home ignition zone. In areas across the country where the risk of wildfire is high, the home ignition zone extends up to 200 feet beyond the actual home structure. Within this 200-foot area, there are three zones:



Danger Zones. Depending on the region in which a home is located, the "ignition zone" can extend up to 200 feet beyond the house itself.

Fire Break. Non-flammable materials, such as hardscaping and brick, help stop the spread of flames.

Firewise Program In Short

FIREWISE IS A KEY COMPONENT of Fire Adapted Communities—a collaborative approach that connects all those who play a role in wildfire education, planning and action with comprehensive resources to help reduce risk. NFPA's Firewise program is co-sponsored by the USDA Forest Service, the U.S Department of the Interior, and the National Association of State Foresters.

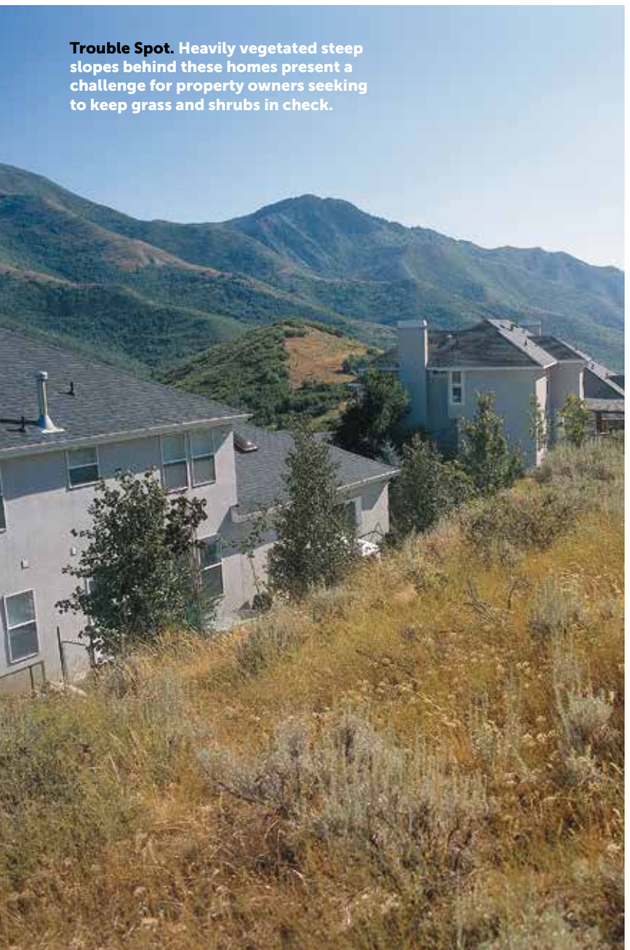
Firewise principles address site design, construction and landscaping, as well as property maintenance and education of residents. These principles can be integrated seamlessly into development design as well as a community's master deed, covenants, conditions and restrictions (CC&Rs), subdivision rules, and architectural review guidelines.

THE PROGRAM ADDRESSES:

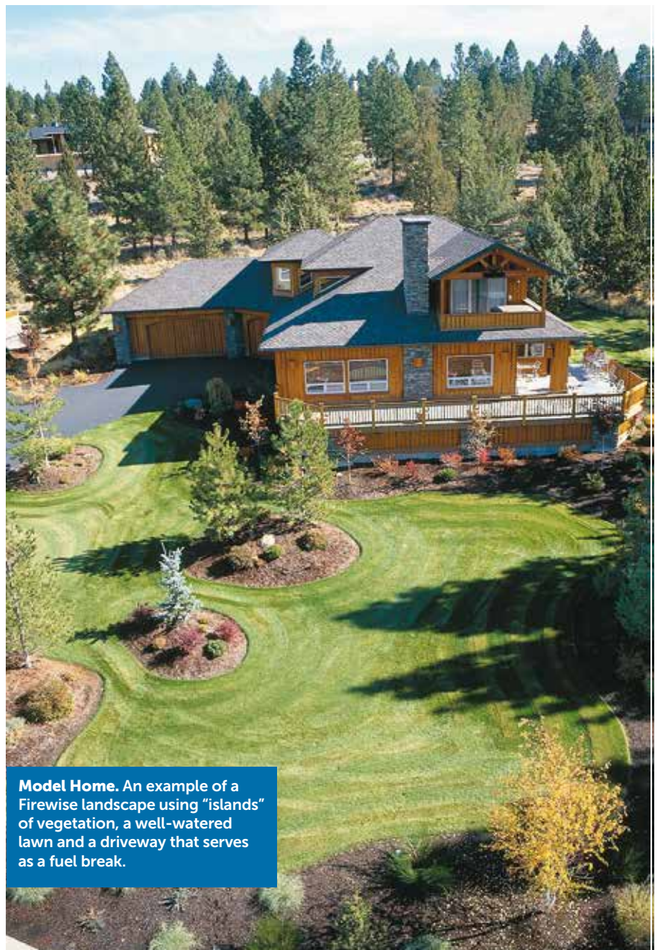
- How we build, design and maintain our homes can make them much less vulnerable to ignition in a wildfire.
- The condition of the home itself and its immediate surroundings are what will affect potential home ignition.
- Firewise principles can be "green" and beautiful.
- It's easier to be Firewise when we design with fire in mind from the beginning.
- For one home to be truly Firewise, neighboring homes must be as well.

For more tips, programs and resources on wildfire preparedness and safety, visit NFPA's Wildland Fire Operations Division webpage.

Separation. Shrubs against the wood deck go against Firewise principles of keeping "fuel" away from anything that is attached to the house.



Trouble Spot. Heavily vegetated steep slopes behind these homes present a challenge for property owners seeking to keep grass and shrubs in check.



Model Home. An example of a Firewise landscape using "islands" of vegetation, a well-watered lawn and a driveway that serves as a fuel break.

ZONE 1 ENCIRCLES THE STRUCTURE AND ALL OF ITS ATTACHMENTS (WOODEN DECKS, FENCES AND BOARDWALKS) FOR AT LEAST 30 FEET ON ALL SIDES. IN THIS AREA:

- Space plants carefully, and use those that are low-growing and free of resins, oils and waxes that burn easily.
- Mow the lawn regularly. Prune trees up six to 10 feet from the ground.
- Space conifer trees 30 feet between crowns. Trim back trees that overhang the house.
- Create a "fire-free" area within five feet of the home, using non-flammable landscaping materials and/or high-moisture-content annuals and perennials.
- Remove dead vegetation from under deck and within 10 feet of house.
- Consider fire-resistant material for patio furniture, swing sets, etc.
- Remove firewood stacks and propane tanks.
- Water plants, trees and mulch regularly.
- Consider xeriscaping.

In the Zone. Potential fuel loads should be minimized in Zone 1, which immediately surrounds the house.

For Developers: Design for Mitigation

Here are some special considerations for developers on how to site developments and homes.

KNOWING THAT TERRAIN and weather are two of the main factors in wildfire risk, consider any major topographical features when designing the subdivision lay-out. These include steep slopes, ridges, bluffs, canyons, "draws", "chimneys" and "saddles." Consider that south-facing slopes will have drier vegetation from solar heating and that winds will carry fire up into chimneys and down through canyons. In addition, heavy rains after a fire may cause mudflows or soil erosion.

When considering location of home sites, think of potential fire exposure and elements related to site maintenance and fire response:

- Setbacks
- Home-to-home proximity
- Access/Egress
- Road/driveway width and grade

Homes sited at the top of a ridge will need to have adequate setback away from potential flames. Residents or community managers will need to have access to vegetated areas in order to maintain them in a Firewise condition.

Think about site design from the point of view of fire approaching, and of the maintenance that will be needed on the landscape to keep fire-prone vegetation from accumulating. Homes with rooflines closer than 30 feet apart can become ignition sources for one another.

Depending on the size of the development, certain infrastructure for fire protection may be required. In the absence of such requirements, you may want to include these features in your plan to enhance community values. For example, since steep, narrow, winding roads make it more difficult for fire engines to respond to fire and medical emergencies, you may want to consider minimizing road gradient where possible both for emergency egress by residents as well as access by fire trucks.

A grade of ten percent or greater will significantly impact the speed and ability of emergency vehicles to arrive and maneuver safely. For a very large community with homes that are widely spread out, a community fire station (or land set aside for one) may be an important addition.

ZONE 2 IS 30–100 FEET FROM THE HOME, AND PLANTS IN THIS ZONE SHOULD BE LOW-GROWING, WELL IRRIGATED AND LESS FLAMMABLE. IN THIS AREA:

- Leave 30 feet between clusters of two to three trees, or 20 feet between individual trees.
- Encourage a mixture of deciduous and coniferous trees.
- Create "fuel breaks," such as driveways, gravel walkways and lawns.
- Prune trees up six to 10 feet from the ground.

ZONE 3 IS 100–200 FEET FROM THE HOME. THIS AREA SHOULD BE THINNED, ALTHOUGH LESS SPACE IS REQUIRED THAN IN ZONE 2. IN THIS AREA:

- Remove smaller conifers that are growing between taller trees.
- Remove heavy accumulation of woody debris.
- Reduce the density of tall trees so canopies are not touching.

For more details on zones, check out the Firewise Landscaping and Construction Guide. NFPA also highlights an array of regional Firewise plant lists here.

Step 2: Consider Fire When Building Homes

Embers can travel a mile or two before landing—a sobering thought that illustrates the invaluable practice of constructing houses using fire-resistant building products.

In fact, according to NFPA, all the research around home destruction and home survival in wildfires points to embers and small flames as the main way that the majority of homes ignite in wildfires. "How we build, design and maintain homes can make them less vulnerable to a fire," says Carli. "A lot of fires start with embers on a roof."

To help homes resist ignition, you should:

- Spec non-flammable roof and ignition-resistant construction elements including siding, decking, and windows.
- Consider openings in the home—vents, doggie doors—as potential ember entry points and protect accordingly.
- Consider roof/gutter/vent design carefully. For example, complex roofs pose more hazards; edges are vulnerable, including skylight edges; gutters can collect debris; gable end vents are most vulnerable to ember entry from wind. The best solutions include simple roofs, no gutters (if practical), and ventless (if practical) or under-eave vents.

According to Carli, the most overlooked area by builders are porches and decks. "Think of porches, decks and fences as an extension of the home. Builders must use flame resistant materials in these areas as well so they won't carry the fire to the home."

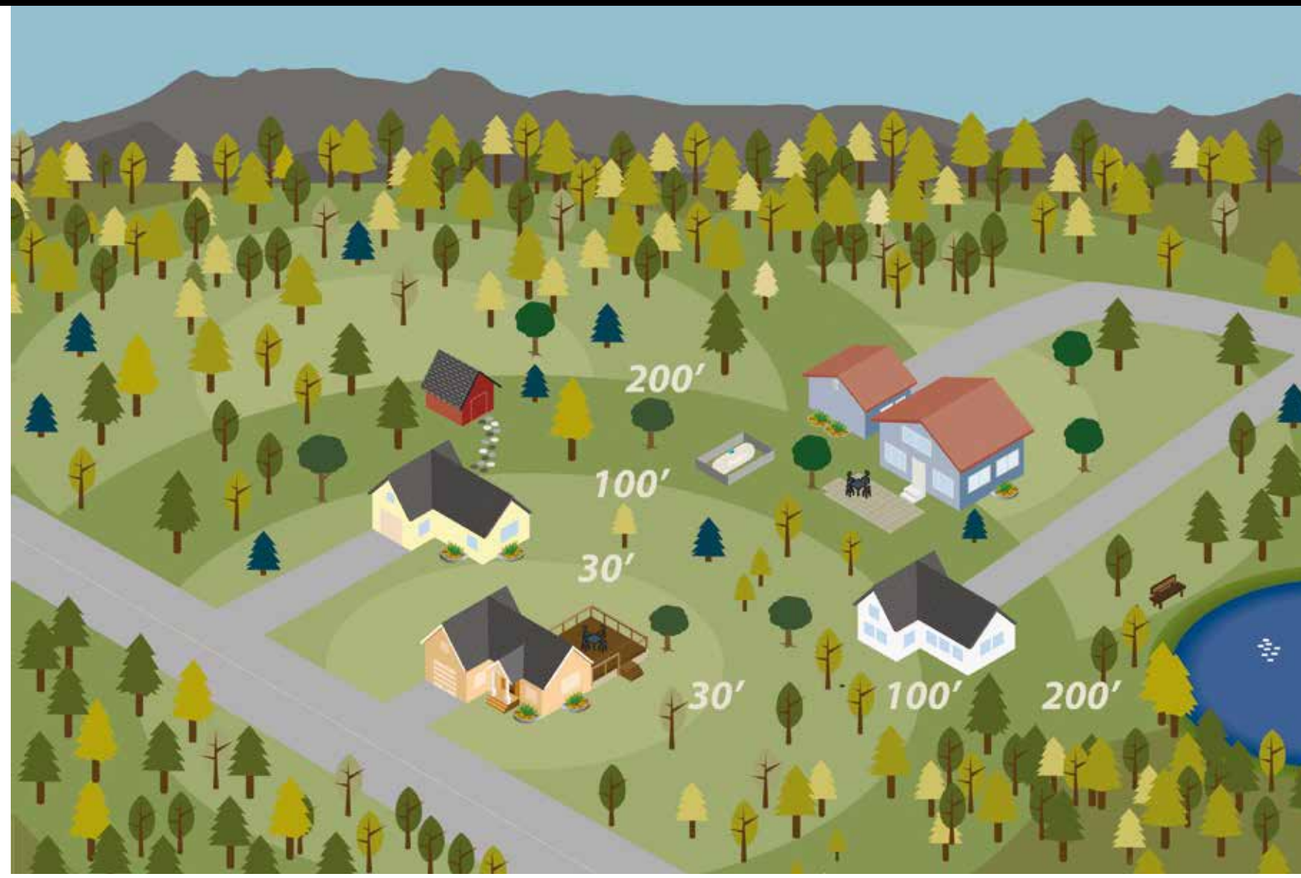
These points are explained in more detail in the Firewise Landscape and Construction Guide.

RESOURCES

Firewise Guide to Landscape and Construction:
http://bit.ly/216M5oE

Video from the Insurance Institute for Business Home & Safety showing the results of ember experiments: **http://bit.ly/1RDKjsr**

Top Choices. In a fire, roofing material with a Class A, B or C rating is fire resistant and will help keep the flames from spreading. Good examples of resistant roofing include composition shingle (top), metal (middle), clay (bottom) and cement tile.



Working Together. This is an example of overlapping home ignition zones. Special care is needed by all neighbors to minimize fire hazards, since homes this close together can ignite one another in a wildfire.

Step 3: Keep Maintenance in Mind

Proper landscaping and fire-smart house construction must be maintained by the homeowner to be effective in the long term. Make it easy to maintain a Firewise condition:

Think about siting in terms of how the homeowner will deal with surrounding vegetation. As can be seen in the photo on the previous page, the site makes it very challenging for property owners to mow or thin out the vegetation, which could ultimately become fuel in a wildfire.

Provide privacy in design. If you don't create privacy via architectural elements or house siting, owners will add privacy fences, hedges and other features that can increase ignition potential on an otherwise Firewise home.

Build a simple storage area away from the house for firewood to be stacked so it won't become a major wildfire fuel source.

Providing your homeowners with a checklist of maintenance items is as important as fulfilling the punch list when you turn over the keys. Some examples of maintenance include keeping gutters clear of leaves and needles, sweeping debris off flat surfaces and keeping fuel sources away from the house.

Fuel Traps. Complex roofs need special attention to avoid debris buildup where embers can ignite.

Be Part of the Community

We've outlined some simple steps you can use. The above are arguably simple steps you can use to be proactive against fire damage. Once you've committed to doing them, don't hesitate to point out the fire safety features of your homes to potential buyers. As the Firewise Communities Program grows in popularity, these will become selling points that buyers will demand.

Your efforts in addressing siting and fire-smart products for the home will be strengthened by the hands-on efforts of the communities who have elected to join the Firewise Communities Program. The program currently has about 1,200 registered communities and plans to add more communities as official Firewise recognized sites.

"We look at fire protection like a bull's eye," says Carli. "In the center is how the house is built, and then what surrounds it, and then what is further out in the community. You have to consider, though, that if one builder or homeowner employs the principles and installs the right types of plants and paving, but the houses surrounding it don't, what does that mean in a fire? So the issue becomes how to get neighbors to take safety steps also."

Ultimately, the program is about communities taking responsibility for their own surroundings and requiring fire-smart practices. "It's neighbors helping neighbors so their homes and communities can withstand a wildfire," Carli says. "We visit them on an annual basis and can see how beautiful the communities look and how beautiful homes look with the Firewise landscaping practices they've employed." GB

Pitching In. The Firewise program is about communities taking responsibility for their own surroundings. Here, a "chipper day" results in reduced "fuel" from brush and dead limbs.

Fire Show. Demonstrations, such as this one showing how fires travel upslope, can help communities prevent and prepare for wildfires.

How Fires Start

Here are the three ways homes ignite:

It's the little things. Embers are estimated to be the culprit in more than half of home ignitions leading to destruction. They land in debris on your gutter or under your deck, and fly into vents and other unscreened openings. They wreak havoc on an untreated wood shake roof.

Small flames cause big problems. Embers can start spot fires in your yard that carry to the house. A dry, grassy lawn or a house draped in pine needles provide a continuous path of fuel that small flames consume until they get to the big fuel—your house.

The furnace effect—radiant heat. Large flames within 30 feet of your house can ignite wood surfaces. Large, heavy stands of trees or bushes close to the house mean flames don't even need to touch the house to ignite it. Woodpiles next to the house are a bad idea.

Visual Aids. Signs remind people that their community is taking important precautions against fire.

Long Live the Spool!

If your client wants a swimming pool, try talking them into a sustainable spa instead.

CREDIT: KCXD (FLICKR)

Spoolside. Using a fraction of the water but no less luxurious, spas are generally a more sustainable choice than a swimming pool.

BY GREEN BUILDER STAFF

SWIMMING POOLS ARE becoming an ever-bigger concern in dry states. According to the Arizona Dept. of Water Resources, "half of the potable water Arizona homeowners use is outdoors." Pools and spas account for approximately 16 percent of that outdoor water use.

In Arizona, a standard (16 ft. x 36 ft.) uncovered pool loses four to six feet per year to evaporation—that's 17,235 to 25,852 gallons. Most of this loss occurs during the summer. Added to the water lost during refilling and backwashing, that's roughly the equivalent of filling the pool every year. Draining a pool doubles this amount. This is why, if you do own a pool, it's extremely important to use a pool cover, which can reduce evaporation losses by up to 30 percent.

Spas, on the other hand, if used wisely, can more or less break even with a home that has no outdoor water features at all, according to experts. Here's the deal, according to the Association of Pool and Spa Professionals:

"Baths use water once, whereas a spa offers four to six months of use for the same water. Taking just five baths, at 80 gallons each (normal tub size), uses enough water to fill a typical 400-gallon spa." Filling and draining a bathtub twice a week for four months uses 2,720 gallons of water. A spa uses the same 400 gallons of water continuously throughout those four months."

"Filling and draining a bathtub twice a week for four months uses 2,720 gallons of water. A spa uses the same 400 gallons of water continuously throughout those four months."

Of course, nothing is quite that simple, and it's important to consider overall environmental impacts. Spas typically require chlorine and other chemicals to keep water from becoming unsafe. Bathtubs don't. So there's an added burden with treating and discharging spa water.

Recycling graywater from the bath and using it to irrigate landscaping helps mitigate the higher overall water use of bathtubs. In fact, depending on the region, the success of a graywater system depends on having a regular source of graywater, such as a weekly bath.

On the other hand, a spa is almost always less water intensive than a swimming pool, especially a pool without an evaporation cover. A spa's smaller volume and surface area means less water is lost to evaporation. But again, the big picture score sheet is more complex. Spas also tend to be kept at much higher temperatures than pools, thus consuming more energy.

One can imagine a water-thrifty family that switches over from weekly baths to regular visits to the spa, in effect relying on recycled water instead of virgin potable H_2O. The challenge is how to minimize chemical use, both for the sake of human health and hygiene, and to address energy consumption (see Sidebar). We predict that with the continued development of UV treatment and other "clean" tech methods, recycled water applications will likely play a bigger role in the spas of the future.

The trend toward "spools" (and away from large swimming pools) is definitely a move in the right direction. But in the end, human behavior will determine just how much the presence of a spool affects the overall household water use. **GB**

SUSTAINABLE SPAS

If your client insists on a hot tub or "spool" (spa-pool), be sure to provide these tips for reducing its environmental impact.

Cover it. As with swimming pools, covers minimize evaporative loss and keep the water cleaner; they also keep the heat from escaping. Foam-core covers come in different thicknesses and foam densities; some even include a reflective metal shield that directs heat into the water. Using a "spa blanket"—also called a floating thermal blanket—in addition to a cover will insulate the water even more.

Create a windbreak. Shielding a spa with fencing, panels or vegetation can reduce heat loss from wind.

Mind the thermostat. Lowering the temperature by a few degrees will cut energy use. If you are going on vacation, lower the temperature even further or, if you're going to be away for more than a week, consider turning it off altogether, unless there is a danger of frozen pipes.

Heat off-peak. You can program your spa to heat during off-peak times, when energy costs are lower.

Cool the jets. Air induction jets cool spa water. More efficient spas use adjustable hydro jets which recover heat from the equipment cabinet rather than using a motor-driven blower.

Size right. If purchasing a new tub, look for the specs. A unit with a high R-value, low wattage, a smaller pump and lower volume will consume less energy.

Heat with the sun. A solar thermal system will preheat water, cutting the energy required to bring it up to temperature.

Go natural. Mineral and enzyme-based alternatives to chemical treatment are not just better for the environment; they are also gentler on skin and recommended for chemically sensitive people. Ozonators can be used in conjunction with natural products, or can reduce the amount of chlorine or bromine needed.

Keep it clean. Your spa pump won't have to work as hard if you regularly clean and change filters. The water will also stay cleaner longer.

SUN TUBS

For guilt-free hot tubbing, consider heating the water with the sun. A few companies offer kits, which typically include solar collectors, a heat exchanger and a solar-powered pump. Some offer storage as well. Kits will set you back at least $1,500, but once installed, they can save several hundred dollars per year in heating costs.

CREDIT: ANDY SCHRODER

Sun Catcher. Flat plate and evacuated tube collectors are two technologies commonly used to capture solar energy for water heating.

CREDIT: HAPPY HOT TUBS

Extra Coverage. A spa blanket doesn't just keep the heat in; it also reduces water loss from evaporation and keeps water away from the hot tub cover.

Irrigation Keeps Getting Smarter

Intelligent controllers offer refined water management based in the cloud.

BY JULIET GRABLE

I'LL NEVER FORGET completing my first four-zone irrigation system, which ran off a battery-powered controller. When I pushed a button, I heard a delightful trickle as all of my landscaping plants were watered simultaneously. That's smart, I thought. But today's smart irrigation controllers put my little system to shame. Rather than running fixed schedules, they adjust to changing conditions, delivering just the right amount of water when and where plants need it.

According to the EPA, WaterSense irrigation controllers can save up to 120 billion gallons of water—and $435 million in costs—annually. For the individual homeowner, that's 8,800 gallons per year.

CREDIT: RACHIO

On Command. The second generation of *Rachio IRO* smart controller builds on user-friendliness; its integration with *Alexa* lets users control it through voice commands.

CLOUD CONTROL

Weather-based smart controllers use evapotranspiration (ET) rates to calculate how much water plants need on a given day. ET is the sum of the water lost from the soil through evaporation and through use by plants (transpiration). In simple terms, the water that goes out must be replaced, either by rainfall or irrigation water. To make calculations, controllers can rely on sensors which take onsite measurements of temperature, humidity and rainfall, or they can access historic or real-time local weather data. Other smart controllers adjust irrigation schedules based on direct measurements of soil moisture. Some do both. For example, *Spruce*, a just-released 16-zone controller, relies on both weather forecasts and rainfall data and its own wireless soil moisture sensors to adjust schedules. Users can specify landscape type for further refinement.

Today's most advanced smart controllers allow users to refine irrigation schedules by adding detailed, zone-by-zone information, such as whether the ground is flat or sloped, sunny or shaded, the types of sprinkler valves and they type and density plants in the zone. *Rachio IRO* includes a SmartCycle feature, which adapts watering schedules based on soil type. For a clay soil, for example, the controller delivers water in several cycles, to ensure it has time to absorb the water. The newer controllers can also be accessed and controlled remotely.

"The big difference now is that the *IRO* can be controlled by an app on your phone," says Chris Klein, CEO of Rachio. "It's Internet-connected, and the technology is in the cloud."

Along with access, user-friendliness is an important selling point in a crowded field. For example, the intuitive, graphical interface for the *BlueSpray* controller allows the user to set up new zones by clicking and dragging icons.

Feedback is also important. *RainMachine*, a WaterSense-qualified controller that has earned favorable reviews on Amazon, includes a gauge that displays how much water has been saved in the last week, month or year.

Rebates and Incentives

Several municipalities offer rebates for smart or weather-based irrigation controllers. Not surprisingly, California has the most programs in place. For example, the SoCal Water$mart program, residential customers can qualify for an $80 rebate for a smart controller. Outside of the Golden State, Southern Nevada Water Authority customers can get a coupon that pays for half of a new smart controller (up to $200).

CyberRain, which offers several WaterSense-qualified controllers, maintains a database of rebates organized by state:
http://www.cyber-rain.com/rebates.html

CREDIT: PLAID SYSTEMS, LLC

Whole Picture. The *Spruce* smart controller uses daily weather data along with wireless moisture sensors to adjust, postpone or start watering.

PLUG-INS AND ADD-ONS

If you're not ready to give up your current irrigation controller, you might be able to boost its IQ. For example, the *HermitCrab* from ETWater converts a conventional controller into a smart controller; it works with many models from several major brands. The user must access the ETWater Manager online and enter site information, but then the *HermitCrab* takes that data along with daily local weather reports to create updated irrigation schedules. In addition to its line of smart controllers, Hunter offers *Solar Sync*, a plug-in available in both wired and wireless versions, which measures sunlight and temperature to calculate ET; it then sends a "seasonal adjustment value" to the controller, which modifies the irrigation schedule accordingly.

Add-ons include soil sensors and simple weather stations, which can be used to manually refine irrigation schedules on a conventional controller. *Edyn*, for example, is a solar-powered wireless sensor that measures temperature, humidity and soil moisture; it is compatible with Samsung's *SmartThings* platform.

THE WHOLE ECOSYSTEM

Is your smart landscaping system compatible with your smart home ecosystem? Companies that have anticipated this question are one step ahead. The second generation of *Rachio IRO*, for example, integrates with Amazon *Echo* and *Alexa*, adding to a long list of compatibilities, including Nexia, Wink and Control4. It also integrates with Nest, and includes a fire protection feature: If Nest *Protect* detects smoke inside the house, *Rachio* starts cycling through the sprinkler zones outside, to help prevent the fire from spreading.

The *Spruce* smart controller and sensors were designed for Samsung's *SmartThings* platform, so if you already own the hub, *Spruce* can simply be added to "Things" and then be controlled via the *SmartThings* app. ETWater has taken a slightly different approach with its *Unity* open platform, which integrates with Apple's *HomeKit* and other platforms. Right now, the *Unity* controller is the main product available, but ETWater anticipates adding other features and devices to control landscape lighting, track tools and more. GB

Good (Water)Sense

Controllers that qualify for EPA's WaterSense label include several water-saving features:

- Allow zone-by-zone control.
- Retain settings if the power goes out.
- Send alerts when the system malfunctions.
- "Percent adjust" feature allows user to change amount of water delivered to a zone by adjusting it to a percentage above or below programmed amount. Original values are preserved.

For a list of all WaterSense-labeled controllers, visit **http://1.usa.gov/1PGu2T1**

Toward Net-Zero Organic Waste

By integrating compost systems into your projects, you can save your clients money and provide them a useful resource.

CREDIT: NICOLAS BOULLOSA

Opportunity. Designating facilities for composting increases the chances that homeowners will use them.

BY JULIET GRABLE

IF YOU'RE A GREEN BUILDING PROFESSIONAL, you likely design and build homes that conserve water and energy once they're occupied. But what about the waste these homes produce?

Collectively, we've made good progress on waste recovery. Recycling rates have increased from 10 percent in 1980 to 34 percent in 2012, the last year for which we have data. However, according to the EPA, the average person produces 4.5 pounds of trash every day, and there are areas with huge potential for improvement. Food waste is a big one. This category comprises 14.5 percent of all municipal solid waste (MSW), yet only 2 percent is diverted from the landfill. In fact, food waste makes up 20 percent of landfill mass.

BUILD IT AND THEY WILL COMPOST

One solution is for people to compost their food scraps at home. Though of course you can't force behavior, builders, designers and landscaping professionals can design in systems and functions that encourage occupants to start seeing one of their biggest waste streams as a resource for growing food or other plants:

- Design and build homes with designated composting areas. If a custom home, tailor the design for the client. While some will accept a plastic food scrap container on the counter, others will want something less conspicuous (or more glamorous). A pull-out drawer near the sink is ideal for "hiding" the compost bucket.
- Make sure the system is practical. The distance between the kitchen and composting area should be minimized.
- Integrate composting facilities into the design. They should be centrally located and sized for the situation (A multifamily complex should have a larger capacity than a single-family home, for example). In hot, dry regions, the bin should be in partial to full shade; in rainy climates, consider a bin with a lid. Consider whether the bins will need protection from wild animals.
- Make sure the composting area is accessible for carts or even small trucks.

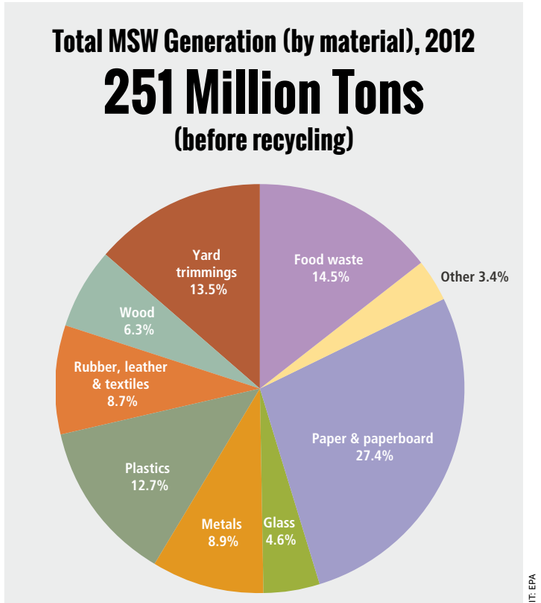
OUTSIDE THE HOME

Being realistic, most people do not and will not compost at home. Many urban dwellers simply don't have the space. The solution? Compost food scraps off-site. The success of pilot programs such as those in San Francisco, Vancouver and Cambridge, Mass., show that, after some initial grumbling, people will participate in composting—even if it doesn't directly benefit their gardens. The City of San Francisco, which has set a zero-waste goal for 2020, boasts the oldest (and mandatory) program. Started in 2009, the city now diverts 80 percent of its waste, including 600 tons of food scraps and yard waste every day.

Municipal composting programs are in their infancy, and only a handful exist. But you can help your clients identify markets for their food scraps. Private companies, such as Raleigh-based CompostNow (www.compostnow.org), will pick up your food waste weekly; customers can choose which local garden or farm receives the finished compost. Alternatively, you can make connections with local farms and contract with them directly.

THE BIGGER PICTURE

Outside of your own projects, there are several things you can do to push organic waste recycling to the forefront. If your region or municipality does not already have a food composting program, consider lobbying for one. Green building programs are lagging behind when it comes to waste. LEED, for example, does not explicitly encourage composting, though LEED v4 will award two points for "a waste reduction and recycling program" that could include composting. If you sit on a green building organization's board, consider bringing the issue of composting to the table. GB



CREDIT: EPA

Incentive. In municipalities that charge by the bag rather than by the month, households can reduce their trash collection bills significantly by composting food scraps instead of throwing them away.

Food for Thought

Composting is an important way to manage this waste; it reduces methane emissions, recycles nutrients and raises consciousness about the quantities of food being wasted. EcoScraps (**www.ecoscraps.com**), a company that turns food waste from stores, restaurants and other sources into organic bagged compost products, shares these facts on the effects of landfilling food waste.

- The organic fraction waste, collection vehicles and waste disposal methods contribute to greenhouse gas emissions, especially methane.
- Methane from landfills represents 12 percent of total global methane emissions. Methane has a global warming potential (GWP) 21 times greater than carbon dioxide.
- Forty percent of food in the U.S. today goes uneaten—the equivalent of $165 billion each year.
- Food waste is the single largest component of U.S. municipal solid waste where it accounts for a large portion of U.S. methane emissions.
- Composting makes possible the capture of methane for energy generation via a process called anaerobic digestion.

Source: EcoScraps

Strategy: Reduce Waste First

Responding to the growing dilemma (and opportunity) of wasted food, the EPA has developed a new toolkit called Get Smart: Take the Challenge, which provides worksheets and instructions so individuals and families can track how much food they waste over a two- to six-week period.

To share with your clients, visit http://1.usa.gov/21hxG90

Where Does Your Garden Go?

These strategies can help incorporate gardening in even the tiniest houses—even those that are on the move.

BY GREEN BUILDER STAFF

IT'S NOT DIFFICULT to understand the tiny house craze. The homes are affordable, flexible, and many are designed for mobility. Tiny houses are often tucked into tiny spaces, even driveways. Yard space is limited, restricting opportunities to grow food or even to cultivate landscape plants. But this mobility comes with a price: the homes can feel transient, rather than lived in. The following five strategies allow tiny house dwellers to have their landscaping, and take it with them, too.

GOING UP

CREDIT: WOOLLY POCKETS

Plant Pockets. Made of 100 percent recycled plastic, modular *Wallys* measure 13" high and are 22" wide. They can be installed indoors or outdoors. **www.woollypocket.com**

Vertical garden is the best solution for the space deprived. Anything that holds soil in a "pocket" and attaches to the wall can do the job. Vertical gardens can be improvised out of anything from rain gutters to plastic bottles, but for a more uniform and, well, cultivated look, there are products that have been developed specifically for this use. The *Living Wall Planter* from Woolly Pocket, for example, consists of modular planters that can be installed either inside or outside; they can be watered either via a self-watering tank or a drip irrigation system.

Best plants for vertical gardens: annual or perennial flowers (dwarf varieties; herbs; bulbs; succulents.)

ATTACHED GREENHOUSES

CREDIT: JEFF TURNER/ARBORFORGE

Sun Room. An attached greenhouse can be used to grow food plants, bring in natural daylight and modulate temperatures inside the tiny house.

Whether you're designing or building tiny houses from scratch or modifying an existing structure, an attached greenhouse can upgrade a tiny house into a passive solar structure capable of growing food year round. The greenhouse can also double as living space. Mobile tiny houses have an advantage here, as the greenhouse can be oriented to the south for maximum sun exposure.

SANS SOIL

Growing plants hydroponically—in water instead of in soil—is another good option for the space starved. Plants grow best when water can circulate, and there are a number of starter kits available. A ready-made system called the *Urban Cultivator* simplifies hydroponic food-growing and is a good option for tiny house dwellers who can't grow food plants outdoors. The smallest residential version can hold

CREDIT: RACHEL KRAMER

Food Security. The *Urban Cultivator* can be plugged into the city water system, or it can operate off an independent water supply.

four trays of plants and tucks under a standard-sized cabinet.

Best plants for hydroponic gardens: greens, microgreens, strawberries, chives, herbs.

BUILT-INS

Planters, garden windows and porches can help tiny homes feel more permanent, and they don't add to interior square footage. Of course, if you're designing a home that might be on the move, you'll have to consider limitations of the trailer and maximum width and length restrictions. One work-around is to design features that "tuck away" or are easily removed (and re-attached). Porches can also temporarily house container plants while the tiny house is on the move.

CREDIT: RACHEL KRAMER

Flower Power. Window boxes can help ground tiny houses in place and make them feel more permanent.

SELF-CONTAINED GARDENS

Container gardening has long allowed apartment dwellers to make the most of their balconies and small stoops. One of the advantages of this type of garden is its versatility—the size, shape, style and origin of the pots is limited only by the imagination. The containers can be salvaged or upcycled; just make sure that if you are growing plants for food, the container won't leach harmful materials into the soil. Just a few possibilities include used tin cans, plastic bottles or glass jars; plastic and wood crates; palettes; cinderblocks, ceramic pipe sections or fittings; old plumbing fixtures; buckets and barrels. Trellises can further optimize space, allowing plants to grow up rather than sprawl horizontally.

Best plants for containers: dwarf trees, strawberries, herbs, tomatoes, annual flowers, succulents.

CREDIT: ANN FISHER

CREDIT: GARDENING SOLUTIONS

Options. Ranging from utilitarian to glamorous, upcycled containers can help create an instant garden almost anywhere.

Multifamily Energy Solution: Watts From Wastewater

"SHARCs" and "Piranhas" eat heat from raw sewage and return it for use in buildings.

BY CATI O'KEEFE

THEY MAY SOUND scary, but for the environmentally conscious and owners of multifamily buildings, International Wastewater Systems' heat-seeking *SHARCs* and *Piranhas* are harbingers of a new energy source for buildings. These heat recovery products can conduct simple and direct heat exchange from untreated wastewater to provide energy-saving, cost-effective solutions for heating, cooling and hot water.

When you consider that, according to the Department of Energy, 400 billion kW of hot water goes down the drain annually in the United States, this represents an important tech innovation that multifamily builders should consider using.

"After the Paris climate talks mandated carbon reduction, my personal thought was: 'Why do we throw it all away?'" says IWS company founder Lynn Mueller, referring to the estimated 25 to 30 percent of heat that is carried by water into sewers daily around the world. "We can recover this energy that's being thrown away. Once a heated water cycle starts, we can use the water, then we capture the heat before it goes into the sewer [...] and then do it over and over. It is counted as part of your base load, because the amount of sewage is constant in the world."

THE NUTS AND BOLTS

Here's how the system works: Wastewater maintains a fairly constant temperature as it travels through sewers to the treatment plant—typically about 60°F. In a sewage heat recovery system, a heat pump is used to capture the warmth of wastewater and transfer it to the clean water stream that enters buildings. It operates as a closed-loop system, meaning that the dirty water never touches the clean water. It takes a lot less energy to heat 60°F water than to heat cold water. And in the summer, buildings with sewage heat recovery systems can reverse their heat pumps and use the system to dissipate excess building heat.

The *Piranha* is designed for smaller buildings, such as multifamily residences and hospitals, and the *SHARC* is sized for commercial buildings.

IWS is presently designing systems that will be installed in the United States and Canada as well as the UK. The company recently

IMAGE CREDIT: INTERNATIONAL WASTEWATER SYSTEMS

Components. The *SHARC* system includes the *Sewage SHARC* filter and heat exchanger, along with DDC controls. An in-line sewage macerator is optional.

completed several installations, which provide the buildings' heating and cooling from either the municipal or the building's sewage waste water. In a recent 172-unit condominium complex installation near the University of British Columbia, the system provides hot water for

IMAGE CREDIT: INTERNATIONAL WASTEWATER SYSTEMS

Heat Source. The *Sewage SHARC* from International Wastewater Systems processes raw sewage in preparation for recovering its heat energy. The system is fully sealed and odor-free.

all of the units at about 550 percent efficiency, saving the residents about 70 percent on their hot water heating bills. In addition, there is an estimated 100 ton per year emissions reduction.

MARKET OUTLOOK

Mueller says there is a two- to five-year payback for the *Piranha* system for multifamily building owners. "The cost is based on the size of the building, but, for example, if you have 50 units, you would need one *Piranha* at about $60,000, which would make about 4,000 gallons of heated water a day," he says. "It's not custom equipment; it comes as a package and is virtually maintenance-free."

IWS is now developing a prototype in Europe for single-family homes. "It won't be on the market for some time, because usually the per-household water use is about 900-1,000 gallons a year, so the payback would be longer. But we are working with boiler manufacturers on ideas," Mueller explains.

He points to HRV and ERV adoption as an example of how wastewater heat extraction will probably follow: "HRVs were a pain in the rear when they first came out. Now they are code, and you can't build without them. More energy can be recovered from water than air, and for this reason we think our [type of system] will be a code item soon one day." A few forward-thinking companies, including Nexus eWater, are counting on this, and have already developed waste heat recovery technologies for the residential market.

"The future for the environment, for the world, is to do things differently," Mueller says. "Recycling waste water will be key, and we want to be a part of it." GB

Rewarding Innovation

This past January, IWS was awarded a Green Building Innovation Award at the AHR Expo (a heating, ventilating, AC and refrigeration convention). The annual AHR Expo Innovation Awards competition honors the most inventive and original products, systems and technologies and is judged by a panel of experts from ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).

IMAGE CREDIT: INTERNATIONAL WASTEWATER SYSTEMS

Ground Control. DDC system controls include a touch screen interface, data logging and remote monitoring capability.

Watch the system in action here:
http://bit.ly/1pok4x8

New Path for Compliance for New Mexico Tax Credit

Owners can now use a Water Efficiency Rating Score (WERS) certificate to show compliance with the State's Sustainable Building Tax Credit program.

BY MIKE COLLIGNON

SINCE 2009, THE State of New Mexico has offered a sustainable building tax credit to its builders. It has been a strong driver of sustainable homebuilding throughout the state. The program, operated by Build Green New Mexico, is both very popular and lucrative, with a maximum tax credit of $13,000 per house. So it was no surprise that the program ran out of money well ahead of schedule. When the State legislature was asked to extend the tax credit, state politicians stipulated that the water efficiency requirement be increased.

Starting on January 1, 2017, an "owner of a building in New Mexico that has been constructed, renovated or manufactured to be a sustainable residential building and that receives certification [...] may receive a certificate of eligibility for a new sustainable building tax credit." When the owners file their documentation, they will be allowed to attach a WERS report to show compliance with the new water efficiency requirement. The WERS program joins Build Green New Mexico and LEED for Homes as compliance paths for water.

Kim Shanahan, executive officer of the Santa Fe Area Home Builders Association, was a big proponent of the WERS program's inclusion in the tax credit extension. "The original language in the legislation simply said a new home had to meet EPA WaterSense. But WaterSense only measures products, and only few products at that. We knew we needed something that could account for all water usage, no matter the product labeling, and for both inside and outside the house. The WERS tool does exactly that," Shanahan explains.

New Mexico Sustainable Building Tax Credit Specs

For qualifying residential projects, the tax credit ranges from $3.00/ft² (for ENERGY STAR-certified manufactured homes) to $9.00/ft² (for LEED Platinum or BGNM Emerald projects). Values go down after the first 2,000 ft².

Requirements for Residential Buildings:

- HERS Index of 60 or lower
- Build Green NM (BGNM) or LEED for Homes Silver certification or higher
- Manufactured homes must be ENERGY STAR certified

ABOUT THE WERS

The Water Efficiency Rating Score, or WERS (**www.wers.us**), is a predictive, performance-based approach to residential water efficiency and water resource management. The WERS is the culmination of calculations that consider the loading from principal plumbing fixtures, clothes washers, structural waste and outdoor water management. Potential rainwater and graywater catchment are also calculated. Applicable for both new and existing single-family and multifamily residential properties, it uses a scoring scale of zero to 100, with zero being the most desirable and 100 representing the baseline property.

The Green Builder® Coalition is the program sponsor for the WERS program. Since February 2014, the Coalition has helped develop the WERS program for new and existing residential properties. It was first used in November 2015 to help a New Mexico homebuilder save significant time and money on his pursuit of a local building permit. **GB**

COURTESY OF
The Green Builder® Coalition

The Green Builder® Coalition is a not-for-profit association dedicated to amplifying the voice of green builders and professionals to drive advocacy and education for more sustainable homebuilding practices. (**http://GreenBuilderCoalition.org**)

For more information, contact Mike Collignon, executive director at mcollignon@greenbuildercoalition.org

AD INDEX

COMING NEXT ISSUE

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Let the Good Times Roll

Electric vehicles with grid-integrated charging. Self-driving cars. Next-generation fuels. When it comes to sustainable transportation, there's a lot to be excited about.

Special Report:
Renewable Energy Update

Solar energy has been in the spotlight the last couple of years. We'll looks at the renewable energy forecast for the next decade—and what it means for the building trades.

IMAGE CREDIT: STEVE JURVETSON

FROM THE TAILGATE

New Offerings for the Sustainable Minded

By Ron Jones

The Weakest Link

BACK IN 2005 when we founded Green Builder Media, I was so naïve to believe that the doors to marketers at building products manufacturers and those who provide services to the residential construction industry would swing wide open when they saw us coming.

After all, with more than twenty years of experience in the homebuilding business, a well-established and recognized brand and trademark, a growing awareness about the surging interest in green building and sustainable development, and a personal reputation as a national leader in the arena, what could possibly get in the way of engaging the folks who make their living selling to homebuilders?

As it turns out, I didn't have a clue as to the realities of how marketing departments for these companies—and the outside agencies many of them employ to deliver legions of ravenous building professionals to their doorsteps—go about accomplishing their goals.

Before long, it became painfully obvious that although there are exceptions, most conversations about how to reach potential customers had very little to do with even the most basic understanding of the industry, but plenty to do with mythology, misinformation, legacy relationships and old habits that die hard, on one end of the spectrum, and meaningless formulas employed by clueless newcomers who have no answers and don't even know the relevant questions to ask, on the other end.

Even today, if we probe these folks to ascertain their basic knowledge of who they're trying to sell to, we are greeted with blank stares and little else. Sometimes, I try to engage them in conversations by asking simple questions like: "Who are you trying to reach with your message?" Usually, the answer is "builders and architects."

I follow up by asking them if they know how many new housing units were built in the U.S. last year, how many of those were single-family homes versus multifamily units, and how they differentiate their marketing to these two categories. If they don't have ready answers, they're already working themselves out of business—even if they haven't realized it yet.

So, how many of those single-family homes are built by, say, the top 50 or 100 (by volume) homebuilding companies in the country, and do they market their offerings to the rest of the builders the same way as they go after the big boys? If the answer is yes, there is probably no point in wasting any more of their time, or mine.

Okay—do they know how many active homebuilders are there in the U.S. today? They usually don't, but they almost always think the number is much greater than it really is. And as for architects, what percentage of new single-family homes are actually designed and specified by architects? Again, they aren't sure, but their guess is always high, so one cannot help wondering if it makes sense to be pursuing them or not.

So how do builders personally select the products and services for their projects? Do they make unilateral decisions, or are they influenced by their customers, their subcontractors and their suppliers, and how much are their choices dependent on their price point, location, climate and the building code?

Does a shotgun approach to selling in this industry really result in success? Does anyone actually have the recipe for the "secret sauce," and do folks in marketing care enough to learn the answers? **GB**

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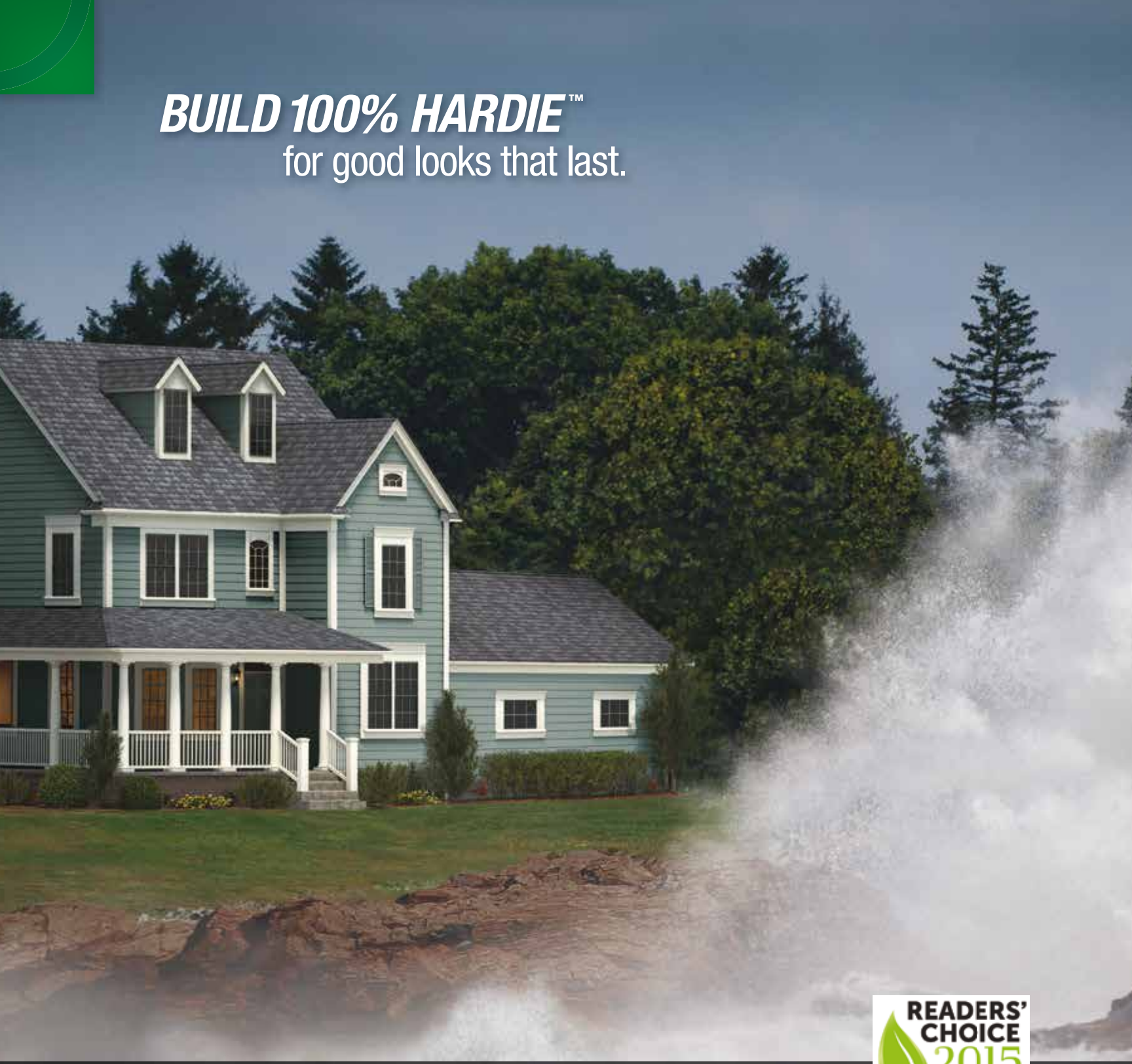

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