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Green Building
DIRECTORY 2016-17

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Westwood Co-housing in West Asheville includes 23 energy-efficient dwellings and the original farmhouse, all clustered around two pedestrian commons and a central common house. Buildings utilize passive solar design, tight building envelopes for energy efficiency, centrally supplied hot water and radiant floor heating, and landscaping for light and shade and multiple functions. People of all ages, family types, races, occupations, income levels, sexual orientations, religious beliefs are welcome. Priorities include a wholesome environment for young people, efficient utilization of resources, and ample opportunities for members to learn skills that enhance community life. The community is organized as a Planned Unit Development (PUD), which allows for clustered buildings and preservation of commons green space. Margaret Hester photo - pictographybymargaret.com



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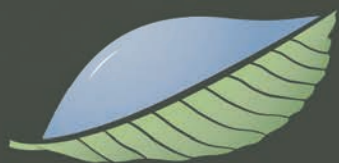


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Welcome to the directory

What you hold is a tool for education, outreach and growth of the green building industry in Western North Carolina. Through a partnership between WNC Green Building Council and The Smoky Mountain News, we offer this free resource on green building to the public and building professionals. The articles in the publication span the range of very technical to the very basics and provide

you keys to successfully reducing energy and water use, improving indoor air quality, choosing the best materials, and being a steward of your home site. For those of you ready to either build a new green home or green your existing home, the business listings will connect you with the many great local companies that are greening Western North Carolina each day. To prevent green washing, as much as possible, all businesses must meet minimum criteria to be listed in this guide and all are members of the WNCGBC.

Over the past 15 years, the WNC Green Building Council has made incredible strides in expanding the know-how of green building in our region through the certification of more than 1,450 new homes, organizing

green home tours, creating new programs for existing homes, and educating professionals and the public in many ways. We also offer a free hotline for your questions, a plethora of online resources and technical assistance through our programs.

If you are building new, the WNCGBC can help you through the process of certifying your home through Green Built or LEED for Homes. If renovating



Solar heat is growing in popularity in the region. Timberwolf Builders photo

your home or buying or selling a house, consider our Green Gauge Assessment tool.

As a membership-supported nonprofit organization, the WNCGBC is here to serve the community thanks to our business and individual members' continued support. We hope that you find the Green Building Directory a valuable resource and support its continued publication through membership with the WNCGBC.

How to use the Guide:

This Directory has something for everyone. Inside, you will find case studies of specific regional projects, feature articles on a variety of themes in green living, and technical articles on emerging technologies for professionals.

In the back of the Directory, you will find a vast directory of local green businesses that are there to help you live a more sus-

tainable life. There are specific requirements for many of the business categories in an effort to keep high standards and provide a truly valuable resource.

Of course, the Directory – both current and archived articles from past issues – is always available online at www.wncgbc.org.

Sam Ruark-Eastes,
Director WNCGBC

Who is the WNCGBC?

We are an organization of people who care about where we live; in our homes, neighborhoods, and the planet. Founded in 2001 by a group of building professionals who wanted to craft homes that were easier on the environment, had lower utility costs, were more durable, and healthier to live in, the WNCGBC continues to serve our region with sustainability programs and education.

We are accomplishing our mission to advance sustainability in the built environment through community educa-

tion, measurable standards, and regional action by building a network of engaged building professionals and citizens who desire to have healthy homes, successful businesses, and participate in the movement of sustainability.

We are currently working on:

- Expanding Green Built NC and LEED for Homes: With more than 1,450 certified homes and counting, these successful programs are being used by builders of affordable and market-rate housing throughout the region and

state.

- Implementing Green Gauge: Green Gauge helps existing homes go green by showing how a home can improve energy and water efficiency, indoor air quality, the use of green materials, and a sustainable site.
- Reviving Appalachian Offsets: This local solution to global pollution allows residents and businesses to offset their carbon footprint while supporting affordable housing and non-profit organizations through energy efficiency upgrades.
- Running the Living Building Challenge Design Competition beginning in September 2016.



Year in Review Accomplishments of the WNCGBC:

- Hired a new Executive Director
- 148 Green Built Certifications
- 138 LEED for Homes certifications
- 15 Green Gauge assessments
- Net Zero Energy certification and Green Built Version 2 launched
- Obtained \$25,000 in grant funding to relaunch Appalachian Offsets
- Obtained \$9,000 from the Blue Ridge Sustainability Institute for Green Gauge marketing
- Partner of USDOE to deliver Home Energy Score throughout North Carolina
- Trained 11 Assessors in Home Energy Score
- Exhibited at four trade shows (Home garden and green living show, Build and Remodel Show, HBA Trade show, Mother Earth News Fair)
- Two Building Green Real Estate Classes
- Quarterly classes with On Track Financial to help homeowners save money and energy
- Joined the Energy Innovation Task Force with City, County, Duke, and nonprofit, educational, and business leaders
- Annual Membership Appreciation Party at Highland Brewing
- Green Homes Tour
- 25,000 copies of the Directory distributed
- Hosted our third Annual Ciderfest for 800 attendees

- Producing high quality educational workshops and trainings.
- Providing educational resources through this directory, our website and hotline.
- Promoting green building professionals and sustainability businesses to the community.
- Throwing CiderFest, a fun-filled fundraiser celebrating our local community (this year October 15, 2016, at Salvage Station).

Thank you to our members for all the good work you do for this community. We hope this year's guide will be a valuable tool for the residents of Western North Carolina.



Olivette, a planned community right outside downtown Asheville along the French Broad River. Bren Photography

Creating the world you envision

Green communities emerge in WNC

By GARRET K. WOODWARD
In Western North Carolina, the green-built movement has transitioned from scattered dots of sustainable construction into pockets of sincere interest and activity, with the scene itself shifting into its next phase of operation – green communities.

“It’s not about the biggest house you can build, it’s about building a thoughtful home – making all of these small changes in hopes of creating a large impact,” said Lesley Groetsch. “How do you get people the maximum energy-efficiency benefit with the smallest investment? Because, frankly, people are about the bottom line.”

Groetsch is the director of sales and marketing for Olivette, a 346-acre planned community right outside downtown Asheville along the French Broad River. With the first of 40 homes to break ground later this year, the “agrihood” property is where sustainability and livability intersect.

“There’s a desire and a will within this community to propel us forward,” Groetsch said. “There are a lot of options now. You can build that sustainable dream house of yours, with all kinds of these differ-

ent aspects available to meet or exceed rating standards to achieve net zero – the tool box is big these days.”

Within Olivette, there are solar energy and geothermal heating/cooling initiatives, which complements the physical features of edible landscapes, local grown produce and sustainable building practices. That sentiment is something Bernie Byrne shares too.

“You realize we need to do something different,” he said. “It’s solar and wind energy. It’s keeping as

“It’s not about the biggest house you can build, it’s about building a thoughtful home — making all of these small changes in hopes of creating a large impact.”

— Lesley Groetsch, Olivette

many trees on the property as possible. It’s being responsible with your water and the land itself, and not destroying the land like other commercial developments do.”

Owner and developer of Mountain Meadows, a 58-acre green community in Mars Hill, Byrne is all about working with the contours of the land, something that’s at the heart of the green communities movement.

“I walked the land, and I listened to the land,” he said. “It’s making that real connection to the earth,

to the soil and your surroundings. The ‘Greening of America’ was an overall concept, not only for homes, but also about recycling and also treating each other well.”

Within the 28 lots on the Mountain Meadows project, nine are already sold. The infrastructure is complete and one house has been built, as that number will steadily increase over the next year. For Olivette, the mountain village already has a 46-acre working farm at its core, which features an array of produce, vegetables, flowers



Lesley Groetsch



Mountain Meadows.

and bees, something that sits inline with the project’s values and mission.

“We recognize you can’t just give lip service about localizing our food source,” Groetsch said. “And what’s really resonating with our homeowners is the farm, having access to food virtually grown in their backyard, having access to a farmer with our community garden, who also serves as an advisor to community members setting up their own gardens.”

That keen attention to detail, with food and with community connections between neighbors, is something that speaks to Byrne, who himself grew up on a working farm in small-town Iowa.

“It’s about eating real food,” he said. “Everything changed in the 1960s and 1970s when it comes to how food was grown and gathered. It went from the fields to the factories, and now we’re turning that practice back around.”

In terms of green building, Mountain Meadows requires its homeowners to stick within the Green Built NC guidelines, whereas Olivette looks to residents to hit a HERS rating of 55 or lower.

“And we let the homeowners work with their builder to get to that HERS rating,” Groetsch said. “Instead of one way or option to build, we let the homeowners decide what path is best, and what path they’d like to create, to get to that rating.”

But, with all of the interest in green building and communities in Western North Carolina, Groetsch is quick to point out how the state’s laws and guidelines are still “behind the curve” compared to other places around the country, which is something to keep in mind knowing that many folks relocating to

this region are coming from out of state.

“People who are moving here are coming from states with more stringent codes that we have in North Carolina, so we have to be ahead of the game here because they expect that coming here,” she said. “If you’re not ahead of the current state codes here, you might be selling them an inferior product compared to where the prospective homeowners are from.”



And as Olivette and Mountain Meadows each push forward with their respective projects, the idea of green communities is a growing, bountiful seed in the minds of builders and developers around Western North Carolina and greater Southern Appalachia.

“When you move into a community that is planned around a set of values you relate to, you’re going to find that you’re doing the right thing – by the environment, by localizing your food supply,” Groetsch said. “And you will also find the intangible aspect of making a connection, with the people and the land, where you focus on the fundamentals of the vision and the values.”

“We as people have a chance to do something special – with each other, all while taking care of each other,” Byrne added.

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The West Asheville net-zero spec home features a modern farmhouse design coupled with sustainable elements that give it a HERS index of 14.



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The Road to Net Zero

BY GARRET K. WOODWARD

It's beyond aesthetics and aiming to be sustainable – it's the inevitable.

"The way everything is going in our world, people are starting to appreciate being sensitive to resource consumption," said Emily Boyd. "People these days, who are going to build and buy homes, they're more in tune with sustainable building – it can only be a growing segment of the market."

Co-owner and designer at Mountain Sun Building & Design in Asheville, Boyd built a net-zero certified spec home in West Asheville. The house was the winner of the 2015 AHBA Parade of Homes "Green Home Award" and "Gold Craftsmanship Award." And amid recognitions – the ENERGY STAR, EPA Indoor AirPlus and Green Built

NC – net zero Energy Platinum Certification – Boyd and her co-owner husband, Jeb, simply believe in the idea of instilling sustainable building practices.

"We see sustainable building as the right thing to do," Emily said. "It's what we feel is responsible development. We're not doing it because the market is asking for it. We're doing it because it's the right thing to do, and we want to push the market in that direction of sustainable building."

A 1,953-square-foot three-bedroom abode, the home is at the crossroads of net-zero construction and having enough space to fit one's lifestyle, an elusive square footage number that Emily deals with day in and day out when clients walk in the door. It's making a cozy, sustainable home, and not cram-

Net zero energy home by Mountain Sun Building & Design

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- Passive and active solar technologies
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- Modern farmhouse design with gardens in front and level, shady back yard
- Open floor plan with large South windows for day lighting and solar gain
- All walls & trim finished with low-VOC premium paints, stains and polyurethane
- Integral color concrete slab floor on main and hardwoods on upper level
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- HERS 14 index = 86% more efficient than same home built to code
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- JeldWen Sitaline aluminum clad wood windows
- Concrete curb and pebble or other permeable driveway for off-street parking

ming your existence into a shoe-box-sized structure.

"You have to educate people. I don't ask our customers to tell me how many square feet they want. I start by asking them how they live their life, and where they spend most of their time in the household,

to figure out their square footage needs," Emily said. "I find that people usually don't have an accurate number of square feet they need, it's usually a higher number than they have in mind. We try to tailor the square feet to their needs, but also have that space feel larger and

"We want the site to respond to our design – what is the site telling us, and what do the homeowner ultimately want?"

— Emily Boyd

how deep the concept is, all the different categories for a built-from-scratch home and ways to make a conventional construction more sustainable – it's better for the inhabitants, better for the environment, better for the community."

Mountain Sun Building & Design focuses on the property itself, where they follow the contours of the landscape, looking for the best way to not only sit the house on the lot, but also make sure it ideally harnesses the natural resources available, whether it be solar orientation, access to water supplies, reclaimed wood from onsite, or merely taking advantage of the winter sun for passive heat with window placements.

"We're very site specific, from the ground up," Emily said. "We won't design a house until we have a piece of property, because we want the site to respond to our design – what is the site telling us, and what does the homeowner ultimately want?"

When asked about the importance of doing your research and weeding through all of the terms, lingo, concepts and all things "sustainable," Emily pointed out the importance of sitting down and discussing your vision – what you want and the budget – with a certified Home Energy Rater, something that will save you from future problems.

"There's a lot of green literature these days," she said. "You really need somebody who understands the process – the more efficient in your decision making and choices in the beginning, the easier it will all be down the road."



more comfortable too – it's about being smart with the use of square feet, every bit of it intentionally planned."

And in an era of exponential interest in sustainable building, Emily emphasized the importance of truly knowing what "net zero" means, what the difference is when compared to other "green building" features that are often just diluted buzz words for marketing purposes.

"There are a whole range of homes being marketed as 'green homes,' and what we try to do is hit the responsible way of doing things," she said. "There's a lot of 'green washing' going on, and we try to educate consumers that there's a lot of levels to it. We show them the Green Built NC checklist because that really explains just

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Finding balance — Asheville Yoga Center

□ BY GARRET K. WOODWARD □

Sunny Keach wanted more. “You get in this reality of what you can actually do with your business, what builders can actually do these days, and what banks are willing to work with you in terms of your vision,” he said.

Co-owner of Asheville Yoga Center, Keach is at the helm of the almost 20-year-old business that pushes forth an agenda of yoga and community all wrapped in a sustainable mindset.

“It’s minimal waste with maximum efficiency,” he said.

Located on Liberty Street, the original building (occupied since 2001) was a work-in-progress as the center refurbished the structure, implementing green initiatives (such as solar panels) while growing the brand as one of the premier yoga facilities in the country. But Keach was looking to expand, and expand smartly.

Seeing what Earthhaven Ecovillage in Black Mountain (an intentional community) was doing in terms of sustainable living and edible landscapes, Keach decided he wanted to pursue something similar with the new center.

“When it came time to construct the second building, I wanted to go that route, which was a low carbon footprint within a design that was functional and efficient,” he said. “We geared the new facility more towards long-term sustainability, one that will use the least amount of energy over time.”

Opened on New Year’s Day 2012, the two-yoga-room 3,500-square-foot half-acre building ideally complements its original refurbished sibling. The property is decorated with an array of edible and aromatic native trees and plants. The building is situated on an East/West axis, which provided for optimal natural light and a passive solar advantage with numerous panels installed on the roof. Rainwater is also directed back into the



Asheville Yoga Center’s 29.1 KW solar system by Sundance Power. Elliot Dunwoody photo

ground instead of the nearby street.

“If you have a business that affords you some opportunities to create some green realities, why not make some of those realities you want to see in the world?” Keach said. “One of our core values is high quality, and we’ve always done our best for high quality with our service, but now we can also offer high quality in the facilities and the location. The building creates and nurtures the spirit of yoga, which is one of calming and centering, with no distractions. And with the natural, edible landscaping, we’re also able to continue to carry our values outside of the building and onto the property.”

Keach also went with Superior Wall construction. The easy-to-setup

walls allow the builder to install the high walls immediately, and with minimal onsite waste that would otherwise end up in a landfill. The walls also eliminate site disturbances, where now a quiet, well-insulated space is constructed. The airtight nature of walls plays into its heating and cooling, with the center using an efficient zoned heating and air conditioning system, which features a fresh air heat exchange and a DuctSox ductwork system. Simply put, hot air is removed between sessions as conditioned air is circulated throughout the building in an eco-friendly fashion.

“We were open for business within a six-month timeframe using the Superior Walls,” Keach said. “There was no need to dig a base-

ment. You just level the land, add gravel, put up the walls, and have almost no leftover waste, which was something I really wanted to focus on – keep the cost down, and also keep the waste down.”

With a total price tag hovering around \$1.4 million, Keach looks at the entire project with all of its green initiatives as an investment in not only his company, but also his community and the future of those around him.

“It’s about thinking more than just the bottom line, and a lot of the time these green initiatives impact the bottom line positively,” he said. “These initiatives do give us more attention and more clients, because they care about green features – people vote with their dollar.”




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The Rhodo Renovation

A case study in 'Right Size' Design

By SEAN SULLIVAN
My wife Laura and I decided to buy a 1960's rancher in downtown Black Mountain to renovate for ourselves. We liked the feel of downtown and wanted to be close in to the lake, park, pool and center of town. We had our work cut out for us though since the home hadn't been touched in nearly 40 years!

The 900-square-foot shack sat on a crawl space situated nicely on a corner lot near the golf course. Believers in making all things beautiful, and the desire to give every home we touch "curb appeal," we first nailed down the floor plan.

We wanted to keep as much of the original structure as possible, leaving the two exterior door locations, existing room layouts (virtually the same), as well as the original location of the hallway and common bath. Because we had to combine the two end bedrooms into a master suite, we needed to design a small addition on the back to replace the lost bedroom and give the home a proper kitchen.

We enlisted the help of an architect partner to create the new style, passive solar design, and get the exterior elevations just right. After that was nailed down, we set out to make this the most efficient use of space we could create. Since most of our clients end up building homes larger than they had originally



A 1960s Black Mountain home after it was remodeled. Sean Sullivan photos

intended (due to having lower levels on sloping lots), we wanted to show what it meant to "right size" a home.

"Right sizing" a home means that you prioritize "quality over quantity," rather than the premise that "bigger is better." As green designers and builders, we also wanted to show that saving a home in an existing neighborhood is priceless when you want to be able

to walk to what's important to you. We designed this home so the 1,450-heated-square-foot main level would be all we would need on a daily basis. We utilized the lower level of the new addition by designing it to be a separate art studio for my wife who is not only an interior designer, but also an artist.

The crawl space that adjoined the existing one-car garage was

dug out by hand in order to create space for the mechanicals, storage, extra bathroom, and TV room/bedroom for the occasional visit from the college student. We intentionally did not include an interior staircase so these overflow spaces could be used when there was want, but not out of need.

Now that the spaces were identified, Laura went about designing



Before the remodel.

each space for maximum use and aesthetic value, while I worked with our Energy Rater to make this the most energy-efficient and green project we possibly could. We began with saving the existing (sinking) foundation by having helical piers rammed into the earth beneath the south corner. We also discovered the previous tenant had been an earnest gardener so we gave away most of the plants in the yard that we couldn't use to interested neighbors and the adult children of the now-deceased previous tenant.

Saving as much of the structure as possible while still being able to get the home certified, we left the exterior 8-foot walls, but raised them to 9-foot, 6-inches by running beams around all the top plates. The exterior walls were then wrapped with foam board insulation to seal off any air infiltration and add maximum insulation values. Wanting a new contemporary look to the home, we opted for a glass garage door as an entrance to the art studio. The only calculated energy loss to the project, we felt it was important to get light and ventilation into the space.

Most visitors get caught up in the details of the architecture, interiors and furnishings while others can't believe the home is only 1,450 heated square feet on the main level. The "outdoor living" spaces are connected to the home by the use of glass, slider doors, and wrap-around porches and patios.

True energy connoisseurs like myself are all about the "performance" of the home though. The mechanical room contains the air handler for the geothermal HVAC system, Energy Recovery Ventilator (ERV), dehumidifier, built-in floor drain and electrical panel that pipes in the solar from the roof. You wouldn't know that the home had solar though because the panels are cleverly hidden behind the butterfly roof facing due south.

One of the biggest surprises has been the "wine room." It started out as just a wine closet in the corner of the basement next to the mechanical room. However, when we decided to use the "jail house" door that was given to us by Laura's aunt, it became an all-out cellar clad with stone all the way up to the 7-foot ceiling. We took a slab of oak from a recently timbered tree (to create a table top) and created wine bottle holders by building a plywood box beneath it and a shallower one above it with 1-inch holes in it to hold the "necks." Lastly, we ducted in the cool exhaust air from the heat pump water heater in the room next door to "chill" the bottles.

As construction drew to a close, we finalized trim and furnishing details. The leftover trim materials were recycled to create a "puzzle trim" detail for the base of the island and as an accent wall in the master bedroom. Saved slabs of walnut were used to make the dining room table that we designed, as well as miscellaneous shelving. Our middle son's bed was built from shiplap siding that was left over and Laura's art-hanging wall was finished with the recycled stained tongue and groove soffit material.

A lot of thought, planning and ingenuity went into getting the Platinum certification we received from Green Built NC as well as the low HERS index of 30. It is very satisfying to see how well the design worked on the lot, how effective the spaces have become, and how comfortable the house is. However, the greatest satisfaction that we have achieved through this exercise in "right size" design is that we get to call this place ... home.

Sean Sullivan is president of Living Stone Construction, a local Design+Build firm located in Black Mountain. As past president of the AHBA, the NCHBA, and Vice Chair of NAHB's Design Committee, Sean's passion for leadership in design has propelled his business to become the trendsetter in his local market.

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Coming down the mountain



A swale created along the property's hillside captures the stormwater overflow, keeping the water on the land. Garret K. Woodward photo

By GARRET K. WOODWARD
Turning onto Audubon Drive in Woodfin, the road winds up the steep hillside, with nearby Interstate 40 fading below, the cityscape of Asheville in the distance. Soon, a residential property appears with a large garden covering the front yard.

The garden, alongside the property itself, is lush, more so than one would believe seeing as Western North Carolina has been experiencing drought-like conditions this year.

"For what we're trying to do, it's about taking responsibility for the effects that my presence has on the environment," said Benjamin Portwood. "It's taking the rainwater falling on your property and making sure it doesn't become a problem for someone else, where it now will become an asset to yourself and your property."

ecological landscaping), Portwood strolls the private residential property, one where the front yard is one large slope downward to the street.

"During rain events, where we experience heavy water flow, as with this steep front yard, the water runs off the property, ultimately flooding the street and making the French Broad River rise exponentially," he said.

Portwood points to a large 1,500-gallon rainwater collection cistern butting up against the residential home. For every inch of rainwater falling on the property, Portwood estimates between 5,000 and 8,000 gallons of water is collected, either through the cistern or by the numerous swales that take the overflow and meticulously distribute the water around the landscape.

"For the rainwater harvesting collection here, we do what I call an 'active' process, which is rainwater harvested through the cistern that has a pump-distribution system

with an irrigation timer that manages the garden," he said. "The overflow from the system goes into the earthworks, in this case swales, that are also known as 'green gardens' and 'basins,' all of which prevents the rainwater from leaving the property."

Within their low-maintenance edible landscaping and rainwater



Benjamin Portwood

collection designs, the company installed more than two-dozen species of plants and trees on the Woodfin property – blueberries to pears, apples to chestnuts, mulberries to asparagus. Atop that, they also planted a natural wildflower meadow mix where more than 30 species of the picturesque blooms are showcased for looks and for purpose.

"It's about sustainable landscaping, and being able to grow all types of food on your own property," Portwood said. "A lack of water infiltration into the ground is responsible for both droughts and flooding. The water running off the property will cause drought-like conditions because it's not infiltrating the ground. With the collection systems and edible landscaping, we're now able to have water stored in the soil, and in the cistern, to be used when drought conditions affect the region."

Portwood noted that municipalities around the country are already instituting green ordinances focusing on rainwater collection, seeing as droughts are projected to become more frequent and stick around much longer (and storms that do occur to become more aggressive) as we push further into the 21st century.

"Asheville is already on track to someday have these green ordinances," he said. "And with collecting the stormwater on your own property, you're not only saving on your water bill and having a fresh source of rainwater, you're also saving your local municipalities money due to the fact there would be a decreased need for expensive earth and stormwater mitigation projects."

Just like solar energy, Portwood pointed out that the upfront cost for rainwater collection systems is becoming more and more of an affordable option for homeowners and commercial businesses. That upfront cost will lead to long-term savings, and with that, the technologies and initiatives themselves can be tailor-made to each customer.

"There are expensive and inexpensive options," Portwood said. "It's about what your needs are, what your budget is, and what you ultimately want out of your system – it's making what was once a nuisance into an asset for your home."

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Fontana Lake Residence

A case study in beautiful efficiency



BY MARGARET CHANDLER
The Fontana Lake Residence is a great demonstration of design elegance harmoniously integrated with environmental sustainability.

This handsome home achieved LEED for Homes Gold certification with a total of 75 points, and earned Green Built NC certification. Located on Fontana Lake, the home has a strong emphasis on outdoor living, featuring a tree-filtered westerly view of the Fontana train trestle and mountains beyond.

The owners selected the location for quick access to lake activities – boating, kayaking, swimming, as well as lakeside campfires and gatherings. Both the site and house provide great lake views and easy walking to the boat dock and lakefront.

Serious consideration was given to the lakefront site, and special emphasis was placed on blending the home harmoniously with its mountain surroundings, to preserve the view quality for other lake enthusiasts. The understated Asian-influenced design nestles unobtrusively into the topography, and the materials and color palette recede into the wooded hillside.

Newly installed, mature landscaping further integrates the house into its setting. It is nearly invisible from the lake, despite being the closest house to the water. All of the plants are native and drought-tolerant, dramatically reducing the home's potable water requirements. Rainwater permeates through a strategic system of catchment, filtration, and slow percolation back into the ground; care was taken to prevent direct stormwater runoff from causing shoreline erosion or further burdening the lake.

Unique to the project, a pre-Depression-era concrete road – on site since before Fontana Lake was dammed – was broken into stackable pieces and used to build the retaining wall along the driveway. The driveway follows the approxi-

mate route of this old roadbed, repurposing an existing feature of the site and limiting further disruption of the property.

The home is distinctly and simply divided into two zones: two levels of bedrooms at the north end, and the kitchen and gathering spaces on the south end. Separating these zones are the transparent main-level entry and the stairs to lower lakeside level.

The entry is a contemporary glass-enclosed interpretation of a “dogtrot” – a traditional breezeway connecting two enclosed spaces. The material palette of the entry interior “brings the outdoors in” – the bluestone floor continues the exterior entry walkway material through to the lake-view balcony; the wall surfaces are a continuation of the exterior stained cedar shingle siding. A generous lakeside screened porch provides the primary outdoor living and dining space during the temperate seasons. The porch opens to the outdoor fire pit and entertaining terrace, and connects with the kitchen via doors and a pass-through window.

The interior of the home embraces the attitude of the exterior. Due to chemical sensitivities, the homeowners requested that special attention be paid to low- and no-VOC materials throughout the interior. While western

red cedar shingles clad the exterior, gray-washed eastern white cedar shingles mimic the coursing of the exterior siding on the feature walls in the entry.

This change in materials is because eastern white cedar is less toxic, and western red cedar is better-performing outdoors. The interior shingles were faux-finished with a diluted zero-VOC interior paint. All flooring is hard surface, to eliminate the accumulation of particulates and off-gassing common with carpeting. High-filtering MERV 9 air filters are installed in the forced-air system, to reduce particulates recirculating through the ductwork. To increase residents’ comfort, the mechanical room is extensively soundproofed from the rest of the house.

With a HERS index of 52, the Fontana Lake Residence is 48 percent more energy efficient than a home built to code. To achieve this high level of energy efficiency, a multi-point approach was taken.

Expansive windows on the west, south, and north walls provide inspiring daytime views, ample daylighting to reduce electric lighting needs, and effective ventilation. The primary view to the west showcases the spectacular mountain sunsets, but presented a solar heat gain challenge. To address this, a six-foot roof overhang and con-

cealed, electric roll-down shades provide full sunlight control.

The geothermal HVAC system includes an energy-recovery ventilator (ERV), allowing latent heat in the conditioned air to be reused, instead of being discharged outdoors. The home is insulated with high-performing Icynene insulation, and all doors and windows have an average U-factor of about 0.26. The geothermal HVAC system is SEER 15, and the cooling equipment uses no HCFCs.

Environmentally preferable materials were used whenever possible, including masonry made of 30 percent fly ash, gypsum wall board made with 95 percent post-industrial recycled content, roofing made of 25 percent post-consumer recycled content, and FSC-certified wood.

Material-efficient, increased-span framing techniques comprise the building’s shell. In a near-perfect example of both waste reduction and local material usage, an existing concrete road bed running through the site and was broken up and reused on-site as a retaining wall.

This home is an exemplary exercise in blending environmentally responsible design with beauty and function. It is lakeside living in the mountains at its finest.

Margaret Chandler works for Samsel Architects.



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hovering around 1,500 square feet, something that plays into the modern mindset of simplification for younger families and retirees. The buildings combine the company's acclaimed structural integrity and 21st-century green technology, of which the models are built in their factory and prefabricated for their clients.

"It's a combination of old-school knowledge and new technology," Dickens said. "Passive solar is the backbone of the design, and we've known for a long time that solar works, and now we can pair that with all of these new energy-efficient gadgets – it's the best of both worlds in terms of human knowledge."

Within the Innovation Center, there is the passive solar design with a grid-tied 5.12-kilowatt solar photovoltaic array located on a two-pole mount in the yard. The high performance insulation includes R30 spray foam insulation, R24 walls and R10 insulated slab foundation, which ties into the south-facing windows in the open living space with limited glass on the east and west sides of the building.

The center also showcases a mini-split HVAC system and fresh air ventilation (ERV) or energy recovery ventilator (ERV). The ERV has a built-in heat exchanger that preheats incoming air which utilizes heating energy from the outgoing air. Add in a heat pump water heater, ENERGY STAR-certified appliances, efficient lighting, low-VOC paint finishes, and edible landscapes (of native plants and trees), and you

are just touching the tip of the iceberg as to what the model can and will do.

"With so many fancy gadgets on the market, it can be a real challenge for homeowners, as in what will go together well with what they want to do, what can they prioritize, and what is just a fancy gadget?" Dickens said. "And Deltec can build and find exactly what each home needs, and point our clients in the right direction of those technologies suitable for their specific project."

Of the key features in the center, one of the most important comes by way of the energy monitors and sensors. These tools provide Deltec with a vast resource of data that speaks to the unique weather of Western North Carolina, a region

with a large a spectrum of temperature and climate.

"One of our goals is to show the best features available, but also the ones that work the best for this particular climate," Dickens said. "We get to demonstrate what works in every climate without going too far into one climate. A lot of studies have been done on these technologies in colder climates, but our varied climate – really hot, really cold, and really humid – and our model center will play into those varying temperatures and elevations."

During the recent open house for the new center, several hundred folks attended, all in an effort to learn more about what could possibly someday become their cozy, sustainable abode.

"The market is looking for something smaller, and more affordable," Dickens said. "And, for me, it's just been fun to see all of this data roll in that will provide us with so much information on where we're at and where we're going with green technologies."

Deltec's Innovation Center

Modeling sustainability

Inside the Deltec Innovation Center. Deltec/Will Corkwright photos



By GARRET K. WOODWARD

When Leigha Dickens wanders around the Innovation Center, she can't help feel like she's in her own laboratory. "The data we're collecting here is not only for my own knowledge, but also for the knowledge of where the technology is at, and the way that technology affects everything else in the building," she said.

Green Building and Sustainability Manager for Deltec, a longtime Asheville-based company at the forefront of the green building movement, Dickens is excited about the endless possibilities of the firm's new center, which is a 1,500-square-foot model home that features the latest green technologies and innovations. The net-zero energy structure provides the company with a physical entity for clients and the curious alike to personally

explore and see firsthand just what they can do with their own housing projects and options.

"The most important thing is being able to have this tangible building to show clients just what we're all about," Dickens said. "We're able to demonstrate the passive solar advantages of the home, and show things like the water heater and how much energy each appliance is using just by pulling up the data on an iPad by the front door."

Though Deltec offers an array of its signature rounded-end homes of all sizes and features, the company was seeing the current market

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Better Together

Community and sustainability

BY OLGA RONAY
 You're interested in living sustainably, but wouldn't it be cool if all your neighbors were too?

For people who live in green communities, that's a reality. Planned communities, where the focus extends beyond an individual home or lot, create opportunities to meet residents' needs in ways that are sustainable, economical, beautiful – and maybe healthier, too. A sustainable planning approach can apply to infrastructure like drainage and transportation, as well as infrastructure that supports social life, like community gardens and common buildings. Let's take a look at some Western North Carolina communities that have built sustainability into their design. We'll also look at ways to retrofit the community you live in to make it more sustainable.

Designing a green community starts with understanding the site. What are its natural features? What's nearby? What impacts will be created by development? How can negative impacts be minimized, or better yet, turned into positives?

Two hallmarks of the Western North Carolina region are water and mountains – wonderful features when treated with respect. Keeping homes off of steep slopes and out of floodplains is a critical first step. But that doesn't mean residents have to forego mountain views or creekside walks. Clustering development on the most suitable land allows for larger open spaces that can protect natural resources, as well as be enjoyed by residents.

In West Asheville, Davenport Park clustered 15 houses on 2.4 acres. Individual yards are small; instead residents share an area of undeveloped land along a stream. That buffer protects the stream and connects to a public greenway – fostering connections with neighbors both inside and outside the community.

The open space created by clustering houses also supports a biologically-based stormwater treatment system. Rainwater can pose

problems in developed areas, not only for flooding but because of pollution from vehicles and litter. In Davenport Park, what looks like a planted area in the median is in fact an engineered stormwater system. Collecting the water protects against flooding, while plants and filtration media ensure that water is clean when it does reenter the stream. Some residents have also installed cisterns to collect rainwater from their roof, or to create rain gardens to hold water and help it infiltrate into the ground. In large-scale natural stormwater treat-



Cohousing boasts an impressive array of green infrastructure, but as an intentional community, its physical features are also designed to strengthen social connections.

ment systems, retention areas can double as play fields – when it's not raining.

Green homes are a given in green communities, but good planning can multiply the advantages. In Davenport Park, streets were laid out so that houses could take advantage of passive (and active) solar. At Westwood Cohousing, a 23-house community in West Asheville (featured on the cover), a central solar collector heats water



Davenport Park features a centralized treatment cell to collect runoff and filter sediment and pollutants. Equinox photo

As Western North Carolina becomes more sustainability-minded with its building practices, green communities are becoming a popular option for homebuyers. High Cove photo

used in all the houses, as well as for radiant floor heating.

Site location can offer significant sustainability advantages. With infill sites like Davenport Park, impacts to the natural environment have already occurred, urban services already exist, and higher densities and a mix of uses make it more likely that people can walk, bike, or use transit for daily needs. The city of Asheville has recognized such advantages in permitting projects like Davenport Park and Craggy Park, both of which required special City Council approval. The city is now considering code changes to reduce the barriers to small-scale infill development.

Rural and semi-rural communities also offer opportunities for sustainable development. At Drovers Road Preserve in Buncombe County, developers protected a 110-acre preserve surrounding the houses. "The preserve," says Dena Chan-

dler of Equinox Environmental, "was delineated based on an inventory of plant communities, water resources, and slope conditions, and is protected by a permanent conservation easement." Olivette, located along the French Broad River north of Asheville, calls itself an "agrihood" in recognition of the community's working farm. Like many rural communities, they offer a network of trails.

There's another dimension to sustainability – the social one. Westwood Cohousing boasts an impressive array of green infrastructure, but as an intentional community its physical features are also designed to strengthen social connections. Cars are kept at the edge, creating a central green space that's quiet and safe for all residents, especially children. In addition to individual homes, Westwood has a common house where residents gather for meals, movies, and birthday parties. The common house includes shared office equipment and guest rooms for residents' guests, which allows houses to be smaller and therefore less expensive to build and maintain. Westwood

also has a community garden.

Sharing things like garden tools, printers, and kayaks saves money and resources and makes it easier for neighbors to do things together, which in turn creates a strong social fabric. Intentional communities are often organized around shared values. The High Cove community, in a rural setting northeast of Asheville, is focused on environmental stewardship, as well as arts, science, and lifelong learning. The High Cove Institute and AS IF center help support this mission through events, classes, and residencies.

Living in a green community may have another advantage. Turns out that in addition to saving the planet, living in a green community may add years to your life. In his book "Blue Zones," Dan Buettner identifies characteristics shared by people who live the longest, health-



Community gardens are a key feature in many green communities.

iest, and happiest lives on the planet. These include moderate daily exercise like walking and gardening, eating healthy local food, and having multiple rich social connections.

The good news is you don't have to move to a green community to live sustainably. In fact, making the community you live in more sustainable is one of the most powerful things you can do – for yourself and the planet. Here are some ideas:

Invite your neighbors to a potluck – There's nothing like sharing food to build friendships. www.shareable.net/blog/how-to-reinvent-the-potluck

Grow a community garden – Potlucks are even better when the food is locally grown by community members. No space? Just start by planting an edible garden in your front yard. www.bountifulcities.org

Hold a community yard sale – Declutter your house, find treasures, make a buck or support a charity, and meet neighbors.

Share stuff – Shared tools, free community bikes, 'little free libraries' – all examples of the sharing econ-

omy. What's a good fit for your community?

Volunteer at a park, school, or community center – Get to know neighbors while supporting a community asset.

Start a neighborhood storytelling event – Storytelling is fun way to get together, and is deeply rooted in Appalachian culture.

Make places special through art or history – Celebrate the unique qualities of your community through public art, or connections to its history.

Support sustainable planning in your community – Learn about your community's land use and planning rules and support initiatives that will result in green, walkable, mixed-use, vibrant places. www.cnu.org

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Green Infrastructure:

The Great Shift in Stormwater Management

□ BY TIM ORMOND □

There was a time when stormwater was primarily considered a problem to be removed.

Get it off site as quickly as possible through constructed systems of gutters, pipes, ditches and concrete-lined channels. Out of sight and out of mind. But that limited view of stormwater management resulted in many unintended consequences, which often worsen over time, especially with increasing population, development and the proliferation of impervious surfaces.

These negative consequences include downstream flooding, streambank erosion, polluted receiving waters, impeded groundwater recharge, and degraded ecosystems and wildlife habitats.

The light at the end of the storm sewer is that a shift is happening. Just like the great shift we are seeing in the energy sector toward solar, wind and other renewables, a shift is taking place in the way we understand and manage stormwater. This new paradigm views stormwater no longer as merely a problem but sees it, in its rightful place, as a valuable and integral part of the interconnected hydrologic cycle that is essential to all life.

Nature as Teacher

Green infrastructure (GI) or green stormwater infrastructure (GSI) are terms now being used to describe an approach to stormwater management that is rooted in the function of natural watersheds. If you've ever been for a hike in the woods in the rain, you've seen the principles behind green infrastructure in action.

In a natural forested watershed, much of the rainfall is intercepted by the tree canopy and other vegetation, and soaks into the spongy leaf litter layer and soil below. Only a small fraction will run off in the form of stormwater runoff. Contrast this to what you'll observe in most urban watersheds, dotted with impervious roofs, streets, parking lots and other hardscape. In the urban landscape, most of the rainfall becomes stormwater runoff with only

a small fraction infiltrating the soil.

With green infrastructure, practitioners design systems where stormwater is intercepted, captured, stored, evapotranspired, dispersed, infiltrated and filtered through natural soil-based vegetated systems. And as the vegetation grows, green infrastructure can actually improve in function over time, taking up even more stormwater and removing more pollutants.

You may already be familiar with some green infrastructure practices, including cisterns for rainwater harvesting, rain gardens and bioretention cells, bioswales, wetlands, green roofs, permeable pavement, street trees, etc. Others may be less familiar, such as simple earthworks, sheet mulching (to build spongy top soil), redirecting downspouts to vegetated areas, creek daylighting, blue roofs, regenerative step pool conveyance, stormwater cascades, terraced bioretention, mushroom mycelium filtration, key-lining techniques and many more.

All of these practices employ basic strategies of slowing, spreading and sinking stormwater and, in the process, preventing the stormwater from conveying pollutants downstream. Green infrastructure also goes beyond individual practices by approaching stormwater holistically at a watershed scale and considering how combining and integrating these practices can provide even greater benefit. Protecting steep slopes, conserving forest and riparian buffers, preserving trees and open pervious space during development are also essential parts of a watershed-based green infrastructure approach.

People and Green Infrastructure

In addition to restoring natural hydrologic function, there are many other benefits to green infrastructure. Many of us who live in Western North Carolina have been drawn here by the stunning natural environment. We come for the mountains and the creeks, rivers and waterfalls which give life to the remarkable biodiversity of our region. A primary reason Asheville has emerged as Beer City is because

of our pristine mountain watersheds and pure water resources.

People love to be connected to water. Our very bodies are 60 percent water. One of the underlying benefits of green infrastructure is how it can reconnect people and communities to the water flowing within our landscape. Researcher Kathleen Wolf at the University of Washington has compiled more than 2,900 articles, many peer-reviewed, demonstrating the "co-benefits" of green infrastructure, which include everything from better public safety, reduced crime, increased property values, improved mental health and well-being, and green job creation.

Opportunities for connecting green infrastructure and local urban food production are also being ex-

plored. For example, the East Capitol Urban Farm in Washington, D.C., is harvesting rainwater from a public housing development and using it to create a three-acre community food oasis in the middle of an historic food desert.

Climate Change and Resilience

According to the most recent National Climate Assessment, heavy downpours are increasing throughout the U.S. and that trend is projected to continue. Already, very heavy precipitation has increased by approximately 30 percent in the southeastern U.S. over the past 50 years. The mountain region of Western North Carolina also has the most variable rainfall patterns in our state, with areas like Weaverville, Mars Hill and parts of Asheville



Stormwater management project in Mars Hill. Tim Ormond photos



having among the lowest annual rainfall, averaging less than 40 inches per year. And on the other extreme, nearby Brevard receives almost 70 inches and Cashiers almost 90 inches per year on average.

Green infrastructure is a key strategy for providing resilience during both water scarcity (by promoting infiltration to recharge groundwater and stream base flow)



as well as water excess (by capturing and storing stormwater). In fact, many are recognizing that green infrastructure is no longer optional for managing stormwater in our changing climate, but is vital for adapting to climate change in ways that conventional infrastructure cannot. Additionally, green infrastructure improves air quality, sequesters carbon, moderates urban heat island effects, and reduces energy consumption for heating and cooling buildings, as well as providing many ecosystem services.

Gray or Green?

Although the need for conventional "gray" stormwater infrastructure will continue as long as we humans live in cities and drive vehicles, green infrastructure can work in harmony with existing conventional infrastructure by helping restore that natural watershed function and improving water quality. In combination, it can also alleviate pressure from gray infrastructure, delaying the need for enlarging and replacing infrastructure and reducing overall costs.

Some major cities in the U.S. have already embarked on ambitious green infrastructure programs. Philadelphia has allocated \$2.4 billion dollars to its green infrastructure program, and in the process, it anticipates saving \$5.6 billion in gray infrastructure costs over the long-term. To be truly effective, a green infrastructure approach should be applied at many levels, including site scale, neighborhood scale and

watershed scale.

Until recently, green stormwater infrastructure was often overlooked as being an essential part of the green building process. Many developers have been unaware of the potential benefits, including cost savings, with green infrastructure. Fortunately, the level of awareness is rapidly changing as well. Applying GI during front-end plan-

ning is generally more cost-effective than retrofitting later.

I've been learning that personally with the green infrastructure retrofit of my own 1920s West Asheville bungalow by incorporating more than 1,800 gallons of rainwater harvesting for edible landscape irrigation, with an integrated stormwater wetland, rain garden, swales, and permeable driveway all in the works.

Stormwater ordinances in municipalities throughout the country are also being rewritten to promote the use of green infrastructure and overcome policy barriers. Some communities are offering financial incentives such as cost-sharing for residents and businesses interested in applying GI on their properties. Even in the case where no applicable stormwater regulations exist, there can be great benefits to both the prospective homeowner and the developer by designing GI measures into the site plan.

The Future is Green

The shift in stormwater management to green infrastructure is here and will continue to grow in the future. Green infrastructure offers numerous benefits for all involved - for the property owner, the developer, the neighborhood, our towns and cities, and our entire bioregion. Using our creativity and skills, within a supportive policy framework, we can develop practical, cost-effective strategies to implement green infrastructure and work together to create more healthy, livable, resilient communities, which honor our watersheds and streams, and the many people and diverse species that inhabit them.

Tim Ormond, P.E., is an Asheville-based water resources engineer and founder of HydroCycle Engineering. He is recognized for his expertise in green infrastructure and innovative stormwater research.

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Following Asheville's lead

Growing green building across the state

BY RYAN MILLER
 All right, Asheville. As the North Carolina city with the deepest market penetration and strongest consumer demand for green building, the rest of our state looks to you for inspiration and leadership in green building. Many new homes built in your market are "green" certified. Award-winning green building companies call your city home. New developments are committed to being green from the start. Your residents don't just ask for green building, they demand it. But you know about your region's great reputation for green building already. WNCGBC has been leading this charge for 15 years now, but green building was cool in your region long before then. So, with such

a storied past of green building success and a continually growing green building future, what can other cities and regions learn from Asheville in order to grow their green building markets?
 For starters, Asheville's green building market is as great as it is due to the people that live there. Your residents understand the benefits of green building, pure and simple. Some of you do it to save energy, some to protect the environment and others just to lower your operating costs in that home or building. And because you all have been this way for so long, your real estate, appraisal and lending markets accept that green homes are worth more than others. Why is that important? Tangible

financial return on investment is a leading factor in developing and maintaining a green-building market anywhere in the country. Green homes offer greater financial return for the sometimes increased costs to make that home green in the first place.
 You have it; most other North Carolina cities don't. A survey of 3,682 actual and prospective purchasers by the National Association of Home Builders found that buyers would be willing to pay an average of \$7,095 more in the upfront cost of a house if that investment saved them \$1,000 a year in utility expenses.
 Another reason the Asheville movement is important is that a good green building market in-

volves an ecosystem of committed people and companies, all of which you have locally. This ecosystem takes:
 • Real estate professionals that are able to sell the short- and long-term features of green homes.
 • Appraisers that attach additional valuation to the home for its green features.
 • Lenders that provide lower interest rates due to lower mortgage default risks from the buyers of green homes.
 • Builders that are willing to invest extra time and sometimes money to make their homes green.
 • Homebuyers that are willing to pay a higher up-front price in order to reap the short- and long-term benefits of green homes.

As a point for comparison, in the case of North Carolina's strong solar market, which was propelled to the third most residential and commercial installed capacity in the country last year, state policies, rebates and incentives were the drivers of that growth. Yes, you folks in Asheville latched on and took advantage, with some of you participating literally decades before others, but the widespread industry growth and increase in consumer demand was a matter of policy, not raw consumer demand like what you all have for green building.

Another advantage to your green building market is the support of WNCGBC, which educates consumers and brings together

that ecosystem to organize market needs, market this important work to residents and help builders and businesses learn how to be green or become more green.

And since there's only one other organization like WNCGBC in the state – the Green Home Builders of the Triangle – other cities and regions could benefit greatly from an organization providing these types of services and benefits.

So, how will other North Carolina cities act on your successes to grow their green building markets? The two largest opportunities are to educate consumers and builders

vidual homes and buildings meeting this criteria, with about five percent coming from Asheville. That's not a high percentage comparatively speaking, but in a smaller market like Asheville, the quality, not the quantity, is what impresses other cities and regions.

Another initiative underway at NCBPA combines the previous two to drive green building further across the state. Our association is leading efforts to create new transaction processes that place green home features and valuation data in the right places to make this happen more accurately, faster and



about their available options and the benefits that come with them, and also to create reliable mechanisms – both financial and transactional – that ensure a higher market value for these green homes. Our association is taking the lead on these and many other market growth opportunities across the state, following your lead.

To improve consumer education across the state, NCBPA launched www.HomeEnergyNC.org in 2015 to centralize home energy usage and savings information for residents and builders. The site offers helpful tips and tricks, DIY checklists and resources, educational materials and much more.

Why home energy and not green building? In this case, the consumer-education angle is geared toward using less energy at home and saving money because of it. That's an important part of green building and a common entry point for homeowners and builders alike.

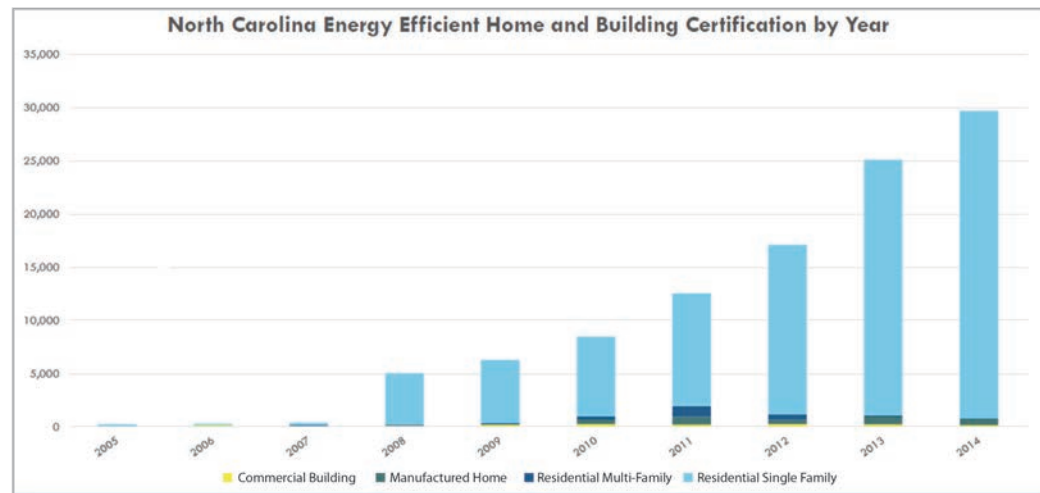
To improve the market value of green homes, last year NCBPA completed a first-of-its-kind study to inventory North Carolina's energy efficient and high performance homes and buildings built new or retrofitted in the past seven years. We found more than 121,000 indi-

better. Greening the MLS will help introduce current and new homeowners to the market for green homes, and increase their value as well, which provides greater return for both the homeowners and builders that invest in them.

So as we think about how Asheville came to be our state's leader in green building and what other cities and regions can do to grow their own markets, we must consider both sides of the coin. On the one side, an educated, motivated and wanting consumer base is vitally important. If homebuyers don't value green homes, they won't pay for them and builders won't build them.

On the other side, the real estate, appraisal and lending transactions have to give proper value to the added features, benefits and worth of green homes in order to support a sustainable market where the investors in these homes – both builders and homeowners – receive their return on investment as well.

Ryan Miller is the founder and executive director of North Carolina Building Performance Association (NCBPA), a 501(c)(6) not-for-profit trade association based in Raleigh serving North Carolina's home and building performance companies and professionals. Learn more about NCBPA at www.BuildingNC.org.



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Up to the Challenge

Asheville's infill plans support smart growth, multimodal transportation and green building



Accessory dwelling units are an important strategy to boost affordable housing in Asheville. City of Asheville photos

By **AMBER WEAVER** AND **VAIDILA SATVIKA**
 Cities across our nation are growing and experiencing urban-planning challenges. From 2000 to 2010, Asheville's population grew more than 14 percent and is expected to continue its progression in the coming decades. Asheville's growth in population, crunch on housing supply and its inability to annex has left many scratching their heads and coming together to consider best practices for expansion. Planning for growth can be a daunting task. To address the challenge, the City of Asheville is about to embark on a Comprehensive Plan update that is expected to take up to 18 months. This a real

opportunity, a time where policy-makers, community leaders and local residents can consider best practices on the way Asheville would like to grow. The city's comprehensive planning process will reach out to our stakeholders, allowing feedback and vision from those who live and work within the area. In the meantime though, the city's Planning and Urban Design Department has responded to current land-use challenges by removing regulatory barriers and allowing more residential infill development that is compatible with neighborhoods and supportive of transit and walkability. The city's residential growth opportunities include three categories: the Downtown's Central Business

District, commercial corridors and residential districts. Downtown's Central Business District provides ample uses for multi-family housing and mixed-use developments. With well over 1,400 parcels of land totaling more than 270 acres and height limits upwards of 145 feet, there is enough developable potential in downtown to accommodate years of Asheville's growth within this area alone. Urban living provides many amenities that maintain a healthy and vibrant quality of life while producing fewer carbon emissions and supporting alternative modes of transportation. As the city designs for density it is imperative that it also plans for open space, parks and greenways while providing additional modes of access. Asheville's commercial corridors also provide significant housing opportunities. Changes to the city's code in December 2014 have effectively doubled the permitted density for projects that provide 20 percent affordable housing units. For example, the maximum residential density is 35 units per acre, but if 20 percent of the units are made affordable then the maximum permitted residential density is raised to 70 units per acre.

Asheville's commercial corridors play a role in supporting the city's affordable housing initiative, allowing for density bonuses. Affordable housing allows Asheville's workforce to grow more sustainably, enabling those that work within the city to live in the city. Asheville's residential districts are a little more challenging as

they are somewhat already defined in both character and land restrictions. In 2015, city council adopted new rules allowing for larger size Accessory Dwelling Units (ADUs). ADUs provide practical housing options for the elderly, empty nesters, young students and small families, and can provide additional rental income for homeowners. ADUs are smaller in size, do not require the extra expense of purchasing lots or land, can be developed by converting existing structures, and do not typically require the extension of city infrastructure for the additional housing units. Because of their smaller size, ADUs are typically more affordable, providing rental units for low- and



A seven-unit apartment home in Asheville's Montford neighborhood.

moderate-income residents. Using alternative modes of transportation to access the downtown corridor, allowing more residents to build accessory dwelling units, and preventing urban sprawl are all ways to support the city's efforts to grow denser and smarter. Amber Weaver is with Asheville's Office of Sustainability and Vaidila Satvika is with Asheville's Planning & Urban Design Department.

"Urban living provides many amenities that maintain a healthy and vibrant quality of life while producing fewer carbon emissions and supporting alternative modes of transportation."

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It's Alive!

The Living Building Challenge Design Competition

BY STEPHENS SMITH FARRELL

Question: "If not now, when; if not here, where; if not us, who?"

Answer: The Asheville Collaborative of the Living Building Challenge Design Competition.

It's on, people; it is so on. The Asheville Collaborative of the Living Building Challenge is hosting an architectural competition to design a mixed-use building based on the incredibly demanding sustainability and resiliency guidelines of the Living Building Challenge (LBC).

The LBC is a design and construction program that stresses the critical work of creating buildings and communities that are not only "less bad" but actually restore the environment, the economy, and the societies in which they exist. The LBC envisions a future that is "ecological restorative, culturally rich, and socially just." How's that for a beautiful vision?

A simple flower inspires the LBC. Like a building, a flower doesn't

The LBC envisions a future that is "ecological restorative, culturally rich, and socially just."

move. Unlike most buildings, a flower gets all its energy and water from its fixed location, creates habitat and food for animals (including humans), and stabilizes the soil. A flower creates no waste; in fact, the byproducts of a flower are oxygen and nutrients.

And flowers are beautiful!

The LBC requires, essentially, that buildings do the same; they

must get all their energy and water from on site (or from closed loops), create no waste, and be beautiful. The program is organized into seven sections or "petals" which further contain twenty imperatives that must be met.

This inspiring vision of the built environment is based on the work of the biomimicry movement, which invites culture and industry to study and benefit from millions of years of Mother Nature's research and development. Lessons in sustainability are all around us, we just have to look carefully at what has worked evolutionarily in botany and in the animal kingdom, paying special attention to the interconnectedness of living things.

The Asheville Collaborative (hosted by WNCGBC) invites teams of students, professional architects and engineers, and other green thinking planners to design a building comprised of affordable housing and other uses on a high-profile site in downtown Asheville. This academic exercise is intended to introduce this exciting and essential vision of the built environment to the community and to demonstrate the viability of the LBC to local and regional planners and design professionals.

A jury of local and regionally renowned green thinkers is being assembled to judge the merits of submissions based on adherence to the program, to LBC imperatives, and to the site's appropriateness for this high-profile competition.

Teams within 500 miles of Asheville are invited to submit designs and to participate in a workshop focused on the LBC and affordable housing. Locals interested in learning more about the LBC in general and the competition in particular can participate (for a small fee) in the workshops even if they do not join the competition or submit a proposal.

Farrell is chief cook and bottle washer at Stephens Smith Farrell Architecture in Asheville. He is Architect of Record for the first LEED Certified Building in WNC and sits on the WNCGBC Board of Directors. He is an ambassador for the Living Building Challenge (LBC) and is a member of the Asheville LBC Collaborative. He lives and gardens in a net-zero energy home.

Websites

- www.biomimicry.org
- www.living-future.org
- www.eowilsonfoundation.org
- www.collaboratives.living-future.org/asheville



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A smarter energy future

Energy Innovation Task Force

By KATIE ONHEIBER
In the Asheville area, burning coal is the largest single source of carbon emissions, releasing the equivalent of 500,000 cars annually. Daily, we are breathing that dirty air and contributing to climate change. The shift to more sustainable energy sources in order for us to live in a healthier environment is a priority in our mountains.

Leaders in our local government, business and nonprofit community are banding together to provide local opportunities that carry global impacts by forming the Energy Innovation Task Force. The Task Force works to curb our demand for fossil fuels and offer clean energy programs and incentives.

This partnership is inspired by concerned community members including the City of Asheville, the Asheville Beyond Coal initiative and Duke Energy's Western Carolinas Modernization Plan. Asheville Beyond Coal campaign was a key player in successfully advocating Duke to close its Lake Julian coal plant. In 2015, Duke announced in its modernization plan that it will replace the coal plant with two new 270-MW natural gas units and a potential 190-MW third "Peaker" unit to be built in the early 2020s. The "Peaker" plant is slated for use during periods of high demand.

Natural gas is a far cry from clean, renewable energy and hopes are high that the Task Force can delay or avoid the construction of



City of Asheville

"The task force anticipates developing a two-year work plan by the end of 2016 to increase energy efficiency and renewable energy and inform and engage the public."

the third "Peaker" unit. Duke's Moderation Plan includes the formation of the Task Force for this exact purpose. Avoiding or delaying the need for the third unit is a primary goal in an effort to transition Western North Carolina to a cleaner, affordable and smarter energy future.

The Task Force includes Sierra Club, Duke Energy, City of Asheville, Buncombe County Board of Commissioners, Green Opportunities, Mission Hospital, Biltmore Farms, New Belgium, Buncombe County Tourism Development Association, UNC Asheville, Self-Help Credit Union, Asheville Chamber, Sustainable Advisory Committee on En-

the end of 2016 to increase energy efficiency and renewable energy and inform and engage the public. The plan will leverage utility expertise, programs and investments, city and county resources, actions by Task Force members and the community.

Our region's natural beauty, clean air and fresh water are why we call this place home and why so many people visit. Protecting our lands, waters and air is not only an environmental issue but also an economic one.

Help our neighbors understand the role they play, from purchasing foods and products made thou-

Energy Innovation Task Force Subcommittees

- **Programs** – Provide increased promotion of and access to new and existing energy efficiency programs. Look at program implementation and solutions to challenges.
- **Technology** – Make deliberate investment in distributed energy resources (DER) working closely with Duke Energy's DER team. Focus on technical analysis for programs like solar installations, battery storage for energy generated by renewable sources, electric vehicle infrastructure and advanced utility metering.
- **Community Engagement** – Help the community understand ways to reduce energy use and opportunities to invest in clean, renewable energy. Develop a branded umbrella campaign, communications templates and communications strategies.
- **Peak Reduction** – Identify the peak reduction goal needed to delay and hopefully avoid construction of the "Peaker" unit, the date by which this goal must be met and benchmarks to measure progress. Reducing the amount of energy the area uses during periods of peak demand will be a critical aspect.



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The Green Building Council is thrilled to be part of the solution. With 15 years of experience executing programs like Green Built NC, LEED for Homes, Green Gauge and Appalachian Offsets, our nonprofit is making significant strides in creating a greener, healthier community. The Green Building Council's program's lower energy use in new and existing homes and bridge the gap between utility programs and what the City offers. WNCGBC Executive Director Sam Ruark-Eastes chairs the Programs Committee, helping to see innovative and accessible energy efficiency programs come to fruition.

The task force anticipates developing a two-year work plan by

sands of miles away to driving gas guzzling vehicles to using inefficient incandescent lightbulbs in homes and businesses. This collaborative partnership is an opportunity to launch clean-energy projects and programs, and to educate our community members on the impact of their actions and how they can make a difference.

Make your voice heard. Visit www.ashevilenc.gov/departments/communityrelations/energyinnovationtaskforce.aspx for more information on meeting dates and locations.

Katie Onheiber is the Communications and Marketing Manager at Carolina Mountain Land Conservancy (www.carolinamountain.org). She is the former Education, Events and Membership Coordinator for WNCGBC. She has a background in events management, fundraising and marketing.

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One Month Average Thus Far = \$121.15

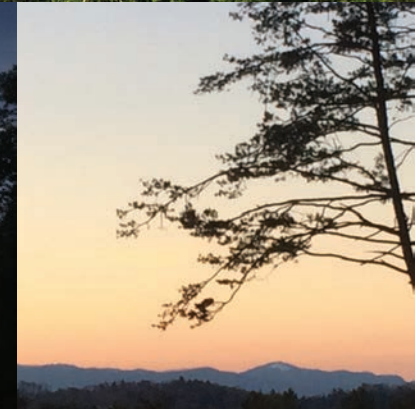
Other than marrying my Wife Stephanie Sue, buying this killer house on the Tuckasegee River we call home, I'd have to say installing solar is the third best investment I have ever made. Appalachian Energy Solutions continues to provide excellent customer service for our system and the results above are a testimony to the quality of their work and materials!
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Appalachian Offsets

Nonprofits reduce energy use, use savings to help their cause

BY SAM RUARK-EASTES
 Cue the music ... Appalachian Offsets, your local solution to global pollution, is back! Back by popular demand and with the help of two grants, Appalachian Offsets (AO) will reduce climate changing emissions through funding energy efficiency upgrades for facilities used by local nonprofit organizations. This voluntary carbon offset program of the WNC Green Building Council offers businesses, organizations and individuals the option to easily reduce or offset their carbon footprint.

The scientific consensus is in. Climate change is happening and is greatly influenced by the burning of fossil fuels. In our everyday lives, our actions emit harmful carbon. The U.S. has one of the most staggering greenhouse gas emissions rates of any country in the world. Climate change is having massive detrimental impacts throughout the world, causing erratic and destructive weather, severe famine, rising sea levels and crop failures. Appalachian Offsets was set up to address this pressing issue. The program encourages all of us to reduce our carbon emissions first, then pay into a fund that collectively helps others do the

same. Through upgrading inefficient lighting and supporting clean energy projects, Appalachian Offsets will help us reduce our collective impact on climate change.

The first era of Appalachian Offsets was launched in 2005. From 2005 to 2007, we completed four energy-efficiency retrofits for local nonprofits, with the most successful project being in fall of 2007. Students from UNC Asheville volunteered with the Asheville Housing Authority (AHA) to switch out 13,000 inefficient incandescent light bulbs with compact fluorescent light bulbs (CFLs). Through this retrofit, the AHA and its residents collectively reduced carbon emissions by more than 1610 tons, saving over \$200,000 per year.

With the onset of the 2008 recession, interest in the program waned as building projects were delayed or cancelled and busi-

nesses lacked the resources to offset their emissions.

Environmental stewardship (and the economy) are once again growing in Western North Carolina. In a survey of our membership, 70 percent of respondents requested that we revive this program to offer a low-cost and community-enhancing pathway to cut emissions. Payments for carbon offsets will be directed to meet the needs of more nonprofits, schools and low-income housing.

Appalachian Offsets is the bridge that matches companies looking to offset their emissions with organizations who need support cutting their costs and upgrading their facilities.

As we revive this program, several changes will be enacted to make it more transparent and connective. The previous program did a great job of

engaging nonprofits and community members to do specific projects. We will build upon this success and add projects that have significant cost and energy savings. We will partner with organizations like the Land of Sky Waste Reduction Partners who perform energy audits for nonprofits, schools and municipalities. Projects will be transparent to ensure that offset buyers are directly aware of the specific projects they help fund, so all participants know the quality of the offset they are purchasing.

Appalachian Offsets offers a tremendous secondary benefit in that offsets allow the recipients to retain more capital for mission-related efforts. And by keeping those dollars local and with community organizations, these credits will cycle funding through the local economy and yield a positive impact for a much longer time than traditional carbon credits.

The relaunch of their program is made possible by grants from the Kendeda Fund and the Ray Anderson Foundation.

Sam is the executive director of the WNCGBC and has been working in the field of sustainability for 18 years with local governments, small businesses and nonprofits. He is a LEED AP and Certified Permaculture Designer.



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Net zero

Insights from Western North Carolina home builders

□ AMY MUSSER □

What is a net-zero energy home? A net-zero energy home is simply a home that produces as much energy throughout the year as it consumes. A home can only truly be considered net zero energy after the first year and there are utility bills showing that the goal has been met. The inset bar chart shows net monthly energy use and production for our personal house, which generates electricity using solar photovoltaic (PV) panels on the roof. In the spring and fall when we are not heating or cooling, we produce more energy than we use. When we use air conditioning in the summer, we are close to even. Production is lowest in the winter when we are also using a lot of energy for heating, so we use more than we produce during those months.



The photo above shows a home using four forms of solar: solar PV, solar hot water, passive solar, and solar clothes drying. Passive solar design is popular with net-zero energy home builders. It's definitely not a requirement, but since these homes have to be oriented for South-facing roofs anyway, it can capture that free heating energy from the sun. Amy Musser photo

Monthly net energy use and production for a net zero energy home

Recognizing a need to identify homes with the potential to achieve net-zero energy, the Green Built North Carolina certification defines a new net-zero energy home as one having a HERS index (including solar PV) of less than 15. The HERS rating is like a "miles per gallon" sticker for a home, with a HERS of 100 being approximately code, and a HERS of zero being a net-zero energy home with typical American appliance usage. The Green Built NC program opted to include homes with a HERS 15 or lower because they recognized that individual "mileage may vary", and many energy-conscious homeowners in the area were reaching net-zero performance with less solar than the typical American would need. They also recognize homes that reach a HERS of 55 or lower that don't have solar but have a conduit and South-facing roof appropriate for future solar as "net-zero ready."

The Green Built NC net-zero designation became available in October 2015, and since then 7 homes have completed certification as net-zero energy and one home has achieved net-zero ready certi-

fication. Prior to the net zero certification becoming available, we know of at least 15 homes in the area that would qualify with a HERS score of less than 15.

Local strategies to build net-zero energy homes

Not all net-zero homes are small, but it really helps. Smaller homes use less energy and require less solar to become net zero. There are net-zero energy "tiny houses" in the program, but there are also several in the 1,200 square foot range. These small homes are able to achieve net zero status with 4 to 5 kW of solar PV, which at current prices would cost approximately \$14,500 to \$18,000. There are larger homes in the program, but they require more solar. Typically homes in the 2,000 to 3,000 square foot range have required 6 to 8 kW of PV to achieve net zero energy status.

Insulation

Many net-zero homes are "super-insulated." All of the net-zero homes we've worked with have more insulation than the code minimum, but builders have a variety of philosophies on how far to go. The building shell and insulation are typically the longest-lived parts of the home so it makes sense to spend more on these since they will save money for a long time. But there is a "law of diminishing returns" and after a certain point, it makes sense to save some money for solar. Our generic advice would be to exceed code, but you don't need to use unconventional materials or techniques (unless you want to). It's helpful to have a design that's easy to build and air seal and to use spray foam insulation where you may have tricky details. Home designs that allow the water heater and ductwork to be located in conditioned space also pay big divi-

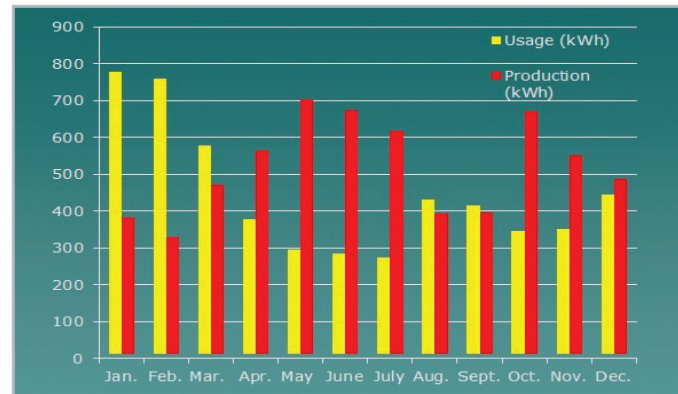
dends. Leaky homes use a lot more energy, so all builders of net-zero energy homes pay particular attention to airtightness. A blower door scores of 1.5 air changes per hour or less is typical for these homes.

Efficient heating and cooling

Efficient building systems are also important. These systems don't last as long as the home itself, but heating and cooling systems do matter. Larger homes and those without access to natural gas often use geothermal heating and cooling systems. Minisplit heat pumps are popular for smaller homes. The new variable speed compressor systems like the Trane Greenspeed offer a great solution for homes in between that need a full-size system but can't make the jump to geothermal.

Water heating

Water heating is a source of significant energy use, and an easy



Author's Site Sage

way to save energy. Heat pump water heaters are the most popular choice in net zero energy homes. These move heat from the indoor air to the hot water, dehumidifying the room they're located in and heating water at about three times the efficiency of regular electric water heaters. Natural gas tankless water heaters are also a popular choice, and have about the same operating cost and carbon emissions as heat pump water heaters. Solar domestic hot water systems are still a good choice, but many homeowners find that the heat pump water heater supplemented with more rooftop PV is more cost-effective overall and lower maintenance.

The choice of whether to use gas in a net-zero home is a complex one. Most homeowners expect ultra-low bills in net-zero energy homes, so it makes sense not to add a second utility. Natural gas service comes with a monthly service charge, which can be a significant addition to energy cost. Also, most of the locally available utility buy-back programs for solar PV won't pay homeowners for generating more electricity than they consume, so mixing fuels can make it difficult to get paid for all of the electricity homes generate. If there's a desire to cook on gas, consider instead an induction cooktop, which are as controllable as gas and have additional safety benefits. There are times when it can make sense to add gas to a project. If the home will need to operate on a backup generator, having a gas furnace is desirable. Gas is also one of the best ways to manage long cold-weather periods in off-grid homes.

The role of appliances

Lighting and appliances account for nearly half of the energy use in typical homes, and make up an even greater percentage in homes that are designed for net-zero energy. Using all compact fluorescent or LED (no incandescent, halogen

or Edison) lightbulbs is something every net-zero energy home should do. Major appliances should be purchased with the ENERGY STAR label. The most important appliances to buy ENERGY STAR are the clothes washer, dishwasher, computers and electronics. Limiting the number of refrigerators and freezers to the minimum needed also helps keep energy use in check.

The role of occupants

An efficient occupant is the most important part of a net-zero energy home. You definitely don't have to suffer with uncomfortable thermostat settings and four-minute military showers. But turning off lights and appliances when you're not using them and being vigilant about finding "phantom loads" (appliances that use energy even when turned off) is absolutely critical to success. The difference can easily be worth 2 to 3 kW of PV on the rooftop, which translates into thousands of dollars of upfront cost. We recommend using a monitoring system like the Energy Detective or the Site Sage. The graphic above is from the Site Sage in my home, which allows me to easily see which circuits are using the most energy and where my phantom loads are located.

Site Sage monitor to help identify energy use by circuit

Net-zero energy living isn't mainstream yet, but it's also not difficult or out of reach. The other good news is that energy efficiency isn't an all-or-nothing proposition. Any of these strategies can be applied to any home, and you will see savings and help the environment. So there's no need to wait until you can go fully net zero to get started.

Amy Musser is the founder/principal of Vandemusser Design PLLC, an Asheville-based home energy efficiency company. A licensed mechanical engineer, she provides design assistance, certification and audits to support high-performance homes.

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The Green Gauge

Engage in your homes potential

By **MARCUS RENNER**
 Savvy homeowners and buyers realize that a green, energy-efficient home adds value while saving money and resources. What is the best way to find out if a home is efficient and sustainable? Created by the WNC Green Building Council, Green Gauge is a simple, innovative, low-cost assessment program working to help residents across North Carolina save money, reduce energy usage and live in



Marcus Renner

homes that are healthier for themselves and the environment. Green Gauge is perfect for existing homes or new homes that don't use a rating system during construction. During a Green Gauge Home Assessment, homes are rated for energy efficiency based on the U.S. Department of Energy's Home Energy Score (HES) criteria.

Each home receives a score on a scale of 1-10, a score of 10 indicating that it is incredibly efficient. Homes are also evaluated for a variety of other factors including water usage, indoor air quality and building material sustainability. After the assessment, participants receive a straightforward, comprehensive report with recommendations on how to improve upon home efficiency and sustainability.

During the Green Gauge Assessment, an Assessor will thoroughly examine all areas of the home including the interior, attic, basement, crawlspace and exterior. Windows and doors, walls, roof, foundations, heating systems and landscaping will be documented and assessed for energy efficiency. Diagnostic tools such as blower door analysis, infrared imaging and zonal pressure testing will pinpoint and quantify areas of air leakage. The assessment is a lot like taking your car to the mechanic; the house



Above: Holes in the ceiling can waste a lot of energy. Here interior walls are drawing in hot attic air. Attic air sealing will stop this. Below, left: A blower door is set up for a Green Gauge assessment. Air leakage will be tested. Below, right: Interior wall top plates and plumbing holes as seen from the attic. These gaps allow a lot of air to escape or enter the home. Kevin Bauguss photos



"Green Gauge is perfect for existing homes or new homes that don't use a rating system during construction."

is plugged into diagnostic equipment and given a thorough once over.

If the home receives a low score, don't worry. The assessment will list recommendations to improve the score and increase energy efficiency. Scores can be re-

calculated once the improvements are made. In fact, the Green Gauge Assessment will measure the potential carbon footprint reduction made once the improvements are in place.

One important outcome of an assessment is the discovery of is-

ssues such as mold, water leaks, and foundation problems. Left undiscovered, these findings can cause real and expensive damage to a home and affect the health of occupants. Green Gauge assessors look at a home with an eye for durability, as durability and longevity are an often overlooked sustainable attribute.

A Green Gauge report is a great way for home builders and sellers to document the "green" features and efficiency of a home. A high Home Energy Score is enticing to buyers as it confirms that they are purchasing an energy-efficient home. It can also be a valuable tool for potential homeowners who want to know how factors such as energy and water usage will impact their overall cost of homeownership. Not buying or selling? Green Gauge can help you identify ways to save money, increase comfort and indoor air

quality, reduce the home's carbon footprint and take advantages of local utility rebates.

To learn more or schedule your Green Gauge Assessment, visit www.wncgbc.org.

Marcus Renner has worked in most sectors of residential sustainable building for over 22 years. He owns Conservation Pros, a residential and commercial building performance retrofitting firm. With over 1,500 buildings weatherized and 1,000 energy audits, Marcus and Conservation Pros bring the most experience to your home or workplace.

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Greening the MLS

Evolving Real Estate systems to meet client needs

BY MARY LOVE

How do we showcase the green features of a home? With an increased understanding of how our actions impact our health and environment and a demand for greener products and services, the Multiple Listing Services (MLS) now offers an efficient way for sellers to show buyers the green features of their homes. This is a great way to meet the expanding desire for greener real estate.

a property is.

This list of green building features in the MLS places a small “g” in front of items that are currently considered green by most certification programs. These features are always subject to change. Most certification programs set standards 15 to 30 percent above current standard building codes and as these codes improve, green features improve.

Appraisers use the MLS as a guide to the current market value of a house. They look for special

real added value for Green Homes.

In order for green features to add value to a house, those features must be mentioned. Sometimes the educated buyer may know more about a certification program and its requirements than the Realtor®. It is critical that sellers, builders and Realtors® learn the advantages of certain products and materials. Once they start to promote the benefits of green features accurately, the market will respond with greater demand for sustainable



Samsel Architects photo

databases used by Realtors®. Realtors® pay to utilize this system and agree to share their listings. A great deal of information can be input into the system and shared with numerous websites that are free to the public.

In 2015, the MLS added energy efficiency and green fields to their system, enabling real estate professionals and home sellers to market properties effectively. Green features have been shown to increase property values and selling prices. The new matrix system allows more features to be available to Realtors® and for the public to efficiently determine just how green

features and upgrades that will increase the value of the house. If the green features have not been marked, the improved value will not be noticed by the appraisers and the lenders.

In 2013, the Residential Green and Energy Efficient Addendum was created for appraisers to use for Green Homes. Builders, homeowners and third-party verifiers are encouraged to complete and present this Addendum to appraisers, agents, lenders and homeowners. Many of the features listed in the Addendum are also features in the MLS. Now, everyone can truly compare “apples to apples” and create

and energy-efficient homes.

WNCGBC, Land of the Sky Association of Realtors and Asheville Home Builders Association offers a class to Realtors® and builders, “Knowing and Using Your MLS Green Features.” Together, they are increasing awareness that green features are healthier for families, communities and our environment – carrying far greater value than cosmetic features.

Mary Love is a Realtor and the team leader for Love The Green Team. She is a certified HERS rater and teaches the Building Green Real Estate Courses. She can be reached at 828-279-6723 or marylovethegreen@gmail.com.

Going “g”

The Land of the Sky Association of Realtors® matrix MLS system utilizes a large scale program format and has several certification options for “Green Built” homes. The two most utilized programs in Western North Carolina are Green Built NC and ENERGY STAR. Additional features that can be selected include:

BUILDING FEATURES

- g-Advanced Framing/Concrete Construction
- g-Engineered Wood Products
- g-No-Low Voc/Paints
- g-Photovoltaic-Solar Power
- g-Recycled Construction/Household Waste
- g-Spray Foam Insulation
- g-Xeriscaping-Drought Resistance Plants

HEATING

- g-Active Solar Heat
- g-ENERGY STAR HVAC
- g-Fresh Air Ventilation
- g-Geothermal
- g-On-Demand Water Heater
- g-Passive Solar Heat
- g-Radiant Heated Floors
- g-Sealed Combustion Fireplace/woodstove

EQUIPMENT

- g-Dual Flush Toilets
- g-ENERGY STAR Clothes Washer
- g-ENERGY STAR Dishwasher
- g-ENERGY STAR Freezer
- g-ENERGY STAR Light Fixtures
- g-ENERGY STAR Refrigerator
- g-Low Flow Fixtures

DOORS/WINDOWS

- g-Insulated Windows

FLOORING

- g-Sustainable Flooring

WATER HEATER

- g-Solar



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Collective impacts of Green Built NC

□ BY NATHAN ANDERSON AND SAM RUARK-EASTES □

Providing actionable information is the strength of the WNCGBC as an institution, and the Green Built NC checklist facilitates a more integrated approach to design and construction. If you're looking for professionals who know how to do this work, what you hold is a list of WNCGBC members who have the experience, holistic thinking, and direct capacity to help.

The WNCGBC has been providing residential green building programs since 2004. The first chapter was called NC Healthy Built Homes, which evolved into Green Built NC when WNCGBC took over administration in 2012. The team here wanted to know, "what is the collective impact and savings of these green homes?" One of the most compelling effects of the Green Built program has been the collective reduction in energy demand and resulting savings the homeowner will experience over the life of their occupancy.

Of the 1,139 completed Green Built homes we analyzed, the average HERS index was a 66. For those unfamiliar with HERS (home energy rating system), it is an industry standard that models energy use relative to a theoretical home at the same location. A code built home in 2016 should theoretically be a HERS 100,



Green Built NC, Net Zero Energy Gold Certified home in west Asheville. Raymond Jennifer Coates photos

while a typical resale home is around a HERS 130. Therefore, Green Built homes are, on average, 34 percent more energy efficient than a brand new, code built home, and around 50 percent more energy efficient than existing homes.

Taking it one step further, the

average home in North Carolina uses 13,632 kWh of electricity annually, and thus the average Green Built home can be assumed to use 9,054 kWh per year. This displaces 5,213,843 kWh of electricity and 5,526 metric tons of CO2 emissions every year across 1,139 homes.

That's also \$508 in annual savings per home on electricity bills (at \$0.11/kWh) for a collective total savings of \$578,612 per year. There are a few complications to consider, and occupancy behavior is a deciding factor in energy use.

For example, bigger houses use

more energy, and a HERS score will not mean the same thing for a 1,000-square-foot house as a 10,000-square-foot one. As it turns out, the average Green Built home is about 3 percent larger than the average home built in 2015 in North Carolina, however it is possible that someone who chooses a Green Built home could be more in touch with how much energy they are using to make up for that. No guarantee though, so tack 3 percent back on that bill if you like.



Another issue is age. Our data goes back to 2005, but isolating the last two years drops the average Green Built NC HERS index further to 55. There are also tiers of Green Built certification, and Platinum homes score an average of a 26, saving homeowners around \$1,124 per year following the same methodology as above.

The point of all this is that there is an unquestionable statistical correlation with Green Built NC, energy efficiency, and cost savings. If you or your clients are in the market for a home that makes a positive environmental impact, and costs less money to own, Green Built is an absolutely proven system to get you there.

One important strength of the Green Built program is in its ability to elevate future building codes and provide a guide of what is possible on a larger scale. Indoor air quality is one such area, and as houses get better at keeping outside air out, they need ventilation to provide fresh air to occupants and control airborne contaminants that can affect respiratory functions. Radon infiltration is one health and safety issue that isn't currently addressed by our building code despite being the second leading cause of lung cancer in the United States. All Green Built homes in Radon Zone 1 now require radon professional testing or mitigation (with testing required in Radon Zones 2 and 3),

again supplying a blueprint for future code development.

Green Built also incentivizes protecting our water resources, rewarding the selection of low-flow fixtures and appliances, watershed-friendly landscaping, and collection of rain for irrigation. Following Green Built specifications can reduce water consumption by more than 50 percent compared to typical fixtures, which, according to the EPA, equates to about 50 gallons a day per person. That means that if every home in North Carolina were Green Built, we would save 181 billion gallons of water annually, enough to water our state's sweet potato crop for three-plus seasons.

Another way to protect our water and air is by incentivizing tree preservation and planting. Following Green Built tree planting guidelines would net 2.7 million trees on residential land in WNC, or 139,000 trees in the city of Asheville just in backyards. For perspective, there are about 23,000 trees in central park.

The way we build, and the environment we build in, has a huge impact on the community that emerges from our development. Incentivizing site stewardship, using responsible forest products and building for energy efficiency and water conservation are clear and available ways to minimize our footprint. Protecting what we have, particularly in such a dramatically beautiful, magnetic and fragile place like Western North Carolina, is a requirement if we want to keep living here.

Fortunately, green building doesn't cost extra over time, it is an investment that pays off by saving us from ourselves, and coincidentally rewards us economically. You don't have to be an environmentalist to appreciate sustainability and its effect on the built environment.

The City of Asheville is notorious for natural beauty and open-minded character. However, rampant suburban sprawl and short-sighted development can do major damage to our sense of community. Let's continue to make this place a beacon of progress, and not a cautionary tale. Be proud of green spaces, pedestrian accessibility, walkable neighborhoods, and front porch conversation. There is always room for improvement, and it starts with whomever has this directory in their hands. Thanks for reading.

Nathan Anderson,
Appalachian State University
Department of Sustainable Technology & the Built Environment,
WNCGBC Intern

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Your home as an ecosystem

Seven characteristics of green and healthy homes



Homeowners often take health and wellness for granted. Though the healthiness of a home may seem all bright and shiny on the outside, hidden problems can cause serious damage to the building and to occupant health. Rick Bayless

also healthy, and vice versa.

The seven characteristics, or steps, of a green and healthy home are as follows:

Safe

Safety is number one when an environmental investigator considers the home environment. We consider the obvious hazards, such as loose steps or weak railings, as well as the subtle ones, such as disconnected flue pipes leaking carbon monoxide into the home. Detection and repair are critical. Safety overrules everything else.

Dry

Dryness isn't restricted to rain water, plumbing leaks and runoff. In the southern Appalachians, humidity, condensation, air conditioning zones, and the ensuing mold and mildew issue also need to be considered. When older homes are upgraded to green homes, for example, these weren't built to handle cooling. When air conditioning chills the air, and ducts become cold, then beads of condensation may form on those surfaces. When that water drips onto surrounding areas or into walls, problems such as stains, warping, mold, rot, and damage may occur. This is also true in new, energy efficient homes with specific ventilation requirements.

Clean

Clean has a lot to do with the simplicity of the indoor space. First, keep the space clear of obvious

dust, debris, soil, spills, stains and soiling. Believe it or not, that's where problems can begin. The second level is not as obvious. Look behind, under and over furniture and appliances to remove buildup. Third, clearing clutter and removing layers, stacks, and piles of items stored around the house reduces dampness, insects, and allergen. To maintain a clean house, watch for those things that need to be addressed.

Maintained

Green homes are smart homes. Homeowners choose green homes for their wonderful systems: recovery ventilators, dehumidifiers, radiant floor heating systems, and more. However, maintaining specialized equipment can be complicated for the average homeowner. Learning to operate and maintain the parts of a home ensures the health of its ecosystem.

Though seasonal maintenance, like cleaning gutters, remains important, a better choice is a monthly maintenance schedule. Repairs from lack of upkeep cost a lot more than maintenance.

Ventilated

Consider ventilation the lungs of the house. Think "out with the bad and in with the good." From the bath exhaust to the kitchen stove and the ducts that run through the house and behind the walls or floors, ventilation must be more than a haphazard mix.

The HVAC, or heating, ventilation, and air conditioning system, could be its own category. Essentially, it maintains the weather conditions inside the house. The more tightly we build houses, the more important it is that the HVAC system is smarter than that of the standard house. A smart HVAC system has multiple outputs, multiple zones, variable speed fans, and great air filtration. Dehumidifying needs to be addressed separately and directly. If fully understood, it's a health asset; if not, it can be a liability and a source of wellness issues for the homeowner.

Pest Free

The wild creatures of the field and forest are wonderful, so long as they don't take up residence in our homes. Chipmunks, squirrels, possums, bears, birds, wasps, frogs, snakes, insects ... and right on down to bacterium and molds ... form quite an array of unwelcome guests. Believe it or not, the nests, droppings and diseases are both health and safety issues.

My best advice is to think like a

mouse. In other words, work with the ecology, biology, and habitual behaviors of a mouse to stop problems at the source. Close, screen, or seal mouse-sized holes. Move the firewood pile away from the house. Investigate under the house, among the eaves, and in shrubbery to deter nesting spots. This approach works for other creatures too.

Good practitioners embrace integrated pest management, or IPM, and consider holistic approaches to pest control. Chemical control is a last line of defense to be used as sparingly as possible and with the guidance of a health-oriented pest control expert.

Toxin Free

Simply, any substance that's natural or manmade in liquid, solid, or gas, that can jeopardize wellness, is a problem. Fluoride, iron, silt, bacteria, mosquitoes, chemical spills, solvents, paints, smoke and soot, asbestos, fiberglass, molds, black widow spiders, noxious plants, and more, make the list in Western North Carolina. Even simple linseed oil or furniture polish could send a person who has a heightened, adverse sensitivity to such materials into respiratory distress, also called "multiple channel afflictions." To ensure your house is toxin free (for you, not a previous resident), you may choose to enlist the assistance of an environmental home health specialist who knows how to assess the house according to your needs and concerns.

Whether old or new, green or standard, existing or planned, consider it a wise investment to conduct a holistic assessment of the healthiness conditions of your unique home ecosystem. When making decisions about any built environment, confirm that the seven healthy home characteristics are in order. If not, identify which of the seven may need an environmental intervention. You'll find that when cost-effective corrections are applied early, the risks associated with house or occupant healthiness decline are radically reduced. If green and healthy priorities are a conscious, cultivated part of your lifestyle, I recommend you get the guidance you need to ensure that home health basics are a solid part of your plans.

With more than 35 years of award-winning experience, environmental home health specialist Rick Bayless owns and operates A Healthier Home™ and EnviroVent™, offering friendly, accessible health and safety investigations in the southern Appalachians. Currently, Rick hosts "Break the Mold," a regional complimentary community education series about home ecosystems. Visit www.ahhealthierhome.com.

BY RICK BAYLESS
The right balance of green initiatives with environmental home health standards sets the stage for Western North Carolina families to thrive, both in lifestyle and wellness. Not only do we live in our homes, but our homes function in much the same way as living organisms. Balancing the characteristics of green homes with those of healthy homes makes it possible to create and maintain

home ecosystems that support the well being of each person who lives there.
As the home is an ecosystem, it may be referred to as a "living building." If the ecosystem of the home is out of balance, this can affect the aspects of the home which ensure human wellness. If you or family members don't feel well when at home, then it's very possible one or more of the systems of your home need your attention.

A good foundation for understanding the ecosystem of homes may be found in the seven characteristics set forth by the National Center for Healthy Housing. These guidelines are foundational to the knowledge the indoor air quality industry is built on. Professionals within the industry may walk through these seven key steps with homeowners to demonstrate the considerations needed to ensure their green home environment is

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IAQ perspective:

From a Green Design and Build Baby Boomer

BY VICTORIA SCHOMER

Years ago, and I do mean years, a friend/client told me she was pregnant and needed to renovate a room in their home for their new baby. "Terrific" I thought. "I've got this."

I'd already been working for 10 years in the "straight" green building business, planning, designing and specifying for new builds and remodels. And I'd been in the "out there" business of the world with the chemically sensitive, searching for the toxin-free products that would work for these folks each with their own unique needs.

Our nursery game plan was not hard even back then. We tore up carpet, sanded and refinished floors – without any stain, using water borne, low VOC clear coats. We painted with safe paints, and used safe, mostly all-wood furniture. The baby mattress was made of metal, wool and organic cotton materials and, with a doctor's letter, sold to us without any flame retardant. Any fabrics, including sheets and 'baby bumpers' were cotton and washed before fabrication and installation. The home's HVAC system was clean, and there was a big window in the room for natural ventilation.

Done! I was confident I had done my best. We finished the job a month in advance of her due date to allow for any possible emissions out gassing. I complet-

ed the job, wished them well, and waited to hear from my friend to come see her new little blessing.

And so I did. I got word of her little boy's arrival, and soon was invited to come say "Hello."

I entered the new nursery and was shocked! I was immediately

struck by the strong smell of plastic! What had gone so terribly wrong? I looked around, and it was obvious. The room was full of all kinds of baby gifts and stuffed animals, rubber play things, and plastic baby toys from friends and well wishers.

And so we are reminded that the road to a healthy life is a complicated one. It takes our engaging of fine green design and building professionals, our own pro-active research into the fine print of that myriad of materials and products we bring into our

homes, and every morsel of food or chemical we consume.

We continue to fight a tremendous battle to gain transparency from the thousands of companies that we support every day.

And so I conclude my story from long ago with a short list of what we have



This was prior to our discovery that there are serious health implications associated with BPA soft plastics and the flame retardants mandated on baby clothes and toys. We were then in a no-man's land of chemical emissions brought into our best-designed green and healthy project.

And yet still today, despite all types of green labels and certification, this scenario must get repeated countless times, all over the planet on even the most sustainably designed, highest labeled, green building projects.

today that can get us started, and keep us up-to-date (see inset box). These are some good resources for researching those better, safer, healthier, greener consumer products with which we fill our green-built homes.

Since 1998, Vicki Schomer has been an activist and spokesperson for the green design and building profession. She is a n award-winning ASID interior design, USGBC LEED accredited Professional, REGREEN co-author, a designer and consultant for sustainable planning, remodeling and green product specifying, and a Realtor specializing in identifying adaptable, and "green-able" properties.

Indoor Air Quality Resources:

- Green Seal (for green and non-toxic products)
- ENERGY STAR Builder's Guide to IAQ – ENERGY STAR Indoor Air Package Brochure
- Guide to Mold, Moisture and Your Home – US EPA's guide providing information and guidance for homeowners and renters on how to prevent and deal with mold
- Healthy House Institute – The resource for a better, safer indoor environment
- North Carolina Radon Program – NC Department of Environmental and Natural Resource's information on radon
- The American Indoor Air Quality Council – Promotes awareness, education and certification in the field of Indoor Air Quality
- US EPA Indoor Air Quality – Information about mold, air quality, asthma, and tips for how to handle mold in your home

How does your home measure up?

Created by the WNC Green Building Council, Green Gauge offers comprehensive, affordable home assessments to residents across North Carolina.

Interested in remodeling and don't know where to start?
Have an assessment done and learn about easy ways to save energy, water and money in your home.

Putting your home on the market?
Provide buyers with a Green Gauge Assessment in order to highlight your home's green features in a simple, easy-to-read format.

Buying a home?
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Green Gauge assesses homes for energy and water efficiency, site walkability and landscape ecology, indoor air quality, and sustainable material usage.

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A permaculture landscape transformation with fruit trees, berry bushes, and culinary herbs. Daily Acts photo

Permaculture

Green Building meets its revolutionary cousin

By SAM RUARK-EASTES

By now, you might have heard of permaculture. The ecological design system has reached the mainstream consciousness with articles in The New York Times and many other publications. It is estimated that more than 50,000 people in the U.S. have taken a 72-

hour permaculture design course.

Permaculture (from “permanent culture”) is a holistic process connecting site design, ecosystem restoration, food and medicine cultivation, home building, urban planning, and social design. It is a movement to guide sound land use and the building of sustainable communities

through the interrelationship of energy, water, soil, plants, animals, and humans.

As Graham Burnett says, “Permaculture is revolution disguised as organic gardening.”

This system, which emerged in Australia and has roots in aboriginal culture, got its inspiration from founders Bill Mollison and David Holmgren,

Permaculture organizations

Western North Carolina is an epicenter for permaculture education, resources, projects, and design professionals. Check out these local permaculture organizations:

- Asheville Institute: www.asheville.org
- Grass to Greens: www.grass2greens.com
- Organic Growers School: www.organicgrowersschool.org
- School of Integrated Living: www.schoolofintegratedliving.org
- Wild Abundance: www.wildabundance.net

who sought to identify a system for ecological living that was modeled after a forest. If you have walked through a permaculture landscape, you have probably seen how it is consciously designed to mimic the patterns and relationships found in nature, while providing an abundance of food, fiber and energy for meeting local needs.

This regenerative system has 12 principles. These principles call us to observe and interact with the natural patterns of a place, design from patterns to details, catch and store energy and water, obtain a yield from the land, receive feedback and apply what you learn, use renewable resources, produce no waste, integrate rather than segregate, use and value diversity, value the edges and margins (in an ecosystem and society), and creatively use and respond to change.

Just as green building helps the building industry evolve codes that encourage better building quality with design and products that minimize environmental impact and save money, permaculture principles and design elements can help evolve green building.

The Green Built NC guidelines include several measures that encourage permaculture. Measures such as the following incorporate these principles:

- Install permanent stormwater controls such as rain gardens, bio-retention basins and/or infiltration strips to reduce storm water impacts.
- Landscape uses native and/or edible plants.
- Drought resistant landscaping.
- Raised garden beds.
- Access to bus routes and bike paths.

- Do not build in the floodplain or within 100 feet of a body of water.
- Greywater systems.
- Composting toilets.
- Rainwater catchment systems.
- Passive solar design.
- Solar electric and solar hot water.
- Use permeable materials for 50 percent of walkways and patios.
- Use permeable materials for driveways (except for required curb cut).

■ Vegetated roof system to reduce impervious surface.

■ Remove existing invasive plant species from the landscape.

■ Preserve existing and plant new trees.

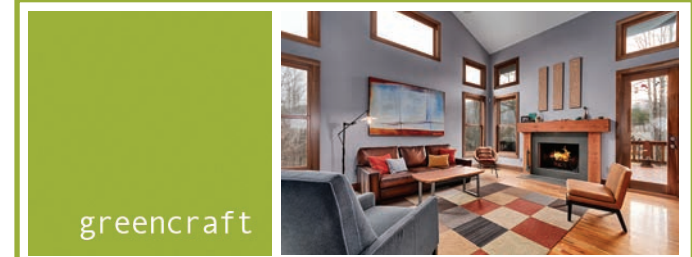
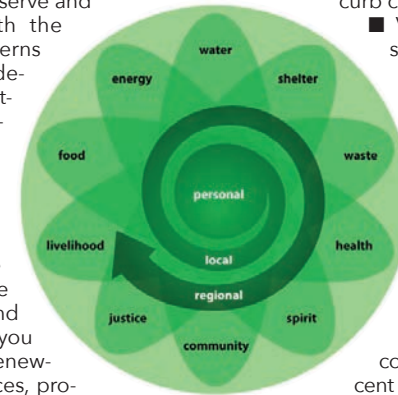
■ If trees are removed during construction, 80 percent of them are milled and used onsite.

Additionally, The Green Gauge program encourages the planting of edible landscapes, walkable community development, and site restoration to minimize stormwater runoff and create raingardens and rich, abundant landscapes that retain water, grow food, create habitat, and provide beauty.

Building codes need to evolve to legalize and encourage things like greywater systems, composting toilets, and some natural building techniques and materials. As more people use these products and systems, the familiarity will increase, precedent will be set, and regulators will get more comfortable seeing them.

If you are searching for a good introduction and overview of permaculture read “Gaia’s Garden” by Toby Hemenway.

Sam is the executive director of the WNCGBC and has been working in the field of sustainability for 18 years with local governments, small businesses and nonprofits. He is a LEED AP and Certified Permaculture Designer.



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Support your local forests

Root Cause to connect sustainable forestry to local builders

□ BY LANG HORNTHAL □

In April 2016, the U.S. Green Building Council announced the Alternative Compliance Path (ACP), a pilot program designed to advance environmentally responsible forest management practices while promoting the use of responsible wood sourcing. ACP seeks to expand the range of responsible forest products for LEED credits by recognizing Forest Stewardship Certification (FSC), Sustainable Forestry Initiative (SFI), American Tree Farm Systems, and other programs endorsed by the Programme for the Endorsement of Forest Certification. The intent of the program is to promote wise forest management and minimize the illegal procurement of wood. It will also benefit local forest products.



Lang Hornthal

Asheville residents are well known for buying local and supporting local farmers' markets and local businesses through the Go Local program. Buying local often means keeping up to three times more money in the local economy. It lends greater support to our community and civic needs. Buying local forest products offers the same opportunity, but it is unique in that it also supports the use of a raw material also found in our backyard.

Our region is known as the "Birthplace of Modern Forestry," where wise forest management was proven to increase the health of a forest while improving the quality of the trees being grown. There is also a history of abusing our forests, but the beauty seen in our surrounding forests is a reminder that our forests are resilient and renewable. Today, clear cutting and illegal harvests have taken a backseat to invasive species and climate change as the biggest threats to our forests. Regardless of the threat, the need for sustainable forestry remains.

Sustainable forestry means different things to different people. To some, it is more conservation-oriented where a forest's health is for the benefit of the ecosystem services they provide: clean air and water, biodiversity, and wildlife habitat, just to name just a few. To others, sustainable forestry is the management of forests for increased yield and healthy trees, which can be cut for the creation of jobs and supply of shelter, food and warmth. As a student obtaining a Masters of Science in Sustainability Studies program at Lenoir-Rhyne University, I embrace a definition of sustainability that encompasses an environmental, economic and social measure as our forests continue to support the needs of the current generation, without compromising the ability of future generations to meet their needs.

The complexity of forest ecosystems is incredible and how forests are best utilized will always mean different things to different people. Solitude, recreation, and livelihood are just a few, but all acknowledge that



the importance of forests cut across all sectors of society. But, in the end, with the exception of our phenomenal public forests, trees are private commodities that give benefits which are shared with the greater public. The clean air we breathe, water we drink, and viewsheds we enjoy are the direct result of private landowners, many of whom have management plans that benefit their forests health. Without conscientious landowners, Western North Carolina would not likely be the draw that it is today.

So, how can we support those landowners and their forests that support our region? One way is by acknowledging the efforts made by landowners to certify their forests. Forest certification is a mechanism for gauging the quality of forest management against a set of standards that are meant to account for many aspects including growth, harvesting and ecological impacts associated with harvesting. Certification not only improves the value of the trees grown, but also signals the level of commitment that the landowner is giving to their forest's management. These

By using local materials, you are contributing to an economy that breeds accountability and transparency by creating relationships that go beyond a Google search and an email.

benefits come with an added layer of management, requiring third-party certifiers to inspect and verify the management efforts. But, access to certified wood markets and healthier forests make it worthwhile.

Another way to support your local forests is to buy local wood. Not all landowners are in a position to certify their forests, but when local wood markets are vibrant, demand will set fair pricing that adequately values local wood and encourages those owners to maintain their forests, rather than converting them to other uses. It also means that more wood stays in our region, creating a smaller carbon footprint, and increasing jobs for loggers, sawmills, wood processors, and end-users. Once again, more money stays in our region under this scenario. This exponentially supports our communities, particularly the more rural counties with a his-

tory of relying on forests for survival.

We will also begin to see many wood products return to our region after losing market share due to a global marketplace and the most recent economic downturn. While the economy has returned, resulting in a regrowth in the building industry, the competition from outside goods remains. Often, these goods are competitively priced and produced on a scale in which smaller mills cannot compete. But, like all markets, there is more to something than just the lowest price. Like knowing where your wood came from and who cut the tree and turned it into a product with a story behind it and a quality that could be relied upon. By using local materials, you are contributing to an economy that breeds accountability and transparency by creating relationships that go beyond a Google search and an email.

While building has returned, the market is still competitive, requiring builders and their clients to carefully consider all aspects of construction while staying on budget. To truly utilize more local forest products requires a trustworthy network of suppliers that can deliver what they promise at a price that was promised. Developing this network will require a consistent supply and demand, but, like the chicken or the egg, which comes first? While the chicken versus the egg answer has eluded me, I believe a solution to our local wood products market is within reach.

Root Cause, with the help of the WNCGBC, is reestablishing the network of quality wood products that can be used by the building industry. To accomplish this, we will identify those products that are sorely needed and cannot be sourced locally. Root Cause is dedicated to helping facilitate the creation of those products and supporting local mills and processors in a manner that will allow them to offer desired products, ultimately becoming certified (if desired). These efforts will require listening to the needs of builders and forest product industry alike, with the end goal of sustainably satisfying those needs and those of our forests.

To learn more about Root Cause and to find more information on local forest products, visit www.root-causewnc.org.

Lang Hornthal is the owner of Appalachian Designs and executive director of Root Cause, an advocacy group for the wise management of our local forests. He is also a student at Lenoir-Rhyne University in Asheville where he is completing his Masters of Science in Sustainability Studies.

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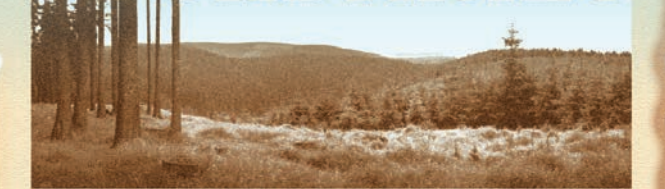
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The journey to being a better corporation

BY LEIGHA DICKENS
 "We envision a global community that uses business as a force for good."

That is the opening line of the B Corporation declaration, a document that business leaders sign as part of a final step to transfer their company's incorporated status from that of a standard for-profit company into a B Corporation®, or B Corp™.

B Corporations represent the evolution of capitalism, a recognition that for-profit companies can, and should, use their enterprises to drive positive change across the globe. Administered by the non-profit B Labs®, earning B Corp certification for a company is a lot like getting a green building certification of a home. Points are awarded for complying with corporate best practices in the categories of social and environmental performance, public transparency and legal accountability. Just like many green building certifications, a company must earn enough total points to achieve certification.

Here at Deltec Homes, we recently undertook the journey to becoming an official B Corp: a move that we thought would be good for us, good for our clients, and good for many businesses in the area as well.

A great fit for green building

The built environment comprises a huge component of our daily lives. The green-building industry should be a natural place for B Corporations, as many green building practices have social and environmental aims. From the perspective of a customer who wants to build a green home, a B Corp offers a great way to ensure that the company values reflect your values. Some of the practices that are recognized by B Corp certification:

- Providing a living wage for all employees, ensuring that your green home is built by people who are likewise invested in, and can equally afford, to stay in this community.

- Environmental sustainability on a deep level. Products that reduce waste, are made of materials sourced from other suppliers who have programs for sustainability, that do not contain harmful chemicals, and that exceed industry standards for energy efficiency.

- Partnering with local nonprofits and advocacy groups to educate and influence state-level policies supporting green building and energy efficiency in the built environment. In our case, we have partnered with great organizations like the WNC Green Building Council and the North Carolina Building Performance Association.

How it helped us

Sustainability has been a priority for our company since the beginning, so some parts of our B Corp certification process were simple. We had already been producing our panelized home product with 100 percent renewable energy and monitoring our process for waste reduction – with more than 78 percent of excess material diverted from the landfill. Other parts of the certification process forced us to push deeper, a great thing for our growth.

- Better documentation. Since setting out to achieve B Corp Certification, we've realized the importance of documenting some of the sustainability policies that as a small business, we had been doing but not thoroughly tracking. For example, how many of our clients exceeded our energy-efficiency goals, and by what amount? What percentage got adequate consulting on indoor air quality? This has helped us see patterns in



B Corporations represent the evolution of capitalism, a recognition that for-profit companies can, and should, use their enterprises to drive positive change.



The Deltec manufacturing process exemplifies B Corps goals for responsible business. Deltec Homes photo

Learn More

The B Corp movement is growing, and there are numerous ways to take part locally:

- Online at www.bcorporation.net
- Mountain Bizworks has partnered with local B Corps to host educational events for the community. On June 21, 2016, a B Corp Hack-A-Thon was held where interested parties could come ask questions and meet with B Labs representatives. www.mountainbizworks.org/business-planning-start-ups-entrepreneur-classes-coaching/bcorps/
- B Corp Meetup Group: www.meetup.com/BtheChangeAsheville/

our projects, maintain knowledge and push for even greater improvements.

- Increased transparency and dialogue with employees. We needed our employees to have a better understanding of where our company stood, and how their efforts were helping move the company forward. Like all companies, we want our employees to stay invested, so we created new programs to give all employees a chance to generate ideas for the company and participate in the process of bringing those ideas to fruition.

It has already been clear that this designation has helped us build value with our clients. Although we already offer a unique product, certification gives clients another compelling reason to spring for us over someone else who may be less expensive, but who also offers less. Being a B Corp also lets us into a wide community of other B Corps of all sizes (such as New Belgium and Patagonia), bringing their missions to their work in their own unique ways, with whom we can share ideas and learn ways to keep improving.

Lastly, B Corp Certification gives us a motivation to keep asking deeper questions of ourselves. Are we continuing to live up to our sustainability mission, and how can we use all of our (now well documented) policies and metrics to keep doing better? How do our employees' needs change? How does our business and our product affect our community in ways that we hadn't even thought of before? Once you build the habit of thinking along these newer lines, you can see things you've never noticed before.

Leigha Dickens is Green Building and Sustainability Manager for Deltec Homes, a manufacturer of hurricane-resistant, energy-efficient and net-zero homes for more than 45 years. Leigha helped usher Deltec through the B Corp certification process. She is a RESNET HERS Rater and graduate of UNC-Asheville with a degree in physics.



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Smart practices in water conservation

BY BRIAN KNIGHT

Water and energy use are connected. Saving energy reduces water pollution. Conserving water reduces energy use. Coal-fired power plants consume extreme amounts of water to produce electricity. Mining and burning coal pollute our soil, streams, lakes and oceans. Natural gas extraction pollutes ground and surface water affecting people's drinking water. One excellent path for improving our environment's water quality involves spending less on heating water.



ENERGY STAR offers a 2016 review of the most efficient washing machines available. If buying new, or replacing existing, this investment is solid. Extra effort spent sourcing more efficient models has big paybacks.

Efficient Plumbing Design

- New construction offers enormous opportunity for a compact and efficient plumbing design.
- Small plumbing footprints are an extremely cost-effective strategy for saving energy and water.

Lag time is how long it takes for hot water to arrive at the faucet after turning it on. Not only is it a gigantic waste of water and energy, it is an inconvenience and wastes time. No one wants to wait for hot water. The faster that sinks and showers deliver hot water, the better.

Smarter, smaller plumbing layouts save money on material and labor costs. Less connections and fewer roof boot penetrations reduce maintenance, and increase durability by preventing bulk water damage. No. 2 on our top three ways water destroys homes and buildings.

Drain waste heat recovery

Small plumbing footprints usually offer a better opportunity for waste heat recovery. These are more of an energy-saving feature but are directly tied to water usage. They make sense when the most heavily-used showers have a waste stack in a lower level. These simple



Many water conservation measures can be "do-it-yourself."

Existing homes should consider replacing older plumbing faucets and choosing the most efficient washing machines and dishwashers.

systems dramatically improve the energy efficiency of showers, washing machines and dishwashers. Incoming cold water supply wraps the outgoing, warm waste pipe, capturing energy.

Drain waste heat recovery can have simple paybacks in the 3.5- to eight-year range for most residential systems, depending on consumption and efficiency of the water heater. These systems have no moving parts and should have long lives. This investment usually beats solar PV and easily beats geothermal. Another renewable method,

similar to waste heat recovery, is compost water heating.

Reducing Lag Time In Other Ways

Insulate Hot Water Distribution. This can reduce lag time and energy use.

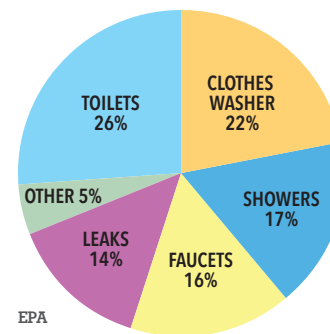
Plumbing Manifolds, Home Runs or More Efficient Distribution

Dedicated pipes of a smaller diameter run to individual fixtures. Typical trunk-and-branch layouts have larger diameters which take longer to flush with hot water from the water heater. Smaller pipes have less water to flush but need dedicated lines for enough pressure. We find it tough to make cost-effective with the extra material and labor charges. A typical trunk-and-branch system can often be designed to be nearly as effective with reduced costs.

Hot Water Recirculation

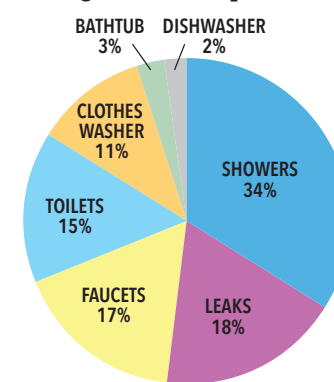
Circulating loops are more of a convenience but do save water. Most systems exist in big homes with lots of space between

Indoor Water Usage: Existing Home



EPA

Indoor Water Usage: High-Efficiency Home



fixtures. Smaller plumbing footprints reduce or eliminate recirculating hot-water systems.

Most recirculation systems are continuously circulating, a crime to the environment and dirty energy costs. Circulating water continuously from the heater to the faucets wastes energy through the pump, water heater and air conditioner. These systems are usually in oversized houses and result in an oversized amount of waste.

More efficient systems activate

the recirculating pump just before hot water is needed. This can be done with a manual switch, timer, or motion detector. These simple controls combined with efficient pumps offer substantial energy improvements. They can also reduce maintenance needs.

This issue is heavily influenced by certain occupant behavior. Those that habitually turn water on and do other things while hot water washes down the drain could benefit more from circulation or an ad-

justment in habits. This comes from a guy who habitually takes 20 minute hot showers. At least I am enjoying the source of my waste and pollution.

Indoor Water Use: Low-Hanging Fruit

The chart on the far left represents an average, existing home. The large toilet consumption being an obvious target for gallons-per-flush restrictions. Clothes washers stand out with the water + energy concerns. It's interesting that dishwashers are nearly immeasurable compared to the biggest-volume users and should be chosen based on energy costs and cleaning performance.

Newer homes built to code begin to change this big picture

The chart on the right depicts averages for newer, more efficient homes; new toilets, high-efficiency washing machines and low-flow fixtures. Interestingly, leaks become the second biggest source of water use indoors. Leak-detection devices may be considered for homes looking to cut water use and reduce problems.

Most leakages are probably from

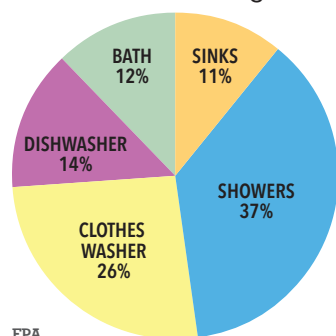
the common issues associated with a toilet's upper tank. Learning to fix these simple problems or hiring a plumber is extremely important for saving water.

These are the most cost-effective approaches to water conservation. Hot water always offers the fastest fiscal and environmental payoffs. Existing homes should consider replacing older plumbing faucets and choosing the most efficient washing machines and dishwashers. Most of a new home's hidden opportunities lie in efficient plumbing footprints and drain waste heat recovery.

For those that garden or irrigate their landscape, outdoor water usually accounts for the biggest overall consumption of water. While it's tougher to make cost-effective, rain-water catchment can be a good choice for many projects.

Springtime Builders is an Asheville green builder specializing in building science best practices. Brian Knight is owner and manager of Springtime Builders. He has a college degree in Business, Construction Management & Technology and Appropriate Technology from Appalachian State University. Since 2001, he has been a construction manager for a production builder, luxury builder and land developer. He started Springtime in

Hot Water Usage



EPA

Cost-Effectiveness Starts with Hot Water

It takes enormous amounts of energy to heat water. That energy is typically supplied by nuclear and fossil fuels. The biggest fiscal and environmental benefits start with reducing hot water usage.

Showerheads

Showerheads that use 2.5 gallons per minute still represent one of the fastest paying investments in energy and water conservation, especially when compared to older or higher flow heads.

Washing Machines

The No. 2 hot water user and most important appliance investment for energy and water con-

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From the team at WNCGBC.

Sealing the envelope

Small measures can equal great gains in efficiency



Air sealing Checklist

BY MAGGIE LESLIE
 Air sealing is a crucial part of building a healthy, energy-efficient home. Below is a checklist of items to use to ensure proper air sealing when building or renovating a conventional stick-frame home. A leaky home will decrease the R-value of your insulation (the measure of how well your insulation resists heat flow), create unwanted drafts and comfort issues, and bring moisture and pollutants into the home. As the saying goes, "Seal it tight, and insulate it right!"

- All holes or penetrations in the building envelope are sealed with

- a material capable of stopping air-flow, such as caulk, foam or rigid material (fibrous insulation does not stop airflow).
- Windows and exterior doors are sealed with backer rod, caulk or non-expanding spray foam.
- Electrical, plumbing and HVAC penetrations between conditioned and unconditioned space are sealed with caulk or spray foam.
- The bottom and top plates of exterior walls and walls to the attic are sealed with caulk or sill seal.
- Band joists are sealed with caulk, spray foam, or gasketing between the top plate and band joist, between band joist and subfloor and at any penetration. Any joists or

- other cavities that span from conditioned to unconditioned spaces are blocked off and air sealed.
- All chase ways that would allow unconditioned air to enter into the conditioned building envelope are capped and sealed.
- Exterior walls behind tub and

shower enclosures are insulated. Prior to installing the tub or shower, a rigid, durable air barrier is installed in direct contact with the insulation.

- Insulation wind baffles to block windwashing at all attic eave bays in roof assemblies with soffit vents are installed.
- An air barrier is blocking any exposed edges of insulation, particularly for cantilevered floor systems and floors above a garage.
- For fireplace cavities on exterior walls a rigid air barrier is fully aligned with the insulated framing in the framed shaft behind the fireplace and any gaps are fully sealed with foam, caulk or tape.
- Recessed light fixtures (if installed in insulated cavities, such as the ceiling between the house and the attic) are rated ICAT (Insulation Contact, Air Tight). Once installed, they are sealed to the drywall with gasket, caulk or foam.

Sources for this fact sheet include Advanced Energy System Vision Guidelines, Southface Energy Institute Technical Bulletins, HealthyBuilt Homes program guidelines and Energy Star guidelines for homes and indoor quality.



Air sealing a home is critical for maximum energy efficiency. Donated photo



Sealing leaks around ductwork improves efficiency. Donated photo

HVAC Checklist

BY MAGGIE LESLIE
 A home can be heated or cooled using electricity, gas, geothermal energy, solar energy or a combination of energy sources. Radiant floor-heating systems are an inherently efficient way to heat, since there is no heat lost through ductwork, but a forced-air heating system can also be a very efficient option if designed and installed properly. The items on this checklist should be considered when installing any type of ducted system.

- First off, a room-by-room manual J heat-loss/heat-gain calculation must be completed. The maximum-oversizing limit for air conditioners and heat pumps is 15 percent. Adhering to the maximum-oversizing limit both ensures that you are not paying for more capacity than you need and that the system will properly dehumidify the home and run efficiently.
- Heat pumps and air conditioners have a Seasonal Energy Efficiency Ratio rating of at least 14 SEER and a Heating Season Performance Factor of at least 7 HSPF. Gas furnaces used for either primary heat or back-up heat have a rating of at least 90 Annual Fuel Utilization Efficiency.
- Ductwork are located and the mechanical unit in the conditioned space, if possible. All ductwork has an insulating value of R-8.
- Use rigid-metal ductwork for increased durability and air quality. Rigid metal is easy to clean, and will not trap dust or absorb moisture.

- Building cavities, such as floor joists, are not used as part of the forced-air supply or return system.
- All joints/seams in the air-distribution system are sealed using fiberglass mesh tape and duct mastic; this includes duct connection to metal boots (in subfloor), trunk lines and air-handler units. The insulating liner of the ducts is also sealed with mastic.
- Indoor and outdoor HVAC units are matched according to the Air-Conditioning & Refrigeration Institute Directory or the manufacturer's listing.
- The correct charge of refrigerant has been installed per the manufacturer's specifications.
- Registers and diffusers have proper throw and spread to keep rooms properly conditioned as the load specifies.
- Duct dampers are installed and accessible on supply vents. The dampers make it possible to adjust the flow and spread of air from the registers.
- Ducts are sealed and tested by a Home Energy Rater to have no more than 5 percent leakage.
- If installing a heat pump, an outdoor thermostat is installed to control when the electric heat strip's power is on. This will maximize your efficiency.
- A programmable thermostat is installed.

Sources for this fact sheet include Advanced Energy System Vision Guidelines, Southface Energy Institute Technical Bulletins, HealthyBuilt Homes program guidelines and ENERGY STAR guidelines for homes and indoor quality.

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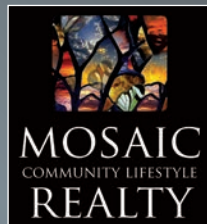
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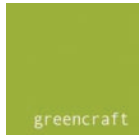
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NCBPA is a 501(c)(6) nonprofit trade association dedicated to growing North Carolina's home and building performance industry through public education, workforce development, advocacy and much more.



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Vandemusser Design provides technical consulting and certification services for green residential construction to builders, architects, developers, and homeowners in Western North Carolina, Tennessee, Virginia, South Carolina and Georgia. Our company is run by an architect and engineer with extensive experience in the industry. We are here to assist with the technical aspects of green building, regardless of whether you are renovating, designing a new home, or certifying the construction of a new home.

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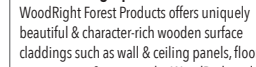
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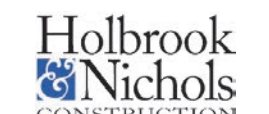
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Solar heat absorbed through windows and roofs can increase cooling costs, and incorporating shade from landscaping elements can help reduce this solar heat gain. Shading and evapotranspiration (the process by which a plant actively moves and releases water vapor) from trees can reduce surrounding air temperatures as much as 6° F. Because cool air settles near the ground, air temperatures directly under trees can be as much as 25°F cooler than air temperatures above nearby blacktop.

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